PLANNING COMMISSIONERS

BRIAN LOWELL
Chair

JEFFREY BARNES
Vice-Chair

RAY L. BAKER
Commissioner

JEFFREY SIMS
Commissioner

CARLOS RAMIREZ
Commissioner

PATRICIA KORZEC
Commissioner

VACANT
Commissioner

PLANNING COMMISSION
Regular Meeting

Agenda

Thursday, March 9, 2017 at 7:00 PM
City Hall Council Chamber – 14177 Frederick Street

CALL TO ORDER

ROLL CALL

PLEDGE OF ALLEGIANCE

APPROVAL OF AGENDA

CONSENT CALENDAR
All matters listed under Consent Calendar are considered to be routine and all will be enacted by one roll call vote. There will be no discussion of these items unless Members of the Planning Commission request specific items be removed from the Consent Calendar for separate action.

APPROVAL OF MINUTES

PUBLIC COMMENTS PROCEDURE
Any person wishing to address the Commission on any matter, either under the Public Comments section of the Agenda or scheduled items or public hearings, must fill out a "Request to Speak" form available at the door. The completed form must be submitted to the Secretary prior to the Agenda item being called by the Chairperson. In speaking to the Commission, member of the public may be limited to three minutes per person, except for the applicant for entitlement. The Commission may establish an overall time limit for comments on a particular Agenda item. Members of the public must direct their questions to the Chairperson of the Commission and not to other members of the Commission, the applicant, the Staff, or the audience.

NON-PUBLIC HEARING ITEMS

Upon request, this agenda will be made available in appropriate alternative formats to persons with disabilities, in compliance with the Americans with Disabilities Act of 1990. Any person with a disability who requires a modification or accommodation in order to participate in a meeting should direct such request to Guy Pegan, ADA Coordinator, at 951.413.3120 at least 72 hours before the meeting. The 72-hour notification will enable the City to make reasonable arrangements to ensure accessibility to this meeting.

Planning Commission Rules of Procedure (Report of: Community Development)

PUBLIC HEARING ITEMS

1. Case: PEN16-0131 (PA15-0032 Master Plot Plan), PEN16-0132 (PA16-0004 Plot Plan), PEN16-0133 (PA16-0005 Plot Plan), & PEN16-0134 (PA16-0006 Plot Plan)

   Applicant: Moreno Valley Cactus Center

   Owner: P6K Portfolio MVCP LLC

   Representative: Ino Cruz

   Location: Northeast corner of Cactus Avenue and Commerce Center Drive

   Case Planner: Gabriel Diaz

   Council District: 1

   Proposal: PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

STAFF RECOMMENDATION

Staff recommends that the Planning Commission **APPROVE** Resolution No. 2017-14 and thereby:

1. **ADOPT** a Mitigated Negative Declaration for Master Plot Plan PEN16-0131, Plot Plan PEN16-0132, Plot Plan PEN16-0133, & Plot Plan PEN16-0134 pursuant to the California Environmental Quality Act (CEQA) Guidelines; and

2. **APPROVE** the Mitigation Monitoring and Reporting Program prepared for Master Plot Plan PEN16-0131, Plot Plan PEN16-0132, Plot Plan PEN16-0133, & Plot Plan PEN16-0134 pursuant to the California Environmental Quality Act (CEQA) Guidelines, and included as Exhibit A; and

3. **APPROVE** Master Plot Plan PEN16-0131, Plot Plan PEN16-0132, Plot Plan PEN16-0133, & Plot Plan PEN16-0134, subject to the attached conditions of approval included as Exhibit B.

OTHER COMMISSION BUSINESS

STAFF COMMENTS

PLANNING COMMISSIONER COMMENTS

ADJOURNMENT

Next Meeting: Planning Commission Regular Meeting, March 23, 2017 at 7:00 P.M., City of Moreno Valley, City Hall Council Chamber, 14177 Frederick Street, Moreno Valley, CA 92553.

PLANNING COMMISSION

STAFF REPORT

Meeting Date: March 9, 2017

PLANNING COMMISSION RULES OF PROCEDURE

SUMMARY

On February 23, 2017 the Planning Commission, under the Other Commission Business portion of their meeting agenda, considered their current adopted Rules of Procedure (Rules). Two particular areas of consideration included 1) Clarification in the Rules on how a vacant seat at a Commission meeting can be filled at a subsequent meeting on a continued public hearing agenda item, and 2) Modification of the Rules to permit Alternate Commissioners to be included in the count for establishing a quorum for a Planning Commission meeting.

Upon concluding their discussion, the Planning Commission directed staff to prepare modifications to the Rules and to bring them back to the Planning Commission for subsequent consideration and action. Attachment 1 to this staff report is a redline version of the Planning Commission Rules of Procedure showing the recommended language modifications that reflect the Planning Commission's direction.

Specifically, Section I - G. ABSENCES AND VACANCIES (4) on page 5 of the Rules reflects the modified language to provide clarification on how a vacant seat can be filled. Section II - I. VOTING REQUIREMENTS (1a) on page 9 of the Rules reflects the modified language to provide clarification on counting Alternate Commissioners for purpose of establishing a quorum for a meeting.

Attachment 2 to this report is a clean version of the recommended modified Rules.

STAFF RECOMMENDATION

Staff recommends that the Planning Commission review and approve the revised Planning Commission Rules of Procedure.

Prepared by:
Erica Tadeo
Administrative Assistant

Approved by:
Allen Brock
Community Development Director

ATTACHMENTS

1. PC RULES OF PROCEDURE Redline 03022017
2. PC RULES OF PROCEDURE Clean Draft 03022017

CITY OF MORENO VALLEY

PLANNING COMMISSION RULES OF PROCEDURE

I. RULES OF ORDER, ORGANIZATION AND OFFICERS

A. RULES OF ORDER

Except as otherwise provided in these Rules of Procedure, "The Standard Code of Parliamentary Procedure 4th Edition," shall be used as a guide to the conduct of the meetings of the Planning Commission; except as may otherwise be provided by applicable law, no omission to conform to said rules of order shall in any instance be deemed to invalidate any action taken by the Commission.

B. ORGANIZATION

The Planning Commission shall consist of seven regular members and two alternate members and shall be organized and exercise such powers as prescribed by Ordinance of the City of Moreno Valley.

C. OFFICERS

1. SELECTION

a. A Chairperson and Vice-Chairperson shall be elected annually from among the Commission's membership at the first meeting in April, to serve at the pleasure of the Commission. The term of office for Chairperson and Vice-Chairperson shall be one (1) year. No person shall serve more than two consecutive terms as either Chairperson or Vice-Chairperson, however a commissioner may serve for two consecutive terms as Vice-Chairperson followed by two consecutive terms as Chairperson, or vice versa.

b. If the Chairperson vacates his or her office before the term of office is completed, a new Chairperson shall be elected at the next regular meeting. A new Vice-Chairperson shall also be elected if the former Vice-Chairperson is elected Chairperson.

c. In the absence of the Chairperson and Vice-Chairperson, any other member may call the Commission to order, whereupon a Chairperson pro tem shall be elected from the members present to preside. Alternate members shall not be eligible to serve as Chairperson or Vice-Chairperson.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

2. RESPONSIBILITIES

The responsibilities and powers of the officers and staff of the Planning Commission shall be as follows:

a. Chairperson

1) Preside at all meetings of the Commission.
2) Call special meetings of the Commission in accordance with legal requirements and these Rules of Procedure.
3) Sign documents of the Commission.
4) See that all actions of the Commission are properly taken.
5) Assist staff in determining agenda items.
6) The Chairperson shall be an ex-officio member of all committees of the Planning Commission with voice but not vote.

b. Vice-Chairperson

During the absence, disability or disqualification of the Chairperson, the Vice-Chairperson shall exercise or perform all the duties and be subject to all the responsibilities of the Chairperson.

c. The Planning Official with the assistance of his staff, shall be responsible for providing the Commission with proposed minutes of its meetings, with proposed forms of resolutions when appropriate, with staff reports and recommendations on matters of business which come before the Commission, and with proposed forms of recommendations and reports for the Commission.

D. POWERS AND DUTIES

The functions, powers and duties of the Planning Commission shall be all those functions, powers and duties of a Planning Commission and Board of Zoning Adjustment as provided in Chapters 3 and 4 of Title 7 commencing with Section 65100 of the Government Code of the State (the Planning and Zoning Law), as the same may be hereafter amended. The Planning Commission shall perform such other duties and functions as may be designated by the City Council.

E. ETHICAL PROCESS AND PROCEDURE

1. Whenever after appointment, a Commissioner possesses or is likely to possess a financial interest in a project which is pending or likely to be pending in the foreseeable future before the Commission, it is the duty of the Commissioner to disclose for the

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

record the interest and abstain not only from discussion and voting, but a higher duty to abstain from discussion with any other Commissioner or staff concerning any matters relevant to the project, wherein the Commissioner has a financial interest in the decision.

2. It is equally unethical and improper for such Commissioner to recommend to other individuals that they contact other Commissioners or staff with respect to any matter relevant to the project.

3. Whenever a Commissioner discovers the existence of a possible conflict of interest and is unsure as to that situation, the Commissioner should consult with the City Attorney or the staff of the FPPC for clarification of his or her position; in the event a financial interest or likely financial interest exists in a project, the record should so disclose and be available for review.

4. No Commissioner should continue to serve as a Commissioner if it appears likely that he or she will receive substantial financial gain (obtain a financial interest as defined in the FPPC) from a large number of Planning Commission decisions on projects in a broad area of interest.

5. Nothing contained herein shall be construed to relieve a Commissioner of any duty imposed by State law or to change the law and regulations applicable to conflict and disclosure matters.

6. With respect to membership by a Commissioner in any other organization which may be incompatible with membership on the Planning Commission, the Commissioner should consider, to the extent recognized by law, any or all of the following, as may be applicable:

   a. Withdrawal of membership from either the Commission or the said organization.

   b. Leave of absence from the conflicting organization.

   c. Inactivity during Commission tenure.

   d. Being a non-voting participant in the conflicting organization.

   e. Being a non-office holder in the conflicting organization.

   f. Being a non-policy making member in the conflicting organization.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

g. Making no public statements within or about the organization.

F. FITNESS TO SERVE; STATEMENT OF PRIOR CONVERSATIONS

1. Any Planning Commissioner who wishes to serve the City of Moreno Valley shall adhere to the goals, performance objectives, duties, responsibilities, ethical process and procedure, and public relations standards as herein listed.

2. Present Commissioners who wish to serve but cannot justifiably adhere to the contents of these Rules of Procedure must evaluate their fitness to serve.

3. Any Commissioner shall declare, prior to voting in the recorded minutes, whether or not they talked or otherwise communicated independently with the developer, with the proponents, or with the opponents or with a representative of the developer, proponents or opponents concerning a project under consideration. Commissioners shall further publicly disclose the substance of any such communication.

G. ABSENCES AND VACANCIES

1. Permanent or long term Commissioner vacancies shall be filled by alternate Commissioners in accordance with Ordinance 890 of the City of Moreno Valley.

2. Regular and alternate Commissioners should attempt to attend all meetings. In the event of an absence of a regular Commissioner for all, or any part of a meeting, an alternate Commissioner who is present shall be seated to serve as a full voting member of the Commission. If alternate Commissioners are not available to serve or are disqualified from serving for any reason, the Commission shall continue with the remaining regular Commissioners as long as a quorum is present. The minutes shall reflect the attendance, seating and voting record of all regular and alternate Commissioners.

3. Alternate Commissioners shall be called on a rotational basis if available. Each meeting will have a Primary and Secondary alternate Commissioner, which assignment shall rotate every meeting. If there is more than one absence or vacancy, the secondary alternate Commissioner may also be called to serve. The service or non-service of one or both alternate Commissioners at any meeting shall not affect the rotational order for any future meeting. For the first meeting after any appointment, the rotational order shall be established in alphabetical order by the last name of the Alternate Commissioner.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

4. If a ~~regular or alternate~~ Commissioner is seated on the first day of any public hearing item, such Commissioner shall continue to be seated for that item until the completion of the vote on that item, without regard to the number of meeting dates the item is continued over. ~~In the event of an absence on any subsequent hearing date, no new Commissioner shall be seated in the vacant seat.~~ If a Commissioner seat was vacant on the first day of a public hearing item, that vacant seat may be filled by a regular or alternate Commissioner on future continued hearing dates ~~A regular or alternate Commissioner may fill a previously absent seat on a public hearing item only~~ if he/she makes a statement on the record that he/she has either (a) attended all prior hearing dates, (b) read all prior hearing transcripts, or (c) listened to the recordings ~~if~~ of all prior hearings on the item. If a Commissioner has not met the aforementioned requirements, they shall be declared ineligible to be seated on the Commission for that item. In no case shall two different Commissioners fill the same vacant seat on any single public hearing item.

5. Alternate members shall be deemed to be participating in a meeting if they are seated as a voting member for all, or any part, of a meeting.

6. Commissioners may participate in the discussion and debate of an agenda item only if seated as a voting Commissioner.

II. MEETINGS

A. PUBLIC MEETINGS

All meetings shall be held in full compliance with state law, ordinances of the City, and these Rules of Procedure.

B. REGULAR MEETINGS

1. Regular meetings shall be held on the second and fourth Thursdays of each month at 7:00 p.m in the Council Chambers at City Hall, 14177 Frederick Street, Moreno Valley, California, unless otherwise determined by the Commission.

2. Whenever a regular meeting falls on a public holiday, no regular meeting shall be held on that day. Such regular meeting shall occur on the next business day, or cancelled by motion adopted by the Planning Commission.

C. ADJOURNED MEETINGS

In the event it is determined by the Planning Commission to adjourn its meeting to a certain hour on another day, a specific date, time, and place must be set by the Commission prior to the regular motion to adjourn, and the meeting so adjourned.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

D. SPECIAL MEETINGS

Special meetings of the Planning Commission may be held at any time upon the call of the Chairperson or by a majority of the voting members of the Commission or upon request of the City Council following at least 48 hours' notice to each member of the Commission and to the press, and to each person who has duly requested notice of such meetings. The time and place of the special meeting shall be determined by the convening authority, except that the meeting place shall be within the corporate limits of the City. Only those matters of business described in the call and notice for a special meeting shall be considered by the Commission.

E. STUDY SESSIONS/WORKSHOPS

1. The Commission may be convened as a whole or as a committee of the whole in the same manner as prescribed for the calling of a special meeting for the purpose of holding a study session provided that no official action shall be taken and no quorum shall be required.

2. All study sessions shall be open to the public.

F. AGENDA

1. An agenda for each meeting of the Commission shall be prepared by the Planning Official or his delegate with the cooperation and approval of the Chairperson or in the absence of the Chairperson, by the Vice-Chairperson.

   a. The Commission cannot guarantee that applicants meeting filing deadlines will be placed on the agenda of the first meeting thereafter.

   b. A copy of the agenda for each meeting of the Commission shall be posted at City Hall seventy-two (72) hours prior to each regular meeting and at least twenty-four (24) hours prior to each special meeting of the Commission.

G. ORDER OF MEETINGS

1. Unless the Chairperson in his or her discretion otherwise directs, the order of business shall be as follows:

   a. The Chairperson shall take the chair precisely at the hour appointed for the meeting and shall immediately call the Commission to order.

   b. Members present and absent shall be recorded, including any alternate members. Alternate members shall be seated on the Commission, if necessary. If all regular

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

Commissioners are present and no conflicts of interest have been announced or appear to be likely, the alternate members may be excused and review the video or transcript of the meeting in lieu of attendance.

c. Pledge of Allegiance shall be made.

d. The agenda shall be approved as submitted or revised (to the extent permitted by law).

e. The public shall be advised of the procedures to be followed in the meeting.

f. The minutes of any preceding meeting shall be submitted for approval.

g. Public comment shall be taken, during which any member of the audience may comment on any matter which is not listed on the agenda. A time limit of three minutes shall be imposed on each individual.

h. The Commission shall then hear and act upon those proposals scheduled for consideration at public hearing, followed by such other matters of business and reports as the Commission or Planning Official finds to require Commission consideration, and as may be properly considered at that time.

i. No action shall be taken by the Commission during any regular meeting on any item not appearing on the posted agenda unless any of the following conditions apply:

1) A majority of the Commission determines that an "emergency situation" exists.

2) The Commission determines by a two-thirds vote, or by a unanimous vote if less than two-thirds of the members are present, that the "need to take action" on the item arose subsequent to the posting of the agenda, or

3) The item was included in a properly posted agenda for a prior meeting occurring not more than five days prior to the date of the meeting at which the action is taken and was continued to the meeting at which the action is taken.

j. At 11:00 p.m., or as soon thereafter as practicable, a Commissioner may make a motion to adjourn the meeting and continue any remaining items to a future date.

k. Adjournment.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

2. PRESENTATION OR HEARING OF PROPOSALS

The following shall be the order of procedure for public hearings or other proposals concerning planning and zoning matters, and for testimony, unless the Chairperson in his or her discretion shall otherwise direct.

a. The Chairperson shall announce the subject of the public hearing or other proposals as advertised.

b. If a request is made for continuance, a motion may be made, seconded and voted upon to continue the public hearing to a definite time, date and place. The Commission may elect to open the hearing and receive evidence prior to acting upon a request or motion to continue the matter.

c. The staff shall be asked to present the substance of the application, staff report and recommendation, and to answer technical questions from the Commission.

d. ORDER OF TESTIMONY

1) Applicant's statement.

2) Public comment.

3) A rebuttal from the applicant.

4) The Chairperson may allow further comments from opponents, proponents and applicant as deemed appropriate by the Chairperson.

5) Public Hearing closed.

6) The Commission shall then deliberate and either determine the matter or continue the matter to another date and time certain.

e. RULES OF TESTIMONY

1) Persons presenting testimony to the Commission are requested to give their name and address for the record.

2) If there are numerous people in the audience who wish to participate on the issue, and it is known that all represent the same opinion, a spokesman should be selected to speak for the entire group, if possible. The spokesman will thus have the opportunity of speaking for a reasonable length of time and of presenting a complete case.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

3) To avoid unnecessary cumulative evidence, the Chairperson may limit the number of witnesses or the time of testimony on a particular issue.

4) Irrelevant and off-the-subject comments will be ruled out of order.

5) The Chairperson will not permit personal remarks regarding the staff or individual Commissioners during a Public Hearing. Complaints should be submitted in writing or presented verbally as a separate item on the agenda.

6) No person shall address the Commission without first securing the permission of the Chairperson to do so.

7) All comments shall be addressed to the Commission. All questions shall be placed through the Chair.

H. MOTIONS

1. Action upon an order, resolution or other action of the Commission may be proposed by any commissioner by a motion. Before a motion can be considered it must be seconded, at which time it shall be on the floor and must be considered. If not seconded, the motion is lost for lack of a second.

2. A motion to adjourn shall always be in order except during roll call.

3. The Chairperson of the Commission, or other presiding officer, may make and second motions and debate from the Chair subject only to such limitations of debate as are imposed on all members of the Commission. However, since the Chairperson is primarily responsible for the conduct of the meeting, if he or she personally desires to engage in extended debate on questions before the Commission, he or she should consider turning the Chair over to another Commissioner.

I. VOTING

1. VOTING REQUIREMENTS

a. Four ~~regular members~~ Commissioners ~~-~~shall constitute a quorum. Alternate members shall ~~not -~~be counted in determining if a quorum is present. An affirmative vote of a majority of Commissioners present and voting (but not less than three votes) shall be required to carry a motion, unless a larger number of votes is required by applicable ordinance or other law.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

b. When a member of the Commission abstains from voting on any matter before it because of a potential conflict of interest, that member shall not be counted towards meeting any quorum requirement. Furthermore, said vote shall not constitute nor be considered as either a vote in favor of or opposition to the matter being considered. When a member of the Commission abstains from voting for any reason other than a potential conflict of interest, the abstention shall be counted with the majority.

2. RECORDING OF VOTES

The minutes of the Commissioner's proceedings shall show the vote of each member, including if they were absent or failed to vote on a matter considered.

3. DISQUALIFICATION FROM VOTING

A member shall disqualify himself or herself from voting in accordance with the applicable Conflict of Interest Code. When a person disqualifies himself or herself, he or she shall disclose the disqualification prior to Commission consideration of the matter, and the disqualified member shall then leave the voting area.

4. RECONSIDERATION
A motion for reconsideration of a matter may be made by any commissioner who voted with the prevailing majority on the matter to be reconsidered. Any commissioner may second a motion for reconsideration. If the matter under reconsideration was first considered under a public hearing, the public hearing shall be reopened before any additional evidence is considered. A motion for reconsideration must be made at the same meeting as the meeting where the matter was voted upon.

J. The Chairperson or such other person who may be presiding at meetings of the Commission is responsible for the maintenance of order and decorum at all times. No person should speak who has not first been recognized by the Chair. All questions and remarks should be addressed to the Chair.

K. Any Commissioner may move to require the Chairperson or person presiding at the meeting to enforce the rules, and the affirmative vote of a majority of the Commissioners present shall require him or her to so act.

L. Commissioners shall accord the utmost courtesy to each other, to City employees, and to the public appearing before the Commission, and shall refrain at all times from rude and derogatory remarks, negative reflections as to integrity, abusive comments, and statements as to motive and personality.

M. All written materials to be delivered to the Planning Commission concerning its official business shall be delivered to Planning Division

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

staff for distribution. Staff is advised to distribute written materials concerning any matter on the agenda to the Planning Commission at least seven days (Thursday of the week before each regular meeting) before the date of the meeting when the matter is to be considered by the Planning Commission. If it is not reasonably possible to distribute the material at least seven days before the meeting when the matter is to be considered, the material may be distributed at the earliest possible time with a copy also distributed at the meeting.

N. During Planning Commission meetings, all written materials not already included in the materials which have been previously provided to the Planning Commission and which are offered for consideration by the Commission, shall be distributed to the Planning Commission. The Planning Commission shall consider such written materials as reasonably possible at the time of the meeting.

O. Failure to comply with the strict provisions of these rules shall not necessarily invalidate any action taken by the Commission.

III. REVIEW AND AMENDMENTS PROCEDURE

A. These Rules of Procedure shall be reviewed in July of each year by a subcommittee appointed by the Chair with the general agreement of the Commission. The review subcommittee shall present their recommendation for amending or not amending these rules.

B. In addition, these Rules of Procedure may be amended at any meeting of the Planning Commission by a majority of the membership (four affirmative votes) of the Commission provided that notice of the proposed amendment is received by each Commissioner not less than five days prior to said meeting.

Attachment: PC RULES OF PROCEDURE Redline 03022017 (2527 : Planning Commission Rules of Procedure)

CITY OF MORENO VALLEY

PLANNING COMMISSION RULES OF PROCEDURE

Attachment: PC RULES OF PROCEDURE Clean Draft 03022017 (2527 : Planning Commission Rules of Procedure)

I. RULES OF ORDER, ORGANIZATION AND OFFICERS

A. RULES OF ORDER

Except as otherwise provided in these Rules of Procedure, "The Standard Code of Parliamentary Procedure 4th Edition," shall be used as a guide to the conduct of the meetings of the Planning Commission; except as may otherwise be provided by applicable law, no omission to conform to said rules of order shall in any instance be deemed to invalidate any action taken by the Commission.

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b. If the Chairperson vacates his or her office before the term of office is completed, a new Chairperson shall be elected at the next regular meeting. A new Vice-Chairperson shall also be elected if the former Vice-Chairperson is elected Chairperson.

c. In the absence of the Chairperson and Vice-Chairperson, any other member may call the Commission to order, whereupon a Chairperson pro tem shall be elected from the members present to preside. Alternate members shall not be eligible to serve as Chairperson or Vice-Chairperson.

2. RESPONSIBILITIES

The responsibilities and powers of the officers and staff of the Planning Commission shall be as follows:

a. Chairperson

1) Preside at all meetings of the Commission.
2) Call special meetings of the Commission in accordance with legal requirements and these Rules of Procedure.
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6) The Chairperson shall be an ex-officio member of all committees of the Planning Commission with voice but not vote.

b. Vice-Chairperson

During the absence, disability or disqualification of the Chairperson, the Vice-Chairperson shall exercise or perform all the duties and be subject to all the responsibilities of the Chairperson.

c. The Planning Official with the assistance of his staff, shall be responsible for providing the Commission with proposed minutes of its meetings, with proposed forms of resolutions when appropriate, with staff reports and recommendations on matters of business which come before the Commission, and with proposed forms of recommendations and reports for the Commission.

D. POWERS AND DUTIES

The functions, powers and duties of the Planning Commission shall be all those functions, powers and duties of a Planning Commission and Board of Zoning Adjustment as provided in Chapters 3 and 4 of Title 7 commencing with Section 65100 of the Government Code of the State (the Planning and Zoning Law), as the same may be hereafter amended. The Planning Commission shall perform such other duties and functions as may be designated by the City Council.

E. ETHICAL PROCESS AND PROCEDURE

1. Whenever after appointment, a Commissioner possesses or is likely to possess a financial interest in a project which is pending or likely to be pending in the foreseeable future before the Commission, it is the duty of the Commissioner to disclose for the

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record the interest and abstain not only from discussion and voting, but a higher duty to abstain from discussion with any other Commissioner or staff concerning any matters relevant to the project, wherein the Commissioner has a financial interest in the decision.

2. It is equally unethical and improper for such Commissioner to recommend to other individuals that they contact other Commissioners or staff with respect to any matter relevant to the project.

3. Whenever a Commissioner discovers the existence of a possible conflict of interest and is unsure as to that situation, the Commissioner should consult with the City Attorney or the staff of the FPPC for clarification of his or her position; in the event a financial interest or likely financial interest exists in a project, the record should so disclose and be available for review.

4. No Commissioner should continue to serve as a Commissioner if it appears likely that he or she will receive substantial financial gain (obtain a financial interest as defined in the FPPC) from a large number of Planning Commission decisions on projects in a broad area of interest.

5. Nothing contained herein shall be construed to relieve a Commissioner of any duty imposed by State law or to change the law and regulations applicable to conflict and disclosure matters.

6. With respect to membership by a Commissioner in any other organization which may be incompatible with membership on the Planning Commission, the Commissioner should consider, to the extent recognized by law, any or all of the following, as may be applicable:

   a. Withdrawal of membership from either the Commission or the said organization.

   b. Leave of absence from the conflicting organization.

   c. Inactivity during Commission tenure.

   d. Being a non-voting participant in the conflicting organization.

   e. Being a non-office holder in the conflicting organization.

   f. Being a non-policy making member in the conflicting organization.

Attachment: PC RULES OF PROCEDURE Clean Draft 03022017 (2527 : Planning Commission Rules of Procedure)

g. Making no public statements within or about the organization.

F. FITNESS TO SERVE; STATEMENT OF PRIOR CONVERSATIONS

1. Any Planning Commissioner who wishes to serve the City of Moreno Valley shall adhere to the goals, performance objectives, duties, responsibilities, ethical process and procedure, and public relations standards as herein listed.

2. Present Commissioners who wish to serve but cannot justifiably adhere to the contents of these Rules of Procedure must evaluate their fitness to serve.

3. Any Commissioner shall declare, prior to voting in the recorded minutes, whether or not they talked or otherwise communicated independently with the developer, with the proponents, or with the opponents or with a representative of the developer, proponents or opponents concerning a project under consideration. Commissioners shall further publicly disclose the substance of any such communication.

G. ABSENCES AND VACANCIES

1. Permanent or long term Commissioner vacancies shall be filled by alternate Commissioners in accordance with Ordinance 890 of the City of Moreno Valley.

2. Regular and alternate Commissioners should attempt to attend all meetings. In the event of an absence of a regular Commissioner for all, or any part of a meeting, an alternate Commissioner who is present shall be seated to serve as a full voting member of the Commission. If alternate Commissioners are not available to serve or are disqualified from serving for any reason, the Commission shall continue with the remaining regular Commissioners as long as a quorum is present. The minutes shall reflect the attendance, seating and voting record of all regular and alternate Commissioners.

3. Alternate Commissioners shall be called on a rotational basis if available. Each meeting will have a Primary and Secondary alternate Commissioner, which assignment shall rotate every meeting. If there is more than one absence or vacancy, the secondary alternate Commissioner may also be called to serve. The service or non-service of one or both alternate Commissioners at any meeting shall not affect the rotational order for any future meeting. For the first meeting after any appointment, the rotational order shall be established in alphabetical order by the last name of the Alternate Commissioner.

Attachment: PC RULES OF PROCEDURE Clean Draft 03022017 (2527 : Planning Commission Rules of Procedure)

4. If a Commissioner is seated on the first day of any public hearing item, such Commissioner shall continue to be seated for that item until the completion of the vote on that item, without regard to the number of meeting dates the item is continued over. If a Commissioner seat was vacant on the first day of a public hearing item, that vacant seat may be filled by a regular or alternate Commissioner on future continued hearing dates if he/she makes a statement on the record that he/she has either (a) attended all prior hearing dates, (b) read all prior hearing transcripts, or (c) listened to the recordings of all prior hearings on the item. If a Commissioner has not met the aforementioned requirements, they shall be declared ineligible to be seated on the Commission for that item. In no case shall two different Commissioners fill the same vacant seat on any single public hearing item.

5. Alternate members shall be deemed to be participating in a meeting if they are seated as a voting member for all, or any part, of a meeting.

6. Commissioners may participate in the discussion and debate of an agenda item only if seated as a voting Commissioner.

II. MEETINGS

A. PUBLIC MEETINGS

All meetings shall be held in full compliance with state law, ordinances of the City, and these Rules of Procedure.

B. REGULAR MEETINGS

1. Regular meetings shall be held on the second and fourth Thursdays of each month at 7:00 p.m in the Council Chambers at City Hall, 14177 Frederick Street, Moreno Valley, California, unless otherwise determined by the Commission.

2. Whenever a regular meeting falls on a public holiday, no regular meeting shall be held on that day. Such regular meeting shall occur on the next business day, or cancelled by motion adopted by the Planning Commission.

C. ADJOURNED MEETINGS

In the event it is determined by the Planning Commission to adjourn its meeting to a certain hour on another day, a specific date, time, and place must be set by the Commission prior to the regular motion to adjourn, and the meeting so adjourned.

D. SPECIAL MEETINGS

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Special meetings of the Planning Commission may be held at any time upon the call of the Chairperson or by a majority of the voting members of the Commission or upon request of the City Council following at least 48 hours' notice to each member of the Commission and to the press, and to each person who has duly requested notice of such meetings. The time and place of the special meeting shall be determined by the convening authority, except that the meeting place shall be within the corporate limits of the City. Only those matters of business described in the call and notice for a special meeting shall be considered by the Commission.

E. STUDY SESSIONS/WORKSHOPS

1. The Commission may be convened as a whole or as a committee of the whole in the same manner as prescribed for the calling of a special meeting for the purpose of holding a study session provided that no official action shall be taken and no quorum shall be required.

2. All study sessions shall be open to the public.

F. AGENDA

1. An agenda for each meeting of the Commission shall be prepared by the Planning Official or his delegate with the cooperation and approval of the Chairperson or in the absence of the Chairperson, by the Vice-Chairperson.

   a. The Commission cannot guarantee that applicants meeting filing deadlines will be placed on the agenda of the first meeting thereafter.

   b. A copy of the agenda for each meeting of the Commission shall be posted at City Hall seventy-two (72) hours prior to each regular meeting and at least twenty-four (24) hours prior to each special meeting of the Commission.

G. ORDER OF MEETINGS

1. Unless the Chairperson in his or her discretion otherwise directs, the order of business shall be as follows:

   a. The Chairperson shall take the chair precisely at the hour appointed for the meeting and shall immediately call the Commission to order.

   b. Members present and absent shall be recorded, including any alternate members. Alternate members shall be seated on the Commission, if necessary. If all regular Commissioners are present and no conflicts of interest have been announced or appear to be likely, the alternate members may be excused and review the video or transcript of the meeting in lieu of attendance.

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c. Pledge of Allegiance shall be made.

d. The agenda shall be approved as submitted or revised (to the extent permitted by law).

e. The public shall be advised of the procedures to be followed in the meeting.

f. The minutes of any preceding meeting shall be submitted for approval.

g. Public comment shall be taken, during which any member of the audience may comment on any matter which is not listed on the agenda. A time limit of three minutes shall be imposed on each individual.

h. The Commission shall then hear and act upon those proposals scheduled for consideration at public hearing, followed by such other matters of business and reports as the Commission or Planning Official finds to require Commission consideration, and as may be properly considered at that time.

i. No action shall be taken by the Commission during any regular meeting on any item not appearing on the posted agenda unless any of the following conditions apply:

   1) A majority of the Commission determines that an "emergency situation" exists.

   2) The Commission determines by a two-thirds vote, or by a unanimous vote if less than two-thirds of the members are present, that the "need to take action" on the item arose subsequent to the posting of the agenda, or

   3) The item was included in a properly posted agenda for a prior meeting occurring not more than five days prior to the date of the meeting at which the action is taken and was continued to the meeting at which the action is taken.

j. At 11:00 p.m., or as soon thereafter as practicable, a Commissioner may make a motion to adjourn the meeting and continue any remaining items to a future date.

k. Adjournment.

2. PRESENTATION OR HEARING OF PROPOSALS

Attachment: PC RULES OF PROCEDURE Clean Draft 03022017 (2527 : Planning Commission Rules of Procedure)

The following shall be the order of procedure for public hearings or other proposals concerning planning and zoning matters, and for testimony, unless the Chairperson in his or her discretion shall otherwise direct.

a. The Chairperson shall announce the subject of the public hearing or other proposals as advertised.

b. If a request is made for continuance, a motion may be made, seconded and voted upon to continue the public hearing to a definite time, date and place. The Commission may elect to open the hearing and receive evidence prior to acting upon a request or motion to continue the matter.

c. The staff shall be asked to present the substance of the application, staff report and recommendation, and to answer technical questions from the Commission.

d. ORDER OF TESTIMONY

1) Applicant's statement.

2) Public comment.

3) A rebuttal from the applicant.

4) The Chairperson may allow further comments from opponents, proponents and applicant as deemed appropriate by the Chairperson.

5) Public Hearing closed.

6) The Commission shall then deliberate and either determine the matter or continue the matter to another date and time certain.

e. RULES OF TESTIMONY

1) Persons presenting testimony to the Commission are requested to give their name and address for the record.

2) If there are numerous people in the audience who wish to participate on the issue, and it is known that all represent the same opinion, a spokesman should be selected to speak for the entire group, if possible. The spokesman will thus have the opportunity of speaking for a reasonable length of time and of presenting a complete case.

3) To avoid unnecessary cumulative evidence, the Chairperson may limit the number of witnesses or the time of testimony on a particular issue.

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4) Irrelevant and off-the-subject comments will be ruled out of order.

5) The Chairperson will not permit personal remarks regarding the staff or individual Commissioners during a Public Hearing. Complaints should be submitted in writing or presented verbally as a separate item on the agenda.

6) No person shall address the Commission without first securing the permission of the Chairperson to do so.

7) All comments shall be addressed to the Commission. All questions shall be placed through the Chair.

H. MOTIONS

1. Action upon an order, resolution or other action of the Commission may be proposed by any commissioner by a motion. Before a motion can be considered it must be seconded, at which time it shall be on the floor and must be considered. If not seconded, the motion is lost for lack of a second.

2. A motion to adjourn shall always be in order except during roll call.

3. The Chairperson of the Commission, or other presiding officer, may make and second motions and debate from the Chair subject only to such limitations of debate as are imposed on all members of the Commission. However, since the Chairperson is primarily responsible for the conduct of the meeting, if he or she personally desires to engage in extended debate on questions before the Commission, he or she should consider turning the Chair over to another Commissioner.

I. VOTING

1. VOTING REQUIREMENTS

a. Four Commissioners shall constitute a quorum. Alternate members shall be counted in determining if a quorum is present. An affirmative vote of a majority of Commissioners present and voting (but not less than three votes) shall be required to carry a motion, unless a larger number of votes is required by applicable ordinance or other law.

b. When a member of the Commission abstains from voting on any matter before it because of a potential conflict of interest, that member shall not be counted towards meeting any quorum requirement. Furthermore, said vote shall not constitute nor be considered as either a vote in

Attachment: PC RULES OF PROCEDURE Clean Draft 03022017 (2527 : Planning Commission Rules of Procedure)

favor of or opposition to the matter being considered. When a member of the Commission abstains from voting for any reason other than a potential conflict of interest, the abstention shall be counted with the majority.

2. RECORDING OF VOTES

The minutes of the Commissioner's proceedings shall show the vote of each member, including if they were absent or failed to vote on a matter considered.

3. DISQUALIFICATION FROM VOTING

A member shall disqualify himself or herself from voting in accordance with the applicable Conflict of Interest Code. When a person disqualifies himself or herself, he or she shall disclose the disqualification prior to Commission consideration of the matter, and the disqualified member shall then leave the voting area.

4. RECONSIDERATION

A motion for reconsideration of a matter may be made by any commissioner who voted with the prevailing majority on the matter to be reconsidered. Any commissioner may second a motion for reconsideration. If the matter under reconsideration was first considered under a public hearing, the public hearing shall be reopened before any additional evidence is considered. A motion for reconsideration must be made at the same meeting as the meeting where the matter was voted upon.

J. The Chairperson or such other person who may be presiding at meetings of the Commission is responsible for the maintenance of order and decorum at all times. No person should speak who has not first been recognized by the Chair. All questions and remarks should be addressed to the Chair.

K. Any Commissioner may move to require the Chairperson or person presiding at the meeting to enforce the rules, and the affirmative vote of a majority of the Commissioners present shall require him or her to so act.

L. Commissioners shall accord the utmost courtesy to each other, to City employees, and to the public appearing before the Commission, and shall refrain at all times from rude and derogatory remarks, negative reflections as to integrity, abusive comments, and statements as to motive and personality.

M. All written materials to be delivered to the Planning Commission concerning its official business shall be delivered to Planning Division staff for distribution. Staff is advised to distribute written materials concerning any matter on the agenda to the Planning Commission at least seven days (Thursday of the week before each regular meeting) before the date of the meeting when the matter is to be considered by the Planning Commission. If it is not reasonably possible to distribute

Attachment: PC RULES OF PROCEDURE Clean Draft 03022017 (2527 : Planning Commission Rules of Procedure)

the material at least seven days before the meeting when the matter is to be considered, the material may be distributed at the earliest possible time with a copy also distributed at the meeting.

N. During Planning Commission meetings, all written materials not already included in the materials which have been previously provided to the Planning Commission and which are offered for consideration by the Commission, shall be distributed to the Planning Commission. The Planning Commission shall consider such written materials as reasonably possible at the time of the meeting.

O. Failure to comply with the strict provisions of these rules shall not necessarily invalidate any action taken by the Commission.

III. REVIEW AND AMENDMENTS PROCEDURE

A. These Rules of Procedure shall be reviewed in July of each year by a subcommittee appointed by the Chair with the general agreement of the Commission. The review subcommittee shall present their recommendation for amending or not amending these rules.

B. In addition, these Rules of Procedure may be amended at any meeting of the Planning Commission by a majority of the membership (four affirmative votes) of the Commission provided that notice of the proposed amendment is received by each Commissioner not less than five days prior to said meeting.

Attachment: PC RULES OF PROCEDURE Clean Draft 03022017 (2527 : Planning Commission Rules of Procedure)

PLANNING COMMISSION

STAFF REPORT

Meeting Date: March 9, 2017

PEN16-0131 (MASTER PLOT PLAN), PEN16-0132 (PLOT PLAN), PEN16-0133 (PLOT PLAN), PEN16-0134 (PLOT PLAN)

Case:	PEN16-0131 (PA15-0032 Master Plot Plan), PEN16-0132 (PA16-0004 Plot Plan), PEN16-0133 (PA16-0005 Plot Plan), & PEN16-0134 (PA16-0006 Plot Plan)
Applicant:	Moreno Valley Cactus Center
Owner:	P6K Portfolio MVCP LLC
Representative:	Ino Cruz
Location:	Northeast corner of Cactus Avenue and Commerce Center Drive
Case Planner:	Gabriel Diaz
Council District:	1

SUMMARY

The applicant proposes to develop the Cactus Commerce Center, which includes several commercial uses and a small warehouse building on an approximately 6.3 acre site. The project is located on the northeast corner of Cactus Avenue and Commerce Center Drive. The project includes applications for a Master Plot Plan for the commercial center, a Plot Plan application for a 36,950 square foot (sf.) warehouse building, and additional Plot Plan applications for a new 24 hour gas station, car wash, a 2,800 sf. fast-food restaurant (#1), a 2,500 sf. fast-food restaurant (#2), and a 2,600 sf. food restaurant (#3). The project site is zoned Business Park-Mix Use (BPX).

The proposed land uses for the project are consistent with the BPX zoning designation, which allows for light industrial and commercial uses.

PROJECT DESCRIPTION

Project

The Master Plot Plan (PEN16-0131) includes the overall layout for the proposed 6.3 acres commercial center. The project details are described below for each Plot Plan:

Plot Plan (PEN16-0132) proposes the development of a 36,950 sf. warehouse building on two acres. The warehouse building is comprised of 33,950 sf. of warehouse space and 3,000 sf. of office space.

Plot Plan (PEN16-0133) proposes the development of a new 24 hour gas station with a 3,800 sf. convenience store, 2,080 sf. car wash, and a 2,800 sf. fast-food restaurant (#1) with a drive through, on 2.93 acres. Fast food restaurant #1 provides stacking for nine vehicles in the drive through lane. The gas station includes 10 gasoline pumps with a 5,611 sf. canopy and four diesel pumps with a 1,680 sf. canopy. The gasoline pumps are located on the southwest area of the site and pump access would be from Cactus Avenue and Commerce Center Drive. The diesel pumps are located on the northern portion of the site and pump access would be from Commerce Center Drive and Goldencrest Drive. The convenience store and fast food restaurant #1 are located between the gas pumps to the south and the diesel pumps to the north.

Plot Plan (PEN16-0134) proposes the development of a 2,500 sf. fast-food restaurant (#2), and a 2,600 sf. fast food restaurant (#3) on 1.37 acres. Both fast food restaurants provide a drive through lane with stacking for eight vehicles.

The proposed land uses are consistent with the existing BPX zoning which allows for light industrial and commercial uses.

Site

The project site is located on the northeast corner of Cactus Avenue and Commerce Center Drive, which is at a prominent gateway to the City from Interstate 215. As a gateway, this is the highest traffic volume gateway serving nearly 45,000 average daily vehicle trips. The project site is zoned BPX. The purpose of the BPX district is to provide locations for limited convenience commercial and business support services within proximity to industrial and business park uses. The project site is bounded by three streets, Goldencrest Drive to the north, Commerce Center Drive to the west, and Cactus Avenue to the south. The eastern border of the site abuts an existing mixed use development. The project site is vacant and relatively flat. The project site is comprised of three rectangular shaped parcels (Assessor Parcels No. 297-130-052, 297-130-053 & 297-130-054). The total project site is 6.3 acres.

The site has been routinely disked for weed abatement over the years. There are no existing trees or rock outcroppings on the site, and there is no evidence of sensitive habitat or riparian areas within the project site.

Surrounding Area

The project site is bounded by existing warehouse buildings to the west and north. The property immediately to the east is also zoned BPX with a mixed use project that includes restaurants, Victory Outreach Church, and a recycling center. The existing March Air Reserve Base is located to the south of the project site south of Cactus Avenue and outside the Moreno Valley City limits.

The proposed commercial and small warehouse development is compatible with the City's General Plan and existing land uses.

Access/Parking

Vehicular access to the proposed development will be provided by one driveway located off of Cactus Avenue, two driveways off of Commerce Center Drive, and two driveways off of Goldencrest Drive. The proposed project will be conditioned with responsibility to construct (i.e. complete) the center median on Cactus Avenue to connect the existing median at Commerce Center Drive with the existing median starting just easterly of the project site. Completion of the raised landscaped median will limit the Cactus Avenue driveway to right-in and right-out movements only. The other driveways off of Commerce Center Drive and Goldencrest Drive to the site will have no limitations on access.

Internal circulation within the project site includes driveway aisles that measure a minimum of 25 feet in width consistent with all City design standards. The site design has been evaluated to ensure adequate truck maneuvering and turnaround for delivery trucks and trash pick-up. It is noted that while the internal circulation standards are being met, the proposed intensity of the site coupled with the desire for drive-thrus at each retail pad could present internal traffic operational challenges. This has been vetted with the applicant on several occasions and it remains their interest to proceed with the design as proposed.

A total of 136 automobile parking spaces and four trailer truck parking spaces are required by the Municipal Code for the proposed project. The project as designed exceeds the Code requirements and provides a total of 158 parking spaces. The project as designed satisfies all parking requirements of the City's Municipal Code including accessible parking.

TRAFFIC

There are a few key project traffic considerations that are of particular note.

The first key item is the applicant's desire to achieve full movements at the Commerce Center Drive/Cactus Avenue intersection, particularly to allow for southbound Commerce Center Drive traffic to make a left-turn movement on to eastbound Cactus Avenue. Various options have been considered in the traffic study including analysis of the full movement intersection as well as restricted movement intersection that would maintain the current configuration with no left turn onto eastbound Cactus Avenue.

Consideration has been given to the high volume of traffic along Cactus Avenue on the approaches to and from Interstate 215, coupled with the large vehicles that frequent this segment of roadway, and consideration has been given to the fact that the ultimate improvements at this location will require approval through Caltrans. A comment letter from Caltrans was received on February 15, 2017 and is attached to this staff report as an Attachment for the Commissions' consideration. The initial findings and interests by both City and Caltrans technical staff is that the no left turn movement be permitted at this location. The condition of approval recommended for the project leaves the option open should the applicant be able to demonstrate to the satisfaction of Caltrans that this configuration can be designed satisfactorily.

A second key item is that the traffic study demonstrates that the volume of eastbound left-turn movements that will occur at the Cactus/Elsworth intersection warrants that the turn pocket be lengthened to 300'. As there are currently back to back left turn pockets along Cactus Avenue at this location, it is noted that the lengthening of the turn pocket will effectively eliminate the uncontrolled left-turn pocket into the adjacent commercial center. In addition, the current restriction for no U-turns at Cactus/Elsworth would be eliminated.

Design/Landscaping

The Cactus Commerce Center, as designed and conditioned, conforms to all development standards of the BPX zoning and the design guidelines for commercial and light industrial developments prescribed in the City's Municipal Code and City Landscape Standards.

The proposed development includes an architectural theme of flat roofs with parapets. The material board provided demonstrates the project will have an earth tone color palette, and a complimentary mix of materials that include stucco, stone veneer, and slate tiles. Architecturally, the simple variety of colors and materials are organized appropriately to break up the massing of buildings and provide visual interest. The mix of proposed roof lines and other vertical and horizontal architectural lines created through the use of color and materials provide desired architectural interest and variation among the buildings consistent with City design regulations.

The gasoline station canopies have a flat rectangular shape and will be constructed of steel columns with a stone veneer base.

The proposed project includes five double-bin trash enclosures, which conforms to the City's design standard. The trash enclosures are evenly distributed throughout the site to ensure ease of access. The enclosures will be designed to the City's standards, which will include solid roofs compatible with the overall project architecture.

A decorative six foot high vinyl coded chain-link fence with a tight weave to limit climbing is proposed on the east and south property lines of the warehouse site. In addition, a pedestrian gate is provided between the warehouse site and fast food restaurants sites #2 and #3. The pedestrian gate achieves the applicant's desired security and separation between land uses, while also facilitating convenient pedestrian

access for warehouse employees to the fast food establishments and gas station. The walls and trash enclosures for this project are conditioned to be consistent with the City's Municipal Code standards for placement, height and materials.

ENVIRONMENTAL

An Initial Study was prepared by City staff in compliance with the California Environmental Quality Act (CEQA) Guidelines. The Initial Study examined the potential of the proposed project to have significant impacts on the environment. The Initial Study supports the determination that a Mitigated Negative Declaration is the appropriate CEQA environmental determination for the project. The proposed project, with implementation of mitigation measures applied that can reduce the potential environmental impacts identified to a less than significant level, will not have a significant effect on the environment. Studies prepared for this project included a traffic impact study, an air quality and greenhouse gas assessment, a cultural resource survey, a hydrology study, a geotechnical investigation, a biological survey for Burrowing Owl, and a preliminary water quality management plan. The electronic files for the IS/MND and appendices are included as electronic attachments with this report and full agenda packet published on the City website (http://morenovalleyca.iqm2.com/Citizens/default.aspx) for public review. Due to document size, hard copies of the technical studies will not be included with the printed Commissioner packets. Any Commissioner and public wishing to view hard copies of the documents can do so at City Hall.

Public notice of the availability of the Initial Study / Mitigated Negative Declaration was published in the newspaper on February 17, 2017, which satisfies the required 20 day review period in advance of the Planning Commission Public Hearing.

Mitigation Monitoring

A mitigation monitoring program has been prepared and is incorporated with the recommended project environmental documents to ensure implementation of the mitigation measures.

NOTIFICATION

The public hearing notice for this project was published in the local newspaper on February 17, 2017. Public notice was sent to all property owners of record within 300 feet of the project site on February 16, 2017. The public hearing notice for this project was also posted on the project site on February 15, 2017.

REVIEW AGENCY COMMENTS

During the course of the project review the following agencies provided input on the project and as appropriate the input has been addressed:

Agency	Response Date
Eastern Municipal Water District	September 3, 2015
Riverside County Flood Control	September 10, 2015
Airport Land Use Commission	July 7, 2016

In addition, the City complied with the requirements of State Assembly Bill 52 requiring notice and consultation with Native American tribal groups. The City coordinated with all participating Native American tribal groups requesting consultation for this project, and has incorporated appropriate conditions of approval and mitigation measures with the recommended Resolutions for the project.

The project site is located within Compatibility Zone B2 of the March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan. This project was reviewed by the Riverside County Airport Land Use Commission (ALUC). In a letter dated October 19, 2016, ALUC confirmed their determination that the project is consistent with the 2014 March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan subject to requirements incorporated into the project's conditions of approval.

STAFF RECOMMENDATION

Staff recommends that the Planning Commission **APPROVE** Resolution No. 2017-14 and thereby:

1. **ADOPT** a Mitigated Negative Declaration for Master Plot Plan PEN16-0131, Plot Plan PEN16-0132, Plot Plan PEN16-0133, & Plot Plan PEN16-0134 pursuant to the California Environmental Quality Act (CEQA) Guidelines; and

2. **APPROVE** the Mitigation Monitoring and Reporting Program prepared for Master Plot Plan PEN16-0131, Plot Plan PEN16-0132, Plot Plan PEN16-0133, & Plot Plan PEN16-0134 pursuant to the California Environmental Quality Act (CEQA) Guidelines, and included as Exhibit A; and

3. **APPROVE** Master Plot Plan PEN16-0131, Plot Plan PEN16-0132, Plot Plan PEN16-0133, & Plot Plan PEN16-0134, subject to the attached conditions of approval included as Exhibit B.

Prepared by:
Gabriel Diaz
Associate Planner

Approved by:
Allen Brock
Community Development Director

ATTACHMENTS

1. Public Hearing Notice
2. Planning Commission Resolution 2017-14
3. Exhibit A Mitigation Monitoring Program
4. Exhibit B Conditions of Approval
5. Initial Study MND
6. Aerial Photograph

7. Zoning Map
8. Master Site Plan
9. Warehouse Plans
10. Fast Food 2 and 3 Plans
11. Gas Station Plans
12. Color Elevations
13. Airport Land Use Commission Letter
14. Caltrans TS Comment Letter_02-15-2017_MoVal_CactusSvcSta
15. Air Quality GHG Assessment
16. Biological Survey
17. Geotechnical Engineering Investigation
18. Hydrology Report
19. Storm Water Pollution Prevention Plan
20. Water Quality Management Plan
21. Traffic Study
22. Traffic Study Appendices
23. Cultural Resources Survey
24. 300 FT Radius Map for Public Notice Mailing Labels

This may affect your property

Notice of PUBLIC HEARING

Notice is hereby given that a Public Hearing will be held by the Planning Commission of the City of Moreno Valley on the following item(s):

Project: PEN16-0131 (PA15-0032 Master Plot Plan), PEN16-0132 (PA16-0004 Plot Plan), PEN16-0133 (PA16-0005 Plot Plan), & PEN16-0134 (PA16-0006 Plot Plan)
Applicant: Moreno Valley Cactus Center
Owner: P6K Portfolio MVCP LLC
Representative: Ino Cruz
A.P. No(s): 297-130-052, 297-130-053, & 297-130-054
Location: Northeast corner of Cactus Avenue and Commerce Center Drive
Proposal: The project is a Master Plot Plan PEN16-0131 for a commercial center on 6.30 acres. The project includes Plot Plan PEN16-0132 for a 39,950 square foot (sf.) warehouse building, Plot Plan PEN16-0133 for a new 24 hour gas station, carwash, and a 2,800 sf. fast-food restaurant (#1), and Plot Plan PEN16-0134 for two 3,000 sf. fast-food restaurants (#2, #3). The project is consistent with the current Business Park-Mixed Use (BPX) zoning which allows for commercial and light warehouse uses.
Council District: 1

The project has been evaluated against criteria set forth in the California Environmental Quality Act (CEQA) Guidelines and it was determined that the project will not have a significant effect on the environment with the incorporation of mitigation measures. A Mitigated Negative Declaration is recommended. Mitigation measures have been required of the project that will reduce potential impacts to a less than significant level.

A public hearing before the Planning Commission has been scheduled for the proposed project. Any person interested in commenting on the proposal and recommended environmental determination may speak at the hearing or provide written testimony at or prior to the hearing. The project application, supporting plans and environmental documents may be inspected at the Community Development Department at 14177 Frederick Street, Moreno Valley, California during normal business hours (7:30 a.m. to 5:30 p.m., Monday through Thursday; 7:30 a.m. to 4:30 p.m., Friday), or you may telephone (951) 413-3206 for further information.

The Planning Commission, at the Hearing or during deliberations, could approve changes or alternatives to the proposal. If you challenge any of these items in court, you may be limited to raising only those items you or someone else raised at the Public Hearing described in this notice or in written correspondence delivered to the Planning Commission at, or prior to, the Public Hearing.

LOCATION N

PLANNING COMMISSION HEARING

City Council Chamber, City Hall
14177 Frederick Street
Moreno Valley, Calif. 92553

DATE AND TIME: March 9, 2017 at 7 PM
CONTACT PLANNER: Gabriel Diaz
PHONE: (951) 413-3226

Upon request and in compliance with the Americans with Disabilities Ac of 1990, any person with a disability who requires a modification o accommodation in order to participate in a meeting should direct suc request to Guy Pegan, ADA Coordinator, at 951.413.3120 at least 4 hours before the meeting. The 48-hour notification will enable the City t make reasonable arrangements to ensure accessibility to this meeting.

Attachment: Public Hearing Notice (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

PLANNING COMMISSION RESOLUTION NO. 2017-14

A RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF MORENO VALLEY APPROVING MASTER PLOT PLAN APPLICATION PEN16-0131 (PA15-0032), PLOT PLAN APPLICATION PEN16-0132 (PA16-0004), PLOT PLAN APPLICATION PEN16-0133 (PA16-0005), PLOT PLAN APPLICATION PEN16-0134 (PA16-0006), FOR DEVELOPMENT OF A COMMERCIAL CENTER ON 6.3 ACRES THAT INCLUDES A 36,950 SQUARE FOOT (SF.) WAREHOUSE BUILDING, A NEW 24 HOUR GAS STATION, CAR WASH, A 2,800 SF. FAST-FOOD RESTAURANT (#1), A 2,500 SF. FAST-FOOD RESTAURANT (#2), AND A 2,600 SF. FOOD RESTAURANT (#3). (ASSESSOR'S PARCEL NUMBERS 297-130-052, 297-130-053, & 297-130-054).

WHEREAS, Moreno Valley Cactus Center has filed an application for the approval of Master Plot Plan PEN16-0131 (PA15-0032) for a commercial center, Plot Plan PEN16-0132 (PA16-0004) for a 36,950 square foot (sf.) warehouse building, Plot Plan PEN16-0133 (PA16-0005) for a new 24 hour gas station, car wash, a 2,800 sf. fast-food restaurant (#1), a Plot Plan PEN16-0132 (PA16-0004) for a 2,500 sf. fast-food restaurant (#2), and a 2,600 sf. food restaurant (#3); and

WHEREAS, the application has been evaluated in accordance with established City of Moreno Valley (City) procedures, and with consideration of the General Plan and other applicable regulations; and

WHEREAS, the City has prepared an Initial Study and Mitigated Negative Declaration consistent with the California Environmental Quality Act (CEQA) based on a thorough analysis of potential environmental impacts; and

WHEREAS, upon completion of a thorough development review process the project was appropriately agendized and noticed for a public hearing before the Planning Commission of the City of Moreno Valley (Planning Commission); and

WHEREAS, the public hearing notice for this project was published in the local newspaper on February 17, 2017. Public notice was sent to all property owners of record within 300 feet of the project site on February 16, 2017. The public hearing notice for this project was also posted on the project site on February 15, 2017;

WHEREAS, on March 9, 2017, the Planning Commission held a public hearing to consider the application; and

WHEREAS, all legal prerequisites to the adoption of this Resolution have occurred; and

Attachment: Planning Commission Resolution 2017-14 [Revision 2] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133

WHEREAS, pursuant to Government Code Section 66020(d)(1), **NOTICE IS HEREBY GIVEN** that this project is subject to certain fees, dedications, reservations and other exactions as provided herein.

NOW, THEREFORE, BE IT RESOLVED, it is hereby found, determined and resolved by the Planning Commission as follows:

A. This Planning Commission hereby specifically finds that all of the facts set forth above in this Resolution are true and correct.

B. Based upon substantial evidence presented to this Planning Commission during the above-referenced meeting on March 9, 2017, including written and oral staff reports, public testimony and the record from the public hearing, this Planning Commission hereby specifically finds as follows:

1. **Conformance with General Plan Policies –** The proposed use is consistent with the General Plan, and its goals, objectives, policies and programs.

   FACT: The project proposes development of a 6.3 acres commercial center with a mix of uses including a gas station with car wash, fast food restaurants, and a warehouse building. The General Plan land use designation for the project site is Business Park (BP).

   The project is consistent with General Plan policies and objectives. Chapter 9 General Plan Policy 2.5.1 states that the primary purpose of areas designated Business Park/Industrial is to provide for manufacturing, research and development, warehousing and distribution, as well as office and support commercial activities. The zoning regulations shall identify the particular uses permitted on each parcel of land. Development intensity should not exceed a Floor Area Ratio of 1.00 and the average floor area ratio should be significantly less.

   The project as designed and conditioned meets the stated General Plan policies for BP development.

   The project as designed and conditioned will achieve the objectives of the City of Moreno Valley's General Plan. The proposed project is consistent with the General Plan and does not conflict with the goals, objectives, policies, and programs established within the Plan.

2. **Conformance with Zoning Regulations –** The proposed use complies with all applicable zoning and other regulations.

   FACT: The project site is currently zoned Business Park-Mix Use (BPX). The proposed commercial and light industrial uses are all permitted under the BPX zoning. The project is designed in accordance with the provisions of Chapter 9.05 Industrial Districts of the City's Municipal Code, Section

Attachment: Planning Commission Resolution 2017-14 [Revision 2] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133

9.09.080 Drive-in, Drive-through, Fast Food and Take-out Restaurants, and Section 9.09.200 Service Station. The project as designed and conditioned would comply with all applicable zoning and other regulations.

3. **Health, Safety and Welfare –** The proposed use will not be detrimental to the public health, safety or welfare or materially injurious to properties or improvements in the vicinity.

FACT: The proposed project as designed and conditioned will provide acceptable levels of protection from natural and man-made hazards to life, health, and property consistent with General Goal 9.6.1. The project site is located within approximately one and one half miles from Fire Station No. 6. Therefore, adequate emergency services can be provided to the site consistent with General Plan Goal 9.6.2.

An Initial Study was prepared by City Staff in compliance with the California Environmental Quality Act (CEQA) Guidelines. The Initial Study examined the potential of the proposed project to have any significant impact on the environment. The Initial Study provides information in support of the finding that a Mitigated Negative Declaration is an appropriate CEQA determination for the project, in that the proposed project, with the implementation of mitigation measures identified, will not have a significant effect on the environment.

The proposed project as designed and conditioned will result in a development that will minimize the potential for loss of life and protect residents and visitors to the City from physical injury and property damage due to seismic ground shaking and flooding as provided for in General Plan Objective 6.1 and General Plan Objective 6.2. The project as designed and conditioned will be consistent with the City's Municipal Code Chapter 9.05 industrial Districts.

4. **Location, Design and Operation –** The location, design and operation of the proposed project will be compatible with existing and planned land uses in the vicinity.

FACT: The project site is bounded by existing warehouse buildings to the west and north zoned Industrial (I). The property immediately to the east is a restaurant, a church, and a recycling center in the Business Park-Mixed Use (BPX) zone. To the south is the existing March Air Reserve Base outside the Moreno Valley City limits.

This project, as designed and conditioned, conforms to all development standards of the BPX zoning and the design guidelines for commercial and light industrial developments prescribed in the City's Municipal Code and City Landscape Standards.

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The propose development includes an architectural theme of flat roofs with parapets, a material board that includes earth tones for the color palette, and materials that include stucco, stone veneer, and slate tiles. Architecturally the simple variety of colors and materials break up the massing of buildings and provide visual interests. .

Overall, the proposed commercial and light industrial development is compatible with the City's General Plan and existing land uses in the vicinity.

Section 2:

FEES, DEDICATIONS, RESERVATIONS, AND OTHER EXACTIONS

1. FEES

Impact, mitigation and other fees are due and payable under currently applicable ordinances and resolutions. These fees may include but are not limited to: Development Impact Fee, Transportation Uniform Mitigation Fee (TUMF), Multi-species Habitat Conservation Plan (MSHCP) Mitigation Fee, Stephens Kangaroo Habitat Conservation fee, Underground Utilities in lieu Fee, Area Drainage Plan fee, Bridge and Thoroughfare Mitigation fee (Future) and Traffic Signal Mitigation fee. The final amount of fees payable is dependent upon information provided by the applicant and will be determined at the time the fees become due and payable.

Unless otherwise provided for by this Resolution, all impact fees shall be calculated and collected at the time and in the manner provided in Chapter 3.32 of the City of Moreno Valley Municipal Code or as so provided in the applicable ordinances and resolutions. The City expressly reserves the right to amend the fees and the fee calculations consistent with applicable law.

2. DEDICATIONS, RESERVATIONS, AND OTHER EXACTIONS

The adopted Conditions of Approval for PEN16-0131(PA15-0032), Plot Plan PEN16-0132 (PA16-0004), Plot Plan PEN16-0133 (PA16-0005), & Plot Plan PEN16-0134 (PA16-0006), incorporated herein by reference, may include dedications, reservations, and exactions pursuant to Government Code Section 66020 (d) (1).

3. CITY RIGHT TO MODIFY/ADJUST; PROTEST LIMITATIONS

The City expressly reserves the right to establish, modify or adjust any fee, dedication, reservation or other exaction to the extent permitted and as authorized by law.

Attachment: Planning Commission Resolution 2017-14 [Revision 2] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133

Pursuant to Government Code Section 66020(d)(1), NOTICE IS FURTHER GIVEN that the 90 day period to protest the imposition of any impact fee, dedication, reservation, or other exaction described in this Resolution begins on the effective date of this Resolution and any such protest must be in a manner that complies with Section 66020(a) and failure to timely follow this procedure will bar any subsequent legal action to attack, review, set aside, void or annul imposition.

The right to protest the fees, dedications, reservations, or other exactions does not apply to planning, zoning, grading, or other similar application processing fees or service fees in connection with this project and it does not apply to any fees, dedication, reservations, or other exactions of which a notice has been given similar to this, nor does it revive challenges to any fees for which the applicable statute of limitations has previously expired.

Attachment: Planning Commission Resolution 2017-14 [Revision 2] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133

Section 3:

BE IT FURTHER RESOLVED that the Planning Commission **HEREBY APPROVES** Resolution No. 2017-14, and thereby:

1. **ADOPT** a Mitigated Negative Declaration for Master Plot Plan PEN16-0131(PA15-0032), Plot Plan PEN16-0132 (PA16-0004), Plot Plan PEN16-0133 (PA16-0005), & Plot Plan PEN16-0134 (PA16-0006) pursuant to the California Environmental Quality Act (CEQA) Guidelines; and

2. **APPROVE** the Mitigation Monitoring and Reporting Program prepared for Master Plot Plan PEN16-0131(PA15-0032), Plot Plan PEN16-0132 (PA16-0004), Plot Plan PEN16-0133 (PA16-0005), and Plot Plan PEN16-0134 (PA16-0006) pursuant to the California Environmental Quality Act (CEQA) Guidelines, included as Exhibit A; and

3. **APPROVE** Master Plot Plan PEN16-0131 (PA15-0032), Plot Plan PEN16-0132 (PA16-0004), Plot Plan PEN16-0133 (PA16-0005), & Plot Plan PEN16-0134 (PA16-0006) based on the findings contained in this resolution, and subject to the attached conditions of approval included as Exhibit B.

APPROVED this 9th day of March, 2017.

_____
Brian Lowell
Chair, Planning Commission

ATTEST:

_____
Richard J. Sandzimier, Planning Official
Secretary to the Planning Commission

APPROVED AS TO FORM:

_____

Attachment: Planning Commission Resolution 2017-14 [Revision 2] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133

City Attorney

Exhibit A

Attachment: Planning Commission Resolution 2017-14 [Revision 2] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133

Cactus Commerce Project – Mitigation Monitoring and Reporting Program

Master Plot Plan PEN16-0131 (PA15-0032), Plot Plan PEN16-0132 (PA16-0004), Plot Plan PEN16-0133 (PA16-0005), & Plot Plan PEN16-0134 (PA16-0006)

Introduction

This Mitigation Monitoring and Reporting Program has been prepared for use in implementing mitigation for the Mitigated Negative Declaration (MND) for The Cactus Commerce Project PEN16-0131 (PA15-0032) – Master Plot Plan, PEN16-0132 (PA16-0004) – Plot Plan, PEN16-0133 (PA16-0005) – Plot Plan, and PEN16-0134 (PA16-0006) – Plot Plan. The program has been prepared in compliance with State law and the MND prepared for the project.

The California Environmental Quality Act (CEQA) requires adoption of a reporting or monitoring program for those measures placed on a project to mitigate or avoid adverse effects on the environment (Public Resources Code Section 21081.6). The law states that the reporting or monitoring program shall be designed to ensure compliance during project implementation.

The monitoring program contains the following elements:

- The mitigation measures are recorded with the action and procedure necessary to ensure compliance. In some instances, one action may be used to verify implementation of several mitigation measures.
- A procedure for compliance and verification has been outlined for each action necessary. This procedure designates who will take action, what action will be taken and when, and to whom and when compliance will be reported.
- The program has been designed to be flexible. As monitoring progresses, changes to compliance procedures may be necessary based upon recommendations by those responsible for the program. As changes are made, new monitoring compliance procedures are records will be developed and incorporated into the program.

Mitigation Monitoring and Responsibilities

As the Lead Agency, the City of Moreno Valley is responsible for ensuring full compliance with the mitigation measures adopted for the proposed project. The City will monitor and report on all mitigation activities. Mitigation measures will be implemented at different stages of development throughout the project. In this regards, the responsibilities for implementation have been assigned to the Applicant, Contractor, or a combination thereof. If during the course of project implementation, any of the mitigation measures identified herein cannot be successfully implemented, the City shall be immediately informed, and the City will then inform any affected responsible agencies. The City, in conjunction with any affected responsible agencies, will then determine if modification to the project is required and/or whether alternative mitigation is appropriate.

Mitigation Monitoring and Reporting Program Checklist

Project: The Cactus Commerce Project PEN16-0131 (PA15-0032) – Master Plot Plan, PEN16-0132 (PA16-0004) – Plot Plan, PEN16-0133 (PA16-0005) – Plot Plan, & PEN16-0134 (PA16-0006) – Plot Plan.

Applicant: Moreno Valley Cactus Center

Date: February 16, 2017

Mitigation Measure No.	Responsible for Monitoring	Monitoring Frequency	Timing of Verification	Method of Verification	Verified Date/Initials	Sanctions for Non-Compliance
Traffic/Transportation						
TR-1: Modification of the existing traffic signal located at Cactus Avenue and Commerce Center Drive and reconstruction of the north east corner of the intersection for the addition of the right-turn lane. Since any modification to this intersection requires the California Department of Transportation's (Caltrans) approval, the project applicant and the project applicant's contractor(s) shall be responsible for contacting Caltrans to obtain Caltrans's approval and encroachment permit prior to perform these works.	City of Moreno Valley Transportation Engineering Division and Planning Division	Ongoing during construction	Prior to Building Final	Final Inspection of signal improvements		Withhold Building Final
TR-2: Construction of a raised, landscaped median on Cactus Avenue along project frontage.	City of Moreno Valley Transportation Engineering Division , Land Development and Planning Division	Ongoing during construction	Prior to Building Final	Final Inspection of improvements		Withhold Building Final
TR-3: Modification of the existing raised, landscaped median on Cactus Avenue west of Elsworth Street to extend the existing east bound left-turn lane storage length to 300 feet at Cactus Avenue/Elsworth Street intersection.	City of Moreno Valley Transportation Engineering Division , Land Development and Planning Division	Ongoing during construction	Prior to Building Final	Final Inspection of improvements		Withhold Building Final

Mitigation Measure No.	Responsible for Monitoring	Monitoring Frequency	Timing of Verification	Method of Verification	Verified Date/Initials	Sanctions for Non-Compliance
Biological Resources						
BR-1: A qualified biologist will conduct a pre-construction presence/absence survey for burrowing owls within 14 days prior to site disturbance. If burrowing owls are detected onsite, the owls will be relocated/excluded from the site outside of the breeding season following accepted protocols, and subject to the approval of the RCA and wildlife agencies.	City of Moreno Valley Planning Division	Ongoing during grading plan check	Prior to Issuance of a grading permit	Review of and approval of pre-construction survey		Withhold Grading Permit
Mitigation Measure No.	**Responsible for Monitoring**	**Monitoring Frequency**	**Timing of Verification**	**Method of Verification**	**Verified Date/Initials**	**Sanctions for Non-Compliance**
Cultural Resources						
CR-1: If a significant archaeological resource(s) or tribal cultural resource is discovered on the property, ground disturbing activities shall be suspended 100 feet around the resource(s). The archaeological monitor and a representative of the appropriate Native American Tribe(s), the Project Proponent, and the City Planning Department shall confer regarding mitigation of the discovered resource(s). A treatment plan shall be prepared and implemented to protect the identified archaeological resource(s) or tribal cultural resources from damage and destruction. The treatment plan shall contain a research design and data recovery program necessary to document the size and content of the discovery such that the resource(s) can be evaluated for significance under CEQA criteria. The research design shall list the sampling procedures appropriate to exhaust the research potential of the archaeological resource(s) or tribal cultural resources in accordance with current professional archaeology standards. The treatment plan	City of Moreno Valley Land Development Division and Planning Division	During grading and construction operations	During grading and construction operations	Review of construction documents and on-site inspection		Issuance of a Stop Work Order

shall require monitoring by the appropriate Native American Tribe(s) during data recovery and shall require that all recovered artifacts undergo basic field analysis and documentation or laboratory analysis, whichever is appropriate. At the completion of the basic field analysis and documentation or laboratory analysis, any recovered archaeological or tribal cultural resources shall be processed and curated according to current professional repository standards. The collections and associated records shall be donated to an appropriate curation facility, or, the artifacts may be delivered to the appropriate Native American Tribe(s) if that is recommended by the City of Moreno Valley. A final report containing the significance and treatment findings shall be prepared by the archaeologist and submitted to the City of Moreno Valley Planning Department, the Eastern Information Center, and the appropriate Native American Tribe.						
CR-2: The landowner(s) shall relinquish ownership of all cultural resources, including sacred items, burial goods, and all archaeological artifacts and non-human remains as part of the required mitigation for impacts to cultural resources. The applicant shall relinquish the artifacts through one or more of the following methods and provide the Moreno Valley Planning Department with evidence of same. a) A fully executed reburial agreement with the appropriate culturally affiliated Native American tribes or bands. This shall include measures and provisions to protect the future reburial area from any future impacts. Reburial shall not occur until all cataloguing and basic recordation have been completed. b) A curation agreement with an appropriate qualified repository within Riverside County that meets federal standards per 36 CFR Part 79 and therefore would be professionally curated and made available to	City of Moreno Valley Land Development Division and Planning Division	During grading and construction operations	During grading and construction operations	Review of construction documents and on-site inspection		Issuance of a Stop Work Order

Attachment: Exhibit A Mitigation Monitoring Program (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

other archaeologists/researchers for further study. The collections and associated records shall be transferred, including title, to an appropriate curation facility within Riverside County, to be accompanied by payment of the fees necessary for permanent curation. c) If more than one Native American Group is involved with the project and cannot come to an agreement as to the disposition of cultural materials, they shall be curated at the Western Science Center by default. d) Should reburial of collected cultural items be preferred, it shall not occur until after the Phase IV monitoring report has been submitted to the Moreno Valley Planning Department. Should curation be preferred, the developer/permit applicant is responsible for all costs and the repository and curation method shall be described in the Phase IV monitoring report.						
CR-3: The Project applicant shall contact the consulting Native American Tribe(s) that have requested monitoring through consultation with the City during the AB 52 process. The applicant shall coordinate with the Tribe(s) to develop a Tribal Monitoring Agreement(s). A copy of the agreement shall be provided to the City of Moreno Valley Planning Department prior to the Issuance of a grading permit.	City of Moreno Valley Land Development Division and Planning Division	Prior to issuance of Grading Permit	Prior to issuance of Grading Permit	Prior to issuance of Grading Permit		Withhold Grading Permit or Issuance of a Stop Work Order

Attachment: Exhibit A Mitigation Monitoring Program (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

CITY OF MORENO VALLEY
FINAL CONDITIONS OF APPROVAL
PEN16-0131 (PA15-0032) Master Plot Plan, PEN16-0132 (PA16-0004) Plot Plan PEN16-0133 (PA16-0005) Plot Plan, PEN16-0134 (PA16-0006) Plot Plan FOR A COMMERCIAL CENTER WITH A 36,950 SQUARE FOOT (SF.) WAREHOUSE BUILDING, 24 HOUR GAS STATION, CAR WASH, A 2,800 SF. FAST-FOOD RESTAURANT (#1), A 2,500 SF. FAST-FOOD RESTAURANT (#2), AND A 2,600 SF. FAST FOOD RESTAURANT (#3).
ASSESSOR'S PARCEL NUMBERS: 297-130-052, 297-130-053 & 297-130-054

Effective Approval Date:
Effective Expiration Date:

COMMUNITY DEVELOPMENT DEPARTMENT

Planning Division

P1. The project has been approved for the development of a commercial center on an approximately 6.3 acre site. The project includes applications for a Master Plot Plan for the commercial center, a Plot Plan application for a 36,950 square foot (sf.) warehouse building, a Plot Plan for a new 24 hour gas station with a car wash, a 2,800 sf. fast-food restaurant (#1), a Plot Plan for a 2,500 sf. fast-food restaurant (#2), and a 2,600 sf. food restaurant (#3).

The project as designed provides a total of 158 parking spaces for the entire development, and four trailer truck parking spaces for the warehouse plot plan. Each parcel will provide the minimum parking for the uses on each parcel based on Municipal Code Section 9.11.

P2. This approval shall comply with all applicable requirements of the City of Moreno Valley Municipal Code.

P3. This master plot plan and plot plans shall expire three years after the approval date unless extended as provided by the City of Moreno Valley Municipal Code; otherwise it shall become null and void and of no effect whatsoever. (MC 9.02.230)

Timing Mechanisms for Conditions (see abbreviation at beginning of affected condition):

R - Map Recordation	GP - Grading Permits	CO - Certificate of Occupancy or building final
WP - Water Improvement Plans	BP - Building Permits	P - Any permit

Governing Document (see abbreviation at the end of the affected condition):

GP - General Plan	MC - Municipal Code	CEQA - California Environmental Quality Act
Ord - Ordinance	DG - Design Guidelines	Ldscp - Landscape Development Guidelines and Specs
Res - Resolution	UFC - Uniform Fire Code	UBC - Uniform Building Code
	SBM - Subdivision Map Act	

P4. The site shall be developed in accordance with the approved plot plan on file in the Community Development Department - Planning Division, the General Plan, the Municipal Code regulations, and the conditions contained herein. (MC 9.14.020)

P5. All undeveloped portions of the site shall be maintained in a manner that provides for the control of weeds, erosion and dust. (MC 9.02.030)

P6. All landscaped areas shall be maintained in a healthy and thriving condition, free from weeds, trash and debris. (MC 9.02.030)

P7. Any signs indicated on the submitted plans are not included with this approval. Any signs, whether permanent (e.g. wall, monument) or temporary (e.g. banner, flag), proposed for this development shall be designed in conformance with the sign provisions of the Municipal Code or an approved sign program, if applicable, and shall require separate application and approval by the Planning Division. No signs are permitted in the public right of way. (MC 9.12)

P8. All site plans, grading plans, landscape and irrigation plans, and street improvement plans shall be coordinated for consistency with this approval.

P9. The design of all swales and basins that are visible from the public right-of-way shall be integrated with the surrounding landscape areas.

P10. If the proposed project requires blasting, it shall be used only as a last resort. In such cases, it shall be approved by the Fire Marshall, and the developer shall comply with the current City ordinance governing blasting. (Ord)

P11. The Airport Land Use Commission conditions as described in the attached letter dated October 19, 2015 will apply to the project.

PRIOR TO GRADING

P12. (GP) Prior to issuance of grading permits, the developer shall pay the applicable Stephen's' Kangaroo Rat (SKR) Habitat Conservation Plan mitigation fee. (Ord)

P13. (GP) Prior to the issuance of grading permits, final erosion control landscape and irrigation plans for all cut or fill slopes over 3 feet in height shall be submitted to the Planning Division for review and approval for the phase in process. The plans shall be designed in accordance with the slope erosion plan as required by the City Engineer for that phase. Man-made slopes greater than 10 feet in height shall be "land formed" to conform to the natural terrain and shall be landscaped and stabilized to minimize visual scarring. (GP Objective 1.5, MC 9.08.080, DG)

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

P14. (GP) Prior to approval of any grading permits, final median enhancement/landscape/irrigation plans shall be submitted to the Planning Division, and Public Works Department – Special Districts Division for review and approval by each division. (GP - Circulation Master Plan)

P15. (GP) Prior to the issuance of grading permits, the grading plan shall show decorative concrete paving for all driveway ingress/egress locations of the project and across drive aisles throughout the development to connect required paths of travel with the public right-of-way.

P16. (GP) Prior to issuance of grading permits, the developer shall submit wall/fence plans to the Planning Division for review and approval and of any proposed retaining walls. The wall and fence materials shall be decorative in nature, while the combination of retaining and other walls on top shall not exceed the City's height requirement.

P17. (GP) Prior to the issuance of grading permits, building permits or building final, mitigation measures contained in the Mitigation Monitoring Program approved with this project and as referenced in the conditions of approval shall be implemented as provided therein. A mitigation monitoring fee, as provided by City ordinance, shall be paid by the applicant within 30 days of project approval. No City permit or approval shall be issued until such fee is paid. (CEQA)

PRIOR TO BUILDING PERMITS

P18. (BP) Prior to issuance of building permits, the Planning Division shall review and approve the location and method of enclosure or screening of transformer cabinets, commercial gas meters and back flow preventers as shown on the final working drawings. Location and screening shall comply with the following criteria: transformer cabinets and commercial gas meters shall not be located within required setbacks and shall be screened from public view either by architectural treatment or landscaping; multiple electrical meters shall be fully enclosed and incorporated into the overall architectural design of the building(s); back-flow preventers shall be screened by landscaping. (GP Objective 43.30, DG)

P19. (BP) Prior to issuance of building permits, screening details shall be addressed on plans for roof top equipment and trash enclosures submitted for Planning Division review and approval. All equipment shall be completely screened so as not to be visible from public view, and the screening shall be an integral part of the building. For trash enclosures, landscaping shall be included on at least three sides. The trash enclosure, including any roofing, shall be compatible with the architecture for the building(s) and will include decorative block wall construction. (GP Objective 43.6, DG)

P20. (BP) Prior to issuance of building permits, two copies of a detailed, on-site, computer generated, point-by-point comparison lighting plan, including exterior

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

building, parking lot, and landscaping lighting, shall be submitted to the Planning Division for review and approval. The lighting plan shall be generated on the plot plan and shall be integrated with the final landscape plan. The plan shall indicate the manufacturer's specifications for light fixtures used and shall include style, illumination, location, height and method of shielding. The lighting shall be designed in such a manner so that it does not exceed one-quarter foot-candle minimum maintained lighting measured from within five feet of any property line. The lighting level for all parking lots or structures shall be a minimum coverage of one foot-candle of light with a maximum of eight foot-candles. After the third plan check review for lighting plans, an additional plan check fee will apply. (MC 9.08.100, DG)

P21. (BP) Prior to issuance of building permits, the developer or developer's successor-in-interest shall pay all applicable impact fees, including but not limited to Transportation Uniform Mitigation fees (TUMF), Multi-species Habitat Conservation Plan (MSHCP) mitigation fees, and the City's adopted Development Impact Fees. (Ord)

P22. (BP) Prior to the issuance of building permits, the site plan shall include landscape for trash enclosures to include landscape on three sides, while elevation plans for trash enclosures shall be provided that include decorative enhancements such as an enclosed roof and other decorative features that are consistent with the architecture of the proposed buildings on the site, subject to the approval of the Planning Division.

P23. (BP) Prior to issuance of any building permits, final landscaping and irrigation plans shall be submitted for review and approved by the Planning Division. After the third plan check review for landscape plans, an additional plan check fee shall apply. The plans shall be prepared in accordance with the City's Landscape Standards and shall include:

A. A three (3) foot high decorative wall, solid hedge or berm shall be placed in any setback areas between a public right of way and a parking lot for screening.
B. Finger and end planters with required step outs and curbing shall be provided every 12 parking stalls as well as at the terminus of each aisle.
C. Drought tolerant landscape shall be used. Sod shall be limited to gathering and recreation areas
D. Street trees shall be provided every 40 feet on center in the parkway along the Cactus Avenue, Commerce Center Drive and Goldencrest Drive, frontages.
E. On-site trees shall be planted at an equivalent of one (1) tree per thirty (30) linear feet of the perimeter of a parking lot and per thirty linear feet of a building dimension for the portions of the building visible from a parking lot or right of way. Trees may be massed for pleasing aesthetic effects.
F. Enhanced landscaping shall be provided at all driveway entries and

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

street corner locations and along the Cactus Avenue, Commerce Center Drive and Goldencrest Drive frontages.

G. The review of all utility boxes, transformers etc. shall be coordinated to provide adequate screening from public view.
H. Landscaping on three sides of any trash enclosure.
I. All site perimeter and parking lot landscape and irrigation shall be installed prior to the release of certificate of any occupancy permits for the site.
J. Bio-retention or other water quality or storm water infrastructure placed in a required landscape planter shall be landscaped per Municipal Code Section 9.17 and the City's Landscape Standards.

P25. (BP) Prior to the issuance of building permits, mitigation measures contained in the Mitigation Monitoring Program approved with this project and as referenced in the conditions of approval shall be implemented as provided therein.

PRIOR TO BUILDING FINAL

P26. (BF) Prior to building final, the required landscaping and irrigation shall be installed. (MC 9.03.040)

P27. (BF) Prior to building final all required and proposed fences and walls shall be constructed according to the approved plans on file in the Planning Division. (MC 9.080.070).

P28. (BF) Prior to building final, installed landscaping and irrigation shall be inspected by the Planning Division. All on-site landscaping shall be installed in accordance with the City's Landscape Standards and the approved project landscape plans and all site clean-up shall be completed. All site perimeter and parking lot landscape and irrigation shall be installed prior to building final for the site or pad in question.

P29. (BF) Prior to building final, Planning approved/stamped landscape plans shall be provided to the Community Development Department – Planning Division on a CD disk.

Mitigation Measures

P30. **TR-1:** Modification of the existing traffic signal located at Cactus Avenue and Commerce Center Drive and reconstruction of the north east corner of the intersection for the addition of the right-turn lane. Since any modification to this intersection requires the California Department of Transportation's (Caltrans) approval, the project applicant and the project applicant's contractor(s) shall be responsible for contacting Caltrans to obtain Caltrans's approval and encroachment permit prior to perform these works.

P31. **TR-2:** Construction of a raised, landscaped median on Cactus Avenue along

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

project frontage.

P32. **TR-3:** Modification of the existing raised, landscaped median on Cactus Avenue west of Elsworth Street to extend the existing east bound left-turn lane storage length to 300 feet at Cactus Avenue/Elsworth Street intersection.

P33. **BR-1:** A qualified biologist will conduct a pre-construction presence/absence survey for burrowing owls within 14 days prior to site disturbance. If burrowing owls are detected onsite, the owls will be relocated/excluded from the site outside of the breeding season following accepted protocols, and subject to the approval of the RCA and wildlife agencies.

P34. **CR-1:** If a significant archaeological resource(s) or tribal cultural resource is discovered on the property, ground disturbing activities shall be suspended 100 feet around the resource(s). The archaeological monitor and a representative of the appropriate Native American Tribe(s), the Project Proponent, and the City Planning Department shall confer regarding mitigation of the discovered resource(s). A treatment plan shall be prepared and implemented to protect the identified archaeological resource(s) or tribal cultural resources from damage and destruction. The treatment plan shall contain a research design and data recovery program necessary to document the size and content of the discovery such that the resource(s) can be evaluated for significance under CEQA criteria. The research design shall list the sampling procedures appropriate to exhaust the research potential of the archaeological resource(s) or tribal cultural resources in accordance with current professional archaeology standards. The treatment plan shall require monitoring by the appropriate Native American Tribe(s) during data recovery and shall require that all recovered artifacts undergo basic field analysis and documentation or laboratory analysis, whichever is appropriate. At the completion of the basic field analysis and documentation or laboratory analysis, any recovered archaeological or tribal cultural resources shall be processed and curated according to current professional repository standards. The collections and associated records shall be donated to an appropriate curation facility, or, the artifacts may be delivered to the appropriate Native American Tribe(s) if that is recommended by the City of Moreno Valley. A final report containing the significance and treatment findings shall be prepared by the archaeologist and submitted to the City of Moreno Valley Planning Department, the Eastern Information Center, and the appropriate Native American Tribe.

P35. **CR-2:** The landowner(s) shall relinquish ownership of all cultural resources, including sacred items, burial goods, and all archaeological artifacts and non-human remains as part of the required mitigation for impacts to cultural resources. The applicant shall relinquish the artifacts through one or more of the following methods and provide the Moreno Valley Planning Department with evidence of same.

a) A fully executed reburial agreement with the appropriate culturally affiliated

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Native American tribes or bands. This shall include measures and provisions to protect the future reburial area from any future impacts. Reburial shall not occur until all cataloguing and basic recordation have been completed.
b) A curation agreement with an appropriate qualified repository within Riverside County that meets federal standards per 36 CFR Part 79 and therefore would be professionally curated and made available to other archaeologists/researchers for further study. The collections and associated records shall be transferred, including title, to an appropriate curation facility within Riverside County, to be accompanied by payment of the fees necessary for permanent curation.
c) If more than one Native American Group is involved with the project and cannot come to an agreement as to the disposition of cultural materials, they shall be curated at the Western Science Center by default.
d) Should reburial of collected cultural items be preferred, it shall not occur until after the Phase IV monitoring report has been submitted to the Moreno Valley Planning Department. Should curation be preferred, the developer/permit applicant is responsible for all costs and the repository and curation method shall be described in the Phase IV monitoring report.

P36. **CR-3:** The Project applicant shall contact the consulting Native American Tribe(s) that have requested monitoring through consultation with the City during the AB 52 process. The applicant shall coordinate with the Tribe(s) to develop a Tribal Monitoring Agreement(s). A copy of the agreement shall be provided to the City of Moreno Valley Planning Department prior to the Issuance of a grading permit.

MORENO VALLEY UNIFIED SCHOOL DISTRICT

S1. (BP) Prior to issuance of building permits, the developer shall provide to the Community Development Director a written certification by the affected school district that either: (1) the project has complied with the fee or other exaction levied on the project by the governing board of the district, pursuant to Government Code Section 65996; or (2) the fee or other requirement does not apply to the project.

UNITED STATES POSTAL SERVICE

PO1. (BP) Prior to the issuance of building permits, the developer shall contact the U.S. Postal Service to determine the appropriate type and location of mailboxes.

BUILDING AND SAFETY DIVISION

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The following comments have been generated based on the information provided with your application. Please note that future revisions or changes in scope to the project may require additional items. Fee estimates for plan review and permits can be obtained by contacting the Building Safety Division at 951.413.3350.

GENERAL CONDITIONS

1. All new structures shall be designed in conformance to the latest design standards adopted by the State of California in the California Building Code, (CBC) Part 2, Title 24, California Code of Regulations including requirements for allowable area, occupancy separations, fire suppression systems, accessibility, etc. The current code edition is the 2016 CBC.

2. Prior to submittal, all new development, including residential second units, are required to obtain a valid property address prior to permit application. Addresses can be obtained by contacting the Building Safety Division at 951.413.3350.

3. The proposed project's occupancy shall be classified by the Building Official and must comply with exiting, occupancy separation(s) and minimum plumbing fixture requirements of the 2016 California Plumbing Code Table 4-1.

4. Building plans submitted shall be signed and sealed by a California licensed design professional as required by the State Business and Professions Code.

5. The proposed non-residential project shall comply with the latest Federal Law, Americans with Disabilities Act, and State Law, California Code of Regulations, Title 24, Chapter 11B for accessibility standards for the disabled including access to the site, exits, bathrooms, work spaces, etc.

6. The proposed development shall be subject to the payment of required development fees as required by the City's current Fee Ordinance at the time a building application is submitted or prior to the issuance of permits as determined by the City.

7. The proposed project will be subject to approval by the Eastern Municipal Water District and all applicable fees and charges shall be paid prior to permit issuance. Contact the water district at 951.928.3777 for specific details.

8. Any construction within the city shall only be as follows: Monday through Friday (except for holidays which occur on weekdays), seven a.m. to seven p.m.; weekends and holidays (as observed by the city and described in the Moreno Valley Municipal Code Chapter 2.55), eight a.m. to four p.m., unless written approval is first obtained from the Building Official or City Engineer.

9. Contact the Building Safety Division for permit application submittal requirements.

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FIRE DEPARTMENT

Application Specific Conditions

F1. Red curbing "NO PARKING FIRE LANE CVC 22500.1" shall be placed on Goldencrest curbing adjacent to north perimeter of Warehouse structure. South warehouse perimeter access fire lane shall also be designated NO "PARKING FIRE LANE" and identified per City of Moreno Valley standards.

F2. A 20 ft. fire lane allowance (only as approved by Fire Chief) on south perimeter of proposed warehouse will only be allowed for this area. All other fire lane areas are to be maintained at a minimum of 24 feet. On the east perimeter of the proposed warehouse, the fire lane shall be maintained at 30" width due to 35' height of structure.

F3. Proposed private hydrant locations shall be shown on plan. Hydrants shall be provided and spaced based on Table C105.1 of the 2013 CFC.

Standard Conditions

F4. Prior to issuance of Building Permits, the applicant/developer shall participate in the Fire Impact Mitigation Program. (Fee Resolution as adopted by City Council)

F5. Prior to issuance of Certificate of Occupancy or Building Final, the applicant/developer shall install a fire sprinkler systems based on square footage and type of construction, occupancy or use. Fire sprinkler plans shall be submitted to the Fire Prevention Bureau for approval prior to installation. (CFC Chapter 9, MVMC 8.36.100[D])

F6. Prior to issuance of Certificate of Occupancy or Building Final, the applicant/developer shall install fire alarm systems monitored by an approved Underwriters Laboratory listed central station based on a requirement for monitoring the sprinkler system, occupancy or use. Fire alarm panel shall be accessible from exterior of building in an approved location. Plans shall be submitted to the Fire Prevention Bureau for approval prior to installation. (CFC Chapter 9 and MVMC 8.36.100)

F7. Prior to issuance of Certificate of Occupancy or Building Final, all commercial buildings shall display street numbers in a prominent location on the street side and rear access locations. The numerals shall be a minimum of twelve inches in height. (CFC 505.1, MVMC 8.36.060[I])

F8. Prior to issuance of Certificate of Occupancy or Building Final, the applicant/developer shall be responsible for obtaining underground and/or above

ground tank permits for the storage of combustible liquids, flammable liquids, or any other hazardous materials from both the County of Riverside Community Health Agency Department of Environmental Health and the Fire Prevention Bureau. (CFC 105)

F9. Prior to issuance of Certificate of Occupancy, approval shall be required from the County of Riverside Community Health Agency (Department of Environmental Health) and Moreno Valley Fire Prevention Bureau to maintain, store, use, handle materials, or conduct processes which produce conditions hazardous to life or property, and to install equipment used in connection with such activities. (CFC 105)

F10. Final fire and life safety conditions will be addressed when the Fire Prevention Bureau reviews building plans. These conditions will be based on occupancy, use, California Building Code (CBC), California Fire Code (CFC), and related codes, which are in effect at the time of building plan submittal.

F11. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, standard fire hydrants shall be provided at spacing not to exceed 1000 feet for transportation hazards. (CFC Appendix C105.1)

F12. The Fire Prevention Bureau is required to set a minimum fire flow for the remodel or construction of all commercial buildings per CFC Appendix B and Table B105.1. The applicant/developer shall provide documentation to show there exists a water system capable of delivering said waterflow for 2 hour(s) duration at 20-PSI residual operating pressure. The required fire flow may be adjusted during the approval process to reflect changes in design, construction type, or automatic fire protection measures as approved by the Fire Prevention Bureau. Specific requirements for the project will be determined at time of submittal. (CFC 507.3, Appendix B)

F13. Prior to issuance of the building permit for development, independent paved access to the nearest paved road, maintained by the City shall be designed and constructed by the developer within the public right of way in accordance with City Standards. (MVMC 8.36.060, CFC 501.4)

F14. If construction is phased, each phase shall provide an approved emergency vehicular access way for fire protection prior to any building construction. (CFC 501.4)

F15. Prior to issuance of Building Permits, the applicant/developer shall provide the Fire Prevention Bureau with an approved site plan for Fire Lanes and signage. (CFC 501.3)

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F16. Prior to construction, all locations where structures are to be built shall have an approved Fire Department access based on street standards approved by the Public Works Director and the Fire Prevention Bureau. (CFC 501.4)

F17. Fire lanes and fire apparatus access roads shall have an unobstructed width of not less than twenty–four (24) feet for building below 35 feet in height and thirty (30) feet for buildings over 35 feet in height. as approved by the Fire Prevention Bureau and an unobstructed vertical clearance of not less the thirteen (13) feet six (6) inches. (CFC 503.2.1 and MVMC 8.36.060[E])

F18. All Fire Department access roads or driveways shall not exceed 12 percent grade. (CFC 503.2.7 and MVMC 8.36.060[G])

F19. The angle of approach and departure for any means of Fire Department access shall not exceed 1 ft drop in 20 ft (0.3 m drop in 6 m), and the design limitations of the fire apparatus of the Fire Department shall be subject to approval by the AHJ. (CFC 503 and MVMC 8.36.060)

F20. Fire Department access driveways over 150 feet in length shall have a turn-around as determined by the Fire Prevention Bureau capable of accommodating fire apparatus. (CFC 503 and MVMC 8.36.060, CFC 501.4)

F21. Prior to issuance of a Certificate of Occupancy or Building Final, a “Knox Box Rapid Entry System” shall be provided (for each building). The Knox-Box shall be installed in an accessible location approved by the Fire Code Official. Electric powered gates shall be provided with Knox key switches for access by emergency personnel. Where manual operated gates are permitted, they shall be provided with a Knox box or Knox padlock. (CFC 506.1, 503.6)

F22. The minimum number of fire hydrants required, as well as the location and spacing of fire hydrants, shall comply with the C.F.C., MVMC, and NFPA 24. Fire hydrants shall be located no closer than 40 feet to a building. A fire hydrant shall be located within 50 feet of the fire department connection for buildings protected with a fire sprinkler system. The size and number of outlets required for the approved fire hydrants are (6” x 4” x 2 ½” x 2 ½”) (CFC 507.5.1, 507.5.7, Appendix C, NFPA 24-7.2.3, MVMC 912.2.1)

F23. Prior to issuance of Certificate of Occupancy or Building Final, “Blue Reflective Markers” shall be installed to identify fire hydrant locations in accordance with City specifications. (CFC 509.1 and MVLT 440A-0 through MVLT 440C-0)

F24. Prior to issuance of Building Permits, the applicant/developer shall furnish one copy of the water system plans to the Fire Prevention Bureau for review. Plans shall:

a. Be signed by a registered civil engineer or a certified fire protection engineer;

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b. Contain a Fire Prevention Bureau approval signature block; and
c. Conform to hydrant type, location, spacing of new and existing hydrants and minimum fire flow required as determined by the Fire Prevention Bureau.

The required water system, including fire hydrants, shall be installed, made serviceable, and be accepted by the Moreno Valley Fire Department prior to beginning construction. They shall be maintained accessible.

F25. Plans for private water mains supplying fire sprinkler systems and/or private fire hydrants shall be submitted to the Fire Prevention Bureau for approval. (CFC 105 and CFC 3312.1)

F26. Existing fire hydrants on public streets are allowed to be considered available. Existing fire hydrants on adjacent properties shall not be considered available unless fire apparatus access roads extend between properties and easements are established to prevent obstruction of such roads. (CFC 507, 501.3)

After the local water company signs the plans, the originals shall be presented to the Fire Prevention Bureau for signatures. The required water system, including fire hydrants, shall be installed, made serviceable, and be accepted by the Moreno Valley Fire Department prior to beginning construction. They shall be maintained accessible.

F27. The Fire Code Official is authorized to enforce the fire safety during construction requirements of Chapter 33. (CFC Chapter 33 & CBC Chapter 33)

F28. Prior to construction, all traffic calming designs/devices must be approved by the Fire Marshal and City Engineer.

SPECIAL DISTRICTS DIVISION

The following items are the Special Districts Division's Conditions of Approval for PEN16-0131 Master Plot Plan (PA15-0032) this project shall be completed at no cost to any Government Agency. All questions regarding the following Conditions including but not limited to intent, requests for change/modification, variance and/or request for extension of time shall be sought from the Special Districts Division of the Public Works Department 951.413.3480 or by emailing specialdistricts@moval.org.

General Conditions

SD-1 The parcel(s) associated with this project have been incorporated into the Moreno Valley Community Services District Zone A (Parks & Community Services) and Zone C (Arterial Street Lighting). All assessable parcels therein shall be subject to annual parcel taxes for Zone A and Zone C for operations and capital improvements.

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SD-2 Plans for parkway, median, slope, and/or open space landscape areas designated in the project's Conditions of Approval for incorporation into a City coordinated landscape maintenance program, shall be prepared and submitted in accordance with the City of Moreno Valley Public Works Department Landscape Design Guidelines. The guidelines are available on the City's website at www.moval.org/sd or from the Special Districts Division (951.413.3480 or specialdistricts@moval.org).

SD-3 The Developer, or the Developer's successors or assignees shall be responsible for all parkway and/or median landscape maintenance for a period of one (1) year commencing from the time all items of work have been completed to the satisfaction of Special Districts staff as per the City of Moreno Valley Public Works Department Landscape Design Guidelines, or until such time as the District accepts maintenance responsibilities.

SD-4 Any damage to existing landscape areas maintained by the City of Moreno Valley due to project construction shall be repaired/replaced by the Developer, or Developer's successors in interest, at no cost to the City of Moreno Valley.

SD-5 The ongoing maintenance of any landscaping required to be installed behind the sidewalk shall be the responsibility of the property owner.

SD-6 Plan check fees for review of parkway/median landscape plans for improvements that shall be maintained by the City of Moreno Valley are due upon the first plan submittal. (MC 3.32.040)

SD-7 Inspection fees for the monitoring of landscape installation associated with the City of Moreno Valley maintained parkways/medians are due prior to the required pre-construction meeting. (MC 3.32.040)

Prior to Building Permit Issuance

SD-8 (BP) This project has been identified to be included in the formation of a Community Facilities District (Mello-Roos) for Public Safety services, including but not limited to Police, Fire Protection, Paramedic Services, Park Rangers, and Animal Control services. The property owner(s) shall not protest the formation; however, they retain the right to object to the rate and method of maximum special tax. In compliance with Proposition 218, the property owner shall agree to approve the mail ballot proceeding (special election) for either formation of the CFD or annexation into an existing district. The Developer must notify the Special Districts Division at 951.413.3480 or at specialdistricts@moval.org when submitting the application for building permit issuance to determine the requirement for participation. If the first building permit is pulled prior to formation of the district, this condition will not apply. If the condition applies, the special election will require a minimum of 90 days prior to issuance of the first building

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permit. This allows adequate time to be in compliance with the provisions of Article 13C of the California Constitution. (California Government Code Section 53313 et. seq.)

SD-9 (BP) This project is conditioned to provide a funding source for the following special financing program(s):

a. Landscape Maintenance Services for median landscaping on Cactus Ave.

The Developer's responsibility is to provide a funding source for the capital improvements and the continued maintenance. The Developer shall satisfy this condition with one of the options below.

i. Participate in a special election (mail ballot proceeding) and pay all associated costs of the special election and formation, if any. Financing may be structured through a Community Services District zone, Community Facilities District, Landscape and Lighting Maintenance District, or other financing structure as determined by the City; or

ii. Establish a Property Owner's Association (POA) or Home Owner's Association (HOA) which will be responsible for any and all operation and maintenance costs

The Developer must notify the Special Districts Division at 951.413.3480 or at specialdistricts@moval.org of its selected financial option when submitting the application for building permit issuance. The option for participating in a special election requires approximately 90 days to complete the special election process. This allows adequate time to be in compliance with the provisions of Article 13C of the California Constitution.

The financial option selected shall be in place prior to the issuance of the first certificate of occupancy for the project.

SD-10 (BP) This project is conditioned for a proposed district to provide a funding source for the operation and maintenance of public improvements and/or services associated with new development in that territory. The Developer shall satisfy this condition with one of the options outlined below.

a. Participate in a special election for maintenance/services and pay all associated costs of the election process and formation, if any. Financing may be structured through a Community Facilities District, Landscape and Lighting Maintenance District, or other financing structure as determined by the City; or

b. Establish an endowment fund to cover the future maintenance and/or service costs.

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The Developer must notify the Special Districts Division at 951.413.3480 or at specialdistricts@moval.org when submitting the application for building permit issuance. If the first building permit is pulled prior to formation of the district, this condition will not apply. If the district has been or is in the process of being formed the Developer must inform the Special Districts Division of its selected financing option (a. or b. above). The option for participating in a special election requires 90 days to complete the special election process. This allows adequate time to be in compliance with the provisions of Article 13C of the California Constitution.

The financial option selected shall be in place prior to the issuance of the first certificate of occupancy for the project.

SD-11 *Commercial* (BP) If Land Development, a Division of the Public Works Department, requires this project to supply a funding source necessary to provide for, but not limited to, stormwater utilities services for the continuous operation, remediation and/or replacement, monitoring, systems evaluations and enhancement of on-site facilities and performing annual inspections of the affected areas to ensure compliance with state mandated stormwater regulations, a funding source needs to be established. The Developer must notify the Special Districts Division at 951.413.3480 or at specialdistricts@moval.org of its selected financial option for the National Pollution Discharge Elimination System (NPDES) program when submitting the application for the first building permit issuance (see Land Development's related condition). Participating in a special election the process requires a 90 day period prior to the City's issuance of a building permit. This allows adequate time to be in compliance with the provisions of Article 13D of the California Constitution. (California Health and Safety Code Sections 5473 through 5473.8 (Ord. 708 Section 3.1, 2006) & City of Moreno Valley Municipal Code Title 3, Section 3.50.050.)

SD-12 (BP) For those areas to be maintained by the City and prior to the issuance of the first Building Permit, Planning Division (Community Development Department), Special Districts Division (the Public Works Department) and Transportation Division (the Public Works Department) shall review and approve the final median, parkway, slope, and/or open space landscape/irrigation plans as designated on the tentative map or in these Conditions of Approval prior to the issuance of the first Building Permit.

<u>Prior to Certificate of Occupancy</u>

SD-13 (CO) Parkway, open space, and/or median landscaping specified in the project's Conditions of Approval shall be constructed in compliance with the City of Moreno Valley Public Works Design Guidelines and completed prior to the issuance of the first Certificate of Occupancy/Building Final for this project.

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SD-14 (CO) Landscape and irrigation plans for parkway, median, slope, and/or open space landscape areas designated to be maintained by the City shall be placed on compact disk (CD) in pdf format. The CD shall include "As Built" plans, revisions, and changes. The CD will become the property of the City of Moreno Valley and the Moreno Valley Community Services District.

MORENO VALLEY UTILITY

Acknowledgement of Conditions

The following items are Moreno Valley Utility's Conditions of Approval for project Case No: PEN16-0131, previously: PA15-0032, PA16-0004, 0005 & 0006; this project shall be completed at no cost to any Government Agency. All questions regarding Moreno Valley Utility's Conditions including but not limited to, intent, requests for change/modification, variance and/or request for extension of time shall be sought from Moreno Valley Utility (the Electric Utility Division) of the Public Works Department 951.413.3500, mvuengineering@moval.org. The applicant is fully responsible for communicating with Moreno Valley Utility staff regarding their conditions.

PRIOR TO ENERGIZING MVU ELECTRIC UTILITY SYSTEM AND CERTIFICATE OF OCCUPANCY

MVU-1 (R) This project requires the installation of electric distribution facilities. A non-exclusive easement shall be provided to Moreno Valley Utility and shall include the rights of ingress and egress for the purpose of operation, maintenance, facility repair, and meter reading.

MVU-2 (BP) City of Moreno Valley Municipal Utility Service – Electrical Distribution: Prior to constructing the MVU Electric Utility System, the developer shall submit a detailed engineering plan showing design, location and schematics for the utility system to be approved by the City Engineer. In accordance with Government Code Section 66462, the Developer shall execute an agreement with the City providing for the installation, construction, improvement and dedication of the utility system following recordation of final map and concurrent with trenching operations and other subdivision improvements so long as said agreement incorporates the approved engineering plan and provides financial security to guarantee completion and dedication of the utility system.

The Developer shall coordinate and receive approval from the City Engineer to install, construct, improve, and dedicate to the City, or the City's designee, all utility infrastructure (including but not limited to conduit, equipment, vaults, ducts, wires, switches, conductors, transformers, and "bring-up" facilities including electrical capacity to serve the identified development and other

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adjoining/abutting/ or benefiting projects as determined by Moreno Valley Utility) – collectively referred to as "utility system" (to and through the development), along with any appurtenant real property easements, as determined by the City Engineer to be necessary for the distribution and /or delivery of any and all "utility services" to each lot and unit within the Tentative Map. For purposes of this condition, "utility services" shall mean electric, cable television, telecommunication (including video, voice, and data) and other similar services designated by the City Engineer. "Utility services" shall not include sewer, water, and natural gas services, which are addressed by other conditions of approval.

The City, or the City's designee, shall utilize dedicated utility facilities to ensure safe, reliable, sustainable and cost effective delivery of utility services and maintain the integrity of streets and other public infrastructure. Developer shall, at developer's sole expense, install or cause the installation of such interconnection facilities as may be necessary to connect the electrical distribution infrastructure within the project to the Moreno Valley Utility owned and controlled electric distribution system.

MVU-3 For all new projects, existing Moreno Valley Utility electrical infrastructure shall be preserved in place. The developer will be responsible, at developer expense, for any and all costs associated with the relocation of any of Moreno Valley Utility's underground electrical distribution facilities, as determined by Moreno Valley Utility, which may be in conflict with any developer planned construction on the project site.

LAND DEVELOPMENT DIVISION

The following are the Public Works Department – Land Development Division Conditions of Approval for this project and shall be completed at no cost to any government agency. All questions regarding the intent of the following conditions shall be referred to the Public Works Department – Land Development Division.

General Conditions

LD1. (G) The developer shall comply with all applicable City ordinances and resolutions, including the City's Municipal Code (MC), and if subdividing land, the Government Code (GC) of the State of California, specifically Sections 66410 through 66499.58; said sections also referred to as the Subdivision Map Act (SMA) (MC 9.14.010).

LD2. (G) If the project involves the subdivision of land, maps may be developed in phases with the approval of the City Engineer. Financial security shall be provided for all improvements associated with each phase of the map. The boundaries of any multiple map increment shall be subject to the approval of the

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City Engineer. The City Engineer may require the dedication and construction of necessary utilities, streets or other improvements outside the area of any particular map, if the improvements are needed for circulation, parking, access, or for the welfare or safety of the public (MC 9.14.080, GC 66412 and 66462.5). If the project does not involve the subdivision of land and it is necessary to dedicate right of way/easements, the developer shall make the appropriate offer of dedication by separate instrument. The City Engineer may require the construction of necessary utilities, streets or other improvements beyond the project boundary, if the improvements are needed for circulation, parking, access, or for the welfare or safety of the public.

LD3. (G) It is understood that the master plot plan (PEN16-0131) and individual plot plans (PEN16-0132, PEN16-0133, and PEN16-0134) correctly show all existing easements, traveled ways, and drainage courses, and that their omission may require any map or plans associated with this application to be resubmitted for further consideration (MC 9.14.040).

LD4. (G) In the event right of way or offsite easements are required to construct offsite improvements necessary for the orderly development of the surrounding area to meet the public health and safety needs, the developer shall make a good faith effort to acquire the needed right of way in accordance with the Land Development Division's administrative policy. In the event that the developer is unsuccessful, he shall enter into an agreement with the City to acquire the necessary right of way or offsite easements and complete the improvements at such time the City acquires the right of way or offsite easements which will permit the improvements to be made. The developer shall be responsible for all costs associated with the right of way or easement acquisition (GC 66462.5).

LD5. (G) If improvements associated with this project are not initiated within two years of the date of approval of the Public Improvement Agreement, the City Engineer may require that the improvement cost estimate associated with the project be modified to reflect current City construction costs in effect at the time of request for an extension of time for the Public Improvement Agreement or issuance of a permit.

LD6. (G) The developer shall monitor, supervise and control all construction and construction supportive activities, so as to prevent these activities from causing a public nuisance, including but not limited to, insuring strict adherence to the following:

(a) Removal of dirt, debris, or other construction material deposited on any public street no later than the end of each working day.
(b) Observance of working hours as stipulated on permits issued by the Public Works Department.
(c) The construction site shall accommodate the parking of all motor vehicles used by persons working at or providing deliveries to the site.

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(d) All dust control measures per South Coast Air Quality Management District (SCAQMD) requirements shall be adhered to during the grading operations.

Violation of any condition or restriction or prohibition set forth in these conditions shall subject the owner, applicant, developer or contractor(s) to remedies as noted in the City Municipal Code 8.14.090. In addition, the City Engineer or Building Official may suspend all construction related activities for violation of any condition, restriction or prohibition set forth in these conditions until such time as it has been determined that all operations and activities are in conformance with these conditions.

LD7. (G) The developer shall protect downstream properties from damage caused by alteration of drainage patterns, i.e., concentration or diversion of flow. Protection shall be provided by constructing adequate drainage facilities, including, but not limited to, modifying existing facilities or by securing a drainage easement (MC 9.14.110).

LD8. (G) Public drainage easements, when required, shall be a minimum of 25 feet wide and shall be shown on the map and plan, and noted as follows: “Drainage Easement – no structures, obstructions, or encroachments by landfills are allowed.” In addition, the grade within the easement area shall not exceed a 3:1 (H:V) slope, unless approved by the City Engineer.

LD9. (G) A detailed (Final) drainage study shall be submitted to the City Engineer for review and approval at the time of any improvement or grading plan submittal. The study shall be prepared by a registered civil engineer and shall include existing and proposed hydrologic conditions. Hydraulic calculations are required for all drainage control devices, storm drain lines, and that 12” of (HGL) free-board below the catch basin flow line, channel embankment or finish pavement surface, shall be maintained. Prior to approval of the related improvement or grading plans, the developer shall submit the approved drainage study, on compact disk, in (.PDF) digital format to the Land Development Division of the Public Works Department (MC 9.14.110).

LD10. (G) The final conditions of approval issued by the Planning Division subsequent to Planning Commission approval shall be photographically or electronically placed on Mylar sheets and included in the grading and street improvement plan sets on twenty-four (24) inch by thirty-six (36) inch Mylar and submitted with the plans for plan check. These conditions of approval shall become part of these plan sets and the approved plans shall be available in the field during grading and construction.

LD11. (G) Upon approval of the master plot plan (PEN16-0131) and three plot plans (PEN16-0132, PEN16-0133, and/or PEN16-0134) by the Planning Commission,

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the Developer shall submit the approved plot plans on compact disk in (PDF) digital format to the Land Development Division of the Public Works Department.

Prior to Grading Plan Approval or Grading Permit

LD12. (GPA) Prior to the grading plan approval, plans shall be drawn on twenty-four (24) inch by thirty-six (36) inch Mylar and signed by a registered civil engineer and other registered/licensed professional as required.

LD13. (GPA) Prior to the grading plan approval, the developer shall ensure compliance with the City Grading ordinance, these Conditions of Approval and the following criteria:

a. The project street and lot grading shall be designed in a manner that perpetuates the existing natural drainage patterns with respect to tributary drainage area and outlet points. Unless otherwise approved by the City Engineer, lot lines shall be located at the top of slopes.
b. Any grading that creates cut or fill slopes adjacent to the street shall provide erosion control, sight distance control, and slope easements as approved by the City Engineer.
c. A grading permit shall be obtained from the Public Works Department Land Development Division prior to commencement of any grading outside of the City maintained road right of way.
d. All improvement plans are substantially complete and appropriate clearance and at-risk letters are provided to the City (MC 9.14.030).
e. The developer shall submit a soils and geologic report to the Public Works Department – Land Development Division. The report shall address the soil's stability and geological conditions of the site.

LD14. (GPA) Prior to the grading plan approval for projects that will result in discharges of storm water associated with construction with a soil disturbance of one or more acres of land, the developer shall submit a Notice of Intent (NOI) and obtain a Waste Discharger's Identification number (WDID#) from the State Water Quality Control Board (SWQCB). The WDID# shall be noted on the grading plans prior to issuance of the first grading permit.

LD15. (GPA) Prior to the grading plan approval, the Developer shall submit two (2) copies of the final project-specific Water Quality Management Plan (WQMP) for review by the City Engineer that:

a. Addresses Site Design Best Management Practices (BMPs) such as minimizing impervious areas, maximizing permeability, minimizes directly connected impervious areas to the City's street and storm drain systems, and conserves natural areas;
b. Incorporates Source Control BMPs and provides a detailed description of their implementation;

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c. Incorporates Treatment Control BMPs and provides information regarding design considerations;
d. Describes the long-term operation and maintenance requirements for BMPs requiring maintenance; and
e. Describes the mechanism for funding the long-term operation and maintenance of the BMPs.

A copy of the final WQMP template can be obtained on the City's Website or by contacting the Land Development Division of the Public Works Department.

LD16. (GPA) Prior to the grading plan approval, the Developer shall secure approval of the final project-specific WQMP from the City Engineer. The final project-specific WQMP shall be submitted at the same time as the grading plan submittal. The approved final WQMP shall be submitted to the Storm Water Program Manager on compact disk(s) in PDF format prior to grading plan approval.

LD17. (GPA) Prior to the grading plan approval, or issuance of a building permit as determined by the City Engineer, the approved final project-specific WQMP shall be incorporated by reference or attached to the project's Storm Water Pollution Prevention Plan as the Post-Construction Management Plan. A WQMP Identification Number may be issued by the Storm Water Management Section and shall be noted on the rough grading plans as confirmation that a project-specific F-WQMP approval has been obtained.

LD18. (GPA) Prior to grading plan approval, the developer shall prepare a Storm Water Pollution Prevention Plan (SWPPP) in conformance with the state's Construction Activities Storm Water General Permit. A copy of the current SWPPP shall be kept at the project site and be available for review upon request.

LD19. (GPA) Prior to the grading plan approval, the developer shall pay applicable remaining grading plan check fees.

LD20. (GPA) Prior to grading plan approval, resolution of all drainage issues shall be as approved by the City Engineer.

LD21. (GP) Prior to the issuance of a grading permit the developer shall submit recorded slope easements from adjacent landowners in all areas where grading resulting in slopes is proposed to take place outside of the project boundaries. For all other offsite grading, written permission from adjacent property owners shall be submitted.

LD22. (GP) Prior to issuance of a grading permit, security, in the form of a cash deposit (preferable), letter of credit, or performance bond shall be required to be submitted as a guarantee of the completion of the grading required as a condition of approval of the project (MC 8.21.070).

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LD23. (GP) Prior to issuance of a grading permit, security, in the form of a cash deposit (preferable), letter of credit, or performance bond shall be required to be submitted as a guarantee of the implementation and maintenance of erosion control measures required as a condition of approval of the project. At least twenty-five (25) percent of the required security shall be in cash and shall be deposited with the City (MC 8.21.160).

LD24. (GP) Prior to issuance of a grading permit, the developer shall pay the applicable grading inspection fees.

Prior to Improvement Plan Approval or Construction Permit

LD25. (IPA) Prior to approval of the improvement plans, the improvement plans shall be drawn on twenty-four (24) inch by thirty-six (36) inch Mylar and signed by a registered civil engineer and other registered/licensed professional as required.

LD26. (IPA) Prior to approval of the improvement plans, the developer shall submit clearances from all applicable agencies, and pay all outstanding plan check fees (MC 9.14.210).

LD27. (IPA) All public improvement plans prepared and signed by a registered civil engineer in accordance with City standards, policies and requirements shall be approved by the City Engineer in order for the Public Improvement Agreement and accompanying security to be executed.

LD28. (IPA) Prior to approval of the improvement plans, securities and a public improvement agreement shall be required to be submitted and executed as a guarantee of the completion of the improvements required as a condition of approval of the project.

LD29. (IPA) The street improvement plans shall comply with all applicable City standards and the following design standards throughout this project:

a. Corner cutbacks in conformance with City Standard No. MVSI-165-0 shall be shown on the final map or, if no map is to be recorded, offered for dedication by separate instrument.
b. Lot access to major thoroughfares shall be restricted except at intersections and approved entrances and shall be so noted on the final map (MC 9.14.100).
c. The minimum centerline and flow line grades shall be one percent unless otherwise approved by the City Engineer (MC 9.14.020).
d. All street intersections shall be at ninety (90) degrees plus or minus five (5) degrees per City Standard No. MVSI-160A-0, or as approved by the City Engineer (MC 9.14.020).
e. All reverse curves shall include a minimum tangent of one hundred (100) feet in length.

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LD30. (IPA) Prior to approval of the improvement plans, the plans shall be based upon a centerline profile, extending beyond the project boundaries a minimum distance of 300 feet at a grade and alignment approved by the City Engineer. Design plan and profile information shall include the minimum 300 feet beyond the project boundaries.

LD31. (IPA) Prior to approval of the improvement plans, the plans shall indicate any restrictions on trench repair pavement cuts to reflect the City's moratorium on disturbing newly-constructed pavement less than three years old and recently slurry sealed streets less than one year old. Pavement cuts for trench repairs may be allowed for emergency repairs or as specifically approved in writing by the City Engineer.

LD32. (IPA) Prior to approval of the improvement plans, the developer shall pothole to determine the exact location of existing underground utilities. The improvement plans shall be designed based on the pothole field investigation results. The developer shall coordinate with all affected utility companies and bear all costs of utility relocations.

LD33. (IPA) Prior to submittal of the improvement plans, all dry and wet utility crossings shall be potholed to determine actual elevations. Any conflicting utilities shall be identified and addressed on the plans. The pothole survey data shall be submitted with the street improvement plans for reference purposes.

LD34. (IPA) Prior to approval of the improvement plans, the developer is required to bring any existing access ramps adjacent to and fronting the project to current ADA (Americans with Disabilities Act) requirements. However, when work is required in an intersection that involves or impacts existing access ramps, those access ramps in that intersection shall be retrofitted to comply with current ADA requirements, unless approved otherwise by the City Engineer.

LD35. (IPA) Prior to approval of the improvement plans, drainage facilities with sump conditions shall be designed to convey the tributary 100-year storm flows. Secondary emergency escape shall also be provided (MC 9.14.110).

LD36. (IPA) Prior to the approval of the improvement plans, the hydrology study shall show that the 10-year storm flow will be contained within the curb and the 100-year storm flow shall be contained within the street right of way. In addition, one lane in each direction shall not be used to carry surface flows during any storm event for street sections equal to or larger than a minor arterial. When any of these criteria is exceeded, additional drainage facilities shall be installed (MC 9.14.110 A.2).

LD37. (IPA) The project shall be designed to accept and properly convey all off-site drainage flowing onto or through the site. All storm drain design and

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improvements shall be subject to review and approval of the City Engineer. In the event that the City Engineer permits the use of streets for drainage purposes, the provisions of the Development Code will apply. Should the quantities exceed the street capacity or the use of streets be prohibited for drainage purposes, as in the case where one travel lane in each direction shall not be used for drainage conveyance for emergency vehicle access on streets classified as minor arterials and greater, the developer shall provide adequate facilities as approved by the Public Works Department – Land Development Division (MC 9.14.110).

LD38. (CP) All work performed within the City right of way requires a construction permit. As determined by the City Engineer, security may be required for work within the right of way. Security shall be in the form of a cash deposit or other approved means. The City Engineer may require the execution of a public improvement agreement as a condition of the issuance of the construction permit. All inspection fees shall be paid prior to issuance of construction permit (MC 9.14.100).

LD39. (CP) Prior to issuance of a construction permit, all public improvement plans prepared and signed by a registered civil engineer in accordance with City standards, policies and requirements shall be approved by the City Engineer.

LD40. (CP) Prior to issuance of construction permits, the developer shall submit all improvement plans on compact disks, in (.PDF) digital format to the Land Development Division of the Public Works Department.

LD41. (CP) Prior to issuance of construction permits, the developer shall pay all applicable inspection fees.

<u>Prior to Building Permit</u>

LD42. (BP) Prior to issuance of building permits, all street dedications shall be irrevocably offered to the public and shall continue in force until the City accepts or abandons such offers, unless otherwise approved by the City Engineer. All dedications shall be free of all encumbrances as approved by the City Engineer.

LD43. (BP) Prior to issuance of building permits for non-subdivisions, security shall be required to be submitted as a guarantee of the completion of the improvements required as a condition of approval of the project. A public improvement agreement will be required to be executed.

LD44. (BP) Prior to issuance of a building permit, an approval by the City Engineer is required of the water quality control basin(s). The developer shall provide certification to the line, grade, flow test and system invert elevations.

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LD45. (BP) Prior to issuance of a building permit, all pads shall meet pad elevations per approved plans as noted by the setting of "Blue-top" markers installed by a registered land surveyor or licensed engineer.

LD46. (BP) Prior to issuance of a building permit, the developer shall record with the County-Clerk Recorder a "Covenant and Agreement" (CC&R) that informs future property owners of the requirement to maintain BMP's, as shown on the approved grading plans on file at the City of Moreno Valley Public Works Department. The CC&R shall be in a form acceptable to the City of Moreno Valley. Proof of recordation must be provided to the City prior to issuance of a building permit.

LD47. (BP) Prior to the first building permit and prior to the payment of the Development Impact Fee (DIF), the developer shall pay current DIF fees adopted by the City Council. If applicable, prior to the payment of the Development Impact Fee (DIF), the developer may enter into a DIF Improvement Credit Agreement to secure credit for the construction of applicable improvements. The Agreement must be submitted prior to the issuance of a grading permit and must be approved by the City Council prior to receiving credit for applicable improvements. If the developer fails to complete this agreement prior to the timing specified above, no credits will be given [Ord. 695 § 1.1 (part), 2005] [MC 3.38.030, 040, 050].

LD48. (BP) Prior to the first building permit, prior to any improvement construction and prior to the payment of the Transportation Uniform Mitigation Fee (TUMF), the developer may enter into a TUMF Improvement Credit Agreement to secure credit for the construction of applicable improvements, if any. If the developer fails to complete this agreement by the timing as specified above, no credits will be given for any work. Prior to approval of the TUMF Improvement Credit Agreement, an approved engineer's cost estimate and street improvement plan are required.

Prior to Certificate of Occupancy

LD49. (CO) Prior to issuance of the last certificate of occupancy or building final, the developer shall pay all outstanding fees.

LD50. (CO) Prior to issuance of a certificate of occupancy, this project is subject to requirements under the current permit for storm water activities required as part of the National Pollutant Discharge Elimination System (NPDES) as mandated by the Federal Clean Water Act. In compliance with Proposition 218, the developer shall agree to approve the City of Moreno Valley NPDES Regulatory Rate Schedule that is in place at the time of certificate of occupancy issuance. Following are the requirements:

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a. Select one of the following options to meet the financial responsibility to provide storm water utilities services for the required continuous operation, maintenance, monitoring system evaluations and enhancements, remediation and/or replacement, all in accordance with Resolution No. 2002-46.
    i. Participate in the mail ballot proceeding in compliance with Proposition 218, for the Common Interest, Commercial, Industrial and Quasi-Public Use NPDES Regulatory Rate Schedule and pay all associated costs with the ballot process; or
    ii. Establish an endowment to cover future City costs as specified in the Common Interest, Commercial, Industrial, and Quasi-Public Use NPDES Regulatory Rate Schedule.

b. Notify the Special Districts Division of the intent to request building permits 90 days prior to their issuance and the financial option selected. The financial option selected shall be in place prior to the issuance of certificate of occupancy (California Government Code & Municipal Code).

LD51. (CO) Prior to issuance of a certificate of occupancy or building final, the developer shall construct all public improvements in conformance with applicable City standards, except as noted in the Special Conditions, including but not limited to the following applicable improvements:

a. Street improvements including, but not limited to: Pavement, base, curb and/or gutter, cross gutters, spandrel, sidewalks, drive approaches, pedestrian ramps, street lights, signing, striping, under sidewalk drains, landscaping and irrigation, medians, redwood header boards, pavement tapers/transitions and traffic control devices as appropriate.
b. Storm drain facilities including, but not limited to: Storm drain pipe, storm drain laterals, open channels, catch basins, and local depressions.
c. City-owned utilities.
d. Sewer and water systems including, but not limited to: Sanitary sewer, potable water, and recycled water.
e. Undergrounding of existing and proposed utility lines less than 115,000 volts.
f. Relocation of overhead electrical utility lines including, but not limited to: Electrical, cable, and telephone.

LD52. (CO) Prior to issuance of a certificate of occupancy or building final, all existing and new utilities adjacent to and on-site shall be placed underground in accordance with City of Moreno Valley ordinances (MC 9.14.130).

LD53. (CO) Prior to issuance of a certificate of occupancy, the Developer shall record a "Stormwater Treatment Device and Control Measure Access and Maintenance Covenant," to provide public notice of the requirement to implement the approved

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final project-specific WQMP and the maintenance requirements associated with the WQMP.

A boilerplate copy of the "Stormwater Treatment Device and Control Measure Access and Maintenance Covenant," can be obtained by contacting the Land Development Division of the Public Works Department.

LD54. (CO) Prior to issuance of a certificate of occupancy or building final for any Commercial/Industrial facility, whichever occurs first, the owner may have to secure coverage under the State's General Industrial Activities Storm Water Permit as issued by the State Water Resources Control Board.

LD55. (CO) Prior to issuance of a certificate of occupancy or building final, the applicant shall ensure the following, pursuant to Section XII.I. of the 2010 NPDES Permit:

a. Field verification that structural Site Design, Source Control and Treatment Control BMPs are designed, constructed and functional in accordance with the approved Final Water Quality Management Plan (WQMP).
b. Certification of best management practices (BMPs) from a state licensed civil engineer. An original WQMP BMP Certification shall be submitted to the City for review and approval.

Prior to Acceptance of Streets into the City Maintained Road System

LD56. (AOS) Aggregate slurry, as defined in Section 203-5 of Standard Specifications for Public Works Construction, may be required just prior to the end of the one-year warranty period of the public streets at the discretion of the City Engineer. If slurry is required, the developer/contractor must provide a slurry mix design submittal for City Engineer approval. The latex additive shall be Ultra Pave 70 (for anionic – per project geotechnical report) or Ultra Pave 65 K (for cationic – per project geotechnical report) or an approved equal. The latex shall be added at the emulsion plant after weighing the asphalt and before the addition of mixing water. The latex shall be added at a rate of two to two-and-one-half (2 to 2½) parts to one-hundred (100) parts of emulsion by volume. Any existing striping shall be removed prior to slurry application and replaced per City standards.

Special Conditions

LD57. (GPA) Prior to the grading plan approval, the Developer shall submit two (2) copies of the final project-specific Water Quality Management Plan (WQMP) for review by the City Engineer that addresses the Special Project Conditions, as stated in the "Project Specific Preliminary Water Quality Management Plan Acceptance Recommendation for Entitlement Processing – Subject to Conditions" letter for this project.

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LD58. (GPA) Prior to the grading plan approval, the plans shall clearly show the extents of all existing easements on the property. All building structures shall be constructed outside of existing easements.

LD59. (GPA) Prior to the grading plan approval, the developer shall dedicate the following right of way to accommodate the required improvements:

(a) The necessary street right of way dedication on the north side of Cactus Avenue (120' R/W / 102' C-C: Modified Divided Major Arterial, City Standard No. MVSI-102A-0) along project frontage.
(b) The necessary street right of way dedication, if required, for a right turn lane on Cactus Avenue.
(c) The necessary street right of way dedication on the east side of Commerce Center Drive (78' R/W / 56' C-C: Industrial Collector, City Standard No. MVSI-106A-0) along project frontage.
(d) The necessary street right of way dedication on the south side of Goldencrest Drive (78' R/W / 56' C-C: Industrial Collector, City Standard No. MVSI-106A-0) along project frontage.
(e) A 4 foot minimum pedestrian right of way dedication behind any driveway approach per City Standard No. MVSI-112C-0 on Cactus Avenue, Commerce Center Drive, and Goldencrest Drive.
(f) Corner cutback right of way dedications per City Standard No. MSVI-165-0 on Cactus Avenue, Commerce Center Drive, and Goldencrest Drive.

LD60. (GPA) Prior to the grading plan approval, for any parcel or project (PEN16-0132, PEN16-0133, and/or PEN16-0134), which will not be fully developed (should project be phased), the grading plans shall show that long-term interim water quality and erosion and sediment control mechanisms are implemented.

LD61. (GPA) Prior to the grading plan approval, the grading plans shall clearly demonstrate that drainage is properly collected and conveyed. The plans shall show all necessary on-site and off-site drainage improvements to properly collect and convey drainage entering, within and leaving the project. This may include, but is not limited to, on-site and perimeter drainage improvements to properly convey drainage within and along the project site, and downstream off-site improvements. The developer will be required to obtain the necessary permission for offsite construction, including easements.

LD62. (GPA) Prior to the grading plan approval, this project shall demonstrate, via a final drainage study, that the increased runoff resulting from the development of this site is mitigated. During no storm event shall the flow leaving the site in the developed condition be larger than that of the pre-developed condition. The drainage study shall analyze the following events: 1, 3, 6 and 24-hour duration events for the 2, 5, 10 and 100-year storm events. The applicant understands that additional detention measures, beyond those shown on the tentative map and preliminary drainage study, may be required.

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LD63. (GPA) Prior to the grading plan approval, the grading plans shall show any proposed trash enclosure as dual bin; one bin for trash and one bin for recyclables.

LD64. (GPA) Prior to the grading plan approval, the grading plans shall clearly show that the parking lot conforms to City standards. The parking lot shall be 5% maximum, 1% minimum, 2% maximum at or near any disabled parking stall and travel way. Ramps, curb openings and travel paths shall all conform to current ADA standards as outlined in Department of Justice's "ADA Standards for Accessible Design", Excerpt from 28 CFR Part 36 (www.usdoj.gov) and as approved by the City's Building and Safety Division.

LD65. (GPA) Prior to the grading plan approval, the plans shall show roof drains directed to a landscaped area rather than being routed directly to the parking lot. Alternatively, roof drain flows can be directed to private storm drains which will connect to the treatment control best management practice.

LD66. (BP) Prior to issuance of a building permit, the developer shall record with the County-Clerk Recorder a "Covenant and Agreement" (CC&R) that informs future property owners that they are required and responsible to maintain, repair, and replace the existing storm drain, as shown on Parcel Map No. 27732 and the Street Improvement Plans for Parcel Map No. 27732, on file at the City of Moreno Valley Public Works Department, and to indemnify the City for any damage for failure to maintain, repair, or replace the existing storm drain. The CC&R shall be in a form acceptable to the City of Moreno Valley. Proof of recordation must be provided to the City prior to issuance of a building permit.

LD67. (BP) Prior to building permit issuance, the applicant shall schedule a walk through with a Public Works Inspector to inspect existing improvements within public right of way along project frontage. The applicant will be required to install, replace, and/or repair any missing, damaged, or substandard improvements including handicap access ramps that do not meet current City standards. The applicant shall post security to cover the cost of the repairs and complete the repairs within the time allowed in the public improvement agreement used to secure the improvements.

LD68. (BP) Prior to building permit issuance, a copy of a reciprocal access agreement between parcels shall be submitted to the City for review and approval.

LD69. Cactus Avenue (120' R/W / 102' C-C: Modified Divided Major Arterial, City Standard No. MVSI-102A-0) shall be constructed to half-width plus an additional 19 feet south of the centerline, along the entire project's south frontage. Improvements shall consist of, but not be limited to, raised median, pavement, base, curb, gutter, sidewalk, driveway approaches, drainage structures, any

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necessary offsite improvement transition/joins to existing, streetlights, pedestrian ramps, and dry and wet utilities.

LD70. Commerce Center Drive (78' R/W / 56' C-C: Industrial Collector, City Standard No. MVSI-106A-0) shall be constructed to join existing improvements along the entire project's west frontage. Improvements shall consist of, but not be limited to, sidewalk, driveway approaches, drainage structures, any necessary offsite improvement transition/joins to existing, streetlights, pedestrian ramps, and dry and wet utilities. Prior to rough grading plan approval, the developer shall provide to the City Engineer the results of coring tests confirming that said pavement section has been constructed per City Standard No. MVSI-106A-0. Any missing or deficient improvements along the project west frontage shall be constructed prior to issuance of a certificate of occupancy.

LD71. Goldencrest Drive (78' R/W / 56' C-C: Industrial Collector, City Standard No. MVSI-106A-0) shall be constructed to join existing improvements along the entire project's north frontage. Improvements shall consist of, but not be limited to, sidewalk, driveway approaches, drainage structures, any necessary offsite improvement transition/joins to existing, streetlights, pedestrian ramps, and dry and wet utilities. Prior to rough grading plan approval, the developer shall provide to the City Engineer the results of coring tests confirming that said pavement section has been constructed per City Standard No. MVSI-106A-0. Any missing or deficient improvements along the project north frontage shall be constructed prior to issuance of a certificate of occupancy.

LD72. The following project engineering design plans shall be submitted on 24" x 36" sheet size for review and approval, as well as additional plans that are deemed necessary, prior to the time as noted below, or as may be required by the City during the plan review process for plans not listed below:

(a) Rough Grading Plan: Prior to approval for Precise Grading
(b) Precise Grading Plan: Prior to Building permits
(c) Improvement Plans (off-site, street, striping/signage): Prior to Building permits
(d) Final Drainage Study: Upon submittal of any grading/improvement plans
(e) Final WQMP: Prior to approval of grading plans
(f) As-Built Plans of all "plans" listed above: Prior to last Occupancy or final building permit issued.

TRANSPORTATION ENGINEERING DIVISION

Based on the information contained in our standard review process, we recommend the following conditions of approval be placed on this project:

GENERAL CONDITIONS

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TE1. Cactus Avenue is classified as a Divided Major Arterial with a Reduced Cross Section (120'RW/102'CC or 130'RW/102'CC) per City Standard Plan No. MVSI-102A/B-0 at the project location. Communication conduits along project frontage shall be required per City Standard Plan No. MVSI-186-0. Any modifications or improvements undertaken by this project shall be consistent with the City's standards for this facility.

TE2. Cactus Avenue shall have a raised, landscaped median installed along project frontage consistent with City Standards.

TE3. Commerce Center Drive and Goldencrest Drive are both classified as an Industrial Collector (78'RW/56'CC) per City Standard Plan No. MVSI-106A-0. Any modifications or improvements undertaken by this project shall be consistent with the City's standards for these facilities.

TE4. Driveways shall conform to City of Moreno Valley Standard No. MVSI-112C-0 for commercial driveway approach. Access at the driveways shall be as follows:

- Cactus Avenue driveway: Right-in and right-out access allowed.
- Commerce Center Drive driveways: Full access allowed.
- Goldencrest Drive driveways: Full access allowed.

TE5. Any modification to the intersection of Cactus Avenue/Commerce Center Drive requires the approval of the California Department of Transportation (Caltrans), including any of the following work (it is noted here that nothing in the project Resolution, conditions of approvals, conceptual or technical plans, and/or technical studies are intended to imply or convey any agreement or commitment by the City as to what improvements Caltrans will allow and approve at this location):

- Modification of the existing traffic signal at Cactus Avenue/Commerce Center Drive intersection;
- Modification of the existing median and re-striping to allow south bound left-turn movement at Cactus Avenue/Commerce Center Drive intersection;
- Reconstruction of the north east corner of Cactus Avenue/Commerce Center Drive intersection for the addition of a right-turn lane.
- Restriping of the eastbound left-turn pocket at Cactus Avenue / Commerce Center to provide 325 feet of vehicle storage.

The project applicant and the project applicant's contractor(s) are responsible for obtaining a Caltrans encroachment permit prior to performing any work within Caltrans right-of-way.

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TE6. Conditions of approval may be modified or added if a modified plan is submitted for this development.

PRIOR TO IMPROVEMENT PLAN APPROVAL OR CONSTRUCTION PERMIT

TE7. Prior to the final approval of the street improvement plans, traffic signal modification plans shall be required for the traffic signal located at Cactus Avenue and Commerce Center Drive. Modifications may include but not limited to installation of new traffic signal controller, controller cabinet, signal poles, pull boxes, traffic detector loops or video detection, etc.

TE8. Prior to the final approval of the street improvement plans, a median construction plan shall be required for the raised, landscaped median on Cactus Avenue along project frontage. The median shall be designed per current City Standards and to the satisfaction of the City Engineer.

TE9. Prior to the final approval of the street improvement plans, a median modification plan shall be required to modify the existing raised, landscaped median on Cactus Avenue west of Elsworth Street (March ARB entrance). The median shall be designed per current City Standards to extend the existing east bound left-turn lane storage length to 300 feet at the Cactus Avenue/Elsworth Street intersection.

TE10. Prior to the final approval of the street improvement plans, a signing and striping plan shall be prepared per current City Standards for Cactus Avenue, Commerce Center Drive and Goldencrest Drive.

TE11. Prior to issuance of encroachment permits for any works within the City of Moreno Valley and/or Caltrans right-of-way, construction traffic control plans shall be prepared by a qualified, registered Civil or Traffic Engineer and submitted for plan approval.

TE12. Prior to final approval of the street improvement plans, the project plans shall demonstrate that sight distance at proposed streets and driveways conforms to City Standard Plan No. MVSI-164A-0 through MVSI-164C-0.

PRIOR TO CERTIFICATE OF OCCUPANCY OR BUILDING FINAL

TE13. (CO) Prior to issuance of Certificate of Occupancy for the 1st phase of the project, improvements identified in TE7 (Cactus Avenue/Commerce Center Drive traffic signal modification), TE8 (new Cactus Avenue median), and TE9 (Cactus Avenue/Elsworth Street eastbound left-turn lane storage length extension) shall be completed per the approved plans to the satisfaction of the City Engineer.

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

TE14. (CO) Prior to issuance of Certificate of Occupancy, all approved signing and striping shall be installed per current City Standards and the approved plans.

PARKS AND COMMUNITY SERVICES (PCS)

GENERAL CONDITIONS:

PCS-GC-1 This project is required to supply a funding source for the continued maintenance, enhancement, and or retrofit of neighborhood parks, open spaces, linear parks, and/or trails systems. This can be achieved through annexing into Community Facilities District No. 1 (Park Maintenance). Please contact the Special Districts Division at 951.413.3480 or specialdistricts@moval.org to complete the annexation process.

PCS-GC-2 The parcel(s) associated with this project have been incorporated into the Moreno Valley Community Services District Zone A (Parks and Community Services). All assessable parcels therein shall be subject to the annual Zone 'A' charge for operations and capital improvements. Proof of such shall be supplied to Parks and Community Services upon Final Map and at Building Permits.

PCS-GC-3 This project is subject to current Development Impact Fees.

PCS-GC-4 This project is subject to current Quimby Fees.

ECONOMIC DEVELOPMENT DEPARTMENT (EDD)

EDD1. New Moreno Valley businesses are encouraged to hire local residents.

EDD2. New Moreno Valley businesses may utilize the workforce recruitment services provided by the Moreno Valley Employment Resource Center ("ERC").

The ERC offers no cost assistance to businesses recruiting and training potential employees. Complimentary services include:

- Job Announcements
- Applicant testing / pre-screening
- Interviewing
- Job Fair support
- Training space

EDD3. New Moreno Valley businesses may work with the Economic Development Department to coordinate job recruitment fairs.

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

EDD4. New Moreno Valley businesses are encouraged to provide a job fair flyer and/or web announcement to the City in advance of job recruitments, so that the City can assist in publicizing these events.

EDD5. New Moreno Valley businesses may adopt a “First Source” approach to employee recruitment that gives notice of job openings to Moreno Valley residents for one week in advance of the public recruitment.

Attachment: Exhibit B Conditions of Approval [Revision 7] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

INITIAL STUDY/
ENVIRONMENTAL CHECKLIST FORM
CITY OF MORENO VALLEY

1. Project Title: Cactus Commerce Center

   PEN16-0131 (PA15-0032) – Master Plot Plan
   PEN16-0132 (PA16-0004) – Plot Plan
   PEN16-0133 (PA16-0005) – Plot Plan
   PEN16-0134 (PA16-0006) – Plot Plan

2. Lead Agency Name and Address: City of Moreno Valley
   14177 Frederick Street
   Moreno Valley, CA 92553

3. Contact Person and Phone Number: Gabriel Diaz, Associate Planner
   (951) 413-3226

4. Project Location: Northeast corner of Cactus Avenue and Commerce Center Drive

5. Project Sponsor's Name and Address: Moreno Valley Cactus Center
   P.O Box 1958
   Corona, CA 92878

6. Existing General Plan Designation: Business Park (BP)

7. Proposed General Plan Designation: Business Park (BP)

8. Existing Zoning: Business Park-Mixed Use (BPX)

9. Proposed Zoning: Business Park-Mixed Use (BPX)

10. Description of the Project:

The project proposes to develop a commercial center on an approximately 6.3 acre site. Applications include a Master Plot Plan PEN16-0131 for the commercial center, a Plot Plan application for a 39,950 square foot (sf.) warehouse building, and additional Plot Plan applications for a new 24 hour gas station, car wash, and a 2,800 sf. fast-food restaurant (#1), and two 3,000 sf. fast-food restaurants (#2, #3).

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

11. Surrounding Land Uses and Setting:

The project site is bounded by existing warehouse buildings to the west and north zoned Industrial (I). The property immediately to the east is a restaurant, Victory Outreach Church, and a recycling center in the Business Park-Mixed Use (BPX) zone. To the south is the existing March Air Reserve Base outside the Moreno Valley City limits.

Overall, the proposed commercial development is compatible with the City's General Plan and existing land uses.

12. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun?

The City received requests for consultation from the following Native American tribes and consultation has begun:

- Agua Caliente Band of Cahuilla Indians;
- Pechanga Band of Luiseno Indians; and
- Soboba Band of Luiseno Indians.

13. Other public agencies whose approval is required:

The project is within the Riverside County Airport Land Use Commission influence area Zone B2. The project has been reviewed by the Riverside County Airport Land Use Commission and in a letter dated October 19, 2016 it was determined to be consistent with the 2014 March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan subject to certain requirements which have been incorporated into the project conditions of approval.

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below(■) would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

	Aesthetics		Greenhouse Gas Emissions		Population/Housing
	Agricultural Resources		Hazards & Hazardous Materials		Public Services
	Air Quality		Hydrology/Water Quality		Recreation
	Biological Resources		Land Use/Planning		Transportation/Traffic
	Cultural Resources		Mineral Resources		Utilities/Service Systems
	Geology/Soils		Noise		Mandatory Findings of Significance
	Tribal Cultural Resources				

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.	
I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.	■
I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.	
I find that the proposed project MAY have a "potential significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.	
I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.	

February 16, 2017

Signature Date

Gabriel Diaz, Associate Planner

Printed Name For

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

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EVALUATION OF ENVIRONMENTAL IMPACTS

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g. the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g. the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Potentially Significant Unless Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analysis," as described in (5) below, may be cross-referenced).

5) Earlier analysis may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063 (c) (3) (d). In this case, a brief discussion should identify the following:

   (a) Earlier Analysis Used. Identify and state where they are available for review.

   (b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   (c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g. general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The analysis of each issue should identify: (a) the significance criteria or threshold used to evaluate each question; and (b) the mitigation measure identified, if any, to reduce the impact to less than significance.

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
I. **AESTHETICS.** Would the project:				
a) Have a substantial adverse effect on a scenic vista?				■
The Moreno Valley General Plan identifies scenic highways, panoramic viewsheds, and photographic viewing locations within the aesthetic resource element. According to General Plan Figure 7-2, the project site is not located within a view corridor, a scenic roadways or panoramic viewsheds. The project site is comprised of level topography with no rock outcroppings. As designed and conditioned, the proposed project will have no effect on a scenic vista.				
b) Substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?				■
The project property topography is flat. Based upon site visits by staff and review of the General Plan, the subject site does not include scenic resources. There are no rock outcroppings, trees or historic buildings on site. There are no scenic highways in the area. The site has been previously disturbed through weed abatement. As designed and conditioned, the proposed project will not substantially damage scenic resources.				
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			■	
The proposed project is surrounded by existing development and streets. The project site is bounded by existing Goldencrest Drive and warehouse buildings to the north, to the west the project is bounded by Commerce Center Drive and warehouse buildings, to the south the project is bounded by Cactus Avenue and March Air Reserve Base, and to the east by a restaurant, a church, and a recycling center. The Municipal Code provides a framework that ensures that any new development is designed and constructed in a manner that is compatible with surrounding land uses. The proposed project as designed is aesthetically compatible with adjacent light industrial and commercial uses. As designed and conditioned, the proposed project would have a less than significant impact on degrading the existing visual character or quality of the site and surroundings.				
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?			■	
The project would introduce some additional new light sources into the area as the project site is currently vacant. The proposed commercial development would include required parking lot lighting, gas station lighting and exterior wall mounted lights. The project has been conditioned for compliance with the City's light standards as referenced in Municipal Code Section 9.08.100 including the shielding of lighting and restrictions on the intensity of exterior lighting which will reduce light and glare impacts to City accepted levels on surrounding properties. Therefore, potential impacts related to substantial light or glare are less than significant and no mitigation would be required.				
II. **AGRICULTURE & FORESTRY RESOURCES:** In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project?				
a) Convert Prime Farmland, Unique Farmland or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency to non-agricultural use?				■
The site is designated as 'Urban and Built-up Land' on the 2014 State Important Farmland Map. This category is described as urban and built up land with structures. There are currently no agriculturally productive activities occurring within the project boundaries. There will be no impact to farmlands as the development of this project will not result in the conversion of Prime Farmland, Unique Farmland or Farmland of Statewide Importance.				
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				■
The site is not currently in agricultural use, or under Williamson Act control. There is no existing surrounding agricultural use, or sites under Williamson Act contract within the City limits. The Municipal Code allows for agricultural uses such as crops in all zoning districts, therefore, the proposed project does not conflict with existing zoning for agricultural use, or impact sites under Williamson Act contract.				
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?				■
The project site is not zoned or designated on the City's General Plan for forest land, timberland, or timberland zoned Timberland Production. The City does not have any forest lands, or timberland as defined in the State Public Resources Code and Government Code within the City limits. Therefore, since the project will not result in impacts to forest land, timberland, or timberland zoned				

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Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
timberland production, no impacts would occur and no mitigation measures would be required.				
d) Result in the loss of forest land or conversion of forest land to non-forest use?				■
The project site is not forest land as defined by Public Resources Code section 12220(g). The project site does not involve the loss of forest land or the conversion of forest land to non-forest use. Therefore, since the project will not result in the loss of forest land or the conversion of forest land to non-forest use, no impacts would occur and no mitigation measures would be required.				
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?				■
There is no immediate surrounding or proposed agricultural use. The proposed project will not involve changes to the existing environment, which will result in the conversion of farmland to non-agricultural use, or conversion of forest land to non-forest land.				
III. **AIR QUALITY:** Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?			■	
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation.			■	

(a and b)

The Air Quality Management Plan (AQMP) adopted by the South Coast Air Quality Management District (SCAQMD) in 2012 sets forth a comprehensive program that will lead the air basin into compliance with all federal and state air quality standards. The proposed project is located within the boundaries of the AQMP. The AQMP control measures and related emission reduction estimates are based upon emissions projections for a future development scenario derived from General Plan land use, population, and employment characteristics defined in consultation with local governments. Moreno Valley's General Plan Land Use Element was considered in the preparation of the 2012 AQMP. Accordingly, conformance with the AQMP for development projects is determined by demonstrating compliance with local land use plans and/or population projections.

The Project proposed is consistent with the General Plan and therefore not result in a land use that is more intense than that anticipated by the General Plan. Furthermore, the Project would not exceed any applicable regional or local thresholds. As such, the Project is therefore considered to be consistent with the AQMP.

Construction-Source Emissions

Based on the Air Quality assessment prepared for this project by Salem Engineering Group, Inc. dated September 13, 2016, emissions of pollutants such as fugitive dust that are generated during construction are generally highest near the construction site. Emissions from the construction phase of the project were estimated through the use of the CalEEMod Model (ENVIRON 2013). These steps include: demolition, site preparation, building construction, paving, and architectural coatings. Construction is anticipated to be carried out in two main phases: Phase I is 4.93 acres and includes the carwash, gas station, fast-food restaurant No. 1, and the warehouse building. Phase II is 1.37 acres and includes fast-food restaurant Nos. 2 and 3. Both phases of the project are being constructed on undeveloped land so demolition is expected to be minimal. The projected emissions for all pollutants during construction are below both the SCAQMD's Air Quality Significance Thresholds as well as the Localized Significance Thresholds. The overall project size exceeds the recommended five acres identified in the SCAQMD's Localized Significance Threshold Methodology guidance. However, site work will be phased to impact less than five acres during either phase.

It was assumed that the entire construction project would be completed within ten (10) months and that heavy construction equipment would be operating at the site for eight hours per day, five days per week during project construction. In addition, it was assumed that, in accordance with the requirements of the SCAQMD Rule 403, fugitive dust controls would be utilized during construction, including watering of active sites three times daily. Project construction-source emissions would not conflict with the applicable AQMP.

Operation-Source Emissions

Based on the Air Quality Assessment prepared for this project by Salem Engineering Group, Inc., Table 8 Estimated Operational Emissions identifies that the estimates of the emissions associated with project operations, the estimated emissions associated with project operations are below the significance criteria for all pollutants. Because emissions are less than significance levels, they would not conflict or obstruct the implementation of the AQMP or applicable portions of the SIP. It should be noted that the emissions from vehicles are projected to decrease with time due to phase-out of older, more polluting vehicles and increasingly stringent emissions standards.

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Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?			■	

CEQA Section 21100 (e) addresses evaluation of cumulative effects allowing the use of approved land use documents in a cumulative impact analysis. CEQA Guidelines Section 15064 (i)(3) further stipulates that for an impact involving a resource that is addressed by an approved plan or mitigation program, the lead agency may determine that a project's incremental contribution is not cumulatively considerable if the project complies with the adopted plan or program. In addressing cumulative effects for air quality, the AQMP is the most appropriate document to use because the AQMP sets forth a comprehensive program that will lead the air basin, including the project area, into compliance with all federal and state air quality standards and utilizes control measures and related emission reduction estimates based upon emissions projections for a future development scenario derived from land use, population, and employment characteristics defined in consultation with local governments.

The Air Quality Management Plan (AQMP) sets forth a comprehensive program that will lead the air basin into compliance with all federal and state air quality standards. The AQMP control measures and related emission reduction estimates are based upon emissions projections for a future development scenario derived from General Plan land use, population, and employment characteristics defined in consultation with local governments. Accordingly, conformance with the AQMP for development projects is determined by demonstrating compliance with local land use plans and/or population projections. The AQMD uses the same significance thresholds for project specific and cumulative impacts for all environmental topics analyzed in an Environmental Assessment or EIR. Projects that exceed the project-specific significance thresholds are considered by the SCAQMD to be cumulatively considerable. This is the reason project-specific and cumulative significance thresholds are the same. Conversely, projects that do not exceed the project-specific thresholds are generally not considered to be cumulatively significant.

The SCAQMD has recognized that there is typically insufficient information to quantitatively evaluate the cumulative contributions of multiple projects because each project applicant has no control over nearby projects.

As previously noted, the Project would not result in any construction-source or operational-source emissions exceedances. Therefore the Project would result in a less than significant impact on a project-specific and cumulative basis.

d) Expose sensitive receptors to substantial pollutant concentrations?			■	

Based on the Air Quality Assessment prepared for this project by Salem Engineering Group, Inc., the distance to the nearest sensitive receptor is estimated to be 25 meters. The proposed project at the intersection of Cactus Avenue and Commerce Center Drive in Moreno Valley evaluated emissions associated with both the construction and operation of the project. Emissions associated with construction and operation were compared with significance thresholds developed by the SCAQMD, which provide a conservative means of evaluating whether project emissions would cause a significant impact on the ambient air quality or whether further evaluation is warranted. Emissions associated with construction and operations are below the significance thresholds for all phases and pollutants. Thus the emissions associated with construction and operation of the project would not result in a significant impact on the ambient air quality.

e) Create objectionable odors affecting a substantial number of people?			■	

Based on the Air Quality Assessment prepared for this project by Salem Engineering Group, Inc., the Project does not contain land uses typically associated with emitting objectionable odors. During construction, diesel equipment operating at the site may generate some nuisance odors; however, due to the distance of sensitive receptors to the project site and the temporary nature of construction, odors associated with project construction would not be significant.

Land uses associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting activities, refineries, landfills, dairies, and fiberglass molding operations. These land uses are not proposed for the project. Odor impacts would be less than significant.

IV. **BIOLOGICAL RESOURCES**. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U. S. Fish and Wildlife Service?			■	
b) Have a substantially adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U. S. Wildlife Service?			■	

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

(a and b) The proposed project is surrounded by existing development and streets. The project site is bounded by Goldencrest Drive and warehouse buildings to the north, to the west the project is bounded by Commerce Center Drive and warehouse buildings, to the south the project is bounded by Cactus Avenue and March Air Reserve Base, and to the east by a restaurant, a church and a recycling center. The site is comprised of level topography and has been disturbed routinely through weed abatement of the site.

A Biological Resources Survey was prepared for the project by Salem Engineering Group, Inc., on September 14, 2016. This report identifies and evaluates impacts to biological resources associated with the proposed Project in accordance with Riverside County protocol survey guidelines.

The Project site is located within the Reche Canyon/Badlands Area Plan of the Western Riverside County-Multi-species Habitat Conservation Plan (MSHCP), but is not located within the MSHCP Criteria Area. The Project site is located within the burrowing owl survey area, but is not located within the amphibian, mammalian, narrow endemic, or special linkage survey areas. Focused burrowing owl surveys were conducted for the Project site; however, no burrowing owls or burrows with owl sign were detected onsite. In compliance with the MSHCP, pre-construction burrowing owl surveys are required prior to site disturbance.

The Project site will not impact special-status plants, but will result in the loss of actual or potential habitat for special-status animals, including potential habitat for Stephens' kangaroo rat (Dipodomys stephensi) (SKR). Impacts to SKR are covered under the SKR Habitat Conservation Plan (HCP) with payment of the SKR mitigation fee. The loss of potential habitat for other special-status animals would be less than significant due to the low degree of sensitivity of the species, the disturbed nature of the site, and the lack of adjacency to native open space. The Project site does not contain jurisdictional waters, MSHCP riparian/riverine areas, or MSHCP vernal pools.

Although not required to reduce a potentially significant impact to an acceptable level, the following mitigation measure requiring a pre-construction burrowing owl survey has been included to ensure compliance with Western Riverside County - Multi-species Habitat Conservation Plan policies (MSHCP Objective 6):

Burrowing Owl

BR1. A qualified biologist will conduct a pre-construction presence/absence survey for burrowing owls within 14 days prior to site disturbance. If burrowing owls are detected onsite, the owls will be relocated/excluded from the site outside of the breeding season following accepted protocols, and subject to the approval of the RCA and wildlife agencies.

Therefore, the project as conditioned, will not have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U. S. Fish and Wildlife Service. There is no riparian habitat or other sensitive natural community on the site. Therefore, the project will not have an impact on any riparian habitat or other sensitive natural community.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				■

The project site is comprised of flat topography. There are no existing trees or vegetation on the project site. The proposed project is surrounded by existing development and streets. The project site is bounded by Goldencrest Drive and warehouse buildings to the north, to the west the project is bounded by Commerce Center Drive and warehouse buildings, to the south the project is bounded by Cactus Avenue and March Air Reserve Base, and to the east by a restaurant, a church and a recycling center. Based upon the results of the Biological Resources Survey and Hydrology Report prepared for the project by Salem Engineering Group, Inc., the project site does not contain jurisdictional waters. Therefore, no impacts would occur to federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.). through direct removal, filling, hydrological interruption, or other means, and no mitigation measures would be required.

d) Interfere substantially with the movement of any resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites?				■

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

The project site is comprised of flat topography. There are no existing trees or vegetation on the project site. The proposed project is surrounded by existing development and streets. The project site is bounded by Goldencrest Drive and warehouse buildings to the north, to the west the project is bounded by Commerce Center Drive and warehouse buildings, to the south the project is bounded by Cactus Avenue and March Air Reserve Base, and to the east by a restaurant, a church and a recycling center. Based upon the conclusions of the Biological Resources Survey prepared for this project, there is no evidence of resident or migratory fish or wildlife species. Therefore, the project will not interfere substantially with the movement of any resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				■

The project site is comprised of flat topography. There are no existing trees or vegetation on the project site. The proposed project is surrounded by existing development and streets. There are no existing trees or vegetation on the project site. Therefore related to any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, no impacts would occur and no mitigation measures would be required.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?			■	

The project site is not located within one of the Multiple Species Habitat Conservation Plan (MSHCP) criteria areas, which are potential habitat preservation areas. The proposed project will not conflict with the Stephen's Kangaroo Rat Habitat Conservation Plan (SKR HCP) or MSHCP or any other known local, regional or state habitat conservation plans. The project will be conditioned to pay required SKR mitigation fees. Also, the City participates in the MSHCP, a comprehensive habitat conservation-planning program addressing multiple species' needs, including preservation of habitat and native vegetation in Western Riverside County. As conditioned, the project will comply with the provisions of the MSHCP. This project will also be subject to impact fees to support the implementation of the Multiple Species Habitat Conservation Plan as provided for by City ordinance.

V. **CULTURAL RESOURCES**. Would the project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?			■	
b) Cause a substantial adverse change in the significance of an archaeological resources pursuant to Section 15064.5?			■	
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?			■	

(a, b and c) A Cultural Resources Assessment was prepared by Salem Engineering Group, Inc., dated December 5, 2016. The project site is comprised of flat topography with no rock outcroppings or other unique geologic features. The results of the records search conducted at the Eastern Information Center at UC Riverside indicated that the property had not been previously surveyed for cultural resources and no prehistoric or historic archaeological sites have been recorded within the boundaries of the study area. The results of the field survey done in September 2016 did not identify any prehistoric or historic finds of any kind.. Consequently, no additional work in conjunction with cultural resources is recommended..

In the event that human remains are encountered during the course of any future development, California State Law (Health and Safety Code Section 7050.5 and Section 5079.98 of the Public Resources Code) states that no further earth disturbance shall occur at the location of the find until the Riverside County Coroner has been notified. If the remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a Most Likely Descendant (MLD).

The current survey did not identify any cultural resources within the project area. Therefore, no impacts to cultural resources are anticipated. However, the project site is in alluvial soils, where there is a potential for buried cultural resources. Based on this, information, it is recommended that an archaeological and Native American monitoring program be implemented. The monitoring program would include attendance by the archaeologist and Native American monitor(s) at a preconstruction meeting with the grading contractor and the presence of archaeological and Native American monitors during initial ground-disturbing activities on site. Both archaeological and Native American monitors would have the authority to temporarily halt or redirect grading and other ground-disturbing activity in the event that cultural resources are encountered.

Although not required to reduce a potentially significant impact to an acceptable level, the following mitigation measures for cultural resources are included have been introduced to ensure compliance with City General Plan Policies and the State Public Resources Code:

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

TREATMENT OF DISCOVERIES:

CR-1: If a significant archaeological resource(s) or tribal cultural resource is discovered on the property, ground disturbing activities shall be suspended 100 feet around the resource(s). The archaeological monitor and a representative of the appropriate Native American Tribe(s), the Project Proponent, and the City Planning Department shall confer regarding mitigation of the discovered resource(s). A treatment plan shall be prepared and implemented to protect the identified archaeological resource(s) or tribal cultural resources from damage and destruction. The treatment plan shall contain a research design and data recovery program necessary to document the size and content of the discovery such that the resource(s) can be evaluated for significance under CEQA criteria. The research design shall list the sampling procedures appropriate to exhaust the research potential of the archaeological resource(s) or tribal cultural resources in accordance with current professional archaeology standards. The treatment plan shall require monitoring by the appropriate Native American Tribe(s) during data recovery and shall require that all recovered artifacts undergo basic field analysis and documentation or laboratory analysis, whichever is appropriate. At the completion of the basic field analysis and documentation or laboratory analysis, any recovered archaeological or tribal cultural resources shall be processed and curated according to current professional repository standards. The collections and associated records shall be donated to an appropriate curation facility, or, the artifacts may be delivered to the appropriate Native American Tribe(s) if that is recommended by the City of Moreno Valley. A final report containing the significance and treatment findings shall be prepared by the archaeologist and submitted to the City of Moreno Valley Planning Department, the Eastern Information Center, and the appropriate Native American Tribe.

DISPOSITION OF DISCOVERIES:

In the event that Native American cultural resources are inadvertently discovered during the course of grading for this project. The following procedures will be carried out for treatment and disposition of the discoveries:

CR-2: The landowner(s) shall relinquish ownership of all cultural resources, including sacred items, burial goods, and all archaeological artifacts and non-human remains as part of the required mitigation for impacts to cultural resources. The applicant shall relinquish the artifacts through one or more of the following methods and provide the Moreno Valley Planning Department with evidence of same.

a) A fully executed reburial agreement with the appropriate culturally affiliated Native American tribes or bands. This shall include measures and provisions to protect the future reburial area from any future impacts. Reburial shall not occur until all cataloguing and basic recordation have been completed.
b) A curation agreement with an appropriate qualified repository within Riverside County that meets federal standards per 36 CFR Part 79 and therefore would be professionally curated and made available to other archaeologists/researchers for further study. The collections and associated records shall be transferred, including title, to an appropriate curation facility within Riverside County, to be accompanied by payment of the fees necessary for permanent curation.
c) If more than one Native American Group is involved with the project and cannot come to an agreement as to the disposition of cultural materials, they shall be curated at the Western Science Center by default.
d) Should reburial of collected cultural items be preferred, it shall not occur until after the Phase IV monitoring report has been submitted to the Moreno Valley Planning Department. Should curation be preferred, the developer/permit applicant is responsible for all costs and the repository and curation method shall be described in the Phase IV monitoring report.

MONITORING:

CR-3: The Project applicant shall contact the consulting Native American Tribe(s) that have requested monitoring through consultation with the City during the AB 52 process. The applicant shall coordinate with the Tribe(s) to develop a Tribal Monitoring Agreement(s). A copy of the agreement shall be provided to the City of Moreno Valley Planning Department Prior to the Issuance of a Grading Permit.

Based on the proceeding information, the development of the project will not result in a potentially significant impact on a historical or archaeological resource, or result in the destruction of a unique paleontological resource or site or unique geologic feature.

d) Disturb any human remains, including those interred outside of dedicated cemeteries?			■	
No known human remains have been identified at the project site. Compliance with mitigation measure CR-2 as identified in the response to checklist questions a, b, and c for Cultural Resources will also serve to prevent the disturbance of any human remains.				
VI. **GEOLOGY AND SOILS**. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:				
(i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-				■

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				
According to the City's General Plan, the project site is not on, or close to, any known earthquake fault. There is no new information that would indicate the existence of a fault or fault tract in proximity of the site. Accordingly, there is no risk of ground rupture due to faulting at the proposed project site.				
(ii) Strong seismic ground shaking?			■	
According to the City's General Plan, the project site is not on, or close to, any known earthquake fault. The nearest fault is the San Jacinto fault system, which is located about 7 miles to the northeast. The San Andreas fault system is more than 17 miles from the site. The active Sierra Madre and San Gabriel fault zones lie roughly 35 and 40 miles respectively to the northwest of the site. The active Elsinore and Newport-Inglewood fault zones lie approximately 20 and 45 miles, respectively, to the southwest of the site. This faulting is not considered a significant constraint to development on the site with the use of current building codes. Ground-shaking intensity could be moderately-high during a 100-year interval earthquake. Foundation designs will be reviewed to ensure incorporation of appropriate engineering recommendations to mitigate any such seismicity. There is no new information that would indicate the existence of a fault on the site.				
(iii) Seismic-related ground failure, including liquefaction?			■	
According to the City's General Plan, the project site is not on, or close to, any known earthquake fault. However, ground-shaking intensity could be moderately-high during a 100-year interval earthquake. Based on the Geotechnical Investigation prepared by SALEM Engineering Group, Inc., the potential for soil liquefaction during a seismic event was evaluated using LiqIT computer program (version 4.7.5) developed by GeoLogismiki Company. The liquefaction analysis indicated that the site soils had a low potential for liquefaction and the total liquefaction-induced settlement was calculated to be negligible.				
(iv) Landslides?				■
The project site is not near or adjacent to mountainside areas. Due to a lack of slopes within or nearby the project site, seismically induced landslides are not anticipated to pose a danger to the project site. Development of the project will not result in impacts from landslides and no mitigation measures would be required.				
(b) Result in substantial soil erosion or the loss of topsoil?			■	
The development of the site will likely result in the reduction of erosion with the placement of buildings and landscaping on the site. During construction, there is the potential for less than significant impacts for short-term soil erosion from minimal excavation and grading. This will be addressed as part of standard construction, such as watering to reduce dust and sandbagging, if required, during raining periods.				
(c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?			■	
According to the City's environmental information, and based on the Geotechnical Engineering Investigation prepared by SALEM dated November 25, 2015, the geologic unit or soil is not known to be unstable. As designed and conditioned, the potential for the impacts resulting from a landslide, lateral spreading, subsidence, liquefaction or collapse is less than significant.				
(d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?			■	
According to the City's environmental information and the results of a Geotechnical Engineering Investigation prepared by SALEM dated November 25, 2015, project soils evaluated in a near surface sample have a very low expansion potential. The potential for the project to create substantial risks to life or property is less than significant.				
(e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?			■	
The proposed project will operate on a sewer system that will be reviewed, approved and installed according to Eastern Municipal Water District requirements. The proposed project will not be introducing septic tanks or alternative water disposal systems.				
VII. **GREENHOUSE GAS EMISSIONS.** Would this project?				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			■	

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

Global climate change is caused by greenhouse gas (GHG) emissions throughout the world. Mitigating global climate change will require worldwide solutions. Greenhouse gases are gases emitted from the earth's surface that absorb infrared radiation in the atmosphere. Increases in these gases lead to more absorption of radiation and warm the lower atmosphere, and therefore increase evaporation rates and temperatures on the Earth's surface.

As provided for in the CEQA Guidelines (Section 15064.4), it is necessary for the lead agency to make a good-faith effort in considering GHG emissions on a project specific basis. An Air Quality and Greenhouse Gas Assessment (GHG) was prepared for the project by SALEM Engineering Group, Inc., dated September 13, 2016, to analyze potential construction resource and operational resource impacts.

Based on the Air Quality and GHG Assessment prepared by SALEM Engineering Group, Inc., emissions associated with both the construction and operation of the project were evaluated. Emissions associated with construction and operation were compared with significance thresholds developed by the SCAQMD, which provide a conservative means of evaluating whether project emissions would cause a significant impact on the ambient air quality or whether further evaluation is warranted. Emissions associated with construction and operation are below the significance thresholds for all phases and pollutants. Thus the emissions associated with construction and operation of the project would not result in a significant impact on the ambient air quality.

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?			■	

AB 32 is the primary plan, policy or regulation adopted in the State of California to reduce GHG emissions. The City's GHG Analysis in 2012 addressed statewide legislation for sustainability through the preparation of GHG inventories and strategies to reduce emissions consistent with AB 32, which established a statewide target to reduce GHG emission to 1990 levels by 2020. Preparing a greenhouse gas analysis supports AB 32 at the local level, and the greenhouse gas analysis provides a policy framework for how the City of Moreno Valley can do its part to reduce emissions.

The City of Moreno Valley adopted a Climate Action Strategy on October 9, 2012. This effort also included the preparation of a Greenhouse Gas Analysis (City's GHG Analysis, 2012) that addresses statewide legislation for sustainability through the preparation of GHG inventories and strategies to reduce emissions consistent with AB 32, which established a statewide target to reduce GHG emission to 1990 levels by 2020.

The Project is consistent with the City of Moreno Valley General Plan. Therefore, the proposed Project will not conflict with any applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases, and impacts in this regard are considered less than significant.

VIII. **HAZARDS AND HAZARDOUS MATERIALS.** Would the project?

a) Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials?			■	

The proposed gasoline/fueling station will involve the routine transport of gasoline and diesel fuel products. The project will not create a significant hazard to the public or the environment through the routine transport and storage of these products. Underground tanks are regulated by the County of Riverside and the State, where necessary permits and regulations such as double tank storage are required to prevent leakage or spill of product that would contaminate soil or groundwater resources.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			■	

The proposed gasoline/fueling station will involve the routine transport of gasoline and diesel fuel products. The project will not create a significant hazard to the public or the environment through the routine transport and storage of these products. Underground tanks are regulated by the County of Riverside and the State, where necessary permits and regulations such as double tank storage are required to prevent leakage or spill of product that would contaminate soil or groundwater resources.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				■

There are no existing and proposed schools within one-quarter of a mile. Therefore the project as designed and conditioned will not emit hazardous emissions or handle hazardous materials within one-quarter mile of an existing or proposed school.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result would it				■

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
create a significant hazard to the public or the environment?				
The site was checked against the list of hazardous material sites pursuant to Government Code Section 65962.5. The project is not located on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.				
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?			■	
The nearest airport is the March Air Reserve Base located across Cactus Avenue to the south. The project site is located within Compatibility Zone B2 of the March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan. This project was reviewed by the Riverside County Airport Land Use Commission and in a letter dated October 19, 2016 it was determined to be consistent with the 2014 March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan subject to certain requirements which have been incorporated into the project conditions of approval. The project, as conditioned, will not result in a safety hazard for future residents.				
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				■
There are no private airstrips within the City of Moreno Valley. The project is not within proximity of a private airstrip. Therefore, the project would not result in a safety hazard pertaining to proximity of a private airstrip.				
g) Impair implementation of, or physically interfere with an adopted emergency response plan or emergency evacuation plan?				■
The proposed project would not have any direct effect on an adopted emergency response plan, or emergency evacuation plan. The City's emergency plans are also consistent with the General Plan. The proposed project has been designed and conditioned to provide required circulation and required fire access to allow for ingress of emergency vehicles and egress of passenger vehicles. Therefore, the proposed project would not be in conflict in any way with the emergency response or emergency evacuation plans.				
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				■
The proposed project site is not adjacent to wildlands and is not located within the Very High Fire Hazard Severity Zone. As designed and conditioned, the project would not expose people or structures to a significant risk of loss, injury or death involving wildland fires. In addition, the project is not located within a designated wildland area.				
IX. **HYDROLOGY AND WATER QUALITY**. Would the project:				
a) Violate any water quality standards or waste discharge requirements?			■	
Pursuant to the requirements of the Santa Ana Regional Water Quality Control Board, a project specific Water Quality Management Plan (WQMP) is required of certain projects involving discretionary approval. This project requires a WQMP to address pollutants of concern. Site Design and Source Control best management practices (BMP) are conditioned to be used throughout the project. The project has proposed the use of bioretention facilities and Low Impact Development (LID) BMP's. Treatment BMPs will be selected and implemented which are medium to highly effective in treating pollutants of concern. Final design and sizing details of all BMPs must be provided in the first submittal of the F-WQMP. The project has been conditioned to provide documentation that runoff will be treated in conformance with the "Riverside County Water Quality Management Plan for Urban Runoff" dated October 22, 2012 and approved by the Santa Ana Regional Water Quality Control Board (Guidance Document). Additionally, grading activities would temporarily expose soils to wind and water erosion that would contribute to downstream sedimentation. The proposed project would comply with all permits and development guidelines associated with urban water runoff and discharge set forth by the City of Moreno Valley and the Regional Water Quality Control Board. With the approval of the storm drainage facilities by the City Engineer and Riverside County Flood Control District (RCFCD), as well as complying with all applicable storm water discharge permits, impacts would be less than significant.				
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?			■	
The Eastern Municipal Water District (EMWD) would provide the proposed project with potable water as opposed to utilizing individual water wells. Potable water is adequate to serve the proposed project. Although the project would cover a majority of the site with impervious surfaces, the landscaped areas would still provide a means for groundwater recharge. Impacts would be less than significant.				
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would			■	

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Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
result in substantial erosion or siltation on- or off-site?				
There is no streambed or river on the project site, so the project will not cause a change in the existing on-site drainage pattern that would result in substantial erosion or siltation on- or off-site. During construction of the project, there is the potential for some sediments to be discharged within the storm water system. Erosion control plans are required for projects prior to issuance of grading permits for preventing substantial erosion. The project as designed and conditioned will not change the existing drainage pattern that would result in substantial erosion or siltation on- or off-site. Impacts would be less than significant.				
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or surface runoff in a manner which would result in flooding on- or off site?			■	
There is no streambed or river on the project site. The on-site project storm drain infrastructure proposes to tie into existing storm drain infrastructure in Cactus Avenue. The project will be responsible for completing both on-site and off-site storm drain infrastructure. The project as designed and conditioned will not cause a change in the existing drainage pattern that would result in substantial erosion or siltation on- or off-site. Therefore, project implementation would not result in modifications that could ultimately result in substantial erosion or siltation on- or off-site. Impacts would be less than significant.				
e) Create or contribute runoff which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?			■	
The proposed project is consistent with the City's General Plan. All storm drainage improvements would be developed to the standards of the City Engineer and the Riverside County Flood Control and Water Conservation District (RCFCD). Additionally, the project has been designed in accordance with the City's standard conditions of approval, which includes measures pertaining to storm drainage facilities and runoff. RCFCD provided a letter dated September 10, 2015, indicating that this project would not be impacted by District Master Drainage Plan facilities nor are other facilities of regional interest proposed. The project proposes to construct on-site storm drain infrastructure and bio-retention/water quality basins. Post-construction, the project will not discharge storm water that exceeds historic capacities and will not exceed the capacity of existing or planned stormwater drainage systems. As with any urban project, runoff entering the storm drainage system would contain minor amounts of pollutants (including pesticides, fertilizers and motor oil). This would incrementally contribute to the degradation of surface and sub-surface water quality. Additionally, grading activities would temporarily expose soils to water erosion that would contribute to downstream sedimentation. However, the project is subject to the permit requirements of the Santa Ana Regional Water Quality Control Board. As the site is currently unpaved and exposed, development of the proposed project would lessen the existing site contribution to sediment runoff at project completion. Additionally, the approved Preliminary WQMP proposes Best Management Practices for water quality treatment at both the project construction and operational stages. With the approval of the storm drainage facilities by the City Engineer and RCFCD, incorporation of conditions of approval into the project's design, as well as compliance with all applicable storm water discharge permits, impacts would be less than significant.				
f) Otherwise substantially degrade water quality?			■	
The proposed project is consistent with the City's General Plan. All storm drainage improvements would be developed to the standards of the City Engineer and the RCFCD. Additionally, the project has been designed in accordance with the City's standard conditions of approval, which includes measures pertaining to storm drainage facilities and runoff. As with any urban project, runoff entering the storm drainage system would contain minor amounts of pollutants (including pesticides, fertilizers and motor oil). This would incrementally contribute to the degradation of surface and sub-surface water quality. Additionally, grading activities would temporarily expose soils to water erosion that would contribute to downstream sedimentation. However, the project is subject to the permit requirements of the Santa Ana Regional Water Quality Control Board. As the site is currently unpaved and exposed, development of the proposed project would lessen the existing site contribution to sediment runoff at project completion. With the approval the storm drainage facilities by the City Engineer and Riverside County Flood Control District, incorporation of conditions of approval into the project's design, as well as compliance with all applicable storm water discharge permits, impacts would be less than significant.				
g) Place housing within a 100-year floodplain, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?			■	
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?			■	

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Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
(g and h) The proposed project site is located within Federal Emergency Management Agency Zone "X" area outside of the 100-year flood hazard area. This is an area determined to be outside of the 0.2% annual chance flood plain. The project is outside of the delineated dam inundation area for Perris Dam at Lake Perris Reservoir and will not place housing or structures within a 100-year flood hazard area. There are no mountains or steep slopes in proximity to the project site, therefore, there is no chance of mudflows from local mountains. Therefore, impacts would be less than significant.				
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				■
The proposed project site is located within Federal Emergency Management Agency Zone "X" area outside of the 100-year flood hazard area. This is an area determined to be outside of the 0.2% annual chance flood plain. The project site is outside of the delineated dam inundation area for Perris Dam at Lake Perris Reservoir and will not expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.				
j) Inundation by seiche, tsunami, or mudflow?				■
The project site is not identified in the General Plan as a location subject to seiche, or mudflow. The project is outside of the delineated dam inundation area for Perris Dam at Lake Perris Reservoir. Additionally, due to the position of the proposed project, mudflows from local mountains would be unlikely due to surrounding development. There would be no impacts resulting from inundation by seiche, tsunami, or mudflow.				
X. **LAND USE AND PLANNING**. Would the project:				
a) Physically divide an established community?			■	
The project proposes to develop a commercial center on an approximately a 6.3 acre site. The project includes a Master Plot Plan for a the commercial center, which includes a 39,950 square foot warehouse building, a new 24 hour gas station, carwash, and a 2,800 sf. fast-food restaurant (#1), and two 3,000 sf. fast-food restaurants (#2, #3). The project site is bounded by existing warehouse buildings to the west and north zoned Industrial (I). The property immediately to the east is improved with a restaurant, a church, and a recycling center in the Business Park-Mixed Use (BPX) zone. To the south is the existing March Air Reserve Base outside the Moreno Valley City limits. Since the proposed commercial development is an extension of an established land use pattern and is compatible with adjacent General Plan and Zoning districts and existing land uses, the project will not physically divide an established community and impacts would be less than significant under this category.				
b) Conflict with an applicable land use plan, policy or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?			■	
This proposed commercial center proposes development that is a permitted use in the Business Park-Mixed Use (BPX) zone and is consistent with the goals, objectives and policies of the Business Park (BP) General Plan designation for the project site. As designed and conditioned, and subject to implementation of mitigation measures, the project will not conflict with an applicable land use plan, policy or regulation of an agency with jurisdiction over the project including the City's General Plan.				
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?			■	
The project is not within one of the Multiple Species Habitat Conservation Plan (MSHCP) criteria areas, which are potential habitat preservation areas. The proposed project will not conflict with the Stephen's Kangaroo Rat Habitat Conservation Plan (SKR HCP) or MSHCP or any other known local, regional or state habitat conservation plans. The project will be conditioned to pay the required SKR mitigation fees. Also, the City participates in the MSHCP, a comprehensive habitat conservation-planning program addressing multiple species' needs, including preservation of habitat and native vegetation in Western Riverside County. As conditioned, the project will comply with the provisions of the MSHCP. This project will also be subject to fees per City ordinance to support the implementation of the Multiple Species Habitat Conservation Plan.				
XI. **MINERAL RESOURCES.** Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				■
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				■
(a and b) The project site is an infill commercial site located within an urbanized area. No active mines or mineral recovery programs are currently active within the project site or the surrounding area. Consequently, the development of the project site would not conflict with a mineral recovery plan as adopted by the General Plan. No significant impacts would occur.				
XII. **NOISE.** Would the project result in:				

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Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			■	
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?			■	
(a and b) The General Plan Environmental Impact Report (EIR) Noise Section for the City of Moreno Valley states that "The noise generated by construction is addressed by existing city regulations. It is unlawful to create noise that annoys reasonable people of normal sensitivity. The Public Works Department has a standard condition of approval regarding the public nuisance aspect of the construction activities. The construction operations including building related activities and deliveries shall be restricted to Monday through Friday (except for holidays which occur on weekdays), seven a.m. to seven p.m.; weekends and holidays (as observed by the city and described in Chapter 2.55 of the Municipal Code), eight a.m. to four p.m., unless written approval is obtained from the city building official or city engineer. Although construction activities will result in an increase in noise levels during construction, this impact will be short-term and will cease upon completion of construction. In addition, there are no sensitive uses in close proximity of the site. The temporary nature of the impact in conjunction with existing city regulations on hours of operation will lessen the potential of a significant impact due to construction noise. The proposed commercial development as designed and conditioned is consistent with City Municipal Code development standards and the City's design guidelines. It is anticipated that project traffic will operate within acceptable Levels of Service at General Plan build-out. Therefore, noise levels will be consistent with General Plan criteria for noise, and noise levels will not exceed the standards set forth in the General Plan. Perceptible groundborne vibrations are typically associated with blasting operations and potentially the use of pile drivers, neither of which will be used during construction of the Proposed Project. As such, no excessive groundborne vibration would be created by the Proposed Project. A less than significant impact would occur.				
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?			■	
The proposed commercial development, as designed and conditioned is consistent with City Municipal Code development standards and Design Guidelines. Noise associated with the proposed project includes, but is not limited to, visitor vehicular traffic, routine landscape and maintenance, and maintenance of common landscape areas. However, these noise sources would be typical of the adjacent area and therefore, the project would not introduce unique noise sources. The project will ensure compliance with City General Plan Policies related to noise regulation. Therefore, noise levels would be consistent with General Plan criteria for noise, and noise levels will not exceed the standards set forth in the General Plan. Impacts would be less than significant as a result of the proposed project.				
d) A substantially temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			■	
During construction, there will be the temporary impact of noise from construction equipment. The Public Works Department has a standard condition of approval regarding the public nuisance aspect of the construction activities. Any construction within the city shall only be completed between the hours of seven a.m. to seven p.m. Monday through Friday, excluding holidays and from eight a.m. to four p.m. on Saturday, unless written approval is obtained from the city building official or city engineer. According to the Moreno Valley Municipal Code (9.10.030), all temporary construction activities are exempt from the noise standards as long as construction activities are limited to the daytime hours as described above and construction equipment is properly maintained with working mufflers. The project will ensure compliance with City General Plan Policies related to noise regulation. Therefore, noise levels would be consistent with General Plan criteria for noise, and noise levels will not exceed the standards set forth in the General Plan. Impacts would be less than significant as a result of the proposed project.				
e) For a project located within an airport land use plan, or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?			■	
The nearest airport is the March Air Reserve Base located across Cactus Avenue to the south. The project site is located within Compatibility Zone B2 of the March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan. Noise impacts are identified as high since the project site is located within or near 65 CNEL contour. This project was reviewed by the Riverside County Airport Land Use Commission and found to be consistent with the 2014 March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan subject to certain requirements which have been incorporated into the project conditions of approval. As designed and conditioned, the project would not expose people working in the project area to excessive noise.				
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				■
There is no private airstrip within the vicinity of the site, or within the City of Moreno Valley.				

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. **POPULATION AND HOUSING.** Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?			■	
The proposed project is surrounded by existing development and streets. The project site is bounded by existing Goldencrest Drive and warehouse buildings to the north, to the west the project is bounded by Commerce Center Drive and warehouse buildings, to the south the project is bounded by Cactus Avenue and March Air Reserve Base, and to the east by a restaurant, a church, and a recycling center. The project is surrounded by urban uses. The proposed commercial development is consistent with surrounding General Plan land use and Zoning designations. The proposed Project is not expected to create substantial population growth. There is considerable existing development and proposed development of the surrounding area. The project has been conditioned to construct all required on-site and off-site public infrastructure and to participate in the payment of applicable development impact fees.				
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				■
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				■
(b and c) This property is currently vacant, and no housing is currently located in proximity. No housing will be displaced by development of this project. The project will not displace any residents.				
XIV. **PUBLIC SERVICES**. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a) Fire protection?			■	
The proposed project has incorporated the City's standard conditions of approval into its design. These standards specifically address concerns regarding the Fire Prevention Bureau. Standards such as providing approved fire hydrants, fire flow requirements, development impact fee programs, and utilizing fire retardant materials have all been incorporated into the project's design. Insurance Services Office (ISO) ratings are given to firefighting districts in order to rank their operation level. This scale ranges from one (1) the highest possible score, to a ten (10), the worst possible score. The City of Moreno Valley currently has an ISO rating of four (4), which is considered high. With the implementation of the conditions of approval of the project pertaining to Fire Services, impacts would be less than significant.				
b) Police protection?			■	
The proposed project conforms to the City's Municipal Code and to the General Plan. Police protection to the project area is provided through the Moreno Valley Police Department. The Police Department was involved in the project review process. Conditions of approval have been included by Police Department to ensure health and safety is protected during construction. Development of the project site would increase the demand for services on the Police Department. The project will pay development impact fees related to Police Facilities. With payment of impact fees, the development of the proposed project would not over-burden their service ability in continuing to provide high quality police service.				
c) Schools?			■	
d) Parks?			■	
e) Other public facilities?			■	
(c-e) The project will not negatively affect services such as fire, police, schools, parks or other public facilities. The various city departments and responsible outside agencies have determined that there will not be a potential significant impact on providing public services for the site. Impact fees will be collected by the City for Police, Fire, City Hall, and City Yard. Therefore, impacts are less than significant. The nature of the project does not necessitate the construction of new facilities or increase the demand upon fire, police, schools parks, or other public facilities. Impact fees will continue to apply to the construction of the project. Therefore, impacts are less than significant.				
XV. **RECREATION.**				
a) Would the project increase the use of existing neighborhood or regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?			■	
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?			■	

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

(a and b) As a commercial use, the proposed development would not increase the potential use of parks or other recreational facilities. The project does not include recreational facilities or involve new housing to directly generate users that would result in an increased use of existing parks or recreational facilities. Therefore, impacts are less than significant.

XVI. **TRANSPORTATION/TRAFFIC.** Would the project:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?		■		
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?		■		

(a and b) The Traffic Impact Analysis dated February 3, 2017 was prepared by David Evans and Associates, Inc. in order to evaluate the project impacts and to recommend improvement to achieve acceptable circulation system operational conditions.

The trip generation information identifies a total of 11,290 weekday trips, 912 AM peak hour trips, and 885 PM peak hour trips that are estimated to be generated from the proposed project per day.

The Traffic Impact Analysis reviewed traffic operations for project adjacent streets and intersections under seven scenarios: Existing traffic condition, background traffic condition, background plus project traffic condition, cumulative traffic condition, cumulative plus project traffic condition, buildout traffic condition and buildout plus project traffic condition.

To mitigate impacts by project traffic, the following mitigation measures will be required:

TR-1. Modification of the existing traffic signal located at Cactus Avenue and Commerce Center Drive and reconstruction of the north east corner of the intersection for the addition of the right-turn lane. Since any modification to this intersection requires the California Department of Transportation's (Caltrans) approval, the project applicant and the project applicant's contractor(s) shall be responsible for contacting Caltrans to obtain Caltrans's approval and encroachment permit prior to performing improvements.

TR-2. Construction of a raised, landscaped median on Cactus Avenue along project frontage.

TR-3. Modification of the existing raised, landscaped median on Cactus Avenue west of Elsworth Street to extend the existing east bound left-turn lane storage length to 300 feet at Cactus Avenue/Elsworth Street intersection.

Cumulative impacts generated by this project shall be mitigated through the payment of DIF and TUMF payments if applicable.

As designed and conditioned, and subject to implementation of mitigation measures TR-1, TR-2 and TR-3, the project will not conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system and will not conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highway.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?			■	

The nearest airport is the March Air Reserve Base located across Cactus Ave. to the south. The project site is located within Compatibility Zone B2 of the March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan. This project was reviewed by the Riverside County Airport Land Use Commission (ALUC). In a letter from ALUC dated October 19, 2015, it was determined to be consistent with the 2014 March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan subject to specific conditions related to the operation of the project. These conditions of approval have been made a requirement for this development. Therefore, as designed and conditioned, this project will not result in a change in air traffic patterns.

d) Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment)?			■	

The project has been conditioned by Public Works to complete street improvements where necessary along the site's Cactus Avenue, Commerce Center Drive and Goldencrest Drive frontages. The street improvements will include but not be limited to, pavement, curb, gutter, sidewalk, streetlights, storm drain, signing and striping, raised median and dry and wet utilities. As designed, the project will not result in hazards, and may reduce potential hazards at this location. The project is not adjacent to any potential incompatible uses.

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
e) Result in inadequate emergency access?			■	
As designed and conditioned, all driveways and drive aisles will be built to the specifications of the City Engineer and Traffic Engineer, the Fire Prevention Bureau and the Municipal Code. This will ensure that no hazardous traffic situations would occur during construction or with completion of the project. The site will be readily accessible for emergency access.				
f) Conflict with adopted policies or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?				■
The project as designed and conditioned will not conflict with adopted alternative transportation policies, therefore, no adverse impacts would occur.				
XVII. **UTILITIES AND SERVICE SYSTEMS.** Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				■
b) Require or result in construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				■
(a and b) A Prelminary Water Quality Management Plan (PWQMP) was prepared by SALEM Engineering Group, Inc., dated February 2, 2017. The PWQMP identifies treatment Best Management Practices (BMP's) to address the project's pollutants of concern. The information presented in the PWQMP has been found by the City to be in general conformance with the document, "Water Quality Management Plan for the Santa Ana Region of Riverside County" dated October 22, 2012 and approved by the Santa Ana Regional Water Quality Control Board (Guidance Document). This project will not exceed the wastewater treatment requirements of the Regional Water Quality Control Board. The Eastern Municipal Water District (EMWD) is the sanitary district provider for the project. The project will not exceed wastewater treatment capacity of the Moreno Water Reclamation Facility, or result in the need for the construction of new water or wastewater facilities.				
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?			■	
Riverside County Flood Control District (RCFCD) provided a letter dated September 10, 2015, indicating that this project would not be impacted by District Master Drainage Plan facilities. The project proposes to construct on-site storm drain infrastructure and bio-retention/water quality basins. The project will not discharge storm water that exceeds historic capacities and will not exceed the capacity of existing or planned stormwater drainage systems.				
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				■
The water purveyor, Eastern Municipal Water District (EMWD), prepared an Urban Water Management Plan in 2010 demonstrating that it has or will have sufficient water supplies available to serve urban development within the City of Moreno Valley. EMWD's plan was based on the City's General Plan Land Use Element. The proposed project is consistent existing General Plan and Zoning designations. Therefore, sufficient water supplies exist to support the proposed project.				
e) Result in a determination by the wastewater treatment provider which serves or may serve the project determined that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				■
The wastewater treatment provider is EMWD. The current wastewater treatment facility has adequate capacity to serve projects within Moreno Valley that are consistent with the General Plan, and EMWD has plans for expansion of the Moreno Water Reclamation Facility to serve future needs. Source: EIR for the 2006 General Plan Update.				
f)) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?				■
Waste Management provides waste hauling service to the City of Moreno Valley. The project will be served by a landfill in the Badlands with sufficient permitted capacity to accommodate the project's solid waste disposal needs. Source: EIR for the 2006 General Plan Update.				
g) Comply with federal, state, and local statues and regulations related to solid waste?				■
City policies require compliance with State and Federal regulations regarding solid waste. As conditioned, this project will be required to comply with all current policies regarding solid waste. (General Plan Objective 7.8 and Municipal Code Section 6.02)				
XVIII. **MANDATORY FINDINGS OF SIGNIFICANCE.**				
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a			■	

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Issues and Supporting Information	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?				
There are no streambeds or riparian habitat within the project site. There were no surveyed rare plant or animal species noted on the project site. The project would not significantly degrade the quality of the environment or reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal. There are no historic structures on the site, and there will be no impact to historic resources. The project will not eliminate important examples of the major periods of California history or prehistory. The analysis in this Initial Study demonstrates that project and cumulative impacts will be less than significant. The project as designed and conditioned would not cause substantial adverse health effects on human beings.				
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			■	
The project will not create any impacts that when viewed in connection with existing land uses, other recently approved projects, and existing land use designations, would be considered cumulatively considerable. It is not expected that the proposed project would result in incremental effects. The analysis in the Initial Study demonstrates that cumulative impacts would be less than significant.				
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?			■	
The project proposes to develop a commercial center on an approximately 6.3 acre site. The project includes a Master Plot Plan for a the commercial center, which includes a 39,950 square foot warehouse building, a new 24 hour gas station, carwash, and a 2,800 sf. fast-food restaurant (#1), and two 3,000 sf. fast-food restaurants (#2, #3). The proposed Project is consistent with the General Plan and zoning for the site. The project as designed and conditioned will not cause substantial adverse effects on human beings, either directly or indirectly for the reasons described in this checklist/initial study.				

List of Key Documents and Resources:

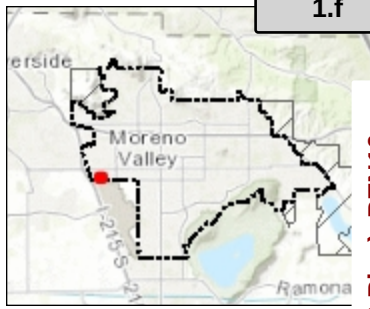
- City of Moreno Valley General Plan, adopted by City Council on July 11, 2006
- City of Moreno Valley Municipal Code, adopted by City Council in 1997
- Preliminary Water Quality Management Plan, prepared by SALEM Engineering Group, Inc., dated February 2, 2017
- Riverside County Integrated Project Long Report, Riverside County Transportation and Land Management Agency, April 15, 2016
- Western Riverside Area Soil Survey – University of California Agricultural Experiment Station, 1971
- Urban Water Management Plan, Eastern Municipal Water District, 2010
- State Important Farmland Map, 2015, http://maps.conservation.ca.gov/ciff/ciff.html
- Air Quality Management Plan (AQMP), South Coast Air Quality Management Board, 2012
- Cultural Resources Inventory, Archeological Research Unit, University of California, Riverside), October 1987
- March Air Reserve Base /Inland Port Airport Land Use Compatibility Plan, Riverside County Airport Land Use Commission, adopted November 13, 2014
- Hydrology Study, prepared by Salem Engineering Group, Inc., dated November 11, 2016
- Flood Insurance Rate Map, Federal Emergency Management Agency, Map Number 06065C0745G, August 28, 2008
- State Wildland Fires Map
- Riverside County Airport Land Use Commission consistency letter dated October 19, 2015
- Air Quality and Greenhouse Gas Assessment prepared by Salem Engineering Group, Inc., dated September 13, 2016
- Cultural Resources Survey prepared by Salem Engineering Group, Inc., dated December 5, 2016
- Biological Survey for Burrowing Owl prepared by Salem Engineering Group, Inc., dated September 30, 2016
- Geotechnical Engineering Investigation prepared by Salem Engineering Group, Inc., dated November 25, 2015
- Traffic Impact Study prepared by David Evans and Associates, Inc., dated February 3, 2017.

**The above documents and studies are incorporated by reference and available in the case file for PEN16-0131 (PA15-0032) and the Community Development Department – Planning Division or Public Works Department – Land Development Division.

Attachment: Initial Study MND [Revision 1] (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

MORENO VALLEY
WHERE DREAMS SOAR

Aerial Photograph



Legend

- Public Facilities
  - Public Facilities
  - Fire Stations
- Parcels
- City Boundary
- Sphere of Influence

Notes

315.5 0 157.74 315.5 Feet

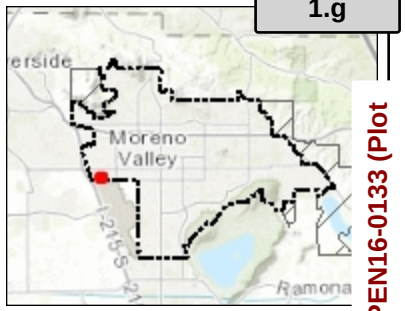
WGS_1984_Web_Mercator_Auxiliary_Sphere

Print Date: 1/30/2017

DISCLAIMER: The information shown on this map was compiled from the City of Moreno Valley GIS and Riverside County GIS. The land base and facility information on this map is for display purposes only and should not be relied upon without independent verification as to its accuracy. Riverside County and City of Moreno Valley will not be held responsible for any claims, losses or damages resulting from the use of this map.

Attachment: Aerial Photograph (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

Zone: BPX



Legend

Zoning

- Commercial
- Industrial/Business Park
- Public Facilities
- Office
- Planned Development
- Large Lot Residential
- Residential Agriculture 2 DU/AC
- Residential 2 DU/AC
- Suburban Residential
- Multi-family
- Open Space/Park

Master Plan of Trails

- Bridge
- Improved
- Multiuse
- Proposed
- Regional
- State

- Parcels
- City Boundary
- Sphere of Influence

Notes

315.5 0 157.74 315.5 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere

Print Date: 3/1/2017

DISCLAIMER: The information shown on this map was compiled from the City of Moreno Valley GIS and Riverside County GIS. The land base and facility information on this map is for display purposes only and should not be relied upon without independent verification as to its accuracy. Riverside County and City of Moreno Valley will not be held responsible for any claims, losses or damages resulting from the use of this map.

Attachment: Zoning Map (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot

PROJECT INFORMATION

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

BUILDING DEPARTMENT NOTES

1. SPECIAL INSPECTIONS: REFER TO SHEET S-1 FOR LIST OF SPECIAL INSPECTIONS REQUIRED BY THE STRUCTURAL ENGINEER.
2. CONTACT CITY BUILDING INSPECTIONS DEPARTMENT TO SCHEDULE A SPECIAL INSPECTION MEETING PRIOR TO ISSUANCE OF THE BUILDING PERMIT.
3. OPEN WEB ROOF TRUSSES ARE DEFERRED. SUBMIT 2-COPIES OF THE ROOF TRUSSES TO THE ARCHITECT OR ENGINEER OF RECORD FOR THEIR SHOP DRAWINGS REVIEW STAMP. SUBMIT THE APPROVED TRUSS DRAWINGS TO THE CITY BUILDING INSPECTIONS DEPARTMENT FOR APPROVAL PRIOR TO REQUESTING THE FRAMING INSPECTION. ADDITIONAL PLAN REVIEW FEE MAYBE ASSESSED
4. EXIT SIGNS AND TACTILE EXIT SIGNS SHALL BE INSTALLED UNDER THE TENANT IMPROVEMENT PLANS. ADDRESSING WILL BE PROVIDED.
5. OUTSIDE SEATING AREA MUST INCLUDE SEATING FOR THE DISABLED. TO BE PROVIDED DURING TENANT BUILD OUT IF APPLICABLE
6. THE ITEMS LISTED BELOW ARE UNDER SEPARATE PERMITS:
   A. SIGN PACKAGE
   B. TRASH ENCLOSURE
   C. FENCE WALLS
7. OCCUPANT LOAD TO BE PROVIDED DURING BUILD OUT. OCCUPANCY OF THIS BUILDING SHALL BE WITHHELD UNTIL ALL DEFERRED ITEMS HAVE BEEN APPROVED FOR PERMITTING AND FINALED BY INSPECTION
8. NO HAZARDOUS MATERIAL WILL BE STORED AND/OR USED WITHIN THE BUILDING, WHICH WILL EXCEED THE QUANTITIES PER CODE
9. REST ROOMS FACILITIES THAT COMPLY WITH THE DISABLED ACCESS REQUIREMENTS WILL BE PROVIDED DURING TENANT BUILD OUT.
10. REQUIRED NUMBER OF PLUMBING FIXTURES PER CODE. ONE MINIMUM UNISEX FACILITY. NOT IN SCOPE, DETERMINED DURING TENANT BUILD OUT.
11. IF THE NUMBER OF EMPLOYEES EXCEED 4, AND BOTH SEXES WILL BE EMPLOYED, PROVIDE SEPARATE TOILET FACILITIES FOR MEN AND WOMEN.
12. A COMPLETE SMOKE DETECTION SYSTEM IS NOT IN SCOPE. A DEFERRED APPROVAL WILL BE SUBMITTED TO THE FIRE DEPARTMENT FOR REVIEW AND APPROVAL DURING TENANT BUILD OUT.

REFERENCE CODES

2016 CALIFORNIA BUILDING CODE (CBC), PART 2
BASED ON 2009 EDITION INTERNATIONAL BUILDING CODE (IBC)
2016 CALIFORNIA ELECTRICAL CODE, PART 3
BASED ON 2008 EDITION NFPA NATIONAL ELECTRICAL CODE (NEC)
2016 CALIFORNIA MECHANICAL CODE (CMC), PART 4
BASED ON 2009 EDITION IAPMO UNIFORM MECHANICAL CODE (UMC)
2016 CALIFORNIA PLUMBING CODE (CPC)
BASED ON 2009 EDITION IAPMO UNIFORM PLUMBING CODE (UPC)
2016 CALIFORNIA ENERGY CODE, PART 6
2016 CALIFORNIA FIRE CODE (CFC), PART 9
BASED ON 2009 EDITION OF ICC INTERNATIONAL FIRE CODE (IFC)
2016 CALIFORNIA GREEN BUILDING STANDARDS CODE, PART 11

ACCESSIBILITY CODE -AMERICAN DISABILITIES ACT
-CALIFORNIA TITLE 24

UTILITY PURVEYORS

POWER COMPANY
Southern California Edison Co.
TEL: (800) 950-2356

GAS COMPANY
Southern California Gas Co.
TEL: (800) 427-2200

WASTE MANAGEMENT
Waste Management
TEL: (800) 423-9986

PHONE COMPANY
Verizon
TEL: (800) 922-0204

WATER COMPANY
Eastern Municipal Water District
TEL: (951) 571-0203
REF: xx

SCHOOL DISTRICT
Moreno Valley Unified School District
TEL: (951) 571-7500 ext. xx
REF: xx

CONSULTANTS

OWNER / APPLICANT
MORENO VALLEY CACTUS CENTER
P.O. BOX 1958
CORONA, CA 92878
TEL: (951) 280-3833
FAX: (951) 280-3832
CONTACT: INO CRUZ
E-MAIL: inc@jnlmgmt.com

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SILOAM ENGINEERING
3333 BREA CANYON RD., SUITE 109
DIAMOND BAR, CALIF. 91765
TEL: (909) 598-8218
FAX: (909) 598-8758
CONTACT: MILES CHANG
E-MAIL: etcx@siloaminc.com

LANDSCAPE ARCHITECT
GENE HIRAO LANDSCAPE ARCHITECTURE
15 POSADA
IRVINE, CA 92614
TEL: (949) 852-0748
FAX: (949) 660-7296
CONTACT: GENE HIRAO
E-MAIL: ghjh@cox.net

CIVIL ENGINEER
A.J. KOLTAVARY/CIVIL ENGINEERS
10005 MULARADO BLVD., STE E.
IRVINE, CA 92614
TEL: (949) 624-9027

CONTACT: ANDREW KOLTAVARY
E-MAIL: andrew.k@ajkce.com

TRAFFIC ENGINEER
HALL & FOREMAN
14297 CAJON AVENUE, SUITE 101
VICTORVILLE, CA 92392-2335
TEL: (760) 524-9100
FAX: (760) 524-9101
CONTACT: ROBERT A. KILPATRICK
E-MAIL:

GEOTECHNICAL-SOIL ENGINEER
SALEM ENGINEERING GROUP, INC.
4055 WEST SHAW AVENUE, SUITE 110
FRESNO, CA 93722
TEL: (559) 271-9700
FAX: (559) 275-0827
CONTACT: SAMMY SALEM
E-MAIL: sammy@salemenggroup.com

OCCUPANCY LOAD

CONVENIENCE STORE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	96 SQ.FT.	200	0.48=1
STORAGE	684 SQ.FT.	300	2.28=3
KITCHEN	226 SQ.FT.	200	1.13=2
SERVICE	1,500 SQ.FT.	15	100
			106 OCC. LOAD

FAST FOOD W/ DRIVE THRU #1

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	50 SQ.FT.	200	0.25=1
STORAGE	400 SQ.FT.	300	1.33=2
KITCHEN	610 SQ.FT.	200	3.05=4
SERVICE	1,050 SQ.FT.	15	70
			77 OCC. LOAD

FAST FOOD W/ DRIVE THRU #2

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

FAST FOOD W/ DRIVE THRU #3

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

WAREHOUSE/OFFICE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	3,000 SQ.FT.	200	15
STORAGE	33,950 SQ.FT.	300	113
			128 OCC. LOAD

PROJECT DATA

SITE LOCATION:
NEC CACTUS AVENUE/COMMERCE CENTER DRIVE, MORENO VALLEY, CA

PROJECT INFORMATION

1. SITE

ASSESSORS PARCEL NO. 297-130-052, 053, 054

A. ZONING -EXISTING BPX
-PROPOSED BPX

B. LOT AREA (6.30 ACRES) 274,636 SQ.FT.
AREA, (CENTERLINE OF ROAD) (7.30 ACRES) 317,988 SQ.FT.
PAD 1 (2.93 ACRES) 127,714 SQ.FT.
PAD 2 (2.00 ACRES) 87,215 SQ.FT.
PAD 3 (1.37 ACRES) 59,702 SQ.FT.

2. BUILDING AREA

A. CONVENIENCE STORE	3,800 SQ.FT.
B. FAST FOOD W/ DRIVE THRU #1	2,800 SQ.FT.
C. CARWASH	2,080 SQ.FT.
D. FAST FOOD W/ DRIVE THRU #2	3,000 SQ.FT.
E. FAST FOOD W/ DRIVE THRU #3	3,000 SQ.FT.
F. OFFICE/WARHOUSE	36,950 SQ.FT.
TOTAL BUILDING AREA	51,630 SQ.FT.
G. 10-PUMP GASOLINE CANOPY	5,611 SQ.FT.
H. 4-PUMP DIESEL CANOPY	1,680 SQ.FT.
PERCENT OF LOT COVERAGE	16.24%

3. BUILDING

	OCCUPANCY	CONSTRUCTION	SPRINKLERED
A. CONVENIENCE STORE	M	V-B	YES
B. FAST FOOD W/ DRIVE THRU #1	A-2	V-B	YES
C. CARWASH	B	II-B	YES
D. FAST FOOD W/ DRIVE THRU #2	A-2	V-B	YES
E. FAST FOOD W/ DRIVE THRU #3	A-2	V-B	YES
F. OFFICE/WARHOUSE	B/S-1	V-B	YES
G. 10 DISPENSER GASOLINE CANOPY	M	II-B	NO
H. 4 DISPENSER DIESEL CANOPY	M	II-B	NO

4. BUILDING HEIGHT

A. CONVENIENCE STORE	22'-0"
B. FAST FOOD W/ DRIVE THRU #1	22'-0"
C. CARWASH	18'-0"
D. FAST FOOD W/ DRIVE THRU #2	22'-0"
E. FAST FOOD W/ DRIVE THRU #3	22'-0"
F. OFFICE/WARHOUSE	35'-0"
G. 10-PUMP GASOLINE CANOPY	19'-0"
H. 4-PUMP DIESEL CANOPY	19'-0"

5. PARKING

A. CONVENIENCE STORE (1/225 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 16 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 1 STALL
B. FAST FOOD W/ DRIVE THRU #1 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 26 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 1 STALLS
C 4-PUMP DIESEL CANOPY	= 0
D. FAST FOOD W/ DRIVE THRU #2 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
E. FAST FOOD W/ DRIVE THRU #3 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
F. OFFICE/WAREHOUSE	
1. REQUIRED STANDARD SPACES (9'x18')	= 37 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
G. CARWASH	= 0
H. 10-PUMP GASOLINE CANOPY	= 0
TOTAL PARKING SPACES REQUIRED	= 144 STALLS
TOTAL PARKING SPACES PROVIDED	= 162 STALLS
TOTAL ACCESSIBLE SPACES REQUIRED	= 8 STALLS
TOTAL ACCESSIBLE SPACES PROVIDED	= 8 STALLS

6. LANDSCAPING

A. LANDSCAPING PROVIDED (17.7%) 48,744 SQ.FT.

DESCRIPTION OF PROPOSED USE

24 HOUR RETAIL SALES OF GASOLINE & DIESEL, FOOD, BEVERAGES, BEER, WINE AND GROCERY ITEMS AND CARWASH SERVICES, WAREHOUSE AND 2 FASTFOODS WITH DRIVE-THRU

INDEX OF DRAWINGS

SHEET NUMBER	DESCRIPTION	REV.	DATE
	ARCHITECTURAL SITE DRAWINGS		
T1-1	TITLE SHEET	-	02/03/17
AS1-1	PRELIMINARY MASTER SITE PLAN	-	02/03/17

224 SOUTH JOY STREET
CORONA, CA 92879-1958

P.O. BOX 1958
CORONA, CA 92878-1958

DIRECT (951) 280-3833
FAX (951) 280-3832

Design Methods, Inc.

CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DRIVE
MORENO VALLEY, CA 92553

CUP CASE NO. PEN16-0131
APN NO. 297-130-052, 053, 054

T1-1

VICINITY MAP

SYMBOLS LEGEND

SUBMITTAL DOCUMENTS FOR:
MASTER PLOT PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DR
MORENO VALLEY, CA 92553

KEYNOTES

1. PROPERTY LINE.
2. PROPOSED PROPERTY LINE / RIGHT OF WAY
3. LANDSCAPE AREA
4. PROPOSED UTILITY TRANSFORMER – LOCATION TO BE DETERMINED BY UTILITY COMPANY
5. TRASH ENCLOSURE, W/SOLID ROOF COVER, FINISH TO MATCH BUILDINGS.
6. 6" CONCRETE CURB, TYP. PER CITY STANDARDS
7. ACCESSIBLE PARKING STALL WITH RAMP PER CITY STANDARD – SEE CIVIL PLANS
8. ACCESSIBLE PATH OF TRAVEL.
9. RACK FOR 5 BICYCLES
10. UNDERGROUND GREASE INTERCEPTOR TANK – TYP. FOR RESTAURANTS.
11. EMERGENCY PUMP SHUT-OFF SWITCH.
12. NEW UST 20,000 GAL. UNLEADED GASOLINE
13. NEW UST 12,000 GAL. UNLEADED PREMIUM
14. NEW UST 10,000 GAL. DIESEL
15. TWO (2) NEW UST 20,000 GAL. DIESEL
16. CAR WASH ENTRANCE SIGN
17. 20'-0" WIDE STORM DRAIN EASEMENT
18. EXISTING FIRE HYDRANT TO BE RELOCATED – SEE CIVIL PLANS FOR NEW LOCATION
19. NEW MONUMENT SIGNAGE
20. NEW AIR AND WATER UNIT
21. TRASH RECEPTACLE
22. 6' HIGH VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
23. NEW GAS METERS
24. CONCRETE LANDING
25. DECORATIVE PAVING AS PER CITY REQUIREMENT.
26. 2' WIDE CURB OPENING – SEE CIVIL PLANS FOR LOCATIONS
27. 12" WIDE CONC. STEP OUT AND 6" CURB – PER CITY STANDARDS – SEE CIVIL PLANS SHEET 3 OF 5
28. COMMERCIAL DRIVEWAY APPROACH PER CITY STANDARD MSI-112C-0 – SEE CIVIL PLANS SHEET 3&4 OF 5
29. 2' SET BACK @ STREET FRONTAGE PER CITY STANDARD
30. ROOF DRAIN LOCATION
31. PROPOSED SIDEWALK – PER CITY STANDARDS MSI-115-0 – SEE CIVIL PLANS SHEET 3&4 OF 5
32. PROPOSED CURB AND GUTTER – PER CITY STANDARDS MSI-120-0 – SEE CIVIL PLANS SHEET 3&4 OF 5
33. EXISTING MEDIAN TO BE REMOVED – SEE CIVIL PLANS SHEET 3&4 OF 5
34. PROPOSED RAMP – PER CITY STANDARDS – SEE CIVIL PLANS SHEET 3&4 OF 5
35. EXISTING ADA RAMP – SEE CIVIL PLANS SHEET 3&4 OF 5
36. EXISTING TRAFFIC SIGNAL TO BE RELOCATED – SEE CIVIL PLANS SHEET 4 OF 5
37. PROPOSED MEDIAN AND STREET STRIPPING – PER CITY STANDARDS MSI-105A-0 – SEE CIVIL PLANS SHEET 3&4 OF 5 AND TRAFFIC STUDY
38. EXISTING CURB AND GUTTER – SEE CIVIL PLANS SHEET 3&4 OF 5
39. EXISTING CURB INLET – SEE CIVIL PLANS SHEET 3&4 OF 5
40. CONCRETE CURB AND WALK
41. 20' X 6' HIGH FENCH GATE VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
42. 3' X 6' HIGH FENCH GATE VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
43. RED CURBING "NO PARKING FIRE LANE"
44. LOW-EMITTING FUEL EFFICIENT PARKING STALLS, SHOWING THE NUMBER OF PARKING DESIGNATED.
45. NEW PARKWAY LANDSCAPE – SEE CIVIL PLANS SHEET 3&4 OF 5
46. 20'-0" BUILDING SETBACK
47. 3'-0" INTERIOR SIDE BUILDING SETBACK
48. EXISTING STREET LIGHT TO BE RELOCATED – SEE CIVIL PLANS SHEET 3&4 OF 5
49. EXISTING STREET LIGHT TO REMAIN – SEE CIVIL PLANS SHEET 3&4 OF 5
50. EXISTING 6" JET FUEL PIPELINE – SEE CIVIL PLANS SHEET 4 OF 5
51. PROPOSED R/W AT DRIVEWAYS – SEE CIVIL PLANS SHEET 3&4 OF 5
52. COMMERCIAL DRIVEWAY APPROACH PER CITY STANDARD MSI-112A-0 – SEE CIVIL PLANS SHEET 3&4 OF 5
53. EXISTING CURB AND GUTTER TO BE REMOVED – SEE CIVIL PLANS SHEET 4 OF 4
54. PROPOSED CURB INLET – SEE CIVIL PLANS SHEET 4 OF 4
55. RECLAIM SYSTEM – (1) 24'X24' CATCH BASIN (2) JENSEN 1500 GAL. TANKS & (1) SAMPLE BOX

GENERAL NOTES

1. EACH SERVICE STATION SHALL PROVIDE A MEN'S AND WOMEN'S PUBLIC RESTROOM WHICH ARE ACCESSIBLE, FROM THE INTERIOR OF THE BUSINESS ONLY, TO THE GENERAL PUBLIC AND PHYSICALLY DISABLED DURING ALL HOURS THE SERVICE STATION IS OPEN TO THE PUBLIC. ENTRANCES OR SIGNAGE SHALL BE CLEARLY VISIBLE FROM THE GASOLINE SERVICE AREA OR CASHIER STATION, AND SHALL BE MAINTAINED ON A REGULAR BASIS.
2. NOISE. ANY DRIVE-UP OR DRIVE-THROUGH SPEAKER SYSTEM SHALL NOT BE DETECTABLE ABOVE DAYTIME AMBIENT NOISE LEVELS BEYOND THE PROPERTY BOUNDARIES. THE SYSTEM SHALL BE DESIGNED TO COMPENSATE FOR AMBIENT NOISE LEVELS IN THE IMMEDIATE AREA. (ORD. 359, 1992).

LEGEND:

(X) PARKING STALL COUNT

224 SOUTH 3RD STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
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PRELIMINARY MASTER SITE PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-27-17	000.000
SCALE AS SHOWN	DRAWN BY INO

PEN16-0131

DRAWING NO.

AMS1-1

INFO_P:\Moreno Valley, Cactus\CUP\CUP-MasterPlotPlan\AMS1-1.DWG, Manon Rivera, 8:07:03, 02-27-17 134153

PROJECT INFORMATION

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

BUILDING DEPARTMENT NOTES

1. SPECIAL INSPECTIONS: REFER TO SHEET S-1 FOR LIST OF SPECIAL INSPECTIONS REQUIRED BY THE STRUCTURAL ENGINEER.
2. CONTACT CITY BUILDING INSPECTIONS DEPARTMENT TO SCHEDULE A SPECIAL INSPECTION MEETING PRIOR TO ISSUANCE OF THE BUILDING PERMIT.
3. OPEN WEB ROOF TRUSSES ARE DEFERRED. SUBMIT 2-COPIES OF THE ROOF TRUSSES TO THE ARCHITECT OR ENGINEER OF RECORD FOR THEIR SHOP DRAWINGS REVIEW STAMP. SUBMIT THE APPROVED TRUSS DRAWINGS TO THE CITY BUILDING INSPECTIONS DEPARTMENT FOR APPROVAL PRIOR TO REQUESTING THE FRAMING INSPECTION. ADDITIONAL PLAN REVIEW FEE MAYBE ASSESSED
4. EXIT SIGNS AND TACTILE EXIT SIGNS SHALL BE INSTALLED UNDER THE TENANT IMPROVEMENT PLANS. ADDRESSING WILL BE PROVIDED.
5. OUTSIDE SEATING AREA MUST INCLUDE SEATING FOR THE DISABLED. TO BE PROVIDED DURING TENANT BUILD OUT IF APPLICABLE
6. THE ITEMS LISTED BELOW ARE UNDER SEPARATE PERMITS:
   A. SIGN PACKAGE
   B. TRASH ENCLOSURE
   C. FENCE WALLS
7. OCCUPANT LOAD TO BE PROVIDED DURING BUILD OUT. OCCUPANCY OF THIS BUILDING SHALL BE WITHHELD UNTIL ALL DEFERRED ITEMS HAVE BEEN APPROVED FOR PERMITTING AND FINALED BY INSPECTION
8. NO HAZARDOUS MATERIAL WILL BE STORED AND/OR USED WITHIN THE BUILDING, WHICH WILL EXCEED THE QUANTITIES PER CODE
9. REST ROOMS FACILITIES THAT COMPLY WITH THE DISABLED ACCESS REQUIREMENTS WILL BE PROVIDED DURING TENANT BUILD OUT.
10. REQUIRED NUMBER OF PLUMBING FIXTURES PER CODE. ONE MINIMUM UNISEX FACILITY. NOT IN SCOPE, DETERMINED DURING TENANT BUILD OUT.
11. IF THE NUMBER OF EMPLOYEES EXCEED 4, AND BOTH SEXES WILL BE EMPLOYED, PROVIDE SEPARATE TOILET FACILITIES FOR MEN AND WOMEN.
12. A COMPLETE SMOKE DETECTION SYSTEM IS NOT IN SCOPE. A DEFERRED APPROVAL WILL BE SUBMITTED TO THE FIRE DEPARTMENT FOR REVIEW AND APPROVAL DURING TENANT BUILD OUT.

REFERENCE CODES

2016 CALIFORNIA BUILDING CODE (CBC), PART 2
BASED ON 2009 EDITION INTERNATIONAL BUILDING CODE (IBC)
2016 CALIFORNIA ELECTRICAL CODE, PART 3
BASED ON 2008 EDITION NFPA NATIONAL ELECTRICAL CODE (NEC)
2016 CALIFORNIA MECHANICAL CODE (CMC), PART 4
BASED ON 2009 EDITION IAPMO UNIFORM MECHANICAL CODE (UMC)
2016 CALIFORNIA PLUMBING CODE (CPC)
BASED ON 2009 EDITION IAPMO UNIFORM PLUMBING CODE (UPC)
2016 CALIFORNIA ENERGY CODE, PART 6
2016 CALIFORNIA FIRE CODE (CFC), PART 9
BASED ON 2009 EDITION OF ICC INTERNATIONAL FIRE CODE (IFC)
2016 CALIFORNIA GREEN BUILDING STANDARDS CODE, PART 11

ACCESSIBILITY CODE –AMERICAN DISABILITIES ACT
–CALIFORNIA TITLE 24

UTILITY PURVEYORS

POWER COMPANY
Southern California Edison Co.
TEL: (800) 950-2356

GAS COMPANY
Southern California Gas Co.
TEL: (800) 427-2200

WASTE MANAGEMENT
Waste Management
TEL: (800) 423-9986

PHONE COMPANY
Verizon
TEL: (800) 922-0204

WATER COMPANY
Eastern Municipal Water District
TEL: (951) 571-0203
REF: xx

SCHOOL DISTRICT
Moreno Valley Unified School District
TEL: (951) 571-7500 ext. xx
REF: xx

CONSULTANTS

OWNER / APPLICANT
MORENO VALLEY CACTUS CENTER
P.O. BOX 1958
CORONA, CA 92878
TEL: (951) 280-3833
FAX: (951) 280-3832
CONTACT: JNO CRUZ
E-MAIL: ino@jntmgmt.com

STRUCTURAL ENGINEER
SLOAM ENGINEERING
3333 BREA CANYON RD., SUITE 109
DIAMOND BAR, CALIF. 91765
TEL: (909) 598-8218
FAX: (909) 598-8758
CONTACT: MILES CHANG
E-MAIL: ebox@slbcainc.com

LANDSCAPE ARCHITECT
GENE HIRAO LANDSCAPE ARCHITECTURE
15 POSADA
IRVINE, CA. 92614
TEL: (949) 652-0748
FAX: (949) 660-7296
CONTACT: GENE HIRAO
E-MAIL: ghjh@cox.net

CIVIL ENGINEER
A.J. KOLTAVARY/CIVIL ENGINEERS
10005 MUIRLANDS BLVD., STE E.
IRVINE, CA 92614
TEL: (949) 624-9027

CONTACT: ANDREW KOLTAVARY
E-MAIL: andrew.k@ajkce.com

TRAFFIC ENGINEER
HALL & FOREMAN
14297 CAJON AVENUE, SUITE 101
VICTORVILLE, CA 92392-2335
TEL: (760) 524-9100
FAX: (760) 524-9101
CONTACT: ROBERT A. KILPATRICK
E-MAIL:

GEOTECHNICAL-SOIL ENGINEER
SALEM ENGINEERING GROUP, INC.
4055 WEST SHAW AVENUE, SUITE 110
FRESNO, CA 93722
TEL: (559) 271-9700
FAX: (559) 275-0827
CONTACT: SAMMY SALEM
E-MAIL: sammy@salemengroup.com

OCCUPANCY LOAD

CONVENIENCE STORE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	96 SQ.FT.	200	0.48=1
STORAGE	684 SQ.FT.	300	2.28=3
KITCHEN	226 SQ.FT.	200	1.13=2
SERVICE	1,500 SQ.FT.	15	100
			106 OCC. LOAD

FAST FOOD W/ DRIVE THRU #1

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	50 SQ.FT.	200	0.25=1
STORAGE	400 SQ.FT.	300	1.33=2
KITCHEN	610 SQ.FT.	200	3.05=4
SERVICE	1,050 SQ.FT.	15	70
			77 OCC. LOAD

FAST FOOD W/ DRIVE THRU #2

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

FAST FOOD W/ DRIVE THRU #3

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

WAREHOUSE/OFFICE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	3,000 SQ.FT.	200	15
STORAGE	33,950 SQ.FT.	300	113
			128 OCC. LOAD

PROJECT DATA

SITE LOCATION:
NEC CACTUS AVENUE/COMMERCE CENTER DRIVE, MORENO VALLEY, CA

PROJECT INFORMATION

1. SITE

ASSESSORS PARCEL NO. 297-130-052, 053, 054

A. ZONING –EXISTING BPX
–PROPOSED BPX

B. LOT AREA
AREA, (CENTERLINE OF ROAD) (6.30 ACRES) 274,636 SQ.FT.
PAD 1 (7.30 ACRES) 317,988 SQ.FT.
PAD 2 (2.93 ACRES) 127,714 SQ.FT.
PAD 3 (2.00 ACRES) 87,215 SQ.FT.
(1.37 ACRES) 59,702 SQ.FT.

2. BUILDING AREA

A. CONVENIENCE STORE	3,800 SQ.FT.
B. FAST FOOD W/ DRIVE THRU #1	2,800 SQ.FT.
C. CARWASH	2,080 SQ.FT.
D. FAST FOOD W/ DRIVE THRU #2	3,000 SQ.FT.
E. FAST FOOD W/ DRIVE THRU #3	3,000 SQ.FT.
F. OFFICE/WARHOUSE	36,950 SQ.FT.
TOTAL BUILDING AREA	51,630 SQ.FT.
G. 10-PUMP GASOLINE CANOPY	5,611 SQ.FT.
H. 4-PUMP DIESEL CANOPY	1,680 SQ.FT.
PERCENT OF LOT COVERAGE	16.24%

3. BUILDINGS

	OCCUPANCY	CONSTRUCTION	SPRINKLERED
A. CONVENIENCE STORE	M	V-B	YES
B. FAST FOOD W/ DRIVE THRU #1	A-2	V-B	YES
C. CARWASH	B	II-B	YES
D. FAST FOOD W/ DRIVE THRU #2	A-2	V-B	YES
E. FAST FOOD W/ DRIVE THRU #3	A-2	V-B	YES
F. OFFICE/WARHOUSE	B/S-1	V-B	YES
G. 10 DISPENSER GASOLINE CANOPY	M	II-B	NO
H. 4 DISPENSER DIESEL CANOPY	M	II-B	NO

4. BUILDING HEIGHT

A. CONVENIENCE STORE	22'-0"
B. FAST FOOD W/ DRIVE THRU #1	22'-0"
C. CARWASH	18'-0"
D. FAST FOOD W/ DRIVE THRU #2	22'-0"
E. FAST FOOD W/ DRIVE THRU #3	22'-0"
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5. PARKING

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B. FAST FOOD W/ DRIVE THRU #1 (1/100 S.F.)	
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C 4-PUMP DIESEL CANOPY	= 0
D. FAST FOOD W/ DRIVE THRU #2 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
E. FAST FOOD W/ DRIVE THRU #3 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
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F. OFFICE/WAREHOUSE	
1. REQUIRED STANDARD SPACES (9'x18')	= 37 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
G. CARWASH	= 0
H. 10-PUMP GASOLINE CANOPY	= 0
TOTAL PARKING SPACES REQUIRED	= 144 STALLS
TOTAL PARKING SPACES PROVIDED	= 162 STALLS
TOTAL ACCESSIBLE SPACES REQUIRED	= 8 STALLS
TOTAL ACCESSIBLE SPACES PROVIDED	= 8 STALLS

6. LANDSCAPING

A. LANDSCAPING PROVIDED (17.7%) 48,744 SQ.FT.

DESCRIPTION OF PROPOSED USE
NEW WAREHOUSE BUILDING.

INDEX OF DRAWINGS

SHEET NUMBER	DESCRIPTION	REV.	DATE
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T1-1	TITLE SHEET	-	02/03/17
AS1-1	PRELIMINARY WAREHOUSE SITE PLAN	-	02/03/17
AS2-1	TRASH ENCLOSURE DETAILS	-	02/03/17
PHS1-1	PHASING PLAN	-	02/03/17
CIVIL DRAWINGS			
1 OF 5	TITLE SHEET	-	02/03/17
2 OF 5	DETAILS	-	02/03/17
3 OF 5	PRELIMINARY GRADING PLAN	-	02/03/17
4 OF 5	PRELIMINARY GRADING PLAN AND STREET SECTIONS	-	02/03/17
5 OF 5	PRELIMINARY UTILITY PLAN	-	02/03/17
ALTA-1	TITLE SHEET	-	02/03/17
ALTA-2	ALTA SURVEY	-	02/03/17
LANDSCAPE DRAWINGS			
L-1	LANDSCAPE PLAN	-	02/03/17
ARCHITECTURAL DRAWINGS			
A1-1	WAREHOUSE FLOOR PLAN	-	02/03/17
A1-2	WAREHOUSE OFFICE FLOOR PLAN	-	02/03/17
A1-3	WAREHOUSE ROOF PLAN	-	02/03/17
A2-1	WAREHOUSE EXTERIOR ELEVATIONS	-	02/03/17
A2-2	WAREHOUSE EXTERIOR ELEVATIONS	-	02/03/17

224 SOUTH JOY STREET
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Design Methods · Established 1993 · Adjusted

CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DRIVE
MORENO VALLEY, CA 92553

CUP CASE NO. PEN16-0132
APN NO. 297-130-052, 053, 054

T1-1

VICINITY MAP

SYMBOLS LEGEND

SUBMITTAL DOCUMENTS FOR:
NEW WAREHOUSE BUILDING

CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DR
MORENO VALLEY, CA 92553

PRELIMINARY WAREHOUSE SITE PLAN

GRAPHIC SCALE: 1"=20'-0"

KEYNOTES

1	PROPERTY LINE.
2	PROPOSED PROPERTY LINE / RIGHT OF WAY
3	LANDSCAPE AREA
4	PROPOSED UTILITY TRANSFORMER - LOCATION TO BE DETERMINED BY UTILITY COMPANY
5	TRASH ENCLOSURE, W/SOLID ROOF COVER, FINISH TO MATCH BUILDINGS.
6	6" CONCRETE CURB, TYP. PER CITY STANDARDS
7	ACCESSIBLE PARKING STALL WITH RAMP PER CITY STANDARD - SEE CIVIL PLANS
8	ACCESSIBLE PATH OF TRAVEL.
9	RACK FOR 5 BICYCLES
10	UNDERGROUND GREASE INTERCEPTOR TANK - TYP. FOR RESTAURANTS.
11	EMERGENCY PUMP SHUT-OFF SWITCH.
12	NEW UST 20,000 GAL. UNLEADED GASOLINE
13	NEW UST 12,000 GAL. UNLEADED PREMIUM
14	NEW UST 10,000 GAL. DIESEL
15	TWO (2) NEW UST 20,000 GAL. DIESEL
16	CAR WASH ENTRANCE SIGN
17	20'-0" WIDE STORM DRAIN EASEMENT
18	EXISTING FIRE HYDRANT TO BE RELOCATED - SEE CIVIL PLANS FOR NEW LOCATION
19	NEW MONUMENT SIGNAGE
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22	6' HIGH VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
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30	ROOF DRAIN LOCATION
31	PROPOSED SIDEWALK - PER CITY STANDARDS MVSI-115-0 - SEE CIVIL PLANS
32	PROPOSED CURB AND GUTTER - PER CITY STANDARDS MVSI-120B-0 - SEE CIVIL PLANS
33	EXISTING MEDIAN TO BE REMOVED - SEE CIVIL PLANS
34	PROPOSED RAMP - PER CITY STANDARDS - SEE CIVIL PLANS
35	EXISTING ADA RAMP - SEE CIVIL PLANS
36	EXISTING TRAFFIC SIGNAL TO BE RELOCATED - SEE CIVIL PLANS
37	PROPOSED MEDIAN AND STREET STRIPPING - PER CITY STANDARDS MVSI-106A-0 - SEE CIVIL PLANS AND TRAFFIC STUDY
38	EXISTING CURB AND GUTTER - SEE CIVIL PLANS
39	EXISTING CURB INLET - SEE CIVIL PLANS
40	CONCRETE CURB AND WALK
41	20' X 6' HIGH FENCH GATE VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
42	3' X 6' HIGH FENCH GATE VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
43	RED CURBING "NO PARKING FIRE LANE"
44	LOW -EMITTING FUEL EFFICIENT PARKING STALLS, SHOWING THE NUMBER OF PARKING DESIGNATED.
45	NEW PARKWAY LANDSCAPE - SEE CIVIL PLANS
46	20'-0" BUILDING SETBACK
47	3'-0" INTERIOR SIDE BUILDING SETBACK
48	EXISTING STREET LIGHT TO BE RELOCATED - SEE CIVIL PLANS
49	EXISTING STREET LIGHT TO REMAIN - SEE CIVIL PLANS
50	EXISTING 6" JET FUEL PIPELINE - SEE CIVIL PLANS
51	PROPOSED P/W AT DRIVEWAYS - SEE CIVIL PLANS
52	COMMERCIAL DRIVEWAY APPROACH PER CITY STANDARD MVSI-112A-0 - SEE CIVIL PLANS
53	EXISTING CURB AND GUTTER TO BE REMOVED - SEE CIVIL PLANS

GENERAL NOTES

1. EACH SERVICE STATION SHALL PROVIDE A MEN'S AND WOMEN'S PUBLIC RESTROOM WHICH ARE ACCESSIBLE, FROM THE INTERIOR OF THE BUSINESS ONLY, TO THE GENERAL PUBLIC AND PHYSICALLY DISABLED DURING ALL HOURS THE SERVICE STATION IS OPEN TO THE PUBLIC. ENTRANCES OR SIGNAGE SHALL BE CLEARLY VISIBLE FROM THE GASOLINE SERVICE AREA OR CASHIER STATION, AND SHALL BE MAINTAINED ON A REGULAR BASIS.
2. NOISE. ANY DRIVE-UP OR DRIVE-THROUGH SPEAKER SYSTEM SHALL NOT BE DETECTABLE ABOVE DAYTIME AMBIENT NOISE LEVELS BEYOND THE PROPERTY BOUNDARIES. THE SYSTEM SHALL BE DESIGNED TO COMPENSATE FOR AMBIENT NOISE LEVELS IN THE IMMEDIATE AREA. (ORD. 359, 1992).

LEGEND:

(X) PARKING STALL COUNT

224 SOUTH JOY STREET
CORONA, CA 92879-1558
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
FAX (951) 280-3832

PRELIMINARY WAREHOUSE SITE PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY INO

PEN16-0132

DRAWING NO.

AS1-1

M:\2. P:\Ventera_Valley_Cactus\Civil\Civil-Proj2-INH\AS1-1.DWG Jimmy Hung PLOTTED: 02-03-17 12:14:29

224 SOUTH JOY STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
FAX (951) 280-3832

Design Methods Engineering

TRASH ENCLOSURE DETAILS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA. 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	IVO

PEN16-0132

DRAWING NO.

AS2-1

224 SOUTH JOY STREET
CORONA, CA 92879-1558
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3823
FAX (951) 280-3832

PRELIMINARY
SITE PLAN

NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

CACTUS COMMERCE, LP

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
1"=30'-0"	

PEN16-0132

DRAWING NO.

PHS1-1

PRELIMINARY GRADING PLAN
GAS STATION, RETAIL & WAREHOUSE

VICINITY MAP

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

APN: 297-130-052, 53, AND 54

UTILITY COMPANY

WATER AND SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
P.O. BOX 8300
PERRIS, CA 92572-8300
(951) 928-3777

TELEPHONE:
VERIZON
(866) 232-4282

ELECTRICITY:
MORENO VALLEY ELECTRIC UTILITY
14331 FREDERICK STREET,
SUITE 2
MORENO VALLEY, CA 92553
(844)341-6469

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
P.O BOX "C"
MONTEREY PARK, CA 91756
(800) 427-2000

OWNER/APPLICANT INFORMATION

J&T MANAGEMENT, INC.	INO CRUZ
COMPANY NAME	CONTACT NAME
139 RADIO ROAD CORONA, CA 92879	(951) 280-3833
ADDRESS	PHONE
INO@JNTMGMT.COM	(951) 280-3832
E-MAIL	FAX

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

Underground Service Alert
Call TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

SALEM engineering group, inc.

ROUGH / CONCEPTUAL GRADING CALCULATIONS

	QUANTITIES (CY) CUT	FILL
EARTHWORK		
ROUGH GRADING	2,368	7,829
OVER-EXCAVATION WORK		
REMEDIAL WORK		
SHRINKAGE (___%)		
EARTHWORK QUANTITY SUBTOTAL		
IMPORT MATERIAL		5,461
EXPORT MATERIAL		
EARTHWORK QUANTITY TOTAL		

ZONE BPX

SITE ACREAGE: 6.31 ACRES

AREA OF DISTURBANCE: 6.31 ACRES

TOPOGRAPH COMPLETED BY: A.J. KOLTAVARY/CE DATED: 10/20/2015

FLOOD ZONE: "X" PER F.I.R.M. MAP PANEL NO. 06065C0745G DATED: 08/28/2008

SHEET INDEX

DESCRIPTION	SHEET NO.
TITLE SHEET	1
DETAILS	2
PRELIMINARY GRADING PLAN	3
PRELIMINARY GRADING PLAN AND STREET SECTIONS	4
PRELIMINARY UTILITY PLAN	5

THE GRADING AND/OR IMPROVEMENT PLANS ARE APPROVED FOR A PERIOD OF TWO (2) YEARS FROM THE DATE SIGNED BY THE CITY ENGINEER. AFTER THE TWO (2) YEAR PERIOD HAS LAPSED, THE ENGINEER OF RECORD MAY BE REQUIRED TO SUBMIT AND PROCESS FOR CITY ENGINEER APPROVAL, UPDATED PLANS THAT COMPLY WITH THE MOST CURRENT CITY STANDARDS, PRACTICES AND POLICIES.

ABBREVIATION

AB	AGGREGATE BASE	MH	MANHOLE
AC	ASPHALT	N&T	NAIL AND TAG
BW	BACK OF WALK	OH	OVERHEAD
CF	CURB FACE	PP	POWER POLE
CO	CLEANOUT	SD	STORM DRAIN
EG	EXISTING GROUND	SPK	SPIKE
FD	FOUND	TC	TOP OF CURB
FF	FINISH FLOOR	TW	TOP OF WALL
FG	FINISH GRADE	TB	TOP OF BERM
FL	FLOWLINE	WV	WATER VALVE
FS	FINISH SURFACE	W	WATER
HP	HIGH POINT	(R)	RECORD
HT	HEIGHT	RD	ROOF DRAIN
L&T	LEAD AND TAG	CB	CATCH BASIN

GEOTECH AND GEOLOGIST CERTIFICATION

THIS GRADING PLAN HAS BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN CONFORMANCE WITH THE RECOMMENDATIONS AS OUTLINED IN THE FOLLOWING SOILS AND GEOLOGICAL REPORT FOR THIS PROJECT.

REPORT NO: 3-215-1091

REPORT DATE: NOVEMBER 25, 2015

FIRM NAME: SALEM ENGINEERING

BY: ..... GEOTECHNICAL ENGINEER ..... DATE

OR

BY: ..... ENGINEERING GEOLOGIST ..... DATE

EASEMENTS

(5) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
GRANTED TO: GTE CALIFORNIA INCORPORATED, A CORPORATION
PURPOSE: FOR THE TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRICAL MEANS
RECORDED: APRIL 30, 1999 AS INSTRUMENT NO. 182988 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.
SAID EASEMENT CONTAINS RESTRICTIONS ON THE USE, BY THE OWNERS OF SAID LAND, OF THE EASEMENT AREA AS SET OUT IN SAID EASEMENT DOCUMENT.

(6) AN EASEMENT FOR THE PURPOSES SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED MAP SHOWN BELOW.
MAP: PARCEL MAP NO. 27732
RECORDED: IN BOOK 195, PAGES 75 TO 79 INCLUSIVE OF PARCEL MAPS
EASEMENT PURPOSE: STORM DRAINAGE
AFFECTS: AS SHOWN ON SAID MAP

(7) THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHT OF ACCESS TO OR FROM THE STREET OR HIGHWAY ABUTTING SAID LAND KWON AS PARCEL 9 AND 10 ABUTTING CACTUS AVENUE SUCH RIGHTS HAVING BEEN RELINQUISHED BY THE MAP OF SAID TRACT.

ENGINEER'S NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

DECLARATION OF ENGINEER OF RECORD

I HEREBY DECLARE THAT THE DESIGN OF THE IMPROVEMENTS AS SHOWN ON THESE PLANS COMPLIES WITH PROFESSIONAL ENGINEERING STANDARDS AND PRACTICES. AS THE ENGINEER IN RESPONSIBLE CHARGE OF DESIGN OF THESE IMPROVEMENTS, I ASSUME FULL RESPONSIBLE CHARGE FOR SUCH DESIGN. I UNDERSTAND AND ACKNOWLEDGE THAT THE PLAN CHECK OF THESE PLANS BY THE CITY OF MORENO VALLEY IS A REVIEW FOR THE LIMITED PURPOSE OF ENSURING THAT THE PLANS COMPLY WITH CITY PROCEDURES, APPLICABLE POLICIES AND ORDINANCES. THE PLAN CHECK IS NOT A DETERMINATION OF THE TECHNICAL ADEQUACY OF THE DESIGN OF THE IMPROVEMENTS. SUCH PLAN CHECK DOES NOT, THEREFORE, RELIEVE ME OF MY RESPONSIBILITY FOR THE DESIGN OF THESE IMPROVEMENTS. AS ENGINEER OF RECORD (EOR), I AGREE TO INDEMNIFY AND HOLD THE CITY OF MORENO VALLEY, THE MORENO VALLEY HOUSING AUTHORITY, AND THE MORENO VALLEY COMMUNITY SERVICE DISTRICT (CSD), ITS OFFICERS, AGENTS AND EMPLOYEES HARMLESS FROM ANY AND ALL LIABILITY OF CLAIMS, DAMAGES OR INJURIES TO ANY PERSON OR PROPERTY WHICH MIGHT ARISE FROM THE NEGLIGENT ACTS, ERRORS OR OMISSIONS OF THE ENGINEER OF RECORD. I HAVE READ AND INFORMED THE PROJECT APPLICANT/DEVELOPER THAT APPROVAL OF THESE PLANS DO NOT RELIEVE THEM FROM THE REQUIREMENTS OF THE CONDITIONS OF APPROVAL (ATTACHED HEREIN OR IN OTHER APPROVED IMPROVEMENT PLANS).

I ALSO HEREBY DECLARE THAT I HAVE COMPARED THESE PLANS WITH ALL APPLICABLE ADA TITLE II AND TITLE 24 REQUIREMENTS FOR DISABILITY ACCESS FOR THIS PROJECT, AND THESE PLANS ARE IN FULL COMPLIANCE WITH THOSE REQUIREMENTS.

SALEM ENGINEERING GROUP, INC	FRANCISCO V. MAGOS II
COMPANY NAME	CONTACT NAME
11650 MISSION PARK DRIVE, SUITE 108 RANCHO CUCAMONGA, CA 91730	(909) 980-6455
ADDRESS	PHONE
FRANCISCO@SALEM.NET	(909) 980-6435
E-MAIL	FAX

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF		
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.	OFFICE	INITIAL	DATE
		ENGINEERING DIVISION MANAGER		
		LAND DEVELOPMENT		
		PLANNING		
		TRANSPORTATION		
		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED: ..... DATE
MARGERY A. LAZARUS
INTERIM CAPITAL PROJECTS DIVISION MANAGER/
ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED: ..... DATE
AHMAD R. ANSARI
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER
FRANCISCO V. MAGOS II
No. 75,227
Exp. 12/31/18
CIVIL
STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF: ..... DATE
FRANCISCO V. MAGOS II, PE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

TITLE SHEET

SHEET 1 OF 5
CITY ID No

*BIORETENTION 'ENGINEERED SOIL' LAYER SHALL BE MINIMUM 24" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.

**3/4" CRUSHED ROCK LAYER SHALL BE A MINIMUM OF 12" BUT MAY BE DEEPENED TO INCREASE THE INFILTRATION AND STORAGE ABILITY OF THE BASIN.

THE EFFECTIVE AREA OF THE BASIN SHALL BE LEVEL AND SHALL BE SIZED BASED ON ENCINITAS STORMWATER MANUAL CALCULATIONS. TYPICALLY, THE SURFACE AREA OF THE BIORETENTION BASIN IS 4% OF THE IMPERVIOUS AREA DRAINING TO IT.

BIO-RETENTION AREA CROSS SECTION 24"x36" SCALE: NTS 11"x17" SCALE: NTS **9**

DRAIN BOX NOTES			
BOX SIZE	(A)	(B)	(C)
24-INCH x 24-INCH 36-INCH x 36-INCH (20)	22" 34"	34" 46"	ALHAMBRA FOUNDRY CO., LTD. (NARROW SLOT, 0.5" WIDE (MAX.) OPENINGS) TRUCK TRAFFIC CAST IRON GRATE AND FRAME (GALVANIZED) OR EQUIVALENT

CONCRETE CATCH BASIN 24"x36" SCALE: NTS 11"x17" SCALE: NTS **5**

NONE 24"x36" SCALE: NTS 11"x17" SCALE: NTS **3**

3' WIDE CONCRETE SWALE 24"x36" SCALE: NTS 11"x17" SCALE: NTS **2**

NONE 24"x36" SCALE: NTS 11"x17" SCALE: NTS **11**

BIO-RETENTION - LID ORIFICE 24"x36" SCALE: NTS 11"x17" SCALE: NTS **8**

NONE 24"x36" SCALE: NTS 11"x17" SCALE: NTS **4**

2' WIDE CURB OPENNING 24"x36" SCALE: NTS 11"x17" SCALE: NTS **1**

NONE 24"x36" SCALE: NTS 11"x17" SCALE: NTS **10**

BIO-RETENTION - GRATE ASSEMBLY 24"x36" SCALE: NTS 11"x17" SCALE: NTS **7**

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

REVIEW BY CITY STAFF		
OFFICE	Initial	DATE
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PRGM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER FRANCISCO V. MAGOS No. 73,227 Exp. 12/31/18 CIVIL STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

DETAILS

SHEET 2 OF 5

CITY ID No

NOTE: FOR PRELIMINARY UTILITIES SEE SHEET 4

PEN 16-0132
(PA16-0004)

PRELIMINARY

CONSTRUCTION NOTES

1	CONSTRUCT 6" CURB ONLY PER CITY STANDARD MVSI-121A-0
2	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL 2, SHEET 2
3	CONSTRUCT CURB & GUTTER PER CITY STANDARD MVSI-120A-0
4	2' WIDE CURB OPENING AT EVERY 20 FEET PER DETAIL 3, SHEET 2
5	CONSTRUCT BIO-RETENTION WITH UNDER DRAIN PER DETAIL 9, SHEET 2
6	CONSTRUCT 3" AC / 5" AB CAR TRAFFIC; 3.5" AC / 6.5" AB TRUCK TRAFFIC
7	JOIN EXISTING IMPROVEMENT, VERIFY ELEVATION PRIOR TO CONSTRUCTION.
8	INSTALL 24"X24" NDS DRAIN PER DETAIL 5, SHEET 2
9	CONSTRUCT LANDSCAPE PER LANDSCAPE PLAN
10	CONSTRUCT DRIVEWAY PER CITY STANDARD MVSI-112C-0
11	CONSTRUCT ADA RAMP
12	STRIPE PARKING STALL PER ARCHITECTURAL PLAN
13	STRIPE ADA PARKING STALL PER ADA STANDARD
14	CONSTRUCT PAVERS PER DETAIL 4, SHEET 2
15	PATH OF TRAVEL
16	CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLAN
17	2' STEP-OUT (TYP)
18	INSTALL 36"X36" NDS DRAIN PER DETAIL 5, SHEET 2
19	PAVEDRAIN SYSTEM PER DETAIL 10 & 11, SHEET 2
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING

LEGEND

- BOUNDARY LINE
- CENTER LINE
- PROPERTY LINE
- CHAIN-LINK FENCE
- GAS LINE
- SEWER LINE
- WATER LINE
- PROPOSED PERFORATED PIPE
- WATER VALVE
- THRUST BLOCK
- END CAP W/THRUST BLOCK
- BIO-RETENTION
- PATH OF TRAVEL
- EXISTING LIGHT
- EXISTING STREET LIGHT
- EXISTING BACKFLOW PREVENTER
- EXISTING WATER METER
- EXISTING SEWER MANHOLE
- POWER POLE
- GUY WIRE ANCHOR
- CATCH BASIN
- METER
- FIRE HYDRANT
- TRAFFIC SIGNAL
- PROPOSED FIRE LINE
- PROPOSED SEWER
- WATER SERVICE
- FIRE SERVICE
- PROPOSED STORMDRAIN
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED GRATE INLET
- PROPOSED STORMDRAIN CLEANOUT
- SEWER MANHOLE
- SEWER LATERAL
- SEWER CLEANOUT

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF		
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.	OFFICE	INITIAL	DATE
		ENGINEERING DIVISION MANAGER		
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		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/
ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER
FRANCISCO V. MAGOS II
No. 75,227
Exp. 12/31/18
CIVIL
STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

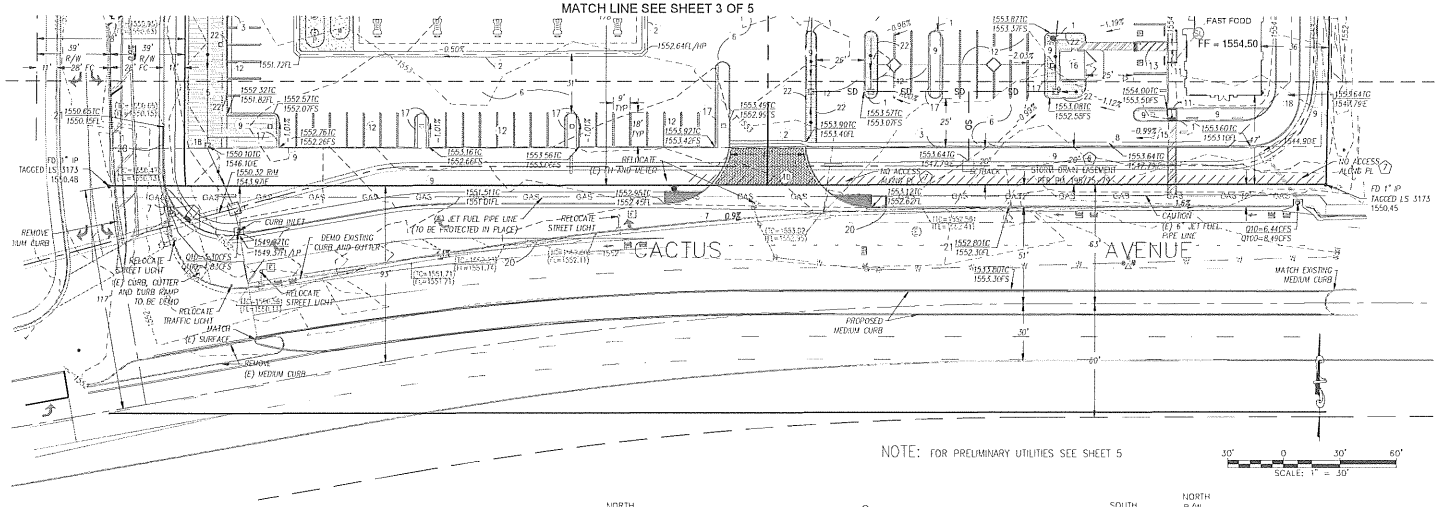
FRANCISCO V. MAGOS II, PE DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING PLAN

SHEET 3 OF 5
CITY ID No



CONSTRUCTION NOTES	
1	CONSTRUCT 6" CURB ONLY PER CITY STANDARD MVSI-121A-0
2	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL 2, SHEET 2
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17	2' STEP-OUT (TYP)
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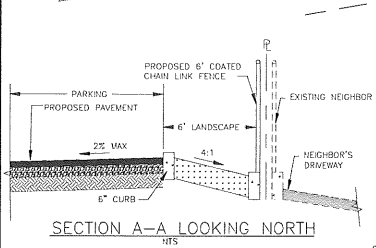
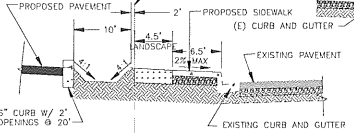
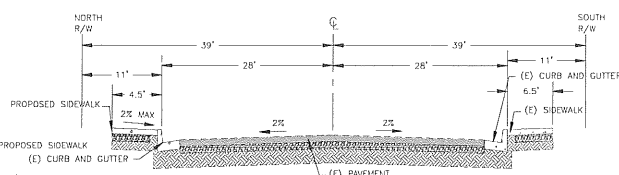
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING



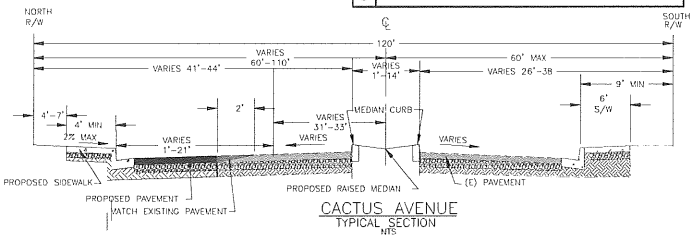
SECTION A–A LOOKING NORTH
NTS



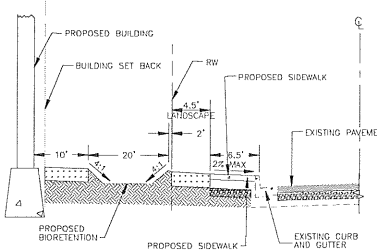
SECTION C–C LOOKING WEST
NTS



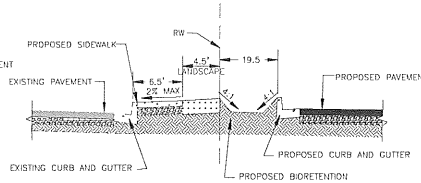
GOLDENCREST AVENUE LOOKING WEST
TYPICAL SECTION PER MVSI-106A-0
NTS



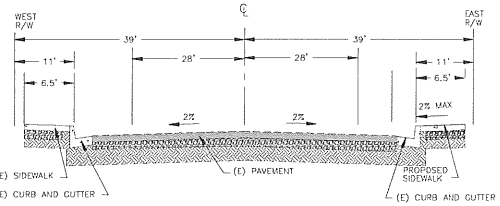
CACTUS AVENUE
TYPICAL SECTION
NTS



SECTION B–B LOOKING WEST
NTS



SECTION D–D LOOKING NORTH
NTS



COMMERCE CENTER DRIVE LOOKING NORTH
TYPICAL SECTION PER MVSIA-0
NTS

LEGEND

BOUNDARY LINE		POWER POLE	
CENTER LINE		GUY WIRE ANCHOR	
PROPERTY LINE		CATCH BASIN	
CHAIN-LINK FENCE		METER	
GAS LINE		FIRE HYDRANT	
SEWER LINE		TRAFFIC SIGNAL	
WATER LINE		PROPOSED FIRE LINE	
PROPOSED PERFORATED PIPE		PROPOSED SEWER	
BIO-RETENTION		WATER SERVICE	
PATH OF TRAVEL		FIRE SERVICE	
SEWER LATERAL		PROPOSED STORMDRAIN	
		EXISTING RIGHT-OF-WAY	
SEWER CLEANOUT		PROPOSED RIGHT-OF-WAY	
EXISTING LIGHT		PROPOSED GRATE INLET	
EXISTING STREET LIGHT		PROPOSED STORMDRAIN CLEANOUT	
EXISTING BACKFLOW PREVENTER		END CAP W/THRUST BLOCK	
EXISTING WATER METER		WATER VALVE	
EXISTING SEWER MANHOLE		THRUST BLOCK	

PRELIMINARY

PEN 16-0132
(PA16-0004)

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF		
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.	OFFICE	INITIAL	DATE
		ENGINEERING DIVISION MANAGER		
		LAND DEVELOPMENT		
		PLANNING		
		TRANSPORTATION		
		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:
MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:
AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — FRANCISCO V. MAGOS — No. 75227 — Exp. 12/31/2018 — CIVIL — STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:
FRANCISCO V. MAGOS, R. PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING AND STREET SECTIONS

SHEET 4 OF 5
CITY ID No

CONSTRUCTION NOTES:

1. CONSTRUCT 8" PVC SEWER LINE
2. CONSTRUCT STANDARD MANHOLE PER SB-61
3. CONSTRUCT SEWER CLEANOUT PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. SB-52
4. CONSTRUCT SEWER LATERAL PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. SB-176
5. REMOVE AND RELOCATE EX. FIRE HYDRANT
6. CONSTRUCT 8" PVC PRIVATE WATER LINE
7. CONSTRUCT 8" PVC PRIVATE FIRE WATER LINE
8. CONSTRUCT FIRE HYDRANT ASSEMBLY PER EASTERN MUNICIPAL WATER DISTRICT W-357
9. CONSTRUCT 2" PVC WATER SERVICE CONNECTION PER EASTERN MUNICIPAL WATER DISTRICT W-658
10. CONSTRUCT THRUST BLOCKING PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. W-407
11. CONSTRUCT BACKFLOW W/FDC PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG W-597C
12. CONSTRUCT 6" PVC PRIVATE FIRE WATER LINE
13. CONSTRUCT 15" PVC STORMDRAIN LINE
14. CONSTRUCT BIORETENTION BASIN WITH PERFORATED 6" PVC PIPE PER COUNTY OF RIVERSIDE LID BMP MANUAL
15. CONSTRUCT 18" X 18" BROOKS CATCH BASIN OR APPROVED EQUAL
16. CONSTRUCT STORMDRAIN CLEANOUT PER EMWD SB-52

LEGEND

- END CAP W/THRUST BLOCK
- FIRE HYDRANT
- WATER VALVE
- THRUST BLOCK
- BACKFLOW PREVENTER W/FDC
- SEWER MANHOLE
- SEWER LATERAL
- SEWER CLEANOUT
- PROPOSED WATER
- PROPOSED FIRE LINE
- PROPOSED SEWER
- WATER SERVICE
- FIRE SERVICE
- PROPOSED STORMDRAIN
- PROPOSED PERFORATED PIPE
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- EXISTING GAS LINE
- PROPOSED GRATE INLET
- PROPOSED STORMDRAIN CLEANOUT

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF		
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.	OFFICE	INITIAL	DATE
		ENGINEERING DIVISION MANAGER		
		LAND DEVELOPMENT		
		PLANNING		
		TRANSPORTATION		
		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROG		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:
MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:
AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER FRANCISCO V. MAGOS II No. 75,227 Exp. 12/31/18 CIVIL STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY UTILITY PLAN

SHEET 5 OF 5
CITY ID No

ALTA/ACSM SURVEY
FOR

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE, RECORDS OF RIVERSIDE COUNTY. LOCATED IN T.3S. R.4W. SEC. 2

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

TITLE REPORT

A PRELIMINARY TITLE REPORT WAS PREPARED BY COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015.

COMMONWEALTH LAND TITLE COMPANY
DOUG ABERNATHY – TITLE OFFICER
888 S. FIGUEROA ST, SUITE 2100
LOS ANGELES, CA 90017
(800) 432-0706

ENGINEER'S CERTIFICATE

TO: –

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4,7(A), 7(B)(1), 7(C), 8, 9, 10(A) (IF PARTY WALLS EXIST), 11(A) AND 20(A) OF TABLE A THEREOF.

THE FIELD WORK WAS COMPLETED ON –.

DATE _____

REGISTERED PROFESSIONAL ENGINEER
ANDREW J. KOLTAVARY
No. 26571
Exp. 03/31/16
CIVIL
STATE OF CALIFORNIA

ANDREW J. KOLTAVARY, RCE 26571 EXP: 03/31/16

SCHEDULE B EXCEPTION

ITEM A IS TAXES RELATED
ITEMS B, C ARE LIEN RELATED RELATED
ITEMS 1, 13, 14 ARE RIGHTS RELATED
ITEM 2 IS COVENANT RELATED
ITEM 3 IS LAND RELATED
ITEMS 4 ARE TERMS AND PROVISIONS RELATED
ITEM 7 IS OWNERSHIP RELATED
ITEMS 8, 9 ARE DOCUMENT RELATED
ITEMS 10, 17 ARE MATTERS RELATED
ITEMS 11, 12 ARE DEED OF TRUST RELATED
ITEM 15 IS DISCREPANCIES RELATED

(5) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
GRANTED TO: GTE CALIFORNIA INCORPORATED, A CORPORATION
PURPOSE: FOR THE TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRICAL MEANS
RECORDED: APRIL 30, 1999 AS INSTRUMENT NO. 182988 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

SAID EASEMENT CONTAINS RESTRICTIONS ON THE USE, BY THE OWNERS OF SAID LAND, OF THE EASEMENT AREA AS SET OUT IN SAID EASEMENT DOCUMENT.

(6) AN EASEMENT FOR THE PURPOSES SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED MAP SHOWN BELOW.
MAP: PARCEL MAP NO. 27732
RECORDED: IN BOOK 195, PAGES 75 TO 79 INCLUSIVE OF PARCEL MAPS
EASEMENT PURPOSE: STORM DRAINAGE
AFFECTS: AS SHOWN ON SAID MAP

(7) THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM THE STREET OR HIGHWAY ABUTTING SAID LAND KNOWN AS PARCELS 9 AND 10 ABUTTING CACTUS AVENUE SUCH RIGHTS HAVING BEEN RELINQUISHED BY THE MAP OF SAID TRACT.
AFFECTS: AS SHOWN ON SAID MAP

UTILITY PROVIDERS:

WATER AND SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
P.O. BOX 8300
PERRIS, CA 92572-8300
(951) 928-3777

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
P.O BOX "C"
MONTEREY PARK, CA 91756
(800) 427-2000

ELECTRICITY:
SOUTHERN CALIFORNIA EDISON
P.O. BOX 6400
RANCHO CUCAMONGA, CA 91729
(800) 990-7788

TELEPHONE:
VERIZON
(866) 232-4282

BENCH MARK

BENCHMARK: M62-69 Elev. 1551.102 FEET
BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN

VICINITY MAP

GENERAL NOTES

1. SURVEYOR HAS RELIED UPON INFORMATION SUPPLIED IN THE CURRENT COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015. DISCLOSE RECORD EASEMENTS THAT BURDEN OR BENEFIT THIS PROPERTY
2. BUILDING SETBACK LINES SHOWN HEREON REFLECT THE INFORMATION AS EXPLAINED BY THE CITY REPRESENTATIVE INDICATED HEREON.
3. BY OBSERVATION NO CEMETERIES ARE KNOWN OR FOUND ON SUBJECT PROPERTY.
4. NO MONUMENTATION WAS FOUND OR SET AT THE PROPERTY CORNERS UNLESS NOTED OTHERWISE.
5. ASSESSORS PARCEL NUMBER FOR THIS PROPERTY IS 297-130-052-7; 053-8; 054-9.
6. SURVEYOR TAKES NO RESPONSIBILITY OF ITEMS OMITTED DUE TO A RESULT OF VISUAL OBSTRUCTIONS.

NOTES

1. FOR THE PURPOSES OF CLARITY, DETAILS NEAR THE PROPERTY LINES ARE NOT NECESSARILY DRAWN TO SCALE.
2. EASEMENTS PLOTTED PER RESEARCHED AND RECORD INFORMATION.
3. MONUMENTS FOUND AS NOTED.

FLOOD ZONE

NATIONAL FLOOD INSURANCE PROGRAM THE SUBJECT PROPERTY IS LOCATED WITHIN ZONE "X", PER F.I.R.M. MAP COMMUNITY PANEL NO. 06065C0745G EFFECTIVE DATE: AUGUST 28, 2008.

BASIS OF BEARING

THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

UNAUTHORIZED CHANGES & USES

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLAN MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARED OF THESE PLANS. IF THE CONTRACTOR DEVIATES FROM THESE PLANS PRIOR TO CONTACTING AND RECEIVING APPROVAL IN WRITING FROM THE DESIGN ENGINEER, THE CONTRACTOR SHALL BE LIABLE AND RESPONSIBLE FOR ALL DAMAGES AND CORRECTIONAL COSTS.

SHEET INDEX

ALTA-1	TITLE SHEET AND NOTES
ALTA-2	ALTA/ACSM SURVEY

PREPARED BY:
A.J. KOLTAVARY/CIVIL ENGINEERS
3 NINOS, IRVINE, CA
PHONE: (714) 624-9027
CIVIL ENGINEERING LAND SURVEYING ENVIRONMENTAL ENGINEERING

PREPARED FOR:
J N T MANAGEMENT CO.
139 RADIO ROAD
CORONA, CA 92879

TITLE SHEET
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION

DATE	JOB NO
8/4/15	.
SCALE	DRAWN BY
NTS	TN

1 OF 2

DRAWING NO.
ALTA-1

ABBREVIATION

AB	AGGREGATE BASE	MH	MANHOLE
AC	ASPHALT	N&T	NAIL AND TAG
BW	BACK OF WALK	OH	OVERHEAD
CF	CURB FACE	PP	POWER POLE
CO	CLEANOUT	SD	STORM DRAIN
EG	EXISTING GROUND	SPK	SPIKE
FD	FOUND	TC	TOP OF CURB
FF	FINISH FLOOR	TW	TOP OF WALL
FG	FINISH GRADE	TB	TOP OF BERM
FL	FLOWLINE	WV	WATER VALVE
FS	FINISH SURFACE	W	WATER
HP	HIGH POINT	(R)	RECORD
HT	HEIGHT		
L&T	LEAD AND TAG		
RD	ROOF DRAIN		
CB	CATCH BASIN		

MONUMENTS

FD. MONUMENT OR AS NOTED

LEGEND

CENTER LINE
PROPERTY LINE
CHAIN-LINK FENCE
GAS LINE
SEWER LINE
WATER LINE
CONC. WALL
EXISTING LIGHT
EXISTING STREET LIGHT
EXISTING BACKFLOW PREVENTER
EXISTING WATER METER
EXISTING SEWER MANHOLE
POWER POLE
GUY WIRE ANCHOR
CATCH BASIN
FIRE HYDRANT
TRAFFIC SIGNAL
METER
TREE
PINE TREE
PALM
BUSH

GRAPHIC SCALE
(IN FEET)
1 INCH = 40 FT.

A.J. KOLTAVARY/CIVIL ENGINEERS
3 NINOS, IRVINE, CA
PHONE: (714) 624-9027
CIVIL ENGINEERING LAND SURVEYING ENVIRONMENTAL ENGINEERING

PREPARED FOR:
J N T MANAGEMENT CO.
139 RADIO ROAD
CORONA, CA 92879

A.L.T.A. SURVEY
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION	DATE	JOB NO
	8/4/15	-
	SCALE	DRAWN BY
	1"=40'	TN

2 OF 2
DRAWING NO.
ALTA-2

PLANT LEGEND

TREES

- RHUS LANCEA – AFRICAN SUMAC 24" BOX
- CERCIDIUM FLORIDUM – BLUE PALO VERDE TREE 24" BOX
- TRISTANIA CONFERTA – BRISBANE BOX 24" BOX
- STREET TREE PER CITY OF MORENO VALLEY SIZE AS REQUIRED LOCATE AT 40' O.C. PER CITY

SHRUBS

- RAPHIOLEPSIS INDICA – BAY BREEZE INDIAN HAWTHORN 5 GALLON
- LEUCOPHYLLUM FRUTESCENS 'GREEN CLOUD' TEXAS SILVERLEAF 5 GALLON
- ESCALLONIA COMPACTA – DWARF ESCALLONIA 5 GALLON
- PHORMIUM TENAX – DARK DELIGHT 5 GALLON
- PENNISETUM SETACEUM – FOUNTAIN GRASS 5 GALLON
- CAESALPINIA GILLIESII – YELLOW BIRD OF PARADISE 5 GALLON
- HESPERALOE PARVIFLORA – RED YUCCA 5 GALLON
- VITUS GIRDIANA – DESERT GRAPE TRAIN TO TRASH ENCLOSURE WALL 5 GALLON
- AGAVE VILORINIANA – OCTOPUS AGAVE 5 GALLON
- DASYLIRION WHEELERI – DESERT SPOON 5 GALLON
- HEMEROCALLIS SPECIES – DAY LILY "DOUBLE YELLOW" 5 GALLON
- JUSTICA SPICIGERA – MEXICAN HONEYSUCKLE 5 GALLON

GROUND COVER

PROVIDE 3" LAYER OF 1/2" TO 3/4" D.G. CALIFORNIA GOLD AS TOP DRESSING FOR ALL SHRUB AREAS

- ROSA X "NOARE" – RED CARPET ROSE 1 GAL. AT 18" O.C. TRIANGULAR SPACING
- LANTANA MONTEVIDENSIS – PURPLE TRAILING LANTANA 1 GAL. AT 18" O.C. TRIANGULAR SPACING

224 SOUTH JOY STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
FAX (951) 280-3832

PRELIMINARY
LANDCAPE PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY

PEN16-0133

DRAWING NO.

L-1

FIRST FLOOR PLAN — SCALE: 1/16" = 1'-0" — 1

SECOND FLOOR PLAN — SCALE: 1/8" = 1'-0" — 2

224 SOUTH 3RD STREET
CORONA, CA 92879-1958

P.O. BOX 1958
CORONA, CA 92878-1958

DIRECT (951) 280-3833
FAX (951) 280-3832

WAREHOUSE
FLOOR PLANS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY INO

PEN16-0132

DRAWING NO.

A1-1

M:\5 P\Moreno_Valley_Cactus\Corr\Corr-Dwg\-WHA1-1.DWG, Jamie Hope PLOTTED: 02-03-17 15:43:01

NEW — SCALE: 3/16"=1'-0" — 3 — NEW SALES OFFICE PLAN — SCALE: 3/16"=1'-0" — 1

NEW — SCALE: 3/16"=1'-0" — 4 — 2ND FLOOR OFFCIE FLOOR PLAN — SCALE: 3/16"=1'-0" — 2

NOTES:

1. NEW GUARDRAIL TO MATCH – SEE DETAIL ?
2. NEW 24" DEEP PLASTIC LAMINATE CABINETRY W/ ECO "WHITE DIAMOND" COUNTERTOP BY COSENTINO. CONTRACTOR TO PROVIDE SHOP DWGS FOR APPROVAL PRIOR TO FABRICATION. SEE DETAILS ?
3. NEW 42" HIGH GUARDRAIL AND HAND RAIL AT STAIRS AND STAIR OPENING – SEE DETAILS ?
4. NEW 3'-0" X 7'-0" METAL DOOR AND HARDWARE – SEE DOOR SCHEDULE SHEET ?
4. NEW GUARDPOST, SEE DETAIL ?
5. 4" ROOF DRAIN W/IN STUD WALL
6. COLUMN – SEE STRUCTURAL DRAWINGS
7. PROVIDE 4" CONCRETE HOUSEKEEPING PAD FOR NEW ELECTRICAL SWITCHBOARD AND DISTRIBUTION PANELS
8. 3"X3"X12GA METAL ANGLE ATTACHED TO THE WALL AT FLOOR LEVEL W/ 3/8"X2" EPOXY BOLTS @ 2'-0" O.C. (NOTE: DO NOT ATTACH ANGLE TO THE FLOOR)
9. FIRE EXTINGUISHER – SEMI-RECESSED – SEE GENERAL NOTE 25, SHEET AS1-2
10. FIRE EXTINGUISHER – SURFACE MOUNTED – SEE GENERAL NOTE 25, SHEET AS1-2

WALL LEGEND:

1. NEW CONCRETE TILT-UP WALL PANEL (SEE STRUCTURAL) WITH METAL STUD WALL ON INTERIOR SIDE (3-5/8" X 25 GA METAL STUDS @ 16" O.C. WITH R-13 BATT INSULATION W/ VAPOR BARRIER & 5/8" GYP BOARD ON INTERIOR SIDE – EXTEND TO MIN. 6" ABOVE CEILING HEIGHT)
2. NEW METAL STUD WALL (3-5/8" X 25 GA METAL STUDS @ 16" O.C. W/ R-13 BATT INSULATION & 5/8" GYP BOARD ON ALL INTERIOR FACING SIDES – EXTEND TO MIN. 6" ABOVE CEILING HEIGHT, WHERE APPROPRIATE)
3. NEW METAL STUD WALL (4" X 22 GA METAL STUDS @ 16" O.C. W/ R-13 BATT INSULATION & 5/8" GYP BOARD ON ALL INTERIOR FACING SIDES – EXTEND TO MIN. 6" ABOVE CEILING HEIGHT, WHERE APPROPRIATE)
4. NEW 1 HR FIRE RATED WALL (3-5/8" METAL STUDS @ 16" O.C. W/ R-13 BATT INSULATION & 5/8" GYP BOARD ON BOTH SIDES, EXTENDED TO CEILING OR ROOF DECK). PROVIDE FIRE SAFING AT ALL PIPE/CONDUIT PENETRATIONS THROUGH FIRE-RATED WALL, TYP. SEE AW5-8 & MECHANICAL AND ELECTRICAL PLANS FOR PENETRATION DETAILS.
5. NEW CONCRETE TILT-UP WALL PANEL (SEE STRUCTURAL) WITH METAL STUD WALL ON INTERIOR SIDE (6" X 25 GA METAL STUDS @ 16" O.C. WITH R-13 BATT INSULATION W/ VAPOR BARRIER & 5/8" GYP BOARD ON INTERIOR SIDE – EXTEND TO MIN. 6" ABOVE CEILING HEIGHT)

LEGEND:

- NEW METAL STUD WALLS
- NEW CONCRETE TILT-UP WALL / INSULATED METAL STUD WALL
- NEW INSULATED METAL STUD WALL
- NEW CONCRETE TILT-UP WALL
- EXISTING METAL STUD WALLS TO REMAIN
- EXISTING CONCRETE TILT-UP WALLS TO REMAIN
- EXISTING WALLS TO BE REMOVED
- 1-HR FIRE RATED OCCUPANCY SEPARATION (B AND A-3) SEE AW1-13
- NEW CONCRETE SLAB, SEE STRUCTURAL

224 SOUTH JOY STREET
CORONA, CA 92879-1965

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DIRECT (951) 280-3833
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Design Methods, Material Innovation

OFFICE FLOOR PLANS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0132

DRAWING NO.

A1-2

INFO P:\Moreno_Valley_Cactus\Cad\PLOT-Pen2-AW\A1-2.DWG Jasmine Hunga PLOTTED: 02-03-17 10:40:27

WAREHOUSE ROOF PLAN

SCALE: 3/32"=1'-0" 1

GENERAL NOTES:

A. THE ROOF STRUCTURE SHALL NOT BE USED FOR STOCKPILING OF EQUIPMENT OR MATERIALS UNLESS APPROVED BY THE ARCHITECT, STRUCTURAL ENGINEER AND THE JOIST MANUFACTURER
B. THE ROOF ASSEMBLY SHALL COMPLY W/ UL-1 90 AND FM CLASS "A" RATINGS INCLUDING BUT NOT LIMITED TO COPINGS, FLASHING, PARAPET WALL COVERINGS, AND ENTIRE ROOF SURFACE.
C. COORDINATE ROOF ELEVATIONS WITH STRUCTURAL DRAWINGS. REFER SPECIFICATION SHEET FOR ROOF RELATED ITEMS, INCLUDING GUARANTEES, CURBS, FLASHING, AND ETC.
D. LOCATION OF ROOF TOP EQUIPMENT IS APPROXIMATE, FOR ACTUAL LOCATION OF ROOF TOP OPENINGS SEE STRUCTURAL FRAMING PLAN.
E. REFER TO ROOFING MANUFACTURE'S WRITTEN INSTRUCTIONS AND DETAILS FOR ROOFING SYSTEM INSTALLATION. CONTRACTOR TO PROVIDE COMPLETE ROOFING PACKAGE PER MANUFACTURE'S RECOMMENDATIONS.
F. GENERAL CONTRACTOR IS TO PROVIDE TEMPORARY PERIMETER GUARDRAIL TO COMPLY WITH CODE OF FEDERAL REGULATIONS 29 CFR 1926, SUBPART M (OSCA). GUARDRAIL TO BE 42" HEIGHT AND BE ABLE TO WITHSTAND 200 POUNDS AT TOP EDGE.
G. ACCESS TO MECHANICAL APPLIANCES IN UNDER-FLOOR AREAS, AND ON ROOFS OR ELEVATED STRUCTURES SHALL BE IN ACCORDANCE WITH THE CALIFORNIA MECHANICAL CODE. (1209.3,MC 904.10)

KEYED NOTES:

1	PLUMBING VENT.
2	DEPRESSED AREA @ ROOF DRAINS
3	ROOF CRICKETS
4	CANOPY BELOW
5	ROOF DRAIN AND OVERFLOW.
6	HVAC UNITS
7	RIDGE LINE.
8	METAL COPING CAP.
9	ROOF ACCESS OPENING.

ROOFING

RF-1 TYPE: 4 - PLY BUILT-UP "CLASS A" ROOFING W/ 15 LB. BASE SHEET. 2 - LAYERS OF 11 LB. FELT & 90 LB. CAPSHEET HOT MOP ALL AREAS
UL 790 (ASTM E108)
WARRANTY:
10 YEAR INSTALLATION AND LABOR.

224 SOUTH JOY STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
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FAX (951) 280-3832

WAREHOUSE ROOF PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
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PEN16-0132

DRAWING NO.

A1-3

M:\2-PJ\Moreno Valley_Cactus\CONFIG\F-Proj2-WH\A1-3.DWG Jamie Hunt PLOTTED: 02-03-17 10:42:58

NORTH ELEVATION — SCALE: 1/8" = 1'-0" — 1

EAST ELEVATION — SCALE: 1/8" = 1'-0" — 2

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. ALUMINUM STOREFRONT SYSTEM.
2. CONCRETE TILT-UP PANEL
3. CORNICE
4. APPROXIMATE ROOF LINE
5. ROOF TOP MECHANICAL UNITS
6. CANOPY
7. EXTERIOR WALL LIGHT
8. 1" REVEAL / SCORE LINES
9. PANEL JOINT
10. 3'-0" x 7'-0" HM DOOR
11. ROLL-UP DOOR
12. DOCK BUMPERS
13. 8'-0" HIGH CMU WALL
14. CONCRETE CURB / CONCRETE WALK.
15. 12" X 12" SLATE TILES
16. 3/4" RECESS
17. METAL AWNING

EXTERIOR PAINTS

- C-01 COLOR: DUNN EDWARDS DEC6130 "WOODED ACRE"
- C-02 COLOR: DUNN EDWARDS DEC618 "SAND DUNE"
- C-03 COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS)
- C-04 SLATE TILES

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Design Methods Associates

WAREHOUSE
EXTERIOR ELEVATIONS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

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DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY INO

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DRAWING NO.

A2-1

INFO_P:\Planning_Projects\CUP\CUP-Proj2_Info\A2-1.DWG Jimmy Hunter PLOTTED: 02-03-17 10:43:27

SOUTH ELEVATION

SCALE: 1/8" = 1'-0" 1

WEST ELEVATION

SCALE: 1/8" = 1'-0" 2

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. ALUMINUM STOREFRONT SYSTEM.
2. CONCRETE TILT-UP PANEL
3. CORNICE
4. APPROXIMATE ROOF LINE
5. ROOF TOP MECHANICAL UNITS
6. CANOPY
7. EXTERIOR WALL LIGHT
8. 1" REVEAL / SCORE LINES
9. PANEL JOINT
10. 3'-0" x 7'-0" HM DOOR
11. ROLL-UP DOOR
12. DOCK BUMPERS
13. 8'-0" HIGH CMU WALL
14. CONCRETE CURB / CONCRETE WALK.
15. 12" X 12" SLATE TILES
16. 3/4" RECESS
17. METAL AWNING

EXTERIOR PAINTS

C-01	COLOR: DUNN EDWARDS DEC6130 "WOODED ACRE"
C-02	COLOR: DUNN EDWARDS DEC618 "SAND DUNE"
C-03	COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS)
C-04	SLATE TILES

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Design Methods Inclusive

WAREHOUSE
EXTERIOR ELEVATIONS

CACTUS COMMERCE LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

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SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY INO

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DRAWING NO.

A2-2

INFO-R:\Moreno_Valley_Cactus\ACAP\CUP-Pack-INI\A2-2.DWG Jimmie Hunge PLOTTED: 02-03-17 10:42:56

PROJECT INFORMATION

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

BUILDING DEPARTMENT NOTES

1. SPECIAL INSPECTIONS: REFER TO SHEET S-1 FOR LIST OF SPECIAL INSPECTIONS REQUIRED BY THE STRUCTURAL ENGINEER.
2. CONTACT CITY BUILDING INSPECTIONS DEPARTMENT TO SCHEDULE A SPECIAL INSPECTION MEETING PRIOR TO ISSUANCE OF THE BUILDING PERMIT.
3. OPEN WEB ROOF TRUSSES ARE DEFERRED. SUBMIT 2-COPIES OF THE ROOF TRUSSES TO THE ARCHITECT OR ENGINEER OF RECORD FOR THEIR SHOP DRAWINGS REVIEW STAMP. SUBMIT THE APPROVED TRUSS DRAWINGS TO THE CITY BUILDING INSPECTIONS DEPARTMENT FOR APPROVAL PRIOR TO REQUESTING THE FRAMING INSPECTION. ADDITIONAL PLAN REVIEW FEE MAYBE ASSESSED
4. EXIT SIGNS AND TACTILE EXIT SIGNS SHALL BE INSTALLED UNDER THE TENANT IMPROVEMENT PLANS. ADDRESSING WILL BE PROVIDED.
5. OUTSIDE SEATING AREA MUST INCLUDE SEATING FOR THE DISABLED. TO BE PROVIDED DURING TENANT BUILD OUT IF APPLICABLE
6. THE ITEMS LISTED BELOW ARE UNDER SEPARATE PERMITS:
   A. SIGN PACKAGE
   B. TRASH ENCLOSURE
   C. FENCE WALLS
7. OCCUPANT LOAD TO BE PROVIDED DURING BUILD OUT. OCCUPANCY OF THIS BUILDING SHALL BE WITHHELD UNTIL ALL DEFERRED ITEMS HAVE BEEN APPROVED FOR PERMITTING AND FINALED BY INSPECTION
8. NO HAZARDOUS MATERIAL WILL BE STORED AND/OR USED WITHIN THE BUILDING, WHICH WILL EXCEED THE QUANTITIES PER CODE
9. REST ROOMS FACILITIES THAT COMPLY WITH THE DISABLED ACCESS REQUIREMENTS WILL BE PROVIDED DURING TENANT BUILD OUT.
10. REQUIRED NUMBER OF PLUMBING FIXTURES PER CODE. ONE MINIMUM UNISEX FACILITY. NOT IN SCOPE, DETERMINED DURING TENANT BUILD OUT.
11. IF THE NUMBER OF EMPLOYEES EXCEED 4, AND BOTH SEXES WILL BE EMPLOYED, PROVIDE SEPARATE TOILET FACILITIES FOR MEN AND WOMEN.
12. A COMPLETE SMOKE DETECTION SYSTEM IS NOT IN SCOPE. A DEFERRED APPROVAL WILL BE SUBMITTED TO THE FIRE DEPARTMENT FOR REVIEW AND APPROVAL DURING TENANT BUILD OUT.

REFERENCE CODES

2016 CALIFORNIA BUILDING CODE (CBC), PART 2
BASED ON 2009 EDITION INTERNATIONAL BUILDING CODE (IBC)
2016 CALIFORNIA ELECTRICAL CODE, PART 3
BASED ON 2008 EDITION NFPA NATIONAL ELECTRICAL CODE (NEC)
2016 CALIFORNIA MECHANICAL CODE (CMC), PART 4
BASED ON 2009 EDITION IAPMO UNIFORM MECHANICAL CODE (UMC)
2016 CALIFORNIA PLUMBING CODE (CPC)
BASED ON 2009 EDITION IAPMO UNIFORM PLUMBING CODE (UPC)
2016 CALIFORNIA ENERGY CODE, PART 6
2016 CALIFORNIA FIRE CODE (CFC), PART 9
BASED ON 2009 EDITION OF ICC INTERNATIONAL FIRE CODE (IFC)
2016 CALIFORNIA GREEN BUILDING STANDARDS CODE, PART 11

ACCESSIBILITY CODE –AMERICAN DISABILITIES ACT
–CALIFORNIA TITLE 24

UTILITY PURVEYORS

POWER COMPANY
Southern California Edison Co.
TEL: (800) 950-2356

GAS COMPANY
Southern California Gas Co.
TEL: (800) 427-2200

WASTE MANAGEMENT
Waste Management
TEL: (800) 423-9986

PHONE COMPANY
Verizon
TEL: (800) 922-0204

WATER COMPANY
Eastern Municipal Water District
TEL: (951) 571-0203
REF: xx

SCHOOL DISTRICT
Moreno Valley Unified School District
TEL: (951) 571-7500 ext. xx
REF: xx

CONSULTANTS

OWNER / APPLICANT
MORENO VALLEY CACTUS CENTER
P.O. BOX 1958
CORONA, CA 92878
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FAX: (951) 280-3832
CONTACT: INO CRUZ
E-MAIL: ino@jmtmgmt.com

STRUCTURAL ENGINEER
SILOAM ENGINEERING
3333 BREA CANYON RD., SUITE 109
DIAMOND BAR, CALIF. 91765
TEL: (909) 598-8218
FAX: (909) 598-8758
CONTACT: MILES CHANG
E-MAIL: ebox@siloaminc.com

LANDSCAPE ARCHITECT
GENE HIRAO LANDSCAPE ARCHITECTURE
15 POSADA
IRVINE, CA. 92614
TEL: (949) 852-0748
FAX: (949) 660-7296
CONTACT: GENE HIRAO
E-MAIL: ghjh@cox.net

CIVIL ENGINEER
A.J. KOLTAVARY/CIVIL ENGINEERS
10005 MULRLANDS BLVD., STE E.
IRVINE, CA 92614
TEL: (949) 624-9027

CONTACT: ANDREW KOLTAVARY
E-MAIL: andrew.k@ajce.com

TRAFFIC ENGINEER
HALL & FOREMAN
14297 CAJON AVENUE, SUITE 101
VICTORVILLE, CA 92392-2335
TEL: (760) 524-9100
FAX: (760) 524-9101
CONTACT: ROBERT A. KILPATRICK
E-MAIL:

GEOTECHNICAL-SOIL ENGINEER
SALEM ENGINEERING GROUP, INC.
4095 WEST SHAW AVENUE, SUITE 110
FRESNO, CA 93722
TEL: (559) 271-9700
FAX: (559) 275-0827
CONTACT: SAMMY SALEM
E-MAIL: sammy@salemenggroup.com

OCCUPANCY LOAD

CONVENIENCE STORE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	96 SQ.FT.	200	0.48=1
STORAGE	684 SQ.FT.	300	2.28=3
KITCHEN	226 SQ.FT.	200	1.13=2
SERVICE	1,500 SQ.FT.	15	100
			106 OCC. LOAD

FAST FOOD W/ DRIVE THRU #1

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	50 SQ.FT.	200	0.25=1
STORAGE	400 SQ.FT.	300	1.33=2
KITCHEN	610 SQ.FT.	200	3.05=4
SERVICE	1,050 SQ.FT.	15	70
			77 OCC. LOAD

FAST FOOD W/ DRIVE THRU #2

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

FAST FOOD W/ DRIVE THRU #3

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

WAREHOUSE/OFFICE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	3,000 SQ.FT.	200	15
STORAGE	33,950 SQ.FT.	300	113
			128 OCC. LOAD

PROJECT DATA

SITE LOCATION:
NEC CACTUS AVENUE/COMMERCE CENTER DRIVE, MORENO VALLEY, CA

PROJECT INFORMATION

1.SITE

ASSESSORS PARCEL NO. 297-130-052, 053, 054

A. ZONING –EXISTING BPX
–PROPOSED BPX

B. LOT AREA (6.30 ACRES) 274,636 SQ.FT.
AREA, (CENTERLINE OF ROAD) (7.30 ACRES) 317,988 SQ.FT.
PAD 1 (2.93 ACRES) 127,714 SQ.FT.
PAD 2 (2.00 ACRES) 87,215 SQ.FT.
PAD 3 (1.37 ACRES) 59,702 SQ.FT.

2.BUILDING AREA

A. CONVENIENCE STORE	3,800 SQ.FT.
B. FAST FOOD W/ DRIVE THRU #1	2,800 SQ.FT.
C. CARWASH	2,080 SQ.FT.
D. FAST FOOD W/ DRIVE THRU #2	3,000 SQ.FT.
E. FAST FOOD W/ DRIVE THRU #3	3,000 SQ.FT.
F. OFFICE/WARHOUSE	36,950 SQ.FT.
TOTAL BUILDING AREA	51,630 SQ.FT.
G. 10–PUMP GASOLINE CANOPY	5,611 SQ.FT.
H. 4–PUMP DIESEL CANOPY	1,680 SQ.FT.
PERCENT OF LOT COVERAGE	16.24%

3.BUILDING

	OCCUPANCY	CONSTRUCTION	SPRINKLERED
A. CONVENIENCE STORE	M	V–B	YES
B. FAST FOOD W/ DRIVE THRU #1	A–2	V–B	YES
C. CARWASH	B	II–B	YES
D. FAST FOOD W/ DRIVE THRU #2	A–2	V–B	YES
E. FAST FOOD W/ DRIVE THRU #3	A–2	V–B	YES
F. OFFICE/WARHOUSE	B/S–1	V–B	YES
G. 10 DISPENSER GASOLINE CANOPY	M	II–B	NO
H. 4 DISPENSER DIESEL CANOPY	M	II–B	NO

4.BUILDING HEIGHT

A. CONVENIENCE STORE	22'–0"
B. FAST FOOD W/ DRIVE THRU #1	22'–0"
C. CARWASH	18'–0"
D. FAST FOOD W/ DRIVE THRU #2	22'–0"
E. FAST FOOD W/ DRIVE THRU #3	22'–0"
F. OFFICE/WARHOUSE	35'–0"
G. 10–PUMP GASOLINE CANOPY	19'–0"
H. 4–PUMP DIESEL CANOPY	19'–0"

5.PARKING

A. CONVENIENCE STORE (1/225 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 16 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 1 STALL
B. FAST FOOD W/ DRIVE THRU #1 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 26 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 1 STALLS
C 4–PUMP DIESEL CANOPY	= 0
D. FAST FOOD W/ DRIVE THRU #2 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
E. FAST FOOD W/ DRIVE THRU #3 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
F. OFFICE/WAREHOUSE	
1. REQUIRED STANDARD SPACES (9'x18')	= 37 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
G. CARWASH	= 0
H. 10–PUMP GASOLINE CANOPY	= 0
TOTAL PARKING SPACES REQUIRED	= 144 STALLS
TOTAL PARKING SPACES PROVIDED	= 162 STALLS
TOTAL ACCESSIBLE SPACES REQUIRED	= 8 STALLS
TOTAL ACCESSIBLE SPACES PROVIDED	= 8 STALLS

6.LANDSCAPING

A. LANDSCAPING PROVIDED (17.7%)_48,744 SQ.FT.

DESCRIPTION OF PROPOSED USE

FAST FOOD #2 AND #3 WITH DRIVE THRU.

INDEX OF DRAWINGS

SHEET NUMBER	DESCRIPTION	REV.	DATE
ARCHITECTURAL SITE DRAWINGS			
T1-1	TITLE SHEET	-	02/03/17
AS1-1	PRELIMINARY FASTFOOD SITE PLAN	-	02/03/17
AS2-1	TRASH ENCLOSURE PLAN & DETAILS	-	02/03/17
PHS1-1	PHASING PLAN	-	02/03/17
CIVIL DRAWINGS			
1 OF 5	TITLE SHEET	-	02/03/17
2 OF 5	DETAILS	-	02/03/17
3 OF 5	PRELIMINARY GRADING PLAN	-	02/03/17
4 OF 5	PRELIMINARY GRADING PLAN AND STREET SECTIONS	-	02/03/17
5 OF 5	PRELIMINARY UTILITY PLAN	-	02/03/17
ALTA.1	TITLE SHEET	-	02/03/17
ALTA.2	ALTA SURVEY	-	02/03/17
LANDSCAPE DRAWINGS			
L-1	LANDSCAPE PLAN	-	02/03/17
ARCHITECTURAL DRAWINGS FAST FOOD #2			
A1-1	FAST FOOD W/ DRIVE THRU #2 FLOOR PLAN	-	02/03/17
A1-2	FAST FOOD W/ DRIVE THRU #2 ROOF PLAN	-	02/03/17
A2-1	FAST FOOD W/ DRIVE THRU #2 EXT. ELEV.	-	02/03/17
A2-2	FAST FOOD W/ DRIVE THRU #2 EXT. ELEV.	-	02/03/17
ARCHITECTURAL DRAWINGS FAST FOOD #3			
A1-1	FAST FOOD W/ DRIVE THRU #3 FLOOR PLAN	-	02/03/17
A1-2	FAST FOOD W/ DRIVE THRU #3 ROOF PLAN	-	02/03/17
A2-1	FAST FOOD W/ DRIVE THRU #3 EXT. ELEV.	-	02/03/17
A2-2	FAST FOOD W/ DRIVE THRU #3 EXT. ELEV.	-	02/03/17

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Design Methods · Engineering · Planning

CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DRIVE
MORENO VALLEY, CA 92553

CUP CASE NO. PEN16-0134
APN NO. 297-130-052, 053, 054

T1-1

VICINITY MAP

SYMBOLS LEGEND

SUBMITTAL DOCUMENTS FOR:
FAST FOOD W/ DRIVE-THRU #2
FAST FOOD W/ DRIVE-THRU #3

CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DR
MORENO VALLEY, CA 92553

KEYNOTES

1. PROPERTY LINE.
2. PROPOSED PROPERTY LINE / RIGHT OF WAY
3. LANDSCAPE AREA
4. PROPOSED UTILITY TRANSFORMER – LOCATION TO BE DETERMINED BY UTILITY COMPANY
5. TRASH ENCLOSURE, W/SOLID ROOF COVER, FINISH TO MATCH BUILDINGS.
6. 6" CONCRETE CURB, TYP. PER CITY STANDARDS
7. ACCESSIBLE PARKING STALL WITH RAMP PER CITY STANDARD – SEE CIVIL PLANS
8. ACCESSIBLE PATH OF TRAVEL.
9. RACK FOR 5 BICYCLES
10. UNDERGROUND GREASE INTERCEPTOR TANK – TYP. FOR RESTAURANTS.
11. EMERGENCY PUMP SHUT-OFF SWITCH.
12. NEW UST 20,000 GAL. UNLEADED GASOLINE
13. NEW UST 12,000 GAL. UNLEADED PREMIUM
14. NEW UST 10,000 GAL. DIESEL
15. TWO (2) NEW UST 20,000 GAL. DIESEL
16. CAR WASH ENTRANCE SIGN
17. 20'-0" WIDE STORM DRAIN EASEMENT
18. EXISTING FIRE HYDRANT TO BE RELOCATED – SEE CIVIL PLANS FOR NEW LOCATION
19. NEW MONUMENT SIGNAGE
20. NEW AIR AND WATER UNIT
21. TRASH RECEPTACLE
22. 6' HIGH VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
23. NEW GAS METERS
24. CONCRETE LANDING
25. DECORATIVE PAVING AS PER CITY REQUIREMENT.
26. 2' WIDE CURB OPENING – SEE CIVIL PLANS FOR LOCATIONS
27. 12" WIDE CONC. STEP OUT AND 6" CURB – PER CITY STANDARDS – SEE CIVIL PLANS
28. COMMERCIAL DRIVEWAY APPROACH PER CITY STANDARD MSVI-112C-0 – SEE CIVIL PLANS
29. 2' SET BACK @ STREET FRONTAGE PER CITY STANDARD
30. ROOF DRAIN LOCATION
31. PROPOSED SIDEWALK – PER CITY STANDARDS MVSI-115-0 – SEE CIVIL PLANS
32. PROPOSED CURB AND GUTTER – PER CITY STANDARDS MVSI-120B-0 – SEE CIVIL PLANS
33. EXISTING MEDIAN TO BE REMOVED – SEE CIVIL PLANS
34. PROPOSED RAMP – PER CITY STANDARDS – SEE CIVIL PLANS
35. EXISTING ADA RAMP – SEE CIVIL PLANS
36. EXISTING TRAFFIC SIGNAL TO BE RELOCATED – SEE CIVIL PLANS
37. PROPOSED MEDIAN AND STREET STRIPPING – PER CITY STANDARDS MVSI-106A-0 – SEE CIVIL PLANS AND TRAFFIC STUDY
38. EXISTING CURB AND GUTTER – SEE CIVIL PLANS
39. EXISTING CURB INLET – SEE CIVIL PLANS
40. CONCRETE CURB AND WALK
41. 20' X 6' HIGH FENCH GATE VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
42. 3' X 6' HIGH FENCH GATE VINYL CODED CHAINLINK FENCE WITH SMALLER SIZE CHAIN-LINK
43. RED CURBING "NO PARKING FIRE LANE"
44. LOW –EMITTING FUEL EFFICIENT PARKING STALLS, SHOWING THE NUMBER OF PARKING DESIGNATED.
45. NEW PARKWAY LANDSCAPE – SEE CIVIL PLANS
46. 20'-0" BUILDING SETBACK
47. 3'-0" INTERIOR SIDE BUILDING SETBACK
48. EXISTING STREET LIGHT TO BE RELOCATED – SEE CIVIL PLANS
49. EXISTING STREET LIGHT TO REMAIN – SEE CIVIL PLANS
50. EXISTING 6" JET FUEL PIPELINE – SEE CIVIL PLANS
51. PROPOSED P/W AT DRIVEWAYS – SEE CIVIL PLANS
52. COMMERCIAL DRIVEWAY APPROACH PER CITY STANDARD MVSI-112A-0 – SEE CIVIL PLANS
53. EXISTING CURB AND GUTTER TO BE REMOVED – SEE CIVIL PLANS

GENERAL NOTES

1. EACH SERVICE STATION SHALL PROVIDE A MEN'S AND WOMEN'S PUBLIC RESTROOM WHICH ARE ACCESSIBLE, FROM THE INTERIOR OF THE BUSINESS ONLY, TO THE GENERAL PUBLIC AND PHYSICALLY DISABLED DURING ALL HOURS THE SERVICE STATION IS OPEN TO THE PUBLIC. ENTRANCES OR SIGNAGE SHALL BE CLEARLY VISIBLE FROM THE GASOLINE SERVICE AREA OR CASHIER STATION, AND SHALL BE MAINTAINED ON A REGULAR BASIS.
2. NOISE. ANY DRIVE-UP OR DRIVE-THROUGH SPEAKER SYSTEM SHALL NOT BE DETECTABLE ABOVE DAYTIME AMBIENT NOISE LEVELS BEYOND THE PROPERTY BOUNDARIES. THE SYSTEM SHALL BE DESIGNED TO COMPENSATE FOR AMBIENT NOISE LEVELS IN THE IMMEDIATE AREA. (ORD. 359. 1992).

LEGEND:

(X) PARKING STALL COUNT

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PRELIMINARY FASTFOOD
SITE PLAN

CACTUS COMMERCE, LP.
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

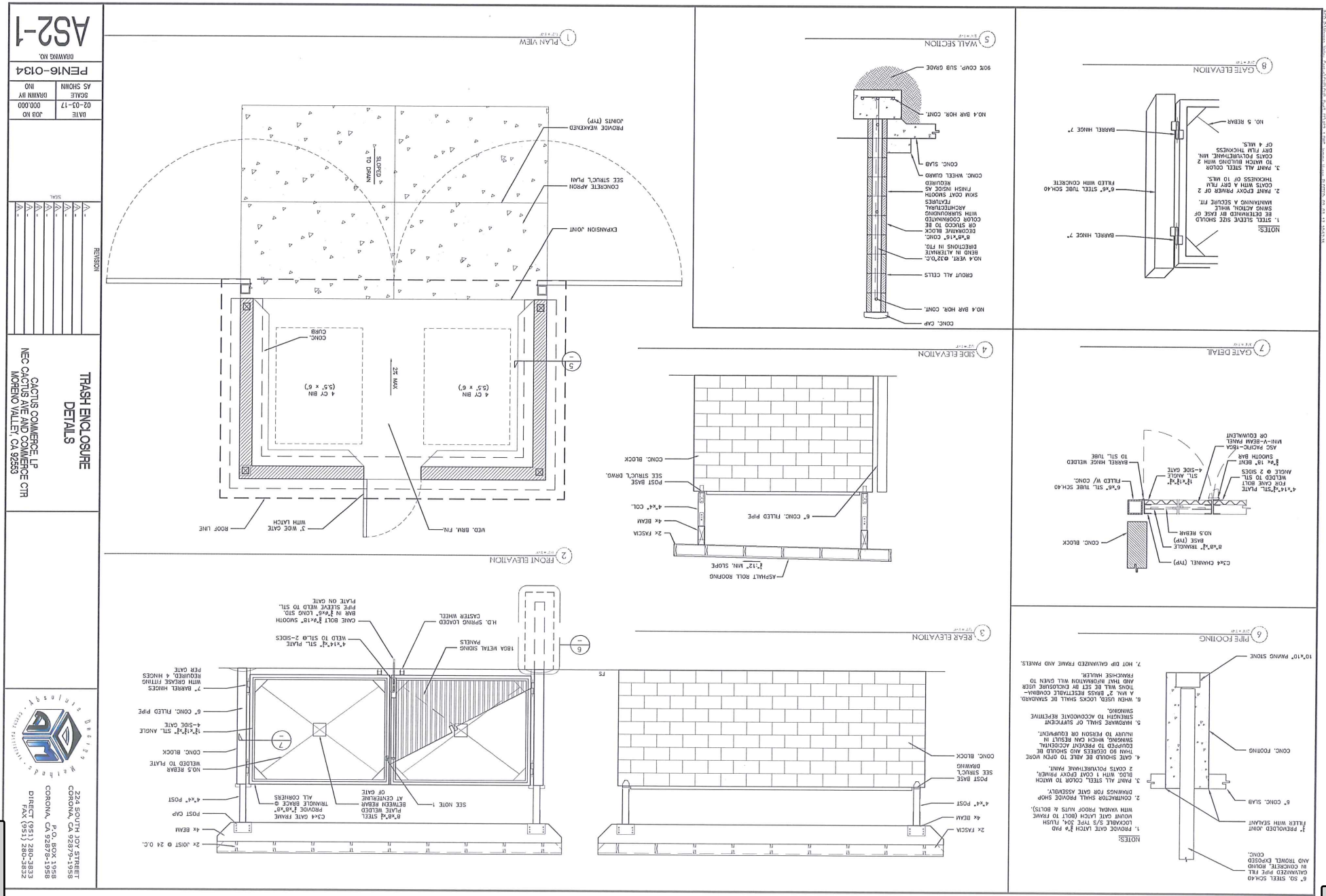
DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0134

DRAWING NO.

AS1-1

N:\P\Verena_Vistas_Fastfood\Civil\Civil-Fast-FF\AS1-1.DWG Jamie Hunter PLOTTED: 02-03-17 12:18:24


TRASH ENCLOSURE DETAILS
CACTUS COMMERCE L.P.
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553
PEN16-0134
A52-1
DRAWING NO.
DATE 02-03-17
JOB NO 000.000
SCALE AS SHOWN
DRAWN BY IND
REVISION
SCALE
Method Studio
224 SOUTH IVY STREET
CORONA, CA 92879-1958
DIRECT (951) 280-3833
FAX (951) 280-3832
P.O. BOX 1958
CORONA, CA 92878-1958
PLAN VIEW
FRONT ELEVATION
SIDE ELEVATION
REAR ELEVATION
WALL SECTION
GATE ELEVATION
GATE DETAIL
PIPE FOOTING
(5.5' x 6') 4 CY BIN
SLOPED ¼" TO DRAIN
PROVIDE WEAKENED JOINTS (TYP)
CONCRETE APRON SEE STRUCT'L PLAN
EXPANSION JOINT
CONC. CURB
25' MAX
ROOF LINE
3' WIDE GATE WITH LATCH
VERT. RIB.
CONC. BLOCK
6" CONC. FILLED PIPE
POST BASE SEE STRUCT'L DRWG.
4"x4" COL.
4x BEAM
2x FASCIA
ASPHALT ROLL ROOFING
1"12" MIN. SLOPE
180A METAL SIDING PANELS
H.D. SPRING LOADED CASTER WHEEL
CANE BOLT 1"x18" SMOOTH BAR IN 1"x40" LONG STD. PIPE SLEEVE WELD TO STL. PLATE ON GATE
4"x14"x¼" STL. PLATE WELD TO STL@ 2-SIDES
7" BARREL HINGES WITH GREASE FITTING REQUIRED. 4 HINGES PER GATE
6" CONC. FILLED PIPE
1½"x1½"x¼" STL. ANGLE 4-SIDE GATE
CONC. BLOCK
NO.5 REBAR WELDED TO PLATE
4"x4" POST
POST CAP
4x BEAM
2x JOIST @ 24 O.C.
C3x4 GATE FRAME TRIANGLE BRACE @ ALL CORNERS
PROVIDE 1"x8"x8" BETWEEN REBAR AT CENTERLINE OF GATE
8"x8"x¼" STEEL PLATE WELDED SEE NOTE 1
FS
CONC. BLOCK
POST BASE SEE STRUCT'L DRAWING
4"x4" POST
4x BEAM
2x FASCIA
90° CONN. SUB GRADE
NO.4 BAR HOR. CONT.
CONC. SLAB
CONC. WHEEL GUARD
SKIM COAT SMOOTH FINISH INSIDE AS REQUIRED
8"x8"x16" CONC. DECORATIVE BLOCK OR STUCCO TO BE COLOR COORDINATED WITH SURROUNDING ARCHITECTURAL FEATURES
NO.4 VERT. @32"O.C. BEND IN ALTERNATE DIRECTIONS IN FTG.
GROUT ALL CELLS
CONC. CAP
NOTES:
1. STEEL SLEEVE SIZE SHOULD BE DETERMINED BY EASE OF SWING ACTION, WHILE MAINTAINING A SECURE FIT.
2. PAINT EPOXY PRIMER OF 2 COATS WITH A GREY FILM THICKNESS OF 10 MILS.
3. PAINT ALL STEEL COLOR TO MATCH BUILDING WITH 2 COATS POLYURETHANE MIN. DRY FILM THICKNESS OF 4 MILS.
NO. 5 REBAR
BARREL HINGE 7"
6"x6" STEEL TUBE SCH.40 FILLED WITH CONCRETE
BARREL HINGE 7"
4"x14"x¾"STL. PLATE FOR CANE BOLT WELDED TO STL. ANGLE 4-SIDE GATE
1½"x1½"x¼" STL. ANGLE FILLED W/ CONC.
6"x6" STL. TUBE SCH.40
BARREL HINGE WELDED TO STL. TUBE
¾"ø 18" BENT SMOOTH BAR
ASG PACIFIC-18GA MINI-V-BEAM PANEL OR EQUIVALENT
C3x4 CHANNEL (TYP)
8"x8"x¼" TRIANGLE BASE (TYP)
NO.5 REBAR
CONC. BLOCK
10"x10" PAVING STONE
CONC. FOOTING
6" CONC. SLAB
¾" PREFOLDED JOINT FILLER WITH SEALANT
6" SCH. STEEL SCH.40 GALVANIZED PIPE FILL W/ CONCRETE, ROUND AND TROWEL EXPOSED CONC.
1. PROVIDE GATE LATCH ¾"ø PAD LOCKABLE S/S TYPE 304, FLUSH MOUNT GATE LATCH (BOLT TO FRAME WITH VANDAL PROOF NUTS & BOLTS).
2. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR GATE ASSEMBLY.
3. PAINT ALL STEEL COLOR TO MATCH BLDG. WITH 1 COAT EPOXY PRIMER, 2 COATS POLYURETHANE PAINT.
4. GATE SHOULD BE ABLE TO OPEN OVER THAN 90 DEGREES AND SHOULD BE EQUIPPED TO PREVENT ACCIDENTAL SWINGING, WHICH CAN RESULT IN INJURY TO PERSON OR EQUIPMENT.
5. HARDWARE SHALL OF SUFFICIENT STRENGTH TO ACCOMODATE REPETITIVE SWINGING.
6. WHEN USED, LOCKS SHALL BE STANDARD, A MIN. 2" BRASS RESTTABLE COMBINATIONS WILL BE SET BY ENCLOSURE USER AND THAT INFORMATION WILL GIVEN TO FRANCHISEE HAULER.
7. HOT DIP GALVANIZED FRAME AND PANELS.
TRASH ENCLOSURE DETAILS
CACTUS COMMERCE L.P.
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

224 SOUTH 10TH STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
FAX (951) 280-3832

PRELIMINARY
SITE PLAN

NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

CACTUS COMMERCE, LP

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
1"=30'-0"	

PEN16-0134

DRAWING NO.

PHS1-1

M:\PLN\Moreno_Valley_Cactus\CUP\CUP-Fast-FT\PHS1-1.DWG Jenna Hurtz PLOTTED: 02-03-17 12:21:16

PRELIMINARY GRADING PLAN
GAS STATION, RETAIL & WAREHOUSE

VICINITY MAP

THOMAS BROS. GUIDE
SAN BERNARDINO/RIVERSIDE,
YEAR 2005 PAGE 717, COORD. A-6

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

APN: 297-130-052, 53, AND 54

UTILITY COMPANY

WATER AND SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
P.O. BOX 8300
PERRIS, CA 92572-8300
(951) 928-3777

TELEPHONE:
VERIZON
(866) 232-4282

ELECTRICITY:
MORENO VALLEY ELECTRIC UTILITY
14331 FREDERICK STREET,
SUITE 2
MORENO VALLEY, CA 92553
(844)341-6469

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
P.O BOX "C"
MONTEREY PARK, CA 91756
(800) 427-2000

OWNER/APPLICANT INFORMATION

J&T MANAGEMENT, INC.	INO CRUZ
COMPANY NAME	CONTACT NAME
139 RADIO ROAD CORONA, CA 92879	(951) 280-3833
ADDRESS	PHONE
INO@JNTMGMT.COM	(951) 280-3832
E-MAIL	FAX

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

Underground Service Alert
Call: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

SALEM engineering group, inc.

ROUGH / CONCEPTUAL GRADING CALCULATIONS

EARTHWORK	QUANTITIES (CY) CUT	FILL
ROUGH GRADING	2,368	7,829
OVER-EXCAVATION WORK		
REMEDIAL WORK		
SHRINKAGE (___%)		
EARTHWORK QUANTITY SUBTOTAL		
IMPORT MATERIAL	5,461	
EXPORT MATERIAL		
EARTHWORK QUANTITY TOTAL		

ZONE BPX

SITE ACREAGE: 6.31 ACRES

AREA OF DISTURBANCE: 6.31 ACRES

TOPOGRAPH COMPLETED BY: A.J. KOLTAVARY/CE DATED: 10/20/2015

FLOOD ZONE: "X" PER F.I.R.M. MAP PANEL NO. 06065C0745G DATED: 08/28/2008

SHEET INDEX

DESCRIPTION	SHEET NO.
TITLE SHEET	1
DETAILS	2
PRELIMINARY GRADING PLAN	3
PRELIMINARY GRADING PLAN AND STREET SECTIONS	4
PRELIMINARY UTILITY PLAN	5

THE GRADING AND/OR IMPROVEMENT PLANS ARE APPROVED FOR A PERIOD OF TWO (2) YEARS FROM THE DATE SIGNED BY THE CITY ENGINEER. AFTER THE TWO (2) YEAR PERIOD HAS LAPSED, THE ENGINEER OF RECORD MAY BE REQUIRED TO SUBMIT AND PROCESS FOR CITY ENGINEER APPROVAL, UPDATED PLANS THAT COMPLY WITH THE MOST CURRENT CITY STANDARDS, PRACTICES AND POLICIES.

ABBREVIATION

AB	AGGREGATE BASE	MH	MANHOLE
AC	ASPHALT	N&T	NAIL AND TAG
BW	BACK OF WALK	OH	OVERHEAD
CF	CURB FACE	PP	POWER POLE
CO	CLEANOUT	SD	STORM DRAIN
EG	EXISTING GROUND	SPK	SPIKE
FD	FOUND	TC	TOP OF CURB
FF	FINISH FLOOR	TW	TOP OF WALL
FG	FINISH GRADE	TB	TOP OF BERM
FL	FLOWLINE	WV	WATER VALVE
FS	FINISH SURFACE	W	WATER
HP	HIGH POINT	(R)	RECORD
HT	HEIGHT	RD	ROOF DRAIN
L&T	LEAD AND TAG	CB	CATCH BASIN

GEOTECH AND GEOLOGIST CERTIFICATION

THIS GRADING PLAN HAS BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN CONFORMANCE WITH THE RECOMMENDATIONS AS OUTLINED IN THE FOLLOWING SOILS AND GEOLOGICAL REPORT FOR THIS PROJECT.

REPORT NO: 3-215-1091

REPORT DATE: NOVEMBER 25, 2015

FIRM NAME: SALEM ENGINEERING

BY: .... DATE
GEOTECHNICAL ENGINEER

OR

BY: .... DATE
ENGINEERING GEOLOGIST

EASEMENTS

(5) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
GRANTED TO: GTE CALIFORNIA INCORPORATED, A CORPORATION
PURPOSE: FOR THE TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRICAL MEANS
RECORDED: APRIL 30, 1999 AS INSTRUMENT NO. 182988 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.
SAID EASEMENT CONTAINS RESTRICTIONS ON THE USE, BY THE OWNERS OF SAID LAND, OF THE EASEMENT AREA AS SET OUT IN SAID EASEMENT DOCUMENT.

(6) AN EASEMENT FOR THE PURPOSES SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED MAP SHOWN BELOW.
MAP: PARCEL MAP NO. 27732
RECORDED: IN BOOK 195, PAGES 75 TO 79 INCLUSIVE OF PARCEL MAPS
EASEMENT PURPOSE: STORM DRAINAGE
AFFECTS: AS SHOWN ON SAID MAP

(7) THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHT OF ACCESS TO OR FROM THE STREET OR HIGHWAY ABUTTING SAID LAND KNOWN AS PARCEL 9 AND 10 ABUTTING CACTUS AVENUE SUCH RIGHTS HAVING BEEN RELINQUISHED BY THE MAP OF SAID TRACT.

ENGINEER'S NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

DECLARATION OF ENGINEER OF RECORD

I HEREBY DECLARE THAT THE DESIGN OF THE IMPROVEMENTS AS SHOWN ON THESE PLANS COMPLIES WITH PROFESSIONAL ENGINEERING STANDARDS AND PRACTICES. AS THE ENGINEER IN RESPONSIBLE CHARGE OF DESIGN OF THESE IMPROVEMENTS, I ASSUME FULL RESPONSIBLE CHARGE FOR SUCH DESIGN. I UNDERSTAND AND ACKNOWLEDGE THAT THE PLAN CHECK OF THESE PLANS BY THE CITY OF MORENO VALLEY IS A REVIEW FOR THE LIMITED PURPOSE OF ENSURING THAT THE PLANS COMPLY WITH CITY PROCEDURES, APPLICABLE POLICIES AND ORDINANCES. THE PLAN CHECK IS NOT A DETERMINATION OF THE TECHNICAL ADEQUACY OF THE DESIGN OF THE IMPROVEMENTS. SUCH PLAN CHECK DOES NOT, THEREFORE, RELIEVE ME OF MY RESPONSIBILITY FOR THE DESIGN OF THESE IMPROVEMENTS. AS ENGINEER OF RECORD (EOR), I AGREE TO INDEMNIFY AND HOLD THE CITY OF MORENO VALLEY, THE MORENO VALLEY HOUSING AUTHORITY, AND THE MORENO VALLEY COMMUNITY SERVICE DISTRICT (CSD), ITS OFFICERS, AGENTS AND EMPLOYEES HARMLESS FROM ANY AND ALL LIABILITY OF CLAIMS, DAMAGES OR INJURIES TO ANY PERSON OR PROPERTY WHICH MIGHT ARISE FROM THE NEGLIGENT ACTS, ERRORS OR OMISSIONS OF THE ENGINEER OF RECORD. I HAVE READ AND INFORMED THE PROJECT APPLICANT/DEVELOPER THAT APPROVAL OF THESE PLANS DO NOT RELIEVE THEM FROM THE REQUIREMENTS OF THE CONDITIONS OF APPROVAL (ATTACHED HEREIN OR IN OTHER APPROVED IMPROVEMENT PLANS).

I ALSO HEREBY DECLARE THAT I HAVE COMPARED THESE PLANS WITH ALL APPLICABLE ADA TITLE II AND TITLE 24 REQUIREMENTS FOR DISABILITY ACCESS FOR THIS PROJECT, AND THESE PLANS ARE IN FULL COMPLIANCE WITH THOSE REQUIREMENTS.

SALEM ENGINEERING GROUP, INC	FRANCISCO V. MAGOS II
COMPANY NAME	CONTACT NAME
11650 MISSION PARK DRIVE, SUITE 108 RANCHO CUCAMONGA, CA 91730	(909) 980-6455
ADDRESS	PHONE
FRANCISCO@SALEM.NET	(909) 980-6435
E-MAIL	FAX

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

REVIEW BY CITY STAFF

OFFICE	INITIAL	DATE
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:
MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:
AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL
REGISTERED PROFESSIONAL ENGINEER FRANCISCO V. MAGOS II No. 75,227 Exp. 12/31/18 CIVIL STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:
FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

TITLE SHEET

SHEET 1 OF 5
CITY ID No

*BIORETENTION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 24" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.

**3/4" CRUSHED ROCK LAYER SHALL BE A MINIMUM OF 12" BUT MAY BE DEEPENED TO INCREASE THE INFILTRATION AND STORAGE ABILITY OF THE BASIN.

THE EFFECTIVE AREA OF THE BASIN SHALL BE LEVEL AND SHALL BE SIZED BASED ON ENCINITAS STORMWATER MANUAL CALCULATIONS. TYPICALLY, THE SURFACE AREA OF THE BIORETENTION BASIN IS 4% OF THE IMPERVIOUS AREA DRAINING TO IT.

BIO-RETENTION AREA CROSS SECTION — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **9**

DRAIN BOX NOTES			
BOX SIZE	(A)	(B)	(C)
24-INCH x 24-INCH 36-INCH x 36-INCH (20)	22" 34"	34" 46"	ALHAMBRA FOUNDRY CO., LTD. [NARROW SLOT, 0.5" WIDE (MAX.) OPENINGS] TRUCK TRAFFIC CAST IRON GRATE AND FRAME (GALVANIZED) OR EQUIVALENT

CONCRETE CATCH BASIN — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **5**

3' WIDE CONCRETE SWALE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **2**

BIO-RETENTION - LID ORIFICE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **8**

BIO-RETENTION - GRATE ASSEMBLY — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **7**

2' WIDE CURB OPENNING — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **1**

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **11**

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **10**

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **4**

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — **3**

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

REVIEW BY CITY STAFF	INITIAL	DATE
OFFICE		
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PROG		

MARK	DATE	INITIAL	DESCRIPTION	REC	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

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MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

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AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — FRANCISCO V. MAGOS II — No. 75227 — Exp. 12/31/18 — CIVIL — STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

DETAILS

SHEET 2 OF 5

CITY ID No

CONSTRUCTION NOTES	
1	CONSTRUCT 6" CURB ONLY PER CITY STANDARD MVSI-121A-0
2	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL 2, SHEET 2
3	CONSTRUCT CURB & GUTTER PER CITY STANDARD MVSI-120A-0
4	2' WIDE CURB OPENING AT EVERY 20 FEET PER DETAIL 3, SHEET 2
5	CONSTRUCT BIO-RETENTION WITH UNDER DRAIN PER DETAIL 9, SHEET 2
6	CONSTRUCT 3" AC / 5" AB CAR TRAFFIC; 3.5" AC / 8.5" AB TRUCK TRAFFIC
7	JOIN EXISTING IMPROVEMENT. VERIFY ELEVATION PRIOR TO CONSTRUCTION.
8	INSTALL 24"X24" NDS DRAIN PER DETAIL 5, SHEET 2
9	CONSTRUCT LANDSCAPE PER LANDSCAPE PLAN
10	CONSTRUCT DRIVEWAY PER CITY STANDARD MVSI-112C-0
11	CONSTRUCT ADA RAMP
12	STRIPE PARKING STALL PER ARCHITECTURAL PLAN
13	STRIPE ADA PARKING STALL PER ADA STANDARD
14	CONSTRUCT PAVERS PER DETAIL 4, SHEET 2
15	PATH OF TRAVEL
16	CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLAN
17	2' STEP-OUT (TYP)
18	INSTALL 36"X36" NDS DRAIN PER DETAIL 5, SHEET 2
19	PAVEDRAIN SYSTEM PER DETAIL 10 & 11, SHEET 2
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING

LEGEND

- BOUNDARY LINE
- CENTER LINE
- PROPERTY LINE
- X — X CHAIN-LINK FENCE
- GAS GAS LINE
- S SEWER LINE
- W WATER LINE
- PROPOSED PERFORATED PIPE
- WATER VALVE
- THRUST BLOCK
- END CAP W/THRUST BLOCK
- BIO-RETENTION
- PATH OF TRAVEL
- EXISTING LIGHT
- EXISTING STREET LIGHT
- EXISTING BACKFLOW PREVENTER
- EXISTING WATER METER
- EXISTING SEWER MANHOLE
- POWER POLE
- GUY WIRE ANCHOR
- CATCH BASIN
- METER
- FIRE HYDRANT
- TRAFFIC SIGNAL
- F — F PROPOSED FIRE LINE
- S PROPOSED SEWER
- W WATER SERVICE
- F FIRE SERVICE
- SD PROPOSED STORMDRAIN
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED GRATE INLET
- CO PROPOSED STORMDRAIN CLEANOUT
- S SEWER MANHOLE
- SL SEWER LATERAL
- SCO SEWER CLEANOUT

NOTE: FOR PRELIMINARY UTILITIES SEE SHEET 4

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

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LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PROG		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

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INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
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APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — FRANCISCO V. MAGOS — No. 75227 Exp. 12/31/18 — CIVIL — STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
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CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING PLAN

SHEET 3 OF 5
CITY ID No

CONSTRUCTION NOTES	
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5	CONSTRUCT BIO-RETENTION WITH UNDER DRAIN PER DETAIL 9, SHEET 2
6	CONSTRUCT 3" AC / 5" AB CAR TRAFFIC; 3.5" AC / 8.5" AB TRUCK TRAFFIC
7	JOIN EXISTING IMPROVEMENT. VERIFY ELEVATION PRIOR TO CONSTRUCTION.
8	INSTALL 24"X24" NDS DRAIN PER DETAIL 5, SHEET 2
9	CONSTRUCT LANDSCAPE PER LANDSCAPE PLAN
10	CONSTRUCT DRIVEWAY PER CITY STANDARD MVSI-112C-0
11	CONSTRUCT ADA RAMP
12	STRIPE PARKING STALL PER ARCHITECTURAL PLAN
13	STRIPE ADA PARKING STALL PER ADA STANDARD
14	CONSTRUCT PAVERS PER DETAIL 4, SHEET 2
15	PATH OF TRAVEL
16	CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLAN
17	2' STEP-OUT (TYP)
18	INSTALL 36"X36" NDS DRAIN PER DETAIL 5, SHEET 2
19	PAVEDRAIN SYSTEM PER DETAIL 10 & 11, SHEET 2
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING

SECTION A–A LOOKING NORTH
NTS

SECTION C–C LOOKING WEST
NTS

GOLDENCREST AVENUE LOOKING WEST
TYPICAL SECTION PER MVSI-106A-0
NTS

CACTUS AVENUE
TYPICAL SECTION
NTS

SECTION B–B LOOKING WEST
NTS

SECTION D–D LOOKING NORTH
NTS

COMMERCE CENTER DRIVE LOOKING NORTH
TYPICAL SECTION PER MVSIA-0
NTS

PEN 16-0132
(PA16-0004)

LEGEND

BOUNDARY LINE		POWER POLE	
CENTER LINE		GUY WIRE ANCHOR	
PROPERTY LINE		CATCH BASIN	
CHAIN-LINK FENCE		METER	
GAS LINE		FIRE HYDRANT	
SEWER LINE		TRAFFIC SIGNAL	
WATER LINE		PROPOSED FIRE LINE	
PROPOSED PERFORATED PIPE		PROPOSED SEWER	
BIO-RETENTION		WATER SERVICE	
PATH OF TRAVEL		FIRE SERVICE	
SEWER LATERAL		PROPOSED STORMDRAIN	
		EXISTING RIGHT-OF-WAY	
SEWER CLEANOUT		PROPOSED RIGHT-OF-WAY	
EXISTING LIGHT		PROPOSED GRATE INLET	
EXISTING STREET LIGHT		PROPOSED STORMDRAIN CLEANOUT	
EXISTING BACKFLOW PREVENTER		END CAP W/THRUST BLOCK	
EXISTING WATER METER		WATER VALVE	
EXISTING SEWER MANHOLE		THRUST BLOCK	

PRELIMINARY

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF		
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75–79.	OFFICE	INITIAL	DATE
		ENGINEERING DIVISION MANAGER		
		LAND DEVELOPMENT		
		PLANNING		
		TRANSPORTATION		
		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:
MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:
AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

FRANCISCO V. MAGOS II
No. 75227
Exp. 12/31/18
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:
FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING AND STREET SECTIONS

SHEET 4 OF 5
CITY ID No

CONSTRUCTION NOTES:

1. CONSTRUCT 8" PVC SEWER LINE
2. CONSTRUCT STANDARD MANHOLE PER SB-61
3. CONSTRUCT SEWER CLEANOUT PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. SB-52
4. CONSTRUCT SEWER LATERAL PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. SB-176
5. REMOVE AND RELOCATE EX. FIRE HYDRANT
6. CONSTRUCT 8" PVC PRIVATE WATER LINE
7. CONSTRUCT 8" PVC PRIVATE FIRE WATER LINE
8. CONSTRUCT FIRE HYDRANT ASSEMBLY PER EASTERN MUNICIPAL WATER DISTRICT B-357
9. CONSTRUCT 2" PVC WATER SERVICE CONNECTION PER EASTERN MUNICIPAL WATER DISTRICT B-658
10. CONSTRUCT THRUST BLOCKING PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. B-407
11. CONSTRUCT BACKFLOW W/FDC PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG B-597C
12. CONSTRUCT 6" PVC PRIVATE FIRE WATER LINE
13. CONSTRUCT 15" PVC STORMDRAIN LINE
14. CONSTRUCT BIORETENTION BASIN WITH PERFORATED 6" PVC PIPE PER COUNTY OF RIVERSIDE LID BMP MANUAL
15. CONSTRUCT 18" X 18" BROOKS CATCH BASIN OR APPROVED EQUAL
16. CONSTRUCT STORMDRAIN CLEANOUT PER EMWD SB-52

LEGEND

- END CAP W/THRUST BLOCK
- FIRE HYDRANT
- WATER VALVE
- THRUST BLOCK
- BACKFLOW PREVENTER W/FDC
- SEWER MANHOLE
- SEWER LATERAL
- SCO SEWER CLEANOUT
- W PROPOSED WATER
- F F PROPOSED FIRE LINE
- S PROPOSED SEWER
- WATER SERVICE
- FIRE SERVICE
- SD PROPOSED STORMDRAIN
- PROPOSED PERFORATED PIPE
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- GAS EXISTING GAS LINE
- PROPOSED GRATE INLET
- CO PROPOSED STORMDRAIN CLEANOUT

PRELIMINARY

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF		
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.	OFFICE	INITIAL	DATE
		ENGINEERING DIVISION MANAGER		
		LAND DEVELOPMENT		
		PLANNING		
		TRANSPORTATION		
		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.D.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — FRANCISCO V. MAGOS — No. 75,227 — Exp. 12/31/18 — CIVIL — STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY UTILITY PLAN

SHEET 5 OF 5

CITY ID No

ALTA/ACSM SURVEY
FOR

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE, RECORDS OF RIVERSIDE COUNTY. LOCATED IN T.3S. R.4W. SEC. 2

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

TITLE REPORT

A PRELIMINARY TITLE REPORT WAS PREPARED BY COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015.

COMMONWEALTH LAND TITLE COMPANY
DOUG ABERNATHY – TITLE OFFICER
888 S. FIGUEROA ST, SUITE 2100
LOS ANGELES, CA 90017
(800) 432-0706

ENGINEER'S CERTIFICATE

TO: –

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4,7(A), 7(B)(1), 7(C), 8, 9, 10(A) (IF PARTY WALLS EXIST), 11(A) AND 20(A) OF TABLE A THEREOF.

THE FIELD WORK WAS COMPLETED ON –.

DATE _____

REGISTERED PROFESSIONAL ENGINEER ANDREW J KOLTAVARY No. 26571 Exp. 03/31/16 CIVIL STATE OF CALIFORNIA

ANDREW J. KOLTAVARY, RCE 26571 EXP: 03/31/16

SCHEDULE B EXCEPTION

ITEM A IS TAXES RELATED
ITEMS B, C ARE LIEN RELATED RELATED
ITEMS 1, 13, 14 ARE RIGHTS RELATED
ITEM 2 IS COVENANT RELATED
ITEM 3 IS LAND RELATED
ITEMS 4 ARE TERMS AND PROVISIONS RELATED
ITEM 7 IS OWNERSHIP RELATED
ITEMS 8, 9 ARE DOCUMENT RELATED
ITEMS 10, 17 ARE MATTERS RELATED
ITEMS 11, 12 ARE DEED OF TRUST RELATED
ITEM 15 IS DISCREPANCIES RELATED

(5) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
GRANTED TO: GTE CALIFORNIA INCORPORATED, A CORPORATION
PURPOSE: FOR THE TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRICAL MEANS
RECORDED: APRIL 30, 1999 AS INSTRUMENT NO. 182988 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

SAID EASEMENT CONTAINS RESTRICTIONS ON THE USE, BY THE OWNERS OF SAID LAND, OF THE EASEMENT AREA AS SET OUT IN SAID EASEMENT DOCUMENT.

(6) AN EASEMENT FOR THE PURPOSES SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED MAP SHOWN BELOW.
MAP: PARCEL MAP NO. 27732
RECORDED: IN BOOK 195, PAGES 75 TO 79 INCLUSIVE OF PARCEL MAPS
EASEMENT PURPOSE: STORM DRAINAGE
AFFECTS: AS SHOWN ON SAID MAP

(7) THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM THE STREET OR HIGHWAY ABUTTING SAID LAND KNOWN AS PARCELS 9 AND 10 ABUTTING CACTUS AVENUE SUCH RIGHTS HAVING BEEN RELINQUISHED BY THE MAP OF SAID TRACT.
AFFECTS: AS SHOWN ON SAID MAP

UTILITY PROVIDERS:

WATER AND SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
P.O. BOX 8300
PERRIS, CA 92572-8300
(951) 928-3777

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
P.O BOX "C"
MONTEREY PARK, CA 91756
(800) 427-2000

ELECTRICITY:
SOUTHERN CALIFORNIA EDISON
P.O. BOX 6400
RANCHO CUCAMONGA, CA 91729
(800) 990-7788

TELEPHONE:
VERIZON
(866) 232-4282

BENCH MARK

BENCHMARK: M62-69 Elev. 1551.102 FEET

BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN

VICINITY MAP

GENERAL NOTES

1. SURVEYOR HAS RELIED UPON INFORMATION SUPPLIED IN THE CURRENT COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015. DISCLOSE RECORD EASEMENTS THAT BURDEN OR BENEFIT THIS PROPERTY
2. BUILDING SETBACK LINES SHOWN HEREON REFLECT THE INFORMATION AS EXPLAINED BY THE CITY REPRESENTATIVE INDICATED HEREON.
3. BY OBSERVATION NO CEMETERIES ARE KNOWN OR FOUND ON SUBJECT PROPERTY.
4. NO MONUMENTATION WAS FOUND OR SET AT THE PROPERTY CORNERS UNLESS NOTED OTHERWISE.
5. ASSESSORS PARCEL NUMBER FOR THIS PROPERTY IS 297-130-052-7; 053-8; 054-9.
6. SURVEYOR TAKES NO RESPONSIBILITY OF ITEMS OMITTED DUE TO A RESULT OF VISUAL OBSTRUCTIONS.

NOTES

1. FOR THE PURPOSES OF CLARITY, DETAILS NEAR THE PROPERTY LINES ARE NOT NECESSARILY DRAWN TO SCALE.
2. EASEMENTS PLOTTED PER RESEARCHED AND RECORD INFORMATION.
3. MONUMENTS FOUND AS NOTED.

FLOOD ZONE

NATIONAL FLOOD INSURANCE PROGRAM THE SUBJECT PROPERTY IS LOCATED WITHIN ZONE "X", PER F.I.R.M. MAP COMMUNITY PANEL NO. 06065C0745G EFFECTIVE DATE: AUGUST 28, 2008.

BASIS OF BEARING

THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

UNAUTHORIZED CHANGES & USES

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLAN MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARED OF THESE PLANS. IF THE CONTRACTOR DEVIATES FROM THESE PLANS PRIOR TO CONTACTING AND RECEIVING APPROVAL IN WRITING FROM THE DESIGN ENGINEER, THE CONTRACTOR SHALL BE LIABLE AND RESPONSIBLE FOR ALL DAMAGES AND CORRECTIONAL COSTS.

SHEET INDEX

ALTA-1	TITLE SHEET AND NOTES
ALTA-2	ALTA/ACSM SURVEY

PREPARED BY:
A.J. KOLTAVARY/CIVIL ENGINEERS
3 NINOS, IRVINE, CA
PHONE: (714) 624-9027
CIVIL ENGINEERING LAND SURVEYING ENVIRONMENTAL ENGINEERING

PREPARED FOR:
J N T MANAGEMENT CO.
139 RADIO ROAD
CORONA, CA 92879

TITLE SHEET
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION	DATE	JOB NO
	8/4/15	.
	SCALE NTS	DRAWN BY TN

1 OF 2

DRAWING NO.
ALTA-1

ABBREVIATION

AB	AGGREGATE BASE	MH	MANHOLE
AC	ASPHALT	N&T	NAIL AND TAG
BW	BACK OF WALK	OH	OVERHEAD
CF	CURB FACE	PP	POWER POLE
CO	CLEANOUT	SD	STORM DRAIN
EG	EXISTING GROUND	SPK	SPIKE
FD	FOUND	TC	TOP OF CURB
FF	FINISH FLOOR	TW	TOP OF WALL
FG	FINISH GRADE	TB	TOP OF BERM
FL	FLOWLINE	WV	WATER VALVE
FS	FINISH SURFACE	W	WATER
HP	HIGH POINT	(R)	RECORD
HT	HEIGHT		
L&T	LEAD AND TAG		
RD	ROOF DRAIN		
CB	CATCH BASIN		

MONUMENTS

FD. MONUMENT OR AS NOTED

LEGEND

CENTER LINE
PROPERTY LINE
CHAIN-LINK FENCE
GAS LINE
SEWER LINE
WATER LINE
CONC. WALL
EXISTING LIGHT
EXISTING STREET LIGHT
EXISTING BACKFLOW PREVENTER
EXISTING WATER METER
EXISTING SEWER MANHOLE
POWER POLE
GUY WIRE ANCHOR
CATCH BASIN
FIRE HYDRANT
TRAFFIC SIGNAL
METER
TREE
PINE TREE
PALM
BUSH

GRAPHIC SCALE
(IN FEET)
1 INCH = 40 FT.

A.J. KOLTAVARY/CIVIL ENGINEERS
3 NINOS, IRVINE, CA
PHONE: (714) 624-9027
CIVIL ENGINEERING LAND SURVEYING ENVIRONMENTAL ENGINEERING

PREPARED FOR:
J N T MANAGEMENT CO.
139 RADIO ROAD
CORONA, CA 92879

A.L.T.A. SURVEY
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION

DATE	JOB NO
8/4/15	
SCALE	DRAWN BY
1"=40'	TN

2 OF 2
DRAWING NO.
ALTA-2

PLANT LEGEND

TREES

- RHUS LANCEA – AFRICAN SUMAC 24" BOX
- CERCIDIUM FLORIDUM – BLUE PALO VERDE TREE 24" BOX
- TRISTANIA CONFERTA – BRISBANE BOX 24" BOX
- STREET TREE PER CITY OF MORENO VALLEY SIZE AS REQUIRED LOCATE AT 40' O.C. PER CITY

SHRUBS

- RAPHIOLEPSIS INDICA – BAY BREEZE INDIAN HAWTHORN 5 GALLON
- LEUCOPHYLLUM FRUTESCENS 'GREEN CLOUD' TEXAS SILVERLEAF 5 GALLON
- ESCALLONIA COMPAKTA – DWARF ESCALLONIA 5 GALLON
- PHORMIUM TENAX – DARK DELIGHT 5 GALLON
- PENNISETUM SETACEUM – FOUNTAIN GRASS 5 GALLON
- CAESALPINIA GILLIESII – YELLOW BIRD OF PARADISE 5 GALLON
- HESPERALOE PARVIFLORA – RED YUCCA 5 GALLON
- VITUS GIRDIANA – DESERT GRAPE TRAIN TO TRASH ENCLOSURE WALL 5 GALLON
- AGAVE VILORINIANA – OCTOPUS AGAVE 5 GALLON
- DASYLIRION WHEELERI – DESERT SPOON 5 GALLON
- HEMEROCALLIS SPECIES – DAY LILY 'DOUBLE YELLOW' 5 GALLON
- JUSTICA SPICIGERA – MEXICAN HONEYSUCKLE 5 GALLON

GROUND COVER

PROVIDE 3" LAYER OF 1/2" TO 3/4" D.G. CALIFORNIA GOLD AS TOP DRESSING FOR ALL SHRUB AREAS

- ROSA X 'NOARE' – RED CARPET ROSE 1 GAL. AT 18" O.C. TRIANGULAR SPACING
- LANTANA MONTEVIDENSIS – PURPLE TRAILING LANTANA 1 GAL. AT 18" O.C. TRIANGULAR SPACING

224 SOUTH JOY STREET
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P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
FAX (951) 280-3832

Design Methods Assistance

PRELIMINARY
LANDCAPE PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY

PEN16-0134

DRAWING NO.

L-1

INFO:P:\Moreno_Valley_Costco\VDP\VDP-Pad3-FT\L-1.DWG Jaime Hurpa PLOTTED: 02-03-17 10:59 A3

FLOOR PLAN

SCALE: 1/4" = 1'-0"

1

224 SOUTH JOY STREET
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P.O. BOX 1958
CORONA, CA 92878-1958
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FASTFOOD W/ DRIVE THRU #2
FLOOR PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
12-14-16	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0134

DRAWING NO.

A1-1

ROOF PLAN

SCALE: 1/4"=1'-0" 1

KEYED NOTES:

1. PLUMBING VENT.
2. DEPRESSED AREA @ ROOF DRAINS
3. LINES REPRESENT LIMITS OF CRICKETS FORMED BY TAPERED ROOF INSULATION (MIN. PITCH IS 1/4" PER FOOT)
4. LINE OF BUILDING BELOW
5. ROOF DRAIN AND OVERFLOW.
6. OVERFLOW DOWNSPOUT NOZZLE.
7. FOR ROOF SLOPE REFER TO STRUCTURAL DRAWINGS. 1/4 PER 12" MIN
8. METAL COPING CAP.
9. ROOF ACCESS OPENING.

ROOFING

RF-1 TYPE:4 - PLY BUILT-UP "CLASS A" ROOFING
W/ 15 LB. BASE SHEET, 2 - LAYERS OF 11 LB. FELT & 90 LB. CAPSHEET HOT MOP ALL AREAS
UL 790 (ASTM E108)
WARRANTY:
10 YEAR INSTALLATION AND LABOR.

GENERAL NOTES:

A. THE ROOF STRUCTURE SHALL NOT BE USED FOR STOCKPILING OF EQUIPMENT OR MATERIALS UNLESS APPROVED BY THE ARCHITECT, STRUCTURAL ENGINEER AND THE JOIST MANUFACTURER

B. THE ROOF ASSEMBLY SHALL COMPLY W/ UL-1 90 AND FM CLASS "A" RATINGS INCLUDING BUT NOT LIMITED TO COPINGS, FLASHING, PARAPET WALL COVERINGS, AND ENTIRE ROOF SURFACE.

C. COORDINATE ROOF ELEVATIONS WITH STRUCTURAL DRAWINGS. REFER SPECIFICATION SHEET FOR ROOF RELATED ITEMS, INCLUDING GUARANTEES, CURBS, FLASHING, AND ETC.

D. LOCATION OF ROOF TOP EQUIPMENT IS APPROXIMATE, FOR ACTUAL LOCATION OF ROOF TOP OPENINGS SEE STRUCTURAL FRAMING PLAN.

E. REFER TO ROOFING MANUFACTURE'S WRITTEN INSTRUCTIONS AND DETAILS FOR ROOFING SYSTEM INSTALLATION. CONTRACTOR TO PROVIDE COMPLETE ROOFING PACKAGE PER MANUFACTURE'S RECOMMENDATIONS.

F. GENERAL CONTRACTOR IS TO PROVIDE TEMPORARY PERIMETER GUARDRAIL TO COMPLY WITH CODE OF FEDERAL REGULATIONS 29 CFR 1926, SUBPART M (OSCA). GUARDRAIL TO BE 42" HEIGHT AND BE ABLE TO WITHSTAND 200 POUNDS AT TOP EDGE.

G. ACCESS TO MECHANICAL APPLIANCES IN UNDER-FLOOR AREAS, AND ON ROOFS OR ELEVATED STRUCTURES SHALL BE IN ACCORDANCE WITH THE CALIFORNIA MECHANICAL CODE. (1209.3,MC 904.10)

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FAX (951) 280-3822

FAST FOOD W/ DRIVE THRU #2
ROOF PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
12-14-16	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0134

DRAWING NO.
A1-2

M:\PLANS\Moreno_Valley_Cactus\CAD\PLOT Files\PEN16-0134 Jimmy Hung PLOTTED 12-13-17 1151.tif

EAST ELEVATION

SCALE: 1/4" = 1'-0" 1

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT.
4. ROOF TOP MECHANICAL UNITS
5. CORNICE
6. APPROXIMATE ROOF LINE
7. 4" BREAK METAL BASE.
8. ALUMINUM
9. 6" CONCRETE CURB
10. 6" ROUND CONCRETE FILLED STEEL BOLLARD.
11. STEEL AWNING ROD & CLEVIS

EXTERIOR FINISHES

STONE — VENEER STONE

STUCCO — 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 — COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE"

C-02 — COLOR: DUNN EDWARDS DEC6128 "SAND DUNE"

C-03 — COLOR: DUNN EDWARDS DEC758 " WHEATHERED BROWN" (HIGH GLOSS)

C-04 — COLOR TO BE SELECTED BY OWNER LATER

SOUTH ELEVATION

SCALE: 1/4" = 1'-0" 2

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Design Methods Interspace

FAST FOOD W/ DRIVE THRU #2
EXTERIOR ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
12-14-16	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0134

DRAWING NO.

A2-1

INFO-R:\Moreno_Valley_Cactus\CUP\CUP_Post-PT\PTA2-1.DWG, Jamie Hunge PLOTTED: 02-03-17 10:50:08

WEST ELEVATION

SCALE: 1/4" = 1'-0" 1

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT.
4. ROOF TOP MECHANICAL UNITS
5. CORNICE
6. APPROXIMATE ROOF LINE
7. 4" BREAK METAL BASE.
8. ALUMINUM
9. 6" CONCRETE CURB
10. 6" ROUND CONCRETE FILLED STEEL BOLLARD.
11. STEEL AWNING ROD & CLEVIS

EXTERIOR FINISHES

STONE VENEER STONE

STUCCO 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE"

C-02 COLOR: DUNN EDWARDS DEC6128 "SAND DUNE"

C-03 COLOR: DUNN EDWARDS DEC758 " WHEATHERED BROWN" (HIGH GLOSS)

C-04 COLOR TO BE SELECTED BY OWNER LATER

NORTH ELEVATION

SCALE: 1/4" = 1'-0" 2

224 SOUTH JOY STREET
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CORONA, CA 92878-1958

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FAX (951) 280-3832

Design Methods Professional

FAST FOOD W/ DRIVE THRU #2
EXTERIOR ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

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FLOOR PLAN

SCALE: 1/4" = 1'-0"

1

224 SOUTH JOY STREET
CORONA, CA 92879-1958
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FASTFOOD W/ DRIVE THRU #3
FLOOR PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

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RESTAURANT #2 AND #3 ROOF PLAN

SCALE: 1/4"=1'-0" 1

KEYED NOTES:

1. PLUMBING VENT.
2. DEPRESSED AREA @ ROOF DRAINS
3. LINES REPRESENT LIMITS OF CRICKETS FORMED BY TAPERED ROOF INSULATION (MIN. PITCH IS 1/4" PER FOOT)
4. LINE OF BUILDING BELOW
5. ROOF DRAIN AND OVERFLOW.
6. OVERFLOW DOWNSPOUT NOZZLE.
7. FOR ROOF SLOPE REFER TO STRUCTURAL DRAWINGS. 1/4 PER 12" MIN.
8. METAL COPING CAP.
9. ROOF ACCESS OPENING.

ROOFING

RF-1 TYPE 4 - PLY BUILT-UP "CLASS A" ROOFING
W/ 15 LB. BASE SHEET, 2 - LAYERS OF 11 LB. FELT & 90 LB. CAPSHEET
HOT MOP ALL AREAS
UL 790 (ASTM E108)
WARRANTY:
10 YEAR INSTALLATION AND LABOR.

GENERAL NOTES:

A. THE ROOF STRUCTURE SHALL NOT BE USED FOR STOCKPILING OF EQUIPMENT OR MATERIALS UNLESS APPROVED BY THE ARCHITECT, STRUCTURAL ENGINEER AND THE JOIST MANUFACTURER

B. THE ROOF ASSEMBLY SHALL COMPLY W/ UL-I 90 AND FM CLASS "A" RATINGS INCLUDING BUT NOT LIMITED TO COPINGS, FLASHING, PARAPET WALL COVERINGS, AND ENTIRE ROOF SURFACE.

C. COORDINATE ROOF ELEVATIONS WITH STRUCTURAL DRAWINGS. REFER SPECIFICATION SHEET FOR ROOF RELATED ITEMS, INCLUDING GUARANTEES, CURBS, FLASHING, AND ETC.

D. LOCATION OF ROOF TOP EQUIPMENT IS APPROXIMATE, FOR ACTUAL LOCATION OF ROOF TOP OPENINGS SEE STRUCTURAL FRAMING PLAN.

E. REFER TO ROOFING MANUFACTURE'S WRITTEN INSTRUCTIONS AND DETAILS FOR ROOFING SYSTEM INSTALLATION. CONTRACTOR TO PROVIDE COMPLETE ROOFING PACKAGE PER MANUFACTURE'S RECOMMENDATIONS.

F. GENERAL CONTRACTOR IS TO PROVIDE TEMPORARY PERIMETER GUARDRAIL TO COMPLY WITH CODE OF FEDERAL REGULATIONS 29 CFR 1926, SUBPART M (OSCA). GUARDRAIL TO BE 42" HEIGHT AND BE ABLE TO WITHSTAND 200 POUNDS AT TOP EDGE.

G. ACCESS TO MECHANICAL APPLIANCES IN UNDER-FLOOR AREAS, AND ON ROOFS OR ELEVATED STRUCTURES SHALL BE IN ACCORDANCE WITH THE CALIFORNIA MECHANICAL CODE. (1209.3,MC 904.10)

226 SOUTH JOY STREET
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FAX (951) 280-3822

Design Methods Professional Engineering

FAST FOOD W/ DRIVE THRU #3
ROOF PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

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AS SHOWN	

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SOUTH ELEVATION

SCALE: 1/4" = 1'-0" 1

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR LIGHT.
4. ROOF TOP MECHANICAL UNITS
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STONE VENEER STONE

STUCCO 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

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C-02 COLOR: DUNN EDWARDS DEC6128 "SAND DUNE"

C-03 COLOR: DUNN EDWARDS DEC758 " WHEATHERED BROWN" (HIGH GLOSS)

C-04 COLOR TO BE SELECTED BY OWNER LATER

WEST ELEVATION

SCALE: 1/4" = 1'-0" 2

224 SOUTH 10Y STREET
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FAST FOOD W/ DRIVE THRU #3
EXTERIOR ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

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DATE	JOB NO
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A2-1

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NORTH ELEVATION

SCALE: 1/4" = 1'-0" 1

(2) ALUMINUM STOREFRONT SYSTEM.
(3) EXTERIOR LIGHT.
(4) ROOF TOP MECHANICAL UNITS
(5) CORNICE
(6) APPROXIMATE ROOF LINE
(7) 4" BREAK METAL BASE.
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EAST ELEVATION

SCALE: 1/4" = 1'-0" 2

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FAST FOOD W/ DRIVE THRU #3
EXTERIOR ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

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DATE	JOB NO
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A2-2

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ALTA/ACSM SURVEY
FOR

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE, RECORDS OF RIVERSIDE COUNTY. LOCATED IN T.3S. R.4W. SEC. 2

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

TITLE REPORT

A PRELIMINARY TITLE REPORT WAS PREPARED BY COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015.

COMMONWEALTH LAND TITLE COMPANY
DOUG ABERNATHY – TITLE OFFICER
888 S. FIGUEROA ST, SUITE 2100
LOS ANGELES, CA 90017
(800) 432-0706

ENGINEER'S CERTIFICATE

TO: –

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4,7(A), 7(B)(1), 7(C), 8, 9, 10(A) (IF PARTY WALLS EXIST), 11(A) AND 20(A) OF TABLE A THEREOF.

THE FIELD WORK WAS COMPLETED ON –.

DATE _____

REGISTERED PROFESSIONAL ENGINEER
ANDREW J KOLTAVARY
No. 26571
Exp. 03/31/16
CIVIL
STATE OF CALIFORNIA

ANDREW J. KOLTAVARY, RCE 26571 EXP: 03/31/16

SCHEDULE B EXCEPTION

ITEM A IS TAXES RELATED
ITEMS B, C ARE LIEN RELATED RELATED
ITEMS 1, 13, 14 ARE RIGHTS RELATED
ITEM 2 IS COVENANT RELATED
ITEM 3 IS LAND RELATED
ITEMS 4 ARE TERMS AND PROVISIONS RELATED
ITEM 7 IS OWNERSHIP RELATED
ITEMS 8, 9 ARE DOCUMENT RELATED
ITEMS 10, 17 ARE MATTERS RELATED
ITEMS 11, 12 ARE DEED OF TRUST RELATED
ITEM 15 IS DISCREPANCIES RELATED

(5) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
GRANTED TO: GTE CALIFORNIA INCORPORATED, A CORPORATION
PURPOSE: FOR THE TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRICAL MEANS
RECORDED: APRIL 30, 1999 AS INSTRUMENT NO. 182988 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

SAID EASEMENT CONTAINS RESTRICTIONS ON THE USE, BY THE OWNERS OF SAID LAND, OF THE EASEMENT AREA AS SET OUT IN SAID EASEMENT DOCUMENT.

(6) AN EASEMENT FOR THE PURPOSES SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED MAP SHOWN BELOW.
MAP: PARCEL MAP NO. 27732
RECORDED: IN BOOK 195, PAGES 75 TO 79 INCLUSIVE OF PARCEL MAPS
EASEMENT PURPOSE: STORM DRAINAGE
AFFECTS: AS SHOWN ON SAID MAP

(7) THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM THE STREET OR HIGHWAY ABUTTING SAID LAND KNOWN AS PARCELS 9 AND 10 ABUTTING CACTUS AVENUE SUCH RIGHTS HAVING BEEN RELINQUISHED BY THE MAP OF SAID TRACT.
AFFECTS: AS SHOWN ON SAID MAP

UTILITY PROVIDERS:

WATER AND SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
P.O. BOX 8300
PERRIS, CA 92572-8300
(951) 928-3777

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
P.O BOX "G"
MONTEREY PARK, CA 91756
(800) 427-2000

ELECTRICITY:
SOUTHERN CALIFORNIA EDISON
P.O. BOX 6400
RANCHO CUCAMONGA, CA 91729
(800) 990-7788

TELEPHONE:
VERIZON
(866) 232-4282

BENCH MARK

BENCHMARK: M62-69 Elev. 1551.102 FEET
BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN

VICINITY MAP

GENERAL NOTES

1. SURVEYOR WAS RELIED UPON INFORMATION SUPPLIED IN THE CURRENT COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015. DISCLOSE RECORD EASEMENTS THAT BURDEN OR BENEFIT THIS PROPERTY
2. BUILDING SETBACK LINES SHOWN HEREON REFLECT THE INFORMATION AS EXPLAINED BY THE CITY REPRESENTATIVE INDICATED HEREON.
3. BY OBSERVATION NO CEMETERIES ARE KNOWN OR FOUND ON SUBJECT PROPERTY.
4. NO MONUMENTATION WAS FOUND OR SET AT THE PROPERTY CORNERS UNLESS NOTED OTHERWISE.
5. ASSESSORS PARCEL NUMBER FOR THIS PROPERTY IS 297-130-052-7; 053-8; 054-9.
6. SURVEYOR TAKES NO RESPONSIBILITY OF ITEMS OMITTED DUE TO A RESULT OF VISUAL OBSTRUCTIONS.

NOTES

1. FOR THE PURPOSES OF CLARITY, DETAILS NEAR THE PROPERTY LINES ARE NOT NECESSARILY DRAWN TO SCALE.
2. EASEMENTS PLOTTED PER RESEARCHED AND RECORD INFORMATION.
3. MONUMENTS FOUND AS NOTED.

FLOOD ZONE

NATIONAL FLOOD INSURANCE PROGRAM THE SUBJECT PROPERTY IS LOCATED WITHIN ZONE "X", PER F.I.R.M. MAP COMMUNITY PANEL NO. 06065C0745G EFFECTIVE DATE: AUGUST 28, 2008.

BASIS OF BEARING

THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

UNAUTHORIZED CHANGES & USES

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLAN MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARED OF THESE PLANS. IF THE CONTRACTOR DEVIATES FROM THESE PLANS PRIOR TO CONTACTING AND RECEIVING APPROVAL IN WRITING FROM THE DESIGN ENGINEER, THE CONTRACTOR SHALL BE LIABLE AND RESPONSIBLE FOR ALL DAMAGES AND CORRECTIONAL COSTS.

SHEET INDEX

ALTA-1	TITLE SHEET AND NOTES
ALTA-2	ALTA/ACSM SURVEY

PREPARED BY:
A.J. KOLTAVARY/CIVIL ENGINEERS
3 NINOS, IRVINE, CA
PHONE: (714) 624-9027
CIVIL ENGINEERING LAND SURVEYING ENVIRONMENTAL ENGINEERING

PREPARED FOR:
J N T MANAGEMENT CO.
139 RADIO ROAD
CORONA, CA 92879

TITLE SHEET
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION	DATE	JOB NO
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1 OF 2

DRAWING NO.
ALTA-1

ABBREVIATION

AB	AGGREGATE BASE	MH	MANHOLE
AC	ASPHALT	N&T	NAIL AND TAG
BW	BACK OF WALK	OH	OVERHEAD
CF	CURB FACE	PP	POWER POLE
CO	CLEANOUT	SD	STORM DRAIN
EG	EXISTING GROUND	SPK	SPIKE
FD	FOUND	TC	TOP OF CURB
FF	FINISH FLOOR	TW	TOP OF WALL
FG	FINISH GRADE	TB	TOP OF BERM
FL	FLOWLINE	WV	WATER VALVE
FS	FINISH SURFACE	W	WATER
HP	HIGH POINT	(R)	RECORD
HT	HEIGHT		
L&T	LEAD AND TAG		
RD	ROOF DRAIN		
CB	CATCH BASIN		

MONUMENTS

FD. MONUMENT OR AS NOTED

LEGEND

CENTER LINE
PROPERTY LINE
CHAIN-LINK FENCE
GAS LINE
SEWER LINE
WATER LINE
CONC. WALL
EXISTING LIGHT
EXISTING STREET LIGHT
EXISTING BACKFLOW PREVENTER
EXISTING WATER METER
EXISTING SEWER MANHOLE
POWER POLE
GUY WIRE ANCHOR
CATCH BASIN
FIRE HYDRANT
TRAFFIC SIGNAL
METER
TREE
PINE TREE
PALM
BUSH

GRAPHIC SCALE
(IN FEET)
1 INCH = 40 FT.

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A.L.T.A. SURVEY
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION

DATE	JOB NO
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1"=40'	TN

2 OF 2
DRAWING NO.
ALTA-2

FLOOR PLAN

SCALE: 1/4" = 1'-0"

1

224 SOUTH JOY STREET
CORONA, CA 92879-1958
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FASTFOOD W/ DRIVE THRU #2
FLOOR PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

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FLOOR PLAN

SCALE: 1/4" = 1'-0"

1

224 SOUTH JOY STREET
CORONA, CA 92879-1958

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FASTFOOD W/ DRIVE THRU #3
FLOOR PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

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AS SHOWN	

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DRAWING NO.

A1-1

ROOF PLAN

SCALE: 1/4"=1'-0" 1

KEYED NOTES:

1. PLUMBING VENT.
2. DEPRESSED AREA @ ROOF DRAINS
3. LINES REPRESENT LIMITS OF CRICKETS FORMED BY TAPERED ROOF INSULATION (MIN. PITCH IS 1/4" PER FOOT)
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5. ROOF DRAIN AND OVERFLOW.
6. OVERFLOW DOWNSPOUT NOZZLE.
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9. ROOF ACCESS OPENING.

ROOFING

RF-1 TYPE 4 - PLY BUILT-UP "CLASS A" ROOFING
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UL 790 (ASTM E108)
WARRANTY:
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Design Methods Engineering, Inc.

FAST FOOD W/ DRIVE THRU #2
ROOF PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

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RESTAURANT #2 AND #3 ROOF PLAN

SCALE: 1/4"=1'-0" 1

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ROOFING

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FAST FOOD W/ DRIVE THRU #3
ROOF PLAN

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
08-04-16	000.000
SCALE: AS SHOWN	DRAWN BY

PEN16-0134

DRAWING NO.
A1-2

INFO_P:\Moreno_Valley_Cactus\CUP - City\FF3\A1-2.DWG Motion Rows PLOTTED: 12-21-15 14:15:52

EAST ELEVATION

SCALE: 1/4" = 1'-0" 1

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT.
4. ROOF TOP MECHANICAL UNITS
5. CORNICE
6. APPROXIMATE ROOF LINE
7. 4" BREAK METAL BASE.
8. ALUMINUM
9. 6" CONCRETE CURB
10. 6" ROUND CONCRETE FILLED STEEL BOLLARD.
11. STEEL AWNING ROD & CLEVIS

EXTERIOR FINISHES

STONE — VENEER STONE

STUCCO — 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 — COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE"

C-02 — COLOR: DUNN EDWARDS DEC6128 "SAND DUNE"

C-03 — COLOR: DUNN EDWARDS DEC758 " WHEATHERED BROWN" (HIGH GLOSS)

C-04 — COLOR TO BE SELECTED BY OWNER LATER

SOUTH ELEVATION

SCALE: 1/4" = 1'-0" 2

224 SOUTH JOY STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
FAX (951) 280-3822

Design Methods Architecture

FAST FOOD W/ DRIVE THRU #2
EXTERIOR ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

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DATE	JOB NO
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DRAWING NO.

A2-1

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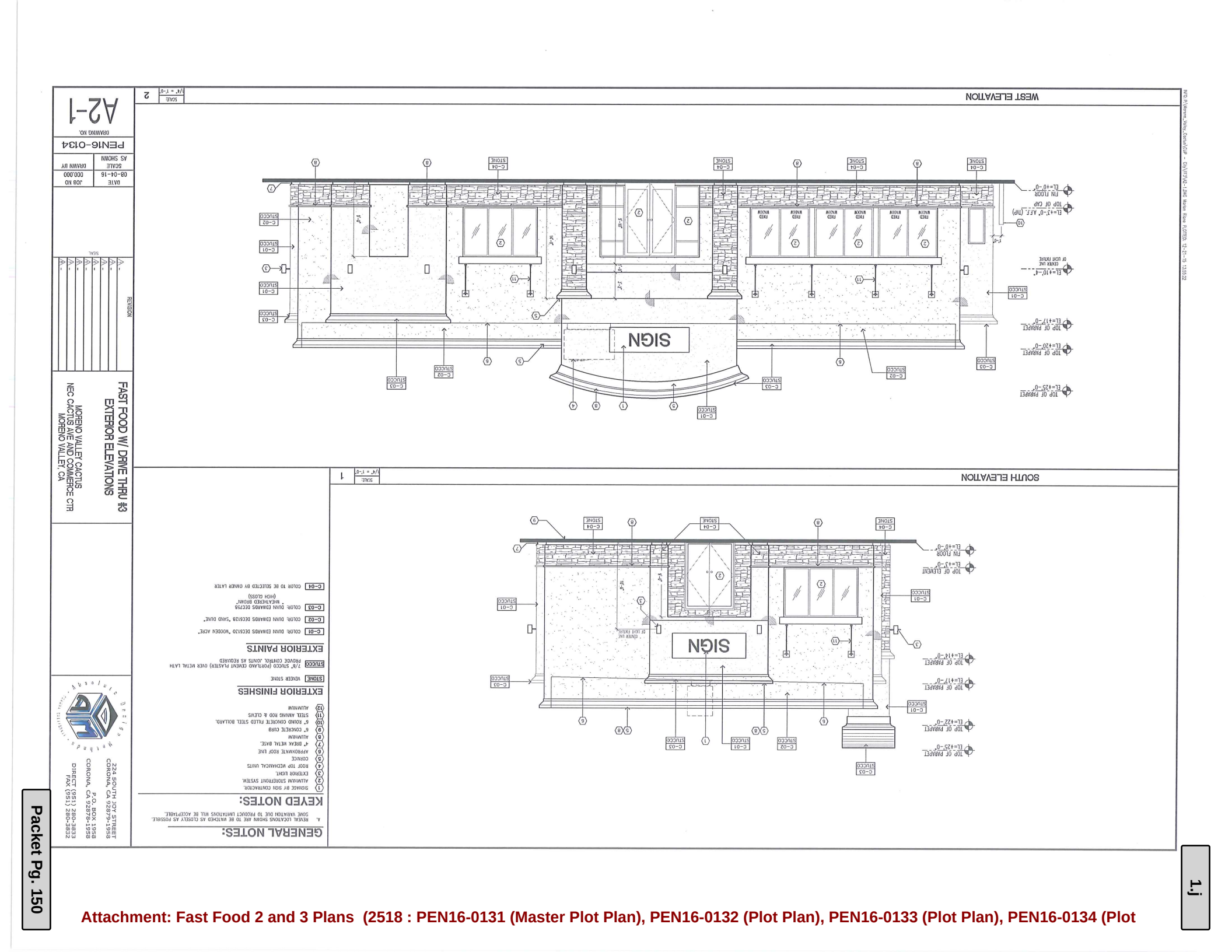
WEST ELEVATION
SCALE: 1/4" = 1'-0" 2
SOUTH ELEVATION
SCALE: 1/4" = 1'-0" 1
SIGN
STONE
STUCCO
TOP OF PARAPET
TOP OF CAP
TOP OF FLOOR
CENTER LINE OF LIGHT FIXTURE
GENERAL NOTES:
A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.
KEYED NOTES:
1 SIGNAGE BY SIGN CONTRACTOR.
2 ALUMINUM STOREFRONT SYSTEM.
3 EXTERIOR LIGHT.
4 ROOF TOP MECHANICAL UNITS
5 COPING
6 APPROXIMATE ROOF LINE
7 4" BREAK METAL BASE.
8 ALUMINUM
9 6" CONCRETE CURB
10 6" ROUND CONCRETE FILLED STEEL BOLLARD.
11 STEEL AWNING ROD & CLEVIS
12 ALUMINUM
EXTERIOR FINISHES
STONE VENEER STONE
STUCCO 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED
EXTERIOR PAINTS
C-01 COLOR: DUNN EDWARDS DEC610 "WOODEN ACRE"
C-02 COLOR: DUNN EDWARDS DEC619B "SAND DUNE"
C-03 COLOR: DUNN EDWARDS DEC758 "WEATHERED BROWN" (HIGH GLOSS)
C-04 COLOR TO BE SELECTED BY OWNER LATER
FAST FOOD W/ DRIVE THRU #3
EXTERIOR ELEVATIONS
MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA
REVISION
SEAL
DATE 08-04-16
JOB NO 000.000
DRAWN BY
SCALE AS SHOWN
PEN16-0134
DRAWING NO. A2-1
Architects Design Method
224 SOUTH JOY STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3833
FAX (951) 280-3832

WEST ELEVATION

SCALE: 1/4" = 1'-0" 1

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT.
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EXTERIOR FINISHES

STONE VENEER STONE

STUCCO 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 COLOR: DUNN EDWARDS DEC630 "WOODEN ACRE"

C-02 COLOR: DUNN EDWARDS DEC6128 "SAND DUNE"

C-03 COLOR: DUNN EDWARDS DEC758 " WHEATHERED BROWN" (HIGH GLOSS)

C-04 COLOR TO BE SELECTED BY OWNER LATER

NORTH ELEVATION

SCALE: 1/4" = 1'-0" 2

224 SOUTH 10TH STREET
CORONA, CA 92879-1958
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FAST FOOD W/ DRIVE THRU #2
EXTERIOR ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
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NORTH ELEVATION

SCALE: 1/4" = 1'-0" 1

2 ALUMINUM STOREFRONT SYSTEM.
3 EXTERIOR LIGHT.
4 ROOF TOP MECHANICAL UNITS
5 CORNICE
6 APPROXIMATE ROOF LINE
7 4" BREAK METAL BASE.
8 ALUMINUM
9 6" CONCRETE CURB
10 6" ROUND CONCRETE FILLED STEEL BOLLARD.
11 STEEL AWNING ROD & CLEVIS
12 ALUMINUM

EXTERIOR FINISHES

STONE VENEER STONE

STUCCO 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

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C-02 COLOR: DUNN EDWARDS DEC6128 "SAND DUNE"

C-03 COLOR: DUNN EDWARDS DEC758 " WHEATHERED BROWN" (HIGH GLOSS)

C-04 COLOR TO BE SELECTED BY OWNER LATER

EAST ELEVATION

SCALE: 1/4" = 1'-0" 2

224 SOUTH JOY STREET
CORONA, CA 92879-1958
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Design Methods Associates

FAST FOOD W/ DRIVE THRU #3
EXTERIOR ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
08-04-16	000.000
SCALE AS SHOWN	DRAWN BY

PEN16-0134

DRAWING NO.

A2-2

INFO: P:\Moreno_Valley_Cactus\CUP - DWG\FF3\A2-2.DWG Mayan Rios PLOTTED: 12-21-15 13:51:16

PROJECT INFORMATION

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY,

BUILDING DEPARTMENT NOTES

1. SPECIAL INSPECTIONS: REFER TO SHEET S-1 FOR LIST OF SPECIAL INSPECTIONS REQUIRED BY THE STRUCTURAL ENGINEER.
2. CONTACT CITY BUILDING INSPECTIONS DEPARTMENT TO SCHEDULE A SPECIAL INSPECTION MEETING PRIOR TO ISSUANCE OF THE BUILDING PERMIT.
3. OPEN WEB ROOF TRUSSES ARE DEFERRED. SUBMIT 2-COPIES OF THE ROOF TRUSSES TO THE ARCHITECT OR ENGINEER OF RECORD FOR THEIR SHOP DRAWINGS REVIEW STAMP. SUBMIT THE APPROVED TRUSS DRAWINGS TO THE CITY BUILDING INSPECTIONS DEPARTMENT FOR APPROVAL PRIOR TO REQUESTING THE FRAMING INSPECTION. ADDITIONAL PLAN REVIEW FEE MAYBE ASSESSED
4. EXIT SIGNS AND TACTILE EXIT SIGNS SHALL BE INSTALLED UNDER THE TENANT IMPROVEMENT PLANS. ADDRESSING WILL BE PROVIDED.
5. OUTSIDE SEATING AREA MUST INCLUDE SEATING FOR THE DISABLED. TO BE PROVIDED DURING TENANT BUILD OUT IF APPLICABLE
6. THE ITEMS LISTED BELOW ARE UNDER SEPARATE PERMITS:
   A. SIGN PACKAGE
   B. TRASH ENCLOSURE
   C. FENCE WALLS
7. OCCUPANT LOAD TO BE PROVIDED DURING BUILD OUT. OCCUPANCY OF THIS BUILDING SHALL BE WITHHELD UNTIL ALL DEFERRED ITEMS HAVE BEEN APPROVED FOR PERMITTING AND FINALED BY INSPECTION
8. NO HAZARDOUS MATERIAL WILL BE STORED AND/OR USED WITHIN THE BUILDING, WHICH WILL EXCEED THE QUANTITIES PER CODE
9. REST ROOMS FACILITIES THAT COMPLY WITH THE DISABLED ACCESS REQUIREMENTS WILL BE PROVIDED DURING TENANT BUILD OUT.
10. REQUIRED NUMBER OF PLUMBING FIXTURES PER CODE. ONE MINIMUM UNISEX FACILITY. NOT IN SCOPE, DETERMINED DURING TENANT BUILD OUT.
11. IF THE NUMBER OF EMPLOYEES EXCEED 4, AND BOTH SEXES WILL BE EMPLOYED, PROVIDE SEPARATE TOILET FACILITIES FOR MEN AND WOMEN.
12. A COMPLETE SMOKE DETECTION SYSTEM IS NOT IN SCOPE. A DEFERRED APPROVAL WILL BE SUBMITTED TO THE FIRE DEPARTMENT FOR REVIEW AND APPROVAL DURING TENANT BUILD OUT.

REFERENCE CODES

2016 CALIFORNIA BUILDING CODE (CBC), PART 2
BASED ON 2009 EDITION INTERNATIONAL BUILDING CODE (IBC)
2016 CALIFORNIA ELECTRICAL CODE, PART 3
BASED ON 2008 EDITION NFPA NATIONAL ELECTRICAL CODE (NEC)
2016 CALIFORNIA MECHANICAL CODE (CMC), PART 4
BASED ON 2009 EDITION IAPMO UNIFORM MECHANICAL CODE (UMC)
2016 CALIFORNIA PLUMBING CODE (CPC)
BASED ON 2009 EDITION IAPMO UNIFORM PLUMBING CODE (UPC)
2016 CALIFORNIA ENERGY CODE, PART 6
2016 CALIFORNIA FIRE CODE (CFC), PART 9
BASED ON 2009 EDITION OF ICC INTERNATIONAL FIRE CODE (IFC)
2016 CALIFORNIA GREEN BUILDING STANDARDS CODE, PART 11

ACCESSIBILITY CODE –AMERICAN DISABILITIES ACT
–CALIFORNIA TITLE 24

UTILITY PURVEYORS

POWER COMPANY
Southern California Edison Co.
TEL: (800) 950-2356

GAS COMPANY
Southern California Gas Co.
TEL: (800) 427-2200

WASTE MANAGEMENT
Waste Management
TEL: (800) 423-9985

PHONE COMPANY
Verizon
TEL: (800) 922-0204

WATER COMPANY
Eastern Municipal Water District
TEL: (951) 571-0203
REF: xx

SCHOOL DISTRICT
Moreno Valley Unified School District
TEL: (951) 571-7500 ext. xx
REF: xx

CONSULTANTS

OWNER / APPLICANT
MORENO VALLEY CACTUS CENTER
P.O. BOX 1958
CORONA, CA 92878
TEL: (951) 280-3833
FAX: (951) 280-3832
CONTACT: INO CRUZ
E-MAIL: ino@jmtmgmt.com

STRUCTURAL ENGINEER
SILOAM ENGINEERING
3333 BREA CANYON RD., SUITE 109
DIAMOND BAR, CALIF. 91765
TEL: (909) 598-8218
FAX: (909) 598-8758
CONTACT: MILES CHANG
E-MAIL: ebow@siloamInc.com

LANDSCAPE ARCHITECT
GENE HIRAO LANDSCAPE ARCHITECTURE
15 POSADA
IRVINE, CA. 92614
TEL: (949) 852-0748
FAX: (949) 660-7296
CONTACT: GENE HIRAO
E-MAIL: gh|h@cox.net

CIVIL ENGINEER
A.J. KOLTAVARY/CIVIL ENGINEERS
10005 MUIRLANDS BLVD., STE E.
IRVINE, CA 92614
TEL: (949) 624-9027

CONTACT: ANDREW KOLTAVARY
E-MAIL: andrew.k@ajice.com

TRAFFIC ENGINEER
HALL & FOREMAN
14297 CAJON AVENUE, SUITE 101
VICTORVILLE, CA 92392-2335
TEL: (760) 524-9100
FAX: (760) 524-9101
CONTACT: ROBERT A. KILPATRICK
E-MAIL:

GEOTECHNICAL-SOIL ENGINEER
SALEM ENGINEERING GROUP, INC.
4095 WEST SHAW AVENUE, SUITE 110
FRESNO, CA 93722
TEL: (559) 271-9700
FAX: (559) 275-0827
CONTACT: SAMMY SALEM
E-MAIL: sammy@salemenggroup.com

OCCUPANCY LOAD

CONVENIENCE STORE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	96 SQ.FT.	200	0.48=1
STORAGE	684 SQ.FT.	300	2.28=3
KITCHEN	226 SQ.FT.	200	1.13=2
SERVICE	1,500 SQ.FT.	15	100
			106 OCC. LOAD

FAST FOOD W/ DRIVE THRU #1

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	50 SQ.FT.	200	0.25=1
STORAGE	400 SQ.FT.	300	1.33=2
KITCHEN	610 SQ.FT.	200	3.05=4
SERVICE	1,050 SQ.FT.	15	70
			77 OCC. LOAD

FAST FOOD W/ DRIVE THRU #2

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

FAST FOOD W/ DRIVE THRU #3

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	130 SQ.FT.	200	0.65=1
STORAGE	500 SQ.FT.	300	1.67=2
KITCHEN	600 SQ.FT.	200	3
SERVICE	1,300 SQ.FT.	15	86.67=87
			93 OCC. LOAD

WAREHOUSE/OFFICE

USE	SQ. FT.	FACTOR	OCCUPANT LOAD
OFFICE	3,000 SQ.FT.	200	15
STORAGE	33,950 SQ.FT.	300	113
			128 OCC. LOAD

PROJECT DATA

SITE LOCATION:
NEC CACTUS AVENUE/COMMERCE CENTER DRIVE, MORENO VALLEY, CA

PROJECT INFORMATION

1 SITE

ASSESSORS PARCEL NO. 297-130-052, 053, 054

A. ZONING –EXISTING BPX
–PROPOSED BPX

B. LOT AREA (6.30 ACRES) 274,636 SQ.FT.
AREA, (CENTERLINE OF ROAD) (7.30 ACRES) 317,988 SQ.FT.
PAD 1 (2.93 ACRES) 127,714 SQ.FT.
PAD 2 (2.00 ACRES) 87,215 SQ.FT.
PAD 3 (1.37 ACRES) 59,702 SQ.FT.

2 BUILDING AREA

A. CONVENIENCE STORE	3,800 SQ.FT.
B. FAST FOOD W/ DRIVE THRU #1	2,800 SQ.FT.
C. CARWASH	2,080 SQ.FT.
D. FAST FOOD W/ DRIVE THRU #2	3,000 SQ.FT.
E. FAST FOOD W/ DRIVE THRU #3	3,000 SQ.FT.
F. OFFICE/WARHOUSE	36,950 SQ.FT.
TOTAL BUILDING AREA	51,630 SQ.FT.
G. 10-PUMP GASOLINE CANOPY	5,611 SQ.FT.
H. 4-PUMP DIESEL CANOPY	1,680 SQ.FT.
PERCENT OF LOT COVERAGE	16.24%

3 BUILDING

	OCCUPANCY	CONSTRUCTION	SPRINKLERED
A. CONVENIENCE STORE	M	V-B	YES
B. FAST FOOD W/ DRIVE THRU #1	A-2	V-B	YES
C. CARWASH	B	II-B	YES
D. FAST FOOD W/ DRIVE THRU #2	A-2	V-B	YES
E. FAST FOOD W/ DRIVE THRU #3	A-2	V-B	YES
F. OFFICE/WARHOUSE	B/S-1	V-B	YES
G. 10 DISPENSER GASOLINE CANOPY	M	II-B	NO
H. 4 DISPENSER DIESEL CANOPY	M	II-B	NO

4 BUILDING HEIGHT

A. CONVENIENCE STORE	22'-0"
B. FAST FOOD W/ DRIVE THRU #1	22'-0"
C. CARWASH	18'-0"
D. FAST FOOD W/ DRIVE THRU #2	22'-0"
E. FAST FOOD W/ DRIVE THRU #3	22'-0"
F. OFFICE/WARHOUSE	35'-0"
G. 10-PUMP GASOLINE CANOPY	19'-0"
H. 4-PUMP DIESEL CANOPY	19'-0"

5 PARKING

A. CONVENIENCE STORE (1/225 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 16 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 1 STALL
B. FAST FOOD W/ DRIVE THRU #1 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 26 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 1 STALLS
C 4-PUMP DIESEL CANOPY	= 0
D. FAST FOOD W/ DRIVE THRU #2 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
E. FAST FOOD W/ DRIVE THRU #3 (1/100 S.F.)	
1. REQUIRED STANDARD SPACES (9'x18')	= 28 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
F. OFFICE/WAREHOUSE	
1. REQUIRED STANDARD SPACES (9'x18')	= 37 STALLS
2. REQUIRED ACCESSIBLE SPACES (9'x18')	= 2 STALLS
G. CARWASH	= 0
H. 10-PUMP GASOLINE CANOPY	= 0
TOTAL PARKING SPACES REQUIRED	= 144 STALLS
TOTAL PARKING SPACES PROVIDED	= 162 STALLS
TOTAL ACCESSIBLE SPACES REQUIRED	= 8 STALLS
TOTAL ACCESSIBLE SPACES PROVIDED	= 8 STALLS

6 LANDSCAPING

A. LANDSCAPING PROVIDED (17.7%)–48,744 SQ.FT.

DESCRIPTION OF PROPOSED USE

24 HOUR RETAIL SALES OF GASOLINE & DIESEL, FOOD, BEVERAGES, BEER, WINE AND GROCERY ITEMS AND CARWASH SERVICES

INDEX OF DRAWINGS

SHEET NUMBER	DESCRIPTION	REV.	DATE
ARCHITECTURAL SITE DRAWINGS			
T1-1	TITLE SHEET	-	02/03/17
AS1-1	PRELIMINARY C-STORE- FF#1 SITE PLAN	-	02/03/17
AS2-1	TRASH ENCLOSURE DETAILS	-	02/03/17
PHS1-1	PHASING PLAN	-	02/03/17
CIVIL DRAWINGS			
1 OF 5	TITLE SHEET	-	02/03/17
2 OF 5	DETAILS	-	02/03/17
3 OF 5	PRELIMINARY GRADING PLAN	-	02/03/17
4 OF 5	PRELIMINARY GRADING PLAN AND STREET SECTIONS	-	02/03/17
5 OF 5	PRELIMINARY UTILITY PLAN	-	02/03/17
ALTA.1	TITLE SHEET	-	02/03/17
ALTA.2	ALTA SURVEY	-	02/03/17
LANDSCAPE DRAWINGS			
L-1	LANDSCAPE PLAN	-	02/03/17
ARCHITECTURAL DRAWINGS			
A1-1	CONVENIENCE STORE & FASTFOOD W/ DRIVE THRU #1 FLOOR PLAN	-	02/03/17
A1-2	CONVENIENCE STORE & FASTFOOD W/ DRIVE THRU #1 ROOF PLAN	-	02/03/17
A2-1	CONVENIENCE STORE & FASTFOOD W/ DRIVE THRU #1 EXT. ELEV.	-	02/03/17
A2-2	CONVENIENCE STORE & FASTFOOD W/ DRIVE THRU #1 EXT. ELEV.	-	02/03/17
CARWASH PLANS			
CWA1-1	CAR WASH FLOOR PLAN	-	02/03/17
CWA1-2	CAR WASH ROOF PLAN	-	02/03/17
CWA2-1	CAR WASH EXTERIOR ELEVATIONS	-	02/03/17
CWA2-2	CAR WASH EXTERIOR ELEVATIONS	-	02/03/17
GASOLINE CANOPY PLANS			
CA1-1	GASOLINE CANOPY SLAB PLAN	-	02/03/17
CA1-2	GASOLINE CANOPY REFLECTED CEILING PLAN	-	02/03/17
CA2-1	GASOLINE CANOPY ELEVATIONS	-	02/03/17
DIESEL CANOPY PLANS			
CAD1-1	DIESEL CANOPY SLAB PLAN	-	02/03/17
CAD1-2	DIESEL CANOPY REFLECTED CEILING PLAN	-	02/03/17
CAD2-1	DIESEL CANOPY ELEVATIONS	-	02/03/17

224 SOUTH JOY STREET
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CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DRIVE
MORENO VALLEY, CA 92553

CUP CASE NO. PEN16-0133
APN NO. 297-130-052, 053, 054

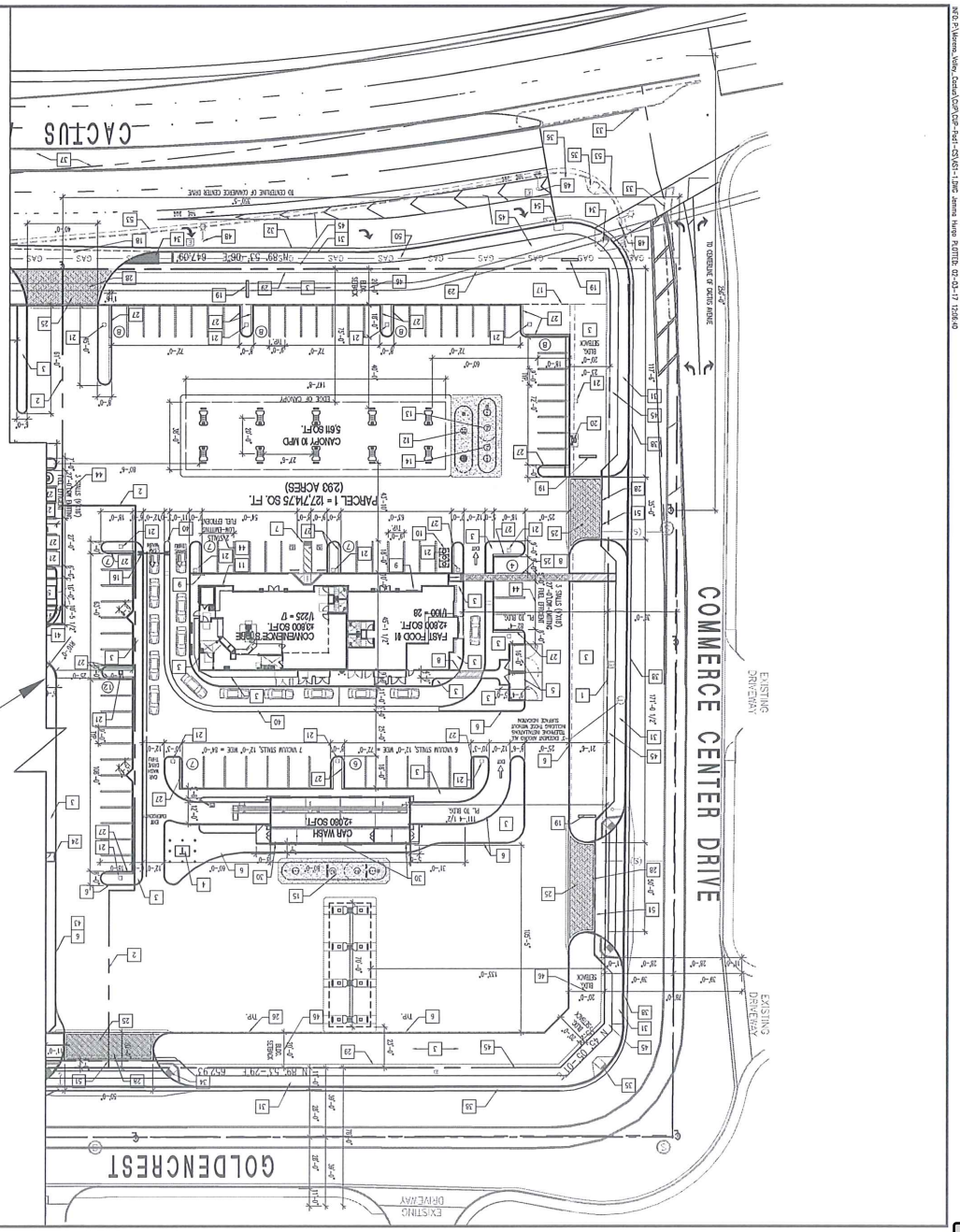
T1-1

VICINITY MAP

SYMBOLS LEGEND

SUBMITTAL DOCUMENTS FOR:
CONVENIENCE STORE WITH FUELING STATIONS & FAST FOOD W/ DRIVE-THRU

CACTUS COMMERCE, LP
NEC CACTUS AVENUE &
COMMERCE CENTER DR
MORENO VALLEY, CA 92553



INCD P:\Moreno_Valley_Cactus\Civil\CSP - Part1 - CSLV01 - 11x17.dwg Jemma Hunter PLOTTED: 02-03-17 12:56:40

274 SOUTH JOY STREET
CORONA, CA 92879-1958
P.O. BOX 1958
CORONA, CA 92878-1958
DIRECT (951) 280-3823
FAX (951) 280-3832

TRASH ENCLOSURE AND DETAIL

CACTUS COMMERCE LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0133

DRAWING NO.

AS2-1

INFO-P:\Moreno_Valley_Cactus\DWG\DUP-Post-CSTUDS-1.DWG Jamie Hardy PLOTTED: 02-03-17 10:27:41

224 SOUTH 10Y STREET
CORONA, CA 92879-1958
P.O. BOX 1958
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DIRECT (951) 280-3833
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PRELIMINARY
SITE PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
1"=30'-0"	

PEN16-0133

DRAWING NO.

PHS1-1

INFO: P:\Moreno_Valley_Cactus\GDP\GDP-Post-CSV\PHS1-1.DWG Jemma Nunpa PLOTTED: 02-03-17 12:12:07

PRELIMINARY GRADING PLAN
GAS STATION, RETAIL & WAREHOUSE

VICINITY MAP

THOMAS BROS. GUIDE
SAN BERNARDINO/RIVERSIDE,
YEAR 2005 PAGE 717, COORD. A-6

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

APN: 297-130-052, 53, AND 54

UTILITY COMPANY

WATER AND SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
P.O. BOX 8300
PERRIS, CA 92572-8300
(951) 928-3777

TELEPHONE:
VERIZON
(866) 232-4282

ELECTRICITY:
MORENO VALLEY ELECTRIC UTILITY
14331 FREDERICK STREET,
SUITE 2
MORENO VALLEY, CA 92553
(844)341-6469

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
P.O BOX "C"
MONTEREY PARK, CA 91756
(800) 427-2000

OWNER/APPLICANT INFORMATION

J&T MANAGEMENT, INC. — COMPANY NAME
INO CRUZ — CONTACT NAME
139 RADIO ROAD
CORONA, CA 92879 — ADDRESS
(951) 280-3833 — PHONE
INO@JNTMGMT.COM — E-MAIL
(951) 280-3832 — FAX

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

Underground Service Alert
Call: TOLL FREE
1-800
227-2600
WWW.CALL811.COM
TWO WORKING DAYS BEFORE YOU DIG

SALEM engineering group, inc.

ROUGH / CONCEPTUAL GRADING CALCULATIONS

EARTHWORK	QUANTITIES (CY) CUT	FILL
ROUGH GRADING	2,368	7,829
OVER-EXCAVATION WORK		
REMEDIAL WORK		
SHRINKAGE (___%)		
EARTHWORK QUANTITY SUBTOTAL		
IMPORT MATERIAL	5,461	
EXPORT MATERIAL		
EARTHWORK QUANTITY TOTAL		

ZONE BPX

SITE ACREAGE: 6.31 ACRES

AREA OF DISTURBANCE: 6.31 ACRES

TOPOGRAPH COMPLETED BY: A.J. KOLTAVARY/CE DATED: 10/20/2015

FLOOD ZONE: "X" PER F.I.R.M. MAP PANEL NO. 06065C0745G DATED: 08/28/2008

SHEET INDEX

DESCRIPTION	SHEET NO.
TITLE SHEET	1
DETAILS	2
PRELIMINARY GRADING PLAN	3
PRELIMINARY GRADING PLAN AND STREET SECTIONS	4
PRELIMINARY UTILITY PLAN	5

THE GRADING AND/OR IMPROVEMENT PLANS ARE APPROVED FOR A PERIOD OF TWO (2) YEARS FROM THE DATE SIGNED BY THE CITY ENGINEER. AFTER THE TWO (2) YEAR PERIOD HAS LAPSED, THE ENGINEER OF RECORD MAY BE REQUIRED TO SUBMIT AND PROCESS FOR CITY ENGINEER APPROVAL, UPDATED PLANS THAT COMPLY WITH THE MOST CURRENT CITY STANDARDS, PRACTICES AND POLICIES.

ABBREVIATION

AB	AGGREGATE BASE	MH	MANHOLE
AC	ASPHALT	N&T	NAIL AND TAG
BW	BACK OF WALK	OH	OVERHEAD
CF	CURB FACE	PP	POWER POLE
CO	CLEANOUT	SD	STORM DRAIN
EG	EXISTING GROUND	SPK	SPIKE
FD	FOUND	TC	TOP OF CURB
FF	FINISH FLOOR	TW	TOP OF WALL
FG	FINISH GRADE	TB	TOP OF BERM
FL	FLOWLINE	WV	WATER VALVE
FS	FINISH SURFACE	W	WATER
HP	HIGH POINT	(R)	RECORD
HT	HEIGHT	RD	ROOF DRAIN
L&T	LEAD AND TAG	CB	CATCH BASIN

GEOTECH AND GEOLOGIST CERTIFICATION

THIS GRADING PLAN HAS BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN CONFORMANCE WITH THE RECOMMENDATIONS AS OUTLINED IN THE FOLLOWNG SOILS AND GEOLOGICAL REPORT FOR THIS PROJECT.

REPORT NO: 3-215-1091

REPORT DATE: NOVEMBER 25, 2015

FIRM NAME: SALEM ENGINEERING

BY: ..... GEOTECHNICAL ENGINEER ..... DATE

OR

BY: ..... ENGINEERING GEOLOGIST ..... DATE

EASEMENTS

(5) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
GRANTED TO: GTE CALIFORNIA INCORPORATED, A CORPORATION
PURPOSE: FOR THE TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRICAL MEANS
RECORDED: APRIL 30, 1999 AS INSTRUMENT NO. 182988 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.
SAID EASEMENT CONTAINS RESTRICTIONS ON THE USE, BY THE OWNERS OF SAID LAND, OF THE EASEMENT AREA AS SET OUT IN SAID EASEMENT DOCUMENT.

(6) AN EASEMENT FOR THE PURPOSES SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED MAP SHOWN BELOW.
MAP: PARCEL MAP NO. 27732
RECORDED: IN BOOK 195, PAGES 75 TO 79 INCLUSIVE OF PARCEL MAPS
EASEMENT PURPOSE: STORM DRAINAGE
AFFECTS: AS SHOWN ON SAID MAP

(7) THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHT OF ACCESS TO OR FROM THE STREET OR HIGHWAY ABUTTING SAID LAND KWON AS PARCEL 9 AND 10 ABUTTING CACTUS AVENUE SUCH RIGHTS HAVING BEEN RELINQUISHED BY THE MAP OF SAID TRACT.

ENGINEER'S NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY LINES SHOWN AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

DECLARATION OF ENGINEER OF RECORD

I HEREBY DECLARE THAT THE DESIGN OF THE IMPROVEMENTS AS SHOWN ON THESE PLANS COMPLIES WITH PROFESSIONAL ENGINEERING STANDARDS AND PRACTICES. AS THE ENGINEER IN RESPONSIBLE CHARGE OF DESIGN OF THESE IMPROVEMENTS, I ASSUME FULL RESPONSIBLE CHARGE FOR SUCH DESIGN. I UNDERSTAND AND ACKNOWLEDGE THAT THE PLAN CHECK OF THESE PLANS BY THE CITY OF MORENO VALLEY IS A REVIEW FOR THE LIMITED PURPOSE OF ENSURING THAT THE PLANS COMPLY WITH CITY PROCEDURES, APPLICABLE POLICIES AND ORDINANCES. THE PLAN CHECK IS NOT A DETERMINATION OF THE TECHNICAL ADEQUACY OF THE DESIGN OF THE IMPROVEMENTS. SUCH PLAN CHECK DOES NOT, THEREFORE, RELIEVE ME OF MY RESPONSIBILITY FOR THE DESIGN OF THESE IMPROVEMENTS. AS ENGINEER OF RECORD (EOR), I AGREE TO INDEMNIFY AND HOLD THE CITY OF MORENO VALLEY, THE MORENO VALLEY HOUSING AUTHORITY, AND THE MORENO VALLEY COMMUNITY SERVICE DISTRICT (CSD), ITS OFFICERS, AGENTS AND EMPLOYEES HARMLESS FROM ANY AND ALL LIABILITY OF CLAIMS, DAMAGES OR INJURIES TO ANY PERSON OR PROPERTY WHICH MIGHT ARISE FROM THE NEGLIGENT ACTS, ERRORS OR OMISSIONS OF THE ENGINEER OF RECORD. I HAVE READ AND INFORMED THE PROJECT APPLICANT/DEVELOPER THAT APPROVAL OF THESE PLANS DO NOT RELIEVE THEM FROM THE REQUIREMENTS OF THE CONDITIONS OF APPROVAL (ATTACHED HEREIN OR IN OTHER APPROVED IMPROVEMENT PLANS).

I ALSO HEREBY DECLARE THAT I HAVE COMPARED THESE PLANS WITH ALL APPLICABLE ADA TITLE II AND TITLE 24 REQUIREMENTS FOR DISABILITY ACCESS FOR THIS PROJECT, AND THESE PLANS ARE IN FULL COMPLIANCE WITH THOSE REQUIREMENTS.

SALEM ENGINEERING GROUP, INC — COMPANY NAME
FRANCISCO V. MAGOS II — CONTACT NAME
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730 — ADDRESS
(909) 980-6455 — PHONE
FRANCISCO@SALEM.NET — E-MAIL
(909) 980-6435 — FAX

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF	INITIAL	DATE
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.	OFFICE		
		ENGINEERING DIVISION MANAGER		
		LAND DEVELOPMENT		
		PLANNING		
		TRANSPORTATION		
		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:
MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:
AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — FRANCISCO V. MAGOS II — No. 73,227 — Exp. 12/31/18 — CIVIL — STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

TITLE SHEET

SHEET 1 OF 5
CITY ID No

*BIORETENTION "ENGINEERED SOIL" LAYER SHALL BE MINIMUM 24" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.

**3/4" CRUSHED ROCK LAYER SHALL BE A MINIMUM OF 12" BUT MAY BE DEEPENED TO INCREASE THE INFILTRATION AND STORAGE ABILITY OF THE BASIN.

THE EFFECTIVE AREA OF THE BASIN SHALL BE LEVEL AND SHALL BE SIZED BASED ON ENCINITAS STORMWATER MANUAL CALCULATIONS. TYPICALLY, THE SURFACE AREA OF THE BIORETENTION BASIN IS 4% OF THE IMPERVIOUS AREA DRAINING TO IT.

BIO-RETENTION AREA CROSS SECTION — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 9

DRAIN BOX NOTES			
BOX SIZE	(A)	(B)	(C)
24-INCH x 24-INCH	22"	34"	ALHAMBRA FOUNDRY CO., LTD. (NARROW SLOT, 0.5" WIDE (MAX.) OPENINGS) TRUCK TRAFFIC CAST IRON GRATE AND FRAME (GALVANIZED) OR EQUIVALENT
36-INCH x 36-INCH	34"	46"	
(20)			

CONCRETE CATCH BASIN — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 5

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 3

3' WIDE CONCRETE SWALE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 2

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 11

BIO-RETENTION - LID ORIFICE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 8

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 4

2' WIDE CURB OPENNING — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 1

NONE — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 10

BIO-RETENTION - GRATE ASSEMBLY — 24"x36" SCALE: NTS / 11"x17" SCALE: NTS — 7

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

REVIEW BY CITY STAFF

	INITIAL	DATE
OFFICE		
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

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PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MACOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

DETAILS

SHEET 2 OF 5

CITY ID No

CONSTRUCTION NOTES

1	CONSTRUCT 6" CURB ONLY PER CITY STANDARD MVSI-121A-0
2	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL 2, SHEET 2
3	CONSTRUCT CURB & GUTTER PER CITY STANDARD MVSI-120A-0
4	2' WIDE CURB OPENING AT EVERY 20 FEET PER DETAIL 3, SHEET 2
5	CONSTRUCT BIO-RETENTION WITH UNDER DRAIN PER DETAIL 9, SHEET 2
6	CONSTRUCT 3" AC / 5" AB CAR TRAFFIC; 3.5" AC / 8.5" AB TRUCK TRAFFIC
7	JOIN EXISTING IMPROVEMENT, VERIFY ELEVATION PRIOR TO CONSTRUCTION.
8	INSTALL 24"X24" NDS DRAIN PER DETAIL 5, SHEET 2
9	CONSTRUCT LANDSCAPE PER LANDSCAPE PLAN
10	CONSTRUCT DRIVEWAY PER CITY STANDARD MVSI-112C-0
11	CONSTRUCT ADA RAMP
12	STRIPE PARKING STALL PER ARCHITECTURAL PLAN
13	STRIPE ADA PARKING STALL PER ADA STANDARD
14	CONSTRUCT PAVERS PER DETAIL 4, SHEET 2
15	PATH OF TRAVEL
16	CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLAN
17	2' STEP-OUT (TYP)
18	INSTALL 36"X36" NDS DRAIN PER DETAIL 5, SHEET 2
19	PAVEDRAIN SYSTEM PER DETAIL 10 & 11, SHEET 2
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING

LEGEND

- BOUNDARY LINE
- CENTER LINE
- PROPERTY LINE
- CHAIN-LINK FENCE
- GAS LINE
- SEWER LINE
- WATER LINE
- PROPOSED PERFORATED PIPE
- WATER VALVE
- THRUST BLOCK
- END CAP W/THRUST BLOCK
- BIO-RETENTION
- PATH OF TRAVEL
- EXISTING LIGHT
- EXISTING STREET LIGHT
- EXISTING BACKFLOW PREVENTER
- EXISTING WATER METER
- EXISTING SEWER MANHOLE
- POWER POLE
- GUY WIRE ANCHOR
- CATCH BASIN
- METER
- FIRE HYDRANT
- TRAFFIC SIGNAL
- PROPOSED FIRE LINE
- PROPOSED SEWER
- WATER SERVICE
- FIRE SERVICE
- PROPOSED STORMDRAIN
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED GRATE INLET
- PROPOSED STORMDRAIN CLEANOUT
- SEWER MANHOLE
- SEWER LATERAL
- SEWER CLEANOUT

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

REVIEW BY CITY STAFF	INITIAL	DATE
OFFICE		
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/
ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER
FRANCISCO V. MAGOS III
No. 75227
Exp. 12/31/18
CIVIL
STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS III, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING PLAN

SHEET 3 OF 5
CITY ID No

CONSTRUCTION NOTES	
1	CONSTRUCT 6" CURB ONLY PER CITY STANDARD MVSI-121A-0
2	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL 2, SHEET 2
3	CONSTRUCT CURB & GUTTER PER CITY STANDARD MVSI-120A-0
4	2' WIDE CURB OPENING AT EVERY 20 FEET PER DETAIL 3, SHEET 2
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7	JOIN EXISTING IMPROVEMENT. VERIFY ELEVATION PRIOR TO CONSTRUCTION.
8	INSTALL 24"X24" NDS DRAIN PER DETAIL 5, SHEET 2
9	CONSTRUCT LANDSCAPE PER LANDSCAPE PLAN
10	CONSTRUCT DRIVEWAY PER CITY STANDARD MVSI-112C-0
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12	STRIPE PARKING STALL PER ARCHITECTURAL PLAN
13	STRIPE ADA PARKING STALL PER ADA STANDARD
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17	2' STEP-OUT (TYP)
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19	PAVEDRAIN SYSTEM PER DETAIL 10 & 11, SHEET 2
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING

LEGEND

BOUNDARY LINE		POWER POLE	PP
CENTER LINE		GUY WIRE ANCHOR	
PROPERTY LINE		CATCH BASIN	
CHAIN-LINK FENCE	X X	METER	M
GAS LINE	GAS	FIRE HYDRANT	
SEWER LINE	S	TRAFFIC SIGNAL	
WATER LINE	W	PROPOSED FIRE LINE	F F
PROPOSED PERFORATED PIPE		PROPOSED SEWER	S
BIO-RETENTION		WATER SERVICE	W
PATH OF TRAVEL		FIRE SERVICE	F
SEWER LATERAL	SL	PROPOSED STORMDRAIN	SD
SEWER CLEANOUT	SCO	EXISTING RIGHT-OF-WAY	
EXISTING LIGHT		PROPOSED RIGHT-OF-WAY	
EXISTING STREET LIGHT		PROPOSED GRATE INLET	
EXISTING BACKFLOW PREVENTER	BP	PROPOSED STORMDRAIN CLEANOUT	CO
EXISTING WATER METER	WM	END CAP W/THRUST BLOCK	
EXISTING SEWER MANHOLE	SMH	WATER VALVE	
		THRUST BLOCK	

PRELIMINARY

PEN 16-0132
(PA16-0004)

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF	INITIAL	DATE
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75–79.	OFFICE		
		ENGINEERING DIVISION MANAGER		
		LAND DEVELOPMENT		
		PLANNING		
		TRANSPORTATION		
		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/
ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

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No. 75227
Exp. 12/31/18
CIVIL
STATE OF CALIFORNIA

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PHONE: (909) 980-6455
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UNDER THE SUPERVISION OF:

FRANCISCO V. MACOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING AND STREET SECTIONS

SHEET 4 OF 5
CITY ID No

CONSTRUCTION NOTES:

1. CONSTRUCT 8" PVC SEWER LINE
2. CONSTRUCT STANDARD MANHOLE PER SB-61
3. CONSTRUCT SEWER CLEANOUT PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. SB-52
4. CONSTRUCT SEWER LATERAL PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. SB-176
5. REMOVE AND RELOCATE EX. FIRE HYDRANT
6. CONSTRUCT 8" PVC PRIVATE WATER LINE
7. CONSTRUCT 8" PVC PRIVATE FIRE WATER LINE
8. CONSTRUCT FIRE HYDRANT ASSEMBLY PER EASTERN MUNICIPAL WATER DISTRICT B-357
9. CONSTRUCT 2" PVC WATER SERVICE CONNECTION PER EASTERN MUNICIPAL WATER DISTRICT B-658
10. CONSTRUCT THRUST BLOCKING PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG. B-407
11. CONSTRUCT BACKFLOW W/FDC PER EASTERN MUNICIPAL WATER DISTRICT STD. DWG B-597C
12. CONSTRUCT 6" PVC PRIVATE FIRE WATER LINE
13. CONSTRUCT 15" PVC STORMDRAIN LINE
14. CONSTRUCT BIORETENTION BASIN WITH PERFORATED 6" PVC PIPE PER COUNTY OF RIVERSIDE LID BMP MANUAL
15. CONSTRUCT 18" X 18" BROOKS CATCH BASIN OR APPROVED EQUAL
16. CONSTRUCT STORMDRAIN CLEANOUT PER EMWD SB-52

LEGEND

- END CAP W/THRUST BLOCK
- FIRE HYDRANT
- WATER VALVE
- THRUST BLOCK
- BACKFLOW PREVENTER W/FDC
- SEWER MANHOLE
- SEWER LATERAL
- SEWER CLEANOUT
- W — PROPOSED WATER
- F — F — PROPOSED FIRE LINE
- S — PROPOSED SEWER
- WATER SERVICE
- FIRE SERVICE
- SD — PROPOSED STORMDRAIN
- PROPOSED PERFORATED PIPE
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- GAS — EXISTING GAS LINE
- PROPOSED GRATE INLET
- CO — PROPOSED STORMDRAIN CLEANOUT

PRELIMINARY

BENCHMARK	BASIS OF BEARING	REVIEW BY CITY STAFF		
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.	OFFICE	INITIAL	DATE
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		PARKS AND COMMUNITY SERVICES		
		SPECIAL DISTRICTS		
		STORM WATER MANAGEMENT PROM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

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APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER — FRANCISCO V. MAGOS II — No. 75,227 — Exp. 12/31/18 — CIVIL — STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11630 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY UTILITY PLAN

SHEET 5 OF 5

CITY ID No

ALTA/ACSM SURVEY
FOR

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE, RECORDS OF RIVERSIDE COUNTY. LOCATED IN T.3S. R.4W. SEC. 2

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCELS 8, 9, AND 10 OF PARCEL MAP NO. 27732, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 195, PAGES 75 THROUGH 79 INCLUSIVE OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

TITLE REPORT

A PRELIMINARY TITLE REPORT WAS PREPARED BY COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015.

COMMONWEALTH LAND TITLE COMPANY
DOUG ABERNATHY – TITLE OFFICER
888 S. FIGUEROA ST, SUITE 2100
LOS ANGELES, CA 90017
(800) 432-0706

ENGINEER'S CERTIFICATE

TO: –

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4,7(A), 7(B)(1), 7(C), 8, 9, 10(A) (IF PARTY WALLS EXIST), 11(A) AND 20(A) OF TABLE A THEREOF.

THE FIELD WORK WAS COMPLETED ON –.

DATE _____

REGISTERED PROFESSIONAL ENGINEER ANDREW J. KOLTAVARY No. 26571 Exp. 03/31/16 CIVIL STATE OF CALIFORNIA

ANDREW J. KOLTAVARY, RCE 26571 EXP: 03/31/16

SCHEDULE B EXCEPTION

ITEM A IS TAXES RELATED
ITEMS B, C ARE LIEN RELATED RELATED
ITEMS 1, 13, 14 ARE RIGHTS RELATED
ITEM 2 IS COVENANT RELATED
ITEM 3 IS LAND RELATED
ITEMS 4 ARE TERMS AND PROVISIONS RELATED
ITEM 7 IS OWNERSHIP RELATED
ITEMS 8, 9 ARE DOCUMENT RELATED
ITEMS 10, 17 ARE MATTERS RELATED
ITEMS 11, 12 ARE DEED OF TRUST RELATED
ITEM 15 IS DISCREPANCIES RELATED

(5) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
GRANTED TO: GTE CALIFORNIA INCORPORATED, A CORPORATION
PURPOSE: FOR THE TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRICAL MEANS
RECORDED: APRIL 30, 1999 AS INSTRUMENT NO. 182988 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

SAID EASEMENT CONTAINS RESTRICTIONS ON THE USE, BY THE OWNERS OF SAID LAND, OF THE EASEMENT AREA AS SET OUT IN SAID EASEMENT DOCUMENT.

(6) AN EASEMENT FOR THE PURPOSES SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SHOWN OR AS OFFERED FOR DEDICATION ON THE RECORDED MAP SHOWN BELOW.
MAP: PARCEL MAP NO. 27732
RECORDED: IN BOOK 195, PAGES 75 TO 79 INCLUSIVE OF PARCEL MAPS
EASEMENT PURPOSE: STORM DRAINAGE
AFFECTS: AS SHOWN ON SAID MAP

(7) THE FACT THAT THE OWNERSHIP OF SAID LAND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM THE STREET OR HIGHWAY ABUTTING SAID LAND KNOWN AS PARCELS 9 AND 10 ABUTTING CACTUS AVENUE SUCH RIGHTS HAVING BEEN RELINQUISHED BY THE MAP OF SAID TRACT.
AFFECTS: AS SHOWN ON SAID MAP

UTILITY PROVIDERS:

WATER AND SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
P.O. BOX 8300
PERRIS, CA 92572-8300
(951) 928-3777

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
P.O BOX "C"
MONTEREY PARK, CA 91756
(800) 427-2000

ELECTRICITY:
SOUTHERN CALIFORNIA EDISON
P.O. BOX 6400
RANCHO CUCAMONGA, CA 91729
(800) 990-7788

TELEPHONE:
VERIZON
(866) 232-4282

BENCH MARK

BENCHMARK: M62-69 Elev. 1551.102 FEET

BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN

VICINITY MAP

GENERAL NOTES

1. SURVEYOR HAS RELIED UPON INFORMATION SUPPLIED IN THE CURRENT COMMONWEALTH LAND TITLE COMPANY FILE NO. 08014849 DATED JUNE 11, 2015. DISCLOSE RECORD EASEMENTS THAT BURDEN OR BENEFIT THIS PROPERTY
2. BUILDING SETBACK LINES SHOWN HEREON REFLECT THE INFORMATION AS EXPLAINED BY THE CITY REPRESENTATIVE INDICATED HEREON.
3. BY OBSERVATION NO CEMETERIES ARE KNOWN OR FOUND ON SUBJECT PROPERTY.
4. NO MONUMENTATION WAS FOUND OR SET AT THE PROPERTY CORNERS UNLESS NOTED OTHERWISE.
5. ASSESSORS PARCEL NUMBER FOR THIS PROPERTY IS 297-130-052-7; 053-8; 054-9.
6. SURVEYOR TAKES NO RESPONSIBILITY OF ITEMS OMITTED DUE TO A RESULT OF VISUAL OBSTRUCTIONS.

NOTES

1. FOR THE PURPOSES OF CLARITY, DETAILS NEAR THE PROPERTY LINES ARE NOT NECESSARILY DRAWN TO SCALE.
2. EASEMENTS PLOTTED PER RESEARCHED AND RECORD INFORMATION.
3. MONUMENTS FOUND AS NOTED.

FLOOD ZONE

NATIONAL FLOOD INSURANCE PROGRAM THE SUBJECT PROPERTY IS LOCATED WITHIN ZONE "X", PER F.I.R.M. MAP COMMUNITY PANEL NO. 06065C0745G EFFECTIVE DATE: AUGUST 28, 2008.

BASIS OF BEARING

THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

UNAUTHORIZED CHANGES & USES

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLAN MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARED OF THESE PLANS. IF THE CONTRACTOR DEVIATES FROM THESE PLANS PRIOR TO CONTACTING AND RECEIVING APPROVAL IN WRITING FROM THE DESIGN ENGINEER, THE CONTRACTOR SHALL BE LIABLE AND RESPONSIBLE FOR ALL DAMAGES AND CORRECTIONAL COSTS.

SHEET INDEX

ALTA-1	TITLE SHEET AND NOTES
ALTA-2	ALTA/ACSM SURVEY

PREPARED BY:
A.J. KOLTAVARY/CIVIL ENGINEERS
3 NINOS, IRVINE, CA
PHONE: (714) 624-9027
CIVIL ENGINEERING LAND SURVEYING ENVIRONMENTAL ENGINEERING

PREPARED FOR:
J N T MANAGEMENT CO.
139 RADIO ROAD
CORONA, CA 92879

TITLE SHEET
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION

DATE	JOB NO
8/4/15	.
SCALE	DRAWN BY
NTS	TN

1 OF 2

DRAWING NO.

ALTA-1

ABBREVIATION

AB	AGGREGATE BASE	MH	MANHOLE
AC	ASPHALT	N&T	NAIL AND TAG
BW	BACK OF WALK	OH	OVERHEAD
CF	CURB FACE	PP	POWER POLE
CO	CLEANOUT	SD	STORM DRAIN
EG	EXISTING GROUND	SPK	SPIKE
FD	FOUND	TC	TOP OF CURB
FF	FINISH FLOOR	TW	TOP OF WALL
FG	FINISH GRADE	TB	TOP OF BERM
FL	FLOWLINE	WV	WATER VALVE
FS	FINISH SURFACE	W	WATER
HP	HIGH POINT	(R)	RECORD
HT	HEIGHT		
L&T	LEAD AND TAG		
RD	ROOF DRAIN		
CB	CATCH BASIN		

MONUMENTS

FD. MONUMENT OR AS NOTED

LEGEND

CENTER LINE
PROPERTY LINE
CHAIN-LINK FENCE
GAS LINE
SEWER LINE
WATER LINE
CONC. WALL
EXISTING LIGHT
EXISTING STREET LIGHT
EXISTING BACKFLOW PREVENTER
EXISTING WATER METER
EXISTING SEWER MANHOLE
POWER POLE
GUY WIRE ANCHOR
CATCH BASIN
FIRE HYDRANT
TRAFFIC SIGNAL
METER
TREE
PINE TREE
PALM
BUSH

GRAPHIC SCALE
(IN FEET)
1 INCH = 40 FT.

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CIVIL ENGINEERING LAND SURVEYING ENVIRONMENTAL ENGINEERING

PREPARED FOR:
J N T MANAGEMENT CO.
139 RADIO ROAD
CORONA, CA 92879

A.L.T.A. SURVEY
FOR
PARCELS 8, 9 10 OF
PARCEL MAP NO. 27732
MORENO VALLEY, CA

REVISION

DATE	JOB NO
8/4/15	
SCALE	DRAWN BY
1"=40'	TN

2 OF 2

DRAWING NO.
ALTA-2

PLANT LEGEND

TREES

- RHUS LANCEA – AFRICAN SUMAC
  24" BOX
- CERCIDIUM FLORIDUM – BLUE PALO VERDE TREE
  24" BOX
- TRISTANIA CONFERTA – BRISBANE BOX
  24" BOX
- STREET TREE PER CITY OF MORENO VALLEY
  SIZE AS REQUIRED LOCATE AT 40' O.C. PER CITY

SHRUBS

- RAPHIOLEPSIS INDICA – BAY BREEZE INDIAN HAWTHORN
  5 GALLON
- LEUCOPHYLLUM FRUTESCENS 'GREEN CLOUD' TEXAS SILVERLEAF
  5 GALLON
- ESCALLONIA COMPAKTA – DWARF ESCALLONIA
  5 GALLON
- PHORMIUM TENAX – DARK DELIGHT
  5 GALLON
- PENNISETUM SETACEUM – FOUNTAIN GRASS
  5 GALLON
- CAESALPINIA GILLIESII – YELLOW BIRD OF PARADISE
  5 GALLON
- HESPERALOE PARVIFLORA – RED YUCCA
  5 GALLON
- VITUS GIRDIANA – DESERT GRAPE TRAIN TO TRASH ENCLOSURE WALL
  5 GALLON
- AGAVE VILORINIANA – OCTOPUS AGAVE
  5 GALLON
- DASYLIRION WHEELERI – DESERT SPOON
  5 GALLON
- HEMEROCALLIS SPECIES – DAY LILY 'DOUBLE YELLOW'
  5 GALLON
- JUSTICA SPICIGERA – MEXICAN HONEYSUCKLE
  5 GALLON

GROUND COVER

PROVIDE 3" LAYER OF 1/2" TO 3/4" D.C. CALIFORNIA GOLD AS TOP DRESSING FOR ALL SHRUB AREAS

- ROSA X 'NOARE' – RED CARPET ROSE
  1 GAL. AT 18" O.C. TRIANGULAR SPACING
- LANTANA MONTEVIDENSIS – PURPLE TRAILING LANTANA
  1 GAL. AT 18" O.C. TRIANGULAR SPACING

224 SOUTH JOY STREET
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CORONA, CA 92878-1958
DIRECT (951) 280-2833
FAX (951) 280-2832

Design Methods, Architecture, Effects, Palettes

PRELIMINARY
LANDCAPE PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	

PEN16-0133

DRAWING NO.

L-1

INFO: P:\Moreno_Valley_Cactus\Civil\CUP\CUP-Part1-CS1-L-1.DWG Jeanne Hirpa PLOTTED: 02-03-17 10:26:12

224 SOUTH JOY STREET
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CONVENIENCE STORE AND
FAST FOOD #1 FLOOR PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
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DRAWING NO.

A1-1

INFO (R:\Moreno_Valley_Cactus\CUP\CUP-Perf-CS\A1-1.DWG Jennie Hartje PLOTTED: 02-03-17 10:23:04

ROOF FRAMING NOTES

1. COORDINATE ALL DIMENSIONS WITH ARCHITECTURAL DRAWINGS. FINISH FLOOR = 0'-0" A.F.F. UNLESS NOTED OTHERWISE.
2. ⊧═══⊧ INDICATES STRUCTURAL WALL EXTENDING TO ROOF

GENERAL NOTES

A. REFER TO SPECIFICATION SHEETS A7.3 & A7.4 FOR ROOF SYSTEM, INCLUDING GUARANTEES, CURBS, FLASHING, AND ECT.
B. REFER TO ROOFING MANUFACTURERS WRITTEN INSTRUCTIONS AND DETAILS FOR ROOFING SYSTEM INSTALLATION. CONTRACTOR TO PROVIDE COMPLETE ROOFING PACKAGE PER MANUFACTURERS RECOMMENDATIONS.
C. ROOF ASSEMBLY SHALL COMPLY WITH U.L. I-90 AND FM CLASS "B" RATINGS INCLUDING COPING, FLASHING, PARAPET WALL, AND ROOF SYSTEM.
D. DO NOT STOCKPILE EQUIPMENT OR MATERIALS ON THE ROOF STRUCTURE, UNLESS APPROVED IN WRITING BY THE ARCHITECT, STRUCTURAL ENGINEER, AND THE TRUSS MANUFACTURER.
E. FOR EQUIPMENT COMPRESSOR & CONDENSER REFER TO EQUIPMENT PLAN ON SHEET Q1.1 AND EQUIPMENT SCHEDULE ON SHEET Q2.1.
F. GENERAL CONTRACTOR IS TO PROVIDE TEMPORARY CONSTRUCTION PERIMETER GUARDRAIL TO COMPLY WITH CODE OF FEDERAL REGULATIONS 29 CFT 1926, SUBPART M (OSCA), GUARDRAIL TO BE 42" HEIGHT AND BE ABLE TO WITHSTAND 200 POUNDS AT TOP EDGE.
H. REFER TO MECHANICAL PLANS FOR VENT PIPE PENETRATION AND CURB DETAILS. ALL ROOF PENETRATIONS SHALL BE THROUGH THE CURBS, UNLESS NOTED OTHERWISE.
I. PARAPET ADJACENT TO MECHANICAL EQUIPMENT / ROOF ACCESS TO BE MINIMUM 42" HIGH WHEN WITHIN 10 FEET OF ROOF EDGE.

KEYED NOTES

1. ROOF HATCH PER DETAIL 7/A4-1
2. ROOF DRAIN AND OVERFLOW
3. CANT STRIP PER DETAIL 8/A4-1
4. TAPERED INSULATION CRICKET
5. ROOFTOP UNIT, REFER TO MECHANICAL PLANS.
6. CONDENSER, REFER TO EQUIPMENT AND ELECTRICAL PLAN
7. EXHAUST FAN, REFER TO MECHANICAL PLANS
8. STEEL CANOPY BELOW
9. SATELLITE ON BALLASTED CURB
10. SHOP FORMED PRE-FINISHED METAL COPING, REFER TO DETAIL 1/A4-1
11. FACE OF EXTERIOR WALL BELOW
12. FACE OF PARAPET WALL
13. METAL LID FLASHING
14. STEEL CANOPY GUTTER
15. ROOF JACK, REFER TO MECHANICAL PLANS.
16. GAS WATER HEATER FLUE, REFER TO MECHANICAL PLANS.
17. CANOPY DOWNSPOUT
18. LINE OF TOWER ROOF
19. TOWER WALL
20. 30"x48" ACCESS DOOR

ROOFING

RF-1 REINFORCED MECHANICALLY FASTENED .045" THICK SINGLE-PLY EPDM MEMBRANE.
PRODUCT: FIRESTONE RUBBERGARD ECOWHITE ROOFING SYSTEM OR APPROVED
INSULATION PROTECTION BOARD: 7/16" OSB, PLYWOOD, OR EQUIVALENT.
ROOF INSULATION: RIGID POLYISOCYANURATE WITH A MINIMUM R-VALUE AS NOTED IN THE ENERGY CALCULATIONS. REFER TO SPECIFICATION SHEET A7-4 FOR ADDITIONAL COMPLIANCE REQUIREMENTS.

EQUIPMENT MAINTENANCE PATH

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Architecture · Engineering · Methods

CONVENIENCE STORE AND FAST FOOD #1 ROOF PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
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DRAWING NO.

A1-2

INFO: P:\Moreno_Valley_Cactus\Cad\Cad-Post-CS\A1-2.DWG Jemma Hurp PLOTTED: 02-03-17 10:24:48

EAST ELEVATION

SCALE: 1/4" = 1'-0" 1

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM, REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING ROD AND CLEVIS
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT
11. FOAM CAP/MOLDING
12. CORNICE
13. VINE TRELLIS

MATERIAL LEGEND

- STUCCO — ⅞" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
- S-FLEX — STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER; INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
- ALUM — CLEAR ANODIZED ALUMINUM (2"x2" EXTRUDED ALUM. BAND)
- STL-1 — STEEL AWNING
- P-1 — COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE".
- P-2 — COLOR: DUNN EDWARDS DEC6128 "SAND DUNE".
- P-3 — COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS).
- S-1 — STONE:

SOUTH ELEVATION

SCALE: 3/16"=1'-0" 2

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Design Methods · Assessing · Fitness Facilities

CONVENIENCE STORE AND FAST FOOD #1 ELEVATIONS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY INO

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DRAWING NO. A2-1

INFO: P:\Mpms_Vista_Cactus\Cup\Cup-Plot1-ES\02-17\PEN16-0133 Jpmms Hurdo PLOTTED: 02-03-17 10:25:36

WEST ELEVATION

SCALE: 1/4" = 1'-0" 1

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM, REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING ROD AND CLEVIS
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT
11. FOAM CAP/MOLDING
12. CORNICE
13. VINE TRELLIS

MATERIAL LEGEND

STUCCO	⅞" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
S-FLEX	STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER; INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
ALUM	CLEAR ANODIZED ALUMINUM (2"x2" EXTRUDED ALUM. BAND)
STL-1	STEEL AWNING
P-1	COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE".
P-2	COLOR: DUNN EDWARDS DEC6128 "SAND DUNE".
P-3	COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS).
S-1	STONE:

NORTH ELEVATION

SCALE: 3/16"=1'-0" 2

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Design Methods Architecture

CONVENIENCE STORE AND FAST FOOD #1 ELEVATIONS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY IHO

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DRAWING NO.

A2-2

INFO: P:\Moreno_Valley_Costco\Cad\Cad-Pad-ESV2-2.DWG Jemma Hurp PLOTTED: 02-03-17 10:26:12

A CARWASH FLOOR PLAN

SCALE: 1/4" = 1'-0"

KEYED NOTES:

1. 6" CONCRETE BOLLARD AT THIS LOCATION (TYP. OF 4)
2. PVC PIPE TO CLARIFIERS–SEE PLUMBING DWGS.
3. TRENCH DRAIN IN CONCRETE SLAB–SEE STRUCTURAL DWGS.
4. FLOOR DRAIN IN CONCRETE SLAB–SEE PLUMBING DWGS
5. NOT USED
6. WINDOW SYSTEM TO BE RECESSED 4" DEEP SEE DETAILS ON SHEET CW 5.0
7. 3070 LOUVERED METAL DOUBLE DOORS – SEE DETAILS ON SHEET CW 5.0 SHOWN ON SHEET CW 2.0 & 5.0
8. CARWASH KEYPAD BEYOND BY OTHERS PER CBC 11B-220.2
9. CARWASH MENU BOARD BEYOND BY OTHERS PER CBC 11B-216.1
10. CARWASH DRYER COUNT DOWN METER BY OTHERS
11. ROOF ACCESS HATCH AND LADDER SEE DETAIL 6/A 3.4
12. LINE OF 6" CURB SEE ARCHITECTURAL SITE PLAN AS 1

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Methods Design + Consulting

CAR WASH
FLOOR PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0133

DRAWING NO.

CWA1-1

INFO_P:\Moreno_Valley_Cactus\CUP\CUP-Plot1-25\DWG Jemma Nunpa PLOTTED: 02-03-17 10:31:25

B CARWASH ROOF PLAN

SCALE: 1/4" = 1'-0"

FLOOR FINISH LEGEND:

CON-1 BUILT-UP ROOFING SYSTEM SHALL BE THREE (3) LAYERS FIBERGLASS REINFORCED BUILT-UP ROOF USING MINERAL COATED CAP SHEET AND RESIN COATED SHEATHING, FIRE RETARDANT CLASS 'A' UL790 (ASTM E108) STANDARD. SEE STRUCTURAL DRAWINGS FOR SHEATHING.

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CAR WASH
FLOOR & ROOF PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
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DRAWING NO.

CWA1-2

INFO: P:\Moreno_Valley_Cactus\CAD\CUP-Pad1-4\5\CWA1-2.DWG Jemma Hunge PLOTTED: 02-03-17 10:31:53

WEST ELEVATION

SCALE: 1/4" = 1'-0" 1

NORTH ELEVATION

SCALE: 1/4" = 1'-0" 2

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM, REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT

MATERIAL LEGEND

STUCCO	⅞" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
S-FLEX	STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER; INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
ALUM	CLEAR ANODIZED ALUMINUM (2"x2" EXTRUDED ALUM. BAND)
STL-1	STEEL AWNING
P-1	COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE".
P-2	COLOR: DUNN EDWARDS DEC6128 "SAND DUNE".
P-3	COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS).
S-1	STONE:

226 SOUTH JOY STREET
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Methods Design Assistance

CAR WASH
EXTERIOR ELEVATIONS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0133

DRAWING NO.

CWA2-1

INFO_P:\Arena Volvo_Costco\CWP\CWP-Perf-DSV.DWG Jeanne Hung PLOTTED: 02-03-17 10:32:39

EAST ELEVATION — SCALE: 1/4" = 1'-0" — 1

SOUTH ELEVATION — SCALE: 1/4" = 1'-0" — 2

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM, REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT

MATERIAL LEGEND

STUCCO	⅞" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
S-FLEX	STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER; INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
ALUM	CLEAR ANODIZED ALUMINUM (2"x2" EXTRUDED ALUM. BAND)
STL-1	STEEL AWNING
P-1	COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE".
P-2	COLOR: DUNN EDWARDS DEC6128 "SAND DUNE".
P-3	COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS).
S-1	STONE:

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Design Methods, Materials, Process

CAR WASH
EXTERIOR ELEVATIONS

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NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

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DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0133

DRAWING NO.

CWA2-2

I:\PROJECTS\Cactus_Commerce_LP\Cactus_Commerce_LP_Moreno_Valley\CWA2-2.DWG Jemma Nunez PLOTTED: 02-03-17 10:33:24

01 CANOPY SLAB PLAN
SCALE: 3/16"=1'-0"

Notes:

1. DOWNSPOUTS ARE DESIGNED TO BE TIGHTLINED TO THE SITES UNDERGROUND STORM DRAINAGE SYSTEM.
2. DRIVE SLAB SHALL BE 6" THICK REINFORCED CONCRETE w/ #4 at 18"o.c. EACH WAY OVER 4" CRUSHED ROCK OR AS SPECIFIED IN SOILS REPORT. FINISH SHALL BE A MEDIUM BROOM PERPENDICULAR TO ISLAND LAYOUT w/ EXPANSION AND CONTROL JOINTS AS SHOWN.
3. CANOPY CONTRACTOR SHALL PROVIDE DOWNPOUTS AND CONDUITS FOR LIGHTING, SIGN, CCTV, SOLAR AND SATELITE IN COLUMNS WHERE SPECIFIED. COORDINATE WITH GENTERAL CONTRACTOR FOR EXACT LOCATION OF CONDUITS, AND HAND HOLES PRIOR TO FABRICATION.
4. SEE SHEET CA1-2 AND ELECTRICAL DRAWINGS FOR ADDITIONAL NOTES AND IN COLUMN ELECTRICAL CONDUIT INFORMATION.
5. GRADE BREAKS AT CONCRETE DRIVE SLAB SHALL OCCUR WITHIN DRIPLINE OF CANOPY.

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10 MPD CANOPY
SLAB PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY INO

PEN16-0133

DRAWING NO.
CA1-1

INFO: P:\Aarons_Valley_Cactus\CUP\CUP-Pad1-CSY\CA1-1.DWG dennis hurpe PLOTTED: 02-03-17 10:28:30

Canopy Reflected Ceiling Plan

SCALE: 3/16" = 1'-0"

ROOF PLAN

SCALE: 1/16" = 1'-0"

Safety System Plan

SCALE: 1/16" = 1'-0"

Schedule of In-Column Requirements by Canopy Mfr.:

1-A	3"ø DOWNSPOUT 1"ø CONDUIT FOR SECURITY SYSTEM
2-A	3"ø DOWNSPOUT 1"ø CONDUIT FOR LIGHTING
3-A	3"ø DOWNSPOUT 1"ø CONDUIT FOR SECURITY SYSTEM 1"ø CONDUIT FOR FUTURE SATELLITE
4-A	3"ø DOWNSPOUT 1"ø CONDUIT FOR LIGHTING
5-A	3"ø DOWNSPOUT 1"ø CONDUIT FOR LIGHTING
1-B	3"ø DOWNSPOUT 1"ø CONDUIT FOR FUTURE
2-B	3"ø DOWNSPOUT
3-B	3"ø DOWNSPOUT 1"ø CONDUIT FOR SPARE
4-B	3"ø DOWNSPOUT 1"ø CONDUIT FOR LIGHTING
5-B	3"ø DOWNSPOUT 1"ø CONDUIT FOR LIGHTING

ALL COLUMNS TO HAVE 1"ø CONDUIT FOR CCTV CAMERA DROPS PER DETAIL A/CA2-1

Canopy Ceiling and General Notes

1) ALL CEILING DECK SHALL BE 20 GA. EMBOSSED AND PREFINISHED WHITE ROLLED PANS WITH 3-INCH HIGH RIBS AT 16 INCHES O.C. PANELS SHALL BE WATERTIGHT INTERLOCKING SECTIONS CLIPPED TO CANOPY FRAME PER STRUCTURAL DWGS. OR PER MANUFACTURER'S REQUIREMENTS.

2) ALL EXPOSED METAL SURFACES UNDER CANOPY, INCLUDING BUT NOT LIMITED TO, CORNICES, RAINWATER LEADER COVERS AND COLUMN TRIM SHALL BE PRE FINISHED TO MATCH CEILING DECK.

3) CANOPY CONTRACTOR SHALL PROVIDE OPENINGS IN DECK FOR LIGHT FIXTURES WHICH SHALL BE FURNISHED BY OWNER AND INSTALLED BY GENERAL CONTRACTOR.

4) FASCIA GRAPHICS BACKING AND FLASHING SHALL BE PROVIDED BY CANOPY CONTRACTOR. ACM GRAPHICS, BLUE TRIM, SPARK ETC ARE PROVIDED BY ARCO'S GRAPHICS CONTRACTOR UNDER SEPARATE CONTRACT UNLESS CANOPY AND GRAPHICS CONTRACTOR ARE THE SAME ENTITY.

5) CANOPY CONTRACTOR IS RESPONSIBLE FOR ALL DRAINAGE AND OVERFLOW FOR CANOPY ROOF INCLUDING, BUT NOT LIMITED TO, GUTTERS, RAINWATER LEADERS, OVERFLOWS, DOWNSPOUTS AND SUITABLE CONNECTION STUBS AT COLUMN BASE WHERE G.C. SHALL THEN EXTEND TO THE SITE'S DRAINAGE SYSTEM. SEE CA1-1 NOTE #1.

6) THE CANOPY SHALL BE ERECTED IN TWO STAGES:

STAGE 1: CANOPY CONTRACTOR TO FINISH ANCHOR BOLTS AND TEMPLATES FOR GENERAL CONTRACTOR'S INSTALLATION PRIOR TO POURING FOUNDATIONS. WHEN FOUNDATIONS HAVE SET, CANOPY CONTRACTOR SHALL INSTALL COLUMNS AND SECURE THEM TO FOUNDATIONS. COLUMNS SHALL BE STABLE, PLUMB AND TRUE.

STAGE 2: AFTER DRIVE SLAB AND SURROUNDING GRADE IS EITHER PAVED OR STABLE BASE HAS BEEN INSTALLED, CANOPY CONTRACTOR SHALL COME BACK TO THE SITE TO COMPLETE THE CANOPY. CANOPY CONTRACTOR SHALL VERIFY THAT COLUMNS HAVE REMAINED PLUMB PRIOR TO COMMENCING CANOPY ROOF INSTALLATION.

7) ALL CONDUIT INSTALLED BY CANOPY CONTRACTOR SHALL HAVE PULL ROPES AND SHALL BE ACCESSIBLE TO GENERAL CONTRACTOR'S ELECTRICIAN TO MAKE CONNECTIONS. EACH END OF CONDUIT SHALL BE TAGGED WITH ROUTING OF CONDUIT RUN (I.E. SALES COUNTER TO CANOPY ROOF.)

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Methods Engineering

10 MPD CANOPY
REFLECTED CEILING PLAN

CACTUS COMMERCE, LP
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MORENO VALLEY, CA 92553

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DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	IHO

PEN16-0133

DRAWING NO.

CA1-2

INFO P:\Arcens_Valle_Cactus\CUP\CUP-Plot-CSCAN-2DWG Jemma Hurga PLOTTED: 02-03-17 10:28:59

01 WEST ELEVATION
SCALE: 3/16"= 1'-0"

02 EAST ELEVATION
SCALE: 3/16"= 1'-0"

KEYED NOTES:

1. A.C.M. FASCIA
2. PLASTIC BULLNOSE
3. ILLUMINATED SPARK LOGO ON A.C.M. BACKING BEYOND. SEE SITE PLAN FOR EXACT LOCATIONS
4. CCTV CAMERAS. EXACT LOCATIONS TO BE DETERMINED BY SECURITY CONTRACTOR
5. DISPENSER (TYP.)
6. BUMPERS (TYP.)
7. COLUMNS
8. STONE

EXTERIOR PAINTS

C-01	BACKING PREFINISHED "PEARLESCENT WHITE"
C-02	"ARCO BLUE" w/ ILLUMINATED REVEAL "POWDER BLUE"
C-03	PAINTED "PEARL WHITE"
C-04	PAINTED BLACK (TYP.)
C-05	STONE

03 SOUTH ELEVATION
SCALE: 3/16"= 1'-0"

04 NORTH ELEVATION
SCALE: 3/16"= 1'-0"

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10 MPD CANOPY
ELEVATIONS

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REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0133

DRAWING NO.

CA2-1

INFO P:\Arena_Vista_Costco\CAP\CAP-Plot-STD\CAD-13MS Jimmis Nurga PLOTTED: 02-03-17 10:29:39

1 Diesel Canopy Slab Plan

SCALE: 1/4" = 1'-0"

Schedule of In-Column Requirements by Mfr.:

A-1	3"ø DOWNSPOUT 1"ø CONDUIT FOR SECURITY SYSTEM
B-1	3"ø DOWNSPOUT 1"ø CONDUIT FOR LIGHTING
A-2	3"ø DOWNSPOUT 1"ø CONDUIT FOR FUTURE
B-2	3"ø DOWNSPOUT

COLUMN NOTE:
ALL COLUMNS TO HAVE 1"ø CONDUIT FOR CCTV CAMERA DROPS

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DIESEL CANOPY SLAB PLAN

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DATE	JOB NO
02-03-17	000.000
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AS SHOWN	INO

PEN16-0133

DRAWING NO.

CAD1-1

INFO: P:\Moreno_Valley_Cactus\CAD\CUP-Plot1-CS\CAD01-1.DWG Jemma Nuno PLOTTED: 02-03-17 10:30:05

1 Diesel Canopy Reflected Ceiling Plan

SCALE: 3/16" = 1'-0"

2 Roof Plan

SCALE: 3/16" = 1'-0"

2 Safety System Plan

SCALE: 3/16" = 1'-0"

Canopy Ceiling and General Notes

1) ALL CEILING DECK SHALL BE 20 GA. EMBOSSED AND PREFINISHED WHITE ROLLED PANS WITH 3-INCH HIGH RIBS AT 16 INCHES O.C. PANELS SHALL BE WATERTIGHT INTERLOCKING SECTIONS CLIPPED TO CANOPY FRAME PER STRUCTURAL DWGS. OR PER MANUFACTURER'S REQUIREMENTS.

2) ALL EXPOSED METAL SURFACES UNDER CANOPY, INCLUDING BUT NOT LIMITED TO, CORNICES, RAINWATER LEADER COVERS AND COLUMN TRIM SHALL BE PRE FINISHED TO MATCH CEILING DECK.

3) CANOPY CONTRACTOR SHALL PROVIDE OPENINGS IN DECK FOR LIGHT FIXTURES WHICH SHALL BE FURNISHED BY OWNER AND INSTALLED BY GENERAL CONTRACTOR.

4) FASCIA GRAPHICS BACKING AND FLASHING SHALL BE PROVIDED BY CANOPY CONTRACTOR. ACM GRAPHICS, BLUE TRIM, SPARK ETC ARE PROVIDED BY ARCO'S GRAPHICS CONTRACTOR UNDER SEPARATE CONTRACT UNLESS CANOPY AND GRAPHICS CONTRACTOR ARE THE SAME ENTITY.

5) CANOPY CONTRACTOR IS RESPONSIBLE FOR ALL DRAINAGE AND OVERFLOW FOR CANOPY ROOF INCLUDING, BUT NOT LIMITED TO, GUTTERS, RAINWATER LEADERS, OVERFLOWS, DOWNSPOUTS AND SUITABLE CONNECTION STUBS AT COLUMN BASE WHERE G.C. SHALL THEN EXTEND TO THE SITE'S DRAINAGE SYSTEM. SEE CA1-1 NOTE #1.

6) THE CANOPY SHALL BE ERECTED IN TWO STAGES:

STAGE 1: CANOPY CONTRACTOR TO FINISH ANCHOR BOLTS AND TEMPLATES FOR GENERAL CONTRACTOR'S INSTALLATION PRIOR TO POURING FOUNDATIONS. WHEN FOUNDATIONS HAVE SET, CANOPY CONTRACTOR SHALL INSTALL COLUMNS AND SECURE THEM TO FOUNDATIONS. COLUMNS SHALL BE STABLE, PLUMB AND TRUE.

STAGE 2: AFTER DRIVE SLAB AND SURROUNDING GRADE IS EITHER PAVED OR STABLE BASE HAS BEEN INSTALLED, CANOPY CONTRACTOR SHALL COME BACK TO THE SITE TO COMPLETE THE CANOPY. CANOPY CONTRACTOR SHALL VERIFY THAT COLUMNS HAVE REMAINED PLUMB PRIOR TO COMMENCING CANOPY ROOF INSTALLATION.

7) ALL CONDUIT INSTALLED BY CANOPY CONTRACTOR SHALL HAVE PULL ROPES AND SHALL BE ACCESSIBLE TO GENERAL CONTRACTOR'S ELECTRICIAN TO MAKE CONNECTIONS. EACH END OF CONDUIT SHALL BE TAGGED WITH ROUTING OF CONDUIT RUN (I.E. SALES COUNTER TO CANOPY ROOF.)

8) DOWNSPOUTS ARE DESIGNED TO BE TIGHTLINED TO THE SITES UNDERGROUND STORM DRAINAGE SYSTEM.

9) DRIVE SLAB SHALL BE 6" THICK REINFORCED CONCRETE w/ #4 at 18"o.c. EACH WAY OVER 4" CRUSHED ROCK OR AS SPECIFIED IN SOILS REPORT. FINISH SHALL BE A MEDIUM BROOM PERPENDICULAR TO ISLAND LAYOUT w/ EXPANSION AND CONTROL JOINTS AS SHOWN.

10) CANOPY CONTRACTOR SHALL PROVIDE DOWNPOUTS AND CONDUITS FOR LIGHTING, SIGN, CCTV, SOLAR AND SATELITE IN COLUMNS WHERE SPECIFIED. COORDINATE WITH GENTERAL CONTRACTOR FOR EXACT LOCATION OF CONDUITS, AND HAND HOLES PRIOR TO FABRICATION.

11) EACH PAIR OF ISLANDS HEIGHTS SHALL BE THE SAME.

12) ISLAND FORMS SHALL BE PAINTED BLACK.

13) PAYMENT ISLAND CASHIER (P.I.C.) UNITS ARE BASED ON GEN III FRONT LOAD DOUBLE SIDED UNITS. CASH ACCEPTING UNITS ONLY.

14) SEE SHEET CA1-2 AND ELECTRICAL DRAWINGS FOR ADDITIONAL NOTES AND IN COLUMN ELECTRICAL CONDUIT INFORMATION.

15) GRADE BREAKS AT CONCRETE DRIVE SLAB SHALL OCCUR WITHIN DRIPLINE OF CANOPY.

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DIESEL CANOPY
REFLECTED CEILING PLAN

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
02-03-17	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PEN16-0133

DRAWING NO.

CAD1-2

INFO: P:\Moreno_Valley_Cactus\CAD\PLOT-PLOT-CS\CAD1-2.DWG Jarrena Nunp PLOTTED: 02-03-17 10:30:30

01 — SIDE ELEVATION
SCALE: 1/4"= 1'-0"

NORTH ELEVATION

SCALE: 1/4"=1'-0" | 1

KEYED NOTES:

1. A.C.M. FASCIA
2. CANOPY DECKING
3. CCTV CAMERAS. EXACT LOCATIONS TO BE DETERMINED BY SECURITY CONTRACTOR
4. DISPENSER (TYP.)
5. BUMPERS (TYP.)
6. COLUMNS (TYP.)
7. DISPENSER PUMP NUMBER (TYP.)
8. CORNICE
9. STONE

EXTERIOR PAINTS

C-01	PAINTED WHITE
C-02	PAINTED "PEARL WHITE"
C-03	PAINTED BLACK (TYP.)
C-04	PAINTED "WARM GREY" (TYP.)

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Design Methods, Integrity, Effective Facilities

DIESEL CANOPY ELEVATIONS

CACTUS COMMERCE, LP
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MORENO VALLEY, CA 92553

REVISION

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02 — FRONT ELEVATION
SCALE: 1/4"= 1'-0"

WEST ELEVATION

SCALE: 1/4"=1'-0" | 2

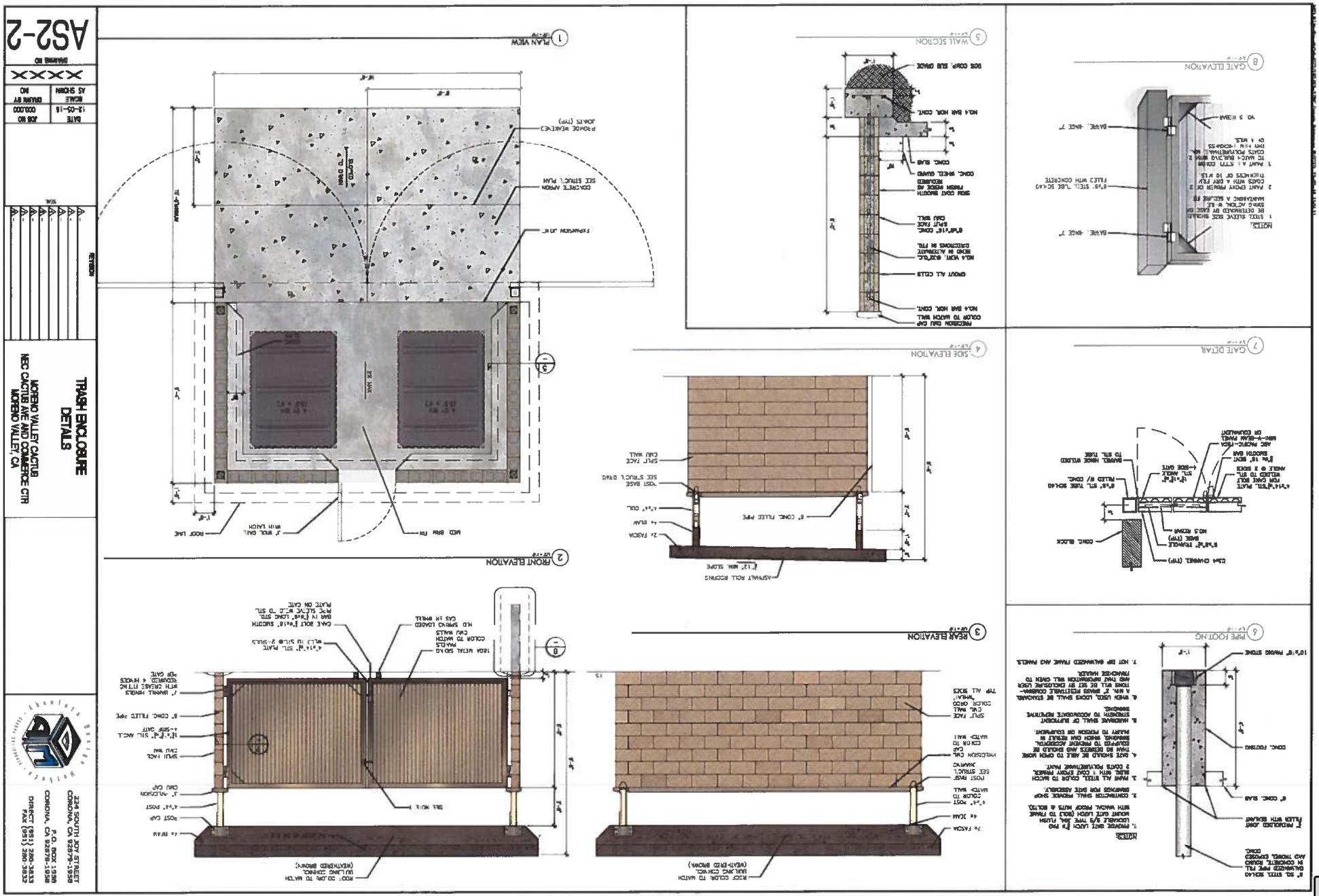
DATE	JOB NO
02-03-17	000.000
SCALE AS SHOWN	DRAWN BY INO

PEN16-0133

DRAWING NO.

CAD2-1

INFO: P:\Moreno_Valley_Cactus\CUP\CUP-Pad1-CS\CAD2-1.DWG Jemma Hurga PLOTTED: 02-03-17 10:30:57


AS2-2
TRASH ENCLOSURE DETAILS
MORENO VALLEY CACTUS
NEC CACTUS AVE. AND COMMERCE CTR
MORENO VALLEY, CA
PLAN VIEW
FRONT ELEVATION
REAR ELEVATION
SIDE ELEVATION
WALL SECTION
GATE ELEVATION
GATE DETAIL
PIPE FOOTING
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CORONA, CA 92879-1958

WEST ELEVATION

SCALE 1/16"=1'-0" 1

SOUTH ELEVATION

SCALE 1/16"=1'-0" 2

KEYED NOTES:

1. A.C.M. FASCIA
2. PLASTIC BULLNOSE
3. ILLUMINATED SPARK LOGO ON A.C.M. BACKING BEYOND. SEE SITE PLAN FOR EXACT LOCATIONS
4. CCTV CAMERAS. EXACT LOCATIONS TO BE DETERMINED BY SECURITY CONTRACTOR
5. DISPENSER (TYP.)
6. BUMPERS (TYP.)
7. COLUMNS

EXTERIOR PAINTS

- C-01 BACKING PRE-FINISHED "PEARLESCENT WHITE"
- C-02 "ARCO BLUE" w/ ILLUMINATED REVEAL "POWDER BLUE"
- C-03 PAINTED "PEARL WHITE"
- C-04 PAINTED BLACK (TYP.)

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10 MFD CANOPY ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
09-15-15	000.000
SCALE	DRAWN BY
AS SHOWN	INO

PA16-0005

DRAWING NO.

CA2-1

MFD P:\Moreno_Valley_Cactus\CA\CA2-1.DWG Jovana Vargas PLOTTED: 04-22-16 16:43:16

EAST ELEVATION

SCALE 1/4"=1'-0" 1

NORTH ELEVATION

SCALE 1/16"=1'-0" 2

KEYED NOTES:

1. A.C.M. FASCIA
2. PLASTIC BULLNOSE
3. ILLUMINATED SPARK LOGO ON A.C.M. BACKING BEYOND. SEE SITE PLAN FOR EXACT LOCATIONS
4. CCTV CAMERAS. EXACT LOCATIONS TO BE DETERMINED BY SECURITY CONTRACTOR
5. DISPENSER (TYP.)
6. BUMPERS (TYP.)
7. COLUMNS

EXTERIOR PAINTS

- C-01 BACKING PREFINISHED "PEARLESCENT WHITE"
- C-02 "APCO BLUE" w/ ILLUMINATED REVEAL "POWDER BLUE"
- C-03 PAINTED "PEARL WHITE"
- C-04 PAINTED BLACK (TYP.)

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10 MPD CANOPY ELEVATIONS

MORENO VALLEY CACTUS
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA

REVISION

SEAL

DATE	JOB NO
09-15-15	000 000
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AS SHOWN	RNO

PA16-0005

DRAWING NO.

CA2-2

RPD: P:\Moreno_Valley_Cactus\CA2\CA2-2.DWG Jeremy Harris PLOTTED: 09.22.16 18:37:52

Attachment: Color Elevations (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

MATERIAL BOARD

NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

STUCCO- "7/8" CEMENT PLASTER
TEXTURE- (FINE SAND FINISH)

S-FLEX- STUC-O-FLEX ELASTOMERIC ACRYLIC
FINISH - TEXTURE- FINE SAND FINISH

ALUM- "CLEAR ANODIZED ALUMINUM"

STL-1 "STEEL AWNING"

P-1 DUN EDWARDS DEC6130, " WOODED ACRE"

P-2 "DUNN EDWARDS DEC6128 "SAND DUNE"

P-3 DUNN EDWARDS DEC 758 " WHEATHETRED
WEATHERED BROWN" HIGH GLOSS"

VENNER STONE

SLATE TILE

CACTUS
COMMERCE, LP

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NORTH ELEVATION

SCALE 1/8" 1

KEYED NOTES:

1. A.C.M. FASCIA
2. CANOPY DECKING
3. CCTV CAMERAS. EXACT LOCATIONS TO BE DETERMINED BY SECURITY CONTRACTOR
4. DISPENSER (TYP.)
5. BUMPERS (TYP.)
6. COLUMNS (TYP.)
7. DISPENSER PUMP NUMBER (TYP.)
8. CORNICE

EXTERIOR PAINTS

C-01	PAINTED WHITE
C-02	PAINTED "PEARL WHITE"
C-03	PAINTED BLACK (TYP.)
C-04	PAINTED "WARM GREY" (TYP.)

WEST ELEVATION

SCALE 1/8" 2

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DIESEL CANOPY ELEVATIONS

CACTUS COMMERCE LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

DATE 08-04-16 | JOB NO 000.000
SCALE AS SHOWN | DRAWN BY IND

PA16-0005

DRAWING NO.
CAD2-1

EAST ELEVATION

SCALE N.T.S. 1

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM, REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING ROD AND CLEVIS
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT
11. FOAM CAP/MOLDING
12. CORNICE
13. VINE TRELLIS

MATERIAL LEGEND

- STUCCO — ¾" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS, TEXTURE: FINE SAND FINISH
- S-FLEX — STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER: INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
- ALUM — CLEAR ANODIZED ALUMINUM (2"x1" EXTRUDED ALUM. BAND)
- STL-1 — STEEL AWNING
- P-1 — COLOR: DUNN EDWARDS DEC613D "WOODEN ACRE"
- P-2 — COLOR: DUNN EDWARDS DEC612B "SAND DUNE"
- P-3 — COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS)
- S-1 — STONE

SOUTH ELEVATION

SCALE N.T.S. 2

224 SOUTH JOY STREET
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CONVENIENCE STORE AND FAST FOOD #1 ELEVATIONS

CACTUS COMMERCE, LP
NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
06-22-16	000 000
SCALE	DRAWN BY
AS SHOWN	CBD

PA16-0005

DRAWING NO.

A2-1

WEST ELEVATION

SCALE: 1/4" = 1'-0" 3

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM. REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING ROD AND CLEVIS
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT
11. FOAM CAP/MOLDING
12. CORNICE
13. VINE TRELLIS

MATERIAL LEGEND

- STUCCO — ⅞" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS, TEXTURE: FINE SAND FINISH
- S-FLEX — STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER. INSTALLED PER MFG. SPECIFICATIONS, TEXTURE: FINE SAND FINISH
- ALUM — CLEAR ANODIZED ALUMINUM (2"x2" EXTRUDED ALUM. BAND)
- STL-1 — STEEL AWNING
- P-1 — COLOR: DUNN EDWARDS DEC630 "WOODEN ACRE"
- P-2 — COLOR: DUNN EDWARDS DEC628 "SAND DUNE"
- P-3 — COLOR: DUNN EDWARDS DEC756 "WEATHERED BROWN" (HIGH GLOSS)
- S-1 — STONE.

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Design Network Associates

CONVENIENCE STORE AND FAST FOOD W/ ELEVATIONS

CACTUS COMMERCE LP
NEC CACTUS AVE AND COMMERCE CTR
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DRAWING NO.

A2-2

NORTH ELEVATION

SCALE: 1/4"=1'-0" 4

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EAST ELEVATION

SCALE: 3/8" = 1'-0" 1

SOUTH ELEVATION

SCALE: 3/8"=1'-0" 2

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM, REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT

MATERIAL LEGEND

- STUCCO — ⅞" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS, TEXTURE, FINE SAND FINISH
- S-FLEX — STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS, TEXTURE, FINE SAND FINISH
- ALUM — CLEAR ANODIZED ALUMINUM (3"x2" EXTRUDED ALUM. BAND)
- STL-1 — STEEL AWNING
- P-1 — COLOR: DUNN EDWARDS DEC8130 "WOODEN ACRE"
- P-2 — COLOR: DUNN EDWARDS DEC6128 "SAND DUNE"
- P-3 — COLOR: DUNN EDWARDS DEC758 "WEATHERED BROWN" (HIGH GLOSS)
- S-1 — STONE.

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CAR WASH
EXTERIOR ELEVATIONS

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CWA2-1

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WEST ELEVATION

SCALE: 1/4" = 1'-0" 3

GENERAL NOTES

REVEAL LOCATIONS IN FINISH SYSTEM SHOWN ARE TO ALIGN AS CLOSELY AS POSSIBLE TO ELEVATIONS.

KEYED NOTES

1. ALUMINUM ENTRANCE AND STOREFRONT SYSTEM, REFER TO SHEET A5.3 & SPECIFICATION.
2. STEEL AWNING
3. OVERFLOW DRAIN
4. WALL POSTER
5. INTERNALLY ILLUMINATED SURFACE MOUNTED WALL SIGN
6. WALL MOUNTED LED FIXTURE
7. WALL MOUNTED SIGN LIGHTING
8. ROOFTOP EQUIPMENT BEYOND
9. HORIZONTAL REVEAL
10. VERTICAL CONTROL JOINT

MATERIAL LEGEND

- STUCCO: ¾" CEMENT PLASTER, INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
- S-FLEX: STUC-O-FLEX ELASTOMERIC ACRYLIC FINISH OVER CEMENT PLASTER; INSTALLED PER MFG. SPECIFICATIONS; TEXTURE: FINE SAND FINISH
- ALUM: CLEAR ANODIZED ALUMINUM (2"x2" EXTRUDED ALUM. BAND)
- STL-1: STEEL AWNING
- P-1: COLOR: DUNN EDWARDS DEC6130 "WOODEN ACRE"
- P-2: COLOR: DUNN EDWARDS DEC6126 "SAND DUNE"
- P-3: COLOR: DUNN EDWARDS DEC758 "WEATHERED BROWN" (HIGH GLOSS).
- S-1: STONE.

NORTH ELEVATION

SCALE: 1/16" = 1'-0" 4

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CONVENIENCE STORE AND FAST FOOD #1 ELEVATIONS

CACTUS COMMERCE LP
NEC CACTUS AVE AND COMMERCE CTR
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CWA2-2

EAST ELEVATION — SCALE: 1/4" = 1'-0" — 1

SOUTH ELEVATION — SCALE: 1/4" = 1'-0" — 2

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT.
4. ROOF TOP MECHANICAL UNITS
5. CORNICE
6. APPROXIMATE ROOF LINE
7. 4" BREAK METAL BASE. ALUMINUM
8. 6" CONCRETE CURB
9. 8" ROUND CONCRETE FILLED STEEL BOLLARD
10. STEEL AWNING ROD & CLEVIS

EXTERIOR FINISHES

STONE — VENEER STONE

STUCCO — 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 — COLOR: DUNN EDWARDS DEC613D "WOODEN ACRE"

C-02 — COLOR: DUNN EDWARDS DEC612B "SAND DUNE"

C-03 — COLOR: DUNN EDWARDS DEC758 "WHEATHERED BROWN" (HIGH GLOSS)

C-04 — COLOR TO BE SELECTED BY OWNER LATER

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FAST FOOD W/ DRIVE THRU #2
EXTERIOR ELEVATIONS

CACTUS COMMERCE LP
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REVISION

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DATE	JOB NO
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DRAWING NO.

A2-1

WEST ELEVATION

SCALE 1/4" = 1'-0" 3

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT.
4. ROOF TOP MECHANICAL UNITS
5. CORNICE.
6. APPROXIMATE ROOF LINE
7. 4" BREAK METAL BASE.
8. ALUMINUM
9. 6" CONCRETE CURB
10. 6" ROUND CONCRETE FILLED STEEL BOLLARD.
11. STEEL AWNING ROD & CLEVIS

EXTERIOR FINISHES

STONE — VENEER STONE

STUCCO — 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 — COLOR: DUNN EDWARDS DEC630 "WOODEN ACRE"

C-02 — COLOR: DUNN EDWARDS DEC628 "SAND DUNE"

C-03 — COLOR: DUNN EDWARDS DEC758 "WEATHERED BROWN" (HIGH GLOSS)

C-04 — COLOR TO BE SELECTED BY OWNER LATER

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FAST FOOD W/ DRIVE THRU #2
EXTERIOR ELEVATIONS

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REVISION

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A2-2

NORTH ELEVATION

SCALE 3/16"=1'-0" 4

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SOUTH ELEVATION

SCALE 1/4" = 1'-0" 1

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR.
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT.
4. ROOF TOP MECHANICAL UNITS
5. CORNICE
6. APPROXIMATE ROOF LINE
7. 4" BREAK METAL BASE. ALUMINUM
8. 6" CONCRETE CURB
9. 6" ROUND CONCRETE FILLED STEEL BOLLARD.
10. STEEL AWNING ROD & CLEVIS

EXTERIOR FINISHES

STONE VENEER STONE

STUCCO 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 COLOR: DUNN EDWARDS DEC813O "WOODEN ACRE"

C-02 COLOR: DUNN EDWARDS DEC812B "SAND DUNE"

C-03 COLOR: DUNN EDWARDS DEC758 "WEATHERED BROWN" (HIGH GLOSS)

C-04 COLOR TO BE SELECTED BY OWNER LATER

WEST ELEVATION

SCALE 1/4"=1'-0" 2

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FAST FOOD W/ DRIVE THRU #3
EXTERIOR ELEVATIONS

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NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

SEAL

DATE	JOB NO
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NORTH ELEVATION

SCALE 1/4" = 1'-0" 3

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. SIGNAGE BY SIGN CONTRACTOR
2. ALUMINUM STOREFRONT SYSTEM.
3. EXTERIOR WALL LIGHT
4. ROOF TOP MECHANICAL UNITS
5. CORNICE
6. APPROXIMATE ROOF LINE
7. 4" BREAK METAL BASE. ALUMINUM
8. 6" CONCRETE CURB
9. 6" ROUND CONCRETE FILLED STEEL BOLLARD.
10. STEEL AWNING ROD & CLEVIS

EXTERIOR FINISHES

STONE VENEER STONE

STUCCO 7/8" STUCCO (PORTLAND CEMENT PLASTER) OVER METAL LATH PROVIDE CONTROL JOINTS AS REQUIRED

EXTERIOR PAINTS

C-01 COLOR: DUNN EDWARDS DEC613O "WOODEN ACRE"

C-02 COLOR: DUNN EDWARDS DEC812B "SAND DUNE"

C-03 COLOR: DUNN EDWARDS DEC758 "WEATHERED BROWN" (HIGH GLOSS)

C-04 COLOR TO BE SELECTED BY OWNER LATER

EAST ELEVATION

SCALE 1/4" = 1'-0" 4

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FAST FOOD W/ DRIVE THRU #3
EXTERIOR ELEVATIONS

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DRAWING NO.
A2-2

NORTH ELEVATION — SCALE: 1/8" = 1'-0" — 1

EAST ELEVATION — SCALE: 1/8" = 1'-0" — 2

EXTERIOR PAINTS

C-01	COLOR: CLEAR ANODIZED ALUMINUM FINISH
C-02	COLOR: BP PEARL KI C 09 - SEMI-GLOSS
C-03	COLOR: ARCO DEEP PEARL KI 4216-0200 - SEMI-GLOSS

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. ALUMINUM STOREFRONT SYSTEM — C-01
2. CONCRETE TILT-UP PANEL — C-02
3. PREMANUFACTURED COPING CAP — C-03
4. APPROXIMATE ROOF LINE
5. ROOF TOP MECHANICAL UNITS
6. CANOPY
7. EXTERIOR LIGHT, REFER TO LIGHTING PLAN SHEET E.1.3
8. 1" REVEAL
9. PANEL JOINT
10. 3'-0"x7'-0" HM DOOR
11. 9'-0"x10'-0" ROLL-UP DOOR
12. DOCK BUMPERS
13. 6'-0" HIGH CMU WALL
14. CONCRETE CURB AND CONCRETE WALK.
15. 3'-8" HIGH CMU WALL
16. 14'-0"x10'-0" ROLL-UP DOOR
17. FOAM CORNICE
18. SLATE TILES
19. 3/4" RECESS

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WAREHOUSE
EXTERIOR ELEVATIONS

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NEC CACTUS AVE AND COMMERCE CTR
MORENO VALLEY, CA 92553

REVISION

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SOUTH ELEVATION — SCALE: 1/8" = 1'-0" — 1

WEST ELEVATION — SCALE: 1/8" = 1'-0" — 2

EXTERIOR PAINTS

C-01	COLOR: CLEAR ANODIZED ALUMINUM FINISH
C-02	COLOR: BP PEARL KO C.09 - SEMI-GLOSS
C-03	COLOR: ARCO DEEP PEARL KO 4218-8200 - SEMI-GLOSS

GENERAL NOTES:

A. REVEAL LOCATIONS SHOWN ARE TO BE MATCHED AS CLOSELY AS POSSIBLE. SOME VARIATION DUE TO PRODUCT LIMITATIONS WILL BE ACCEPTABLE.

KEYED NOTES:

1. ALUMINUM STOREFRONT SYSTEM — C-01
2. CONCRETE TILT-UP PANEL — C-02
3. PREMANUFACTURED COPING CAP — C-03
4. APPROXIMATE ROOF LINE
5. ROOF TOP MECHANICAL UNITS
6. CANOPY
7. EXTERIOR LIGHT. REFER TO LIGHTING PLAN SHEET E1.3
8. 1" REVEAL
9. PANEL JOINT
10. 3'-0"x7'-0" HM DOOR
11. 8'-0"x10'-0" ROLL-UP DOOR
12. DOCK BUMPERS
13. 6'-0" HIGH CMU WALL
14. CONCRETE CURB AND CONCRETE WALK
15. 3'-8" HIGH CMU WALL
16. 14'-0"x10'-0" ROLL-UP DOOR
17. FOAM CORNICE
18. SLATE TILES
19. 3/4" RECESS

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WAREHOUSE
EXTERIOR ELEVATIONS

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DRAWING NO.

A2-2

AIRPORT LAND USE COMMISSION
RIVERSIDE COUNTY

RCALUC

CHAIR
Simon Housman
Rancho Mirage

VICE CHAIRMAN
Rod Ballance
Riverside

COMMISSIONERS

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Riverside

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STAFF

Director
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John Guerin
Russell Brady
Barbara Santos

County Administrative Center
4080 Lemon St., 14th Floor.
Riverside, CA 92501
(951) 955-5132

www.rcaluc.org

October 19, 2015

Mr. Gabriel Diaz, Associate Planner
City of Moreno Valley Community Development Department/Planning Division
14177 Frederick Street
P. O. Box 88005
Moreno Valley, CA 92552

RE: AIRPORT LAND USE COMMISSION (ALUC) DEVELOPMENT REVIEW
File No.: ZAP1135MA15
Related File No.: PA15-0032 (Master Plot Plan)
APNs: 297-130-052; 297-130-053; 297-130-054

Dear Mr. Diaz:

On October 8, 2015, the Riverside County Airport Land Use Commission (ALUC) found City of Moreno Valley Planning Case No. PA15-0032 (Master Plot Plan), a proposal to develop and operate a 48,140 square foot industrial warehouse (including 4,000 square feet of office space), a gasoline and diesel service station with 14 pumps, a 3,800 square foot convenience store, three fast-food restaurants with a combined gross floor area of 9,200 square feet, and a car wash on 6.31 acres located northerly of Cactus Avenue, easterly of Commerce Center Drive, and southerly of Goldencrest Drive in the City of Moreno Valley, **CONSISTENT** with the 2014 March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan, subject to the following conditions.

CONDITIONS:

1. Any outdoor lighting installed shall be hooded or shielded to prevent either the spillage of lumens or reflection into the sky. Outdoor lighting shall be downward facing.

2. The following uses shall be prohibited:

   (a) Any use which would direct a steady light or flashing light of red, white, green, or amber colors associated with airport operations toward an aircraft engaged in an initial straight climb following takeoff or toward an aircraft engaged in a straight final approach toward a landing at an airport, other than an FAA-approved navigational signal light or visual approach slope indicator.

   (b) Any use which would cause sunlight to be reflected towards an aircraft engaged in an initial straight climb following takeoff or towards an aircraft engaged in a straight final approach towards a landing at an airport.

   (c) Any use which would generate smoke or water vapor or which would attract large concentrations of birds, or which may otherwise affect safe air navigation within the area. (Such uses include landscaping utilizing water features, aquaculture, production of cereal grains, sunflower, and row crops, composting operations,

1.m

Attachment: Airport Land Use Commission Letter (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Packet Pg. 195

trash transfer stations that are open on one or more sides, recycling centers containing putrescible wastes, construction and demolition debris facilities, fly ash disposal, and incinerators.)

(d) Any use which would generate electrical interference that may be detrimental to the operation of aircraft and/or aircraft instrumentation.

(e) Children's schools, day care centers, libraries, hospitals, skilled nursing and care facilities, congregate care facilities, hotels/motels, places of assembly, noise sensitive outdoor nonresidential uses, and hazards to flight.

3. Prior to issuance of any building permits, the landowner shall convey and have recorded an avigation easement to the March Inland Port Airport Authority. Contact March Joint Powers Authority at (951) 656-7000 for additional information.

4. The attached notice shall be given to all prospective purchasers and/or tenants of the property. While not required, the applicant and its successors-in-interest are encouraged to provide a copy of said notice to employees who would regularly be working at this location.

5. Any new detention basin(s) on the site (including bioswales) shall be designed so as to provide for a maximum 48-hour detention period following the conclusion of the storm event for the design storm (may be less, but not more), and to remain totally dry between rainfalls. Vegetation in and around the detention basin(s) that would provide food or cover for bird species that would be incompatible with airport operations shall not be utilized in project landscaping. Trees shall be spaced so as to prevent large expanses of contiguous canopy, when mature. Landscaping in and around the detention basin(s) shall not include trees that produce seeds, fruits, or berries.

6. The City of Moreno Valley shall require that an acoustical analysis be performed prior to issuance of building permits for the warehouse/office building to determine whether sound attenuation features are sufficient to reduce interior noise from aircraft to no more than 45 dBA CNEL in office areas.

7. Overall office and manufacturing area within the warehouse/office building shall be limited to a maximum of 4,000 square feet in the absence of further review by ALUC. The southerly 60 feet of the building shall be limited to warehouse use only. If any development of the industrial building proposes to exceed the maximum office and manufacturing area, or if any use other than warehousing is proposed in the remaining area, further ALUC review shall be required to determine its consistency with the applicable criteria in place at that time.

8. March Air Reserve Base must be notified of any land use having an electromagnetic radiation component to assess whether a potential conflict with Air Base radio communications could result. Sources of electromagnetic radiation include radio wave transmission in conjunction with remote equipment inclusive of irrigation controllers, access gates, etc.

9. The dining/serving area in each of the freestanding fast food restaurants shall be limited to 1,500 square feet apiece. (The remaining area may be utilized as commercial kitchen, storage, etc., including one manager's office.)

10. The Federal Aviation Administration has conducted an aeronautical study of the proposed industrial warehouse building (Aeronautical Study No. 2015-AWP-8873-OE) and has determined that neither marking nor lighting of the structure is necessary for

aviation safety. However, if marking and/or lighting for aviation safety are accomplished on a voluntary basis, such marking and/or lighting (if any) shall be installed in accordance with FAA Advisory Circular 70/7460-1 K Change 2 and shall be maintained in accordance therewith for the life of the project.

11. The maximum height of the proposed industrial warehouse building, including all roof-mounted equipment (if any) shall not exceed 35 feet above ground level, and the maximum elevation of the proposed industrial warehouse building shall not exceed 1,588 feet above mean sea level.

12. The specific coordinates, height, and top point elevation of the proposed industrial warehouse building shall not be amended without further review by the Airport Land Use Commission and the Federal Aviation Administration; provided, however, that reduction in building height or elevation shall not require further review by the Airport Land Use Commission.

13. Temporary construction equipment used during actual construction of the industrial warehouse building shall not exceed 35 feet in height, unless separate notice is provided to the Federal Aviation Administration through the Form 7460-1 process.

14. Within five (5) days after construction of the industrial warehouse building reaches its greatest height, FAA Form 7460-2 (Part II), Notice of Actual Construction or Alteration, shall be completed by the project proponent or his/her designee and e-filed with the Federal Aviation Administration. (Go to https://oeaaa.faa.gov for instructions.) This requirement is also applicable in the event the project is abandoned or a decision is made not to construct the industrial warehouse building.

If you have any questions, please contact John Guerin, ALUC Principal Planner, at (951) 955-0982.

Sincerely,
RIVERSIDE COUNTY AIRPORT LAND USE COMMISSION

Edward C. Cooper, Director

JJGJG

Attachments: Notice of Airport in Vicinity
Aeronautical Study No. 2015-AWP-8873-OE

cc: Jack Kofdarali, French Valley Benton Road, LP (applicant/payee)
Ino Cruz, French Valley Benton Road, LP (representative)
P6K Portfolio MVCP (landowner)
Gary Gosliga, Airport Manager, March Inland Port Airport Authority
Denise Hauser or Sonia Pierce, March Air Reserve Base
ALUC Case File

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DEPARTMENT OF TRANSPORTATION
DISTRICT 8, PLANNING
INTERGOVERNMENTAL REVIEW, COMMUNITY &
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February 15, 2017

File: 08-215-PM 35.76
Moreno Valley Cactus Service Station

Mr. Richard Sandzimier
Planning Official
City of Moreno Valley
14177 Frederick Street
P.O. Box 88005
Moreno Valley, CA 92552

Dear Mr. Sandzimier:

Moreno Valley Gas Station, Market & Retail Center, Cactus Avenue & Commerce Center Drive

The California Department of Transportation (Caltrans) has completed the review of the Traffic Impact Study prepared by David Evans & Associates dated October 20, 2016, for the above referenced project located at the northeast corner of Cactus Ave and Commerce Center Drive. As proposed, development includes a gas station with convenience market and car wash, fast food restaurants, and an office/warehouse building.

Two alternatives are proposed to improve the project's Cactus Avenue frontage that vary at the Commerce Center Drive intersection. Alternative 1 proposes to retain the existing southbound (SB) left-turn restriction from Commerce Center Drive to eastbound (EB) Cactus Avenue. A driveway is proposed for construction along the Cactus Avenue frontage. Alternative 2 also proposes construction of the Cactus Avenue driveway, but the introduction of a left-turn movement from SB Commerce Center Drive to EB Cactus Avenue is also proposed. It appears however, that a substantial portion of Alternative 2 improvements will be implemented with pavement restriping only.

It is the Department's recommendation that the existing SB-to-EB left-turn restriction is retained as proposed with Alternative 1; however, we also recommend deletion of the Cactus Avenue driveway as proposed. Deletion of this driveway will help to ensure that the integrity of the currently interconnected signals at the southbound (SB) and northbound (NB) I-215 ramps in addition to the Cactus Avenue/Commerce Center Drive intersection remains intact.

Attachment: Caltrans TS Comment Letter_02-15-2017_MoVal_CactusSvcSta (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Caltrans TS Comment Letter_02-15-2017_MoVal_CactusSvcSta (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

However, implementation of Alternative 2 may be considered if Cactus Avenue mitigation measures also include adding the existing Cactus Avenue/Elsworth Street traffic signal to the interconnected I-215/Cactus Avenue Interchange synchronized system.

The Department's recommendations are offered as follows

Alternative 1:

While this Alternative proposes to keep the existing Cactus Avenue/Commerce Center Drive signalized intersection intact, the construction of a driveway to the east of this intersection along the Cactus Ave frontage is proposed. However, the extent of proposed modification to the existing Cactus Ave roadway is unclear under this Alternative. These recommendations are based upon our review of project details as shown in this Moreno Valley Cactus Traffic Study:

1. The Cactus Ave driveway as proposed appears inconsistent with allowable distances between interchange ramps, local road intersections, and access openings. Topic 504.3 (3) and Topic 504.8 of the Caltrans Highway Design Manual (HDM) describes these distances in more detail.
2. Given Topic 504.8, the Cactus driveway may be allowed if a raised centerline median is constructed to reinforce a right-in/right-out turning restriction. It appears that median modification as presently proposed is limited to restriping under this Alternative.
3. At the location shown, the Cactus Avenue driveway is proposed where an access restriction appears on Parcel Map 27732, book 195, pages 75 through 79. This restriction coincides with the existing lane-drop transition within Cactus Ave where three WB through lanes are reduced to two. Verify if the access restriction at this location is required under the Parcel Map 27732 conditions of approval to facilitate uninterrupted traffic flows along WB Cactus Ave.
4. Pending the review of Parcel Map 27732 conditions of approval, delete the proposed Cactus Avenue driveway; or adjust this access restriction in accordance with City's requirements to facilitate WB traffic flows in addition to driveway construction.
5. If or when available, submit Cactus Avenue street improvement and/or striping plans detailing the extent of mitigation measures proposed under Alternative 1 for further review and comment.

Alternative 2:

This Alternative proposes to modify the existing Cactus Ave/Commerce Center Drive intersection to add a SB left-turn movement from Commerce Center Drive to EB Cactus Avenue. Construction of the Cactus Avenue driveway in addition to other improvements is also proposed.

As with Alternative 1, the full extent of intersection and roadway improvements under Alternative 2 is unclear. Therefore, these recommendations are based on our review of project details as shown in this Moreno Valley Cactus Traffic Study:

1. As construction of the Cactus Avenue driveway is also proposed under this mitigation Alternative, Items 1 through 4 under Alternative 1 are similarly recommended for consideration with Alternative 2.
2. For reference, submit a copy of the Fontana Truck Trip Generation Study cited in this traffic study.
3. For a thorough evaluation of this project's impact to the existing I-215/Cactus Avenue interchange, traffic analysis should include merge/diverge analysis at both SB and NB directions to verify study findings at these locations.
4. Synchro analysis must also include all interconnected traffic signals along Cactus Avenue, beginning with the I-215 SB and NB ramps, the Cactus Avenue/Commerce Center Drive intersection, and the Cactus Ave/Elsworth St intersection if added to this signal system.
5. Figure 14 on page 29 depicts background plus project volumes under Alternative 2, but does not include volumes for the proposed SB left-turn. Revise as necessary.
6. Table 4-5-1 depicting the Plus Project Condition for Alternatives 1 and 2, show different queue lengths for the SB and NB I-215 ramps intersections although lane geometry and volumes are the same for both Alternatives. Verify if analysis at this location includes construction of the 3rd WB through lane along Cactus Avenue as recommended for the existing condition.
7. Although recommended as Project Specific Mitigation, construction of the 3rd WB through lane along Cactus Avenue from Elsworth Street to the I-215 NB ramps is not depicted on Figure 33. Verify whether traffic study analysis includes capacity provided with this "future" 3rd through lane and revise mitigation recommendations and/or Figure 33 as necessary.
8. Although changes to the existing turning movements at the Cactus Avenue/Commerce Center Drive intersection are proposed, modifications to the existing traffic signal at this intersection are not included in mitigation measures under Alternative 2. Verify extent of signal modifications proposed at this location.
9. Submit Cactus Avenue street improvement and/or restriping plans detailing all mitigation measures proposed for implementation under Alternative 2 for review and comment.

Caltrans Encroachment Permit Requirements:

As noted in this study, issuance of a Caltrans encroachment permit will be required if mitigation for the Moreno Valley Cactus Service Station impacts the existing Cactus Avenue/Commerce Center Drive intersection in any way. To evaluate the need for such a permit, submit street improvement, roadway striping, and/or traffic signal plans for the Moreno Valley Cactus Service

Attachment: Caltrans TS Comment Letter_02-15-2017_MoVal_CactusSvcSta (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Station. Additional recommendations addressing Encroachment Permit requirements may be made following review of these plans.

In the event Service Station construction occurs within the Cactus Avenue/Commerce Center Drive intersection, issuance of a Caltrans Encroachment Permit will be required prior to the commencement of construction activity. In addition, all such work performed shall be in compliance to all current design standards, applicable policies, and construction practices. Detailed information regarding permit application and submittal requirements is available at:

Office of Encroachment Permits
California Department of Transportation
464 West 4th Street, 6th Floor, MS 619
San Bernardino, CA 92401-1400
(909) 383-4526
www.dot.ca.gov/trafficops/ep/

Thank you for your consideration of these recommendations for the Moreno Valley Cactus Service Station development. We anticipate reaching a mitigation strategy for this development proposal that reasonably addresses project impacts to this vital area of the City. If you have any questions regarding this letter or would like to meet to discuss these comments, you may contact me at (909) 383-4557 or Rosa F. Clark at (909) 806-3923 for assistance.

Sincerely,

Original signed by

MARK B. ROBERTS
Office Chief
Intergovernmental Review, Community & Regional Planning

cc: R. Kilpatrick, David Evans and Associates

Attachment: Caltrans TS Comment Letter_02-15-2017_MoVal_CactusSvcSta (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

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AIR QUALITY AND GREENHOUSE GAS ASSESSMENT

PROPOSED RETAIL PROJECT - CACTUS CENTER PROJECT
NE CORNER OF CACTUS AVE. AND COMMERCE CENTER DR.
MORENO VALLEY, CALIFORNIA

SALEM PROJECT NO. 3-416-0904
SEPTEMBER 13, 2016

PREPARED FOR:

MR. INO CRUZ
COTTONWOOD COMMONS, LP
139 RADIO ROAD
CORONA, CA 92878-1958

PREPARED BY:

SALEM ENGINEERING GROUP, INC.
4729 W. JAQUELYN AVENUE
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Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

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Job No. 3-416-0904

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Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

SALEM engineering group, inc.

4729 W. Jacquelyn Avenue
Fresno, California 93722
(559) 271-9700 Office
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September 13, 2016 **Job No. 3-416-0904**

AIR QUALITY AND GREENHOUSE GAS ASSESSMENT

CACTUS CENTER PROJECT NE CORNER OF CACTUS AVENUE AND COMMERCE CENTER DRIVE MORENO VALLEY, CALIFORNIA

1.0 INTRODUCTON

This report presents an assessment of potential air quality and greenhouse gas (GHG) impacts associated with the proposed retail, office and warehouse project to be constructed at the northeastern quadrant of the intersection of Cactus Avenue and Commerce City Drive in the city of Moreno Valley, California (subject property). At this time the following improvements are planned on four building pads.

Pad 1 is 127,715 square feet (2.93 acres) to be final graded and will include:
One, 3,800 sf Convenience Store/Gasoline Station with 14 fuel pumps
One, 2,800 sf Drive Thru Fast Food Restaurant
One, 2,080 sf Drive Thru Car Wash with 13 Vacuum Stalls
45 Parking Stalls and Associated Drives

Pad 2 is 87,215 sf (2.0 acres) to be final graded and will include:
One, 33,950 sf Non Refrigerated Warehouse
One, 3,000 sf Office Integrated into the Warehouse
Four Loading Docks
Four Tractor Trailer Parking Stalls
40 Parking Stalls and Associated Drives

Pad 3 is 59,702 sf (1.37 acres) to be final graded and will include:
Two, 3,000 sf each Drive Thru Fast Food Restaurants
60 Parking Stalls and Associated Drives

The retail center and warehouse/office structure will be constructed on a currently undeveloped 6.30 acre parcel of land that has been rough graded. Minor additional grading will be required to accommodate proposed site improvements.

GHG impacts will be attributable to emissions associated with construction and operational emissions including traffic and energy use. This report presents an evaluation of existing conditions at the subject property, thresholds of significance, and potential air quality and GHG impacts associated with construction and operation of the project.

2.0 EXISTING CONDITIONS

2.1 Current Development

The subject property is currently undeveloped land. Curb cuts to access the facilities will be constructed off of Cactus Avenue to the south, Commerce Center Drive to the west and Goldcrest Avenue to the north.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

2.2 Regulatory Setting

The United States Environmental Protection Agency (EPA) defines air quality by ambient air concentrations of specific pollutants that have been shown to be of concern with respect to health and welfare of the general public. The EPA is responsible for enforcing the Federal Clean Air Act (CAA) of 1970 and its 1977 and 1990 Amendments. The CAA required the EPA to establish National Ambient Air Quality Standards (NAAQS), which identify concentrations of pollutants in the ambient air below which no adverse effects on the public health and welfare are anticipated. In response, the EPA established both primary and secondary standards for several pollutants (called "criteria" pollutants). Primary standards are designed to protect human health with an adequate margin of safety. Secondary standards are designed to protect property and the public welfare from air pollutants in the atmosphere.

The Federal CAA allows states to adopt ambient air quality standards and other regulations provided they are at least as stringent as federal standards. More stringent California Ambient Air Quality Standards (CAAQS) have been adapted by the California Air Resources Board (ARB) for the six criteria pollutants through the California Clean Air Act of 1988 (CCAA). The CCAA also established California Ambient Air Quality Standards (CAAQS) for additional pollutants, including sulfates, hydrogen sulfide, vinyl chloride and visibility-reducing particles (see Table 1 for NAAQS and CAAQS.)

Areas that do not meet the NAAQS or the CAAQS for a particular pollutant are considered to be "Nonattainment Areas" for that pollutant. In September 1997, the EPA promulgated 8-hour O_3 and 24-hour and annual $PM_{2.5}$ national standards. As a result, this action has initiated a new planning process to monitor and evaluate emission control measures for these pollutants.

The South Coast Air Basin (SCAB) is classified as an Extreme Nonattainment Area for the NAAQS for O_3 for all Averaging Times and a Nonattainment Area for the NAAQS $PM_{2.5}$ for all Averaging times. The SCAB is also designated as a Maintenance Area for the NAAQS for CO and NO_2. The SCAB is also considered a Serious Nonattainment Area for the CAAQS pollutant PM_{10}. The area is considered unclassified or Attainment for all other NAAQS and CAAQS for the other criteria pollutants.

The California ARB is the state regulatory agency with authority to enforce regulations to both achieve and maintain the NAAQS and CAAQS. The ARB is responsible for the development, adoption, and enforcement of the state's motor vehicle emissions program, as well as the adoption of the CAAQS. The ARB also reviews operations and programs of the local air districts, and requires each air district with jurisdiction over a nonattainment area to develop its own strategy for achieving the NAAQS and CAAQS.

The local air district has the primary responsibility for the development and implementation of rules and regulations designed to attain the NAAQS and CAAQS, as well as the permitting of new or modified sources, development of air quality management plans, and adoption and enforcement of air pollution regulations. The South Coast Air Quality Management District (SCAQMD) is the local agency responsible for the administration and enforcement of air quality regulations for the SCAB.

The SCAQMD and the Southern California Association of Governments (SCAG) are responsible for developing and implementing the clean air plan for attainment and maintenance of the ambient air quality standards in the SCAB. The most recently adopted air quality plan in the SCAB is the 2012 Air Quality Management Plan (AQMP), which was adopted by the Board on December 7, 2012.

Table 1 presents a summary of the ambient air quality standards adopted by the federal and California Clean Air Acts.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

TABLE 1
Ambient Air Quality Standards

POLLUTANT	AVERAGE TIME	CALIFORNIA STANDARDS CONCENTRATION	CALIFORNIA STANDARDS METHODS	NATIONAL STANDARDS PRIMARY	NATIONAL STANDARDS SECONDARY	NATIONAL STANDARDS METHOD
Ozone (O_3)	1 hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry			Ultraviolet Photometry
	8 hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)	0.075 ppm (147 µg/m^3)	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 µg/m^3)	—	Non-Dispersive Infrared Spectroscopy (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 µg/m^3)	—	
Nitrogen Dioxide (NO_2)	Annual	0.030 ppm (56 µg/m^3)	Gas Phase Chemiluminescence	0.053 ppm (100 µg/m^3)		Gas Phase Chemiluminescence
	1 hour	0.18 ppm (338 µg/m^3)		0.100 ppm (188 µg/m^3)		
Sulfur Dioxide (SO_2)	24 hours	0.04 ppm (105 µg/m^3)	Ultraviolet Fluorescence			Pararosaniline
	3 hours	--			0.5 ppm (1300 µg/m^3)	
	1 hour	0.25 ppm (655 µg/m^3)		0.075 ppm (196 µg/m^3)		
Respirable Particulate Matter (PM_{10})	24 hours	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	150 µg/m^3	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3				
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12.0 µg/m^3	15 µg/m^3	Inertial Separation and Gravimetric Analysis
	24 hours			35 µg/m^3		
Sulfates	24 hours	25 µg/m^3	Ion Chromatography	No National Standards		
Lead	30-day Average	1.5 µg/m^3	Atomic Absorption			Atomic Absorption
	Calendar Quarter			1.5 µg/m^3	1.5 µg/m^3	
	3-Month Rolling			0.15 µg/m^3	0.15 µg/m^3	
Hydrogen Sulfide	1 hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence	No National Standards		
Vinyl Chloride	24 hours	0.010 ppm (26 µg/m^3)	Gas Chromatography	No National Standards		

ppm= parts per million; µg/m^3 = micrograms per cubic meter ; mg/m^3= milligrams per cubic meter Source: California Air Resources Board, www.arb.ca.gov, 2014

2.3 Background Air Quality

The SCAQMD operates a network of ambient air monitoring stations throughout the SCAB. The purpose of the monitoring stations is to measure ambient concentrations of the pollutants and determine whether the ambient air quality meets the CAAQS and the NAAQS.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

The nearest ambient monitoring station to the project site is the Magnolia Avenue monitoring station approximately 8 miles west of the subject site. However the Riverside-Rubidoux monitoring station approximately 10 miles northwest of the subject site has more complete data for the pollutants O_3, PM_{10}, NO_2, and $PM_{2.5}$. Worst case measurements were identified for the years 2013, 2014 and 2015 where available. Data for CO and SO_2 in the SCAB were not available for these three years. Ambient concentrations of pollutants over the last three years are presented in Table 2.

TABLE 2
Ambient Background Concentrations
(ppm unless otherwise indicated)

POLLUTANT	AVERAGE	2013	2014	2015	CAAQS	NAAQS	MONITORING STATION
Ozone	8 hour	0.104	0.105	0.106	0.070	0.075	Riverside-Rubidoux
	1 hour	0.123	0.141	0.132	0.090	--	Riverside-Rubidoux
PM_{10}	Annual	34.6 µg/m^3	44.8 µg/ m^3	40.0 µg/m^3	20 µg/m^3	--	Riverside-Rubidoux
	24 hour	199.2 µg/m^3	122.7 µg/m^3	107.4 µg/m^3	50 µg/m^3	150 µg/m^3	Riverside-Rubidoux
$PM_{2.5}$	Annual	17.1 µg/m^3	16.8 µg/m^3	15.3 µg/m^3	12 µg/m^3	12 µg/m^3	Riverside-Rubidoux
	24 hour	60.3 µg/m^3	48.9 µg/m^3	54.7 µg/m^3	--	35 µg/m^3	Riverside-Rubidoux
NO_2	Annual	*	0.015	0.014	0.030	0.053	Riverside-Rubidoux
	1 hour	0.0596	0.0599	0.0574	0.18	0.100	Riverside-Rubidoux
CO	8 hour	*	*	*	9	9	All in South Coast
SO_2	Annual	*	*	*	--	0.5[1]	All in South Coast
	24 hour	*	*	*	0.25	NA	All in South Coast

* Insufficient data to determine value

[1]Secondary NAAQS

3.0 THRESHOLDS OF SIGNIFICANCE

The SCAQMD has adopted CEQA significance thresholds as of 2011 (SCAQMD 2011), which provide guidance on the requirements for evaluating potential air quality impacts and on thresholds of significance under CEQA. The SCAQMD has identified numerical emission thresholds for significance for construction and operation for a project. The project-level numerical thresholds are summarized in Table 3.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

TABLE 3
SCAQMD Significance Thresholds

POLLUTANT	CONSTRUCTION	OPERATION
Criteria Pollutants Mass Daily Thresholds		
NO_X	100 lbs/day	55 lbs/day
ROG (VOC)	75 lbs/day	55 lbs/day
PM_{10}	150 lbs/day	150 lbs/day
$PM_{2.5}$	55 lbs/day	55 lbs/day
SO_X	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
TAC, AHM, and Odor Thresholds		
Toxic Air Contaminants (TACs)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Cancer Burden > 0.5 (in areas ≥ 1 in a million) Chronic and Acute Hazard Index ≥ 1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
GHG	10,000 MT/yr CO_2 eq for industrial facilities	
Ambient Air Quality for Criteria Pollutants		
NO2 1-hour average Annual arithmetic mean	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards 0.18 ppm (state) 0.03 ppm (state) and 0.0534 ppm (federal)	
PM10 24-hour average Annual geometric mean	10.4 $\mu g/m^3$ construction & 2.5 $\mu g/m^3$ operation 1.0 $\mu g/m^3$	
PM2.5 24-hour average	10.4 $\mu g/m^3$ construction & 2.5 $\mu g/m^3$ operation	
SO2 1-hour average 24-hour average	0.25 ppm (state) & 0.075 ppm (federal – 99th percentile) 0.04 ppm (state)	
Sulfate 24-hour average	25 $\mu g/m^3$ (state)	
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards 20 ppm (state) and 35 ppm (federal) 9.0 ppm (state/federal)	
Pollutant	***Construction***	***Operation***
Lead 30-day average Rolling 3-month average Quarterly average	1.5 $\mu g/m^3$ (state) 0.15 $\mu g/m^3$ (federal) 1.5 $\mu g/m^3$ (federal)	

$\mu g/m^3$ = microgram per cubic meter; ppm = parts per million; MT = Metric Ton

To further evaluate the potential for significant impacts associated with the project, the SCAQMD's *Final Localized Significance Threshold Methodology* (SCAQMD 2003) can be considered to evaluate whether a project's emissions could cause a localized exceedance of an ambient air quality standard. The Localized Significance Threshold (LST) Methodology provides a look-up table for construction and operational emissions based on the emission rate, location, and distance from receptors, and provides a methodology for air dispersion modeling to evaluate whether a construction or operation could cause an exceedance of an ambient air quality standard. The LST lookup tables (SCAQMD 2009) are applicable only to sources that are five acres or less in size. This total project is 6.30 acres in size and exceeds the acceptance criteria. In these cases the SCAQMD recommends that the lead agencies perform project-specific air modeling. However, the project is to be constructed in phases, which will involve improvements in increments of less than five acres.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Based on this assumption, to obtain an "order of magnitude" projection of impacts, a screening air dispersion modeling approach was used to assess the significance of localized construction impacts on receptors in the project vicinity using the five acre site value in all cases. The LST Methodology only applied to impacts to NO_2, CO, $PM_{2.5}$ and PM_{10} concentrations.

According to the LST Methodology, the project is located in Source Receptor Area 23, Metropolitan Riverside County. LSTs for the Project are shown in Table 4, based on the size of the site and the distance to the nearest receptor.

The site is approximately 6.30 acres in size and as noted above will involve phased construction in increments of less than five acres. Based on a review of the site location and aerial maps of the vicinity, the distance to the nearest receptor is estimated to be 25 meters. For conservative purposes, the LSTs for a 5-acre site and 25-meter distance were used to evaluate the potential significance of impacts.

TABLE 4
SCAQMD Localized Significance Thresholds for Construction and Operation, lb/day

Distance to Nearest Receptor, Meters	Pollutant					
	NOX*	CO*	PM10 Construction	PM10 Operation	PM2.5 Construction	P2.5 Operation
25	270	1,577	13	4	8	2

* Construction or Operation

The impacts associated with construction and operation of the project were evaluated for significance based on these significance criteria.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

4.0 IMPACTS

The proposed Cactus Center improvements to be constructed at Cactus Avenue and Commerce Center Drive includes both construction and operational impacts. Construction impacts include emissions associated with site grading/preparation, utilities installation, construction of buildings, and paving. Operational impacts include emissions associated with the project, including traffic, at full build-out. Construction is to be done in phases as summarized in Table 5 below.

Table 5
Construction Summary Cactus Avenue and Commerce Center Drive

Phase	Acres Disturbed	Construction Summary	Parking Spaces	Approximate Duration
I	4.93	2,080 sf Car Wash	13	Ten Months
		3,800 sf Convenience Store/Gasoline Sta.	17	
		2,800 sf Drive Thru Restaurant	28	
		36,950 Warehouse/Office	52*	
II	1.37	3,000 sf Drive Thru Restaurant	30	Five Months
		3,000 sf Drive Thru Restaurant	30	

* For emissions analysis the three tractor-trailer parking were considered to equal 12 automobile parking spaces.

4.1 Construction

Emissions of pollutants such as fugitive dust that are generated during construction are generally highest near the construction site. Emissions from the construction phase of the project were estimated through the use of the CalEEMod Model (ENVIRON 2013). Construction is anticipated to be carried out in two main phases as outlined in Table 5 above. It was assumed that the entire construction project would be completed within ten (10) months and that heavy construction equipment would be operating at the site for eight hours per day, five days per week during project construction. In addition, it was assumed that, in accordance with the requirements of the SCAQMD Rule 403, fugitive dust controls would be utilized during construction, including watering of active sites three times daily.

For the purpose of estimating emissions from the application of architectural coatings, it was assumed that water-based coatings that would be compliant with SCAQMD Regulations would be used for both exterior and interior surfaces. Within the CalEEMod Model, this assumption was included by assigning all architectural coating a VOC content of 150 grams per liter.

Tables 6 through 9 provide a summary of the emission estimates for construction of each of the phases the proposed project, assuming standard measures are implemented to reduce emissions, as calculated with the CalEEMod Model, in comparison with the regional and localized significance thresholds. The localized significance thresholds are applicable only to on-site emissions and do not consider emissions occurring on roadways during travel to and from the site. Refer to Appendix A for detailed model output files.

Tables 6 and 7 include projected emissions for all steps of construction for both Phase I and II, averaged over each Phase's projected duration. These steps include: Demolition, Site Preparation, Building Construction, Paving, and Architectural Coatings. Both phases of the project are being constructed on undeveloped land so demolition is expected to be minimal. Note that projected emissions for all pollutants during construction are below both the SCAQMD's Air Quality Significance Thresholds as well as the Localized Significance Thresholds. As noted earlier, the overall project size exceeds the recommended five acre limit given in the SCAQMD's Localized Significance Threshold Methodology guidance. However, site work will be phased to impact less than five acres during either phase.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Construction of the project would be short-term and temporary. Thus the emissions associated with construction would not result in a significant impact on the ambient air quality. Because emissions are less than the significance levels, they would not conflict or obstruct the implementation of the AQMP or applicable portions of the SIP.

Project construction would also not result in emission of any odor compounds that would cause a nuisance or significant impact to nearby receptors. The impacts associated with Project construction are therefore not considered significant.

TABLE 6
Estimated Construction Emissions, Phase I[1]
LBS/Day (unless otherwise shown)

EMISSION SOURCE	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Total Emissions for Phase I	13.38	71.38	53.77	0.08	4.61	2.55
Significance Criteria	75	100	550	150	150	55
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
Localized Significance thresholds*	N/A	270	1,577	N/A	13	8
Significant?	-	*No*	*No*	-	*No*	*No*
Total Emissions for Phase I (Tons/Year)	1.24	6.38	4.84	0.01	0.49	0.42

1 – Phase I to include: Grading, site preparation and grading, building construction, paving and architectural coatings for a 3,800 sf Convenience Store/Gasoline Station, a 36,950 sf Office/Warehouse, and a 2080 sf Drive Thru Car Wash. See attached CalEEMod runs in Appendix A.
* SCAQMD October 21, 2009 Localized Significance Thresholds used for reference (see Section 3.0 of this report)

TABLE 7
Estimated Construction Emissions, Phase II[1]
LBS/Day (unless otherwise shown)

EMISSION SOURCE	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Total Emissions for Phase II	3.36	24.42	16.58	0.02	1.82	1.56
Significance Criteria	75	100	550	150	150	55
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
Localized Significance thresholds*	N/A	270	1577	N/A	13	8
Significant?	-	*No*	*No*	-	*No*	*No*
Total Emissions for Phase II (Tons/Year)	0.19	1.39	0.95	0	0.10	0.09

1 – Phase II to include: Site preparation and grading, building construction, paving and architectural coatings for two, 3,000 sf Drive Thru Restaurants. See attached CalEEMod runs in Appendix A.
* SCAQMD October 21, 2009 Localized Significance Thresholds used for reference (see Section 3.0 of this report)

4.2 Operational Impacts

The main operational impacts associated with the Project would be impacts associated with traffic. Minor impacts would be associated with energy use and area sources.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

To address whether the Project would result in emissions that would violate any air quality standard or contribute substantially to an existing or proposed air quality violation, the emissions associated with Project-generated traffic and area sources were compared with the SCAQMD's quantitative significance criteria. Default trip generation rates in the CalEEMod Model were used to estimate emissions from vehicles. The CalEEMod Model contains emission factors from the EMFAC2011 model, which is the latest version of the Caltrans emission factor model for on-road traffic. Project-related traffic was assumed to be comprised of a mixture of vehicles in accordance with the CalEEMod Model default outputs for traffic. This assumption includes light duty autos and light duty trucks (i.e., small trucks, SUVs, and vans) as well as medium- and heavy-duty vehicles that may be traveling to the facility to make deliveries. For conservative purposes, emission factors representing the vehicle mix for 2018 were used to estimate emissions as 2018 was assumed to be the first year of full operation; based on the results of the EMFAC2011 model for subsequent years, emissions would decrease on an annual basis from 2018 onward due to phase-out of higher polluting vehicles and implementation of more stringent emission standards that are taken into account in the EMFAC2011 model. Emissions associated with area sources (energy use and landscaping activities) were also estimated using the default assumptions in the CalEEMod Model.

Tables 8 below presents the results of the CalEEMod emission calculations in lbs/day, as an annual average considering the project's design features listed above (both Phase I and II site improvements), along with a comparison with the SCAQMD Air Quality Significance Thresholds for Operations. The calculation assumed that the project would be constructed to current Title 24 buildings standards, and would use low-flow plumbing fixtures.

TABLE 8
Estimated Operational Emissions[1]

EMISSION SOURCE	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
ANNUAL, LBS/DAY						
TOTAL (lbs/day)	**26.43**	**36.71**	**173.56**	**0.26**	**15.84**	**4.79**
Significance Criteria, Operations	55	55	550	150	150	55
Significant?	*No*	*No*	*No*	*No*	*No*	*No*
TOTAL(TONS/YR)	**4.82**	**6.70**	**31.67**	**0.037**	**3.05**	**0.88**

1 – Site improvements to include operation of a 3,800 sf Convenience Store/Gasoline Station, a 36,950 sf Office/Warehouse, two, 3,000 sf Drive Thru Restaurants, one, 2,800 sf Drive Thru Restaurant, and a 2,080 sf Drive Thru Car Wash. See attached CalEEMod runs in Appendix A.

Based on the estimates of the emissions associated with project operations, the emissions are below the significance criteria for all pollutants. Because emissions are less than the significance levels, they would not conflict or obstruct the implementation of the AQMP or applicable portions of the SIP. It should be noted that the emissions from vehicles are projected to decrease with time due to phase-out of older, more polluting vehicles and increasingly stringent emissions standards..

Projects involving traffic impacts may result in the formation of locally high concentrations of CO, known as CO "hot spots." It is not anticipated that the project would have a significant impact on traffic in the area, and no intersections would degrade to unacceptable levels. The intersections in the project area would therefore operate at an acceptable LOS and would not experience CO "hot spots" because traffic congestion would not result.

4.3 Odors

During construction, diesel equipment operating at the site may generate some nuisance odors; however, due to the distance of sensitive receptors to the project site and the temporary nature of construction, odors associated with project construction would not be significant.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Land uses associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting activities, refineries, landfills, dairies, and fiberglass molding operations. These land uses are not proposed for the retail project at Cactus Avenue and Commerce City Drive. Odor impacts would not be significant.

5.0 GREENHOUSE GAS EVALUATION

According to the California Natural Resources Agency, "due to the global nature of GHG emissions and their potential effects, GHG emissions will typically be addressed in a cumulative impacts analysis." According to Appendix G of the CEQA Guidelines, the following criteria may be considered to establish the significance of GHG emissions:

Would the project:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

As discussed in Section 15064.4 of the CEQA Guidelines, the determination of the significance of greenhouse gas emissions calls for a careful judgment by the lead agency, consistent with the provisions in Section 15064. Section 15064.4 further provides that a lead agency should make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of GHG emissions resulting from a project. A lead agency shall have discretion to determine, in the context of a particular project, whether to:

- Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use. The lead agency has discretion to select the model or methodology it considers most appropriate provided it supports its decision with substantial evidence. The lead agency should explain the limitations of the particular model or methodology selected for use; and/or
- Rely on a qualitative analysis or performance based standards.

Section 15064.4 also advises a lead agency to consider the following factors, among others, when assessing the significance of impacts from greenhouse gas emissions on the environment:

1. The extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting;
2. Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; and
3. The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions.

On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal for an interim GHG significance threshold for projects where the SCAQMD is lead agency. On September 28, 2010, the SCAQMD has recommended a threshold of 3,000 metric tons of CO2e (carbon dioxide equivalent) as a Tier 3 threshold for all residential and commercial land uses under CEQA. For the purpose of this evaluation, a threshold of 3,000 metric tons of CO2e is used to assess significance of greenhouse gas emissions.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

The proposed retail project at Cactus Avenue and Commerce Center Drive in Moreno Valley would generate an estimated total of 772 metric tons of CO_2e emissions during construction. The SCAQMD recommends amortizing construction emissions over a period of 30 years to estimate the contribution of construction emissions to operational emissions over the project lifetime. Amortized over 30 years, the construction of the project will generate approximately 26 metric tons of CO_2e on an annualized basis.

Based on the results of the CalEEMod Model, the Cactus Avenue/Commerce Center Drive project would generate a total of 4,067 metric tons of CO_2e emissions annually from operations. Adding the amortized construction emissions results in an estimate of 4,093 metric tons of CO_2e emissions annually. This cumulative level is slightly above the SCAQMD's recommended Tier 3 threshold of 3,000 metric tons of CO_2e emissions for residential and commercial land uses. However, the great majority of CO2e in the total is contributed by mobile sources expected to patronize the proposed gasoline station/convenience store and drive thru restaurants. It is reasonable to conclude that many, if not most trips to the proposed gasoline station/convenience store and restaurants are incidental to other travel and therefore not inherent to the operation of the gasoline station/convenience store. For this reason and because emissions of the other pollutants are less than the significance levels, it is our opinion that the construction of the proposed improvements at Cactus Avenue and Commerce Center Drive in Moreno Valley would not result in a significant impact on the ambient air quality or greenhouse gases or to the degradation of air quality in general.

6.0 CONCLUSIONS

The air quality and GHG analysis for the proposed retail project at the intersection of Cactus Avenue and Commerce Center Drive in Moreno Valley evaluated emissions associated with both the construction and operation of the project. Emissions associated with construction and operation were compared with significance thresholds developed by the SCAQMD, which provide a conservative means of evaluating whether project emissions would cause a significant impact on the ambient air quality or whether further evaluation is warranted. Emissions associated with construction and operation are below the significance thresholds for all phases and pollutants. Thus the emissions associated with construction and operation of the project would not result in a significant impact on the ambient air quality.

7.0 REFERENCES

Association of Environmental Professionals. 2007. *Recommendations by the Association of Environmental Professionals (AEP) on How to Analyze Greenhouse Gas Emissions and Global Climate Change in CEQA Documents.* June.

California Air Pollution Control Officers Association. 2008. *CEQA and Climate Change – Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act.* January.

California Air Resources Board. 2011. EMFAC2011 Emissions Model.

California Air Resources Board. 2008. *Climate Change Scoping Plan*. November. ENVIRON. 2013.

CalEEMod Model, Version 2013.2.2.

SCAQMD. 2003. Localized Significance Threshold Methodology.

SCAQMD. 2008. GHG Significance Threshold, SCAQMD Board Agenda Item 31, December 5.

SCAQMD. 2009. LST Look-up Tables.

SCAQMD. 2011. CEQA Significance Thresholds. http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

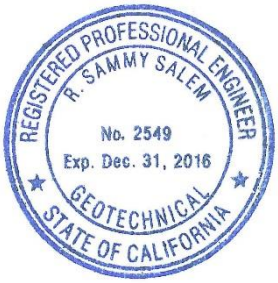
U.S. EPA. 2006. *The U.S. Inventory of Greenhouse Gas Emissions and Sinks: Fast Facts.* www.epa.gov/climatechange/emissions/downloads06/06FastFacts.pdf.

We appreciate the opportunity to assist you with this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 271-9700.

Respectfully submitted,

SALEM Engineering Group, Inc.

Ashley Brown, P.E.
Senior Project Manager



R. Sammy Salem, MS, PE, GE, REA
Principal Engineer

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

APPENDIX A

CalEEMod Model Outputs

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

NEC Cactus Ave and Commerce Center Moreno Valley P1 2080 sf Car Wash

South Coast AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Automobile Care Center	2.08	1000sqft	0.20	2,080.00	0
Parking Lot	13.00	Space	1.00	5,200.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2018
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Lot is 1.2 acres

Construction Phase - Minimal demolition. To be built on a vacant lot.

Architectural Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Mitigation - Low VOC paints to be used IAW SCAQMD 1113.

Water Mitigation - Low flow plumbing fixtures to be used.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	150
tblConstructionPhase	NumDays	20.00	1.00
tblConstructionPhase	PhaseEndDate	1/4/2017	1/31/2017
tblConstructionPhase	PhaseStartDate	1/3/2017	1/28/2017
tblLandUse	LotAcreage	0.05	0.20
tblLandUse	LotAcreage	0.12	1.00
tblProjectCharacteristics	OperationalYear	2014	2018

2.0 Emissions Summary

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.3296	2.0697	1.5715	2.4100e-003	0.0206	0.1315	0.1521	9.3500e-003	0.1265	0.1359	0.0000	203.1498	203.1498	0.0425	0.0000	204.0420
Total	**0.3296**	**2.0697**	**1.5715**	**2.4100e-003**	**0.0206**	**0.1315**	**0.1521**	**9.3500e-003**	**0.1265**	**0.1359**	**0.0000**	**203.1498**	**203.1498**	**0.0425**	**0.0000**	**204.0420**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.3296	2.0697	1.5715	2.4100e-003	0.0206	0.1315	0.1521	9.3500e-003	0.1265	0.1359	0.0000	203.1496	203.1496	0.0425	0.0000	204.0418
Total	**0.3296**	**2.0697**	**1.5715**	**2.4100e-003**	**0.0206**	**0.1315**	**0.1521**	**9.3500e-003**	**0.1265**	**0.1359**	**0.0000**	**203.1496**	**203.1496**	**0.0425**	**0.0000**	**204.0418**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0287	0.0000	2.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.7000e-004	3.7000e-004	0.0000	0.0000	4.0000e-004
Energy	3.7000e-004	3.3900e-003	2.8500e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	11.5937	11.5937	4.3000e-004	1.4000e-004	11.6471
Mobile	0.0599	0.1152	0.5030	1.0000e-003	0.0655	1.4900e-003	0.0670	0.0175	1.3700e-003	0.0189	0.0000	74.7623	74.7623	3.0300e-003	0.0000	74.8259
Waste						0.0000	0.0000		0.0000	0.0000	1.6138	0.0000	1.6138	0.0954	0.0000	3.6166
Water						0.0000	0.0000		0.0000	0.0000	0.0621	1.1105	1.1726	6.4300e-003	1.6000e-004	1.3575
Total	**0.0890**	**0.1185**	**0.5060**	**1.0200e-003**	**0.0655**	**1.7500e-003**	**0.0672**	**0.0175**	**1.6300e-003**	**0.0192**	**1.6759**	**87.4669**	**89.1428**	**0.1053**	**3.0000e-004**	**91.4476**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0279	0.0000	2.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.7000e-004	3.7000e-004	0.0000	0.0000	4.0000e-004
Energy	3.7000e-004	3.3900e-003	2.8500e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	11.5937	11.5937	4.3000e-004	1.4000e-004	11.6471
Mobile	0.0599	0.1152	0.5030	1.0000e-003	0.0655	1.4900e-003	0.0670	0.0175	1.3700e-003	0.0189	0.0000	74.7623	74.7623	3.0300e-003	0.0000	74.8259
Waste						0.0000	0.0000		0.0000	0.0000	1.6138	0.0000	1.6138	0.0954	0.0000	3.6166
Water						0.0000	0.0000		0.0000	0.0000	0.0544	1.0204	1.0748	5.6300e-003	1.4000e-004	1.2369
Total	**0.0882**	**0.1185**	**0.5060**	**1.0200e-003**	**0.0655**	**1.7500e-003**	**0.0672**	**0.0175**	**1.6300e-003**	**0.0192**	**1.6682**	**87.3768**	**89.0450**	**0.1045**	**2.8000e-004**	**91.3270**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.88**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.46**	**0.10**	**0.11**	**0.76**	**6.67**	**0.13**

3.0 Construction Detail

Construction Phase

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	1/2/2017	5	1	
2	Site Preparation	Site Preparation	1/28/2017	1/31/2017	5	2	
3	Grading	Grading	2/1/2017	2/6/2017	5	4	
4	Building Construction	Building Construction	2/7/2017	11/13/2017	5	200	
5	Paving	Paving	11/14/2017	11/27/2017	5	10	
6	Architectural Coating	Architectural Coating	11/28/2017	12/11/2017	5	10	

Acres of Grading (Site Preparation Phase): 1

Acres of Grading (Grading Phase): 1.5

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 3,354; Non-Residential Outdoor: 1,118 (Architectural Coating – sqft)

OffRoad Equipment

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Cranes	1	6.00	226	0.29
Building Construction	Forklifts	1	6.00	89	0.20
Site Preparation	Graders	1	8.00	174	0.41
Paving	Pavers	1	6.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Demolition	Rubber Tired Dozers	1	8.00	255	0.40
Grading	Rubber Tired Dozers	1	6.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Grading	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Graders	1	6.00	174	0.41
Paving	Paving Equipment	1	8.00	130	0.36
Site Preparation	Rubber Tired Dozers	1	7.00	255	0.40
Building Construction	Welders	3	8.00	46	0.45

Trips and VMT

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	5	13.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	7	3.00	1.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	5	13.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.3600e-003	0.0133	0.0104	1.0000e-005		8.0000e-004	8.0000e-004		7.5000e-004	7.5000e-004	0.0000	1.1147	1.1147	2.8000e-004	0.0000	1.1206
Total	**1.3600e-003**	**0.0133**	**0.0104**	**1.0000e-005**		**8.0000e-004**	**8.0000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**1.1147**	**1.1147**	**2.8000e-004**	**0.0000**	**1.1206**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	3.6000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0643	0.0643	0.0000	0.0000	0.0643
Total	**2.0000e-005**	**3.0000e-005**	**3.6000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0643**	**0.0643**	**0.0000**	**0.0000**	**0.0643**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.3600e-003	0.0133	0.0104	1.0000e-005		8.0000e-004	8.0000e-004		7.5000e-004	7.5000e-004	0.0000	1.1147	1.1147	2.8000e-004	0.0000	1.1206
Total	**1.3600e-003**	**0.0133**	**0.0104**	**1.0000e-005**		**8.0000e-004**	**8.0000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**1.1147**	**1.1147**	**2.8000e-004**	**0.0000**	**1.1206**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	3.6000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0643	0.0643	0.0000	0.0000	0.0643
Total	**2.0000e-005**	**3.0000e-005**	**3.6000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0643**	**0.0643**	**0.0000**	**0.0000**	**0.0643**

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.8000e-003	0.0000	5.8000e-003	2.9500e-003	0.0000	2.9500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.3100e-003	0.0242	0.0159	2.0000e-005		1.3100e-003	1.3100e-003		1.2000e-003	1.2000e-003	0.0000	1.5895	1.5895	4.9000e-004	0.0000	1.5997
Total	**2.3100e-003**	**0.0242**	**0.0159**	**2.0000e-005**	**5.8000e-003**	**1.3100e-003**	**7.1100e-003**	**2.9500e-003**	**1.2000e-003**	**4.1500e-003**	**0.0000**	**1.5895**	**1.5895**	**4.9000e-004**	**0.0000**	**1.5997**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.4000e-004	0.0000	9.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0791	0.0791	0.0000	0.0000	0.0792
Total	**3.0000e-005**	**4.0000e-005**	**4.4000e-004**	**0.0000**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0791**	**0.0791**	**0.0000**	**0.0000**	**0.0792**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.8000e-003	0.0000	5.8000e-003	2.9500e-003	0.0000	2.9500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.3100e-003	0.0242	0.0159	2.0000e-005		1.3100e-003	1.3100e-003		1.2000e-003	1.2000e-003	0.0000	1.5895	1.5895	4.9000e-004	0.0000	1.5997
Total	**2.3100e-003**	**0.0242**	**0.0159**	**2.0000e-005**	**5.8000e-003**	**1.3100e-003**	**7.1100e-003**	**2.9500e-003**	**1.2000e-003**	**4.1500e-003**	**0.0000**	**1.5895**	**1.5895**	**4.9000e-004**	**0.0000**	**1.5997**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.4000e-004	0.0000	9.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0791	0.0791	0.0000	0.0000	0.0792
Total	**3.0000e-005**	**4.0000e-005**	**4.4000e-004**	**0.0000**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0791**	**0.0791**	**0.0000**	**0.0000**	**0.0792**

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					9.8300e-003	0.0000	9.8300e-003	5.0500e-003	0.0000	5.0500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.7700e-003	0.0396	0.0264	3.0000e-005		2.1300e-003	2.1300e-003		1.9600e-003	1.9600e-003	0.0000	2.6112	2.6112	8.0000e-004	0.0000	2.6280
Total	**3.7700e-003**	**0.0396**	**0.0264**	**3.0000e-005**	**9.8300e-003**	**2.1300e-003**	**0.0120**	**5.0500e-003**	**1.9600e-003**	**7.0100e-003**	**0.0000**	**2.6112**	**2.6112**	**8.0000e-004**	**0.0000**	**2.6280**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-005	9.0000e-005	8.9000e-004	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1582	0.1582	1.0000e-005	0.0000	0.1583
Total	**6.0000e-005**	**9.0000e-005**	**8.9000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.1582**	**0.1582**	**1.0000e-005**	**0.0000**	**0.1583**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					9.8300e-003	0.0000	9.8300e-003	5.0500e-003	0.0000	5.0500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.7700e-003	0.0396	0.0264	3.0000e-005		2.1300e-003	2.1300e-003		1.9600e-003	1.9600e-003	0.0000	2.6112	2.6112	8.0000e-004	0.0000	2.6280
Total	**3.7700e-003**	**0.0396**	**0.0264**	**3.0000e-005**	**9.8300e-003**	**2.1300e-003**	**0.0120**	**5.0500e-003**	**1.9600e-003**	**7.0100e-003**	**0.0000**	**2.6112**	**2.6112**	**8.0000e-004**	**0.0000**	**2.6280**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-005	9.0000e-005	8.9000e-004	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1582	0.1582	1.0000e-005	0.0000	0.1583
Total	**6.0000e-005**	**9.0000e-005**	**8.9000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.1582**	**0.1582**	**1.0000e-005**	**0.0000**	**0.1583**

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2955	1.9109	1.4311	2.2000e-003		0.1226	0.1226		0.1182	0.1182	0.0000	184.5473	184.5473	0.0387	0.0000	185.3605
Total	**0.2955**	**1.9109**	**1.4311**	**2.2000e-003**		**0.1226**	**0.1226**		**0.1182**	**0.1182**	**0.0000**	**184.5473**	**184.5473**	**0.0387**	**0.0000**	**185.3605**

3.5 Building Construction - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2955	1.9109	1.4311	2.2000e-003		0.1226	0.1226		0.1182	0.1182	0.0000	184.5471	184.5471	0.0387	0.0000	185.3603
Total	**0.2955**	**1.9109**	**1.4311**	**2.2000e-003**		**0.1226**	**0.1226**		**0.1182**	**0.1182**	**0.0000**	**184.5471**	**184.5471**	**0.0387**	**0.0000**	**185.3603**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

3.6 Paving - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.9300e-003	0.0605	0.0452	7.0000e-005		3.6700e-003	3.6700e-003		3.3800e-003	3.3800e-003	0.0000	6.1129	6.1129	1.8400e-003	0.0000	6.1515
Paving	1.3100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.2400e-003**	**0.0605**	**0.0452**	**7.0000e-005**		**3.6700e-003**	**3.6700e-003**		**3.3800e-003**	**3.3800e-003**	**0.0000**	**6.1129**	**6.1129**	**1.8400e-003**	**0.0000**	**6.1515**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	3.5000e-004	3.6000e-003	1.0000e-005	7.1000e-004	1.0000e-005	7.2000e-004	1.9000e-004	1.0000e-005	1.9000e-004	0.0000	0.6425	0.6425	3.0000e-005	0.0000	0.6432
Total	**2.3000e-004**	**3.5000e-004**	**3.6000e-003**	**1.0000e-005**	**7.1000e-004**	**1.0000e-005**	**7.2000e-004**	**1.9000e-004**	**1.0000e-005**	**1.9000e-004**	**0.0000**	**0.6425**	**0.6425**	**3.0000e-005**	**0.0000**	**0.6432**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.9300e-003	0.0605	0.0452	7.0000e-005		3.6700e-003	3.6700e-003		3.3800e-003	3.3800e-003	0.0000	6.1129	6.1129	1.8400e-003	0.0000	6.1515
Paving	1.3100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.2400e-003**	**0.0605**	**0.0452**	**7.0000e-005**		**3.6700e-003**	**3.6700e-003**		**3.3800e-003**	**3.3800e-003**	**0.0000**	**6.1129**	**6.1129**	**1.8400e-003**	**0.0000**	**6.1515**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.3000e-004	3.5000e-004	3.6000e-003	1.0000e-005	7.1000e-004	1.0000e-005	7.2000e-004	1.9000e-004	1.0000e-005	1.9000e-004	0.0000	0.6425	0.6425	3.0000e-005	0.0000	0.6432
Total	**2.3000e-004**	**3.5000e-004**	**3.6000e-003**	**1.0000e-005**	**7.1000e-004**	**1.0000e-005**	**7.2000e-004**	**1.9000e-004**	**1.0000e-005**	**1.9000e-004**	**0.0000**	**0.6425**	**0.6425**	**3.0000e-005**	**0.0000**	**0.6432**

3.7 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0156					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6600e-003	0.0109	9.3400e-003	1.0000e-005		8.7000e-004	8.7000e-004		8.7000e-004	8.7000e-004	0.0000	1.2766	1.2766	1.3000e-004	0.0000	1.2795
Total	**0.0172**	**0.0109**	**9.3400e-003**	**1.0000e-005**		**8.7000e-004**	**8.7000e-004**		**8.7000e-004**	**8.7000e-004**	**0.0000**	**1.2766**	**1.2766**	**1.3000e-004**	**0.0000**	**1.2795**

3.7 Architectural Coating - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0156					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6600e-003	0.0109	9.3400e-003	1.0000e-005		8.7000e-004	8.7000e-004		8.7000e-004	8.7000e-004	0.0000	1.2766	1.2766	1.3000e-004	0.0000	1.2795
Total	**0.0172**	**0.0109**	**9.3400e-003**	**1.0000e-005**		**8.7000e-004**	**8.7000e-004**		**8.7000e-004**	**8.7000e-004**	**0.0000**	**1.2766**	**1.2766**	**1.3000e-004**	**0.0000**	**1.2795**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.7 Architectural Coating - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0599	0.1152	0.5030	1.0000e-003	0.0655	1.4900e-003	0.0670	0.0175	1.3700e-003	0.0189	0.0000	74.7623	74.7623	3.0300e-003	0.0000	74.8259
Unmitigated	0.0599	0.1152	0.5030	1.0000e-003	0.0655	1.4900e-003	0.0670	0.0175	1.3700e-003	0.0189	0.0000	74.7623	74.7623	3.0300e-003	0.0000	74.8259

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Automobile Care Center	128.96	128.96	128.96	172,749	172,749
Parking Lot	0.00	0.00	0.00		
Total	128.96	128.96	128.96	172,749	172,749

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Automobile Care Center	16.60	8.40	6.90	33.00	48.00	19.00	21	51	28
Parking Lot	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.511172	0.060004	0.180590	0.138995	0.042398	0.006681	0.016070	0.032568	0.001938	0.002493	0.004370	0.000586	0.002135

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	7.8987	7.8987	3.6000e-004	8.0000e-005	7.9296
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	7.8987	7.8987	3.6000e-004	8.0000e-005	7.9296
NaturalGas Mitigated	3.7000e-004	3.3900e-003	2.8500e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	3.6951	3.6951	7.0000e-005	7.0000e-005	3.7176
NaturalGas Unmitigated	3.7000e-004	3.3900e-003	2.8500e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	3.6951	3.6951	7.0000e-005	7.0000e-005	3.7176

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Automobile Care Center	69243.2	3.7000e-004	3.3900e-003	2.8500e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	3.6951	3.6951	7.0000e-005	7.0000e-005	3.7176
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**3.7000e-004**	**3.3900e-003**	**2.8500e-003**	**2.0000e-005**		**2.6000e-004**	**2.6000e-004**		**2.6000e-004**	**2.6000e-004**	**0.0000**	**3.6951**	**3.6951**	**7.0000e-005**	**7.0000e-005**	**3.7176**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Automobile Care Center	69243.2	3.7000e-004	3.3900e-003	2.8500e-003	2.0000e-005		2.6000e-004	2.6000e-004		2.6000e-004	2.6000e-004	0.0000	3.6951	3.6951	7.0000e-005	7.0000e-005	3.7176
Total		**3.7000e-004**	**3.3900e-003**	**2.8500e-003**	**2.0000e-005**		**2.6000e-004**	**2.6000e-004**		**2.6000e-004**	**2.6000e-004**	**0.0000**	**3.6951**	**3.6951**	**7.0000e-005**	**7.0000e-005**	**3.7176**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Automobile Care Center	23025.6	6.5892	3.0000e-004	6.0000e-005	6.6150
Parking Lot	4576	1.3095	6.0000e-005	1.0000e-005	1.3146
Total		**7.8987**	**3.6000e-004**	**7.0000e-005**	**7.9296**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Automobile Care Center	23025.6	6.5892	3.0000e-004	6.0000e-005	6.6150
Parking Lot	4576	1.3095	6.0000e-005	1.0000e-005	1.3146
Total		**7.8987**	**3.6000e-004**	**7.0000e-005**	**7.9296**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0279	0.0000	2.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.7000e-004	3.7000e-004	0.0000	0.0000	4.0000e-004
Unmitigated	0.0287	0.0000	2.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.7000e-004	3.7000e-004	0.0000	0.0000	4.0000e-004

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.3300e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0263					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.0000e-005	0.0000	2.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.7000e-004	3.7000e-004	0.0000	0.0000	4.0000e-004
Total	**0.0287**	**0.0000**	**2.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**3.7000e-004**	**3.7000e-004**	**0.0000**	**0.0000**	**4.0000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	1.5500e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0263					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	2.0000e-005	0.0000	2.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.7000e-004	3.7000e-004	0.0000	0.0000	4.0000e-004
Total	**0.0279**	**0.0000**	**2.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**3.7000e-004**	**3.7000e-004**	**0.0000**	**0.0000**	**4.0000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Toilet

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	1.0748	5.6300e-003	1.4000e-004	1.2369
Unmitigated	1.1726	6.4300e-003	1.6000e-004	1.3575

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Automobile Care Center	0.195689 / 0.119938	1.1726	6.4300e-003	1.6000e-004	1.3575
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**1.1726**	**6.4300e-003**	**1.6000e-004**	**1.3575**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Automobile Care Center	0.171502 / 0.119938	1.0748	5.6300e-003	1.4000e-004	1.2369
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**1.0748**	**5.6300e-003**	**1.4000e-004**	**1.2369**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	1.6138	0.0954	0.0000	3.6166
Unmitigated	1.6138	0.0954	0.0000	3.6166

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Automobile Care Center	7.95	1.6138	0.0954	0.0000	3.6166
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**1.6138**	**0.0954**	**0.0000**	**3.6166**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Automobile Care Center	7.95	1.6138	0.0954	0.0000	3.6166
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**1.6138**	**0.0954**	**0.0000**	**3.6166**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

10.0 Vegetation

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

NEC Cactus Ave and Commerce Center Moreno Valley P1 2800 sf

South Coast AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Fast Food Restaurant with Drive Thru	2.80	1000sqft	0.07	2,800.00	0
Parking Lot	28.00	Space	0.66	11,200.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2018
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Lot is 073 acres

Construction Phase - To be constructed on vacant lot. Demolition minimal.

Architectural Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Mitigation - Low VOC paints to be used IAW SCAQMD 1113.

Water Mitigation - Low flow plulmbing fixtures to be used.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	150
tblConstructionPhase	NumDays	10.00	1.00
tblConstructionPhase	PhaseEndDate	1/3/2017	1/16/2017
tblConstructionPhase	PhaseStartDate	1/3/2017	1/14/2017
tblLandUse	LotAcreage	0.06	0.07
tblLandUse	LotAcreage	0.25	0.66
tblProjectCharacteristics	OperationalYear	2014	2018

2.0 Emissions Summary

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0944	0.6960	0.4725	7.0000e-004	5.6400e-003	0.0463	0.0520	1.6800e-003	0.0427	0.0444	0.0000	63.2493	63.2493	0.0175	0.0000	63.6169
Total	**0.0944**	**0.6960**	**0.4725**	**7.0000e-004**	**5.6400e-003**	**0.0463**	**0.0520**	**1.6800e-003**	**0.0427**	**0.0444**	**0.0000**	**63.2493**	**63.2493**	**0.0175**	**0.0000**	**63.6169**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0944	0.6960	0.4725	7.0000e-004	5.6400e-003	0.0463	0.0520	1.6800e-003	0.0427	0.0444	0.0000	63.2492	63.2492	0.0175	0.0000	63.6168
Total	**0.0944**	**0.6960**	**0.4725**	**7.0000e-004**	**5.6400e-003**	**0.0463**	**0.0520**	**1.6800e-003**	**0.0427**	**0.0444**	**0.0000**	**63.2492**	**63.2492**	**0.0175**	**0.0000**	**63.6168**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0539	0.0000	4.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.6000e-004	7.6000e-004	0.0000	0.0000	8.1000e-004
Energy	4.1900e-003	0.0381	0.0320	2.3000e-004		2.8900e-003	2.8900e-003		2.8900e-003	2.8900e-003	0.0000	86.2720	86.2720	2.8500e-003	1.1900e-003	86.6997
Mobile	0.6707	1.1330	5.1994	9.2600e-003	0.5976	0.0140	0.6116	0.1599	0.0129	0.1729	0.0000	693.7749	693.7749	0.0290	0.0000	694.3836
Waste						0.0000	0.0000		0.0000	0.0000	6.5465	0.0000	6.5465	0.3869	0.0000	14.6710
Water						0.0000	0.0000		0.0000	0.0000	0.2696	3.3393	3.6090	0.0279	6.9000e-004	4.4063
Total	**0.7288**	**1.1711**	**5.2318**	**9.4900e-003**	**0.5976**	**0.0169**	**0.6145**	**0.1599**	**0.0158**	**0.1757**	**6.8161**	**783.3871**	**790.2032**	**0.4466**	**1.8800e-003**	**800.1615**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0528	0.0000	4.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.6000e-004	7.6000e-004	0.0000	0.0000	8.1000e-004
Energy	4.1900e-003	0.0381	0.0320	2.3000e-004		2.8900e-003	2.8900e-003		2.8900e-003	2.8900e-003	0.0000	86.2720	86.2720	2.8500e-003	1.1900e-003	86.6997
Mobile	0.6707	1.1330	5.1994	9.2600e-003	0.5976	0.0140	0.6116	0.1599	0.0129	0.1729	0.0000	693.7749	693.7749	0.0290	0.0000	694.3836
Waste						0.0000	0.0000		0.0000	0.0000	6.5465	0.0000	6.5465	0.3869	0.0000	14.6710
Water						0.0000	0.0000		0.0000	0.0000	0.2157	2.7060	2.9217	0.0223	5.5000e-004	3.5593
Total	**0.7277**	**1.1711**	**5.2318**	**9.4900e-003**	**0.5976**	**0.0169**	**0.6145**	**0.1599**	**0.0158**	**0.1757**	**6.7622**	**782.7537**	**789.5159**	**0.4410**	**1.7400e-003**	**799.3145**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.79**	**0.08**	**0.09**	**1.25**	**7.45**	**0.11**

3.0 Construction Detail

Construction Phase

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	1/2/2017	5	1	
2	Site Preparation	Site Preparation	1/14/2017	1/16/2017	5	1	
3	Grading	Grading	1/17/2017	1/18/2017	5	2	
4	Building Construction	Building Construction	1/19/2017	6/7/2017	5	100	
5	Paving	Paving	6/8/2017	6/14/2017	5	5	
6	Architectural Coating	Architectural Coating	6/15/2017	6/21/2017	5	5	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 4,704; Non-Residential Outdoor: 1,568 (Architectural Coating – sqft)

OffRoad Equipment

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Cranes	1	4.00	226	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Site Preparation	Graders	1	8.00	174	0.41
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Demolition	Rubber Tired Dozers	1	1.00	255	0.40
Grading	Rubber Tired Dozers	1	1.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	6.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0000e-004	5.2400e-003	4.2900e-003	1.0000e-005		3.6000e-004	3.6000e-004		3.5000e-004	3.5000e-004	0.0000	0.5370	0.5370	1.1000e-004	0.0000	0.5392
Total	**6.0000e-004**	**5.2400e-003**	**4.2900e-003**	**1.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.5000e-004**	**3.5000e-004**	**0.0000**	**0.5370**	**0.5370**	**1.1000e-004**	**0.0000**	**0.5392**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0000e-004	5.2400e-003	4.2900e-003	1.0000e-005		3.6000e-004	3.6000e-004		3.5000e-004	3.5000e-004	0.0000	0.5370	0.5370	1.1000e-004	0.0000	0.5392
Total	**6.0000e-004**	**5.2400e-003**	**4.2900e-003**	**1.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.5000e-004**	**3.5000e-004**	**0.0000**	**0.5370**	**0.5370**	**1.1000e-004**	**0.0000**	**0.5392**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.3000e-004	6.3400e-003	3.6200e-003	0.0000		3.9000e-004	3.9000e-004		3.5000e-004	3.5000e-004	0.0000	0.4336	0.4336	1.3000e-004	0.0000	0.4364
Total	**6.3000e-004**	**6.3400e-003**	**3.6200e-003**	**0.0000**	**2.7000e-004**	**3.9000e-004**	**6.6000e-004**	**3.0000e-005**	**3.5000e-004**	**3.8000e-004**	**0.0000**	**0.4336**	**0.4336**	**1.3000e-004**	**0.0000**	**0.4364**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.3000e-004	6.3400e-003	3.6200e-003	0.0000		3.9000e-004	3.9000e-004		3.5000e-004	3.5000e-004	0.0000	0.4336	0.4336	1.3000e-004	0.0000	0.4364
Total	**6.3000e-004**	**6.3400e-003**	**3.6200e-003**	**0.0000**	**2.7000e-004**	**3.9000e-004**	**6.6000e-004**	**3.0000e-005**	**3.5000e-004**	**3.8000e-004**	**0.0000**	**0.4336**	**0.4336**	**1.3000e-004**	**0.0000**	**0.4364**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2000e-003	0.0105	8.5800e-003	1.0000e-005		7.3000e-004	7.3000e-004		6.9000e-004	6.9000e-004	0.0000	1.0739	1.0739	2.1000e-004	0.0000	1.0784
Total	**1.2000e-003**	**0.0105**	**8.5800e-003**	**1.0000e-005**	**7.5000e-004**	**7.3000e-004**	**1.4800e-003**	**4.1000e-004**	**6.9000e-004**	**1.1000e-003**	**0.0000**	**1.0739**	**1.0739**	**2.1000e-004**	**0.0000**	**1.0784**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	5.0000e-005	5.5000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0988	0.0988	1.0000e-005	0.0000	0.0990
Total	**4.0000e-005**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0988**	**0.0988**	**1.0000e-005**	**0.0000**	**0.0990**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2000e-003	0.0105	8.5800e-003	1.0000e-005		7.3000e-004	7.3000e-004		6.9000e-004	6.9000e-004	0.0000	1.0739	1.0739	2.1000e-004	0.0000	1.0784
Total	**1.2000e-003**	**0.0105**	**8.5800e-003**	**1.0000e-005**	**7.5000e-004**	**7.3000e-004**	**1.4800e-003**	**4.1000e-004**	**6.9000e-004**	**1.1000e-003**	**0.0000**	**1.0739**	**1.0739**	**2.1000e-004**	**0.0000**	**1.0784**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	5.0000e-005	5.5000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0988	0.0988	1.0000e-005	0.0000	0.0990
Total	**4.0000e-005**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0988**	**0.0988**	**1.0000e-005**	**0.0000**	**0.0990**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0637	0.6337	0.4020	5.7000e-004		0.0428	0.0428		0.0394	0.0394	0.0000	52.5954	52.5954	0.0161	0.0000	52.9339
Total	**0.0637**	**0.6337**	**0.4020**	**5.7000e-004**		**0.0428**	**0.0428**		**0.0394**	**0.0394**	**0.0000**	**52.5954**	**52.5954**	**0.0161**	**0.0000**	**52.9339**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0637	0.6337	0.4020	5.7000e-004		0.0428	0.0428		0.0394	0.0394	0.0000	52.5954	52.5954	0.0161	0.0000	52.9338
Total	**0.0637**	**0.6337**	**0.4020**	**5.7000e-004**		**0.0428**	**0.0428**		**0.0394**	**0.0394**	**0.0000**	**52.5954**	**52.5954**	**0.0161**	**0.0000**	**52.9338**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6000e-003	0.0246	0.0181	3.0000e-005		1.5000e-003	1.5000e-003		1.3900e-003	1.3900e-003	0.0000	2.4243	2.4243	6.7000e-004	0.0000	2.4384
Paving	8.6000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.4600e-003**	**0.0246**	**0.0181**	**3.0000e-005**		**1.5000e-003**	**1.5000e-003**		**1.3900e-003**	**1.3900e-003**	**0.0000**	**2.4243**	**2.4243**	**6.7000e-004**	**0.0000**	**2.4384**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.4900e-003	1.0000e-005	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4448	0.4448	2.0000e-005	0.0000	0.4453
Total	**1.6000e-004**	**2.4000e-004**	**2.4900e-003**	**1.0000e-005**	**4.9000e-004**	**0.0000**	**5.0000e-004**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**0.4448**	**0.4448**	**2.0000e-005**	**0.0000**	**0.4453**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6000e-003	0.0246	0.0181	3.0000e-005		1.5000e-003	1.5000e-003		1.3900e-003	1.3900e-003	0.0000	2.4243	2.4243	6.7000e-004	0.0000	2.4384
Paving	8.6000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.4600e-003**	**0.0246**	**0.0181**	**3.0000e-005**		**1.5000e-003**	**1.5000e-003**		**1.3900e-003**	**1.3900e-003**	**0.0000**	**2.4243**	**2.4243**	**6.7000e-004**	**0.0000**	**2.4384**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.4900e-003	1.0000e-005	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4448	0.4448	2.0000e-005	0.0000	0.4453
Total	**1.6000e-004**	**2.4000e-004**	**2.4900e-003**	**1.0000e-005**	**4.9000e-004**	**0.0000**	**5.0000e-004**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**0.4448**	**0.4448**	**2.0000e-005**	**0.0000**	**0.4453**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.7 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0218					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0226**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.7 Architectural Coating - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0218					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0226**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.6707	1.1330	5.1994	9.2600e-003	0.5976	0.0140	0.6116	0.1599	0.0129	0.1729	0.0000	693.7749	693.7749	0.0290	0.0000	694.3836
Unmitigated	0.6707	1.1330	5.1994	9.2600e-003	0.5976	0.0140	0.6116	0.1599	0.0129	0.1729	0.0000	693.7749	693.7749	0.0290	0.0000	694.3836

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Fast Food Restaurant with Drive Thru	1,389.14	2,021.68	1519.62	1,576,624	1,576,624
Parking Lot	0.00	0.00	0.00		
Total	1,389.14	2,021.68	1,519.62	1,576,624	1,576,624

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Fast Food Restaurant with Drive	16.60	8.40	6.90	2.20	78.80	19.00	29	21	50
Parking Lot	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.511172	0.060004	0.180590	0.138995	0.042398	0.006681	0.016070	0.032568	0.001938	0.002493	0.004370	0.000586	0.002135

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	44.8069	44.8069	2.0600e-003	4.3000e-004	44.9822
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	44.8069	44.8069	2.0600e-003	4.3000e-004	44.9822
NaturalGas Mitigated	4.1900e-003	0.0381	0.0320	2.3000e-004		2.8900e-003	2.8900e-003		2.8900e-003	2.8900e-003	0.0000	41.4652	41.4652	7.9000e-004	7.6000e-004	41.7175
NaturalGas Unmitigated	4.1900e-003	0.0381	0.0320	2.3000e-004		2.8900e-003	2.8900e-003		2.8900e-003	2.8900e-003	0.0000	41.4652	41.4652	7.9000e-004	7.6000e-004	41.7175

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Fast Food Restaurant with Drive Thru	777028	4.1900e-003	0.0381	0.0320	2.3000e-004		2.8900e-003	2.8900e-003		2.8900e-003	2.8900e-003	0.0000	41.4652	41.4652	7.9000e-004	7.6000e-004	41.7175
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**4.1900e-003**	**0.0381**	**0.0320**	**2.3000e-004**		**2.8900e-003**	**2.8900e-003**		**2.8900e-003**	**2.8900e-003**	**0.0000**	**41.4652**	**41.4652**	**7.9000e-004**	**7.6000e-004**	**41.7175**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant with Drive Thru	777028	4.1900e-003	0.0381	0.0320	2.3000e-004		2.8900e-003	2.8900e-003		2.8900e-003	2.8900e-003	0.0000	41.4652	41.4652	7.9000e-004	7.6000e-004	41.7175
Total		**4.1900e-003**	**0.0381**	**0.0320**	**2.3000e-004**		**2.8900e-003**	**2.8900e-003**		**2.8900e-003**	**2.8900e-003**	**0.0000**	**41.4652**	**41.4652**	**7.9000e-004**	**7.6000e-004**	**41.7175**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Fast Food Restaurant with Drive Thru	146720	41.9864	1.9300e-003	4.0000e-004	42.1507
Parking Lot	9856	2.8205	1.3000e-004	3.0000e-005	2.8315
Total		**44.8069**	**2.0600e-003**	**4.3000e-004**	**44.9822**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Fast Food Restaurant with Drive Thru	146720	41.9864	1.9300e-003	4.0000e-004	42.1507
Parking Lot	9856	2.8205	1.3000e-004	3.0000e-005	2.8315
Total		**44.8069**	**2.0600e-003**	**4.3000e-004**	**44.9822**

6.0 Area Detail

6.1 Mitigation Measures Area

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0528	0.0000	4.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.6000e-004	7.6000e-004	0.0000	0.0000	8.1000e-004
Unmitigated	0.0539	0.0000	4.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.6000e-004	7.6000e-004	0.0000	0.0000	8.1000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.2700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0506					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	4.0000e-005	0.0000	4.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.6000e-004	7.6000e-004	0.0000	0.0000	8.1000e-004
Total	**0.0539**	**0.0000**	**4.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**7.6000e-004**	**7.6000e-004**	**0.0000**	**0.0000**	**8.1000e-004**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.1800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0506					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	4.0000e-005	0.0000	4.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.6000e-004	7.6000e-004	0.0000	0.0000	8.1000e-004
Total	**0.0528**	**0.0000**	**4.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**7.6000e-004**	**7.6000e-004**	**0.0000**	**0.0000**	**8.1000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	2.9217	0.0223	5.5000e-004	3.5593
Unmitigated	3.6090	0.0279	6.9000e-004	4.4063

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Fast Food Restaurant with Drive Thru	0.849894 / 0.0542486	3.6090	0.0279	6.9000e-004	4.4063
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**3.6090**	**0.0279**	**6.9000e-004**	**4.4063**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Fast Food Restaurant with Drive Thru	0.679916 / 0.0542486	2.9217	0.0223	5.5000e-004	3.5593
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**2.9217**	**0.0223**	**5.5000e-004**	**3.5593**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	6.5465	0.3869	0.0000	14.6710
Unmitigated	6.5465	0.3869	0.0000	14.6710

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Fast Food Restaurant with Drive Thru	32.25	6.5465	0.3869	0.0000	14.6710
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**6.5465**	**0.3869**	**0.0000**	**14.6710**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Fast Food Restaurant with Drive Thru	32.25	6.5465	0.3869	0.0000	14.6710
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**6.5465**	**0.3869**	**0.0000**	**14.6710**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

10.0 Vegetation

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

NEC Cactus Ave and Commercial Center Moreno Valley P1 3800 sf

South Coast AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Convenience Market With Gas Pumps	3.80	1000sqft	0.09	3,800.00	0
Parking Lot	17.00	Space	0.91	6,800.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2014
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Lot size is 1.0 acre.

Construction Phase - To be constructed on vacant lot. Demolition minimal.

Architectural Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Mitigation - Low VOC paints to be used IAW SCAQMD 1113.

Water Mitigation - Low flow plumbing fixtures to be used.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	150
tblConstructionPhase	NumDays	10.00	1.00
tblConstructionPhase	PhaseEndDate	1/3/2017	1/16/2017
tblConstructionPhase	PhaseStartDate	1/3/2017	1/14/2017
tblLandUse	LotAcreage	0.15	0.91

2.0 Emissions Summary

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.1867	1.0459	0.7994	1.2300e-003	0.0112	0.0662	0.0774	4.9200e-003	0.0637	0.0686	0.0000	103.6281	103.6281	0.0214	0.0000	104.0779
Total	**0.1867**	**1.0459**	**0.7994**	**1.2300e-003**	**0.0112**	**0.0662**	**0.0774**	**4.9200e-003**	**0.0637**	**0.0686**	**0.0000**	**103.6281**	**103.6281**	**0.0214**	**0.0000**	**104.0779**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.1867	1.0459	0.7994	1.2300e-003	0.0112	0.0662	0.0774	4.9200e-003	0.0637	0.0686	0.0000	103.6280	103.6280	0.0214	0.0000	104.0777
Total	**0.1867**	**1.0459**	**0.7994**	**1.2300e-003**	**0.0112**	**0.0662**	**0.0774**	**4.9200e-003**	**0.0637**	**0.0686**	**0.0000**	**103.6280**	**103.6280**	**0.0214**	**0.0000**	**104.0777**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0425	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	5.2000e-004	5.2000e-004	0.0000	0.0000	5.5000e-004
Energy	5.0000e-005	4.3000e-004	3.6000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	19.2121	19.2121	8.7000e-004	1.9000e-004	19.2883
Mobile	2.1007	2.6498	13.8156	0.0137	0.8416	0.0311	0.8726	0.2251	0.0285	0.2536	0.0000	1,146.3012	1,146.3012	0.0667	0.0000	1,147.7026
Waste						0.0000	0.0000		0.0000	0.0000	2.3182	0.0000	2.3182	0.1370	0.0000	5.1951
Water						0.0000	0.0000		0.0000	0.0000	0.0893	1.5973	1.6866	9.2500e-003	2.3000e-004	1.9526
Total	**2.1433**	**2.6502**	**13.8162**	**0.0137**	**0.8416**	**0.0311**	**0.8727**	**0.2251**	**0.0285**	**0.2536**	**2.4075**	**1,167.1111**	**1,169.5186**	**0.2139**	**4.2000e-004**	**1,174.1392**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0411	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	5.2000e-004	5.2000e-004	0.0000	0.0000	5.5000e-004
Energy	5.0000e-005	4.3000e-004	3.6000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	19.2121	19.2121	8.7000e-004	1.9000e-004	19.2883
Mobile	2.1007	2.6498	13.8156	0.0137	0.8416	0.0311	0.8726	0.2251	0.0285	0.2536	0.0000	1,146.3012	1,146.3012	0.0667	0.0000	1,147.7026
Waste						0.0000	0.0000		0.0000	0.0000	2.3182	0.0000	2.3182	0.1370	0.0000	5.1951
Water						0.0000	0.0000		0.0000	0.0000	0.0714	1.3876	1.4590	7.4000e-003	1.9000e-004	1.6721
Total	**2.1419**	**2.6502**	**13.8162**	**0.0137**	**0.8416**	**0.0311**	**0.8727**	**0.2251**	**0.0285**	**0.2536**	**2.3896**	**1,166.9013**	**1,169.2909**	**0.2120**	**3.8000e-004**	**1,173.8587**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.74**	**0.02**	**0.02**	**0.87**	**9.52**	**0.02**

3.0 Construction Detail

Construction Phase

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	1/2/2017	5	1	
2	Site Preparation	Site Preparation	1/14/2017	1/16/2017	5	1	
3	Grading	Grading	1/17/2017	1/18/2017	5	2	
4	Building Construction	Building Construction	1/19/2017	6/7/2017	5	100	
5	Paving	Paving	6/8/2017	6/14/2017	5	5	
6	Architectural Coating	Architectural Coating	6/15/2017	6/21/2017	5	5	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 0.75

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 6,006; Non-Residential Outdoor: 2,002 (Architectural Coating – sqft)

OffRoad Equipment

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Cranes	1	6.00	226	0.29
Building Construction	Forklifts	1	6.00	89	0.20
Site Preparation	Graders	1	8.00	174	0.41
Paving	Pavers	1	6.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Demolition	Rubber Tired Dozers	1	8.00	255	0.40
Grading	Rubber Tired Dozers	1	6.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Grading	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Graders	1	6.00	174	0.41
Paving	Paving Equipment	1	8.00	130	0.36
Site Preparation	Rubber Tired Dozers	1	7.00	255	0.40
Building Construction	Welders	3	8.00	46	0.45

Trips and VMT

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	5	13.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	7	4.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	5	13.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.3600e-003	0.0133	0.0104	1.0000e-005		8.0000e-004	8.0000e-004		7.5000e-004	7.5000e-004	0.0000	1.1147	1.1147	2.8000e-004	0.0000	1.1206
Total	**1.3600e-003**	**0.0133**	**0.0104**	**1.0000e-005**		**8.0000e-004**	**8.0000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**1.1147**	**1.1147**	**2.8000e-004**	**0.0000**	**1.1206**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	3.6000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0643	0.0643	0.0000	0.0000	0.0643
Total	**2.0000e-005**	**3.0000e-005**	**3.6000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0643**	**0.0643**	**0.0000**	**0.0000**	**0.0643**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.3600e-003	0.0133	0.0104	1.0000e-005		8.0000e-004	8.0000e-004		7.5000e-004	7.5000e-004	0.0000	1.1147	1.1147	2.8000e-004	0.0000	1.1206
Total	**1.3600e-003**	**0.0133**	**0.0104**	**1.0000e-005**		**8.0000e-004**	**8.0000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**1.1147**	**1.1147**	**2.8000e-004**	**0.0000**	**1.1206**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	3.6000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0643	0.0643	0.0000	0.0000	0.0643
Total	**2.0000e-005**	**3.0000e-005**	**3.6000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0643**	**0.0643**	**0.0000**	**0.0000**	**0.0643**

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.9000e-003	0.0000	2.9000e-003	1.4800e-003	0.0000	1.4800e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1600e-003	0.0121	7.9600e-003	1.0000e-005		6.5000e-004	6.5000e-004		6.0000e-004	6.0000e-004	0.0000	0.7948	0.7948	2.4000e-004	0.0000	0.7999
Total	**1.1600e-003**	**0.0121**	**7.9600e-003**	**1.0000e-005**	**2.9000e-003**	**6.5000e-004**	**3.5500e-003**	**1.4800e-003**	**6.0000e-004**	**2.0800e-003**	**0.0000**	**0.7948**	**0.7948**	**2.4000e-004**	**0.0000**	**0.7999**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	2.0000e-005	2.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0395	0.0395	0.0000	0.0000	0.0396
Total	**1.0000e-005**	**2.0000e-005**	**2.2000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0395**	**0.0395**	**0.0000**	**0.0000**	**0.0396**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.9000e-003	0.0000	2.9000e-003	1.4800e-003	0.0000	1.4800e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.1600e-003	0.0121	7.9600e-003	1.0000e-005		6.5000e-004	6.5000e-004		6.0000e-004	6.0000e-004	0.0000	0.7948	0.7948	2.4000e-004	0.0000	0.7999
Total	**1.1600e-003**	**0.0121**	**7.9600e-003**	**1.0000e-005**	**2.9000e-003**	**6.5000e-004**	**3.5500e-003**	**1.4800e-003**	**6.0000e-004**	**2.0800e-003**	**0.0000**	**0.7948**	**0.7948**	**2.4000e-004**	**0.0000**	**0.7999**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	2.0000e-005	2.2000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0395	0.0395	0.0000	0.0000	0.0396
Total	**1.0000e-005**	**2.0000e-005**	**2.2000e-004**	**0.0000**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0395**	**0.0395**	**0.0000**	**0.0000**	**0.0396**

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.9100e-003	0.0000	4.9100e-003	2.5300e-003	0.0000	2.5300e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.8800e-003	0.0198	0.0132	1.0000e-005		1.0700e-003	1.0700e-003		9.8000e-004	9.8000e-004	0.0000	1.3056	1.3056	4.0000e-004	0.0000	1.3140
Total	**1.8800e-003**	**0.0198**	**0.0132**	**1.0000e-005**	**4.9100e-003**	**1.0700e-003**	**5.9800e-003**	**2.5300e-003**	**9.8000e-004**	**3.5100e-003**	**0.0000**	**1.3056**	**1.3056**	**4.0000e-004**	**0.0000**	**1.3140**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.4000e-004	0.0000	9.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0791	0.0791	0.0000	0.0000	0.0792
Total	**3.0000e-005**	**4.0000e-005**	**4.4000e-004**	**0.0000**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0791**	**0.0791**	**0.0000**	**0.0000**	**0.0792**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.9100e-003	0.0000	4.9100e-003	2.5300e-003	0.0000	2.5300e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.8800e-003	0.0198	0.0132	1.0000e-005		1.0700e-003	1.0700e-003		9.8000e-004	9.8000e-004	0.0000	1.3056	1.3056	4.0000e-004	0.0000	1.3140
Total	**1.8800e-003**	**0.0198**	**0.0132**	**1.0000e-005**	**4.9100e-003**	**1.0700e-003**	**5.9800e-003**	**2.5300e-003**	**9.8000e-004**	**3.5100e-003**	**0.0000**	**1.3056**	**1.3056**	**4.0000e-004**	**0.0000**	**1.3140**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.4000e-004	0.0000	9.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0791	0.0791	0.0000	0.0000	0.0792
Total	**3.0000e-005**	**4.0000e-005**	**4.4000e-004**	**0.0000**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0791**	**0.0791**	**0.0000**	**0.0000**	**0.0792**

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1477	0.9554	0.7156	1.1000e-003		0.0613	0.0613		0.0591	0.0591	0.0000	92.2737	92.2737	0.0194	0.0000	92.6803
Total	**0.1477**	**0.9554**	**0.7156**	**1.1000e-003**		**0.0613**	**0.0613**		**0.0591**	**0.0591**	**0.0000**	**92.2737**	**92.2737**	**0.0194**	**0.0000**	**92.6803**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	7.2000e-004	1.0700e-003	0.0111	3.0000e-005	2.1900e-003	2.0000e-005	2.2100e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	1.9768	1.9768	1.0000e-004	0.0000	1.9790
Total	**1.5300e-003**	**9.2800e-003**	**0.0221**	**5.0000e-005**	**2.8100e-003**	**1.5000e-004**	**2.9500e-003**	**7.6000e-004**	**1.4000e-004**	**8.9000e-004**	**0.0000**	**3.9158**	**3.9158**	**1.1000e-004**	**0.0000**	**3.9183**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1477	0.9554	0.7156	1.1000e-003		0.0613	0.0613		0.0591	0.0591	0.0000	92.2736	92.2736	0.0194	0.0000	92.6801
Total	**0.1477**	**0.9554**	**0.7156**	**1.1000e-003**		**0.0613**	**0.0613**		**0.0591**	**0.0591**	**0.0000**	**92.2736**	**92.2736**	**0.0194**	**0.0000**	**92.6801**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	7.2000e-004	1.0700e-003	0.0111	3.0000e-005	2.1900e-003	2.0000e-005	2.2100e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	1.9768	1.9768	1.0000e-004	0.0000	1.9790
Total	**1.5300e-003**	**9.2800e-003**	**0.0221**	**5.0000e-005**	**2.8100e-003**	**1.5000e-004**	**2.9500e-003**	**7.6000e-004**	**1.4000e-004**	**8.9000e-004**	**0.0000**	**3.9158**	**3.9158**	**1.1000e-004**	**0.0000**	**3.9183**

3.6 Paving - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.9600e-003	0.0303	0.0226	3.0000e-005		1.8300e-003	1.8300e-003		1.6900e-003	1.6900e-003	0.0000	3.0564	3.0564	9.2000e-004	0.0000	3.0757
Paving	1.1900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.1500e-003**	**0.0303**	**0.0226**	**3.0000e-005**		**1.8300e-003**	**1.8300e-003**		**1.6900e-003**	**1.6900e-003**	**0.0000**	**3.0564**	**3.0564**	**9.2000e-004**	**0.0000**	**3.0757**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2000e-004	1.7000e-004	1.8000e-003	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3212	0.3212	2.0000e-005	0.0000	0.3216
Total	**1.2000e-004**	**1.7000e-004**	**1.8000e-003**	**0.0000**	**3.6000e-004**	**0.0000**	**3.6000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.3212**	**0.3212**	**2.0000e-005**	**0.0000**	**0.3216**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.9600e-003	0.0303	0.0226	3.0000e-005		1.8300e-003	1.8300e-003		1.6900e-003	1.6900e-003	0.0000	3.0564	3.0564	9.2000e-004	0.0000	3.0757
Paving	1.1900e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.1500e-003**	**0.0303**	**0.0226**	**3.0000e-005**		**1.8300e-003**	**1.8300e-003**		**1.6900e-003**	**1.6900e-003**	**0.0000**	**3.0564**	**3.0564**	**9.2000e-004**	**0.0000**	**3.0757**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2000e-004	1.7000e-004	1.8000e-003	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3212	0.3212	2.0000e-005	0.0000	0.3216
Total	**1.2000e-004**	**1.7000e-004**	**1.8000e-003**	**0.0000**	**3.6000e-004**	**0.0000**	**3.6000e-004**	**9.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.3212**	**0.3212**	**2.0000e-005**	**0.0000**	**0.3216**

3.7 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0278					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0287**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

3.7 Architectural Coating - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0278					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0287**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.7 Architectural Coating - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	2.1007	2.6498	13.8156	0.0137	0.8416	0.0311	0.8726	0.2251	0.0285	0.2536	0.0000	1,146.3012	1,146.3012	0.0667	0.0000	1,147.7026
Unmitigated	2.1007	2.6498	13.8156	0.0137	0.8416	0.0311	0.8726	0.2251	0.0285	0.2536	0.0000	1,146.3012	1,146.3012	0.0667	0.0000	1,147.7026

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Convenience Market With Gas Pumps	3,213.28	5,503.65	4491.90	2,222,246	2,222,246
Parking Lot	0.00	0.00	0.00		
Total	3,213.28	5,503.65	4,491.90	2,222,246	2,222,246

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Convenience Market With Gas	16.60	8.40	6.90	0.80	80.20	19.00	14	21	65
Parking Lot	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.515683	0.060583	0.179994	0.140474	0.041721	0.006653	0.015053	0.028382	0.001919	0.002521	0.004323	0.000600	0.002094

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	18.7416	18.7416	8.6000e-004	1.8000e-004	18.8150
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	18.7416	18.7416	8.6000e-004	1.8000e-004	18.8150
NaturalGas Mitigated	5.0000e-005	4.3000e-004	3.6000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.4705	0.4705	1.0000e-005	1.0000e-005	0.4733
NaturalGas Unmitigated	5.0000e-005	4.3000e-004	3.6000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.4705	0.4705	1.0000e-005	1.0000e-005	0.4733

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Convenience Market With Gas Pumps	8816	5.0000e-005	4.3000e-004	3.6000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.4705	0.4705	1.0000e-005	1.0000e-005	0.4733
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**5.0000e-005**	**4.3000e-004**	**3.6000e-004**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.4705**	**0.4705**	**1.0000e-005**	**1.0000e-005**	**0.4733**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Convenience Market With Gas Pumps	8816	5.0000e-005	4.3000e-004	3.6000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.4705	0.4705	1.0000e-005	1.0000e-005	0.4733
Total		**5.0000e-005**	**4.3000e-004**	**3.6000e-004**	**0.0000**		**3.0000e-005**	**3.0000e-005**		**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.4705**	**0.4705**	**1.0000e-005**	**1.0000e-005**	**0.4733**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Convenience Market With Gas Pumps	59508	17.0292	7.8000e-004	1.6000e-004	17.0959
Parking Lot	5984	1.7124	8.0000e-005	2.0000e-005	1.7191
Total		**18.7416**	**8.6000e-004**	**1.8000e-004**	**18.8150**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Convenience Market With Gas Pumps	59508	17.0292	7.8000e-004	1.6000e-004	17.0959
Parking Lot	5984	1.7124	8.0000e-005	2.0000e-005	1.7191
Total		**18.7416**	**8.6000e-004**	**1.8000e-004**	**18.8150**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0411	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	5.2000e-004	5.2000e-004	0.0000	0.0000	5.5000e-004
Unmitigated	0.0425	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	5.2000e-004	5.2000e-004	0.0000	0.0000	5.5000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	4.1800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0383					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	3.0000e-005	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	5.2000e-004	5.2000e-004	0.0000	0.0000	5.5000e-004
Total	**0.0425**	**0.0000**	**2.8000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**5.2000e-004**	**5.2000e-004**	**0.0000**	**0.0000**	**5.5000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.7800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0383					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	3.0000e-005	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	5.2000e-004	5.2000e-004	0.0000	0.0000	5.5000e-004
Total	**0.0411**	**0.0000**	**2.8000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**5.2000e-004**	**5.2000e-004**	**0.0000**	**0.0000**	**5.5000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	1.4590	7.4000e-003	1.9000e-004	1.6721
Unmitigated	1.6866	9.2500e-003	2.3000e-004	1.9526

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Convenience Market With Gas Pumps	0.281476 / 0.172517	1.6866	9.2500e-003	2.3000e-004	1.9526
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**1.6866**	**9.2500e-003**	**2.3000e-004**	**1.9526**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Convenience Market With Gas Pumps	0.22518 / 0.172517	1.4590	7.4000e-003	1.9000e-004	1.6721
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**1.4590**	**7.4000e-003**	**1.9000e-004**	**1.6721**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.3182	0.1370	0.0000	5.1951
Unmitigated	2.3182	0.1370	0.0000	5.1951

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Convenience Market With Gas Pumps	11.42	2.3182	0.1370	0.0000	5.1951
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**2.3182**	**0.1370**	**0.0000**	**5.1951**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Convenience Market With Gas Pumps	11.42	2.3182	0.1370	0.0000	5.1951
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**2.3182**	**0.1370**	**0.0000**	**5.1951**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

10.0 Vegetation

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

NEC Cactus Ave and Commerce Center Moreno Valley P2 Whse w Office

South Coast AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Unrefrigerated Warehouse-No Rail	33.95	1000sqft	0.78	33,950.00	0
Office Park	3.00	1000sqft	0.07	3,000.00	0
Parking Lot	52.00	Space	1.15	20,800.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2018
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Lot is 2.0 acres.

Construction Phase - To be constructed on vacant lot. Demolition minimal.

Architectural Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Mitigation - Low VOC paints to be used IAW SCAQMD 1113.

Water Mitigation - Low flow plumbing fixtures to be used.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	150
tblConstructionPhase	NumDays	20.00	1.00
tblConstructionPhase	PhaseEndDate	1/4/2017	1/31/2017
tblConstructionPhase	PhaseStartDate	1/3/2017	1/28/2017
tblLandUse	LotAcreage	0.47	1.15
tblProjectCharacteristics	OperationalYear	2014	2018

2.0 Emissions Summary

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.6311	2.5647	1.9996	3.2100e-003	0.0480	0.1589	0.2069	0.0159	0.1517	0.1676	0.0000	270.8018	270.8018	0.0532	0.0000	271.9187
Total	**0.6311**	**2.5647**	**1.9996**	**3.2100e-003**	**0.0480**	**0.1589**	**0.2069**	**0.0159**	**0.1517**	**0.1676**	**0.0000**	**270.8018**	**270.8018**	**0.0532**	**0.0000**	**271.9187**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.6311	2.5647	1.9996	3.2100e-003	0.0480	0.1589	0.2069	0.0159	0.1517	0.1676	0.0000	270.8015	270.8015	0.0532	0.0000	271.9184
Total	**0.6311**	**2.5647**	**1.9996**	**3.2100e-003**	**0.0480**	**0.1589**	**0.2069**	**0.0159**	**0.1517**	**0.1676**	**0.0000**	**270.8015**	**270.8015**	**0.0532**	**0.0000**	**271.9184**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.2480	1.0000e-005	1.1500e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.2100e-003	2.2100e-003	1.0000e-005	0.0000	2.3300e-003
Energy	4.4000e-004	4.0100e-003	3.3700e-003	2.0000e-005		3.0000e-004	3.0000e-004		3.0000e-004	3.0000e-004	0.0000	48.5192	48.5192	2.1100e-003	5.0000e-004	48.7186
Mobile	0.0711	0.2493	0.9079	2.5600e-003	0.1755	3.6400e-003	0.1791	0.0470	3.3600e-003	0.0503	0.0000	192.1051	192.1051	7.1500e-003	0.0000	192.2553
Waste						0.0000	0.0000		0.0000	0.0000	7.0438	0.0000	7.0438	0.4163	0.0000	15.7856
Water						0.0000	0.0000		0.0000	0.0000	2.6599	32.2798	34.9397	0.2747	6.7600e-003	42.8029
Total	**0.3195**	**0.2533**	**0.9124**	**2.5800e-003**	**0.1755**	**3.9400e-003**	**0.1794**	**0.0470**	**3.6600e-003**	**0.0506**	**9.7037**	**272.9063**	**282.6100**	**0.7002**	**7.2600e-003**	**299.5647**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.2349	1.0000e-005	1.1500e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.2100e-003	2.2100e-003	1.0000e-005	0.0000	2.3300e-003
Energy	4.4000e-004	4.0100e-003	3.3700e-003	2.0000e-005		3.0000e-004	3.0000e-004		3.0000e-004	3.0000e-004	0.0000	48.5192	48.5192	2.1100e-003	5.0000e-004	48.7186
Mobile	0.0711	0.2493	0.9079	2.5600e-003	0.1755	3.6400e-003	0.1791	0.0470	3.3600e-003	0.0503	0.0000	192.1051	192.1051	7.1500e-003	0.0000	192.2553
Waste						0.0000	0.0000		0.0000	0.0000	7.0438	0.0000	7.0438	0.4163	0.0000	15.7856
Water						0.0000	0.0000		0.0000	0.0000	2.1279	26.0316	28.1596	0.2197	5.4000e-003	34.4476
Total	**0.3065**	**0.2533**	**0.9124**	**2.5800e-003**	**0.1755**	**3.9400e-003**	**0.1794**	**0.0470**	**3.6600e-003**	**0.0506**	**9.1717**	**266.6582**	**275.8299**	**0.6453**	**5.9000e-003**	**291.2093**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**4.09**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.48**	**2.29**	**2.40**	**7.85**	**18.73**	**2.79**

3.0 Construction Detail

Construction Phase

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	1/2/2017	5	1	
2	Site Preparation	Site Preparation	1/28/2017	1/31/2017	5	2	
3	Grading	Grading	2/1/2017	2/6/2017	5	4	
4	Building Construction	Building Construction	2/7/2017	11/13/2017	5	200	
5	Paving	Paving	11/14/2017	11/27/2017	5	10	
6	Architectural Coating	Architectural Coating	11/28/2017	12/11/2017	5	10	

Acres of Grading (Site Preparation Phase): 3

Acres of Grading (Grading Phase): 2

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 56,361; Non-Residential Outdoor: 18,787 (Architectural Coating – sqft)

OffRoad Equipment

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	1	8.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Cranes	1	8.00	226	0.29
Building Construction	Forklifts	2	7.00	89	0.20
Site Preparation	Graders	1	8.00	174	0.41
Paving	Pavers	1	8.00	125	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	1	8.00	255	0.40
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Grading	Tractors/Loaders/Backhoes	2	7.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Paving	Paving Equipment	1	8.00	130	0.36
Site Preparation	Scrapers	1	8.00	361	0.48
Building Construction	Welders	3	8.00	46	0.45

Trips and VMT

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	5	13.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	8	24.00	9.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.3600e-003	0.0133	0.0104	1.0000e-005		8.0000e-004	8.0000e-004		7.5000e-004	7.5000e-004	0.0000	1.1147	1.1147	2.8000e-004	0.0000	1.1206
Total	**1.3600e-003**	**0.0133**	**0.0104**	**1.0000e-005**		**8.0000e-004**	**8.0000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**1.1147**	**1.1147**	**2.8000e-004**	**0.0000**	**1.1206**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	3.6000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0643	0.0643	0.0000	0.0000	0.0643
Total	**2.0000e-005**	**3.0000e-005**	**3.6000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0643**	**0.0643**	**0.0000**	**0.0000**	**0.0643**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	1.3600e-003	0.0133	0.0104	1.0000e-005		8.0000e-004	8.0000e-004		7.5000e-004	7.5000e-004	0.0000	1.1147	1.1147	2.8000e-004	0.0000	1.1206
Total	**1.3600e-003**	**0.0133**	**0.0104**	**1.0000e-005**		**8.0000e-004**	**8.0000e-004**		**7.5000e-004**	**7.5000e-004**	**0.0000**	**1.1147**	**1.1147**	**2.8000e-004**	**0.0000**	**1.1206**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	3.6000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0643	0.0643	0.0000	0.0000	0.0643
Total	**2.0000e-005**	**3.0000e-005**	**3.6000e-004**	**0.0000**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0643**	**0.0643**	**0.0000**	**0.0000**	**0.0643**

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.5900e-003	0.0000	1.5900e-003	1.7000e-004	0.0000	1.7000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.5300e-003	0.0286	0.0171	2.0000e-005		1.4000e-003	1.4000e-003		1.2800e-003	1.2800e-003	0.0000	2.2130	2.2130	6.8000e-004	0.0000	2.2273
Total	**2.5300e-003**	**0.0286**	**0.0171**	**2.0000e-005**	**1.5900e-003**	**1.4000e-003**	**2.9900e-003**	**1.7000e-004**	**1.2800e-003**	**1.4500e-003**	**0.0000**	**2.2130**	**2.2130**	**6.8000e-004**	**0.0000**	**2.2273**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.4000e-004	0.0000	9.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0791	0.0791	0.0000	0.0000	0.0792
Total	**3.0000e-005**	**4.0000e-005**	**4.4000e-004**	**0.0000**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0791**	**0.0791**	**0.0000**	**0.0000**	**0.0792**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.5900e-003	0.0000	1.5900e-003	1.7000e-004	0.0000	1.7000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.5300e-003	0.0286	0.0171	2.0000e-005		1.4000e-003	1.4000e-003		1.2800e-003	1.2800e-003	0.0000	2.2130	2.2130	6.8000e-004	0.0000	2.2273
Total	**2.5300e-003**	**0.0286**	**0.0171**	**2.0000e-005**	**1.5900e-003**	**1.4000e-003**	**2.9900e-003**	**1.7000e-004**	**1.2800e-003**	**1.4500e-003**	**0.0000**	**2.2130**	**2.2130**	**6.8000e-004**	**0.0000**	**2.2273**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.4000e-004	0.0000	9.0000e-005	0.0000	9.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.0791	0.0791	0.0000	0.0000	0.0792
Total	**3.0000e-005**	**4.0000e-005**	**4.4000e-004**	**0.0000**	**9.0000e-005**	**0.0000**	**9.0000e-005**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0791**	**0.0791**	**0.0000**	**0.0000**	**0.0792**

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0131	0.0000	0.0131	6.7300e-003	0.0000	6.7300e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.3900e-003	0.0563	0.0379	4.0000e-005		3.1100e-003	3.1100e-003		2.8600e-003	2.8600e-003	0.0000	3.8185	3.8185	1.1700e-003	0.0000	3.8430
Total	**5.3900e-003**	**0.0563**	**0.0379**	**4.0000e-005**	**0.0131**	**3.1100e-003**	**0.0162**	**6.7300e-003**	**2.8600e-003**	**9.5900e-003**	**0.0000**	**3.8185**	**3.8185**	**1.1700e-003**	**0.0000**	**3.8430**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	1.1000e-004	1.1100e-003	0.0000	2.2000e-004	0.0000	2.2000e-004	6.0000e-005	0.0000	6.0000e-005	0.0000	0.1977	0.1977	1.0000e-005	0.0000	0.1979
Total	**7.0000e-005**	**1.1000e-004**	**1.1100e-003**	**0.0000**	**2.2000e-004**	**0.0000**	**2.2000e-004**	**6.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.1977**	**0.1977**	**1.0000e-005**	**0.0000**	**0.1979**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0131	0.0000	0.0131	6.7300e-003	0.0000	6.7300e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.3900e-003	0.0563	0.0379	4.0000e-005		3.1100e-003	3.1100e-003		2.8600e-003	2.8600e-003	0.0000	3.8185	3.8185	1.1700e-003	0.0000	3.8430
Total	**5.3900e-003**	**0.0563**	**0.0379**	**4.0000e-005**	**0.0131**	**3.1100e-003**	**0.0162**	**6.7300e-003**	**2.8600e-003**	**9.5900e-003**	**0.0000**	**3.8185**	**3.8185**	**1.1700e-003**	**0.0000**	**3.8430**

3.4 Grading - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	1.1000e-004	1.1100e-003	0.0000	2.2000e-004	0.0000	2.2000e-004	6.0000e-005	0.0000	6.0000e-005	0.0000	0.1977	0.1977	1.0000e-005	0.0000	0.1979
Total	**7.0000e-005**	**1.1000e-004**	**1.1100e-003**	**0.0000**	**2.2000e-004**	**0.0000**	**2.2000e-004**	**6.0000e-005**	**0.0000**	**6.0000e-005**	**0.0000**	**0.1977**	**0.1977**	**1.0000e-005**	**0.0000**	**0.1979**

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.3328	2.2859	1.6249	2.4900e-003		0.1462	0.1462		0.1400	0.1400	0.0000	211.8141	211.8141	0.0471	0.0000	212.8027
Total	**0.3328**	**2.2859**	**1.6249**	**2.4900e-003**		**0.1462**	**0.1462**		**0.1400**	**0.1400**	**0.0000**	**211.8141**	**211.8141**	**0.0471**	**0.0000**	**212.8027**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.3000e-003	0.0739	0.0993	2.0000e-004	5.5400e-003	1.1500e-003	6.6900e-003	1.5800e-003	1.0500e-003	2.6400e-003	0.0000	17.4512	17.4512	1.2000e-004	0.0000	17.4538
Worker	8.6400e-003	0.0128	0.1328	3.2000e-004	0.0263	2.2000e-004	0.0266	6.9900e-003	2.0000e-004	7.1900e-003	0.0000	23.7219	23.7219	1.2300e-003	0.0000	23.7476
Total	**0.0159**	**0.0867**	**0.2321**	**5.2000e-004**	**0.0319**	**1.3700e-003**	**0.0332**	**8.5700e-003**	**1.2500e-003**	**9.8300e-003**	**0.0000**	**41.1730**	**41.1730**	**1.3500e-003**	**0.0000**	**41.2014**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.3328	2.2859	1.6249	2.4900e-003		0.1462	0.1462		0.1400	0.1400	0.0000	211.8138	211.8138	0.0471	0.0000	212.8024
Total	**0.3328**	**2.2859**	**1.6249**	**2.4900e-003**		**0.1462**	**0.1462**		**0.1400**	**0.1400**	**0.0000**	**211.8138**	**211.8138**	**0.0471**	**0.0000**	**212.8024**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	7.3000e-003	0.0739	0.0993	2.0000e-004	5.5400e-003	1.1500e-003	6.6900e-003	1.5800e-003	1.0500e-003	2.6400e-003	0.0000	17.4512	17.4512	1.2000e-004	0.0000	17.4538
Worker	8.6400e-003	0.0128	0.1328	3.2000e-004	0.0263	2.2000e-004	0.0266	6.9900e-003	2.0000e-004	7.1900e-003	0.0000	23.7219	23.7219	1.2300e-003	0.0000	23.7476
Total	**0.0159**	**0.0867**	**0.2321**	**5.2000e-004**	**0.0319**	**1.3700e-003**	**0.0332**	**8.5700e-003**	**1.2500e-003**	**9.8300e-003**	**0.0000**	**41.1730**	**41.1730**	**1.3500e-003**	**0.0000**	**41.2014**

3.6 Paving - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	8.2000e-003	0.0823	0.0603	9.0000e-005		5.1100e-003	5.1100e-003		4.7100e-003	4.7100e-003	0.0000	8.0625	8.0625	2.4200e-003	0.0000	8.1134
Paving	1.5100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**9.7100e-003**	**0.0823**	**0.0603**	**9.0000e-005**		**5.1100e-003**	**5.1100e-003**		**4.7100e-003**	**4.7100e-003**	**0.0000**	**8.0625**	**8.0625**	**2.4200e-003**	**0.0000**	**8.1134**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-004	4.0000e-004	4.1500e-003	1.0000e-005	8.2000e-004	1.0000e-005	8.3000e-004	2.2000e-004	1.0000e-005	2.2000e-004	0.0000	0.7413	0.7413	4.0000e-005	0.0000	0.7421
Total	**2.7000e-004**	**4.0000e-004**	**4.1500e-003**	**1.0000e-005**	**8.2000e-004**	**1.0000e-005**	**8.3000e-004**	**2.2000e-004**	**1.0000e-005**	**2.2000e-004**	**0.0000**	**0.7413**	**0.7413**	**4.0000e-005**	**0.0000**	**0.7421**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	8.2000e-003	0.0823	0.0603	9.0000e-005		5.1100e-003	5.1100e-003		4.7100e-003	4.7100e-003	0.0000	8.0625	8.0625	2.4200e-003	0.0000	8.1134
Paving	1.5100e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**9.7100e-003**	**0.0823**	**0.0603**	**9.0000e-005**		**5.1100e-003**	**5.1100e-003**		**4.7100e-003**	**4.7100e-003**	**0.0000**	**8.0625**	**8.0625**	**2.4200e-003**	**0.0000**	**8.1134**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.7000e-004	4.0000e-004	4.1500e-003	1.0000e-005	8.2000e-004	1.0000e-005	8.3000e-004	2.2000e-004	1.0000e-005	2.2000e-004	0.0000	0.7413	0.7413	4.0000e-005	0.0000	0.7421
Total	**2.7000e-004**	**4.0000e-004**	**4.1500e-003**	**1.0000e-005**	**8.2000e-004**	**1.0000e-005**	**8.3000e-004**	**2.2000e-004**	**1.0000e-005**	**2.2000e-004**	**0.0000**	**0.7413**	**0.7413**	**4.0000e-005**	**0.0000**	**0.7421**

3.7 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.2612					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6600e-003	0.0109	9.3400e-003	1.0000e-005		8.7000e-004	8.7000e-004		8.7000e-004	8.7000e-004	0.0000	1.2766	1.2766	1.3000e-004	0.0000	1.2795
Total	**0.2629**	**0.0109**	**9.3400e-003**	**1.0000e-005**		**8.7000e-004**	**8.7000e-004**		**8.7000e-004**	**8.7000e-004**	**0.0000**	**1.2766**	**1.2766**	**1.3000e-004**	**0.0000**	**1.2795**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.7 Architectural Coating - 2017

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	1.3000e-004	1.3800e-003	0.0000	2.7000e-004	0.0000	2.8000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.2471	0.2471	1.0000e-005	0.0000	0.2474
Total	**9.0000e-005**	**1.3000e-004**	**1.3800e-003**	**0.0000**	**2.7000e-004**	**0.0000**	**2.8000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.2471**	**0.2471**	**1.0000e-005**	**0.0000**	**0.2474**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.2612					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.6600e-003	0.0109	9.3400e-003	1.0000e-005		8.7000e-004	8.7000e-004		8.7000e-004	8.7000e-004	0.0000	1.2766	1.2766	1.3000e-004	0.0000	1.2795
Total	**0.2629**	**0.0109**	**9.3400e-003**	**1.0000e-005**		**8.7000e-004**	**8.7000e-004**		**8.7000e-004**	**8.7000e-004**	**0.0000**	**1.2766**	**1.2766**	**1.3000e-004**	**0.0000**	**1.2795**

3.7 Architectural Coating - 2017

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.0000e-005	1.3000e-004	1.3800e-003	0.0000	2.7000e-004	0.0000	2.8000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.2471	0.2471	1.0000e-005	0.0000	0.2474
Total	**9.0000e-005**	**1.3000e-004**	**1.3800e-003**	**0.0000**	**2.7000e-004**	**0.0000**	**2.8000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.2471**	**0.2471**	**1.0000e-005**	**0.0000**	**0.2474**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0711	0.2493	0.9079	2.5600e-003	0.1755	3.6400e-003	0.1791	0.0470	3.3600e-003	0.0503	0.0000	192.1051	192.1051	7.1500e-003	0.0000	192.2553
Unmitigated	0.0711	0.2493	0.9079	2.5600e-003	0.1755	3.6400e-003	0.1791	0.0470	3.3600e-003	0.0503	0.0000	192.1051	192.1051	7.1500e-003	0.0000	192.2553

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Office Park	34.26	4.92	2.28	86,156	86,156
Parking Lot	0.00	0.00	0.00		
Unrefrigerated Warehouse-No Rail	87.93	87.93	87.93	376,845	376,845
Total	122.19	92.85	90.21	463,001	463,001

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Office Park	16.60	8.40	6.90	33.00	48.00	19.00	82	15	3
Parking Lot	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0
Unrefrigerated Warehouse-No	16.60	8.40	6.90	59.00	0.00	41.00	92	5	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.511172	0.060004	0.180590	0.138995	0.042398	0.006681	0.016070	0.032568	0.001938	0.002493	0.004370	0.000586	0.002135

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	44.1507	44.1507	2.0300e-003	4.2000e-004	44.3235
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	44.1507	44.1507	2.0300e-003	4.2000e-004	44.3235
NaturalGas Mitigated	4.4000e-004	4.0100e-003	3.3700e-003	2.0000e-005		3.0000e-004	3.0000e-004		3.0000e-004	3.0000e-004	0.0000	4.3685	4.3685	8.0000e-005	8.0000e-005	4.3951
NaturalGas Unmitigated	4.4000e-004	4.0100e-003	3.3700e-003	2.0000e-005		3.0000e-004	3.0000e-004		3.0000e-004	3.0000e-004	0.0000	4.3685	4.3685	8.0000e-005	8.0000e-005	4.3951

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unrefrigerated Warehouse-No Rail	72653	3.9000e-004	3.5600e-003	2.9900e-003	2.0000e-005		2.7000e-004	2.7000e-004		2.7000e-004	2.7000e-004	0.0000	3.8770	3.8770	7.0000e-005	7.0000e-005	3.9006
Office Park	9210	5.0000e-005	4.5000e-004	3.8000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.4915	0.4915	1.0000e-005	1.0000e-005	0.4945
Total		**4.4000e-004**	**4.0100e-003**	**3.3700e-003**	**2.0000e-005**		**3.0000e-004**	**3.0000e-004**		**3.0000e-004**	**3.0000e-004**	**0.0000**	**4.3685**	**4.3685**	**8.0000e-005**	**8.0000e-005**	**4.3951**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unrefrigerated Warehouse-No Rail	72653	3.9000e-004	3.5600e-003	2.9900e-003	2.0000e-005		2.7000e-004	2.7000e-004		2.7000e-004	2.7000e-004	0.0000	3.8770	3.8770	7.0000e-005	7.0000e-005	3.9006
Office Park	9210	5.0000e-005	4.5000e-004	3.8000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.4915	0.4915	1.0000e-005	1.0000e-005	0.4945
Total		**4.4000e-004**	**4.0100e-003**	**3.3700e-003**	**2.0000e-005**		**3.0000e-004**	**3.0000e-004**		**3.0000e-004**	**3.0000e-004**	**0.0000**	**4.3685**	**4.3685**	**8.0000e-005**	**8.0000e-005**	**4.3951**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Office Park	33450	9.5723	4.4000e-004	9.0000e-005	9.6097
Parking Lot	18304	5.2380	2.4000e-004	5.0000e-005	5.2585
Unrefrigerated Warehouse-No Rail	102529	29.3404	1.3500e-003	2.8000e-004	29.4552
Total		**44.1507**	**2.0300e-003**	**4.2000e-004**	**44.3235**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Office Park	33450	9.5723	4.4000e-004	9.0000e-005	9.6097
Parking Lot	18304	5.2380	2.4000e-004	5.0000e-005	5.2585
Unrefrigerated Warehouse-No Rail	102529	29.3404	1.3500e-003	2.8000e-004	29.4552
Total		**44.1507**	**2.0300e-003**	**4.2000e-004**	**44.3235**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.2349	1.0000e-005	1.1500e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.2100e-003	2.2100e-003	1.0000e-005	0.0000	2.3300e-003
Unmitigated	0.2480	1.0000e-005	1.1500e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.2100e-003	2.2100e-003	1.0000e-005	0.0000	2.3300e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0392					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.2087					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.1000e-004	1.0000e-005	1.1500e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.2100e-003	2.2100e-003	1.0000e-005	0.0000	2.3300e-003
Total	**0.2480**	**1.0000e-005**	**1.1500e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.2100e-003**	**2.2100e-003**	**1.0000e-005**	**0.0000**	**2.3300e-003**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0261					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.2087					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.1000e-004	1.0000e-005	1.1500e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.2100e-003	2.2100e-003	1.0000e-005	0.0000	2.3300e-003
Total	**0.2349**	**1.0000e-005**	**1.1500e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.2100e-003**	**2.2100e-003**	**1.0000e-005**	**0.0000**	**2.3300e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	28.1596	0.2197	5.4000e-003	34.4476
Unmitigated	34.9397	0.2747	6.7600e-003	42.8029

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Office Park	0.533201 / 0.326801	3.1950	0.0175	4.4000e-004	3.6989
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Unrefrigerated Warehouse-No Rail	7.85094 / 0	31.7447	0.2572	6.3200e-003	39.1041
Total		**34.9397**	**0.2747**	**6.7600e-003**	**42.8029**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Office Park	0.426561 / 0.326801	2.7638	0.0140	3.5000e-004	3.1675
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Unrefrigerated Warehouse-No Rail	6.28075 / 0	25.3958	0.2057	5.0500e-003	31.2801
Total		**28.1596**	**0.2197**	**5.4000e-003**	**34.4476**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	7.0438	0.4163	0.0000	15.7856
Unmitigated	7.0438	0.4163	0.0000	15.7856

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Office Park	2.79	0.5663	0.0335	0.0000	1.2692
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Unrefrigerated Warehouse-No Rail	31.91	6.4774	0.3828	0.0000	14.5164
Total		**7.0438**	**0.4163**	**0.0000**	**15.7856**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Office Park	2.79	0.5663	0.0335	0.0000	1.2692
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Unrefrigerated Warehouse-No Rail	31.91	6.4774	0.3828	0.0000	14.5164
Total		**7.0438**	**0.4163**	**0.0000**	**15.7856**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

NEC Cactus Ave and Commerce Center Moreno Valley P3 FF2 3000 sf

South Coast AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Fast Food Restaurant with Drive Thru	3.00	1000sqft	0.07	3,000.00	0
Parking Lot	30.00	Space	0.61	12,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2018
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Lot size 0.68 acre.

Construction Phase - To be consturcted on vacant lot. Demolition minimal.

Architectural Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Mitigation - Low VOC paints to be used IAW SCAQMD 1113.

Water Mitigation - Low flow plumbing fixtuers to be used.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	150
tblConstructionPhase	NumDays	10.00	1.00
tblConstructionPhase	PhaseEndDate	1/3/2017	1/16/2017
tblConstructionPhase	PhaseStartDate	1/3/2017	1/14/2017
tblLandUse	LotAcreage	0.27	0.61
tblProjectCharacteristics	OperationalYear	2014	2018

2.0 Emissions Summary

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0959	0.6960	0.4725	7.0000e-004	5.6400e-003	0.0463	0.0520	1.6800e-003	0.0427	0.0444	0.0000	63.2493	63.2493	0.0175	0.0000	63.6169
Total	**0.0959**	**0.6960**	**0.4725**	**7.0000e-004**	**5.6400e-003**	**0.0463**	**0.0520**	**1.6800e-003**	**0.0427**	**0.0444**	**0.0000**	**63.2493**	**63.2493**	**0.0175**	**0.0000**	**63.6169**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0959	0.6960	0.4725	7.0000e-004	5.6400e-003	0.0463	0.0520	1.6800e-003	0.0427	0.0444	0.0000	63.2492	63.2492	0.0175	0.0000	63.6168
Total	**0.0959**	**0.6960**	**0.4725**	**7.0000e-004**	**5.6400e-003**	**0.0463**	**0.0520**	**1.6800e-003**	**0.0427**	**0.0444**	**0.0000**	**63.2492**	**63.2492**	**0.0175**	**0.0000**	**63.6168**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0578	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Energy	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	92.4343	92.4343	3.0600e-003	1.2700e-003	92.8926
Mobile	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824
Waste						0.0000	0.0000		0.0000	0.0000	7.0154	0.0000	7.0154	0.4146	0.0000	15.7219
Water						0.0000	0.0000		0.0000	0.0000	0.2889	3.5779	3.8668	0.0298	7.3000e-004	4.7211
Total	**0.7809**	**1.2548**	**5.6055**	**0.0102**	**0.6403**	**0.0181**	**0.6584**	**0.1713**	**0.0170**	**0.1883**	**7.3043**	**839.3433**	**846.6476**	**0.4786**	**2.0000e-003**	**857.3188**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0566	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Energy	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	92.4343	92.4343	3.0600e-003	1.2700e-003	92.8926
Mobile	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824
Waste						0.0000	0.0000		0.0000	0.0000	7.0154	0.0000	7.0154	0.4146	0.0000	15.7219
Water						0.0000	0.0000		0.0000	0.0000	0.2311	2.8992	3.1304	0.0239	5.9000e-004	3.8136
Total	**0.7797**	**1.2548**	**5.6055**	**0.0102**	**0.6403**	**0.0181**	**0.6584**	**0.1713**	**0.0170**	**0.1883**	**7.2465**	**838.6647**	**845.9112**	**0.4726**	**1.8600e-003**	**856.4113**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.79**	**0.08**	**0.09**	**1.25**	**7.00**	**0.11**

3.0 Construction Detail

Construction Phase

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	1/2/2017	5	1	
2	Site Preparation	Site Preparation	1/14/2017	1/16/2017	5	1	
3	Grading	Grading	1/17/2017	1/18/2017	5	2	
4	Building Construction	Building Construction	1/19/2017	6/7/2017	5	100	
5	Paving	Paving	6/8/2017	6/14/2017	5	5	
6	Architectural Coating	Architectural Coating	6/15/2017	6/21/2017	5	5	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 5,040; Non-Residential Outdoor: 1,680 (Architectural Coating – sqft)

OffRoad Equipment

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Cranes	1	4.00	226	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Site Preparation	Graders	1	8.00	174	0.41
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Demolition	Rubber Tired Dozers	1	1.00	255	0.40
Grading	Rubber Tired Dozers	1	1.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	6.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0000e-004	5.2400e-003	4.2900e-003	1.0000e-005		3.6000e-004	3.6000e-004		3.5000e-004	3.5000e-004	0.0000	0.5370	0.5370	1.1000e-004	0.0000	0.5392
Total	**6.0000e-004**	**5.2400e-003**	**4.2900e-003**	**1.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.5000e-004**	**3.5000e-004**	**0.0000**	**0.5370**	**0.5370**	**1.1000e-004**	**0.0000**	**0.5392**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0000e-004	5.2400e-003	4.2900e-003	1.0000e-005		3.6000e-004	3.6000e-004		3.5000e-004	3.5000e-004	0.0000	0.5370	0.5370	1.1000e-004	0.0000	0.5392
Total	**6.0000e-004**	**5.2400e-003**	**4.2900e-003**	**1.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.5000e-004**	**3.5000e-004**	**0.0000**	**0.5370**	**0.5370**	**1.1000e-004**	**0.0000**	**0.5392**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.3000e-004	6.3400e-003	3.6200e-003	0.0000		3.9000e-004	3.9000e-004		3.5000e-004	3.5000e-004	0.0000	0.4336	0.4336	1.3000e-004	0.0000	0.4364
Total	**6.3000e-004**	**6.3400e-003**	**3.6200e-003**	**0.0000**	**2.7000e-004**	**3.9000e-004**	**6.6000e-004**	**3.0000e-005**	**3.5000e-004**	**3.8000e-004**	**0.0000**	**0.4336**	**0.4336**	**1.3000e-004**	**0.0000**	**0.4364**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.3000e-004	6.3400e-003	3.6200e-003	0.0000		3.9000e-004	3.9000e-004		3.5000e-004	3.5000e-004	0.0000	0.4336	0.4336	1.3000e-004	0.0000	0.4364
Total	**6.3000e-004**	**6.3400e-003**	**3.6200e-003**	**0.0000**	**2.7000e-004**	**3.9000e-004**	**6.6000e-004**	**3.0000e-005**	**3.5000e-004**	**3.8000e-004**	**0.0000**	**0.4336**	**0.4336**	**1.3000e-004**	**0.0000**	**0.4364**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2000e-003	0.0105	8.5800e-003	1.0000e-005		7.3000e-004	7.3000e-004		6.9000e-004	6.9000e-004	0.0000	1.0739	1.0739	2.1000e-004	0.0000	1.0784
Total	**1.2000e-003**	**0.0105**	**8.5800e-003**	**1.0000e-005**	**7.5000e-004**	**7.3000e-004**	**1.4800e-003**	**4.1000e-004**	**6.9000e-004**	**1.1000e-003**	**0.0000**	**1.0739**	**1.0739**	**2.1000e-004**	**0.0000**	**1.0784**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	5.0000e-005	5.5000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0988	0.0988	1.0000e-005	0.0000	0.0990
Total	**4.0000e-005**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0988**	**0.0988**	**1.0000e-005**	**0.0000**	**0.0990**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2000e-003	0.0105	8.5800e-003	1.0000e-005		7.3000e-004	7.3000e-004		6.9000e-004	6.9000e-004	0.0000	1.0739	1.0739	2.1000e-004	0.0000	1.0784
Total	**1.2000e-003**	**0.0105**	**8.5800e-003**	**1.0000e-005**	**7.5000e-004**	**7.3000e-004**	**1.4800e-003**	**4.1000e-004**	**6.9000e-004**	**1.1000e-003**	**0.0000**	**1.0739**	**1.0739**	**2.1000e-004**	**0.0000**	**1.0784**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	5.0000e-005	5.5000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0988	0.0988	1.0000e-005	0.0000	0.0990
Total	**4.0000e-005**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0988**	**0.0988**	**1.0000e-005**	**0.0000**	**0.0990**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0637	0.6337	0.4020	5.7000e-004		0.0428	0.0428		0.0394	0.0394	0.0000	52.5954	52.5954	0.0161	0.0000	52.9339
Total	**0.0637**	**0.6337**	**0.4020**	**5.7000e-004**		**0.0428**	**0.0428**		**0.0394**	**0.0394**	**0.0000**	**52.5954**	**52.5954**	**0.0161**	**0.0000**	**52.9339**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

3.5 Building Construction - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0637	0.6337	0.4020	5.7000e-004		0.0428	0.0428		0.0394	0.0394	0.0000	52.5954	52.5954	0.0161	0.0000	52.9338
Total	**0.0637**	**0.6337**	**0.4020**	**5.7000e-004**		**0.0428**	**0.0428**		**0.0394**	**0.0394**	**0.0000**	**52.5954**	**52.5954**	**0.0161**	**0.0000**	**52.9338**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6000e-003	0.0246	0.0181	3.0000e-005		1.5000e-003	1.5000e-003		1.3900e-003	1.3900e-003	0.0000	2.4243	2.4243	6.7000e-004	0.0000	2.4384
Paving	8.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.4000e-003**	**0.0246**	**0.0181**	**3.0000e-005**		**1.5000e-003**	**1.5000e-003**		**1.3900e-003**	**1.3900e-003**	**0.0000**	**2.4243**	**2.4243**	**6.7000e-004**	**0.0000**	**2.4384**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.4900e-003	1.0000e-005	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4448	0.4448	2.0000e-005	0.0000	0.4453
Total	**1.6000e-004**	**2.4000e-004**	**2.4900e-003**	**1.0000e-005**	**4.9000e-004**	**0.0000**	**5.0000e-004**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**0.4448**	**0.4448**	**2.0000e-005**	**0.0000**	**0.4453**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6000e-003	0.0246	0.0181	3.0000e-005		1.5000e-003	1.5000e-003		1.3900e-003	1.3900e-003	0.0000	2.4243	2.4243	6.7000e-004	0.0000	2.4384
Paving	8.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.4000e-003**	**0.0246**	**0.0181**	**3.0000e-005**		**1.5000e-003**	**1.5000e-003**		**1.3900e-003**	**1.3900e-003**	**0.0000**	**2.4243**	**2.4243**	**6.7000e-004**	**0.0000**	**2.4384**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.4900e-003	1.0000e-005	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4448	0.4448	2.0000e-005	0.0000	0.4453
Total	**1.6000e-004**	**2.4000e-004**	**2.4900e-003**	**1.0000e-005**	**4.9000e-004**	**0.0000**	**5.0000e-004**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**0.4448**	**0.4448**	**2.0000e-005**	**0.0000**	**0.4453**

3.7 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0234					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0242**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.7 Architectural Coating - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0234					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0242**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824
Unmitigated	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Fast Food Restaurant with Drive Thru	1,488.36	2,166.09	1628.16	1,689,240	1,689,240
Parking Lot	0.00	0.00	0.00		
Total	1,488.36	2,166.09	1,628.16	1,689,240	1,689,240

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Fast Food Restaurant with Drive	16.60	8.40	6.90	2.20	78.80	19.00	29	21	50
Parking Lot	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.511172	0.060004	0.180590	0.138995	0.042398	0.006681	0.016070	0.032568	0.001938	0.002493	0.004370	0.000586	0.002135

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	48.0074	48.0074	2.2100e-003	4.6000e-004	48.1952
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	48.0074	48.0074	2.2100e-003	4.6000e-004	48.1952
NaturalGas Mitigated	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974
NaturalGas Unmitigated	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Fast Food Restaurant with Drive Thru	832530	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**4.4900e-003**	**0.0408**	**0.0343**	**2.4000e-004**		**3.1000e-003**	**3.1000e-003**		**3.1000e-003**	**3.1000e-003**	**0.0000**	**44.4270**	**44.4270**	**8.5000e-004**	**8.1000e-004**	**44.6974**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant with Drive Thru	832530	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974
Total		**4.4900e-003**	**0.0408**	**0.0343**	**2.4000e-004**		**3.1000e-003**	**3.1000e-003**		**3.1000e-003**	**3.1000e-003**	**0.0000**	**44.4270**	**44.4270**	**8.5000e-004**	**8.1000e-004**	**44.6974**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Fast Food Restaurant with Drive Thru	157200	44.9854	2.0700e-003	4.3000e-004	45.1615
Parking Lot	10560	3.0219	1.4000e-004	3.0000e-005	3.0338
Total		**48.0074**	**2.2100e-003**	**4.6000e-004**	**48.1952**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Fast Food Restaurant with Drive Thru	157200	44.9854	2.0700e-003	4.3000e-004	45.1615
Parking Lot	10560	3.0219	1.4000e-004	3.0000e-005	3.0338
Total		**48.0074**	**2.2100e-003**	**4.6000e-004**	**48.1952**

6.0 Area Detail

6.1 Mitigation Measures Area

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0566	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Unmitigated	0.0578	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.5000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0542					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	4.0000e-005	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Total	**0.0577**	**0.0000**	**4.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.2000e-004**	**8.2000e-004**	**0.0000**	**0.0000**	**8.7000e-004**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.3400e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0542					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	4.0000e-005	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Total	**0.0566**	**0.0000**	**4.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.2000e-004**	**8.2000e-004**	**0.0000**	**0.0000**	**8.7000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	3.1304	0.0239	5.9000e-004	3.8136
Unmitigated	3.8668	0.0298	7.3000e-004	4.7211

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Fast Food Restaurant with Drive Thru	0.910601 / 0.0581235	3.8668	0.0298	7.3000e-004	4.7211
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**3.8668**	**0.0298**	**7.3000e-004**	**4.7211**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Fast Food Restaurant with Drive Thru	0.728481 / 0.0581235	3.1304	0.0239	5.9000e-004	3.8136
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**3.1304**	**0.0239**	**5.9000e-004**	**3.8136**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	7.0154	0.4146	0.0000	15.7219
Unmitigated	7.0154	0.4146	0.0000	15.7219

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Fast Food Restaurant with Drive Thru	34.56	7.0154	0.4146	0.0000	15.7219
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**7.0154**	**0.4146**	**0.0000**	**15.7219**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Fast Food Restaurant with Drive Thru	34.56	7.0154	0.4146	0.0000	15.7219
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**7.0154**	**0.4146**	**0.0000**	**15.7219**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

10.0 Vegetation

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

NEC Cactus Ave and Commerce Center Moreno Valley P3 FF3 3000 sf

South Coast AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Fast Food Restaurant with Drive Thru	3.00	1000sqft	0.07	3,000.00	0
Parking Lot	30.00	Space	0.61	12,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	10			**Operational Year**	2018
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	630.89	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Lot size is 0.68 acre.

Construction Phase - To be constructed on vacant lot. Demolition minimal.

Architectural Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Coating - Low VOC paints to be used IAW SCAQMD 1113.

Area Mitigation - Low VOC paints to be used IAW SCAQMD 1113.

Water Mitigation - Low flow plumbing fixtures to be used.

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	EF_Nonresidential_Exterior	250.00	150.00
tblArchitecturalCoating	EF_Nonresidential_Interior	250.00	150.00
tblAreaCoating	Area_EF_Nonresidential_Exterior	250	150
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	150
tblConstructionPhase	NumDays	10.00	1.00
tblConstructionPhase	PhaseEndDate	1/3/2017	1/16/2017
tblConstructionPhase	PhaseStartDate	1/3/2017	1/14/2017
tblLandUse	LotAcreage	0.27	0.61
tblProjectCharacteristics	OperationalYear	2014	2018

2.0 Emissions Summary

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0959	0.6960	0.4725	7.0000e-004	5.6400e-003	0.0463	0.0520	1.6800e-003	0.0427	0.0444	0.0000	63.2493	63.2493	0.0175	0.0000	63.6169
Total	**0.0959**	**0.6960**	**0.4725**	**7.0000e-004**	**5.6400e-003**	**0.0463**	**0.0520**	**1.6800e-003**	**0.0427**	**0.0444**	**0.0000**	**63.2493**	**63.2493**	**0.0175**	**0.0000**	**63.6169**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2017	0.0959	0.6960	0.4725	7.0000e-004	5.6400e-003	0.0463	0.0520	1.6800e-003	0.0427	0.0444	0.0000	63.2492	63.2492	0.0175	0.0000	63.6168
Total	**0.0959**	**0.6960**	**0.4725**	**7.0000e-004**	**5.6400e-003**	**0.0463**	**0.0520**	**1.6800e-003**	**0.0427**	**0.0444**	**0.0000**	**63.2492**	**63.2492**	**0.0175**	**0.0000**	**63.6168**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0578	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Energy	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	92.4343	92.4343	3.0600e-003	1.2700e-003	92.8926
Mobile	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824
Waste						0.0000	0.0000		0.0000	0.0000	7.0154	0.0000	7.0154	0.4146	0.0000	15.7219
Water						0.0000	0.0000		0.0000	0.0000	0.2889	3.5779	3.8668	0.0298	7.3000e-004	4.7211
Total	**0.7809**	**1.2548**	**5.6055**	**0.0102**	**0.6403**	**0.0181**	**0.6584**	**0.1713**	**0.0170**	**0.1883**	**7.3043**	**839.3433**	**846.6476**	**0.4786**	**2.0000e-003**	**857.3188**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0566	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Energy	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	92.4343	92.4343	3.0600e-003	1.2700e-003	92.8926
Mobile	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824
Waste						0.0000	0.0000		0.0000	0.0000	7.0154	0.0000	7.0154	0.4146	0.0000	15.7219
Water						0.0000	0.0000		0.0000	0.0000	0.2311	2.8992	3.1304	0.0239	5.9000e-004	3.8136
Total	**0.7797**	**1.2548**	**5.6055**	**0.0102**	**0.6403**	**0.0181**	**0.6584**	**0.1713**	**0.0170**	**0.1883**	**7.2465**	**838.6647**	**845.9112**	**0.4726**	**1.8600e-003**	**856.4113**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.79**	**0.08**	**0.09**	**1.25**	**7.00**	**0.11**

3.0 Construction Detail

Construction Phase

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2017	1/2/2017	5	1	
2	Site Preparation	Site Preparation	1/14/2017	1/16/2017	5	1	
3	Grading	Grading	1/17/2017	1/18/2017	5	2	
4	Building Construction	Building Construction	1/19/2017	6/7/2017	5	100	
5	Paving	Paving	6/8/2017	6/14/2017	5	5	
6	Architectural Coating	Architectural Coating	6/15/2017	6/21/2017	5	5	

Acres of Grading (Site Preparation Phase): 0.5

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 5,040; Non-Residential Outdoor: 1,680 (Architectural Coating – sqft)

OffRoad Equipment

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Building Construction	Cranes	1	4.00	226	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Site Preparation	Graders	1	8.00	174	0.41
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Demolition	Rubber Tired Dozers	1	1.00	255	0.40
Grading	Rubber Tired Dozers	1	1.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Demolition	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	6.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0000e-004	5.2400e-003	4.2900e-003	1.0000e-005		3.6000e-004	3.6000e-004		3.5000e-004	3.5000e-004	0.0000	0.5370	0.5370	1.1000e-004	0.0000	0.5392
Total	**6.0000e-004**	**5.2400e-003**	**4.2900e-003**	**1.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.5000e-004**	**3.5000e-004**	**0.0000**	**0.5370**	**0.5370**	**1.1000e-004**	**0.0000**	**0.5392**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.2 Demolition - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.0000e-004	5.2400e-003	4.2900e-003	1.0000e-005		3.6000e-004	3.6000e-004		3.5000e-004	3.5000e-004	0.0000	0.5370	0.5370	1.1000e-004	0.0000	0.5392
Total	**6.0000e-004**	**5.2400e-003**	**4.2900e-003**	**1.0000e-005**		**3.6000e-004**	**3.6000e-004**		**3.5000e-004**	**3.5000e-004**	**0.0000**	**0.5370**	**0.5370**	**1.1000e-004**	**0.0000**	**0.5392**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	3.0000e-005	2.8000e-004	0.0000	5.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0494	0.0494	0.0000	0.0000	0.0495
Total	**2.0000e-005**	**3.0000e-005**	**2.8000e-004**	**0.0000**	**5.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0494**	**0.0494**	**0.0000**	**0.0000**	**0.0495**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.3000e-004	6.3400e-003	3.6200e-003	0.0000		3.9000e-004	3.9000e-004		3.5000e-004	3.5000e-004	0.0000	0.4336	0.4336	1.3000e-004	0.0000	0.4364
Total	**6.3000e-004**	**6.3400e-003**	**3.6200e-003**	**0.0000**	**2.7000e-004**	**3.9000e-004**	**6.6000e-004**	**3.0000e-005**	**3.5000e-004**	**3.8000e-004**	**0.0000**	**0.4336**	**0.4336**	**1.3000e-004**	**0.0000**	**0.4364**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.3 Site Preparation - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.7000e-004	0.0000	2.7000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.3000e-004	6.3400e-003	3.6200e-003	0.0000		3.9000e-004	3.9000e-004		3.5000e-004	3.5000e-004	0.0000	0.4336	0.4336	1.3000e-004	0.0000	0.4364
Total	**6.3000e-004**	**6.3400e-003**	**3.6200e-003**	**0.0000**	**2.7000e-004**	**3.9000e-004**	**6.6000e-004**	**3.0000e-005**	**3.5000e-004**	**3.8000e-004**	**0.0000**	**0.4336**	**0.4336**	**1.3000e-004**	**0.0000**	**0.4364**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2000e-003	0.0105	8.5800e-003	1.0000e-005		7.3000e-004	7.3000e-004		6.9000e-004	6.9000e-004	0.0000	1.0739	1.0739	2.1000e-004	0.0000	1.0784
Total	**1.2000e-003**	**0.0105**	**8.5800e-003**	**1.0000e-005**	**7.5000e-004**	**7.3000e-004**	**1.4800e-003**	**4.1000e-004**	**6.9000e-004**	**1.1000e-003**	**0.0000**	**1.0739**	**1.0739**	**2.1000e-004**	**0.0000**	**1.0784**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	5.0000e-005	5.5000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0988	0.0988	1.0000e-005	0.0000	0.0990
Total	**4.0000e-005**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0988**	**0.0988**	**1.0000e-005**	**0.0000**	**0.0990**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.4 Grading - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.5000e-004	0.0000	7.5000e-004	4.1000e-004	0.0000	4.1000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2000e-003	0.0105	8.5800e-003	1.0000e-005		7.3000e-004	7.3000e-004		6.9000e-004	6.9000e-004	0.0000	1.0739	1.0739	2.1000e-004	0.0000	1.0784
Total	**1.2000e-003**	**0.0105**	**8.5800e-003**	**1.0000e-005**	**7.5000e-004**	**7.3000e-004**	**1.4800e-003**	**4.1000e-004**	**6.9000e-004**	**1.1000e-003**	**0.0000**	**1.0739**	**1.0739**	**2.1000e-004**	**0.0000**	**1.0784**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.0000e-005	5.0000e-005	5.5000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0988	0.0988	1.0000e-005	0.0000	0.0990
Total	**4.0000e-005**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0988**	**0.0988**	**1.0000e-005**	**0.0000**	**0.0990**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0637	0.6337	0.4020	5.7000e-004		0.0428	0.0428		0.0394	0.0394	0.0000	52.5954	52.5954	0.0161	0.0000	52.9339
Total	**0.0637**	**0.6337**	**0.4020**	**5.7000e-004**		**0.0428**	**0.0428**		**0.0394**	**0.0394**	**0.0000**	**52.5954**	**52.5954**	**0.0161**	**0.0000**	**52.9339**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.5 Building Construction - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0637	0.6337	0.4020	5.7000e-004		0.0428	0.0428		0.0394	0.0394	0.0000	52.5954	52.5954	0.0161	0.0000	52.9338
Total	**0.0637**	**0.6337**	**0.4020**	**5.7000e-004**		**0.0428**	**0.0428**		**0.0394**	**0.0394**	**0.0000**	**52.5954**	**52.5954**	**0.0161**	**0.0000**	**52.9338**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	8.1000e-004	8.2100e-003	0.0110	2.0000e-005	6.2000e-004	1.3000e-004	7.4000e-004	1.8000e-004	1.2000e-004	2.9000e-004	0.0000	1.9390	1.9390	1.0000e-005	0.0000	1.9393
Worker	1.0800e-003	1.6000e-003	0.0166	4.0000e-005	3.2900e-003	3.0000e-005	3.3200e-003	8.7000e-004	2.0000e-005	9.0000e-004	0.0000	2.9652	2.9652	1.5000e-004	0.0000	2.9685
Total	**1.8900e-003**	**9.8100e-003**	**0.0276**	**6.0000e-005**	**3.9100e-003**	**1.6000e-004**	**4.0600e-003**	**1.0500e-003**	**1.4000e-004**	**1.1900e-003**	**0.0000**	**4.9043**	**4.9043**	**1.6000e-004**	**0.0000**	**4.9078**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6000e-003	0.0246	0.0181	3.0000e-005		1.5000e-003	1.5000e-003		1.3900e-003	1.3900e-003	0.0000	2.4243	2.4243	6.7000e-004	0.0000	2.4384
Paving	8.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.4000e-003**	**0.0246**	**0.0181**	**3.0000e-005**		**1.5000e-003**	**1.5000e-003**		**1.3900e-003**	**1.3900e-003**	**0.0000**	**2.4243**	**2.4243**	**6.7000e-004**	**0.0000**	**2.4384**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.4900e-003	1.0000e-005	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4448	0.4448	2.0000e-005	0.0000	0.4453
Total	**1.6000e-004**	**2.4000e-004**	**2.4900e-003**	**1.0000e-005**	**4.9000e-004**	**0.0000**	**5.0000e-004**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**0.4448**	**0.4448**	**2.0000e-005**	**0.0000**	**0.4453**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.6 Paving - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.6000e-003	0.0246	0.0181	3.0000e-005		1.5000e-003	1.5000e-003		1.3900e-003	1.3900e-003	0.0000	2.4243	2.4243	6.7000e-004	0.0000	2.4384
Paving	8.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.4000e-003**	**0.0246**	**0.0181**	**3.0000e-005**		**1.5000e-003**	**1.5000e-003**		**1.3900e-003**	**1.3900e-003**	**0.0000**	**2.4243**	**2.4243**	**6.7000e-004**	**0.0000**	**2.4384**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.4900e-003	1.0000e-005	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4448	0.4448	2.0000e-005	0.0000	0.4453
Total	**1.6000e-004**	**2.4000e-004**	**2.4900e-003**	**1.0000e-005**	**4.9000e-004**	**0.0000**	**5.0000e-004**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**0.4448**	**0.4448**	**2.0000e-005**	**0.0000**	**0.4453**

3.7 Architectural Coating - 2017

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0234					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0242**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

3.7 Architectural Coating - 2017

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0234					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	8.3000e-004	5.4600e-003	4.6700e-003	1.0000e-005		4.3000e-004	4.3000e-004		4.3000e-004	4.3000e-004	0.0000	0.6383	0.6383	7.0000e-005	0.0000	0.6397
Total	**0.0242**	**5.4600e-003**	**4.6700e-003**	**1.0000e-005**		**4.3000e-004**	**4.3000e-004**		**4.3000e-004**	**4.3000e-004**	**0.0000**	**0.6383**	**0.6383**	**7.0000e-005**	**0.0000**	**0.6397**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	1.4000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0247	0.0247	0.0000	0.0000	0.0247
Total	**1.0000e-005**	**1.0000e-005**	**1.4000e-004**	**0.0000**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0247**	**0.0247**	**0.0000**	**0.0000**	**0.0247**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824
Unmitigated	0.7186	1.2140	5.5708	9.9200e-003	0.6403	0.0150	0.6553	0.1713	0.0139	0.1852	0.0000	743.3303	743.3303	0.0311	0.0000	743.9824

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Fast Food Restaurant with Drive Thru	1,488.36	2,166.09	1628.16	1,689,240	1,689,240
Parking Lot	0.00	0.00	0.00		
Total	1,488.36	2,166.09	1,628.16	1,689,240	1,689,240

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Fast Food Restaurant with Drive	16.60	8.40	6.90	2.20	78.80	19.00	29	21	50
Parking Lot	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.511172	0.060004	0.180590	0.138995	0.042398	0.006681	0.016070	0.032568	0.001938	0.002493	0.004370	0.000586	0.002135

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	48.0074	48.0074	2.2100e-003	4.6000e-004	48.1952
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	48.0074	48.0074	2.2100e-003	4.6000e-004	48.1952
NaturalGas Mitigated	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974
NaturalGas Unmitigated	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Fast Food Restaurant with Drive Thru	832530	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**4.4900e-003**	**0.0408**	**0.0343**	**2.4000e-004**		**3.1000e-003**	**3.1000e-003**		**3.1000e-003**	**3.1000e-003**	**0.0000**	**44.4270**	**44.4270**	**8.5000e-004**	**8.1000e-004**	**44.6974**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant with Drive Thru	832530	4.4900e-003	0.0408	0.0343	2.4000e-004		3.1000e-003	3.1000e-003		3.1000e-003	3.1000e-003	0.0000	44.4270	44.4270	8.5000e-004	8.1000e-004	44.6974
Total		**4.4900e-003**	**0.0408**	**0.0343**	**2.4000e-004**		**3.1000e-003**	**3.1000e-003**		**3.1000e-003**	**3.1000e-003**	**0.0000**	**44.4270**	**44.4270**	**8.5000e-004**	**8.1000e-004**	**44.6974**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Fast Food Restaurant with Drive Thru	157200	44.9854	2.0700e-003	4.3000e-004	45.1615
Parking Lot	10560	3.0219	1.4000e-004	3.0000e-005	3.0338
Total		**48.0074**	**2.2100e-003**	**4.6000e-004**	**48.1952**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Fast Food Restaurant with Drive Thru	157200	44.9854	2.0700e-003	4.3000e-004	45.1615
Parking Lot	10560	3.0219	1.4000e-004	3.0000e-005	3.0338
Total		**48.0074**	**2.2100e-003**	**4.6000e-004**	**48.1952**

6.0 Area Detail

6.1 Mitigation Measures Area

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0566	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Unmitigated	0.0578	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	3.5000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0542					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	4.0000e-005	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Total	**0.0577**	**0.0000**	**4.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.2000e-004**	**8.2000e-004**	**0.0000**	**0.0000**	**8.7000e-004**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	2.3400e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0542					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	4.0000e-005	0.0000	4.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	8.2000e-004	8.2000e-004	0.0000	0.0000	8.7000e-004
Total	**0.0566**	**0.0000**	**4.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**8.2000e-004**	**8.2000e-004**	**0.0000**	**0.0000**	**8.7000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	3.1304	0.0239	5.9000e-004	3.8136
Unmitigated	3.8668	0.0298	7.3000e-004	4.7211

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Fast Food Restaurant with Drive Thru	0.910601 / 0.0581235	3.8668	0.0298	7.3000e-004	4.7211
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**3.8668**	**0.0298**	**7.3000e-004**	**4.7211**

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Fast Food Restaurant with Drive Thru	0.728481 / 0.0581235	3.1304	0.0239	5.9000e-004	3.8136
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**3.1304**	**0.0239**	**5.9000e-004**	**3.8136**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	7.0154	0.4146	0.0000	15.7219
Unmitigated	7.0154	0.4146	0.0000	15.7219

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Fast Food Restaurant with Drive Thru	34.56	7.0154	0.4146	0.0000	15.7219
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**7.0154**	**0.4146**	**0.0000**	**15.7219**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Fast Food Restaurant with Drive Thru	34.56	7.0154	0.4146	0.0000	15.7219
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**7.0154**	**0.4146**	**0.0000**	**15.7219**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

10.0 Vegetation

Attachment: Air Quality GHG Assessment (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan),

SALEM engineering group, inc.

11650 Mission Park Drive, Suite 108
Rancho Cucamonga, California 91730
(909) 980-6455 Office
(909) 980-6435 Fax

September 30, 2016 **Job No. 3-416-0904**

MR. Ino Cruz
J&T Management, Inc.
139 Radio Road
Corona, CA 92878-1958

Subject: **BIOLOGICAL SURVEY FOR BURROWING OWL**
Proposed Retail Project – Cactus Center
NEC Cactus Avenue & Commerce Drive
Moreno Valley, California

Dear Mr. Cruz:

At your request and authorization, a Biological Resources Survey for the above-referenced project (Riverside County Assessor Parcel Numbers [APNs] 297-130-052; -053; and -054) located on the northeast corner of Cactus Avenue & Commerce Drive in Moreno Valley, California (subject property) was conducted. The Biological Resources Survey was conducted to address Burrowing Owl Species The Biological Survey was prepared in accordance with Riverside County protocol survey guidelines.

During the course of this assessment, no evidence of burrowing owls were observed.

We appreciate the opportunity to assist you with this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (909) 980-6455.

Respectfully submitted,

SALEM Engineering Group, Inc.

Maria G. Ruvalcaba, EP
Project Manager

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Burrowing Owl Survey

Salem Engineering

6.31-acres, Moreno Valley, CA

APN's 297-130-052, -053, -054
USGS Riverside East Quadrangle
Township 3 South, Range 4 West, Section 14

Executive Summary:
Burrowing owl (*Athene cunicularia*) surveys were completed from September 10-14, 2016 and followed the Riverside County protocol survey guidelines for burrowing owl surveys. No signs of the burrowing owl were observed on-site and occupied habitat is absent.

Completed For:
Salem Engineering
13355 Noel Road, Suite 1100
Dallas, TX 95240

Completed By:
VHBC, Incorporated
6895 Ironwood Drive
Riverside, CA 92506

Survey Dates: 9-10-16 to 9-14-16

Report Date: 9-14-16

CERTIFICATION: **I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this biological evaluation, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.**

DATE: 9-14-16
9-14-16

SIGNED: _____
Victor M. Horchar

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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APPENDICES

A) BOTANICAL COMPENDIUM

B) WILDLIFE COMPENDIUM

C) HABITAT MAP

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

EXECUTIVE SUMMARY

Burrowing owl surveys were completed over five days and followed Riverside County protocol survey guidelines for the burrowing owl (*Athene cunicularia*). No burrowing owls or their burrows were observed. The site is comprised of bare ground and sparse non-native invasive grasses on a 6.31-acre disced field.

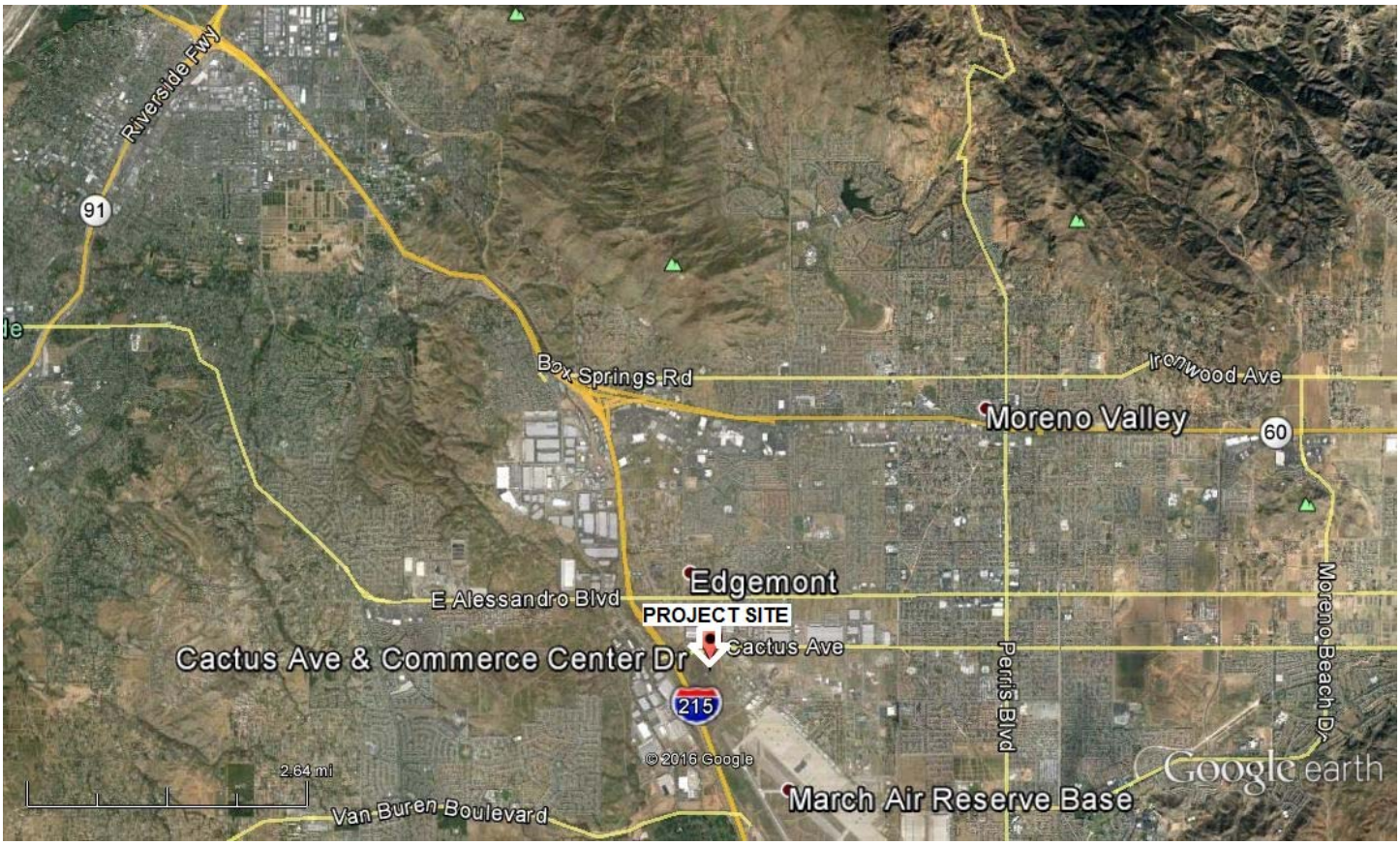
INTRODUCTION

The project site owner proposes to construct building pads on the 6.31-acre site located in Moreno Valley, CA (Figure 1, Figure 2). The project site is comprised of three parcels (Figure 3; APN's 297-130-052, -053, -054) which are located adjacent to existing commercial buildings on the corner of Cactus Avenue and Commerce Street across from March Air Reserve Base. The entire site has been disced repeatedly for weed control and fire safety purposes. Development of the proposed project site will cover 6.31-acres and will require typical rough grading to accommodate the proposed development plan (Figure 4) on the flat site (Figure 5).

PROPOSED PROJECT SITE

The site is comprised of a disced bare parcel and there are no native plant communities on-site. The site is flat at approximately 1560 feet above sea level (Figure 6). The soil composition of the site is Monserate sandy loam (Figure 6) which is common in the area.

FIGURE 1
VICINITY MAP



Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

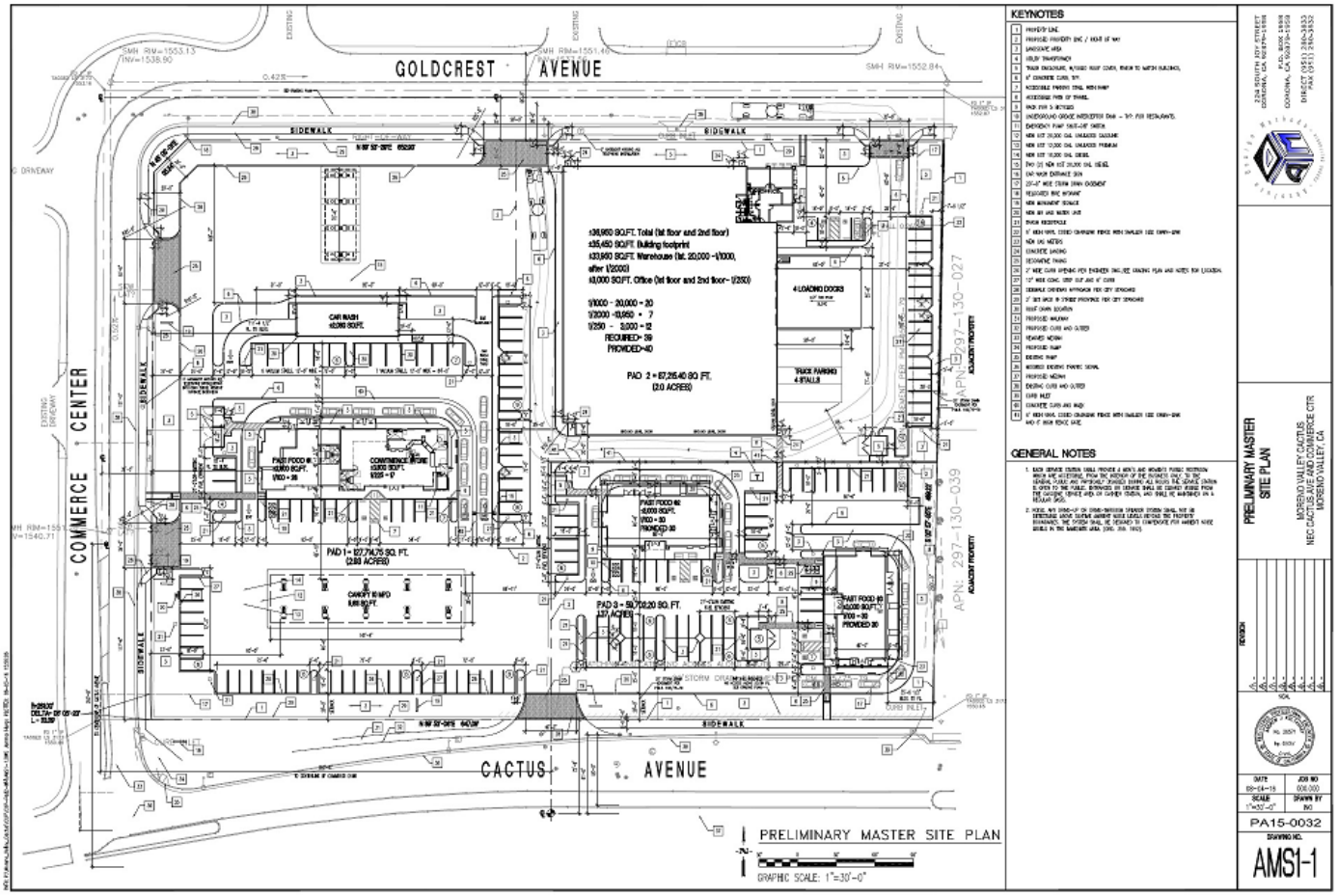
FIGURE 2
LOCATION

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 3
APN MAP

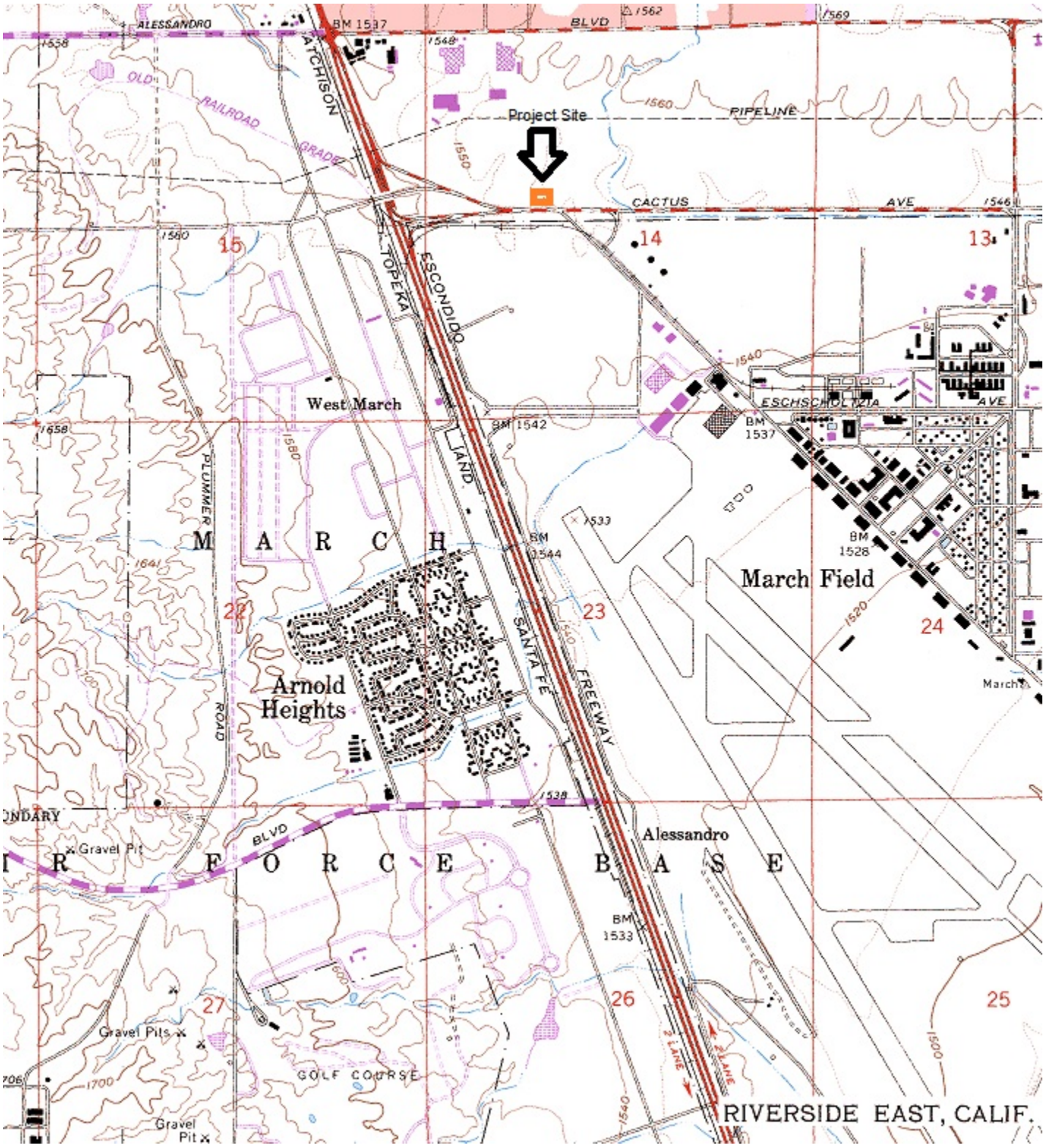
Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 4
PROPOSED DEVELOPMENT PLAN



Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 5
SITE TOPOGRAPHY



Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 6
SOIL COMPOSITION OF THE PROJECT SITE

Map Unit Legend

Western Riverside Area, California (CA679)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
MmB	Monserate sandy loam, 0 to 5 percent slopes	6.31	100.0%
Totals for Area of Interest		**6.31**	**100.0%**

Project Site Wildlife: The wildlife observed on the project site included the mourning dove (*Zenaida macroura*), house finch (*Carpodacus mexicana*), house sparrow (*Passer domesticus*), raven (*Corvus corax*), California ground squirrel (*Spermophilus beechyi*), pocket gopher (*Thomomys bottae*), domestic dog off-site (*Canis familiaris*), side-blotched lizard (*Uta stansburiana*) and western fence lizard (*Sceloporus occidentalis*).

Project Site Vegetation: There are no native plant communities on-site. The disced site does support spares amounts of several invasive plants including *Salsola tragus, Bromus madritensis*, *Bromus diandrus*, *Avena barbata*, *Taraxicum officionale* and *Heterotheca grandiflora.*

Project Site Surrounding Land Use: Land use around the project site is shown in Figure 7. The site is bordered by commercial developments to the north, east and west. Cactus Avenue and March Air Reserve Base are to the south.

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 7
SURROUNDING LAND USE

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

SURVEY METHODOLOGY

Burrowing owl surveys were required by the City of Moreno Valley. Surveys were conducted between September 10-14, 2016 during acceptable survey conditions and starting more than five days since the most recent rain. Surveys were completed by evaluating linear transects across the site (Figure 8).

The goal of these surveys was to determine burrowing owl presence and site conditions (botanical/wildlife composition, soil types, topography, etc.). The weather during the surveys is detailed in Table 1, and all surveys were completed within acceptable weather parameters. Periods of unacceptable weather were avoided.

FIGURE 8
SURVEY TRANSECTS

TABLE 1
SURVEY WEATHER

DATE	TEMP	WIND	COVER	RAIN
August 10	94 F	8 mph	clear	-0-
August 11	92 F	5 mph	clear	-0-
August 12	78 F	6 mph	a.m. fog	a.m. mist
August 13	67 F	9 mph	100%	-0-
August 14	80 F	3 mph	clear	-0-

No rain with five days prior to surveys.
Annual precipitation: 4.28”

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

BURROWING OWL SPECIES BACKGROUND

The Burrowing Owl (*Athene cunicularia*) is the smallest owl in the United States. Burrowing owls begin nesting in spring within burrows. The female does all of the incubation and brooding. Clutch size ranges from 6 to 11 eggs. Eggs are laid at intervals of 24 to 72 hours. The incubation period is 27 to 30 days and begins when the first egg is laid, resulting in a multi-aged brood. Owlets are born partially covered with down and with eyes closed. Eyes open at 5 days of age. Owlets move among nest burrows when 10 days old. They fly well by 6 weeks of age, and fledge when about 44 days old. An item of interest is a DNA fingerprinting study of burrowing owl study at U.C. Davis which showed that 37 percent of adult owls were raising owlets other than their biological offspring.

Burrowing owls hunt in both day and night. They hunt while flying or while on high spots on the ground including fence posts or other elevated perches. Prey is either run down on foot or caught by hovering and swooping. Arthropods, mainly insects, form the majority of the burrowing owl diet, but they do eat small rodents, reptiles and even small birds. Young ground squirrels, pocket gophers, voles, mice, young cottontails, and young jackrabbits are common mammalian prey. Grasshoppers, Jerusalem crickets, and beetles are the most common arthropod prey.

Distribution: Burrowing owl is a pan-American species. In North America, it is distributed from British Columbia and Manitoba south through the western half of the United States, Louisiana, Florida, the Caribbean islands, and Mexico (Figure 14). Distribution continues through Central America to western South America, from Columbia south to Tierra del Fuego in Argentina. Distribution of North American subspecies: *Athene cunicularia* is distributed from southern interior British Columbia east to south-central Manitoba and south to west-central Mexico. Populations in British Columbia are reintroduced; prior to the 1986 reintroduction, burrowing owl had not been sighted in British Columbia since 1979. The range of this species once extended to Minnesota and Iowa, but burrowing owl is probably extirpated from those states.

Christmas bird counts show California as the most important state for wintering burrowing owls, followed by New Mexico, Florida, Arizona, and Texas, respectively. Florida, the Southwest, and southern California have year-round burrowing owl residents as well as winter migrants. California Natural Diversity Database records include many observations of this owl in California including observations in Riverside County over the past 25 years.

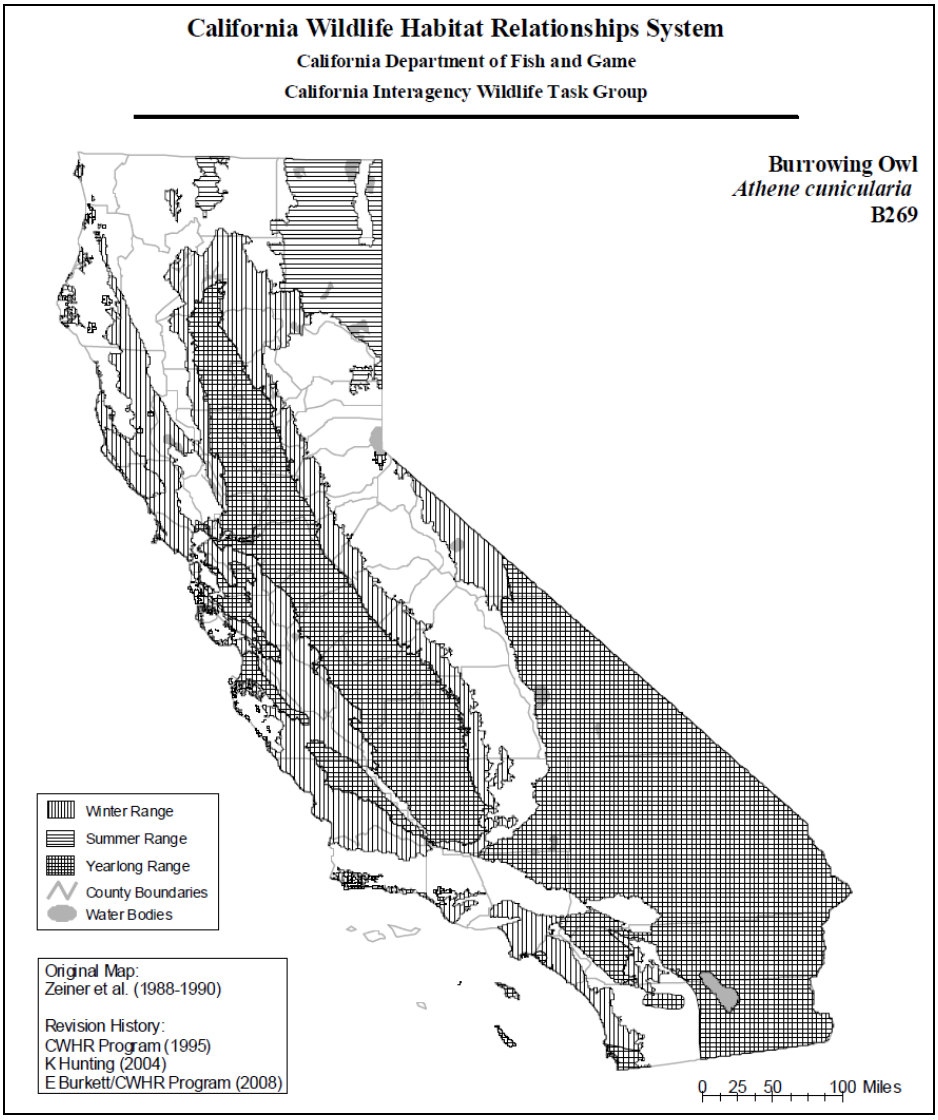
Habitat: The preferred habitat for the Burrowing owl includes grasslands, shrub land, and savannas. They also occur in other open areas such as agricultural lands, old fields, extensive forest clearings, airports, golf courses, and spacious residential zones.

Burrowing owls typically live in colonies, using burrows excavated by other animal species for cover. Burrows are used for breeding, nesting, and brooding. When selecting a burrow, the owls prefer burrows with low, open cover that provide good horizontal visibility. Burrowing owls are commonly found in plant communities in early stages of succession because cover is low. Long-abandoned burrows are usually not used because the burrow entrance has become overgrown. Burrows adjacent to burrows occupied by other burrowing owls are preferred, although burrowing owl pairs have nested alone if other burrowing owls were not in the area. Burrowing owls often evict other animal species from desirable burrows.

In California, burrowing owls primarily use ground squirrel burrows. The length and depth of the burrow depends upon the requirements of the species that dug it. In friable soil, burrowing owls dig their own burrows when suitable ones are not available. Additionally, burrowing owls use ground cavities other than burrows for cover, including human-constructed cavities such as culverts and pipes.

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 9
BURROWING OWL RANGE IN CALIFORNIA



Soil Requirements: This species is a generalist and only avoids toxic soils where possible. It has been observed in sand, decomposed granite, clay soils, farmed disturbed soils, etc.

Riverside County Locations: This species has been observed throughout Riverside County including locations in the following cities/regions – Corona, Norco, Riverside, Woodcrest, Lake Elsinore, Perris, Temecula, Winchester, Moreno Valley, Hemet, San Jacinto, Sun City and Murrieta among others.

Status: This species is a State of California Species of Concern.

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

SURVEY RESULTS

Burrowing Owl (*Athene cunicularia*): No burrowing owls were observed on-site. No burrowing owl burrows were observed. All burrows were utilized by ground squirrels. The project site has been disced repeatedly for weed control purposes.

PROJECT SITE PHOTOGRAPHS

FIGURE 10
PHOTOGRAPH KEY

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 11
PHOTOGRAPH NUMBER 1

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 12
PHOTOGRAPH NUMBER 2

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 13
PHOTOGRAPH NUMBER 3

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 14
PHOTOGRAPH NUMBER 4

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 15
PHOTOGRAPH NUMBER 5

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

FIGURE 16
PHOTOGRAPH NUMBER 6

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

CONCLUSIONS

Burrowing Owl (*Athene cunicularia*):

The absence of burrowing owl observations and the degraded nature of the project site indicate that this species does not utilize the site for nesting. Although burrowing owls and burrowing owl burrows are absent, the site can be used by this species for foraging when flying through the area.

Development of the proposed project is not expected to have a significant impact on the long-term viability of the burrowing owl.

MITIGATION

Burrowing Owl (*Athene cunicularia*):

No mitigation is expected because the site has been disced and excludes burrowing owls.

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX A
BOTANICAL COMPENDIUM

Asteraceae	**Sunflower family**
Ambrosia psilostachya	Western ragweed
Centaurea melitensis	Tacalote
Heterotheca grandiflora	Telegraph weed
Taraxicum officionale	Dandelion
Boraginaceae	**Borage family**
Cryptantha intermedia	Popcorn flower
Brassicaceae	**Mustard family**
Brassica geniculata	Mustard
Hirschfeldia incana	Short-podded mustard
Chenopodiaceae	**Goosefoot Family**
Salsola tragus	Russian thistle (dominant species on-site)
Euphorbiaceae	**Spurge family**
Eremocarpus setigerus	Doveweed
Euphorbia albomarginata	Rattlesnake weed
Geraniaceae	**Geranium family**
Erodium cicutarium	Red-stemmed filaree
Lamiaceae	**Mint Family**
Marrubium vulgare	Horehound
Poaceae	**Grass family**
Avena barbata	Slender wild oats
Bromus diandrus	Ripgut brome
Bromus madritensis	Foxtail chess

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX B
WILDLIFE COMPENDIUM

REPTILES

Iguanidae	**Iguanid Lizard Family**
Sceloporus occidentalis	Western fence lizard
Uta stansburiana	Side-blotched lizard

BIRDS

Accipitridae	**Hawks**
Buteo jamaicensis	Red-tailed hawk (overflight)
Columbidae	**Pigeon & Dove Family**
Zenadia macroura	Mourning dove
Corvidae	**Crow & Raven Family**
Corvus corax	Raven
Fringillidae	**Finch Family**
Carpodactus mexicanus	House finch
Mimidae	**Mockingbirds**
Mimus polyglottos	Mockingbird (on fence)
Passeridae	**Old World Sparrow Family**
Passer domesticus	House sparrow
Trochilidae	**Hummingbird Family**
Calypte anna	Anna's hummingbird (on fence)

MAMMALS

Canidae	**Dog, Wolf & Fox Family**
Canis familiaris	Domestic dog (at gate off-site)
Geomyidae	**Pocket Gophers**
Thomomys bottae	Pocket gopher
Leporidae	**Rabbit & Hare Family**
Sylvilagus auduboni	Cottontail (off-site)

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX C
HABITAT MAP
No native habitat is present.

Attachment: Biological Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

GEOTECHNICAL • ENVIRONMENTAL • GEOLOGY • MATERIALS TESTING & INSPECTION • FORENSIC • LABORATORY

SALEM
engineering group, inc.

PRELIMINARY
GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

SALEM PROJECT NO. 3-215-1091
NOVEMBER 25, 2015

PREPARED FOR:

MR. INO CRUZ
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November 25, 2015 Project No. 3-215-1091

Mr. Ino Cruz
J&T Business Management
139 Radio Road
Corona, CA 92879

SUBJECT: GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

Dear Mr. Cruz:

At your request and authorization, SALEM Engineering Group, Inc. (SALEM) has prepared this Geotechnical Engineering Investigation report for the Proposed Moreno Valley Cactus Center to be located at the subject site.

The accompanying report presents our findings, conclusions, and recommendations regarding the geotechnical aspects of designing and constructing the project as presently proposed. In our opinion, the proposed project is feasible from a geotechnical viewpoint provided our recommendations are incorporated into the design and construction of the project.

We appreciate the opportunity to assist you with this project. Should you have questions regarding this report or need additional information, please contact the undersigned at (909) 980-6455.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

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STATE OF CALIFORNIA

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

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Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

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GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

1. PURPOSE AND SCOPE

This report presents the results of our Geotechnical Engineering Investigation for the Proposed Moreno Valley Cactus Center to be located at the northeast corner of the intersection of Cactus Avenue and Commerce Center Drive in Moreno Valley, California (see Figure 1, Vicinity Map).

The purpose of our geotechnical engineering investigation was to observe and sample the subsurface conditions encountered at the site, and provide conclusions and recommendations relative to the geotechnical aspects of constructing the project as presently proposed.

The scope of this investigation included a field exploration, laboratory testing, engineering analysis and the preparation of this report. Our field exploration was performed on November 17, 2015 and included the drilling of sixteen (16) small-diameter soil borings to a maximum depth of 50 feet at the site. Additionally, six (6) percolation tests were performed at a depth of approximately 5 feet below existing grade for determination of the percolation rate. The locations of the soil borings and percolation tests are depicted on Figure 2, Site Plan. A detailed discussion of our field investigation, exploratory boring logs and percolation test results are presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to evaluate pertinent physical properties for engineering analyses. Appendix B presents the laboratory test results in tabular and graphic format.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions.

If project details vary significantly from those described herein, SALEM should be contacted to determine the necessity for review and possible revision of this report. Earthwork and Pavement Specifications are presented in Appendix C. If text of the report conflict with the specifications in Appendix C, the recommendations in the text of the report have precedence.

2. PROJECT DESCRIPTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structure are unavailable. On a preliminary basis, the development of the site will include construction of a total of six (6) commercial buildings and two (2) fuel pump canopies. The buildings will include a 2,080 square-foot car wash, a 3,800 square-foot

convenience store, a 2,800 square-foot fast food restaurant #1, a 3,200 square-foot fast food restaurant #2, a 3,200 square-foot fast food restaurant #3, and a 48,140 square-foot warehouse/office building. The canopies will include a 6,165 square-foot 10-pump gasoline canopy and a 4-pump diesel canopy. On-site parking and landscaping are planned to be associated with the development. Maximum wall load is expected to be on the order of 3.5 kips per linear foot. Maximum column load is expected to be on the order of 100 kips. Floor slab bearing pressure is expected to be on the order of 150 psf.

Concrete and asphaltic concrete pavement for parking area, customers travel lanes, and truck lane are to be designed for standard duty and heavy-duty traffic loading based on an Equivalent Single Axle Load (ESAL) of 18 kips, a maximum load of 60,000 ESAL and a design life of 20 years. The pavement design recommendations provided herein are based on the State of California Department (CALTRANS) design manual.

Based on the initial site grading plan provided to us and our field observation, we anticipate that cuts and fills during earthwork will be minimal and limited to providing level pads and positive site drainage. In the event that changes occur in the nature or design of the project, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions of our report are modified. The site configuration and locations of proposed improvements are shown on the Site Plan, Figure 1.

3. SITE LOCATION AND DESCRIPTION

The site is rectangular in shape and encompasses approximately 6.3 acres. The subject site is located on the northeast corner of the intersection of Cactus Avenue and Commerce Center Drive in the City of Moreno Valley, California (see Vicinity Map, Figure 1). The site is currently vacant with sparse vegetation and weeds. The site is enclosed by a chain-linked fence. The site is predominantly surrounded by industrial and commercial developments. The site is relatively flat with no major changes in grade. The average elevation of the site is approximately 1,563 feet above mean sea level (AMSL), based on Google Earth Imagery.

4. FIELD EXPLORATION

Our field exploration consisted of site surface reconnaissance and subsurface exploration. The exploratory test borings (B-1 through B-16) were drilled on November 17, 2015 in the area shown on the Site Plan, Figure 2. The test borings were advanced with a 6½ -inch diameter hollow stem auger rotated by a truck-mounted Mobile B-61 drill rig. The test borings were extended to depths of 10 to 50 feet below existing grade.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by a field engineer and stratification lines were approximated on the basis of observations made at the time of drilling. Visual classification of the materials encountered in the test borings were generally made in accordance with the Unified Soil Classification System (ASTM D2487). A soil classification chart and key to sampling is presented on the Unified Soil Classification Chart, in Appendix "A." The logs of the test borings are presented in Appendix "A." The Boring Logs include the soil type, color, moisture content, dry density, and the applicable Unified Soil Classification System symbol. The location of the test borings were determined by measuring from features shown on the Site

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Plan, provided to us. Hence, accuracy can be implied only to the degree that this method warrants. The actual boundaries between different soil types may be gradual and soil conditions may vary. For a more detailed description of the materials encountered, the Boring Logs in Appendix "A" should be consulted.

Soil samples were obtained from the test borings at the depths shown on the logs of borings. The MCS samples were recovered and capped at both ends to preserve the samples at their natural moisture content; SPT samples were recovered and placed in a sealed bag to preserve their natural moisture content. The borings were backfilled with soil cuttings after completion of the drilling.

5. LABORATORY TESTING

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory-testing program was formulated with emphasis on the evaluation of natural moisture, density, shear strength, consolidation potential, expansion index, maximum density and optimum moisture determination, and gradation of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and the results of laboratory test are summarized in Appendix "B." This information, along with the field observations, was used to prepare the final boring logs in Appendix "A."

6. GEOLOGIC SETTING

The subject site is located within the Peninsular Range Geomorphic Province, an area characterized by active northeast trending strike slip faults, including the San Jacinto to the northwest, and the Elsinore to the southwest. The project site is situated between the Santa Rosa Mountains and the San Jacinto Mountains to the east; and Santa Ana Mountains to the west and south. The near-surface deposits in the vicinity of the subject site are comprised of recent alluvium consisting of unconsolidated sands, silt, and clays derived from erosion of local mountain ranges. Deposits encountered on the subject site during exploratory drilling are discussed in detail in this report.

7. GEOLOGIC HAZARDS

7.1 Faulting and Seismicity

The Peninsular Range has historically been a province of relatively high seismic activity. The nearest faults to the project site are associated with the San Jacinto Fault system located approximately 6.8 miles from the site. There are no known active fault traces in the project vicinity. Based on mapping and historical seismicity, the seismicity of the Peninsular Range has been generally considered high by the scientific community.

The project area is not within an Alquist-Priolo Earthquake Fault (Special Studies) Zone and will not require a special site investigation by an Engineering Geologist. Soils on site are classified as Site Class D in accordance with Chapter 16 of the California Building Code. The proposed structures are determined to be in Seismic Design Category D. To determine the distance of known active faults within 100 miles of the site, we used the United States Geological Survey (USGS) web-based application *2008 National Seismic Hazard Maps - Fault Parameters.* Site latitude is 33.9109° North; site longitude is 117.2734° West. The ten closest active faults are summarized below in Table 7.1.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

TABLE 7.1
REGIONAL FAULT SUMMARY

Fault Name	Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
San Jacinto; SBV+SJV+A+CC+B+SM	6.8	7.9
San Jacinto; SBV	7.6	7.1
San Jacinto; A+CC+B+SM	9.5	7.6
Elsinore; W+GI+T+J+CM	15.8	7.8
S. San Andreas; PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	16.2	8.2
S. San Andreas; PK+CH+CC+BB+NM+SM+NSB	16.7	8.0
Chino, alt 2	17.9	6.8
Elsinore; T+J+CM	18.1	7.6
Chino, alt 1	19.1	7.0
Elsinore; W	20.9	7.0

The faults tabulated above and numerous other faults in the region are sources of potential ground motion. However, earthquakes that might occur on other faults throughout California are also potential generators of significant ground motion and could subject the site to intense ground shaking.

7.2 Surface Fault Rupture

The site is not within a currently established State of California Earthquake Fault Zone for surface fault rupture hazards. No active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low.

7.3 Ground Shaking

We used the USGS web-based application *US Seismic Design Maps* to estimate the peak ground acceleration adjusted for site class effects (PGA_M). Because of the proximity to the subject site and the maximum probable events for these faults, it appears that a maximum probable event along the fault zones could produce a peak horizontal acceleration of approximately 0.520g (2% probability of being exceeded in 50 years). While listing PGA is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and soil conditions underlying the site.

7.4 Liquefaction

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. Primary factors that trigger liquefaction are: moderate to strong ground shaking (seismic source), relatively clean, loose granular soils (primarily poorly graded sands and silty sands), and saturated soil conditions (shallow groundwater). Due to the increasing overburden pressure with depth, liquefaction of granular soils is generally limited to the upper 50 feet of a soil profile. However, liquefaction has occurred in soils other than clean sand.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

The soils encountered within the depth of 50 feet on the project site consisted predominately of silty sand/sandy silt with trace clay, silty sand with varying amounts of clay, sandy silt with varying amounts of clay, clayey silt, silty sand/sand and sand. The historically highest groundwater is estimated to be at a depth of 10 feet below ground surface according to the County of Riverside Geologic Hazards Map (2004) and regional groundwater well data. Low to very low cohesion strength is associated with the sandy soil. A seismic hazard, which could cause damage to the proposed development during seismic shaking, is the post-liquefaction settlement of the liquefied sands. The potential for soil liquefaction during a seismic event was evaluated using LiqIT computer program (version 4.7.5) developed by GeoLogismiki of Greece. For the analysis, a maximum earthquake magnitude of 8.2 M_w and a peak horizontal ground surface acceleration of 0.52g (with a 2 percent probability of exceedance in 50 years) and a groundwater depth of 10 feet were considered appropriate for the liquefaction analysis. The liquefaction analysis indicated that the site soils had a low potential for liquefaction and the total liquefaction-induced settlement was calculated to be negligible.

7.5 Lateral Spreading

Lateral spreading is a phenomenon in which soils move laterally during seismic shaking and is often associated with liquefaction. The amount of movement depends on the soil strength, duration and intensity of seismic shaking, topography, and free face geometry. Due to the relatively flat site topography and low liquefaction potential, we judge the likelihood of lateral spreading to be low.

7.6 Landslides

There are no known landslides at the site, nor is the site in the path of any known or potential landslides. We do not consider the potential for a landslide to be a hazard to this project.

7.7 Tsunamis and Seiches

The site is not located within a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site. Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

8. SOIL AND GROUNDWATER CONDITIONS

8.1 Subsurface Conditions

The subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the soils within the depth of exploration consisted of alluvium deposits of medium dense to dense silty sand/sandy silt with trace clay, medium dense to very dense silty sand with varying amounts of clay, very stiff to hard sandy silt with varying amounts of clay, stiff clayey silt, dense silty sand/sand and sand.

Organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. The organic materials are not suitable to be used to support the proposed structures. Thicker organic material may be present onsite between our test borings. Verification of the extent of the organic material should be determined during site grading. Field and laboratory tests

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

suggest that the deeper native soils are moderately strong and slightly compressible. These soils extended to the termination depth of our borings.

The soils were classified in the field during the drilling and sampling operations. The stratification lines were approximated by the field engineer on the basis of observations made at the time of drilling. The actual boundaries between different soil types may be gradual and soil conditions may vary. For a more detailed description of the materials encountered, the Boring Logs in Appendix "A" should be consulted. The Boring Logs include the soil type, color, moisture content, dry density, and the applicable Unified Soil Classification System symbol. The locations of the test borings were determined by measuring from feature shown on the Site Plan, provided to us. Hence, accuracy can be implied only to the degree that this method warrants.

8.2 Groundwater

The test boring locations were checked for the presence of groundwater during and after the drilling operations. Free groundwater was encountered during this investigation at a depth of approximately 29 feet below existing grades. The historically highest groundwater is estimated to be at a depth of 10 feet below ground surface according to the County of Riverside Geologic Hazards Map (2004) and regional groundwater well data. It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, localized pumping, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

8.3 Soil Corrosion Screening

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete and the soil. The 2011 Edition of ACI 318 (ACI 318) has established criteria for evaluation of sulfate and chloride levels and how they relate to cement reactivity with soil and/or water.

A soil sample was obtained from the project site and was tested for the evaluation of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts and soluble chloride. The water-soluble sulfate concentration in the saturation extract from the soil sample was detected to be 187 mg/kg. ACI 318 Tables 4.2.1 and 4.3.1 outline exposure categories, classes, and concrete requirements by exposure class. ACI 318 requirements for site concrete based upon soluble sulfate are summarized in Table 8.3 below.

TABLE 8.3
WATER SOLUBLE SULFATE EXPOSURE REQUIREMENTS

Water Soluble Sulfate (SO_4) in Soil, Percentage by Weight	Exposure Severity	Exposure Class	Maximum w/cm Ratio	Minimum Concrete Compressive Strength	Cementations Materials Type
0.0187	Not Applicable	S0	N/A	2,500 psi	No Restriction

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The water-soluble chloride concentration detected in saturation extract from the soil samples was 112 mg/kg. This level of chloride concentration is considered mildly to moderately corrosive. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, applicable manufacturer's recommendations for corrosion protection of buried metal pipe be closely followed.

8.4 Percolation Testing

Six percolation tests (P-1 through P-6) were performed within assumed infiltration areas and were conducted in accordance with in accordance with the guidelines established by the County of Riverside. The approximate locations of the percolation tests are shown on the attached Site Plan, Figure 2. Seven-inch diameter boreholes were advanced to the depths shown on the percolation test worksheets. The holes were pre-saturated a minimum of 18 hours and maximum of 24 hours before percolation testing commenced. Percolation rates were measured by filling the test holes with clean water and measuring the water drops at a certain time interval.

The percolation rate data are presented in tabular format at the end of this Report. The difference in the percolation rates are reflected by the varied type of soil materials at the bottom of the test holes. The test results are shown on the table below.

Test No.	Depth (feet)	Measured Percolation Rate (min/inch)	Tested Infiltration Rate* (inch/hour)	Soil Type
P-1	5	62.5	0.19	Silty Sand (SM) w/trace clay
P-2	5	41.7	0.32	Silty Sand (SM) w/trace clay
P-3	5	50.0	0.25	Silty Sand (SM) w/trace clay
P-4	5	125.0	0.07	Silty Sand (SM) w/trace clay
P-5	5	83.3	0.12	Silty Sand (SM) w/trace clay
P-6	5	83.3	0.17	Silty Sand (SM) w/trace clay

*** Tested infiltration Rate = $(\Delta H\ 60\ r) / (\Delta t(r + 2H_{avg}))$**

The soil infiltration or percolation rates are based on tests conducted with clear water. The infiltration/percolation rates may vary with time as a result of soil clogging from water impurities. The infiltration/percolation rates will deteriorate over time due to the soil conditions and an appropriate factor of safety (FS) may be applied. The owner or civil engineer may elect to use a lower FS for the design; however, more frequent maintenance will be expected. The soils may also become less permeable to impermeable if the soil is compacted. Thus, periodic maintenance consisting of clearing the bottom of the drainage system of clogged soils should be expected.

The infiltration/percolation rate may become slower if the surrounding soil is wet or saturated due to prolonged rainfalls. Additional percolation tests may be conducted at bottom of the drainage system during construction to verify the infiltration/percolation rate. Groundwater, if closer to the bottom of the drainage system, will also reduce the infiltration/percolation rate.

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The scope of our services did not include a groundwater study and was limited to the performance of percolation testing and soil profile description, and the submitted data only. Our services did not include those associated with septic system design. Neither did services include an Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands.

Any statements, or absence of statements, in this report or on any boring logs regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment. The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices. The work conducted through the course of this investigation, including the preparation of this report, has been performed in accordance with the generally accepted standards of geotechnical engineering practice, which existed in the geographic area at the time the report was written. No other warranty, express or implied, is made.

Please be advised that when performing percolation testing services in relatively small diameter borings, that the testing may not fully model the actual full scale long term performance of a given site. This is particularly true where percolation test data is to be used in the design of large infiltration system such as may be proposed for the site.

The measured percolation rate includes dispersion of the water at the sidewalls of the boring as well as into the underlying soils. Subsurface conditions, including percolation rates, can change over time as fine-grained soils migrate. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site is suitable for the proposed construction of improvements at the site as planned, provided the recommendations contained in this report are incorporated into the project design and construction. Conclusions and recommendations provided in this report are based on our review of available literature, analysis of data obtained from our field exploration and laboratory testing program, and our understanding of the proposed development at this time.

9.1.2 The primary geotechnical constraints identified in our investigation is the presence of organic and potentially compressible material at the site. Recommendations to mitigate the effects of these soils are provided in this report.

9.1.3 Slight to abundant organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. Thicker organic materials may be present onsite between our test boring locations. Verification of the extent of the organic materials should be determined during site grading. All organic materials in excess of 3 percent by volume are not suitable to support the proposed structures and should be removed and

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

replaced with Engineered Fill. Moreover, undocumented fill materials are not suitable to support any future structures and should be replaced with Engineered Fill. The extent and consistency of the organic material or fills should be verified during site construction. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify the fill condition.

9.1.4 Site demolition activities shall include removal of all surface obstructions not intended to be incorporated into final site design. In addition, underground buried structures and/or utility lines encountered during demolition and construction should be properly removed and the resulting excavations backfilled with Engineered Fill. It is suspected that possible demolition activities of the existing structures may disturb the upper soils. After demolition activities, it is recommended that disturbed soils be removed and/or recompacted.

9.1.5 The upper 2 to 4 inches of the soils containing, vegetation, roots and other objectionable organic matter encountered at the time of grading should be stripped and removed from the surface. Deeper stripping may be required in localized areas. The stripped vegetation will not be suitable for use as Engineered Fill but may be stockpiled and reused in landscape or non-structural areas or exported from the site.

9.1.6 The near-surface onsite soils are moisture-sensitive and are moderately compressible (collapsible soil) under saturated conditions. Structures within the project vicinity have experienced excessive post-construction settlement, when the foundation soils become near saturated. The collapsible or weak soils should be removed and recompacted according to the recommendations in the Grading section of this report.

9.1.7 Based on the subsurface conditions at the site and the anticipated structural loading, we anticipate that the proposed buildings may be supported using conventional shallow foundations or deep foundations provided that the recommendations presented herein are incorporated in the design and construction of the project.

9.1.8 SALEM shall review the project grading and foundation plans prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required. If SALEM is not provided plans and specifications for review, we cannot assume any responsibility for the future performance of the project.

9.1.9 SALEM shall be present at the site during site demolition and preparation to observe site clearing/demolition, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.

9.1.10 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

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9.2 Seismic Design Criteria

9.2.1 For seismic design of the structures, and in accordance with the seismic provisions of the 2013 CBC, our recommended parameters are shown below. These parameters are based on Probabilistic Ground Motion of 2% Probability of Exceedance in 50 years. The Site Class was determined based on the results of our field exploration.

TABLE 9.2.1
2013 CBC SEISMIC DESIGN PARAMETERS

Seismic Item	Symbol	Value	2010 ASCE 7 or 2013 CBC Reference
Site Coordinates (Datum = NAD 83)		33.9109 Lat -117.2734 Lon	
Site Class	--	D	ASCE 7 Table 20.3
Soil Profile Name	--	Stiff Soil	ASCE 7 Table 20.3
Risk Category	--	II	CBC Table 1604.5
Site Coefficient for PGA	F_{PGA}	1.000	ASCE 7 Table 11.8-1
Peak Ground Acceleration (adjusted for Site Class effects)	PGA_M	0.682	ASCE 7 Equation 11.8-1
Seismic Design Category	SDC	D	ASCE 7 Table 11.6-1 & 2
Mapped Spectral Acceleration (Short period - 0.2 sec)	S_S	1.500 g	CBC Figure 1613.3.1(1-6)
Mapped Spectral Acceleration (1.0 sec. period)	S_1	0.600 g	CBC Figure 1613.3.1(1-6)
Site Class Modified Site Coefficient	F_a	1.000	CBC Table 1613.3.3(1)
Site Class Modified Site Coefficient	F_v	1.500	CBC Table 1613.3.3(2)
MCE Spectral Response Acceleration (Short period - 0.2 sec) $S_{MS} = F_a S_S$	S_{MS}	1.500 g	CBC Equation 16-37
MCE Spectral Response Acceleration (1.0 sec. period) $S_{M1} = F_v S_1$	S_{M1}	0.900 g	CBC Equation 16-38
Design Spectral Response Acceleration $S_{DS}=⅔S_{MS}$ (short period - 0.2 sec)	S_{DS}	1.000 g	CBC Equation 16-39
Design Spectral Response Acceleration $S_{D1}=⅔S_{M1}$ (1.0 sec. period)	S_{D1}	0.600 g	CBC Equation 16-40

9.2.2 Conformance to the criteria in the above table for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

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9.3 Soil and Excavation Characteristics

9.3.1 Based on the soil conditions encountered in our soil borings, the onsite soils can be excavated with moderate effort using conventional excavation equipment.

9.3.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable Occupational Safety and Health Administration (OSHA) rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.

9.3.3 The upper soils are moisture-sensitive and moderately collapsible under saturated conditions. These soils, in their present condition, possess moderate risk to construction in terms of possible post-construction movement of the foundations and floor systems if no mitigation measures are employed. Accordingly, measures are considered necessary to reduce anticipated expansion and collapse potential. As recommended in Section 9.5, the collapsible soils should be overexcavated and recompacted. Mitigation measures will not eliminate post-construction soil movement, but will reduce the soil movement. Success of the mitigation measures will depend on the thoroughness of the contractor in dealing with the soil conditions.

9.3.4 The near surface soils identified as part of our investigation are, generally, slightly moist to moist due to the absorption characteristics of the soil. Earthwork operations may encounter very moist unstable soils which may require removal to a stable bottom. Exposed native soils exposed as part of site grading operations shall not be allowed to dry out and should be kept continuously moist prior to placement of subsequent fill.

9.4 Materials for Fill

9.4.1 Excavated soils generated from cut operations at the site are suitable for use as general Engineered Fill in structural areas, provided they have an Expansion Index of 20 or less, do not contain deleterious matter, organic materials more than 3% or rock materials larger than 3 inches in maximum dimension

9.4.2 Import soil shall be well-graded, slightly cohesive silty fine sand or sandy silt, with relatively impervious characteristics when compacted. A clean sand or very sandy soil is not acceptable for this purpose. This material should be approved by the Engineer prior to use and should typically possess the soil characteristics summarized below in Table 9.4.2.

TABLE 9.4.2
IMPORT FILL REQUIREMENTS

Minimum Percent Passing No. 200 Sieve	20
Maximum Percent Passing No. 200 Sieve	50
Maximum Particle Size	3"
Maximum Plasticity Index	12
Maximum CBC Expansion Index	20

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9.4.3 The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since they have complete control of the project site.

9.4.4 Environmental characteristics and corrosion potential of import soil materials should also be considered.

9.4.5 Proposed import materials should be sampled, tested, and approved by SALEM prior to its transportation to the site.

9.5 Grading

9.5.1 A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Geotechnical Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section as well as other portions of this report.

9.5.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and geotechnical engineer in attendance.

9.5.3 Site preparation should begin with removal of existing surface/subsurface structures, underground utilities (as required), any existing uncertified fill, and debris. Excavations or depressions resulting from site clearing operations, or other existing excavations or depressions, should be restored with Engineered Fill in accordance with the recommendations of this report.

9.5.4 Organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. Thicker organic materials may be present onsite between our test boring locations. Verification of the extent of the organic materials should be determined during site grading. All organic materials in excess of 3 percent by volume are not suitable to support the proposed structures and should be replaced with Engineered Fill. Additionally, undocumented fill materials are not suitable to support any future structures and should be replaced with Engineered Fill. The extent and consistency of the organic material or fills should be verified during site construction. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify the fill condition.

9.5.5 Surface vegetation should be removed by stripping to a sufficient depth to remove organic-rich topsoil. The upper 2 to 4 inches of the soils containing, vegetation, roots and other objectionable organic matter encountered at the time of grading should be stripped and removed from the surface. Deeper stripping may be required in localized areas. The stripped vegetation will not be suitable for use as Engineered Fill but may be stockpiled and reused in landscape or non-structural areas or exported from the site.

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9.5.6 The upper 1.5 feet of soil (below soils containing vegetation, and roots) were very dry and loose, it is recommended that the overexcavation and recompaction within the proposed buildings be performed to a minimum depth of **two (2)** feet below existing grade or **one (1)** foot below proposed footing bottom, whichever is deeper. The overexcavation and recompaction should also extend laterally to a minimum of 5 feet beyond the outer edges of the proposed buildings.

9.5.7 Deeper overexcavation and recompaction should be performed within the Fast Food #1, Convenience Store and 10-Pump Canopy areas to remove all the organic materials. Based on the boring logs, the organic materials are present at depths of 3½ to 7 feet below existing grade.

9.5.8 Any fill materials encountered during grading should be removed and replaced with engineered fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction.

9.5.9 Prior to placement of fill soils, the upper 10 to 12 inches of native subgrade soils should be scarified, moisture-conditioned to no less than the optimum moisture content and recompacted to a minimum of 95 percent (90 percent for cohesive soils) of the maximum dry density based on ASTM D1557 Test Method.

9.5.10 All Engineered Fill (including scarified ground surfaces and backfill) should be placed in thin lifts to allow for adequate bonding and compaction (typically 6 to 8 inches in loose thickness).

9.5.11 Engineered Fill soils should be placed, moisture conditioned to near optimum moisture content, and compacted to at least 95% (90% for cohesive soils) relative compaction.

9.5.12 An integral part of satisfactory fill placement is the stability of the placed lift of soil. If placed materials exhibit excessive instability as determined by a SALEM field representative, the lift will be considered unacceptable and shall be remedied prior to placement of additional fill material. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

9.5.13 Within pavement areas, it is recommended that scarification, moisture conditioning and recompaction be performed to at least 12 inches below existing grade or finish grade, whichever is deeper. In addition, the upper 12 inches of final pavement subgrade, whether completed at-grade, by excavation, or by filling, should be uniformly moisture-conditioned to no less than the optimum moisture content and compacted to at least 95% (90% for cohesive soils) relative compaction.

9.5.14 Final pavement subgrade should be finished to a smooth, unyielding surface. We further recommend proof-rolling the subgrade with a loaded water truck (or similar equipment with high contact pressure) to verify the stability of the subgrade prior to placing aggregate base.

9.5.15 The most effective site preparation alternatives will depend on site conditions prior to grading. We should evaluate site conditions and provide supplemental recommendations immediately prior to grading, if necessary.

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9.5.16 We do not anticipate groundwater or seepage to adversely affect construction if conducted during the drier moths of the year (typically summer and fall). However, groundwater and soil moisture conditions could be significantly different during the wet season (typically winter and spring) as surface soil becomes wet; perched groundwater conditions may develop. Grading during this time period will likely encounter wet materials resulting in possible excavation and fill placement difficulties. Project site winterization consisting of placement of aggregate base and protecting exposed soils during construction should be performed. If the construction schedule requires grading operations during the wet season, we can provide additional recommendations as conditions warrant.

9.5.17 The wet soils may become non conducive to site grading as the upper soils yield under the weight of the construction equipment. Therefore, mitigation measures should be performed for stabilization. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material or placement of crushed rocks or aggregate base material; or mixing the soil with an approved lime or cement product.

The most common remedial measure of stabilizing the bottom of the excavation due to wet soil condition is to reduce the moisture of the soil to near the optimum moisture content by having the subgrade soils scarified and aerated or mixed with drier soils prior to compacting. However, the drying process may require an extended period of time and delay the construction operation. To expedite the stabilizing process, crushed rock may be utilized for stabilization provided this method is approved by the owner for the cost purpose. If the use of crushed rock is considered, it is recommended that the upper soft and wet soils be replaced by 6 to 24 inches of ¾-inch to 1-inch crushed rocks. The thickness of the rock layer depends on the severity of the soil instability. The recommended 6 to 24 inches of crushed rock material will provide a stable platform. It is further recommended that lighter compaction equipment be utilized for compacting the crushed rock. A layer of geofabric is recommended to be placed on top of the compacted crushed rock to minimize migration of soil particles into the voids of the crushed rock, resulting in soil movement. Although it is not required, the use of geogrid (e.g. Tensar BX 1100 or TX 140) below the crushed rock will enhance stability and reduce the required thickness of crushed rock necessary for stabilization. Our firm should be consulted prior to implementing remedial measures to provide appropriate recommendations.

9.6 Shallow Foundations

9.6.1 The site is suitable for use of conventional shallow foundations consisting of continuous footings and isolated pad footings bearing in properly compacted Engineered Fill.

9.6.2 The bearing wall footings considered for the structures should be continuous with a minimum width of 15 inches and extend to a minimum depth of 18 inches below the lowest adjacent grade. Isolated column footings should have a minimum width of 24 inches and extend a minimum depth of 18 inches below the lowest adjacent grade. The bottom of footing excavations should be maintained free of loose and disturbed soil. Footing concrete should be placed into a neat excavation.

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9.6.3 For design purposes, total settlement due to static loading on the order of 1.0 inches may be assumed for shallow footings. Differential settlement due to static loading, along a 20-foot exterior wall footing or between adjoining column footings, should be ½ inch, producing an angular distortion of 0.002. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. The footing excavations should not be allowed to dry out any time prior to pouring concrete.

9.6.4 Footings proportioned as recommended above may be designed for the maximum allowable soil bearing pressures shown in the table below.

Loading Condition	Allowable Bearing
Dead Load Only	2,500 psf
Dead-Plus-Live Load	3,000 psf
Total Load, Including Wind or Seismic Loads	4,000 psf

9.6.5 Resistance to lateral footing displacement can be computed using an allowable coefficient of friction factor of 0.38 acting between the base of foundations and the supporting native subgrade.

9.6.6 Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 360 pounds per cubic foot acting against the appropriate vertical native footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. An increase of one-third is permitted when using the alternate load combination in Section 1605.3.2 of the 2012 IBC/2013 CBC that includes wind or earthquake loads.

9.6.7 Underground utilities running parallel to footings should not be constructed in the zone of influence of footings. The zone of influence may be taken to be the area beneath the footing and within a 1:1 plane extending out and down from the bottom edge of the footing.

9.6.8 The foundation subgrade should be sprinkled as necessary to maintain a moist condition without significant shrinkage cracks as would be expected in any concrete placement. Prior to placing rebar reinforcement, foundation excavations should be evaluated by a representative of SALEM for appropriate support characteristics and moisture content. Moisture conditioning may be required for the materials exposed at footing bottom, particularly if foundation excavations are left open for an extended period.

9.7 Caisson Foundations

9.7.1 The caisson foundation should have a minimum depth of 10 feet below the lowest adjacent grade.

9.7.2 The caissons may be designed using an allowable sidewall friction of 250 psf. This value is for dead-plus-live loads. An allowable end bearing capacity of 5,000 psf may be used

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provided that the bottom of the caisson is cleaned with the use of a clean-out bucket or equivalent and inspected by our representative prior to placement of reinforcement and concrete. An increase of one-third is permitted when using the alternate load combination in Section 1605.3.2 that includes wind or earthquake loads.

9.7.3 Uplift loads can be resisted by caissons using an allowable sidewall friction of 200 psf of the surface area and the weight of the caisson.

9.7.4 The total settlement of the caisson footing is not expected to exceed 1 inch. Differential settlement should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied.

9.7.5 Lateral loads for caissons may be designed utilizing the Isolated Pole Formula and Specifications shown on Table 1804.2, Sections 1804.3.1 and 1808.2.2 of the California Building Code. The drilled caissons may be designed for a lateral capacity of 360 pounds per square foot per foot of depth below the lowest adjacent grade to a maximum of 5,400 psf. The lowest adjacent grade should all the ground surface within 5 feet of the caisson.

9.7.6 These values may be increased by one-third when using the alternative load combinations in Section 1605.3.2 of the IBC that include wind or earthquake loads. These values should not be doubled since the values given herein are higher than the tabular values shown on the Table 1804.2. The lateral loading criteria is based on the assumption that the load application is applied at the ground level, flexible cap connections applied and a minimum embedment depth of 10 feet.

9.7.7 Sandy soil and groundwater conditions were encountered at the site. Casing of the drilled caisson will be required if groundwater/seepage is encountered or the drilled hole has to be left open for an extended period of time.

9.8 Concrete Slabs-on-Grade

9.8.1 Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. We recommend that non-structural slabs-on-grade be at least 4 inches thick and underlain by six (6) inches of compacted granular aggregate subbase material compacted to at least 95% relative compaction.

9.8.2 Granular aggregate subbase material shall conform to ASTM D-2940, Latest Edition (Table 1, bases) with at least 95 percent passing a 1½-inch sieve and not more than 8% passing a No. 200 sieve to prevent capillary moisture rise.

9.8.3 We recommend reinforcing slabs, at a minimum, with No. 3 reinforcing bars placed 18 inches on center, each way.

9.8.4 Slabs subject to structural loading may be designed utilizing a modulus of subgrade reaction K of 140 pounds per square inch per inch. The K value was approximated based on inter-relationship of soil classification and bearing values (Portland Cement Association, Rocky Mountain Northwest).

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9.8.5 The spacing of crack control joints should be designed by the project structural engineer. In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs and 12 feet for 4-inch thick slabs.

9.8.6 Crack control joints should extend a minimum depth of one-fourth the slab thickness and should be constructed using saw-cuts or other methods as soon as practical after concrete placement. The exterior floors should be poured separately in order to act independently of the walls and foundation system.

9.8.7 It is recommended that the utility trenches within the structures be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the structures is recommended.

9.8.8 Moisture within the structures may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structures. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with manufacturer's recommendations and/or ASTM guidelines, whichever is more stringent. In addition, ventilation of the structures is recommended to reduce the accumulation of interior moisture.

9.8.9 In areas where it is desired to reduce floor dampness where moisture-sensitive coverings are anticipated, construction should have a suitable waterproof vapor retarder (a minimum of 15 mils thick polyethylene vapor retarder sheeting, Raven Industries "VaporBlock 15, Stego Industries 15 mil "StegoWrap" or W.R. Meadows Sealtight 15 mil "Perminator") incorporated into the floor slab design. The water vapor retarder should be decay resistant material complying with ASTM E96 not exceeding 0.04 perms, ASTM E154 and ASTM E1745 Class A. The vapor barrier should be placed between the concrete slab and the compacted granular aggregate subbase material. The water vapor retarder (vapor barrier) should be installed in accordance with ASTM Specification E 1643-94.

9.8.10 The concrete maybe placed directly on vapor retarder. The vapor retarder should be inspected prior to concrete placement. Cut or punctured retarder should be repaired using vapor retarder material lapped 6 inches beyond damaged areas and taped.

9.8.11 The recommendations of this report are intended to reduce the potential for cracking of slabs due to soil movement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to soil movement. This is common for project areas that contain expansive soils since designing to eliminate potential soil movement is cost prohibitive. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

9.8.12 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.9 Lateral Earth Pressures and Frictional Resistance

9.9.1 Active, at-rest and passive unit lateral earth pressures against footings and walls are summarized in the table below:

Lateral Pressure Conditions	Ultimate Equivalent Fluid Pressure, pcf
Active Pressure, Drained	40
At-Rest Pressure, Drained	60
Passive Pressure	360
Related Parameters	
Allowable Coefficient of Friction	0.38
In-Place Soil Density (lbs/ft^3)	120

9.9.2 Active pressure applies to walls, which are free to rotate. At-rest pressure applies to walls, which are restrained against rotation. The preceding lateral earth pressures assume sufficient drainage behind retaining walls to prevent the build-up of hydrostatic pressure. The top one-foot of adjacent subgrade should be deleted from the passive pressure computation.

9.9.3 The foregoing values of lateral earth pressures represent ultimate soil values and a safety factor consistent with the design conditions should be included in their usage.

9.9.4 For stability against lateral sliding, which is resisted solely by the passive pressure, we recommend a minimum safety factor of 1.5.

9.9.5 For stability against lateral sliding, which is resisted by the combined passive and frictional resistance, a minimum safety factor of 2.0 is recommended.

9.9.6 For lateral stability against seismic loading conditions, we recommend a minimum safety factor of 1.1.

9.9.7 For dynamic seismic lateral loading the following equation shall be used:

Dynamic Seismic Lateral Loading Equation
Dynamic Seismic Lateral Load = $\frac{3}{8}\gamma K_h H^2$
Where: γ = In-Place Soil Density
K_h = Horizontal Acceleration = $\frac{2}{3}PGA_M$
H = Wall Height

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Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.10 Retaining Walls

9.10.1 Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic-concrete or other suitable backfill to minimize surface drainage into the wall drain system. The gravel should conform to Class II permeable materials graded in accordance with the current CalTrans Standard Specifications.

9.10.2 Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

9.10.3 Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The top of the perforated pipe should be placed at or below the bottom of the adjacent floor slab or pavements. The pipe should be placed in the center line of the drainage blanket and should have a minimum diameter of 4 inches. Slots should be no wider than 1/8-inch in diameter, while perforations should be no more than ¼-inch in diameter.

9.10.4 If retaining walls are less than 5 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 2-inch minimum diameter holes (concrete walls) or unmortared head joints (masonry walls) and placed no higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to the CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

9.10.5 During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

9.11 Temporary Excavations

9.11.1 We anticipate that the majority of the sandy site soils will be classified as Cal-OSHA "Type C" soil when encountered in excavations during site development and construction. Excavation sloping, benching, the use of trench shields, and the placement of trench spoils should conform to the latest applicable Cal-OSHA standards. The contractor should have a Cal-OSHA-approved "competent person" onsite during excavation to evaluate trench conditions and make appropriate recommendations where necessary.

9.11.2 It is the contractor's responsibility to provide sufficient and safe excavation support as well as protecting nearby utilities, structures, and other improvements which may be damaged by earth movements. All onsite excavations must be conducted in such a manner that potential

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load.

9.11.3 Temporary excavations and slope faces should be protected from rainfall and erosion. Surface runoff should be directed away from excavations and slopes.

9.11.4 Open, unbraced excavations in undisturbed soils should be made according to the slopes presented in the following table:

RECOMMENDED EXCAVATION SLOPES

Depth of Excavation (ft)	Slope (Horizontal : Vertical)
0-5	1:1
5-10	2:1

9.11.5 If, due to space limitation, excavations near property lines or existing structures are performed in a vertical position, slot cuts, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavations and installation. A Specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction.

9.11.6 Braced shorings should be designed for a maximum pressure distribution of 30H, (where H is the depth of the excavation in feet). The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given herein. Equipment traffic should concurrently be limited to an area at least 3 feet from the shoring face or edge of the slope.

9.11.7 The excavation and shoring recommendations provided herein are based on soil characteristics derived from the borings within the area. Variations in soil conditions will likely be encountered during the excavations. SALEM Engineering Group, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation. Slope height, slope inclination, or excavation depth should in no case exceed those specified in local, state, or federal safety regulation, (e.g. OSHA) standards for excavations, 29 CFR part 1926, or Assessor's regulations.

9.12 Underground Utilities

9.12.1 Underground utility trenches should be backfilled with properly compacted material. The material excavated from the trenches should be adequate for use as backfill provided it does not contain deleterious matter, vegetation or rock larger than 3 inches in maximum dimension. Trench backfill should be placed in loose lifts not exceeding 8 inches and compacted to at least 95% (90% for cohesive soils) relative compaction at or above optimum moisture content.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.12.2 Bedding and pipe zone backfill typically extends from the bottom of the trench excavations to approximately 6 to 12 inches above the crown of the pipe. Pipe bedding and backfill material should conform to the requirements of the governing utility agency.

9.12.3 It is suggested that underground utilities crossing beneath new or existing structures be plugged at entry and exit locations to the buildings or structures to prevent water migration. Trench plugs can consist of on-site clay soils, if available, or sand cement slurry. The trench plugs should extend 2 feet beyond each side of individual perimeter foundations.

9.12.4 The contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

9.13 Surface Drainage

9.13.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change to important engineering properties. Proper drainage should be maintained at all times.

9.13.2 Site drainage should be collected and transferred away from improvements in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundations or retaining walls. Drainage should not be allowed to flow uncontrolled over any descending slope. The proposed structures should be provided with roof gutters. Discharge from downspouts, roof drains and scuppers are not permitted onto unprotected soils within five feet of the buildings perimeters. Planters which are located adjacent to foundations should be sealed or properly drained to prevent moisture intrusion into the materials providing foundation support. Landscape irrigation within 5 feet of the buildings perimeter footings should be kept to a minimum to just support vegetative life.

9.13.3 The ground immediately adjacent to the foundation shall be sloped away from buildings at a slope of not less than 5 percent for a minimum distance of 10 feet. Impervious surfaces within 10 feet of building's foundations shall be sloped a minimum of 2 percent away from buildings and drainage gradients maintained to carry all surface water to collection facilities and off site. These grades should be maintained for the life of the project.

9.14 Pavement Design

9.14.1 Based on site soil conditions, an R-value of 30 was used for the preliminary flexible asphaltic concrete pavement design. The R-value may be verified during grading of the pavement areas.

9.14.2 The pavement design recommendations provided herein are based on the State of California Department of Transportation (CALTRANS) design manual. The asphaltic concrete (flexible pavement) is based on a 20-year pavement life utilizing 1200 passenger vehicles, 10 single unit

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trucks, and 2 multi-unit trucks. The following table shows the recommended pavement sections for various traffic indices.

TABLE 9.13.2
ASPHALT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
5.0 (Parking and Vehicle Drive Areas)	3.0"	5.0"	12.0"
6.5 (Heavy Truck Areas)	3.5"	8.5"	12.0"

****95% compaction based on ASTM D1557 Test Method***
****95% (90% for cohesive soils) compaction based on ASTM D1557 Test Method***

9.14.3 The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

TABLE 9.13.3
PORTLAND CEMENT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Portland Cement Concrete*	Class II Aggregate Base**	Compacted Subgrade***
5.0 (Light Duty)	5.0"	4.0"	12.0"
6.5 (Heavy Duty)	6.5"	6.0"	12.0"

**** Minimum Compressive Strength of 4,000 psi***
***** 95% compaction based on ASTM D1557 Test Method***
******95% (90% for cohesive soils) compaction based on ASTM D1557 Test Method***

10. PLAN REVIEW, CONSTRUCTION OBSERVATION AND TESTING

10.1 Plan and Specification Review

10.1.1 SALEM should review the project plans and specifications prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required.

10.2 Construction Observation and Testing Services

10.2.1 The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for others interpretation of our recommendations, and therefore the future performance of the project.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

10.2.2 SALEM should be present at the site during site preparation to observe site clearing, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.

10.2.3 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

11. LIMITATIONS AND CHANGED CONDITIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the test borings drilled at the approximate locations shown on the Site Plan, Figure 1. The report does not reflect variations which may occur between borings. The nature and extent of such variations may not become evident until construction is initiated.

If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-site observations during the excavation period and noting the characteristics of such variations. The findings and recommendations presented in this report are valid as of the present and for the proposed construction. If site conditions change due to natural processes or human intervention on the property or adjacent to the site, or changes occur in the nature or design of the project, or if there is a substantial time lapse between the submission of this report and the start of the work at the site, the conclusions and recommendations contained in our report will not be considered valid unless the changes are reviewed by SALEM and the conclusions of our report are modified or verified in writing.

The validity of the recommendations contained in this report is also dependent upon an adequate testing and observations program during the construction phase. Our firm assumes no responsibility for construction compliance with the design concepts or recommendations unless we have been retained to perform the on-site testing and review during construction. SALEM has prepared this report for the exclusive use of the owner and project design consultants.

SALEM does not practice in the field of corrosion engineering. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, that manufacturer's recommendations for corrosion protection be closely followed. Further, a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of concrete slabs and foundations in direct contact with native soil.

The importation of soil and or aggregate materials to the site should be screened to determine the potential for corrosion to concrete and buried metal piping. The report has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (909) 980-6455.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

Ibrahim Ibrahim, MS, EIT
Geotechnical Staff Engineer

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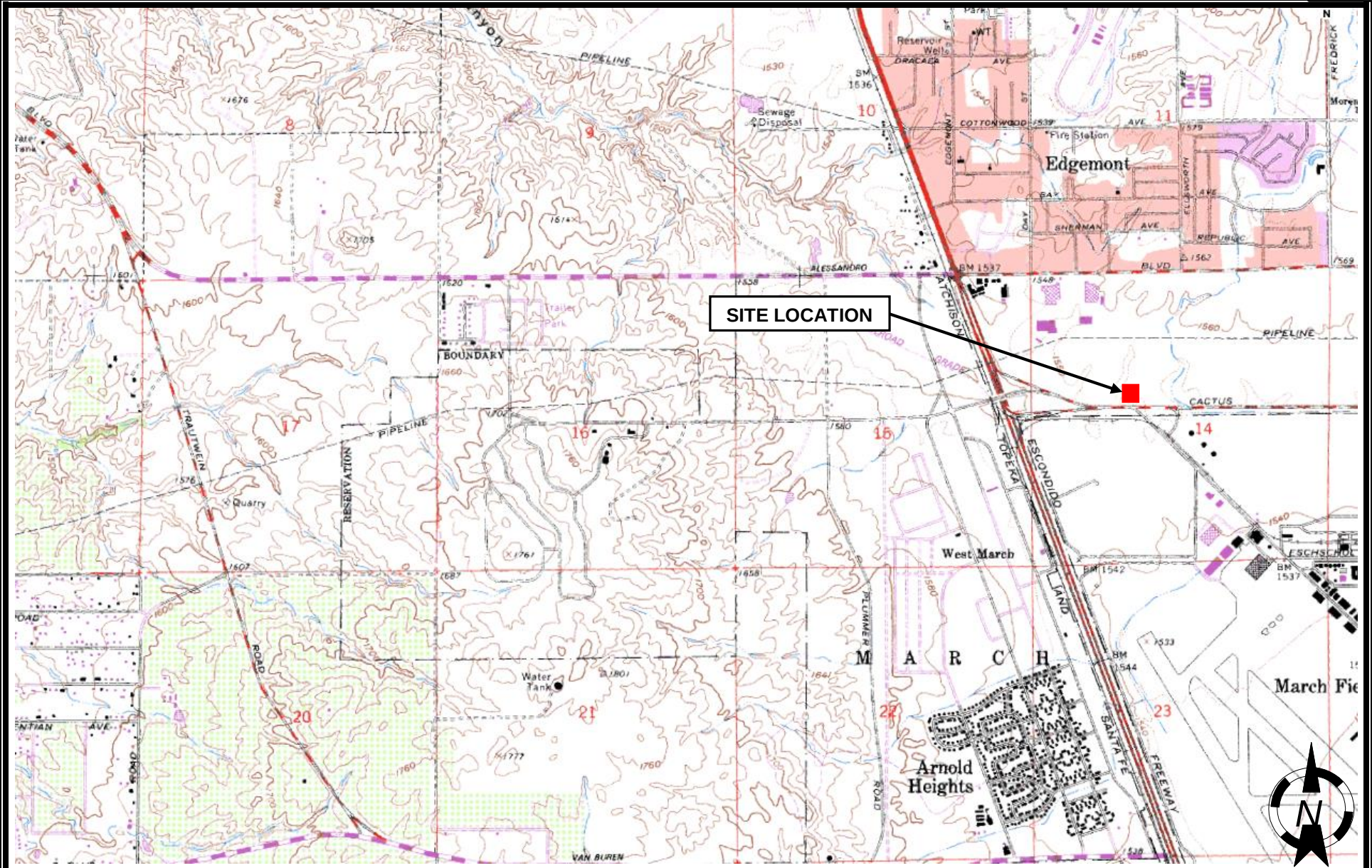
Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),



Source Image: U.S. Geological Survey, Riverside East, Calif. 7.5' Quadrangle, 1967 (Photorevised 1980)

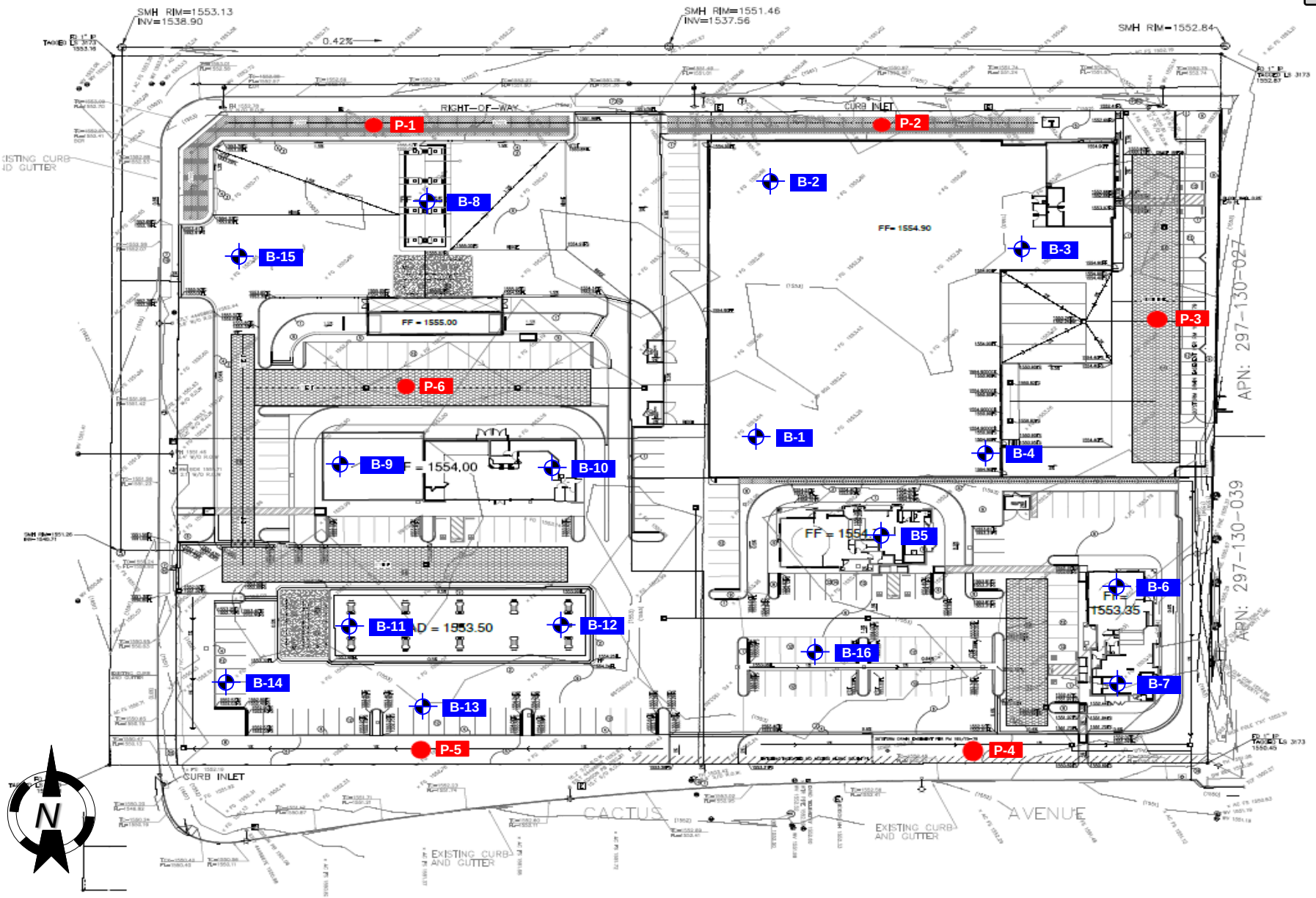
VICINITY MAP

GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Moreno Valley Cactus Center
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, California

SCALE:	DATE:
NOT TO SCALE	11/2015
DRAWN BY:	APPROVED BY:
AA	CJ
PROJECT NO.	FIGURE NO.
3-215-1091	1

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132



SITE PLAN

GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Moreno Valley Cactus Center
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, California

SCALE:	DATE:
NOT TO SCALE	11/2015
DRAWN BY:	APPROVED BY:
AA	CJ
PROJECT NO.	FIGURE NO.
3-215-1091	2

LEGEND:

B-1 Soil Boring Locations

P-1 Percolation Test Locations

All Locations Approximate

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Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

SALEM engineering group, inc.

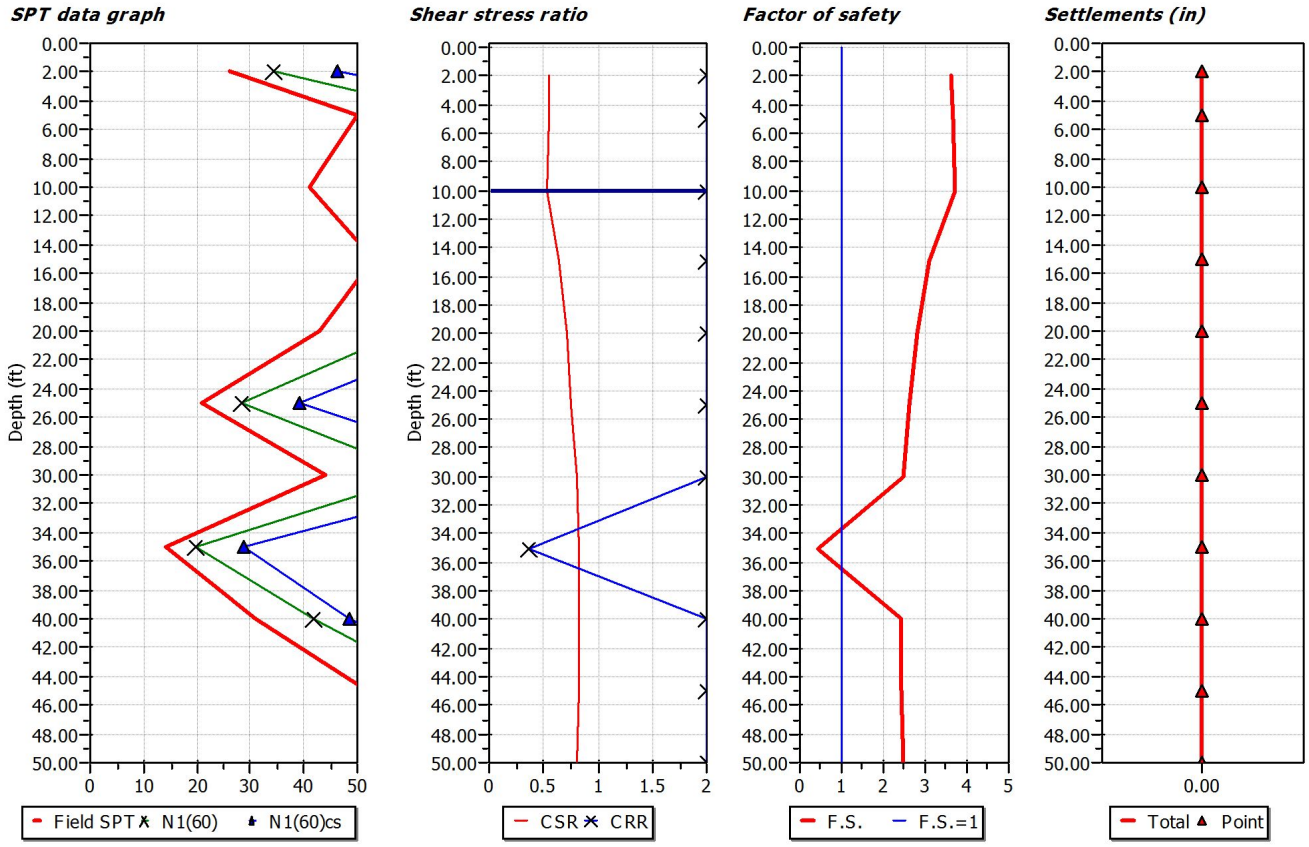
LIQUEFACTION ANALYSIS REPORT

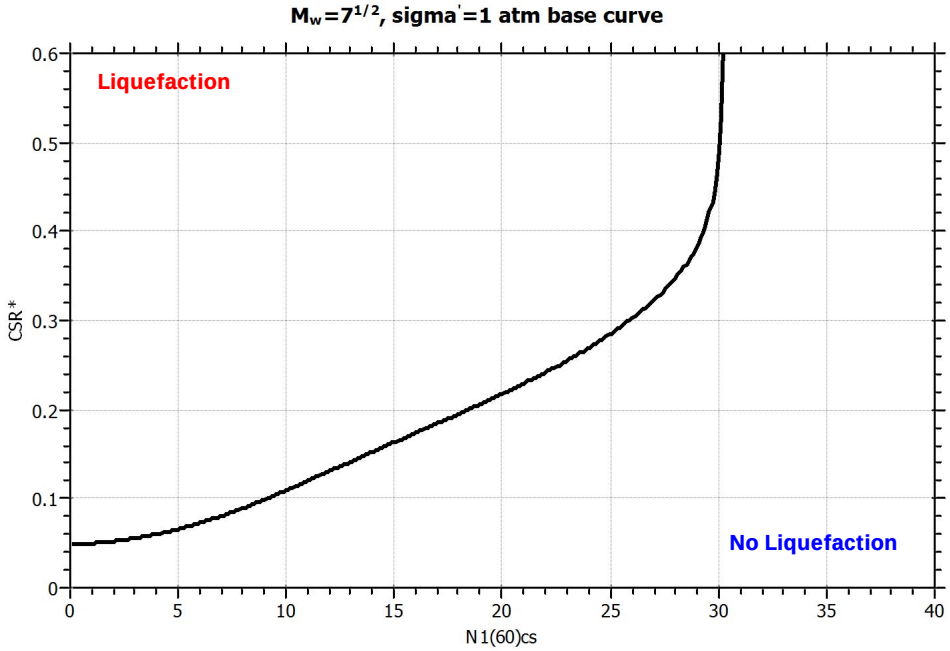
Project title : Proposed Moreno Valley Cactus Center

Project subtitle : 3-215-1091

Input parameters and analysis data

In-situ data type:	Standard Penetration Test	Depth to water table:	10.00 ft
Analysis type:	Deterministic	Earthquake magnitude M_w:	8.20
Analysis method:	NCEER 1998	Peak ground accelaration:	0.52 g
Fines correction method:	Idriss & Seed	User defined F.S.:	1.30





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:: Field input data ::

Point ID	Depth (ft)	Field N_{SPT} (blows/feet)	Unit weight (pcf)	Fines content (%)
1	2.00	26.00	120.00	49.00
2	5.00	50.00	120.00	45.00
3	10.00	41.00	120.00	39.00
4	15.00	53.00	120.00	45.00
5	20.00	43.00	120.00	29.00
6	25.00	21.00	120.00	50.00
7	30.00	44.00	120.00	54.00
8	35.00	14.00	120.00	73.00
9	40.00	31.00	120.00	19.00
10	45.00	52.00	120.00	25.00
11	50.00	52.00	120.00	25.00

Depth : Depth from free surface, at which SPT was performed (ft)
Field SPT : SPT blows measured at field (blows/feet)
Unit weight : Bulk unit weight of soil at test depth (pcf)
Fines content : Percentage of fines in soil (%)

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Point ID	Depth (ft)	Sigma (tsf)	u (tsf)	Sigma' (tsf)	r_d	CSR	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*
1	2.00	0.12	0.00	0.12	1.00	0.34	0.80	0.42	1.00	0.42
2	5.00	0.30	0.00	0.30	0.99	0.33	0.80	0.42	1.00	0.42
3	10.00	0.60	0.00	0.60	0.98	0.33	0.80	0.41	1.00	0.41
4	15.00	0.90	0.16	0.74	0.97	0.39	0.80	0.50	1.00	0.50
5	20.00	1.20	0.31	0.89	0.95	0.44	0.80	0.55	1.00	0.55
6	25.00	1.50	0.47	1.03	0.94	0.46	0.80	0.58	1.00	0.58
7	30.00	1.80	0.62	1.18	0.93	0.48	0.80	0.61	0.98	0.62
8	35.00	2.10	0.78	1.32	0.89	0.48	0.80	0.60	0.95	0.63
9	40.00	2.40	0.94	1.46	0.85	0.47	0.80	0.59	0.93	0.63
10	45.00	2.70	1.09	1.61	0.81	0.46	0.80	0.58	0.92	0.63
11	50.00	3.00	1.25	1.75	0.77	0.44	0.80	0.56	0.90	0.62

Depth : Depth from free surface, at which SPT was performed (ft)
Sigma : Total overburden pressure at test point, during earthquake (tsf)
u : Water pressure at test point, during earthquake (tsf)
Sigma' : Effective overburden pressure, during earthquake (tsf)
r_d : Nonlinear shear mass factor
CSR : Cyclic Stress Ratio
MSF : Magnitude Scaling Factor
$CSR_{eq,M=7.5}$ CSR adjusted for M=7.5
K_{sigma} Effective overburden stress factor
CSR^* CSR fully adjusted

:: Cyclic Resistance Ratio calculation $CRR_{7.5}$ ::

Point ID	Field SPT	C_n	C_e	C_b	C_r	C_s	$N_{1(60)}$	DeltaN	$N_{1(60)cs}$	$CRR_{7.5}$
1	26.00	1.70	0.86	1.00	0.75	1.20	34.25	11.85	46.10	2.00
2	50.00	1.70	0.90	1.00	0.75	1.20	69.05	18.81	87.86	2.00
3	41.00	1.32	0.97	1.00	0.85	1.20	53.62	15.72	69.34	2.00
4	53.00	1.18	1.04	1.00	0.95	1.20	74.53	19.91	94.44	2.00
5	43.00	1.08	1.11	1.00	0.95	1.20	59.03	13.27	72.30	2.00
6	21.00	1.01	1.18	1.00	0.95	1.20	28.41	10.68	39.10	2.00
7	44.00	0.94	1.25	1.00	1.00	1.20	62.15	17.43	79.58	2.00
8	14.00	0.89	1.32	1.00	1.00	1.20	19.70	8.94	28.64	0.37
9	31.00	0.84	1.33	1.00	1.00	1.20	41.90	6.48	48.38	2.00
10	52.00	0.81	1.33	1.00	1.00	1.20	67.06	12.00	79.06	2.00
11	52.00	0.77	1.33	1.00	1.00	1.20	64.25	11.68	75.93	2.00

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

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:: Cyclic Resistance Ratio calculation $CRR_{7.5}$ ::

Point ID	Field SPT	C_n	C_e	C_b	C_r	C_s	$N_{1(60)}$	DeltaN	$N_{1(60)cs}$	$CRR_{7.5}$

C_n : Overburden corretion factor
C_e : Energy correction factor
C_b : Borehole diameter correction factor
C_r : Rod length correction factor
C_s : Liner correction factor
$N_{1(60)}$: Corrected N_{SPT}
DeltaN : Addition to corrected N_{SPT} value due to the presence of fines
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines
$CRR_{7.5)}$: Cyclic resistance ratio for M=7.5

:: Settlements calculation for saturated sands ::

Point ID	$N_{1(60)}$	N_1	FS_L	e_v (%)	Settle. (in)
1	46.10	38.42	3.64	0.00	0.00
2	87.86	73.22	3.66	0.00	0.00
3	69.34	57.78	3.71	0.00	0.00
4	94.44	78.70	3.10	0.00	0.00
5	72.30	60.25	2.81	0.00	0.00
6	39.10	32.58	2.64	0.00	0.00
7	79.58	66.32	2.48	0.00	0.00
8	28.64	23.87	0.45	1.80	0.00
9	48.38	40.32	2.43	0.00	0.00
10	79.06	65.89	2.44	0.00	0.00
11	75.93	63.27	2.48	0.00	0.00

Total settlement : 0.00

$N_{1,(60)}$: Stress normalized and corrected SPT blow count
N_1: Japanese equivalent corrected value
FS_L: Calculated factor of safety
e_v: Post-liquefaction volumentric strain (%)
Settle.: Calculated settlement (in)

:: Liquefaction potential according to Iwasaki ::

Point ID	F	w_z	I_L
1	0.00	9.70	0.00
2	0.00	9.24	0.00
3	0.00	8.48	0.00
4	0.00	7.71	0.00
5	0.00	6.95	0.00
6	0.00	6.19	0.00
7	0.00	5.43	0.00
8	0.55	4.67	3.91
9	0.00	3.90	0.00
10	0.00	3.14	0.00
11	0.00	2.38	0.00

Overall potential I_L : 3.91

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

APPENDIX

A

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

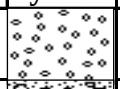
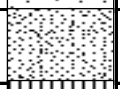
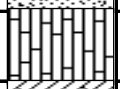
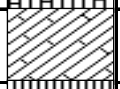
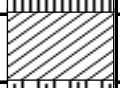
APPENDIX A
FIELD EXPLORATION

Fieldwork for our investigation (drilling) was conducted on November 17, 2015 and included a site visit, subsurface exploration, percolation tests, and soil sampling. The locations of the exploratory borings and percolation tests are shown on the Site Plan, Figure 2. Boring logs for our exploration are presented in figures following the text in this appendix. Borings were located in the field using existing reference points. Therefore, actual boring locations may deviate slightly.

In general, our borings were performed using a truck-mounted Mobile B-61 drill rig equipped with 6½ - inch Hollow-stem augers. Sampling in the borings was accomplished using a hydraulic 140-pound hammer with a 30-inch drop. Samples were obtained with a 3-inch outside-diameter (OD), split spoon (California Modified) sampler, and a 2-inch OD, Standard Penetration Test (SPT) sampler. The number of blows required to drive the sampler the last 12 inches (or fraction thereof) of the 18-inch sampling interval were recorded on the boring logs. The blow counts shown on the boring logs should not be interpreted as standard SPT "N" values; corrections have not been applied. Upon completion, the borings were backfilled with drill cuttings.

Subsurface conditions encountered in the exploratory borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488). This system uses the Unified Soil Classification System (USCS) for soil designations. The logs depict soil and geologic conditions encountered and depths at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, drill rig penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the field logs were revised based on subsequent laboratory testing.

Unified Soil Classification System

Major Divisions			Letter	Symbol	Description
Coarse-grained Soils More than ½ retained on the No. 200 Sieve	**Gravels** More than ½ coarse fraction retained on the No. 4 sieve	Clean Gravels	GW		Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP		Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM		Silty gravels, gravel-sand-silt mixtures.
			GC		Clayey gravels, gravel-sand-clay mixtures.
	Sands More than ½ passing through the No. 4 sieve	Clean Sands	SW		Well-graded sands and gravelly sands, little or no fines.
			SP		Poorly-graded sands and gravelly sands, little or no fines.
		Sands With Fines	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sandy-clay mixtures.
Fine-grained Soils More than ½ passing through the No. 200 Sieve	**Silts and Clays** Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL		Organic clays of medium to high plasticity.
	Silts and Clays Liquid Limit greater than 50%		MH		Inorganic silts, micaceous or diatomaceous fines sands or silts, elastic silts.
			CH		Inorganic clays of high plasticity, fat clays.
			OH		Organic clays of medium to high plasticity.
Highly Organic Soils			PT		Peat, muck, and other highly organic soils.

Consistency Classification

Granular Soils			***Cohesive Soils***		
Description - Blows Per Foot (Corrected)			Description - Blows Per Foot (Corrected)		
	MCS	SPT		MCS	SPT
Very loose	<5	<4	Very soft	<3	<2
Loose	5 - 15	4 - 10	Soft	3 - 5	2 - 4
Medium dense	16 - 40	11 - 30	Firm	6 - 10	5 - 8
Dense	41 - 65	31 - 50	Stiff	11 - 20	9 - 15
Very dense	>65	>50	Very Stiff	21 - 40	16 - 30
			Hard	>40	>30

MCS = Modified California Sampler

SPT = Standard Penetration Test Sampler

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-1

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-1
Logged By: SK
Initial: 36.5 feet
Depth to Water>
At Completion: 29.0 feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (ML) Dense; moist; brown; fine-medium grained; with trace clay.	126.3	6.0	MCS		42
5		**Silty SAND (SM)** Very dense; moist; brown; fine-medium grained; with trace clay.	128.5	9.1	MCS		50
10		Grades as above; dense; with more clay.	-	11.5	SPT		41
15		Grades as above; very dense; fine grained.	-	10.7	SPT		53
20		Grades as above; dense; fine-medium grained; with less clay.	-	10.3	SPT		43
25		**Sandy SILT (ML)** Very stiff; wet; brown; fine grained; with clay.	-	18.8	SPT		21

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 2

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-1

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-1
Logged By: SK
Initial: 36.5 feet
Depth to Water>
At Completion: 29.0 feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
30		Grades as above; hard; moist; perched groundwater encountered at 29 feet.	-	15.7	SPT		44
		Clayey SILT (ML) Stiff; very moist; brown; fine grained.					
35			-	24.1	SPT		14
		Sand (SP) Wet; mottled brown; coarse grained.					
40		**Silty SAND (SM)** Dense; moist; brown; medium-coarse grained; with trace clay.	-	16.8	SPT		31
45		Grades as above; very dense; moist.	-	12.8	SPT		52
		Grades as above.					
50		End of Borehole					

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 2 of 2

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-2

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-2
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	132.7	4.5	MCS		36		
		Silty SAND (SM) Very dense; slightly moist; light brown; fine-medium grained; with trace clay.	118.4	5.8	MCS		50		
10		Grades as above; brown; fine grained; with trace clay.	-	11.3	SPT		51		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	11.9	SPT		31		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-3

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-3
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) dense; slightly moist; brown; fine-medium grained; with trace clay.	121.2	5.4	MCS		24
5		**Silty SAND (SM)** Very dense; slightly moist; light brown brown; fine-medium grained.	112.7	13.5	MCS		50
10		Grades as above; dense; brown; fine grained; with trace clay.		12.3	SPT		37
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.		10.1	SPT		47
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-4

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-4
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	123.5	4.2	MCS		20		
5		**Silty SAND (SM)** Dense; moist; brown; fine-medium grained; with trace clay.	124.3	7.9	MCS		45		
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	12.9	SPT		32		
15		Grades as above.	-	11.7	SPT		44		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-5

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-5
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.7	5.9	MCS		41
5		**Silty SAND (SM)** Very dense; moist; light brown; fine-medium grained; with trace clay.	132.0	6.7	MCS		50
		Sandy SILT (ML) Hard; moist; brown; fine grained; with trace clay.					
10			-	12.5	SPT		41
15		Grades as above.	-	10.9	SPT		43
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-6

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-6
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.7	5.9	MCS		41
5		**Silty SAND (SM)** Very dense; moist; light brown; fine-medium grained; with trace clay.	132.0	6.7	MCS		50
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	12.5	SPT		41
15		Grades as above.	-	10.9	SPT		43
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-7

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-7
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; moist; brown; fine-medium grained; with clay.	114.4	13.9	MCS		19		
5		**Silty SAND (SM)** Very dense; moist; brown; fine-medium grained; with less clay.	115.7	7.9	MCS		50		
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	13.2	SPT		35		
15		Grades as above.	-	12.0	SPT		40		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-8

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-8
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
		Ground Surface							
0		**Silty SAND/Sandy SILT (SM/ML)** Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.5	5.8	MCS		45		
5		**Silty SAND (SM)** Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	124.0	6.0	MCS		37		
10		Grades as above; very dense; no clay.	-	5.4	SPT		66		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	13.5	SPT		36		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-9

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-9
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Silty SAND (SM/ML) Dense; moist; brown; fine-medium grained; with trace clay.	123.5	6.8	MCS		42		
5		**Silty SAND (SM)** Dense; moist; dark gray/black; fine-medium; **with slight organic material.**	127.7	6.9	MCS		47		
10		Grades as above; dense; no clay; no organic material.	-	9.6	SPT		33		
15		**Sandy SILT (ML)** Very stiff; moist; brown; fine grained; with trace clay.	-	17.4	SPT		25		
20		**Silty SAND (SM)** Wet; brown; fine-medium grained; with trace clay.							
		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-10

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-10
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	124.7	5.9	MCS		39
5		**Silty SAND (SM)** Medium dense; moist; dark gray/black; fine-medium grained; **with abundant organic material.**	96.1	9.1	MCS		31
10		Grades as above; dense; brown; no organic material.	-	9.4	SPT		48
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	10.0	SPT		34
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-11

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-11
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; moist; brown; fine-medium grained; with trace clay	129.1	6.1	MCS		39		
5		**Silty SAND (SM)** Medium dense; moist; dark gray/black; fine-medium grained; **with slight organic material.**	127.8	6.6	MCS		40		
10		Grades as above; dense; light brown; no organic material.	-	7.0	SPT		39		
15		**Sandy SILT (ML)** Very stiff; very moist; brown; fine grained; with trace clay.	-	16.4	SPT		20		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-12

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-12
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay	130.6	5.3	MCS		42
5		**Silty SAND (SM)** Very dense; slightly moist; brown; fine-medium grained; with trace clay.	120.8	5.9	MCS		50
10		Grades as above; moist.	-	10.6	SPT		64
15		**Silty SAND / SAND (SM/SP)** Dense; slightly moist; light brown; fine-medium grained.	-	2.4	SPT		34
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-13

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-13
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	135.1	5.8	MCS		45		
5		**Silty SAND (SM)** Dense; slightly moist; brown; fine-medium grained; with trace clay.	132.1	5.4	MCS		40		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-14

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-14
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	116.3	5.0	MCS		39		
5		**Silty SAND (SM)** Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	120.7	5.3	MCS		36		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-15

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-15
Logged By: SK
Initial: None
At Completion: None
Depth to Water>

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND (SM) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	116.8	4.7	MCS		38		
5		Grades as above.	121.3	5.0	MCS		36		
10		Grades as above.							
		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Boring No. B-16

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-16
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	119.1	4.8	MCS		33		
5		**Silty SAND (SM)** Medium dense; moist; brown; fine-medium grained; with trace clay.	118.3	7.2	MCS		31		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-1
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:00	9:30	5.0	N	0:30	4.00	4.12	1.44	30	20.8	12.0	10.6	11.3	0.39
9:30	10:00	5.0	N	0:30	4.12	4.21	1.08	30	27.8	10.6	9.5	10.0	0.32
10:00	10:30	5.0	N	0:30	4.21	4.28	0.84	30	35.7	9.5	8.6	9.1	0.27
10:30	11:00	5.0	N	0:30	4.28	4.34	0.72	30	41.7	8.6	7.9	8.3	0.25
11:00	11:30	5.0	N	0:30	4.34	4.39	0.60	30	50.0	7.9	7.3	7.6	0.22
11:30	12:00	5.0	N	0:30	4.39	4.43	0.48	30	62.5	7.3	6.8	7.1	0.19
12:00	12:30	5.0	N	0:30	4.43	4.47	0.48	30	62.5	6.8	6.4	6.6	0.20
12:30	13:00	5.0	N	0:30	4.47	4.51	0.48	30	62.5	6.4	5.9	6.1	0.21
Recommended for Design:										**Infiltration Rate**			**0.19**

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-2
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:05	9:35	5.0	N	0:30	3.80	3.98	2.16	30	13.9	14.4	12.2	13.3	0.50
9:35	10:05	5.0	N	0:30	3.98	4.11	1.56	30	19.2	12.2	10.7	11.5	0.41
10:05	10:35	5.0	N	0:30	4.11	4.21	1.20	30	25.0	10.7	9.5	10.1	0.36
10:35	11:05	5.0	N	0:30	4.21	4.30	1.08	30	27.8	9.5	8.4	8.9	0.35
11:05	11:35	5.0	N	0:30	4.30	4.38	0.96	30	31.3	8.4	7.4	7.9	0.35
11:35	12:05	5.0	N	0:30	4.38	4.45	0.84	30	35.7	7.4	6.6	7.0	0.34
12:05	12:35	5.0	N	0:30	4.45	4.51	0.72	30	41.7	6.6	5.9	6.2	0.32
12:35	13:05	5.0	N	0:30	4.51	4.57	0.72	30	41.7	5.9	5.2	5.5	0.35
Recommended for Design:										**Infiltration Rate**			**0.32**

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-3
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:10	9:40	5.0	N	0:30	3.95	4.07	1.44	30	20.8	12.6	11.2	11.9	0.37
9:40	10:10	5.0	N	0:30	4.07	4.16	1.08	30	27.8	11.2	10.1	10.6	0.31
10:10	10:40	5.0	N	0:30	4.16	4.24	0.96	30	31.3	10.1	9.1	9.6	0.30
10:40	11:10	5.0	N	0:30	4.24	4.31	0.84	30	35.7	9.1	8.3	8.7	0.28
11:10	11:40	5.0	N	0:30	4.31	4.37	0.72	30	41.7	8.3	7.6	7.9	0.26
11:40	12:10	5.0	N	0:30	4.37	4.43	0.72	30	41.7	7.6	6.8	7.2	0.28
12:10	12:40	5.0	N	0:30	4.43	4.48	0.60	30	50.0	6.8	6.2	6.5	0.25
12:40	13:10	5.0	N	0:30	4.48	4.53	0.60	30	50.0	6.2	5.6	5.9	0.27
Recommended for Design:										**Infiltration Rate**			**0.25**

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-4
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:15	9:45	5.0	N	0:30	3.95	4.02	0.84	30	35.7	12.6	11.8	12.2	0.21
9:45	10:15	5.0	N	0:30	4.02	4.07	0.60	30	50.0	11.8	11.2	11.5	0.16
10:15	10:45	5.0	N	0:30	4.07	4.11	0.48	30	62.5	11.2	10.7	10.9	0.13
10:45	11:15	5.0	N	0:30	4.11	4.14	0.36	30	83.3	10.7	10.3	10.5	0.10
11:15	11:45	5.0	N	0:30	4.14	4.17	0.36	30	83.3	10.3	10.0	10.1	0.11
11:45	12:15	5.0	N	0:30	4.17	4.19	0.24	30	125.0	10.0	9.7	9.8	0.07
12:15	12:45	5.0	N	0:30	4.19	4.21	0.24	30	125.0	9.7	9.5	9.6	0.07
12:45	13:15	5.0	N	0:30	4.21	4.23	0.24	30	125.0	9.5	9.2	9.4	0.08
Recommended for Design:										**Infiltration Rate**			**0.07**

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-5
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:20	9:50	5.0	N	0:30	3.98	4.07	1.08	30	27.8	12.2	11.2	11.7	0.28
9:50	10:20	5.0	N	0:30	4.07	4.13	0.72	30	41.7	11.2	10.4	10.8	0.20
10:20	10:50	5.0	N	0:30	4.13	4.18	0.60	30	50.0	10.4	9.8	10.1	0.18
10:50	11:20	5.0	N	0:30	4.18	4.22	0.48	30	62.5	9.8	9.4	9.6	0.15
11:20	11:50	5.0	N	0:30	4.22	4.26	0.48	30	62.5	9.4	8.9	9.1	0.15
11:50	12:20	5.0	N	0:30	4.26	4.29	0.36	30	83.3	8.9	8.5	8.7	0.12
12:20	12:50	5.0	N	0:30	4.29	4.32	0.36	30	83.3	8.5	8.2	8.3	0.12
12:50	13:20	5.0	N	0:30	4.32	4.35	0.36	30	83.3	8.2	7.8	8.0	0.13
Recommended for Design:										**Infiltration Rate**			**0.12**

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-6
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:25	9:55	5.0	N	0:30	4.12	4.24	1.44	30	20.8	10.6	9.1	9.8	0.43
9:55	10:25	5.0	N	0:30	4.24	4.32	0.96	30	31.3	9.1	8.2	8.6	0.32
10:25	10:55	5.0	N	0:30	4.32	4.38	0.72	30	41.7	8.2	7.4	7.8	0.26
10:55	11:25	5.0	N	0:30	4.38	4.43	0.60	30	50.0	7.4	6.8	7.1	0.24
11:25	11:55	5.0	N	0:30	4.43	4.47	0.48	30	62.5	6.8	6.4	6.6	0.20
11:55	12:25	5.0	N	0:30	4.47	4.51	0.48	30	62.5	6.4	5.9	6.1	0.21
12:25	12:55	5.0	N	0:30	4.51	4.54	0.36	30	83.3	5.9	5.5	5.7	0.17
12:55	13:25	5.0	N	0:30	4.54	4.57	0.36	30	83.3	5.5	5.2	5.3	0.18
Recommended for Design:										**Infiltration Rate**			**0.17**

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

APPENDIX

B

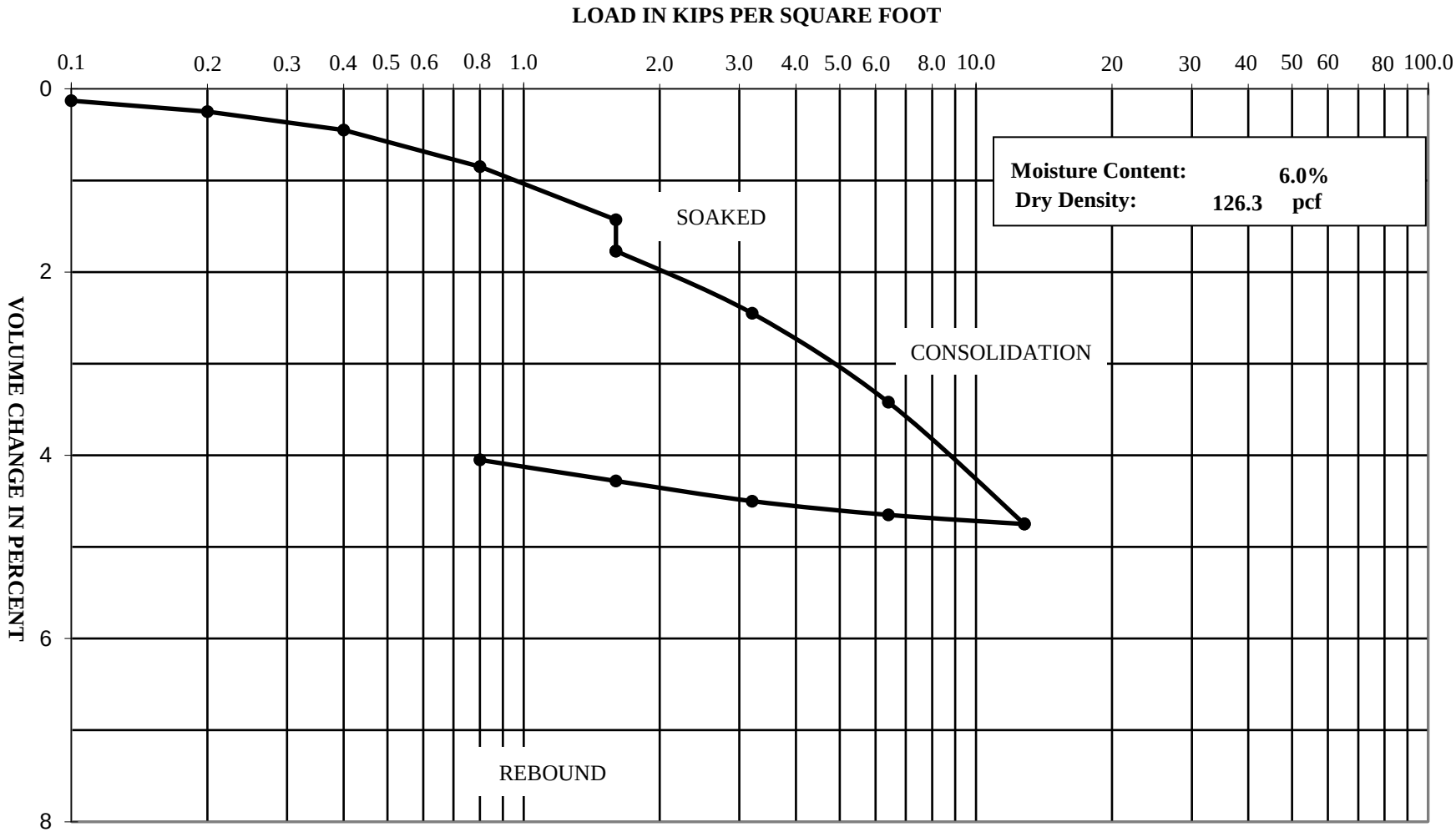
APPENDIX B
LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM), Caltrans, or other suggested procedures. Selected samples were tested for in-situ dry density and moisture content, corrosivity, consolidation, shear strength, expansion index, and grain size distribution. The results of the laboratory tests are summarized in the following figures.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

CONSOLIDATION - PRESSURE TEST DATA

ASTM D 2435



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

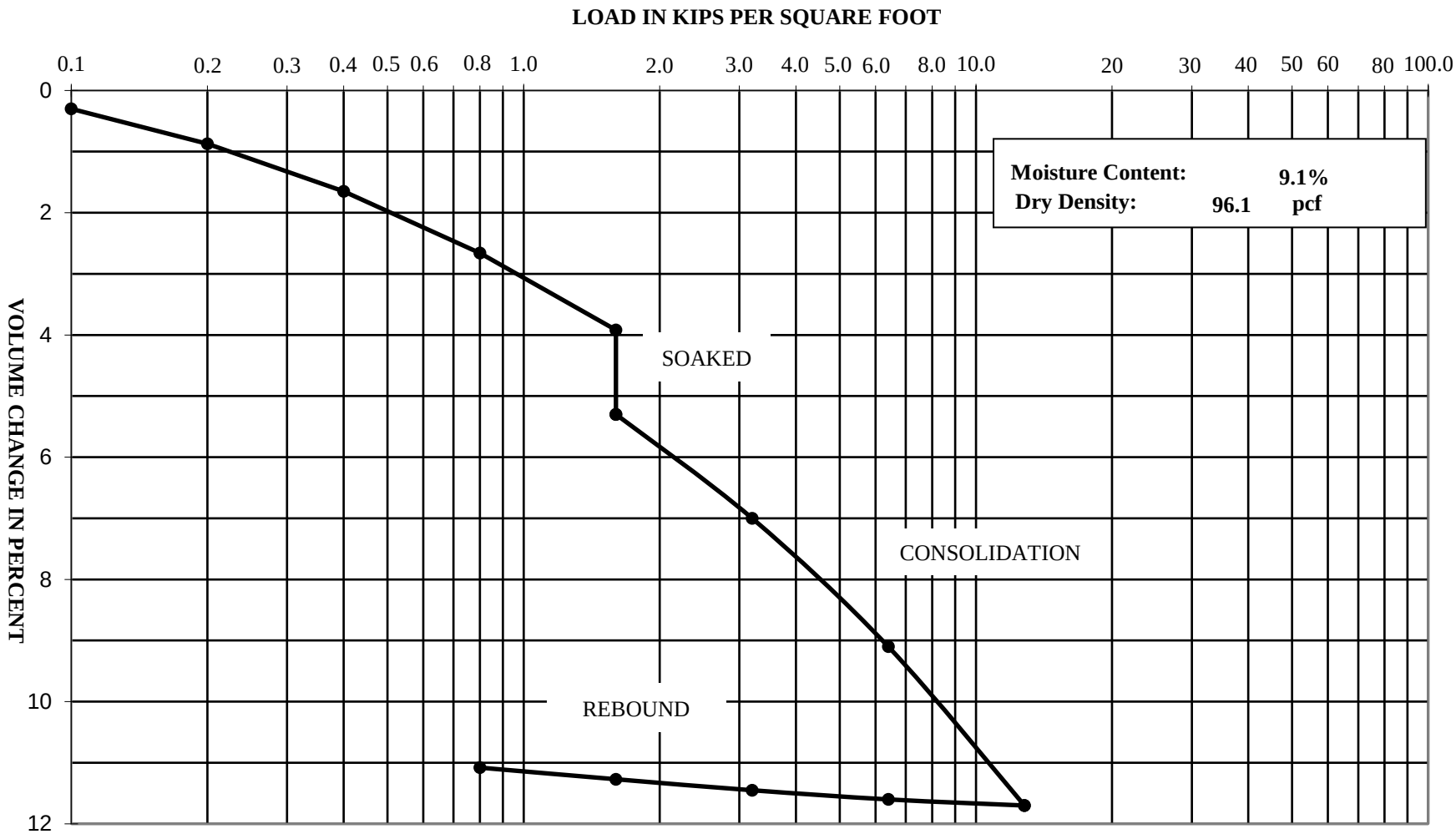
Project Number: 3-215-1091

Boring: B-1 @ 2'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

CONSOLIDATION - PRESSURE TEST DATA
ASTM D 2435



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

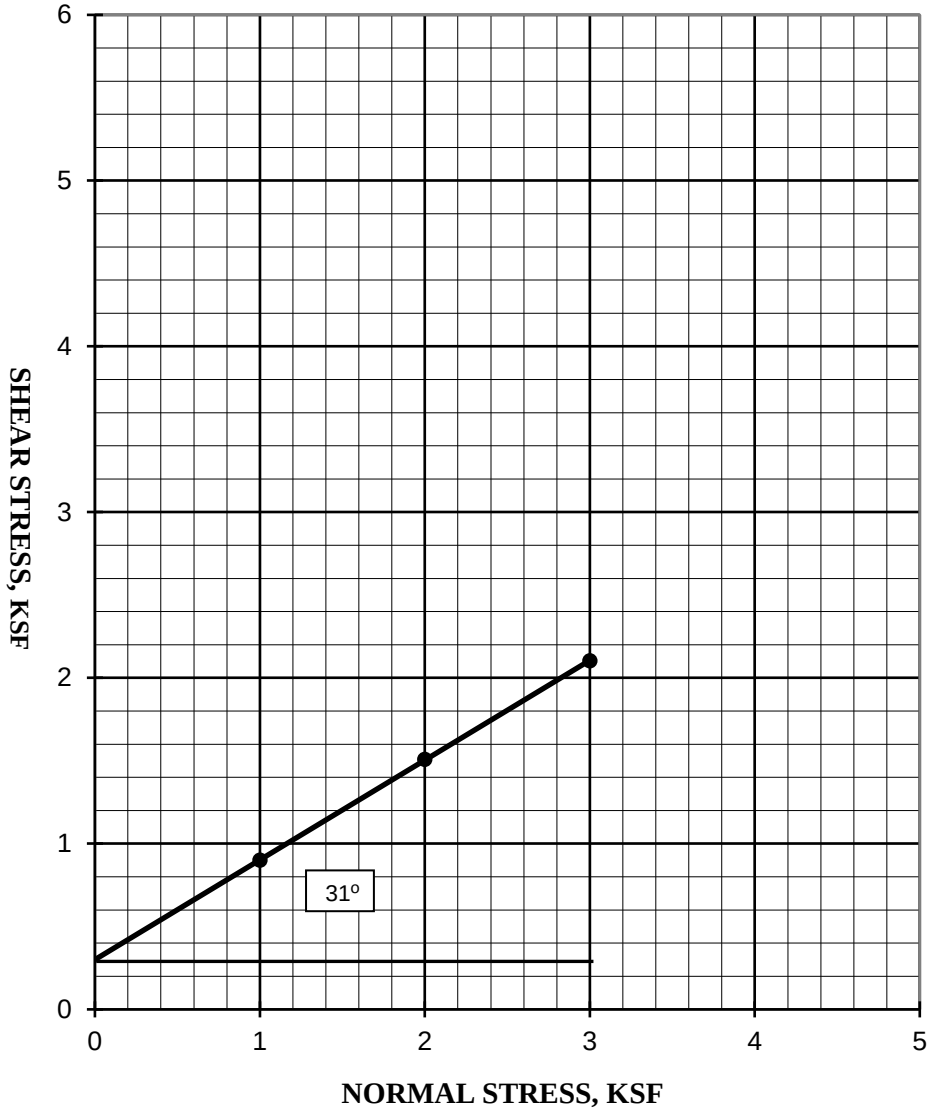
Project Number: 3-215-1091

Boring: B-10 @ 5'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

SHEAR STRENGTH DIAGRAM
(DIRECT SHEAR)
ASTM D - 3080



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 5'
Soil Type: Silty SAND (SM) with trace clay

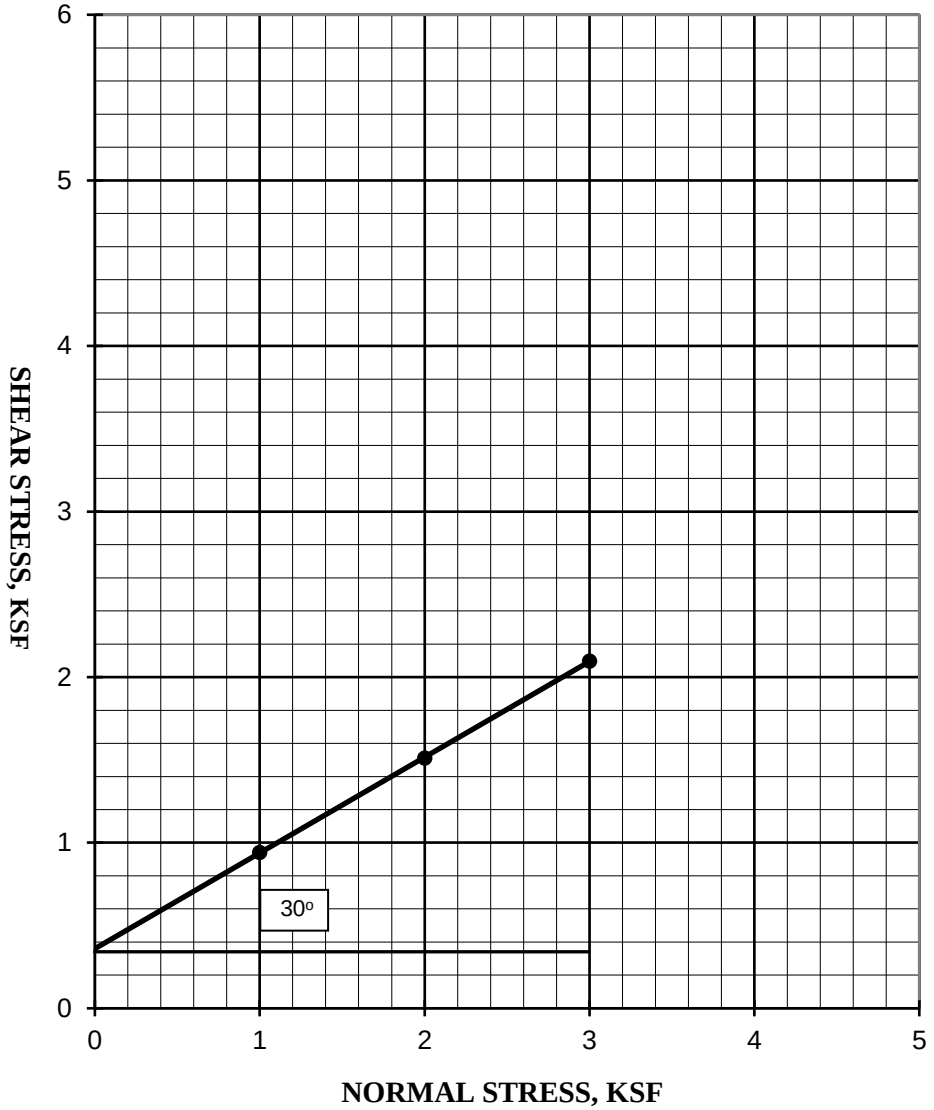
Friction Angle:	**31.0**	**degrees**
Cohesion:	**300**	**psf**

Moisture Content	**9.1%**
Dry Density	**128.5 pcf**

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

SHEAR STRENGTH DIAGRAM
(DIRECT SHEAR)
ASTM D - 3080



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-2 @ 2'
Soil Type: Silty SAND/Sandy SILT (SM/ML) with trace clay

Friction Angle:	**30.0**	**degrees**
Cohesion:	**360**	**psf**

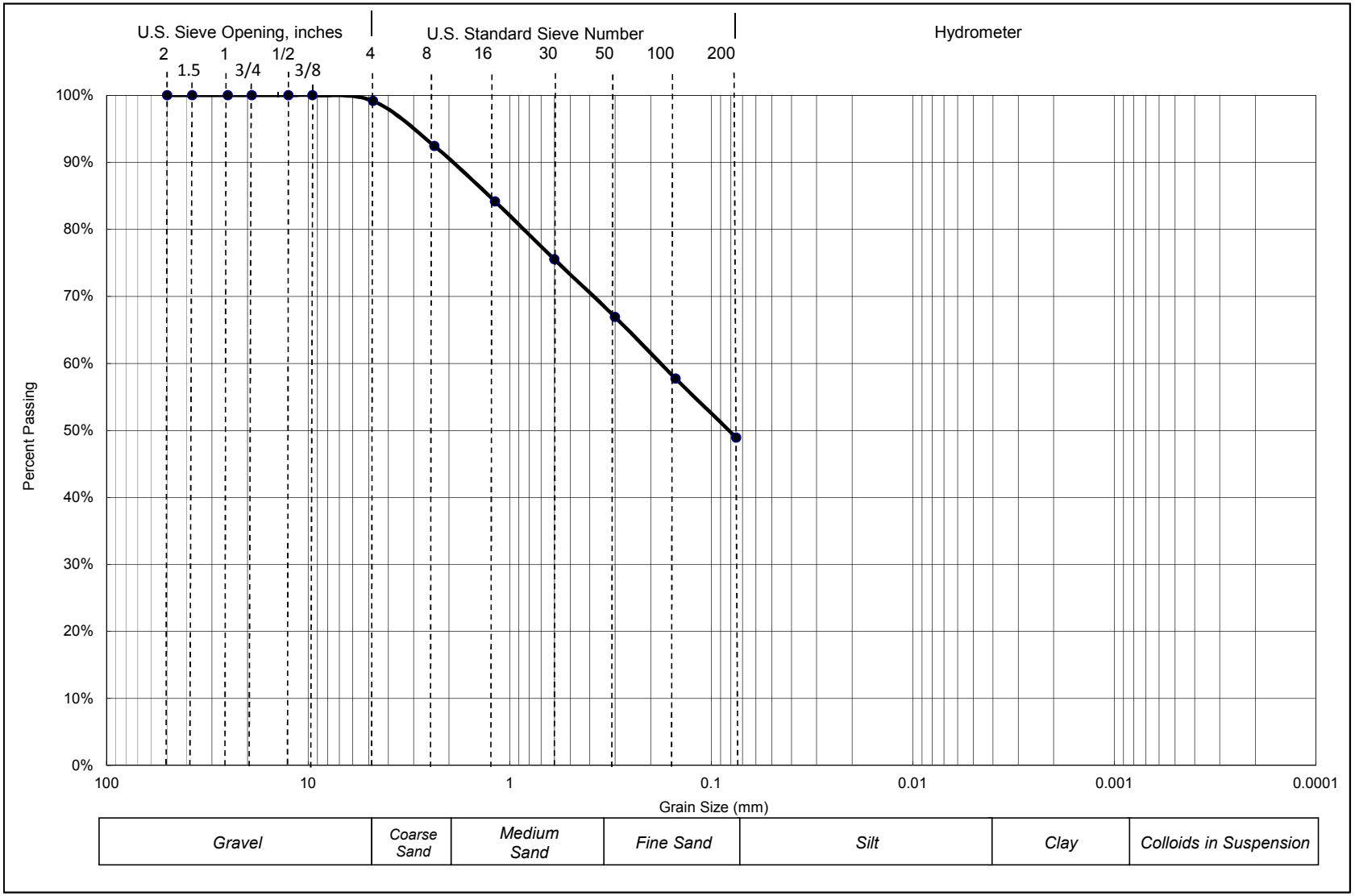
Moisture Content	**4.5%**
Dry Density	**132.7 pcf**

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 2'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

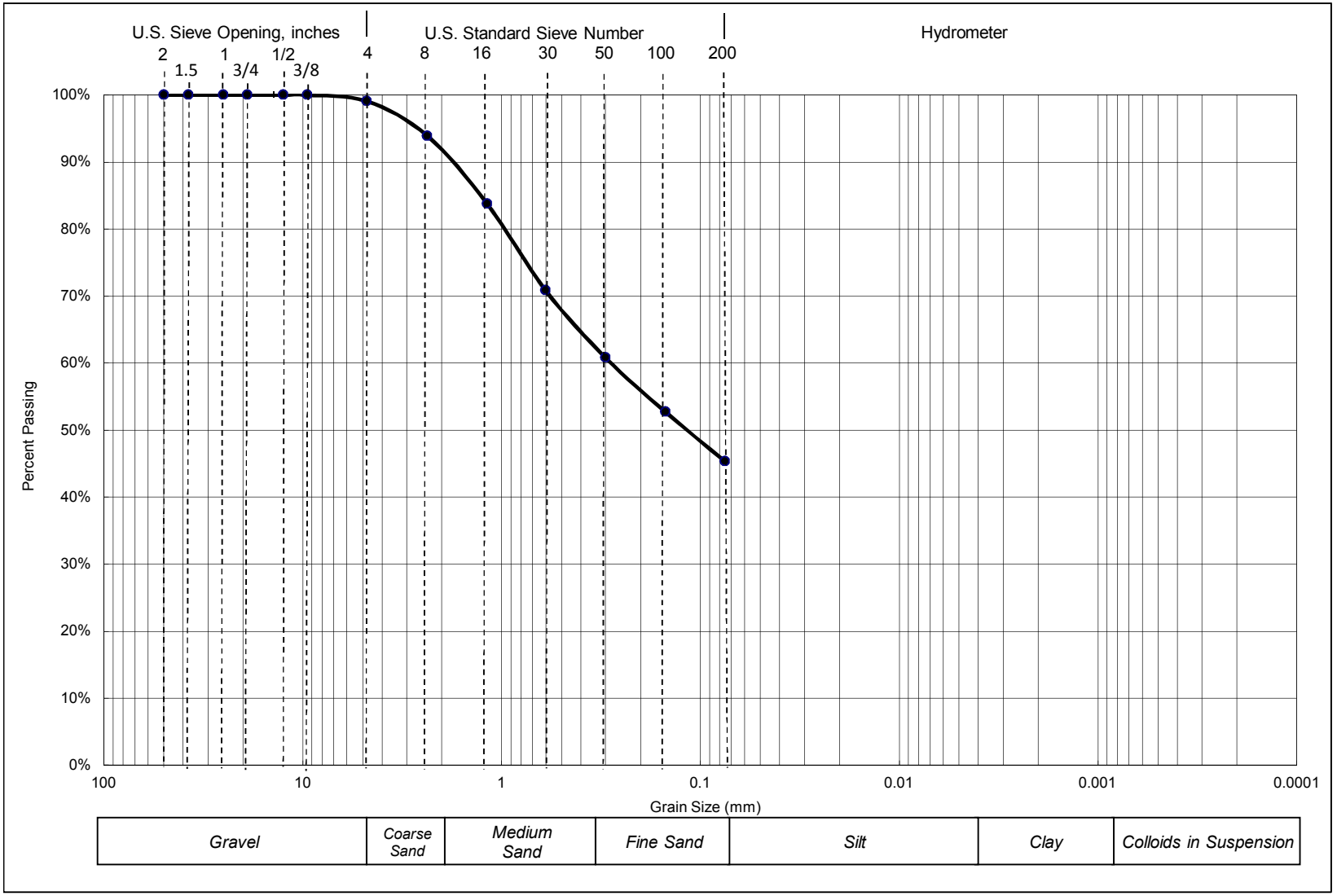
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.2%
No. 8	2.36	92.4%
No. 16	1.18	84.2%
No. 30	0.6	75.5%
No. 50	0.3	66.9%
No. 100	0.15	57.7%
No. 200	0.075	48.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 2'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 5'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

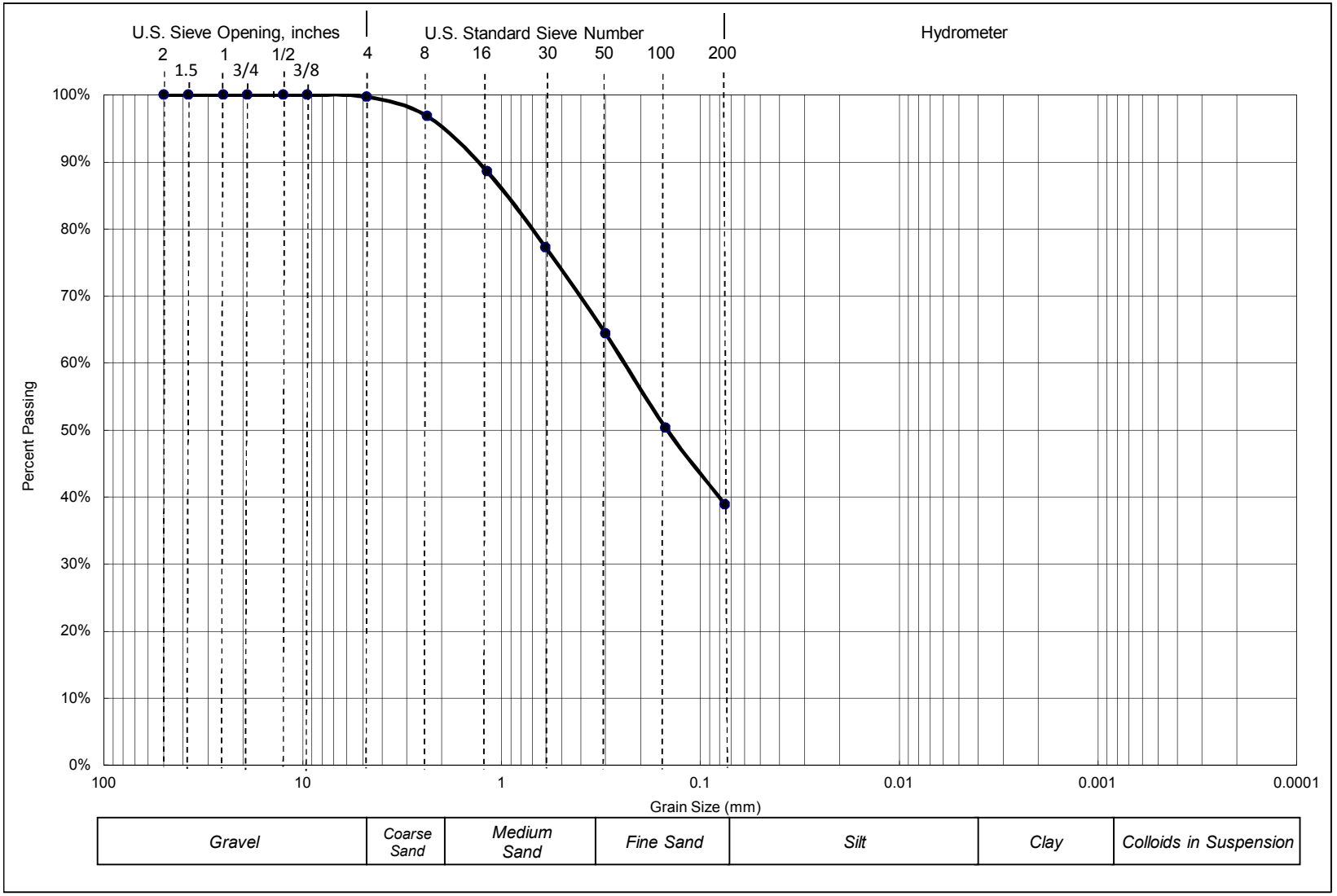
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.1%
No. 8	2.36	93.9%
No. 16	1.18	83.8%
No. 30	0.6	70.8%
No. 50	0.3	60.8%
No. 100	0.15	52.7%
No. 200	0.075	45.3%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 10'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

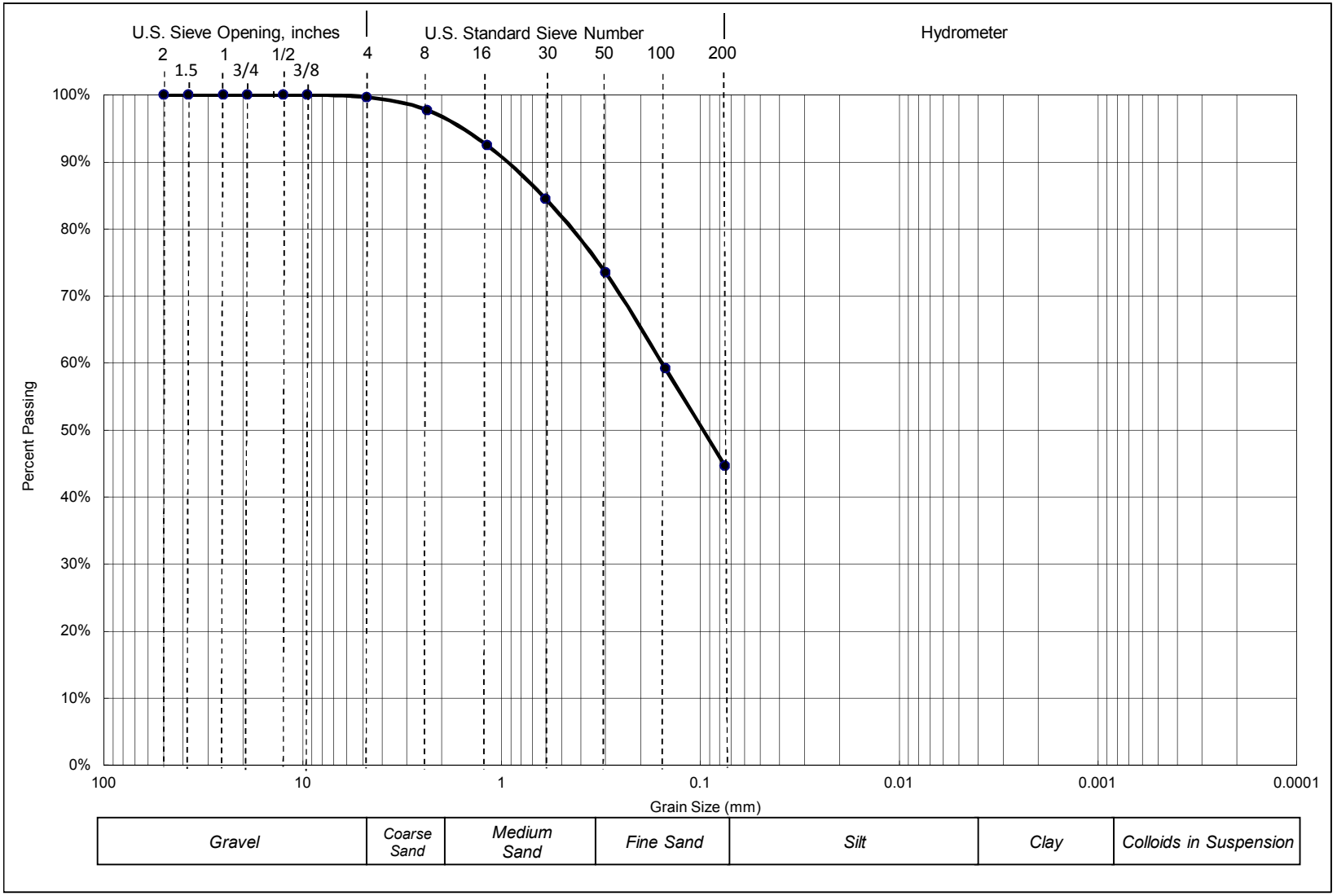
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	96.8%
No. 16	1.18	88.6%
No. 30	0.6	77.2%
No. 50	0.3	64.4%
No. 100	0.15	50.4%
No. 200	0.075	38.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 10'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 15'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

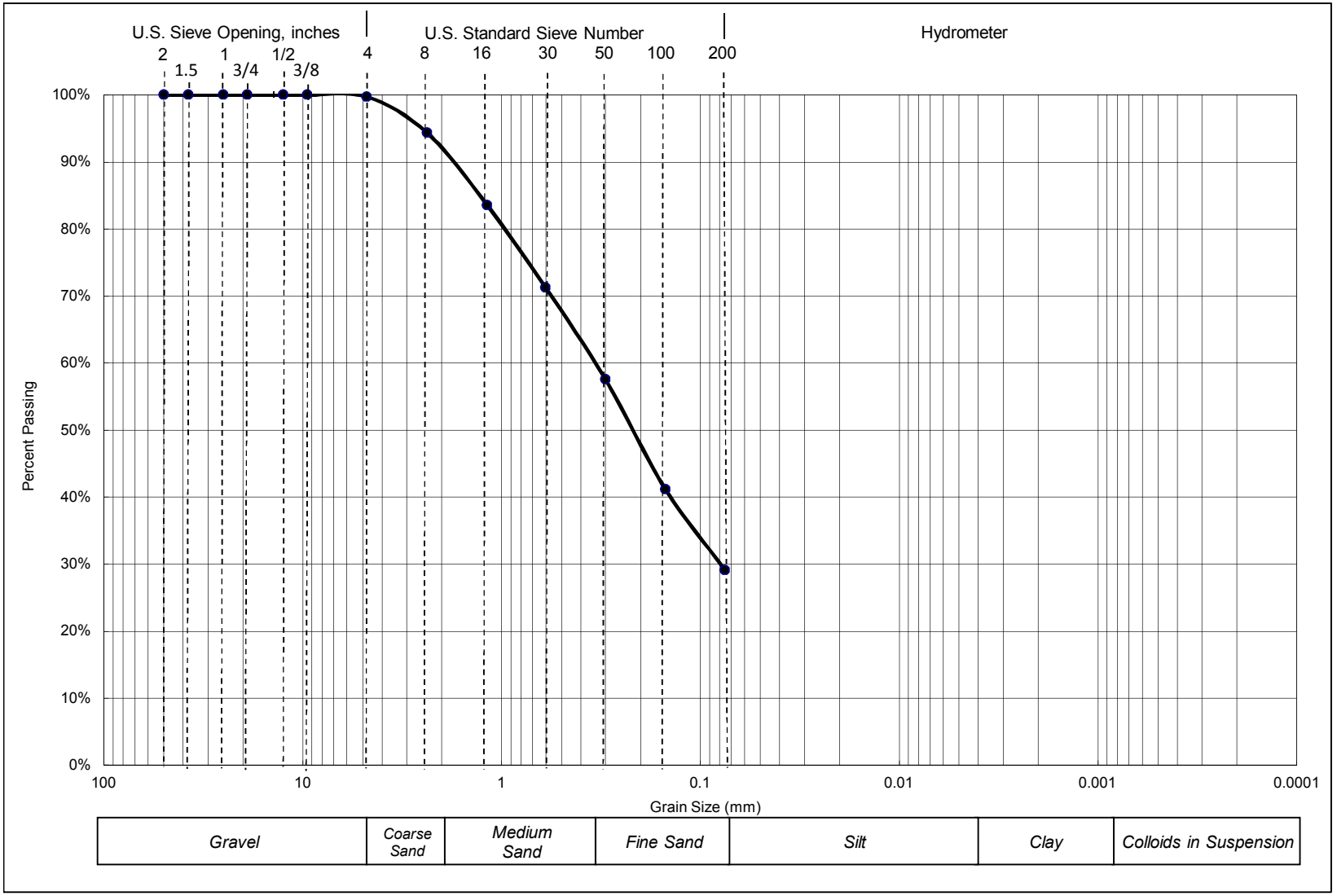
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	97.7%
No. 16	1.18	92.5%
No. 30	0.6	84.5%
No. 50	0.3	73.5%
No. 100	0.15	59.2%
No. 200	0.075	44.6%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 15'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 20'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

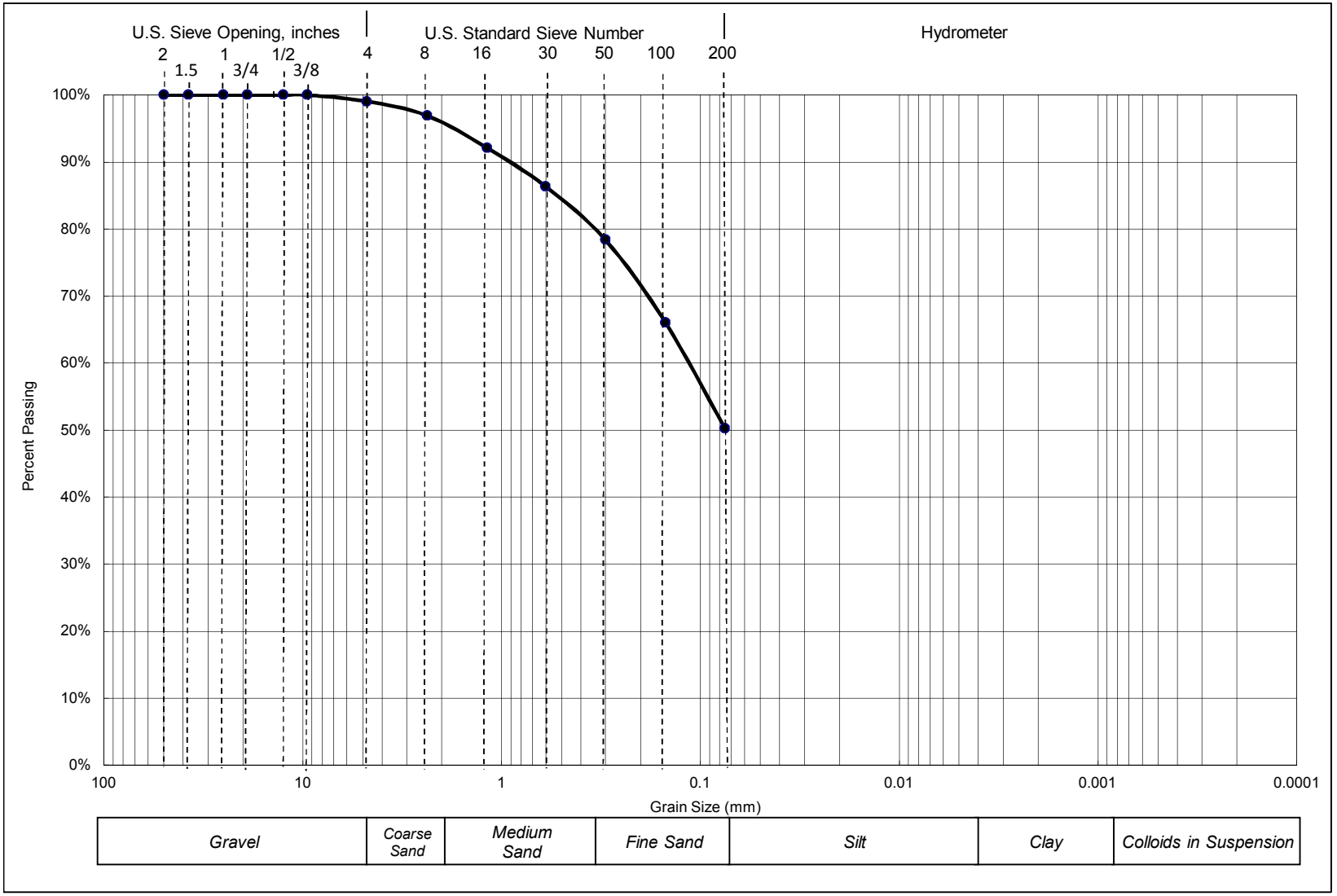
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	94.3%
No. 16	1.18	83.6%
No. 30	0.6	71.2%
No. 50	0.3	57.6%
No. 100	0.15	41.2%
No. 200	0.075	29.1%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 20'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 25'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

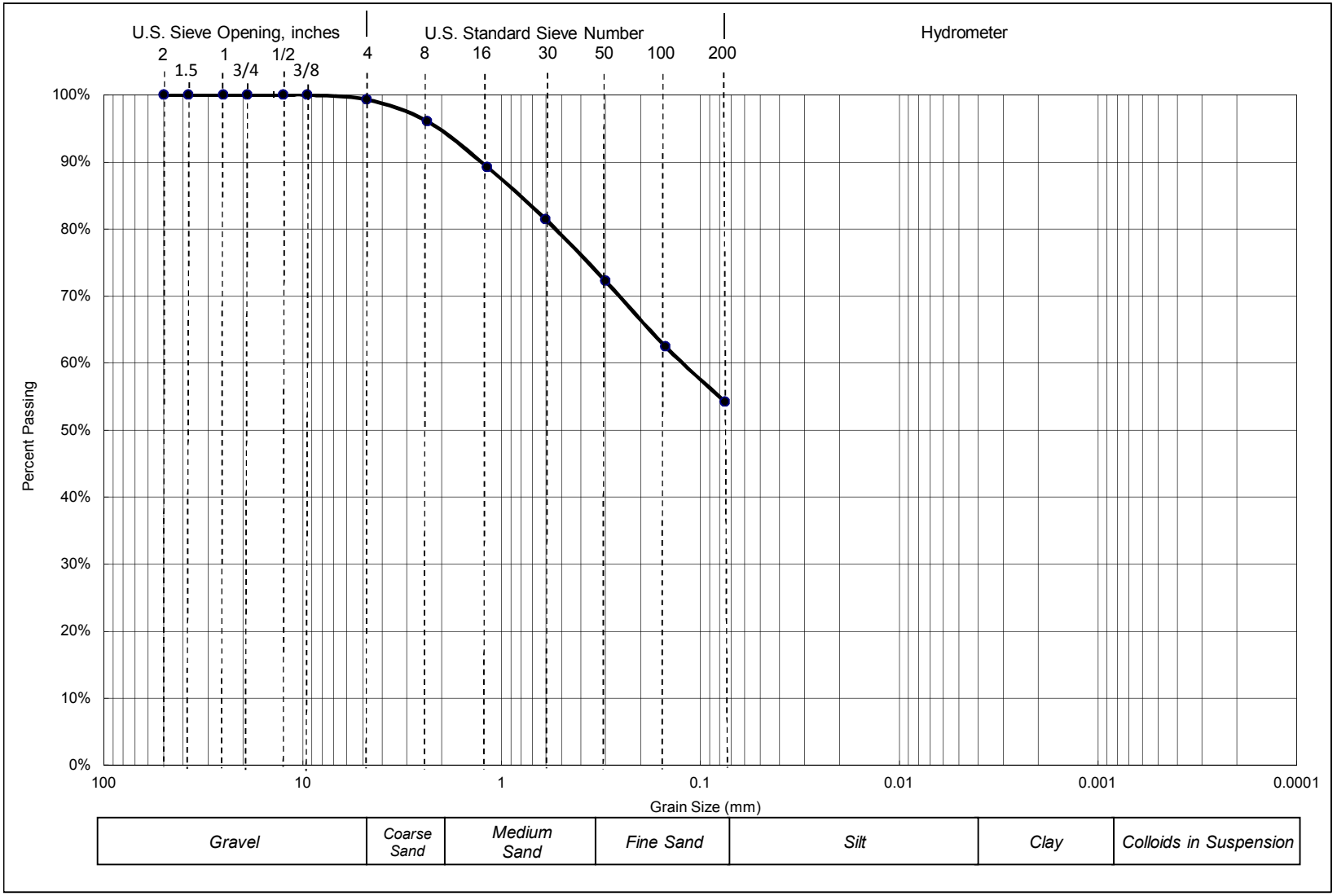
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.0%
No. 8	2.36	96.9%
No. 16	1.18	92.1%
No. 30	0.6	86.3%
No. 50	0.3	78.4%
No. 100	0.15	66.1%
No. 200	0.075	50.2%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 25'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 30'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

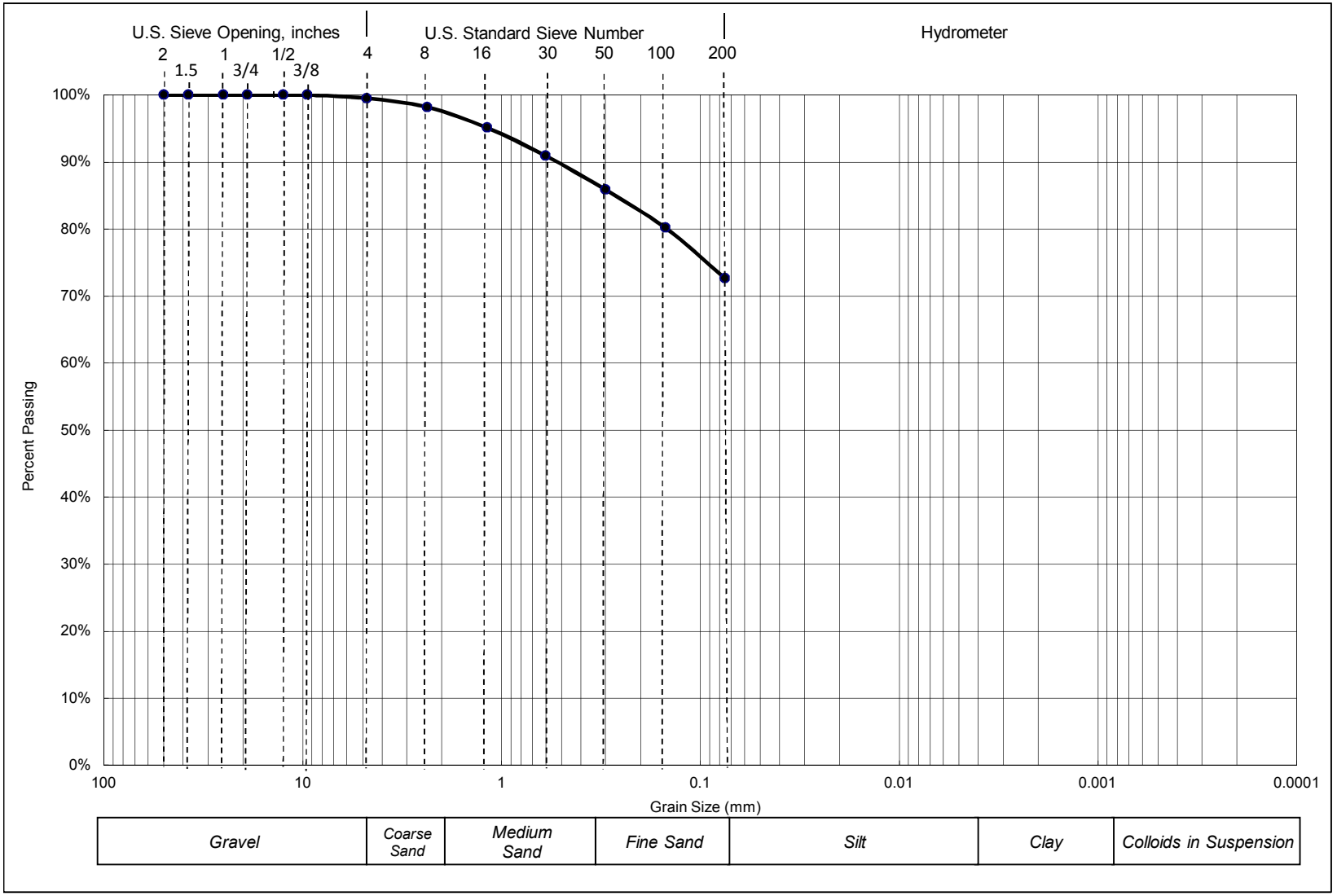
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.3%
No. 8	2.36	96.1%
No. 16	1.18	89.2%
No. 30	0.6	81.4%
No. 50	0.3	72.2%
No. 100	0.15	62.5%
No. 200	0.075	54.2%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 30'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 35'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

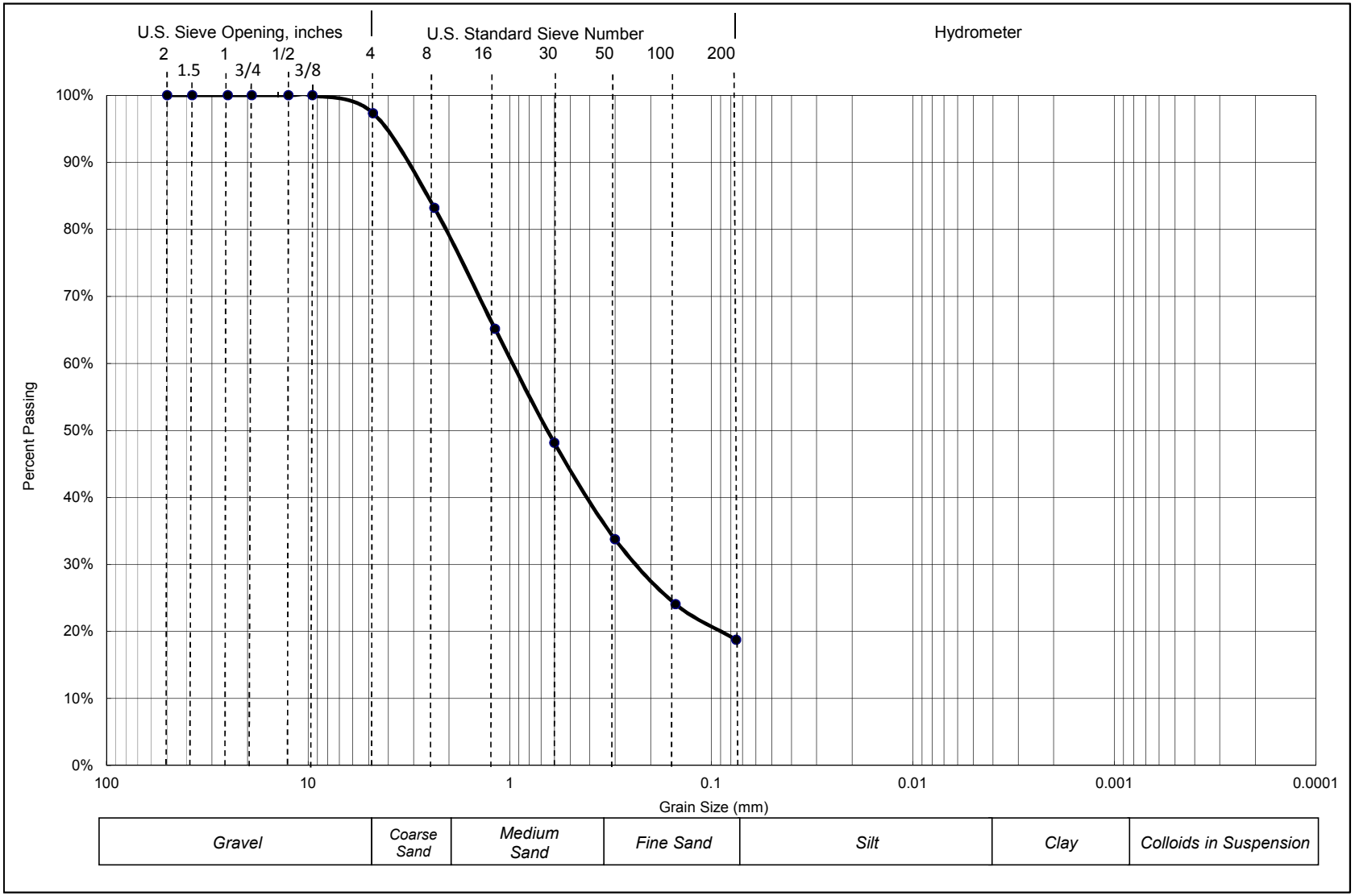
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.5%
No. 8	2.36	98.2%
No. 16	1.18	95.1%
No. 30	0.6	90.9%
No. 50	0.3	85.8%
No. 100	0.15	80.2%
No. 200	0.075	72.6%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 35'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 40'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

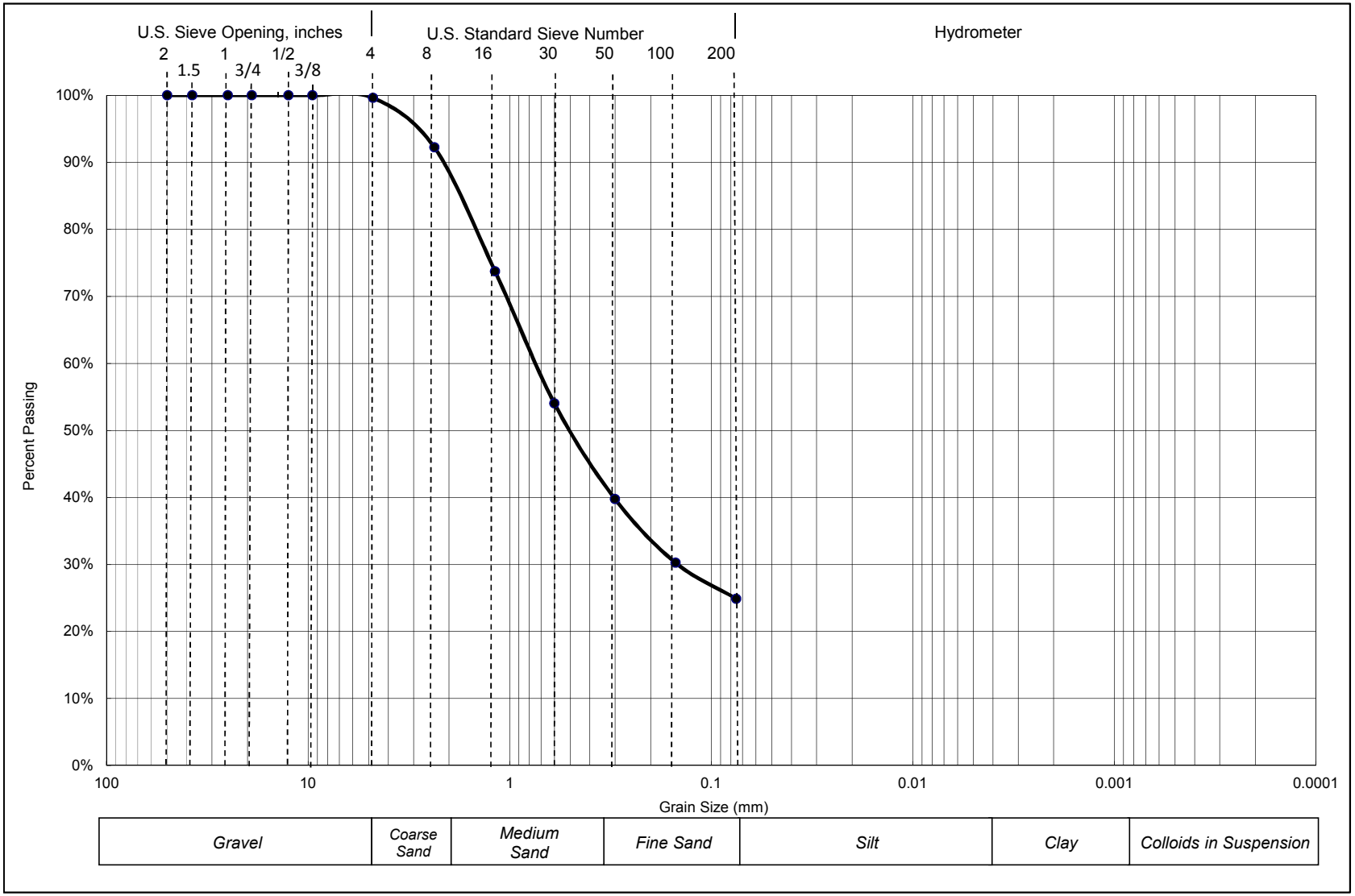
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	97.3%
No. 8	2.36	83.2%
No. 16	1.18	65.1%
No. 30	0.6	48.1%
No. 50	0.3	33.8%
No. 100	0.15	24.1%
No. 200	0.075	18.8%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 40'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 45'

SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.6%
No. 8	2.36	92.2%
No. 16	1.18	73.7%
No. 30	0.6	54.0%
No. 50	0.3	39.8%
No. 100	0.15	30.2%
No. 200	0.075	24.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 45'

SALEM engineering group, inc.

EXPANSION INDEX TEST
ASTM D 4829 / UBC Std. 29-2

Project Number: 3-215-1091
Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Date Tested: 11/20/15
Sample location/ Depth: B-1 @ 0' - 3'
Sample Number: 1
Soil Classification: Silty SAND/ Sandy SILT (SM/ML) with trace clay

Trial #	1	2	3
Weight of Soil & Mold, gms	615.4		
Weight of Mold, gms	186.7		
Weight of Soil, gms	428.7		
Wet Density, Lbs/cu.ft.	129.3		
Weight of Moisture Sample (Wet), gms	300.0		
Weight of Moisture Sample (Dry), gms	279.2		
Moisture Content, %	7.4		
Dry Density, Lbs/cu.ft.	120.3		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	50.3		

Time	Inital	30 min	1 hr	6 hrs	12 hrs	24 hrs
Dial Reading	0	--	--	--	--	0.0203

Expansion Index $_{measured}$ = 20.3
Expansion Index $_{50}$ = 20.4

Expansion Index = **20**

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

SALEM engineering group

CHEMICAL ANALYSIS

SO_4 - Modified Caltrans 417 & Cl - Modified Caltrans 417/422

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Date: 11/20/15
Soil Classification: Silty SAND/ Sandy SILT (SM/ML) with trace clay

Sample Number	Sample Location	Soluble Sulfate SO_4-S	Soluble Chloride Cl	pH
1a.	B-1 @ 0' - 3'	205 mg/Kg	119 mg/Kg	7.4
1b.	B-1 @ 0' - 3'	186 mg/Kg	109 mg/Kg	7.4
1c.	B-1 @ 0' - 3'	170 mg/Kg	107 mg/Kg	7.4
Average:		**187 mg/Kg**	**112 mg/Kg**	**7.4**

SALEM engineering group, inc.

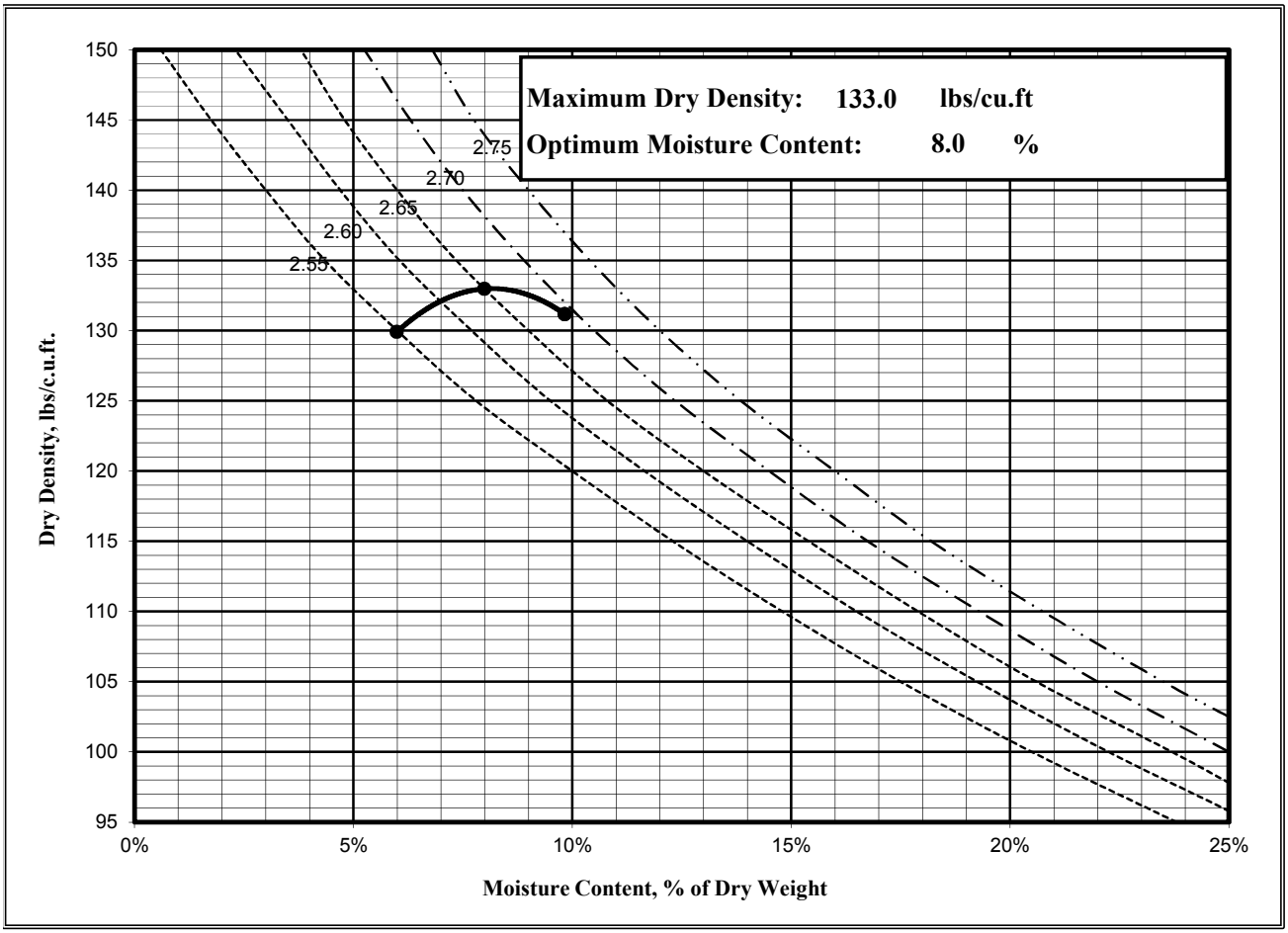
Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

LABORATORY COMPACTION CURVE

ASTM - D1557, D698

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Date Tested: 11/20/15
Sample Location: B-1 @ 0' - 3'
Soil Classification: Brown Silty SAND/ Sandy SILT (SM/ML) with trace clay
Sample/Curve Number: 1
Test Method: 1557 A

	1	2	3
Weight of Moist Specimen & Mold, gm	4428.3	4435.2	4338.8
Weight of Compaction Mold, gm	2259.1	2259.1	2259.1
Weight of Moist Specimen, gm	2169.2	2176.1	2079.7
Volume of mold, cu. ft.	0.0333	0.0333	0.0333
Wet Density, lbs/cu.ft.	143.6	144.1	137.7
Weight of Wet (Moisture) Sample, gm	200.0	200.0	200.0
Weight of Dry (Moisture) Sample, gm	185.2	182.1	188.7
Moisture Content, %	8.0%	9.8%	6.0%
Dry Density, lbs/cu.ft.	133.0	131.2	129.9



SALEM engineering group, inc.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

APPENDIX

C

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

APPENDIX C
GENERAL EARTHWORK AND PAVEMENT SPECIFICATIONS

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

1.0 SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including, but not limited to, the furnishing of all labor, tools and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans and disposal of excess materials.

2.0 PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of SALEM Engineering Group, Incorporated, hereinafter referred to as the Soils Engineer and/or Testing Agency. Attainment of design grades, when achieved, shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary adjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer, or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

3.0 TECHNICAL REQUIREMENTS: All compacted materials shall be densified to no less that 95 percent of relative compaction (90 percent for cohesive soils) based on ASTM D1557 Test Method (latest edition), UBC or CAL-216, or as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

4.0 SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the Geotechnical Engineering Report. The Contractor shall make his own interpretation of the data contained in the Geotechnical Engineering Report and the Contractor shall not be relieved of liability for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

5.0 DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or wind-blown materials attributable to his work. Site preparation shall consist of site clearing and grubbing and preparation of foundation materials for receiving fill.

6.0 CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter and all other matter determined by the Soils Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed improvement areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots greater than 1 inch in diameter. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations is not permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

7.0 SUBGRADE PREPARATION: Surfaces to receive Engineered Fill and/or building or slab loads shall be prepared as outlined above, scarified to a minimum of 12 inches, moisture-conditioned as necessary, and recompacted to 95 percent relative compaction (90 percent for cohesive soils).

Loose soil areas and/or areas of disturbed soil shall be moisture-conditioned as necessary and recompacted to 95 percent relative compaction (90 percent for cohesive soils). All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any fill material.

8.0 EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

9.0 FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence or approval of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills, provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

10.0 PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. Compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer. Both cut and fill shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

11.0 SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing, or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill is as specified.

12.0 DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to, is the most recent edition of the Standard Specifications of the State of California, Department of Transportation. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as determined by ASTM D1557 Test Method (latest edition) or California Test Method 216 (CAL-216), as applicable.

13.0 PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 95 percent (90 percent for cohesive soils) based upon ASTM D1557. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

14.0 AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class II material, ¾-inch or 1½-inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent based upon CAL-216. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

15.0 AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class II Subbase material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent based upon CAL-216, and it shall be spread and compacted in accordance with the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

16.0 ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10, unless otherwise stipulated or local conditions warrant more stringent grade. The mineral aggregate shall be Type A or B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39. The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

combination steel-wheel and pneumatic rollers, as described in the Standard Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

Attachment: Geotechnical Engineering Investigation (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

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HYDROLOGY REPORT

PROPOSED
COMMERICAL DEVELOPMENT
NEC CACTUS AVE. & COMMERCE CENTER DR.
MORENO VALLEY, CALIFORNIA

SALEM PROJECT NO.
3-716-1096 FEBRUARY 3, 2016

PREPARED FOR:

INO CRUZ
139 RADIO ROAD
CORONA, CA 92879
(951)280-3833

PREPARED BY:

SALEM ENGINEERING GROUP, INC.
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
P: (909)980-6455
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Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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APPENDIX H
Geotechnical Report

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

PROJECT INFORMATION

The project is located on the northeast corner of Cacuts Avenue and Commerce Center Drive in Moreno Valley, California in Riverside County as shown in Appendix A. The site is approximately 6.3 acres and roughly graded. The proposed project consists of developing a warehouse, gas stations, convenience store, car wash, and fast food restuarants, also shown in Appendix A. The surrounding area is mostly commerical. The streets, curb and gutter was previously developed for this site. A hydrology report was approved in 1995 for the site as part of a larger scope of work which included the offsite analysis. The approved hydrology report has been attached in Appendix G.

DESIGN CRITERIA AND CALCULATION

The flow rate was calculated using the Rational Method for a 10 year, 1 hour and 100 year, 1 hour storm event with standards from the Riverside County Flood Control and Water Conservation District Hydrology Manual. Per USDA, Natural Resources Conservation Service, the hydrologic soil group was found to be C, Appendix B.

The time of concentration for the 100 year storm was calculated by using Plate D-3. For lengths less than 100 ft, the kinematic wave equation per the National Resource Conservation Serves was used. The rainfall intensity was determined using Plate D-4.1 and the time of concentration from Plate D-3. The runoff coefficient was found using Plate D-5.3.

The runoff increased due to the conversion from pervious to impervious of the property. The runoff would be filtrated by bioretention basin and pervious pavers. Plates used to calculate the Q have been included in the attached calculations.

In addition, the 1995 hydrology report analyzied our property to be commercialized. Therefore the proposed impacted will be compared with the 1995 hydrology report.

EXISTING SITE INFORMATION

The site was previously rough graded. For light rain events, the water would remain on site and for heavier storms, once the soil was saturated would sheetflow to the northeast and southwest of the property. The stormwater is not filtrated before continuing to flow offsite. A detailed exhibit and calculations can be found on Appendix C and E, respectively.

10 Year, 60 min

Basin Number	Q (CFS)
EX-1	4.98
EX-2	0.29
EX-3	0.20
EX-4	3.05
EX-5	3.03
EX-6	0.08
	11.63

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Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

100 Year, 60 min

Basin Number	Q (CFS)
EX-1	8.01
EX-2	0.48
EX-3	0.36
EX-4	4.65
EX-5	4.87
EX-6	0.09
	18.46

The total existing flow rate is 11.45 CFS and 1 CFS for the 10 year, 24 hour and 100 year, 24 hour storm events. Calculations can be found in Appendix E.

PROPOSED SITE INFORMATION

The proposed project site is dedicating a 20 ft storm drain easement along the eastern and western portion of the city of Moreno Valley. The proposed grading allows the stormwater to flow to pervious pavers and bioretention basins for filtration and is connected to the existing stormdrain line. A detailed exhibit can be found on Appendix D. This site was also taken into consideration by a previous report which was approved on August 18, 1995, Appendix G. This site was included in the sizing of the storm drain pipes as a commerical area. The calculations done are in more detailed from the 1995 report. However, our values are quite similar, the first column of runoff is what was calculated for this project and the second column is the sum of runoff from the 1995 report:

10 Year, 60 min

Basin Number	Q (CFS)	1995 Q (CFS)
PR-1	4.11	
PR-2	3.30	
PR-3	6.44	
	13.85	13.3

100 Year, 60 min

Basin Number	Q (CFS)	1995 Q (CFS)
PR-1	4.83	
PR-2	5.99	
PR-3	8.49	
	19.31	20.1

The total proposed flow rate is 13.85 CFS and 19.31 CFS for the 10 year, 24 hour and 100 year, 24 hour events, respectively. Detailed calculations can be found in Appendix F.

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Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

CONCLUSION

Q (CFS)	Existing	1995	Difference
10 year	11.45	13.3	1.85
100 year	18.13	20.1	1.97

Q (CFS)	Existing	Proposed	Difference
10 year	11.45	13.85	2.4
100 year	18.13	19.31	1.18

Q (CFS)	1995	Proposed	Difference
10 year	13.3	13.85	0.55
100 year	20.1	19.31	-0.79

The difference between the designed storm drain pipes and the proposed work for the site is less than 2 CFS. The increase from the 1995 hydrology report is less than 5%. Though infiltration would be ideal, the site has low infiltration rates per the geotechnical report (Appendix H) and does not meet the minimum requirement. Further analysis, (ie street capacity analysis, etc) will be done at a later time after the conditionals of approval have been received and prior to grading.

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Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX

A

VICINITY MAP

VICINITY MAP	SCALE: NTS	DATE: OCT. 2016
CACTUS COMMERCE NEC COMMERCE CTR DR & CACTUS AVE MORENO VALLEY, CA 92553	DRAWN BY: TB	APPROVED BY: FVM
	PROJECT NO. 03-716-1096	FIGURE NO. 1A

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LOCATION MAP	SCALE: NTS	DATE: OCT. 2016
CACTUS COMMERCE NEC COMMERCE CTR DR & CACTUS AVE MORENO VALLEY, CA 92553	DRAWN BY: TB	APPROVED BY: FVM
	PROJECT NO. 03-716-1096	FIGURE NO. 1B

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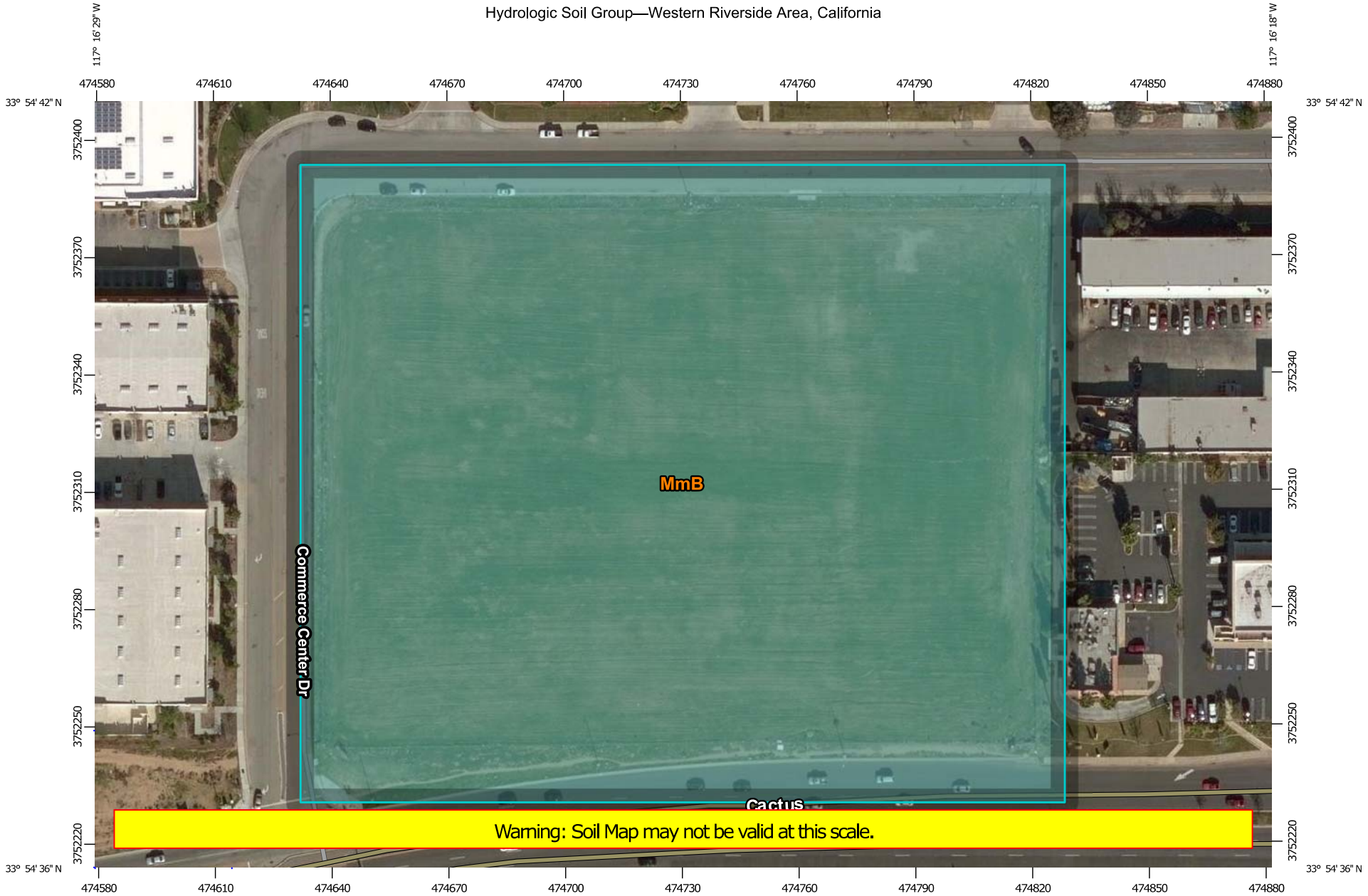
APPENDIX

B

SOIL AND PRECIPITATION

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Map Scale: 1:1,380 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 8, Sep 22, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 14, 2015—Jan 21, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Western Riverside Area, California (CA679)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
MmB	Monserate sandy loam, 0 to 5 percent slopes	C	7.9	100.0%
Totals for Area of Interest			**7.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Tie-break Rule: Higher

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX

C

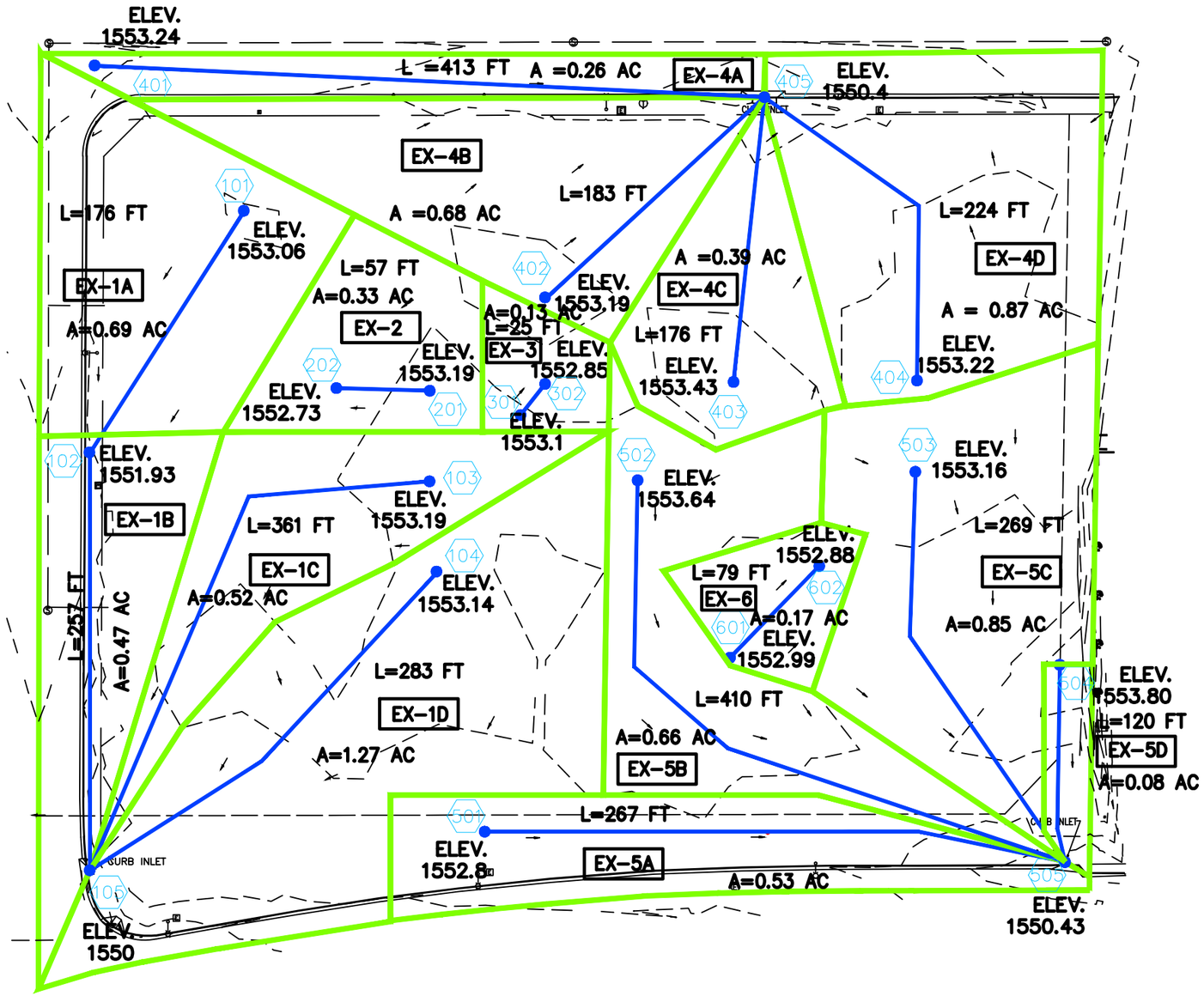
EXISTING HYDROLOGY EXHIBIT

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

1.r

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Packet Pg. 524



NODE	Q 10YR (CFS)	Q 100YR (CFS)
105	5.00	8.02
202	0.29	0.48
302	0.20	0.36
405	3.05	4.65
505	3.03	4.87
602	0.08	0.09

NORTH
Not to Scale

EXISTING HYDROLOGY	PROJECT NO. 3-716-1096	DRAWN BY: KL	DATE: NOV. 2016
PROPOSED COMMERCIAL DEVELOPMENT CACTUS AVE & COMMERCE CENTER DR MORENO VALLEY, CA	FIGURE NO. 1	APPROVED BY: LCD	SCALE: NTS

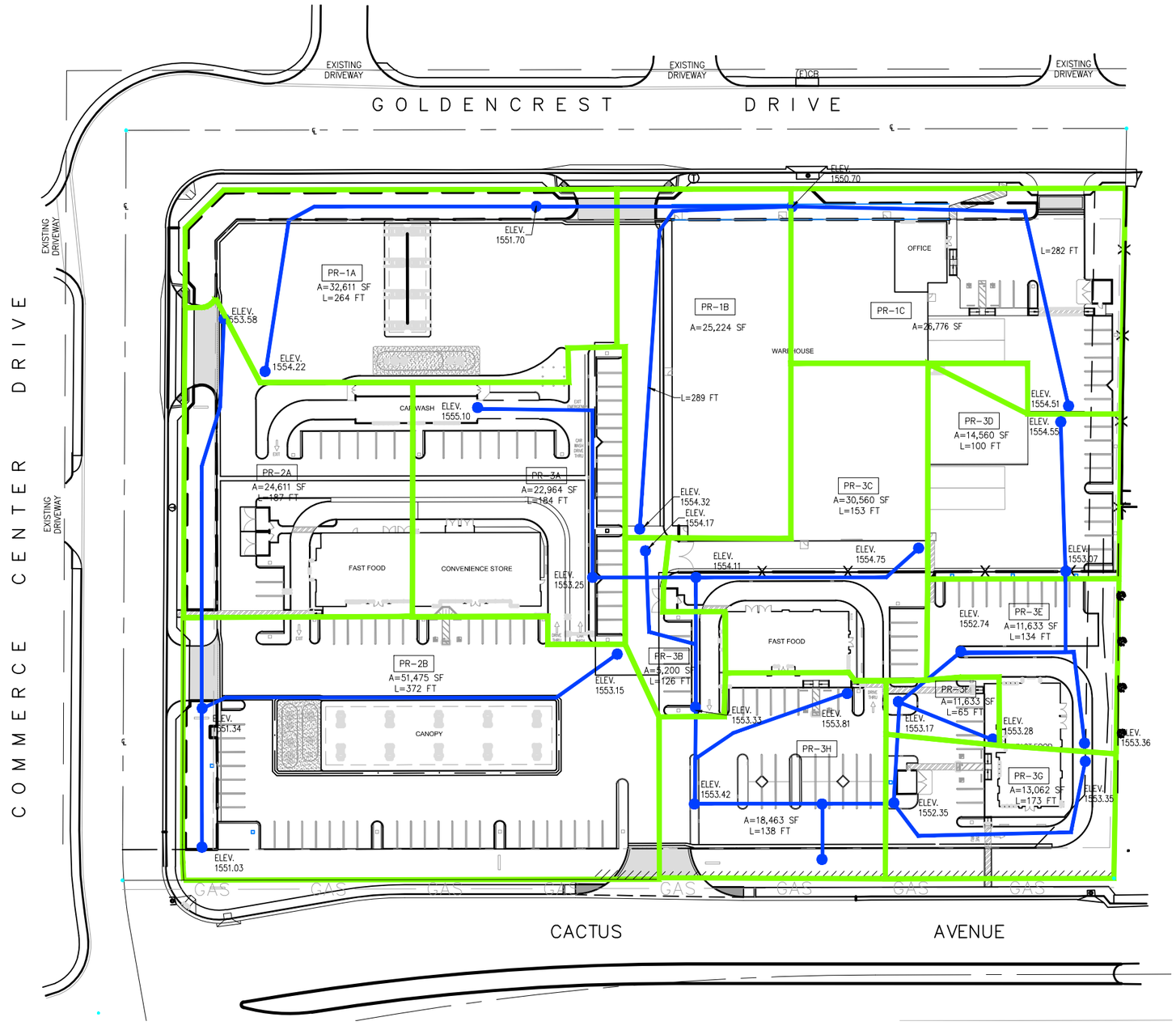
SALEM engineering group, inc.

APPENDIX

D

PROPOSED HYDROLOGY EXHIBIT

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



NODE	Q 10YR (CFS)	Q 100YR (CFS)
105	4.23	6.09
203	3.83	5.60
318	6.43	8.49

NORTH
Not to Scale

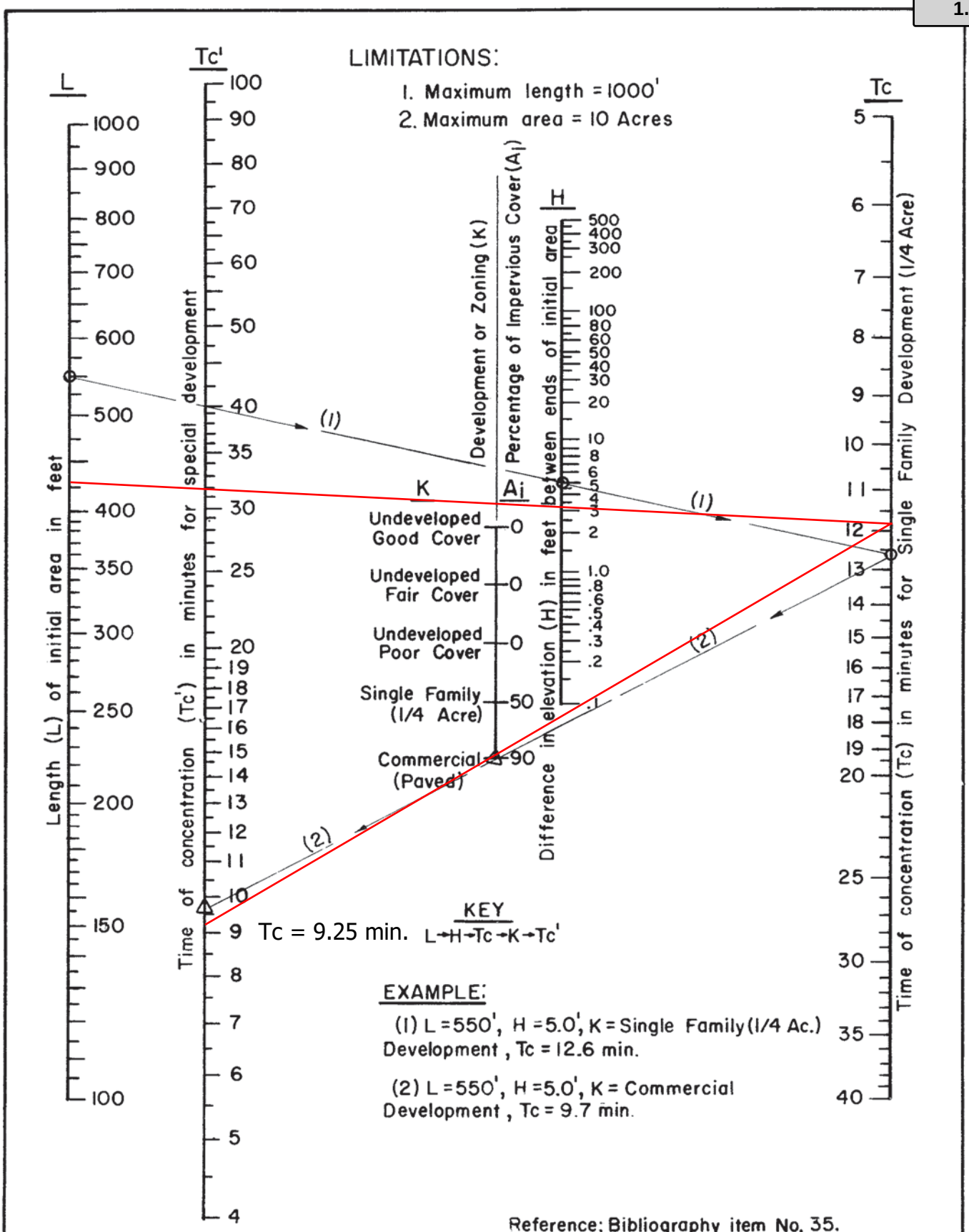
PROPOSED HYDROLOGY	PROJECT NO. 3-716-1096	DRAWN BY: KL	DATE: NOV. 2016
PROPOSED COMMERCIAL DEVELOPMENT CACTUS AVE & COMMERCE CENTER DR MORENO VALLEY, CA	FIGURE NO. 1	APPROVED BY: LCD	SCALE: NTS

SALEM engineering group, inc.

APPENDIX

E

EXISTING HYDROLOGY EXHIBIT



RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

Interpolation:

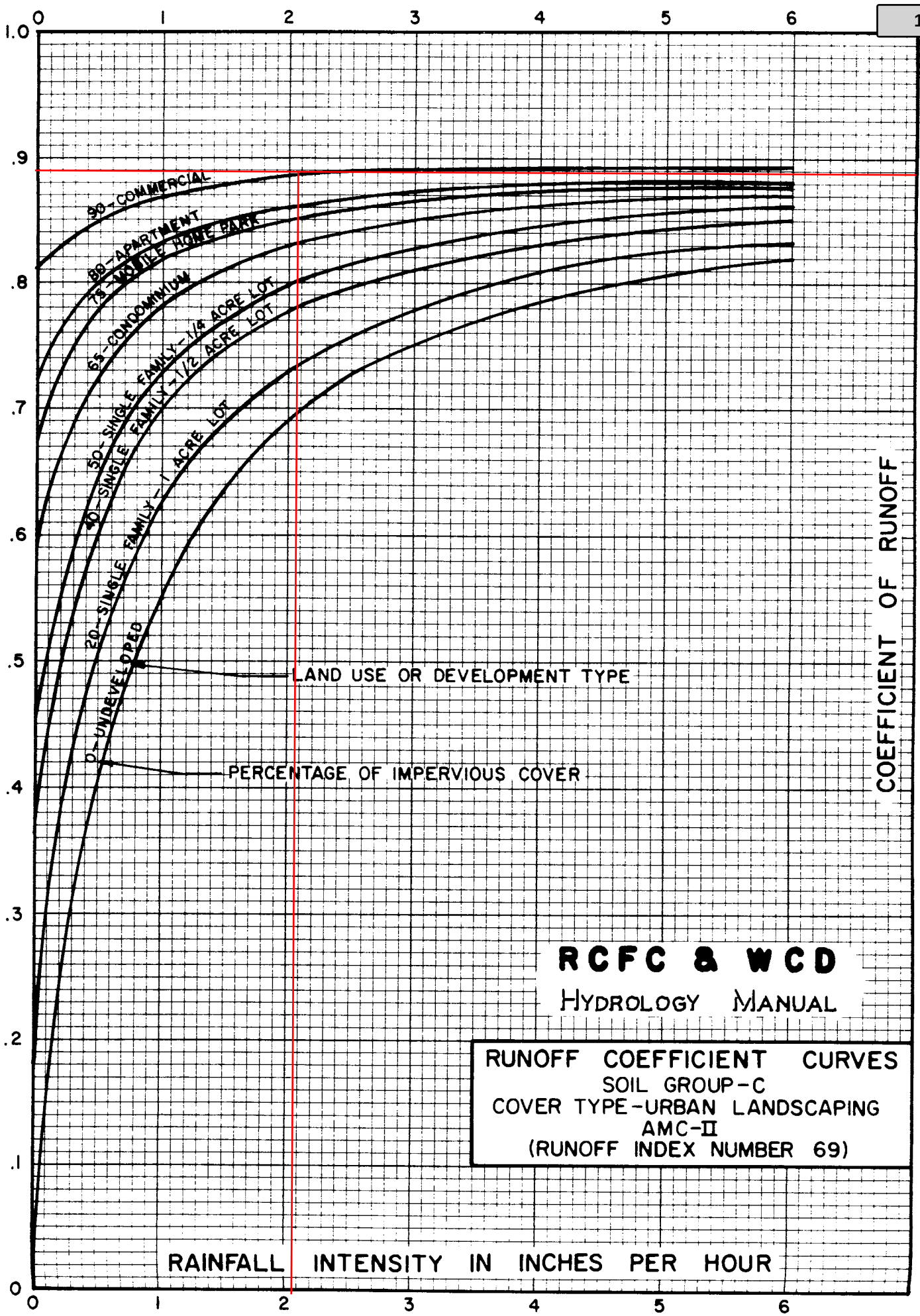
9.25 mins = 2.09 in/ hr for 10 year event

9.25 mins = 3.06 in/ hr for 100 year event

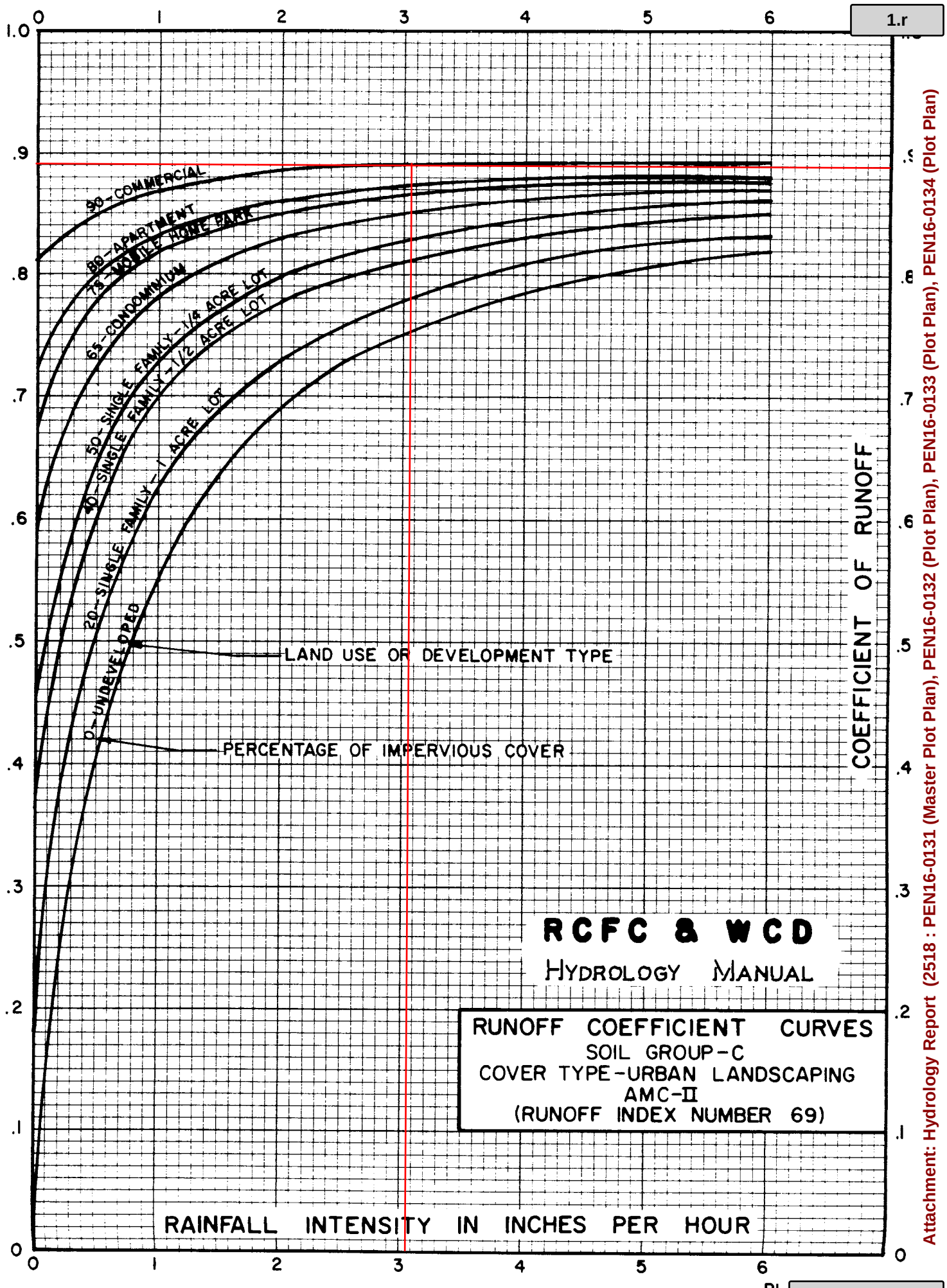
SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

EX-2

TIME OF CONCENTRATION CALCULATION
KINEMATIC WAVE EQUATION PER THE NATIONALRESOURCE CONSERVATION SERVICES

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

Where,

Tc = Time of concentration, Hr
L = Length of flow path in feet
S = Slope of flow FT/FT
P2 = Precipitation in inches
City of Moreno Valley requires, (10 Yr , 1 hr) & (100Yr, 1 hr), Frequency
n = Manning's number per Caltrans Table 816.6A

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

L =	57
S =	0.008
P10 Yr, 1 hr =	0.73
P100 Yr, 1 hr =	1.21
n =	0.4

Tc 10yr,1hr =	0.690 hr	=	41.37 mins
Tc 100 yr,1hr =	0.536 hr	=	32.13 mins

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

INTERPOLATED:

41.37 mins = 0.99 in/ hr for 10 year event
32.13 mins = 1.64 in/ hr for 100 year event

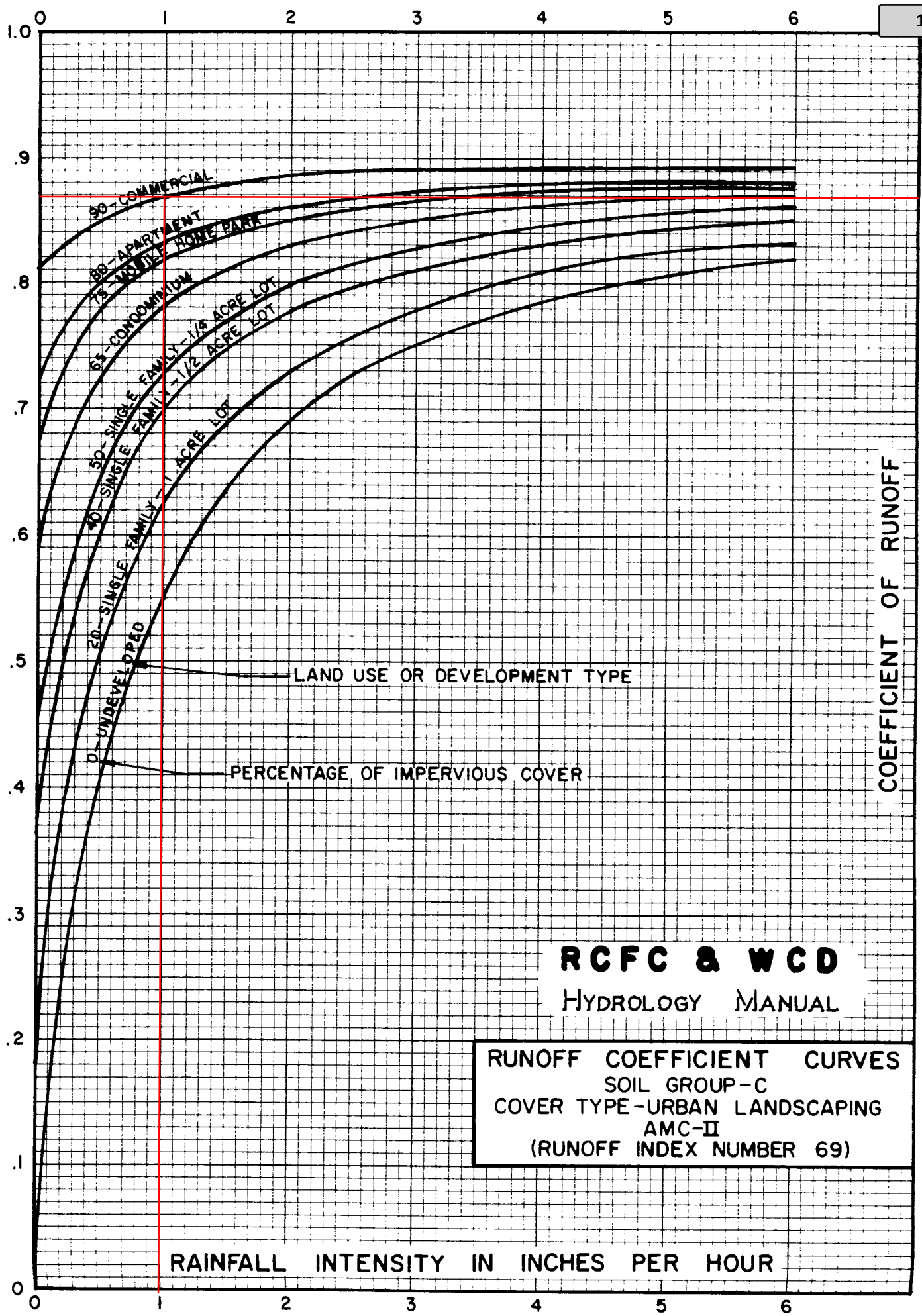
SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

STANDARD
INTENSITY—DURATION
CURVES DATA

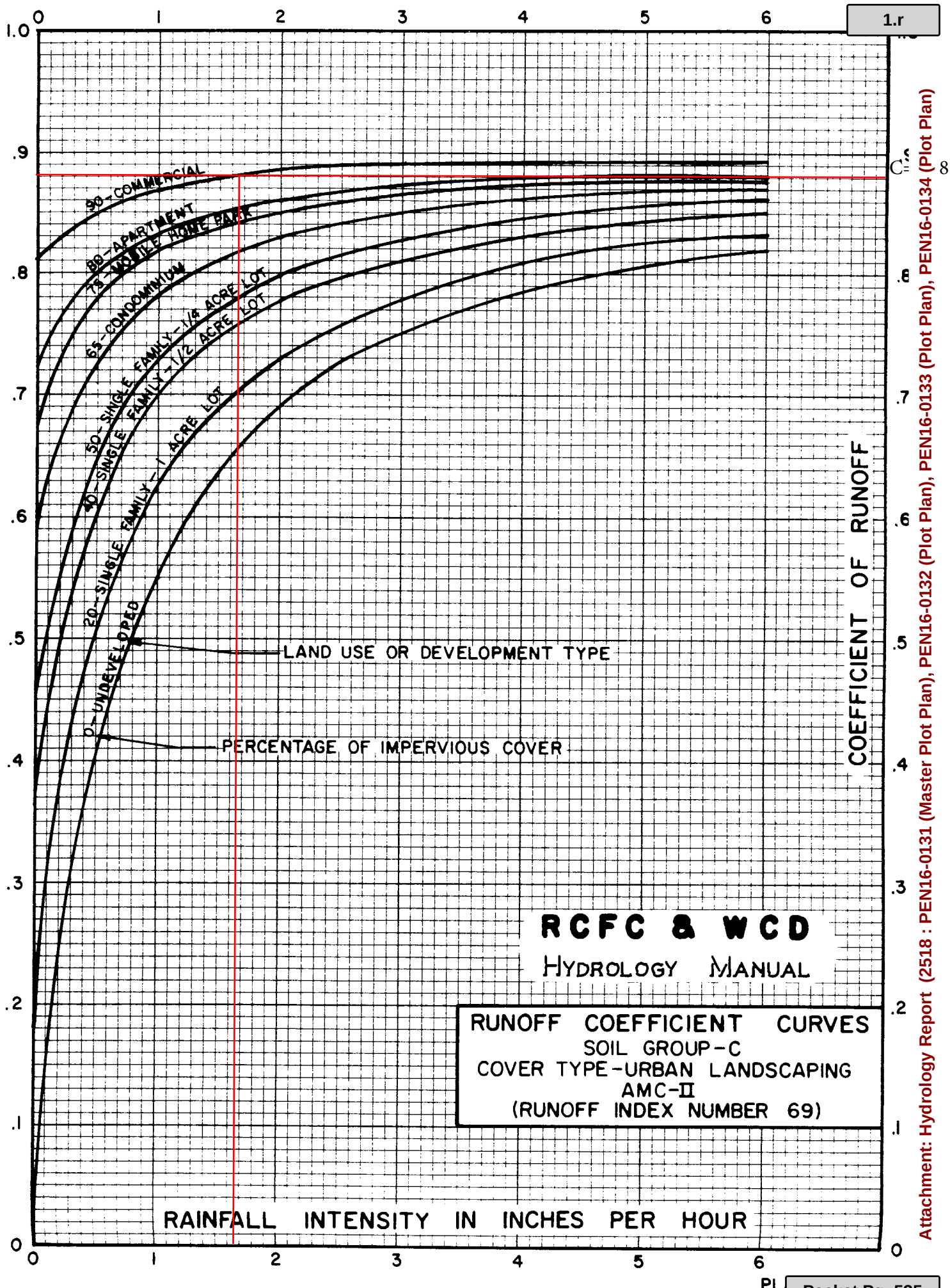
PLATE D-4.1 (6 of 6)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

10 YR



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

EX-3

TIME OF CONCENTRATION CALCULATION
KINEMATIC WAVE EQUATION PER THE NATIONALRESOURCE CONSERVATION SERVICES

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

Where,

Tc = Time of concentration, Hr
L = Length of flow path in feet
S = Slope of flow FT/FT
P2 = Precipitation in inches
City of Moreno Valley requires, (10 Yr , 1 hr) & (100Yr, 1 hr), Frequency
n = Manning's number per Caltrans Table 816.6A

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

L =	25
S =	0.01
P10 Yr, 1 hr =	0.726
P100 Yr, 1 hr =	1.21
n =	0.15

Tc 10yr,1hr =	0.149	hr	=	8.95 mins
Tc 100 yr,1hr =	0.116	hr	=	6.94 mins

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

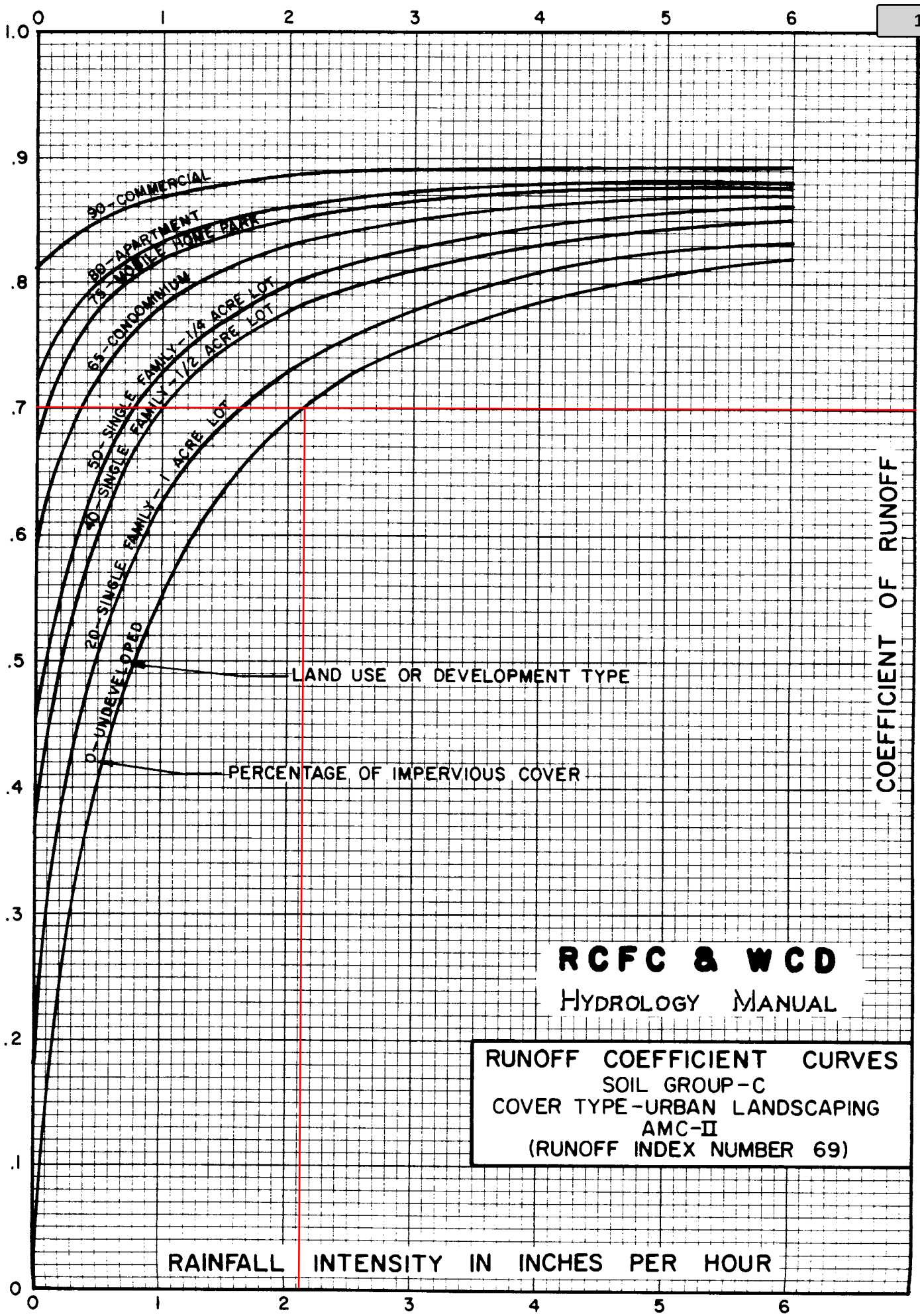
RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

10 yr = 2.13 in/hr
100 yr = 3.53 in/hr

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



RCFC & WCD

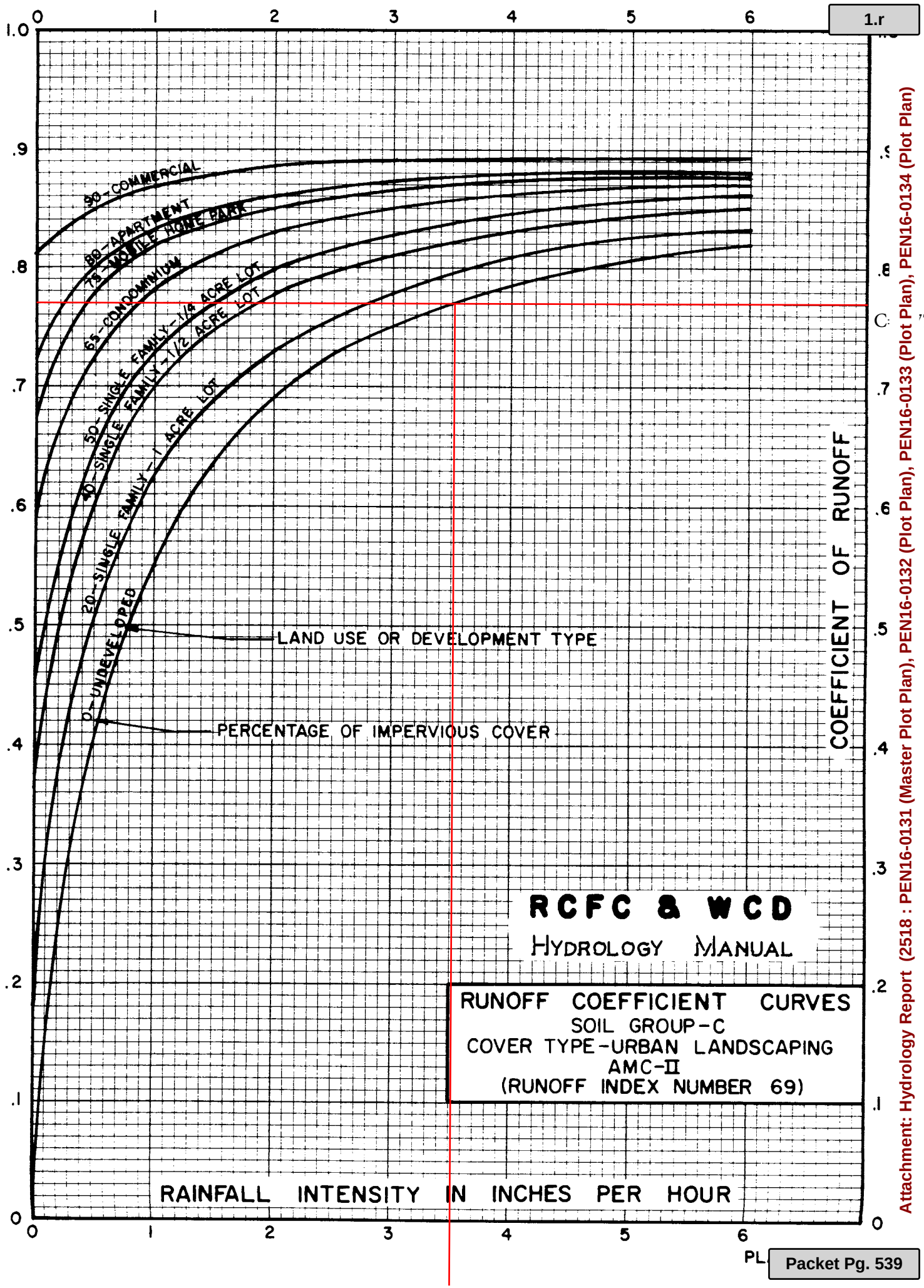
HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-C
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 69)

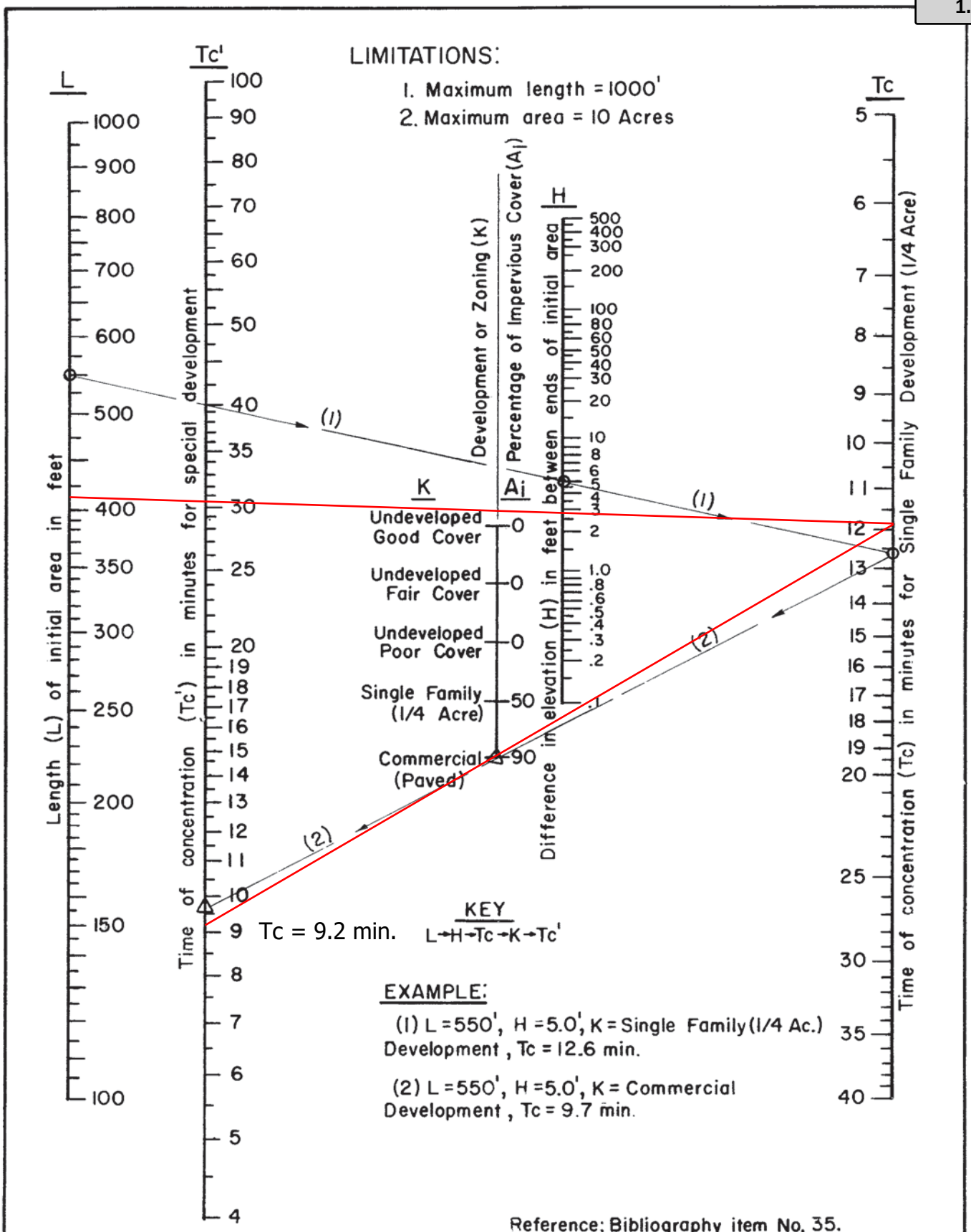
C 7

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

100 YR



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

EX-4A

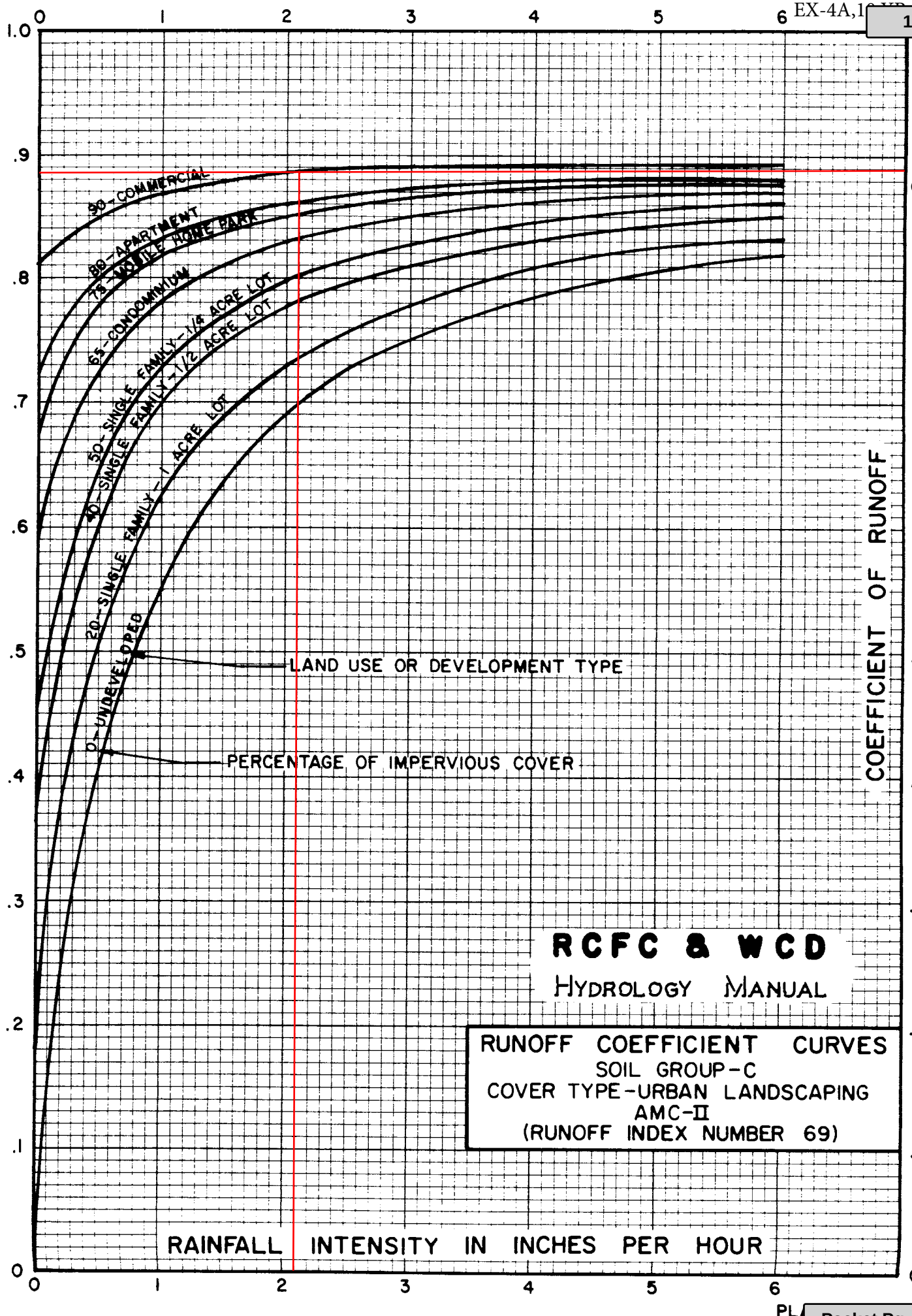
Interpolation:

9.2 mins = 2.10 in/ hr for 10 year event

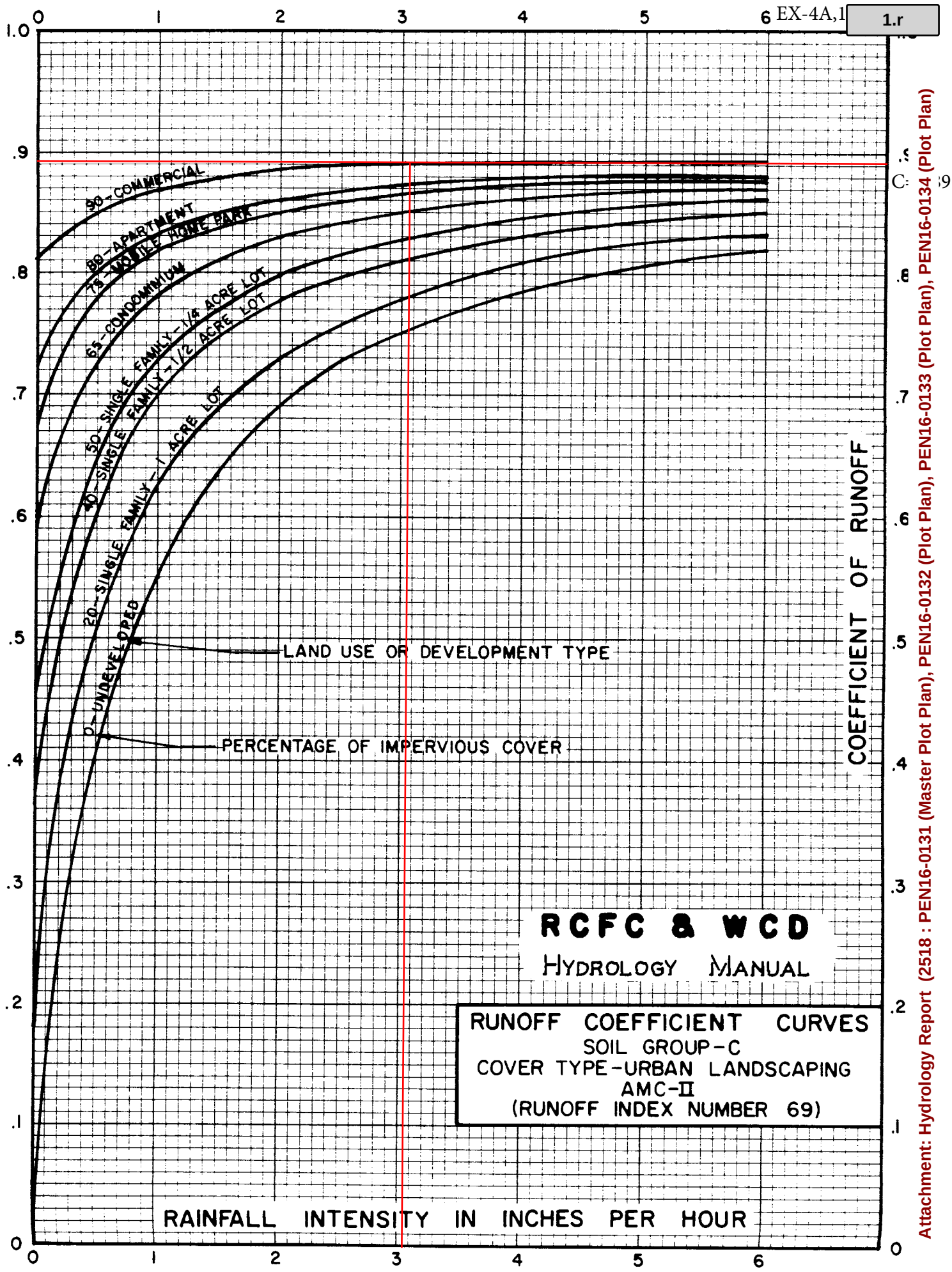
9.2 mins = 3.07 in/ hr for 100 year event

STANDARD INTENSITY – DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

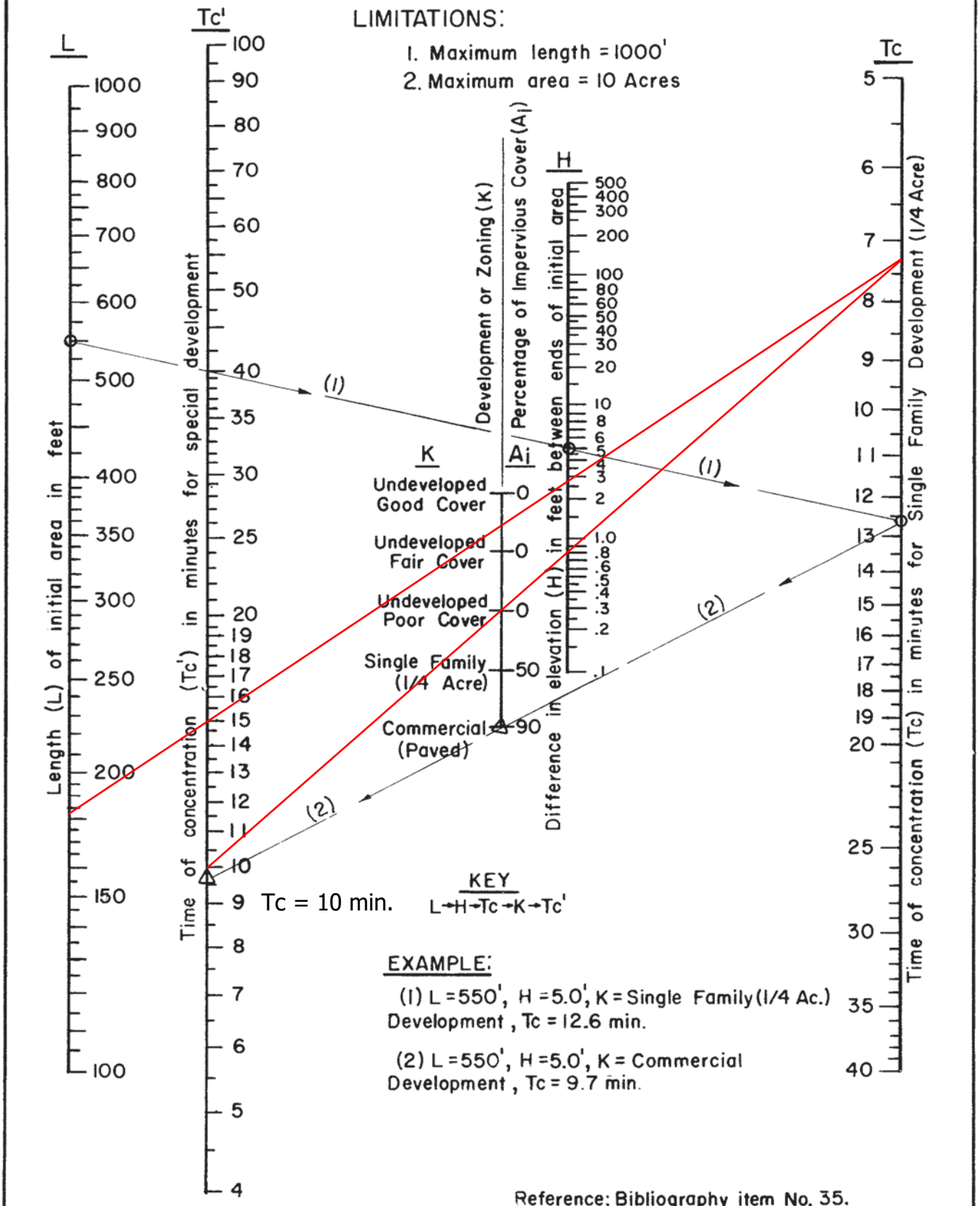


RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP - C
COVER TYPE - URBAN LANDSCAPING
AMC - II
(RUNOFF INDEX NUMBER 69)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

EX-4B

Interpolation:

10 mins = 2.01 in/ hr for 10 year event

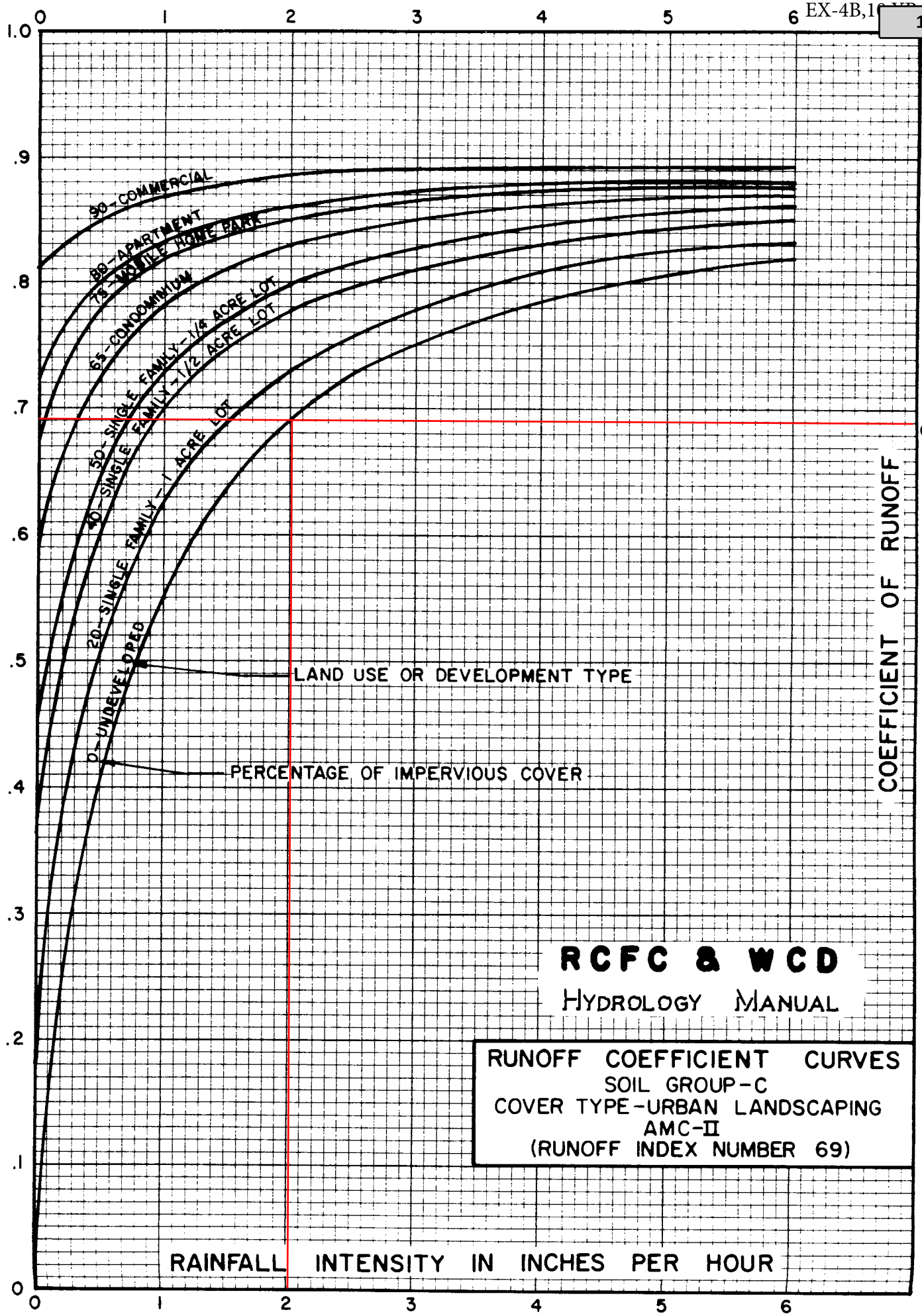
10 mins = 2.94 in/ hr for 100 year event

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

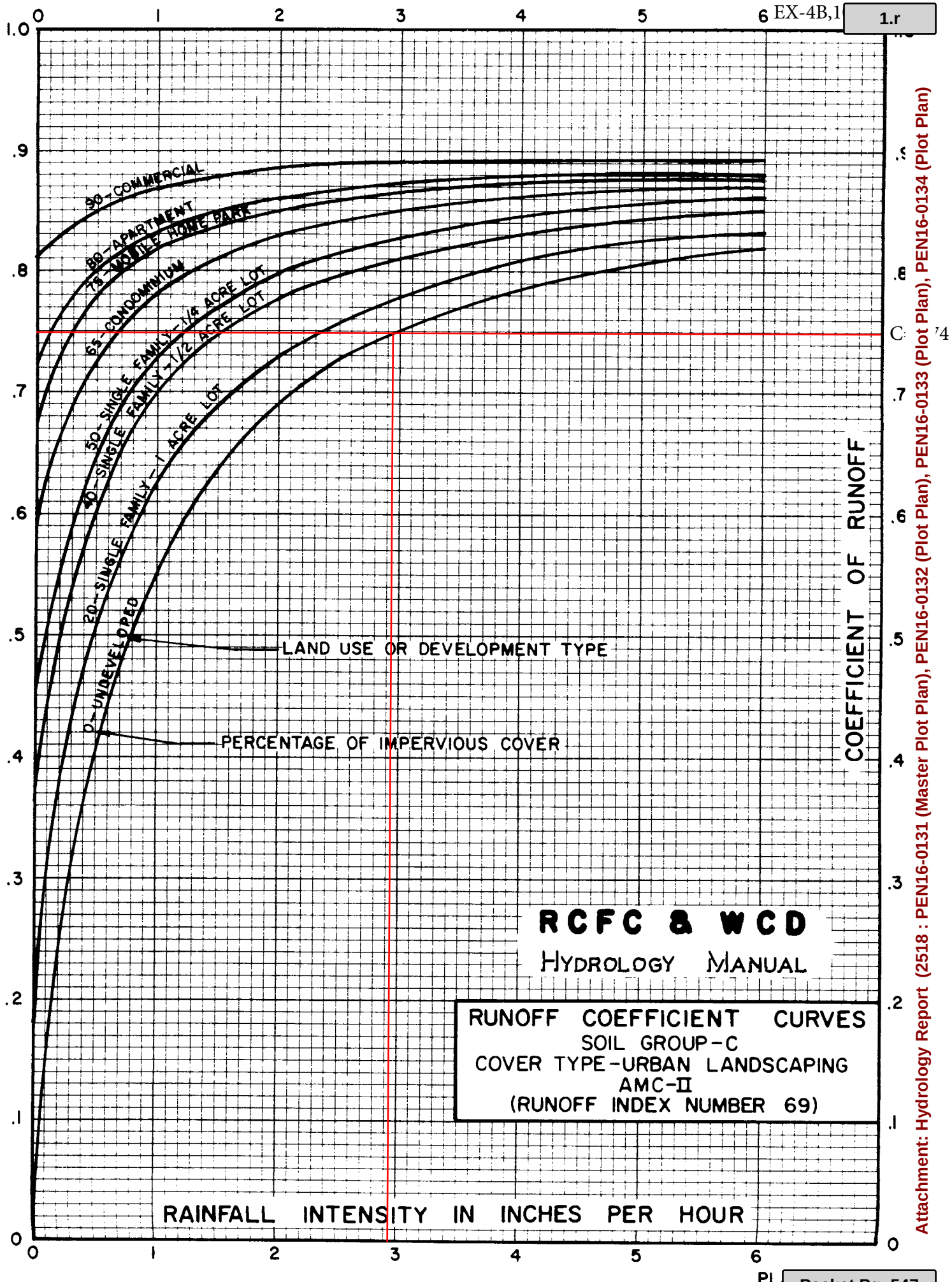
STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

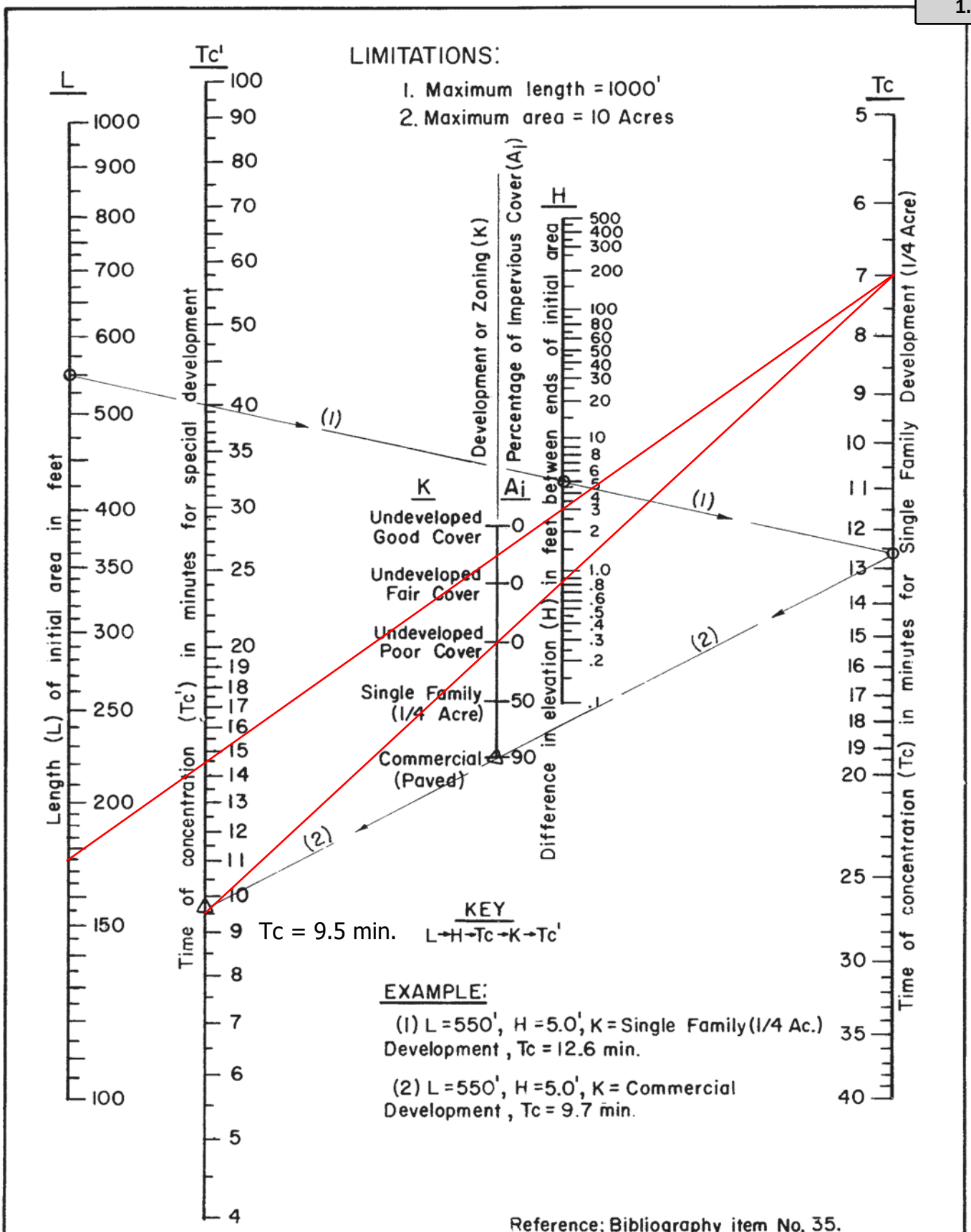


C = 59

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

EX-4C

Interpolation:

9.5 mins = 2.07 in/ hr for 10 year event

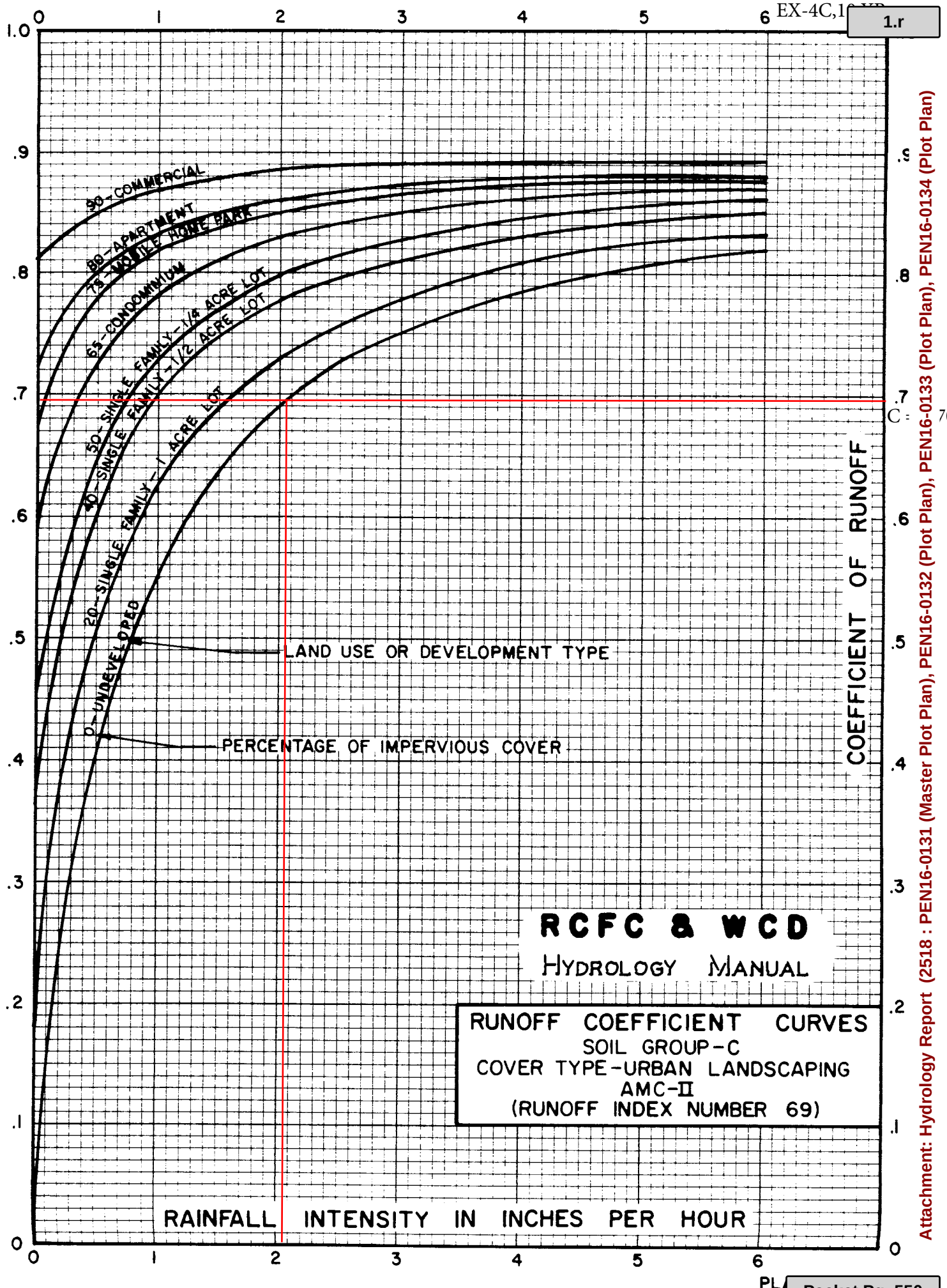
9.5 mins = 3.02 in/ hr for 100 year event

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

STANDARD INTENSITY—DURATION CURVES DATA

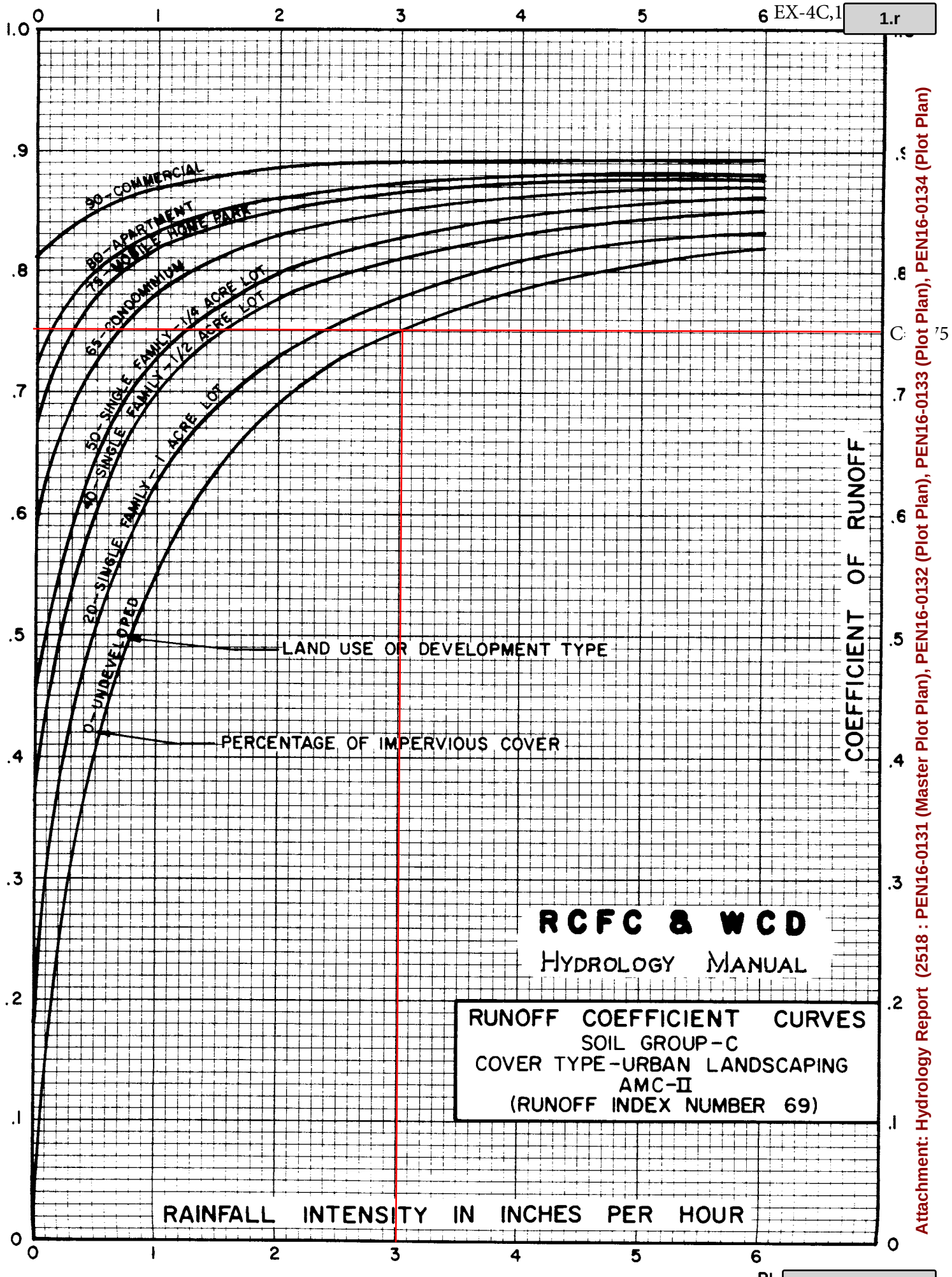
PLATE D-4.1 (6 of 6)



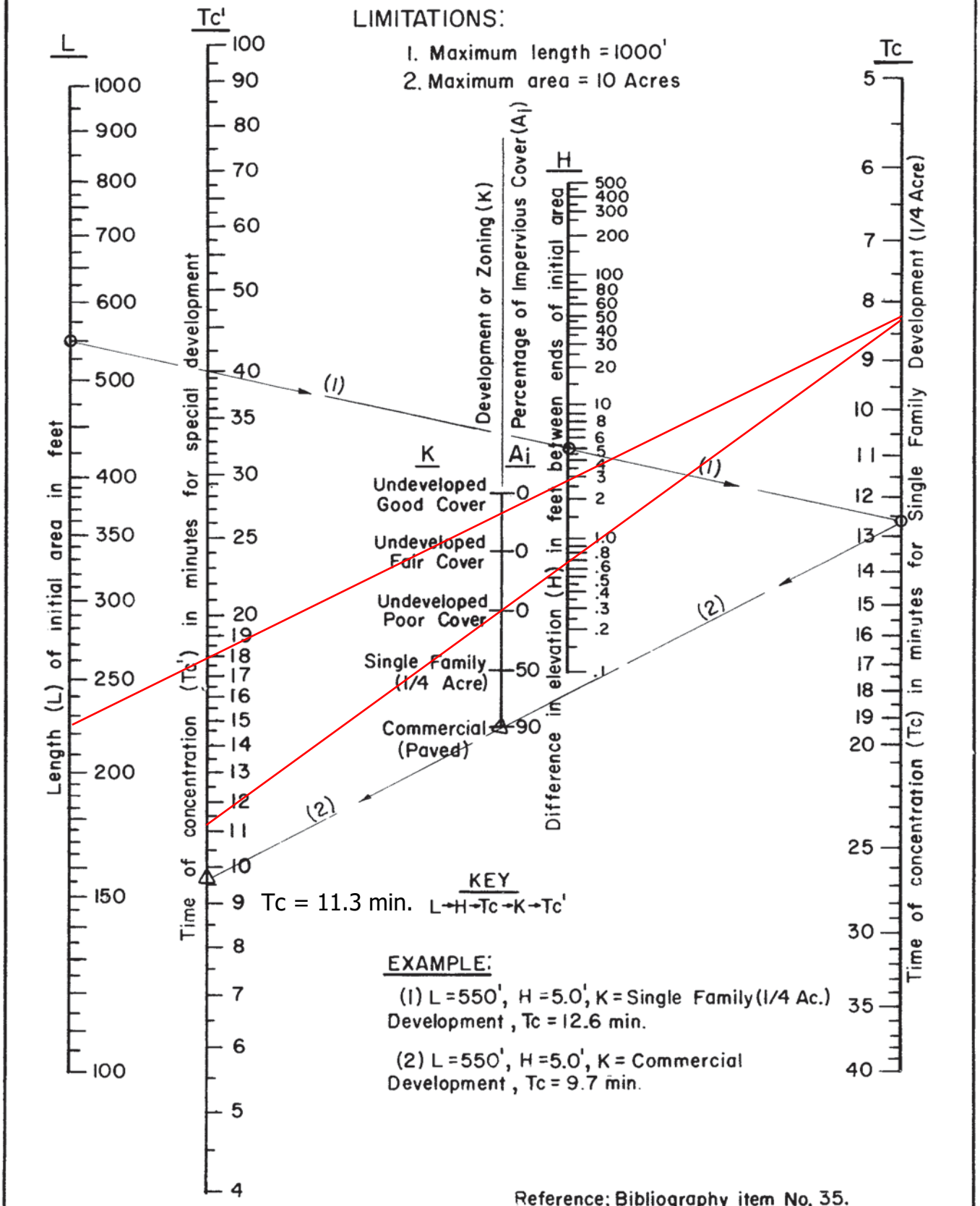
C = 70

1.r

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

EX-4D

Interpolation:

11.3 mins = 1.89 in/ hr for 10 year event

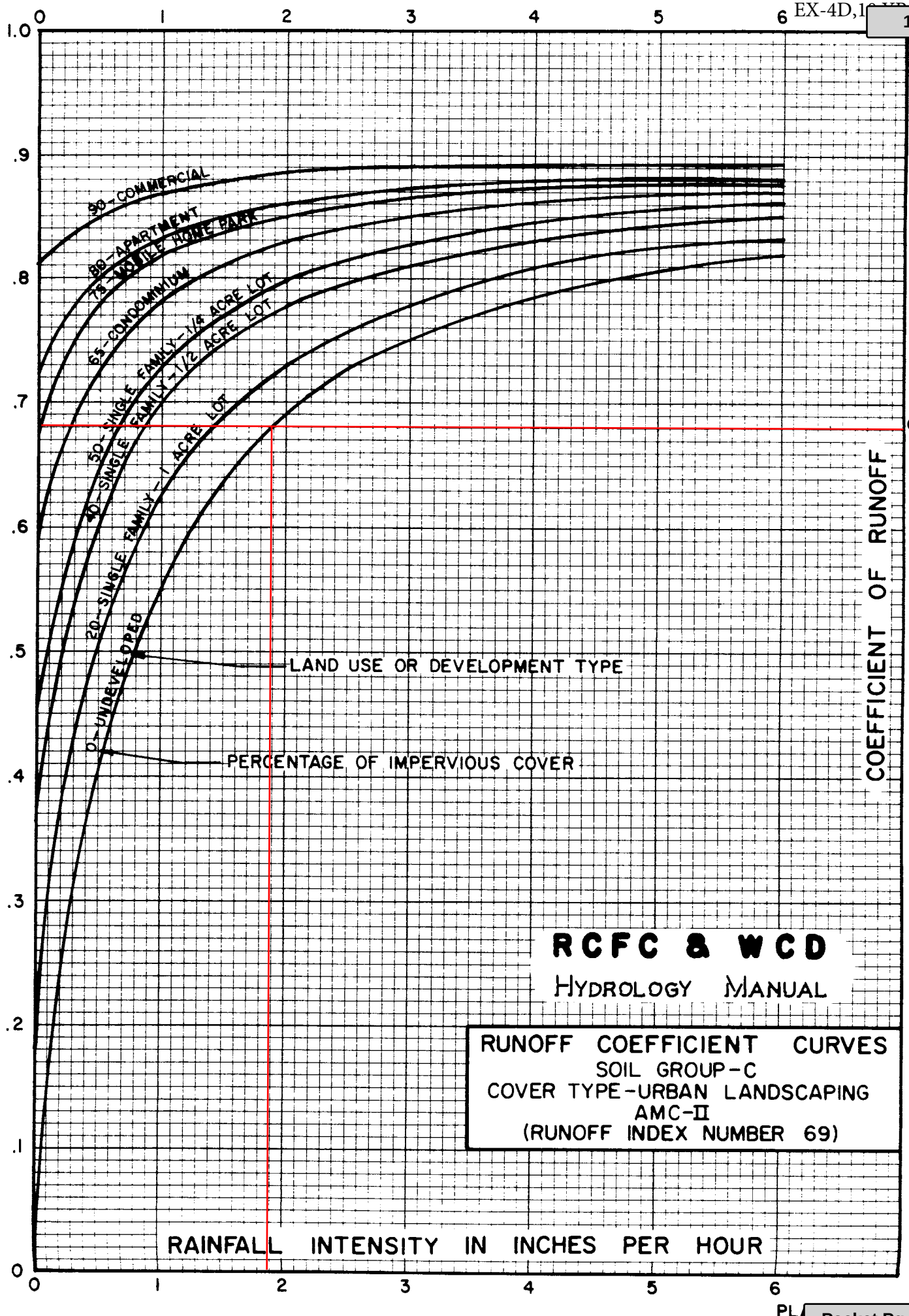
11.3 mins = 2.76 in/ hr for 100 year event

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

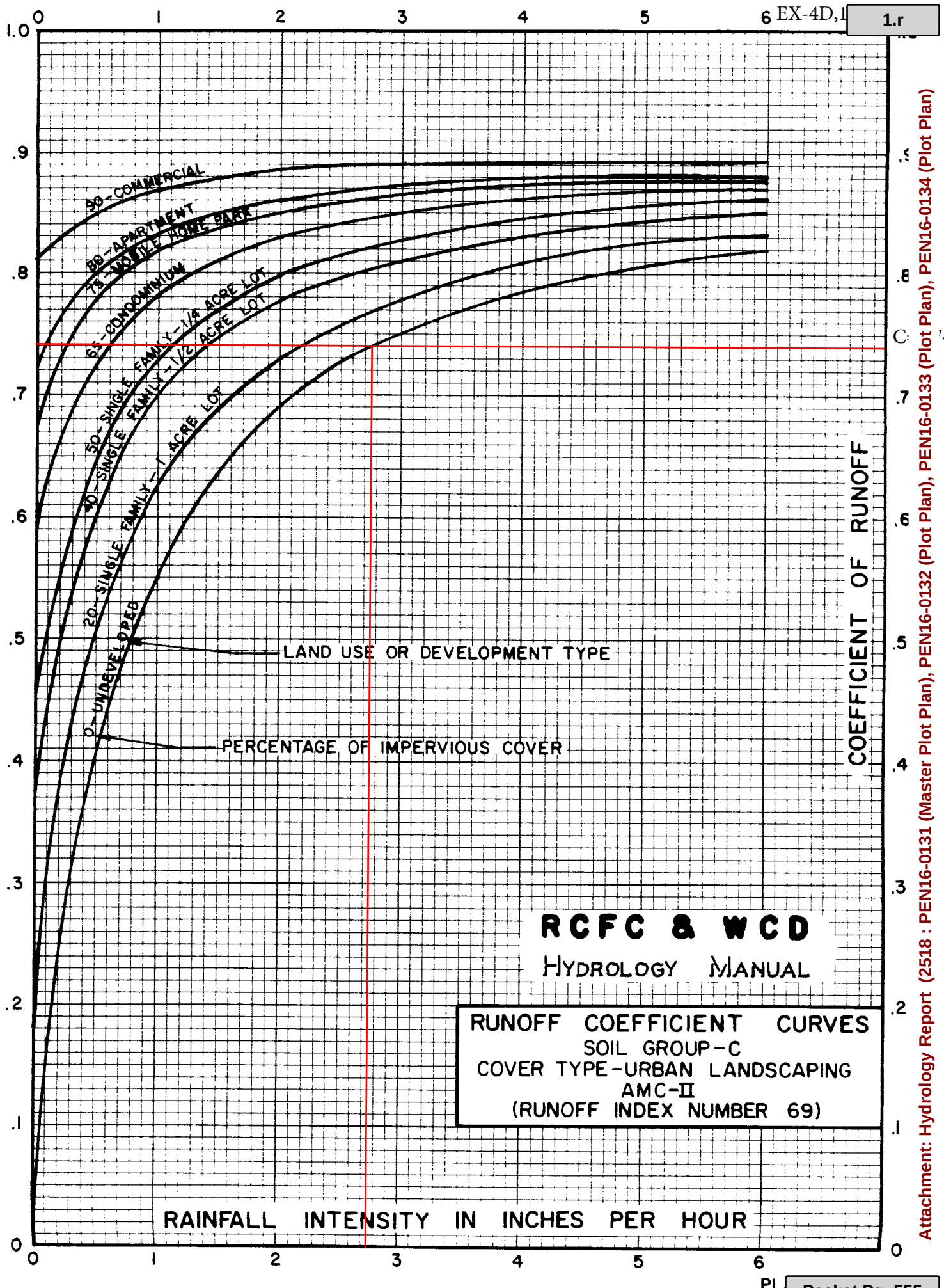
STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



C = 58

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

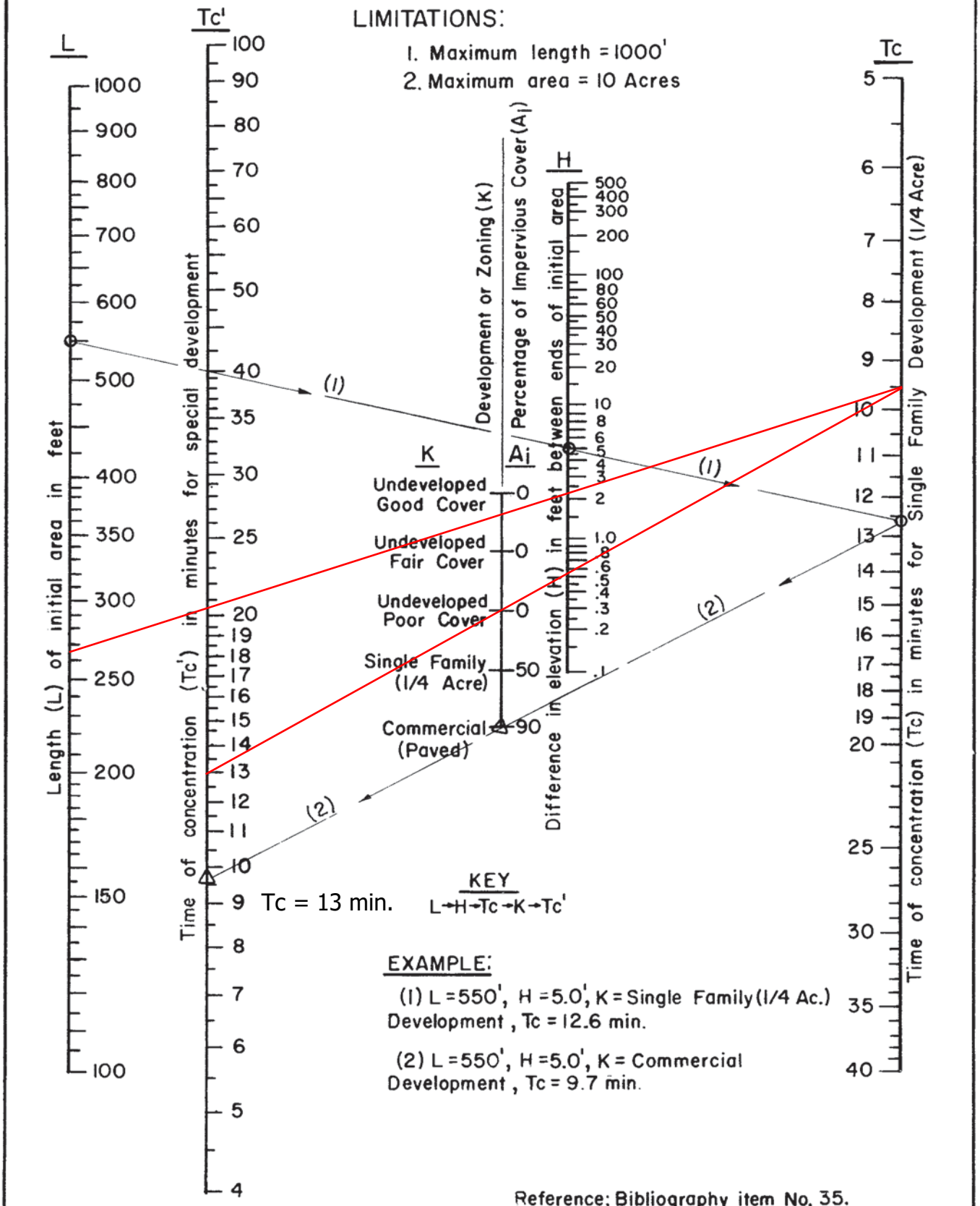


RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP-C
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 69)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

EX-5A

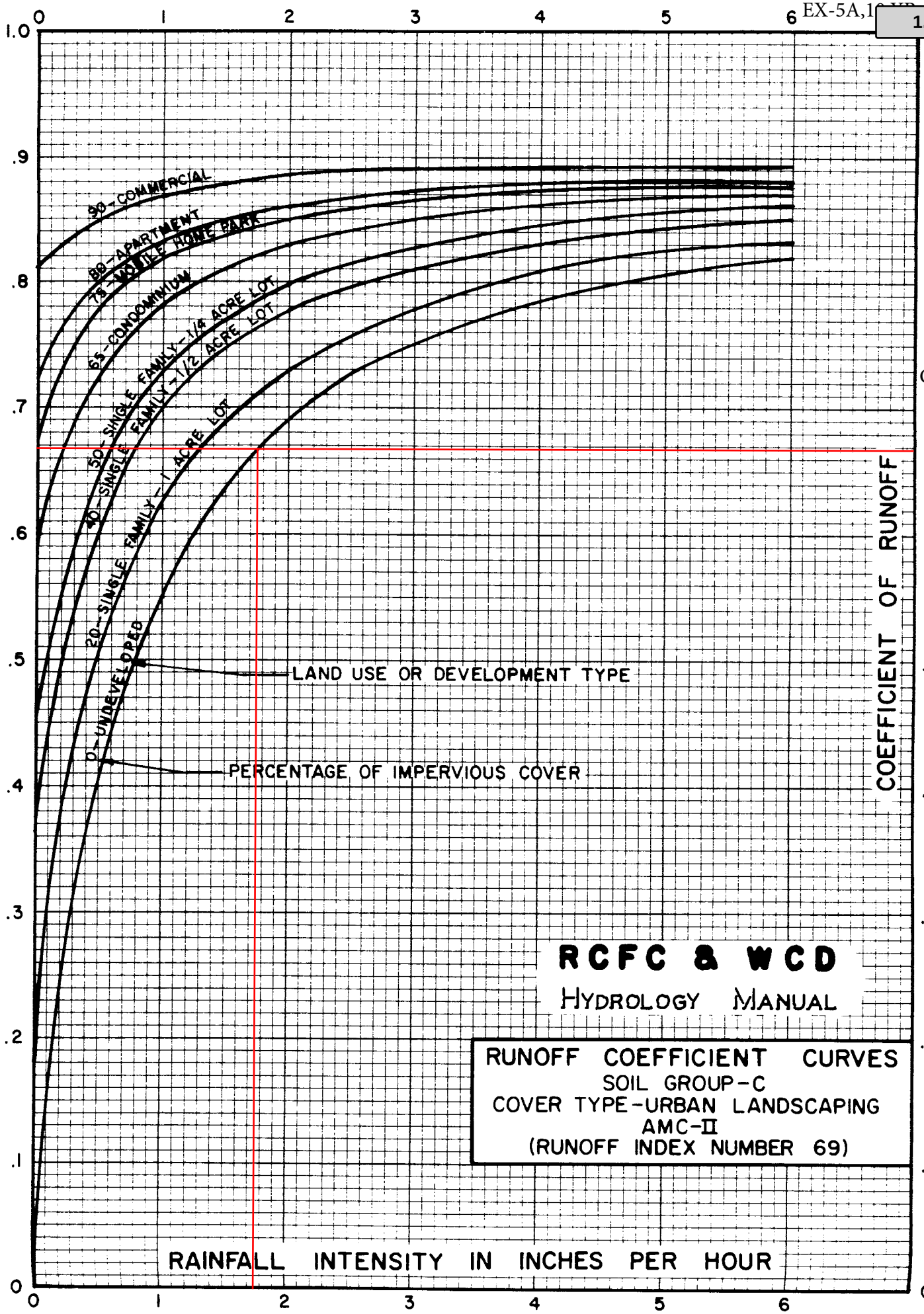
Interpolation:

13 mins = 1.76 in/ hr for 10 year event

13 mins = 2.58 in/ hr for 100 year event

STANDARD INTENSITY—DURATION CURVES DATA

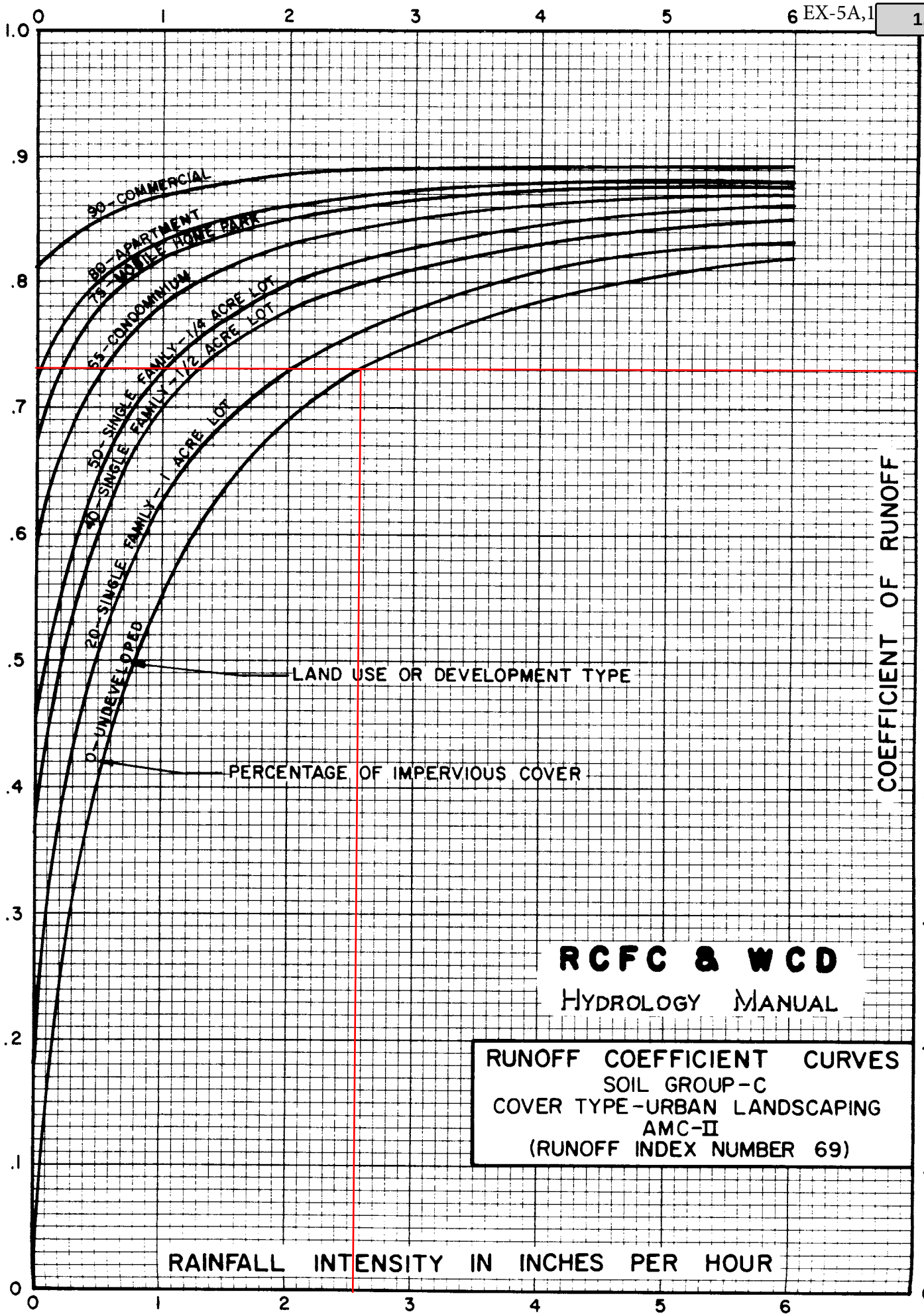
PLATE D-4.1 (6 of 6)



1.r

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Packet Pg. 558



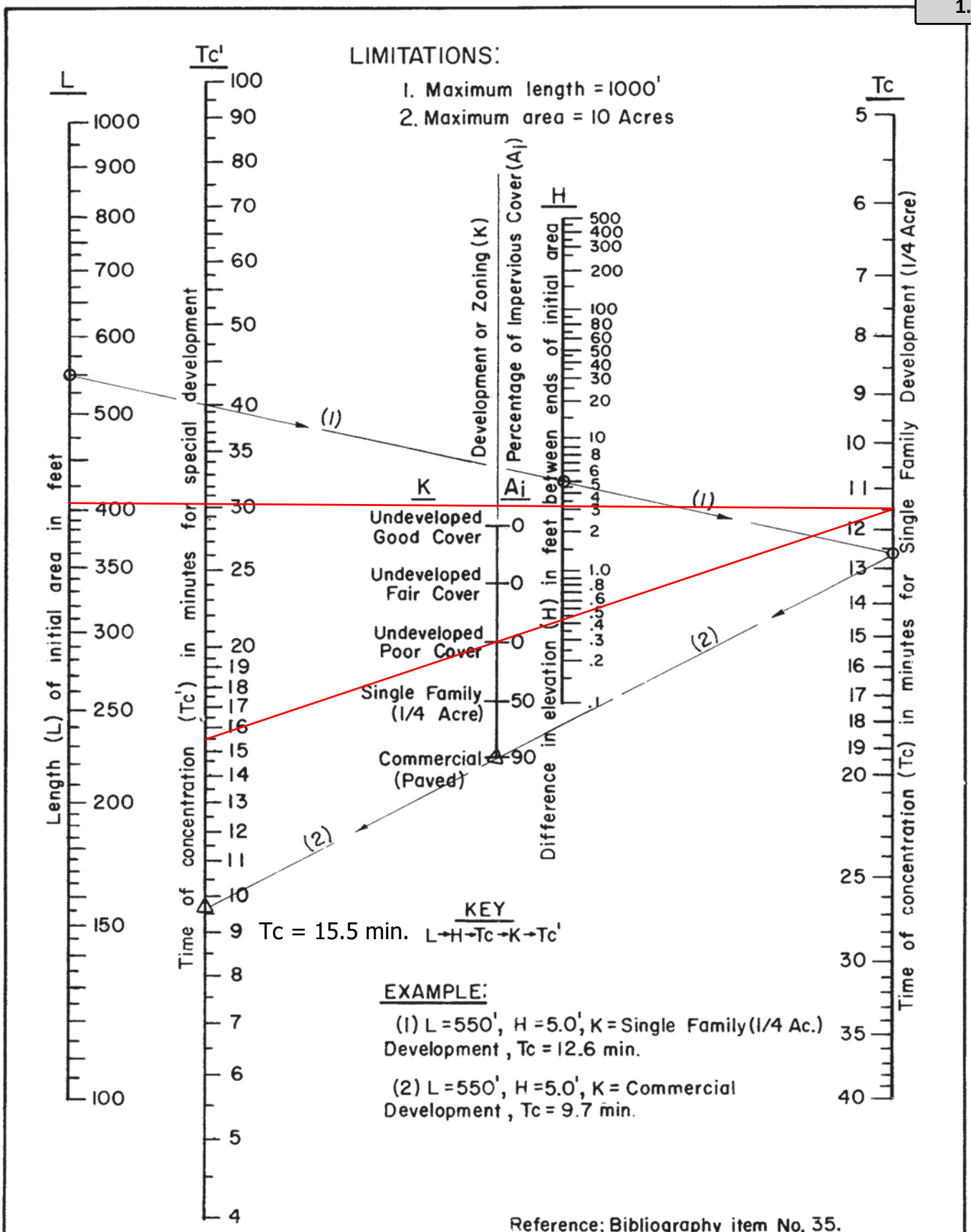
RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP - C
COVER TYPE - URBAN LANDSCAPING
AMC - II
(RUNOFF INDEX NUMBER 69)

C 73

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

EX-5B

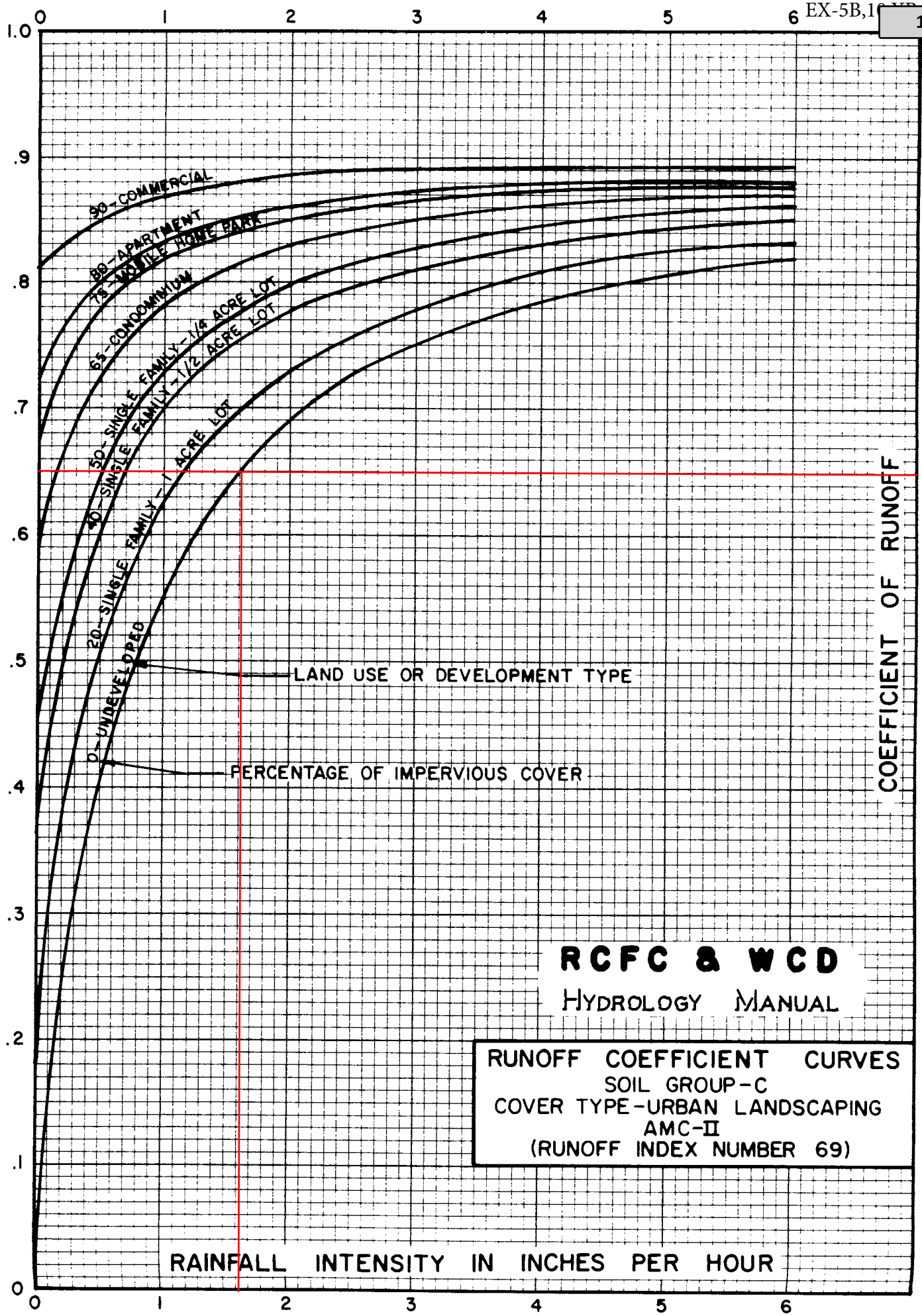
Interpolation:

15.5 mins = 1.62 in/ hr for 10 year event

15.5 mins = 2.36 in/ hr for 100 year event

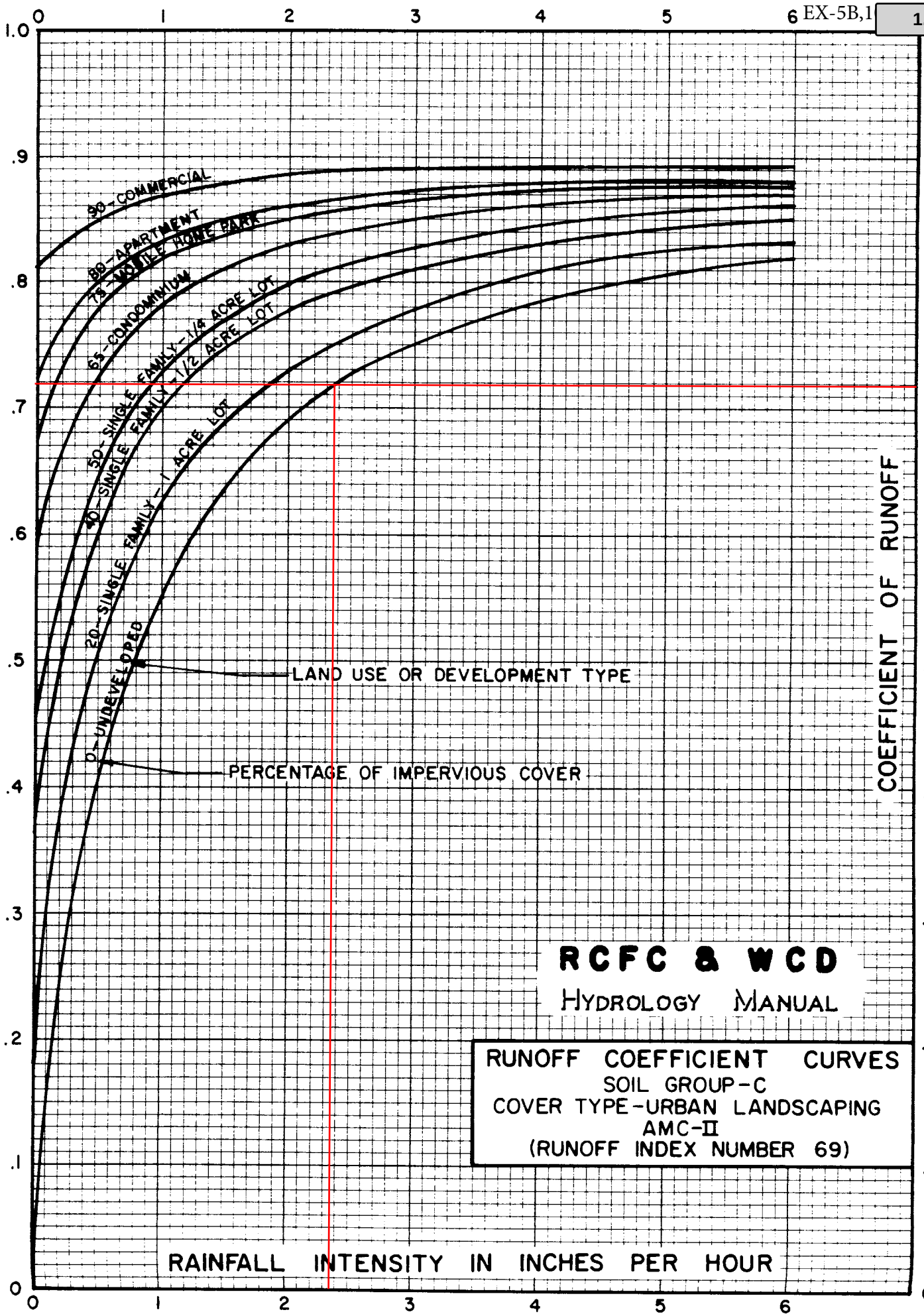
STANDARD INTENSITY – DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



C .65

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



RCFC & WCD

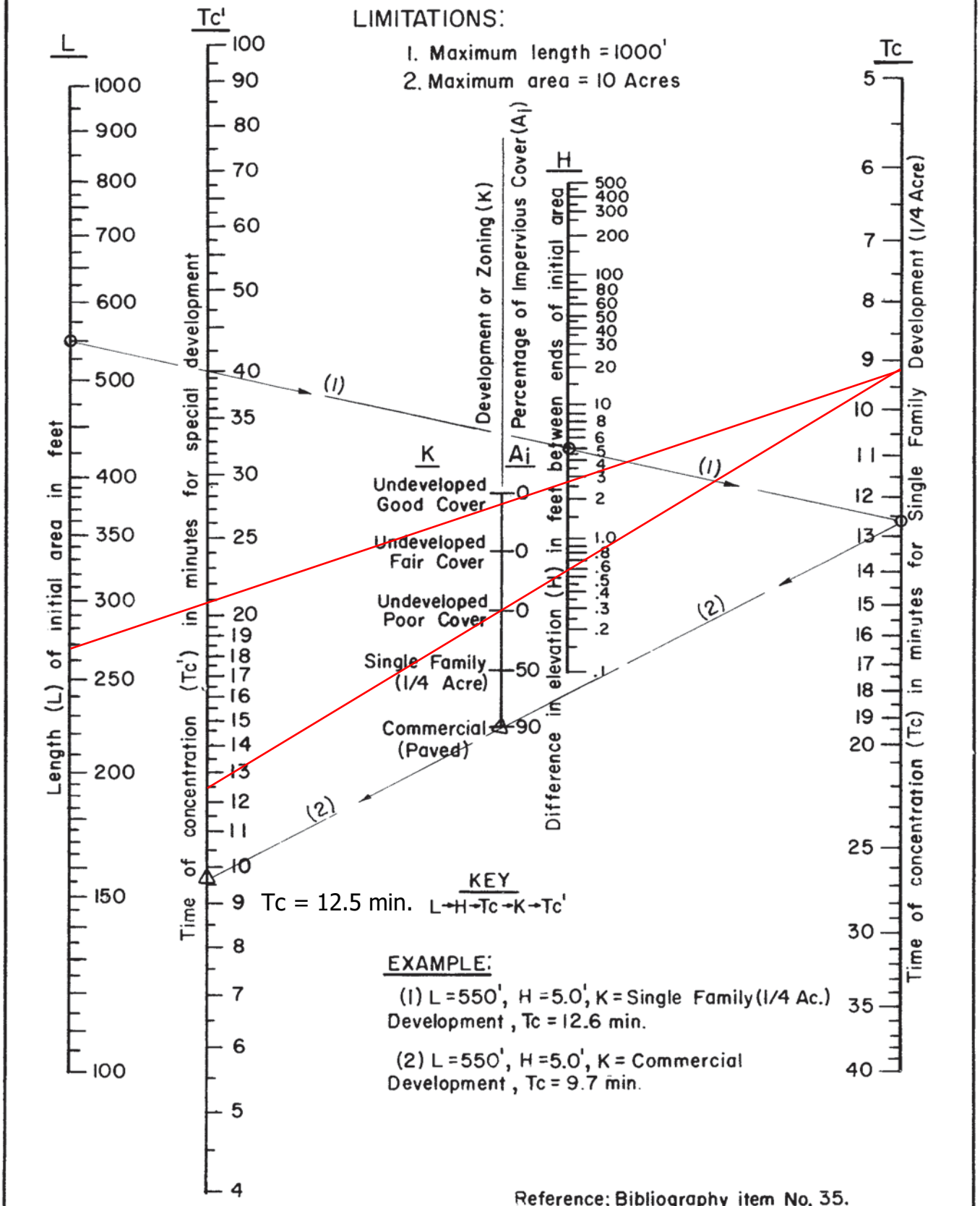
HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP - C
COVER TYPE - URBAN LANDSCAPING
AMC - II
(RUNOFF INDEX NUMBER 69)

C 72

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

PL



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

EX-5C

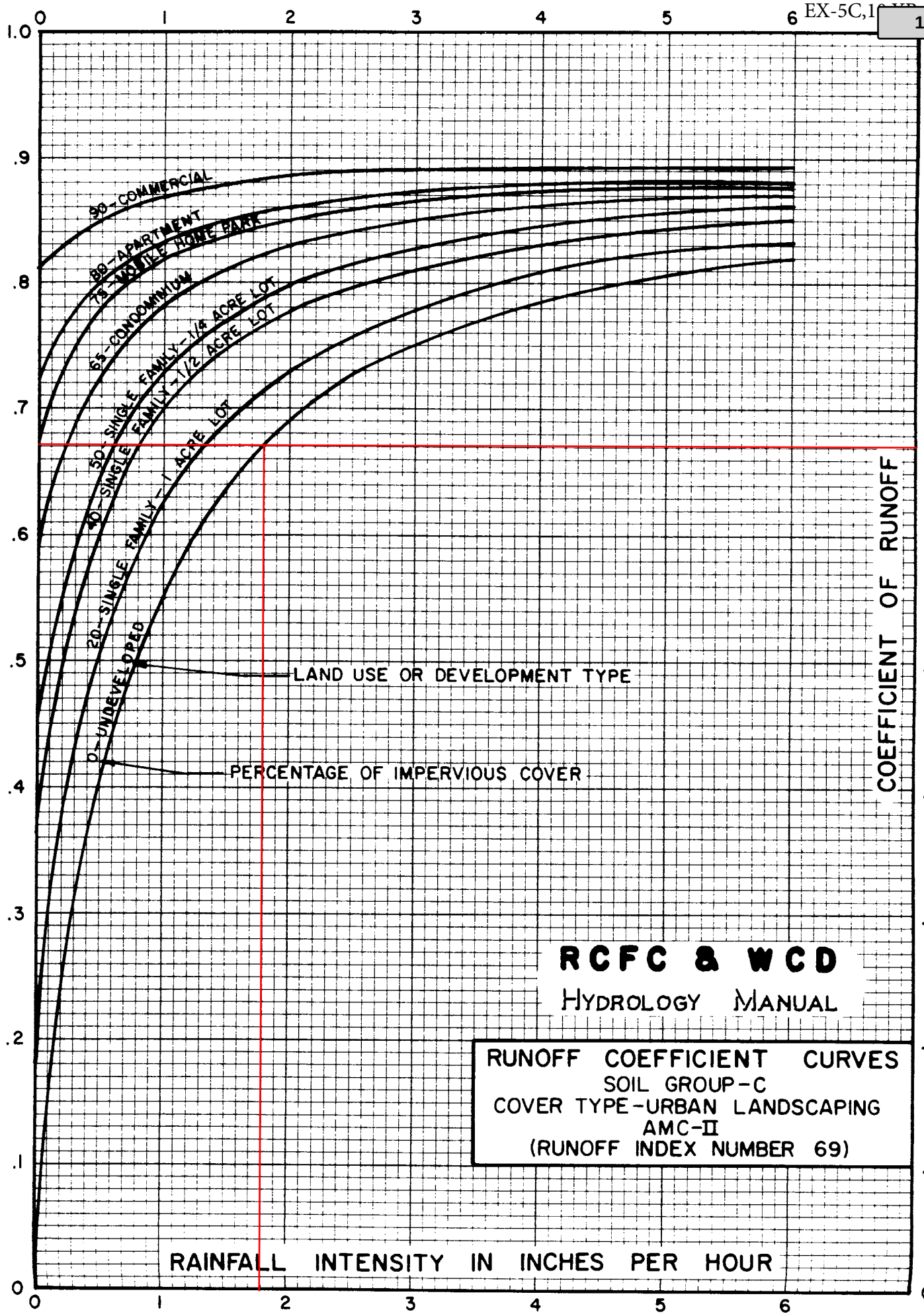
Interpolation:

12.50 mins = 1.80 in/ hr for 10 year event

12.50 mins = 2.63 in/ hr for 100 year event

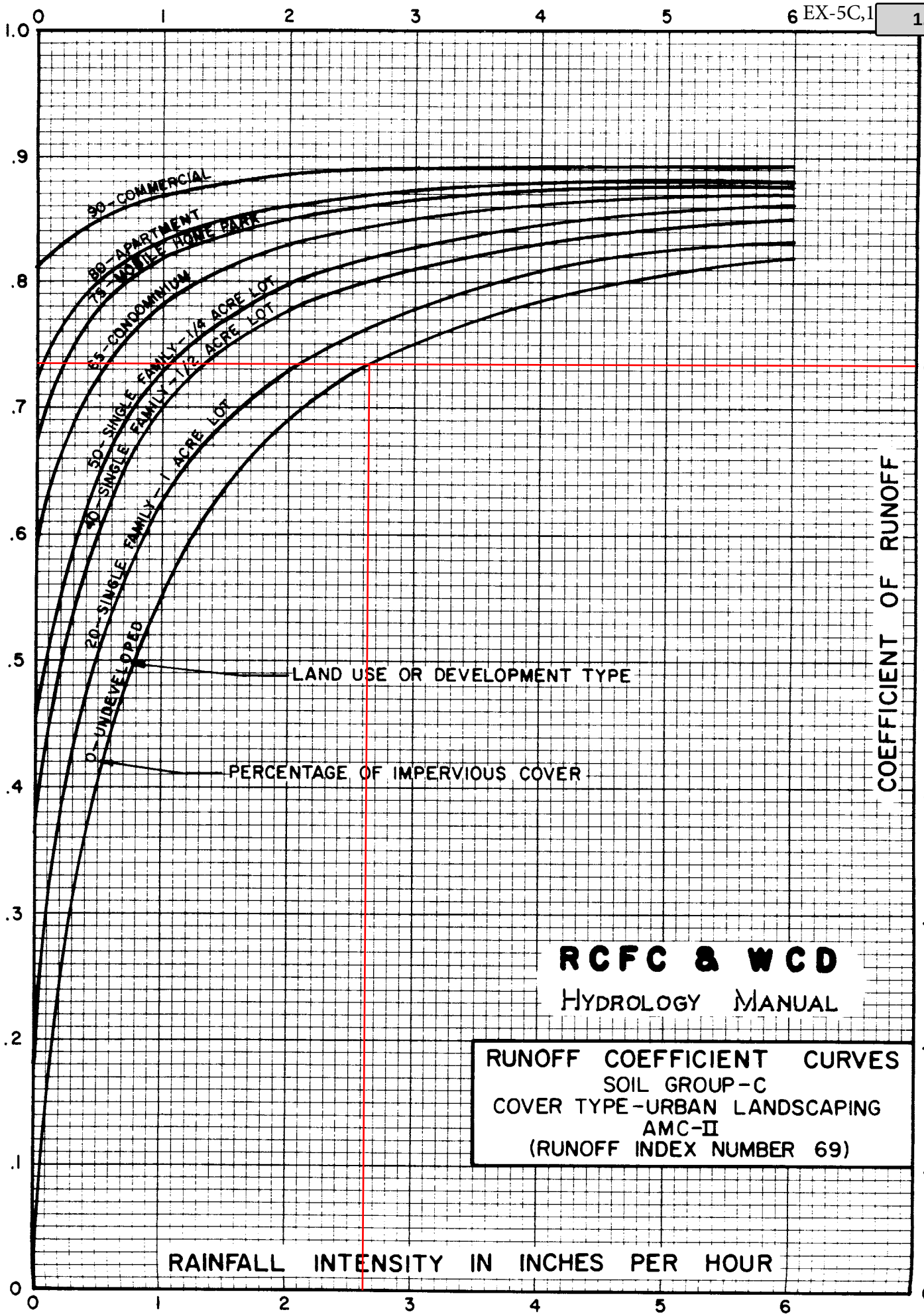
STANDARD INTENSITY – DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



C 67

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

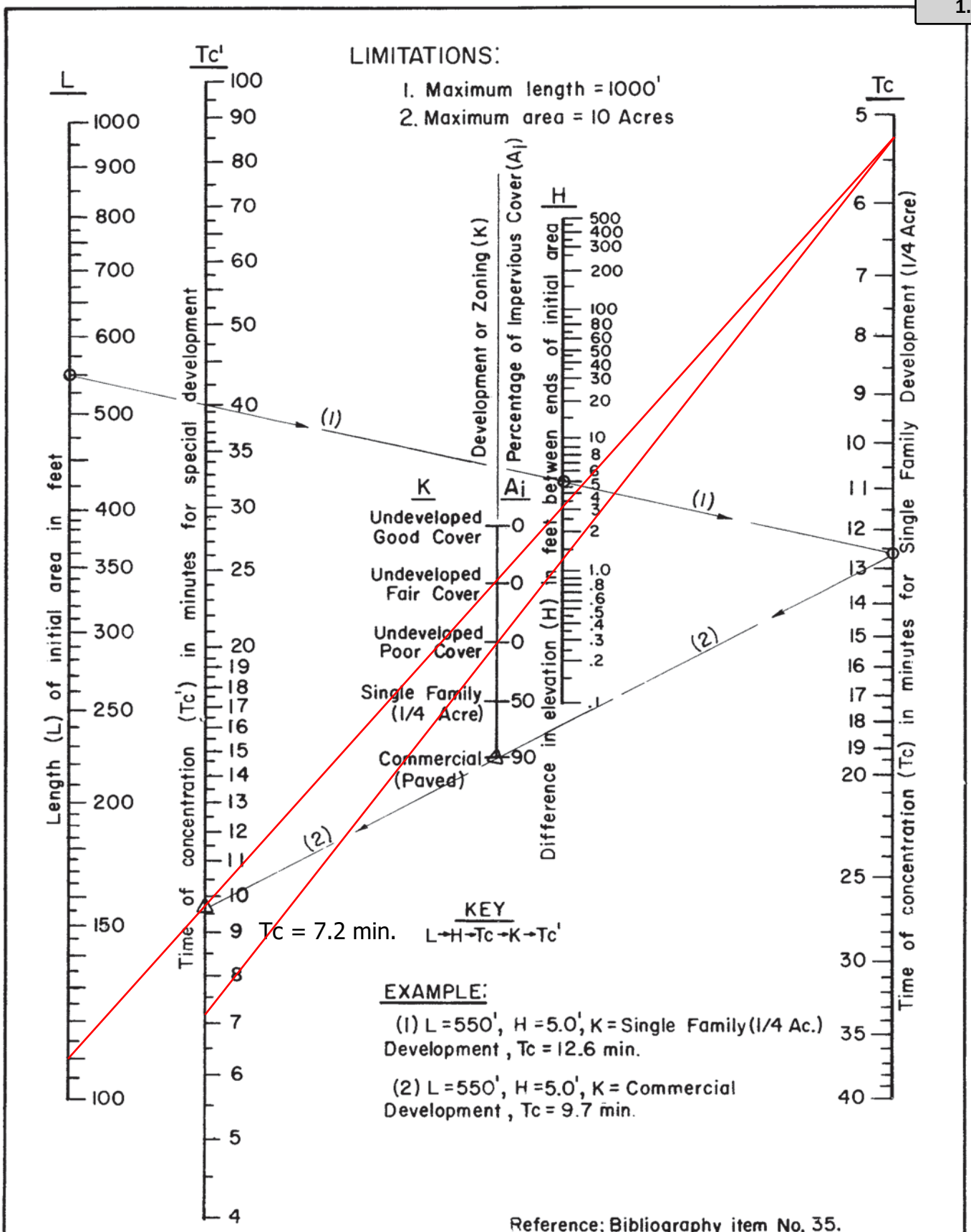


RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP - C
COVER TYPE - URBAN LANDSCAPING
AMC - II
(RUNOFF INDEX NUMBER 69)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

EX-5D

Interpolation:

7.2 mins = 2.37 in/ hr for 10 year event

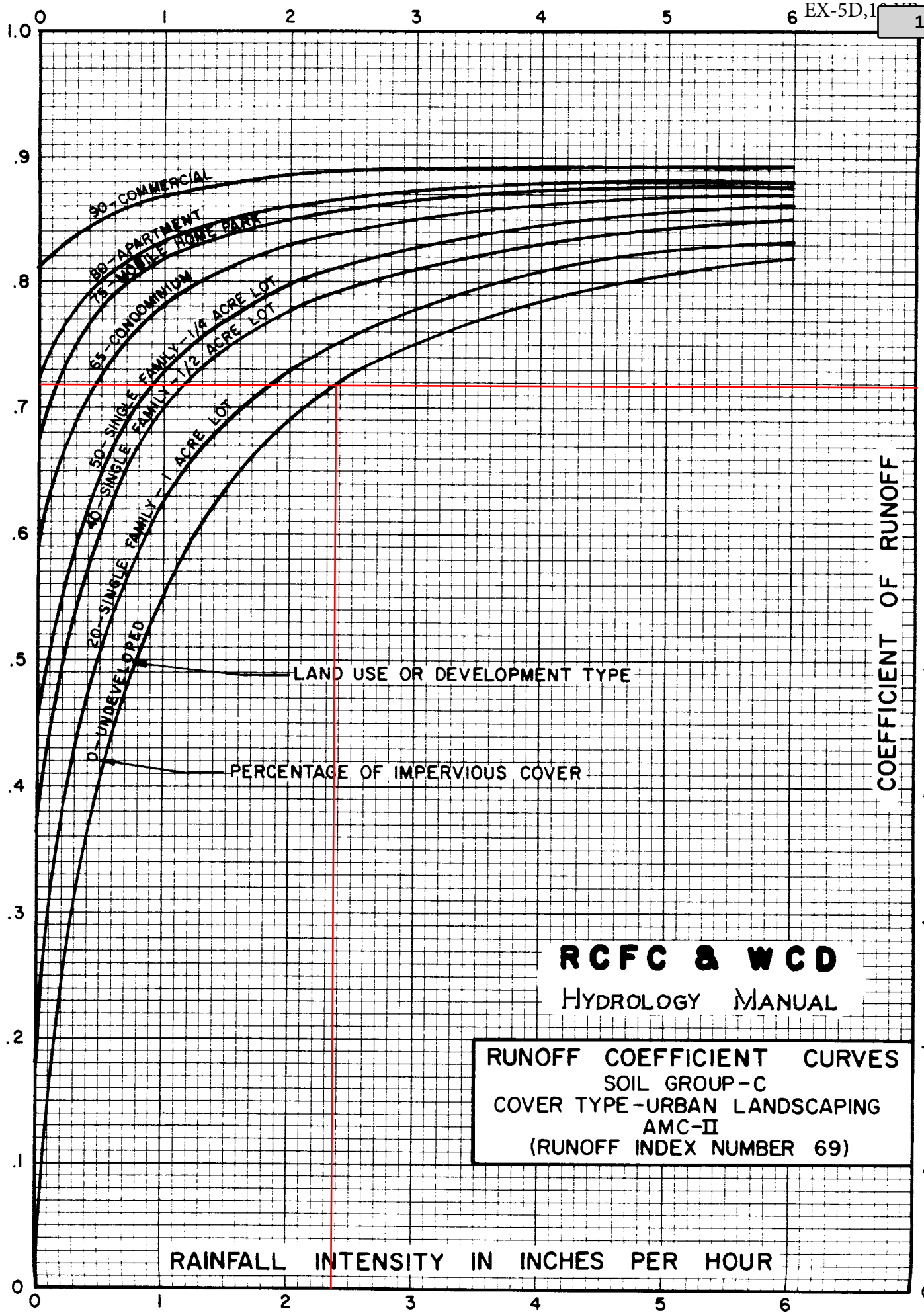
7.2 mins = 3.47 in/ hr for 100 year event

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

STANDARD INTENSITY—DURATION CURVES DATA

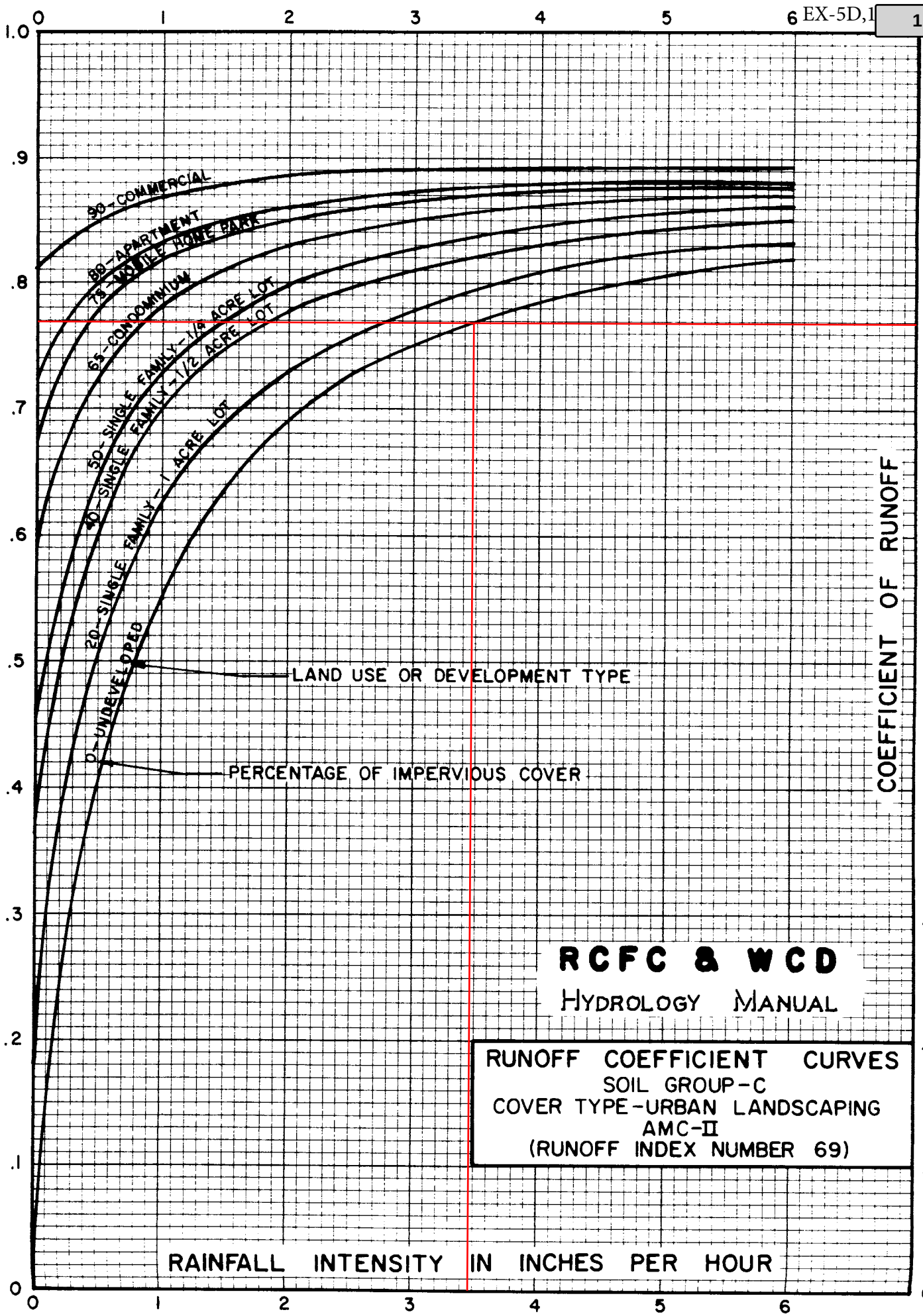
PLATE D-4.1 (6 of 6)



1.r

C 72

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



RCFC & WCD

HYDROLOGY MANUAL

RUNOFF COEFFICIENT CURVES
SOIL GROUP - C
COVER TYPE - URBAN LANDSCAPING
AMC - II
(RUNOFF INDEX NUMBER 69)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

EX-6

TIME OF CONCENTRATION CALCULATION
KINEMATIC WAVE EQUATION PER THE NATIONALRESOURCE CONSERVATION SERVICES

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

Where,

Tc = Time of concentration, Hr
L = Length of flow path in feet
S = Slope of flow FT/FT
P2 = Precipitation in inches
City of Moreno Valley requires, (10 Yr , 1 hr) & (100Yr, 1 hr), Frequency
n = Manning's number per Caltrans Table 816.6A

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

L =	79
S =	0.001
P10 Yr, 1 hr =	0.726
P100 Yr, 1 hr =	1.21
n =	0.15

Tc 10yr,1hr =	0.941	hr	=	56.46 mins
Tc 100 yr,1hr =	0.729	hr	=	43.74 mins

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

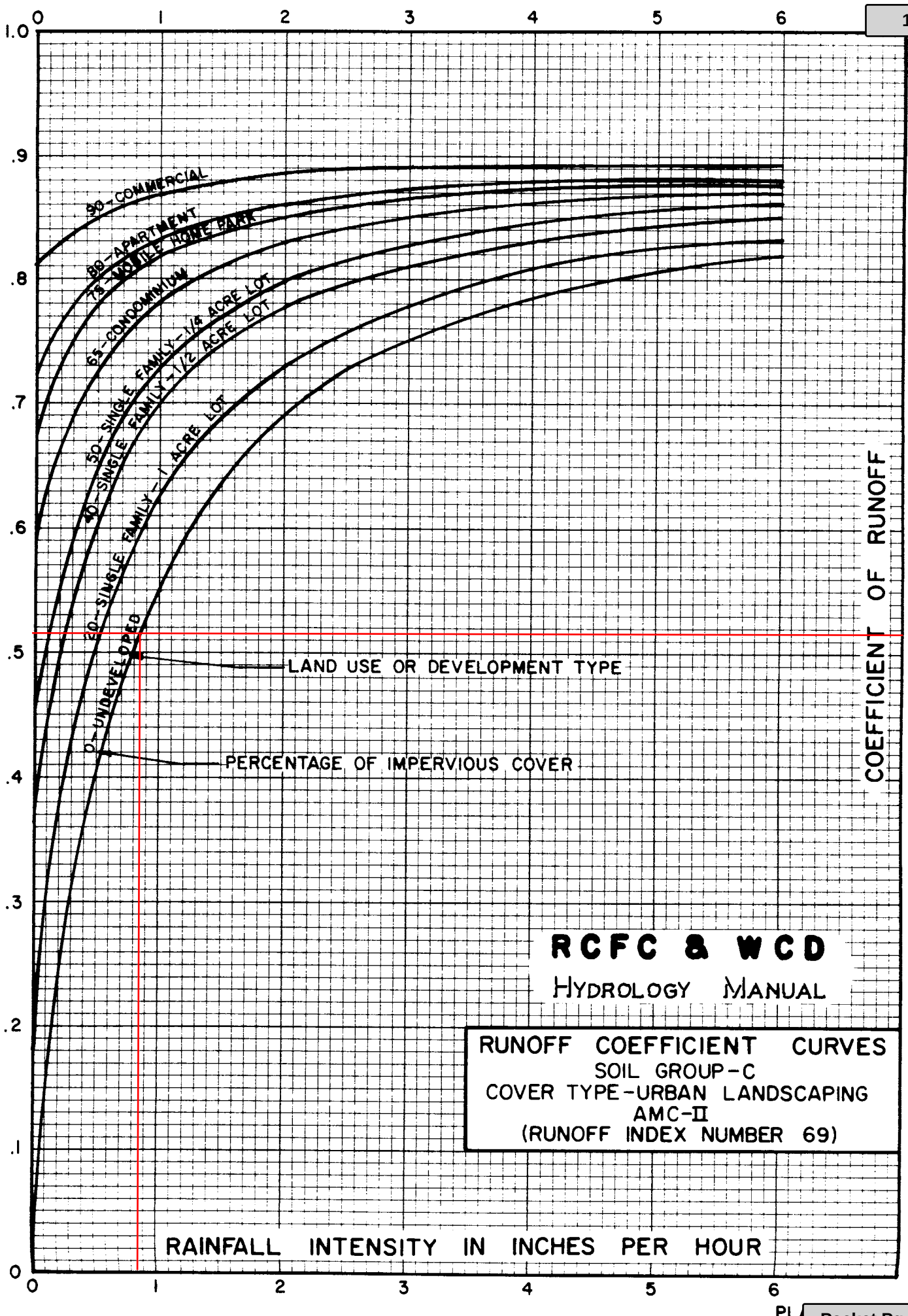
SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

10 yr = 0.85 in/hr
100 yr = 0.96 in/hr

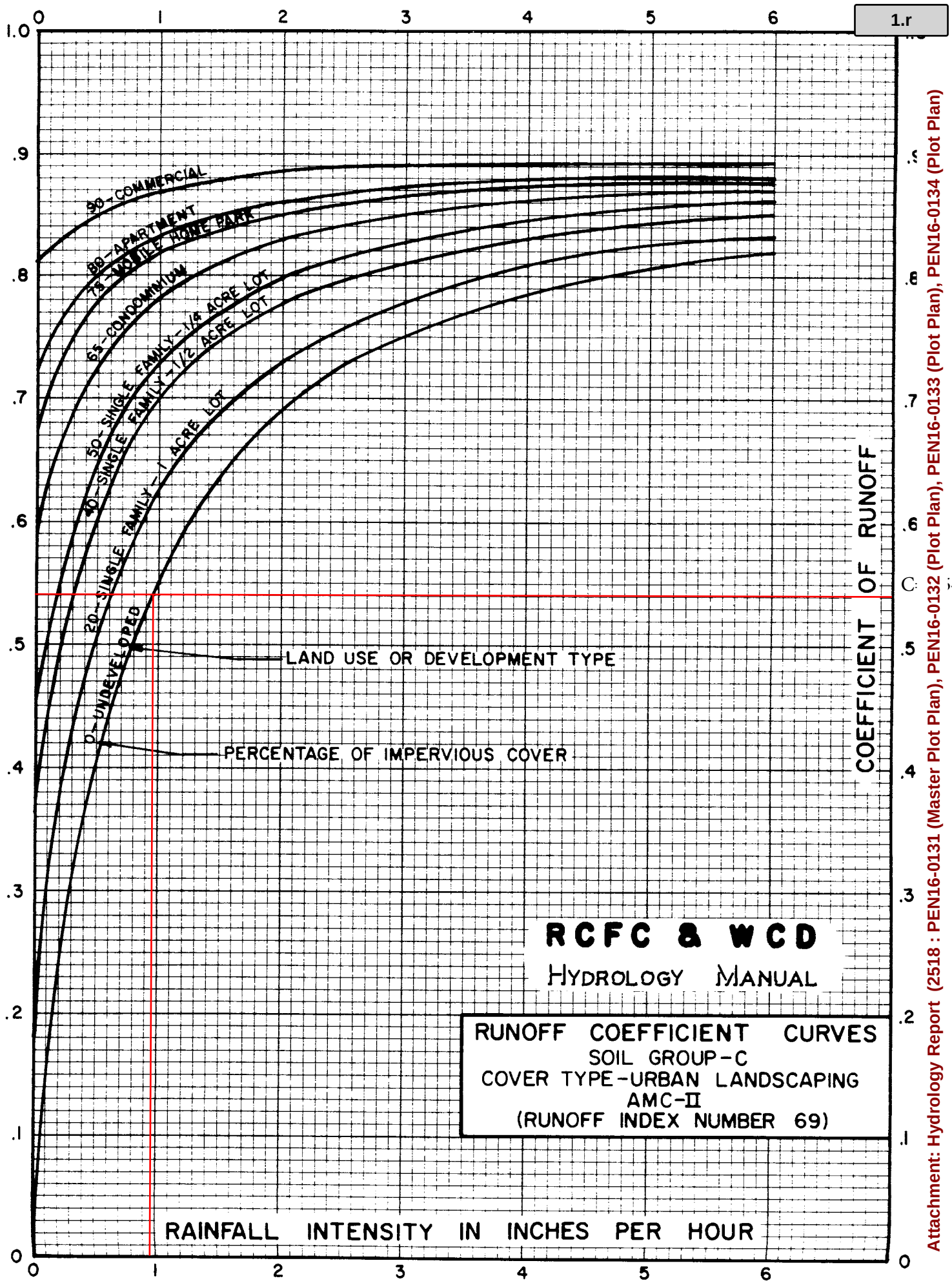
STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

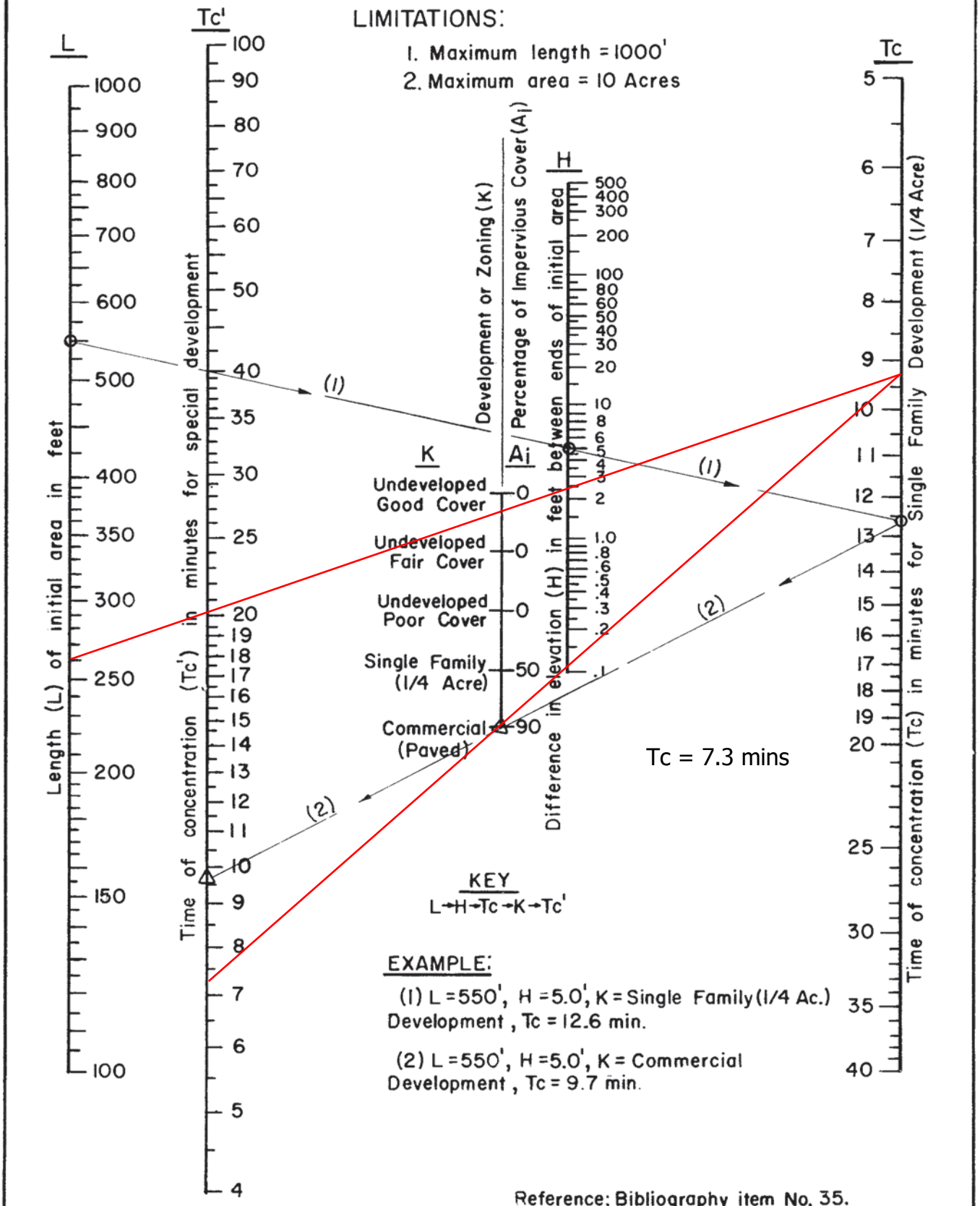


Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

PROPOSED HYDROLOGY

APPENDIX

F



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

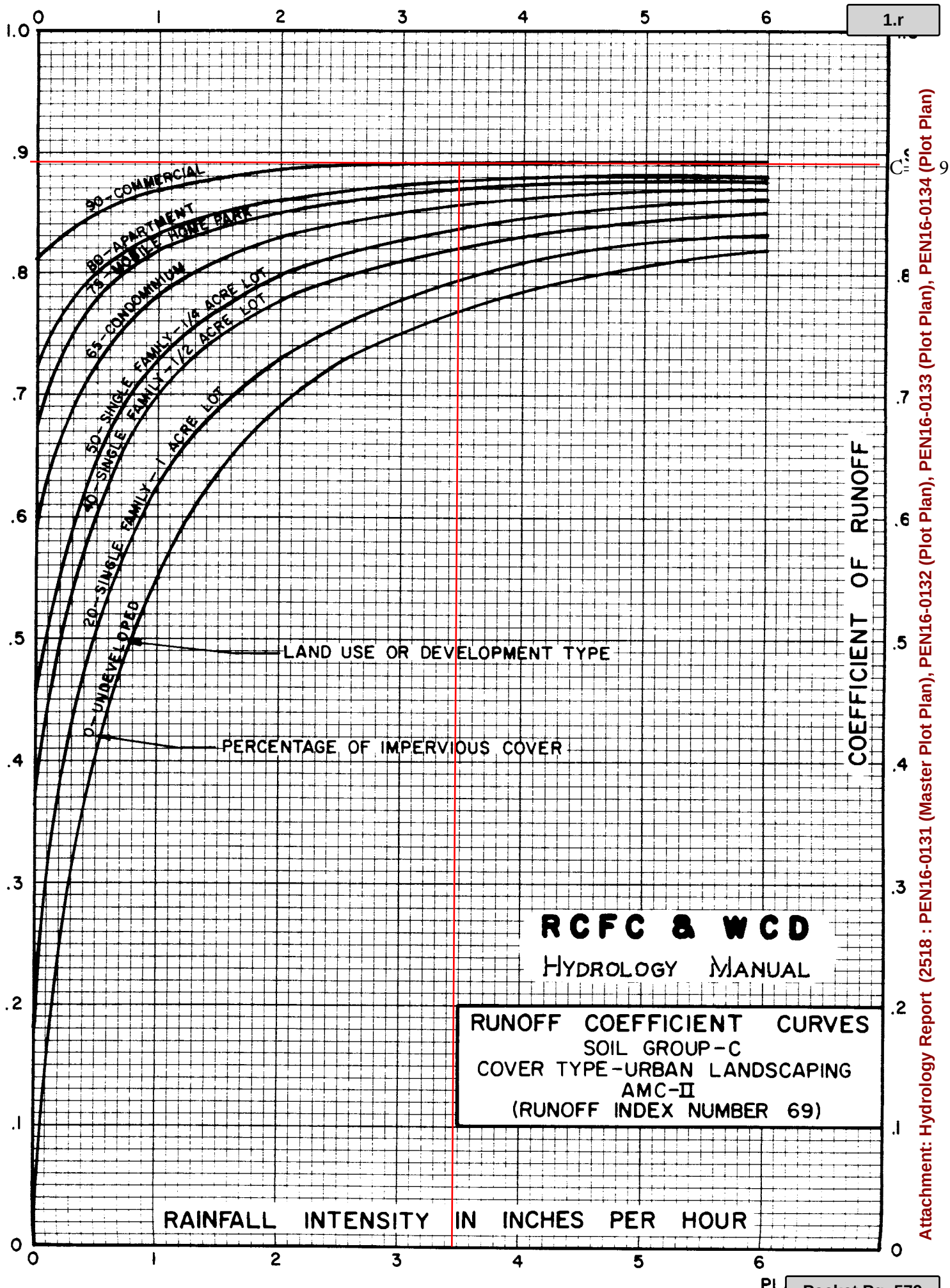
INTERPOLATED:
10 year = 2.3 in/hr
100 year = 3.44 in/hr

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

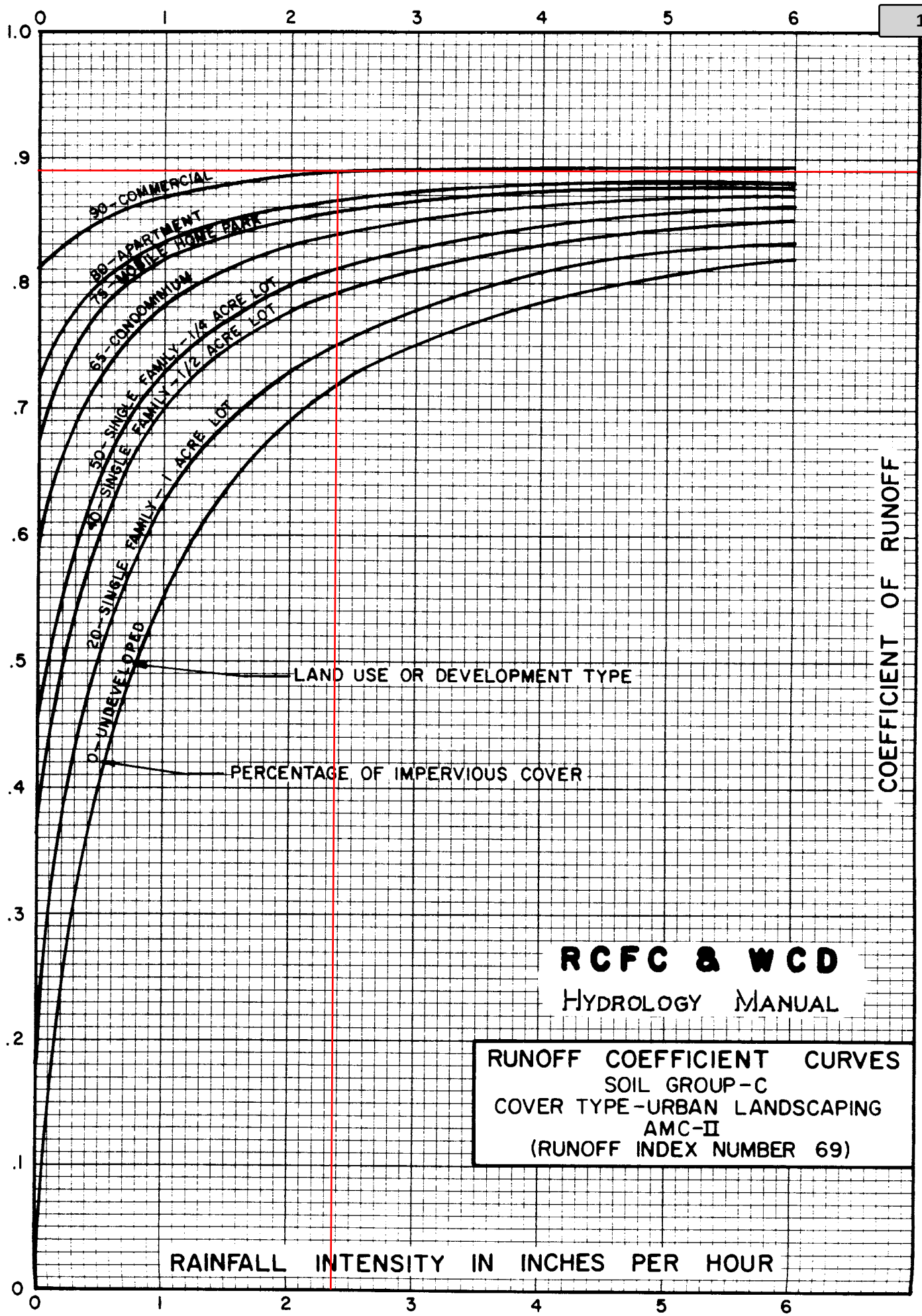
STANDARD
INTENSITY—DURATION
CURVES DATA

PLATE D-4.1 (6 of 6)

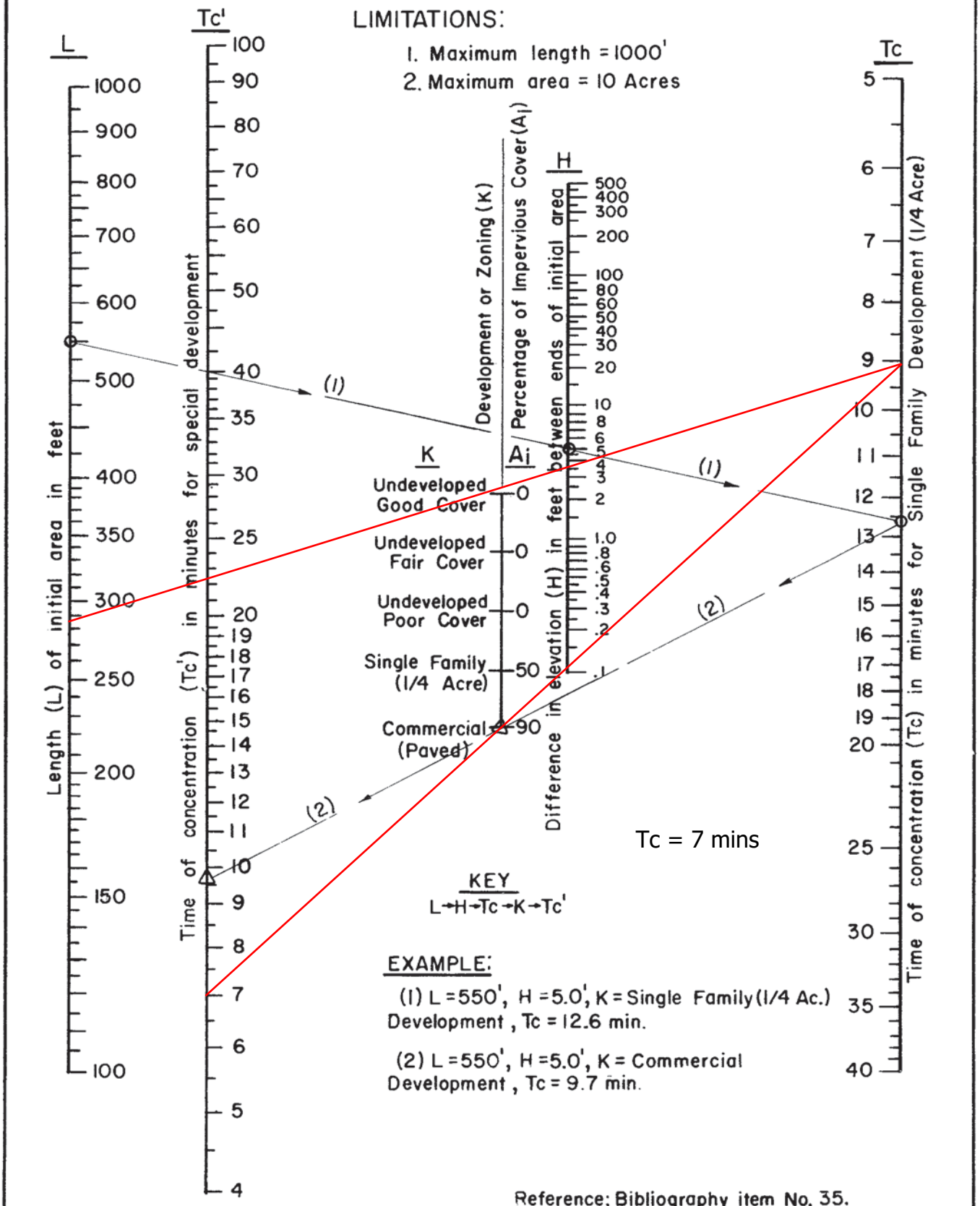
Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

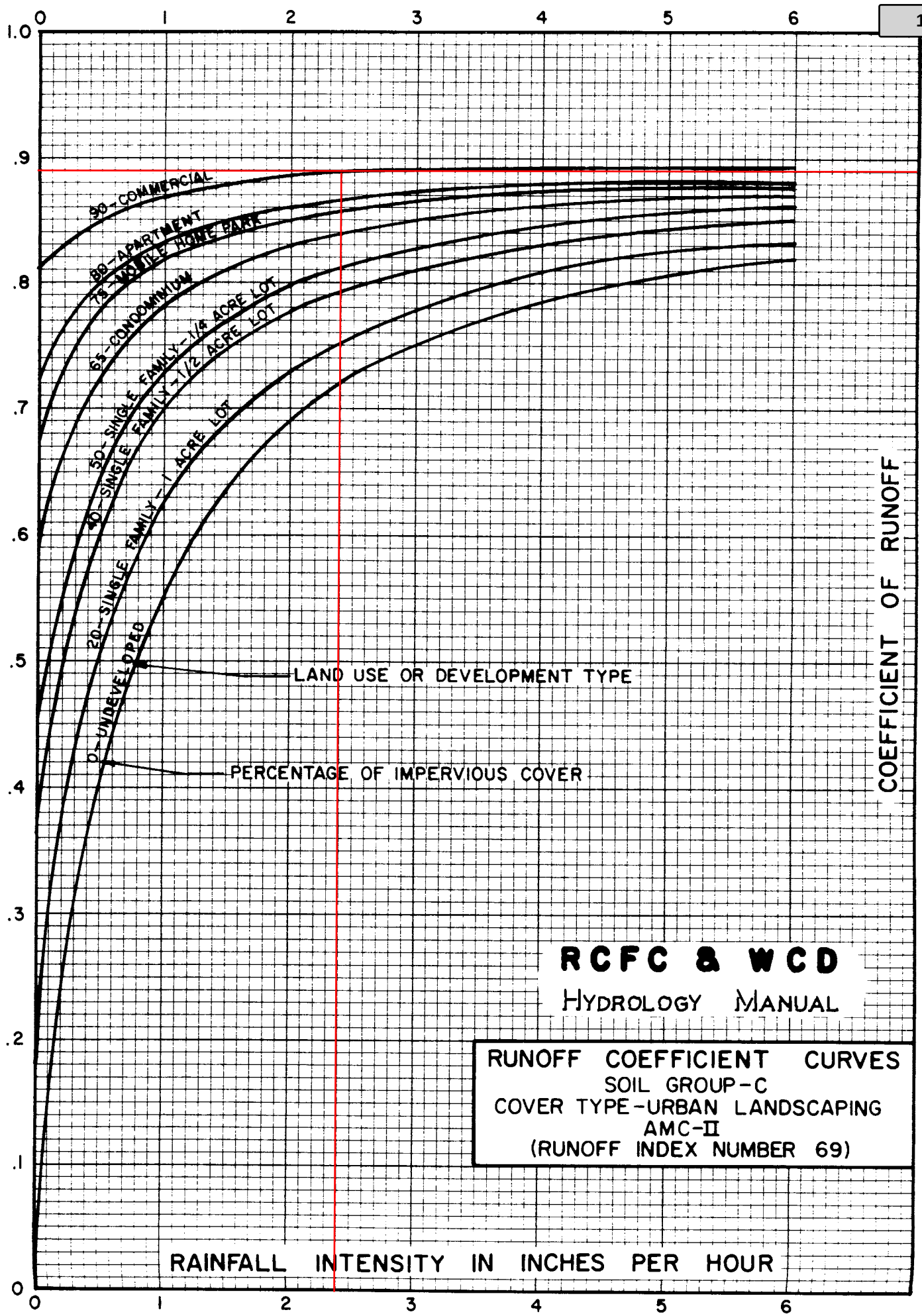
RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

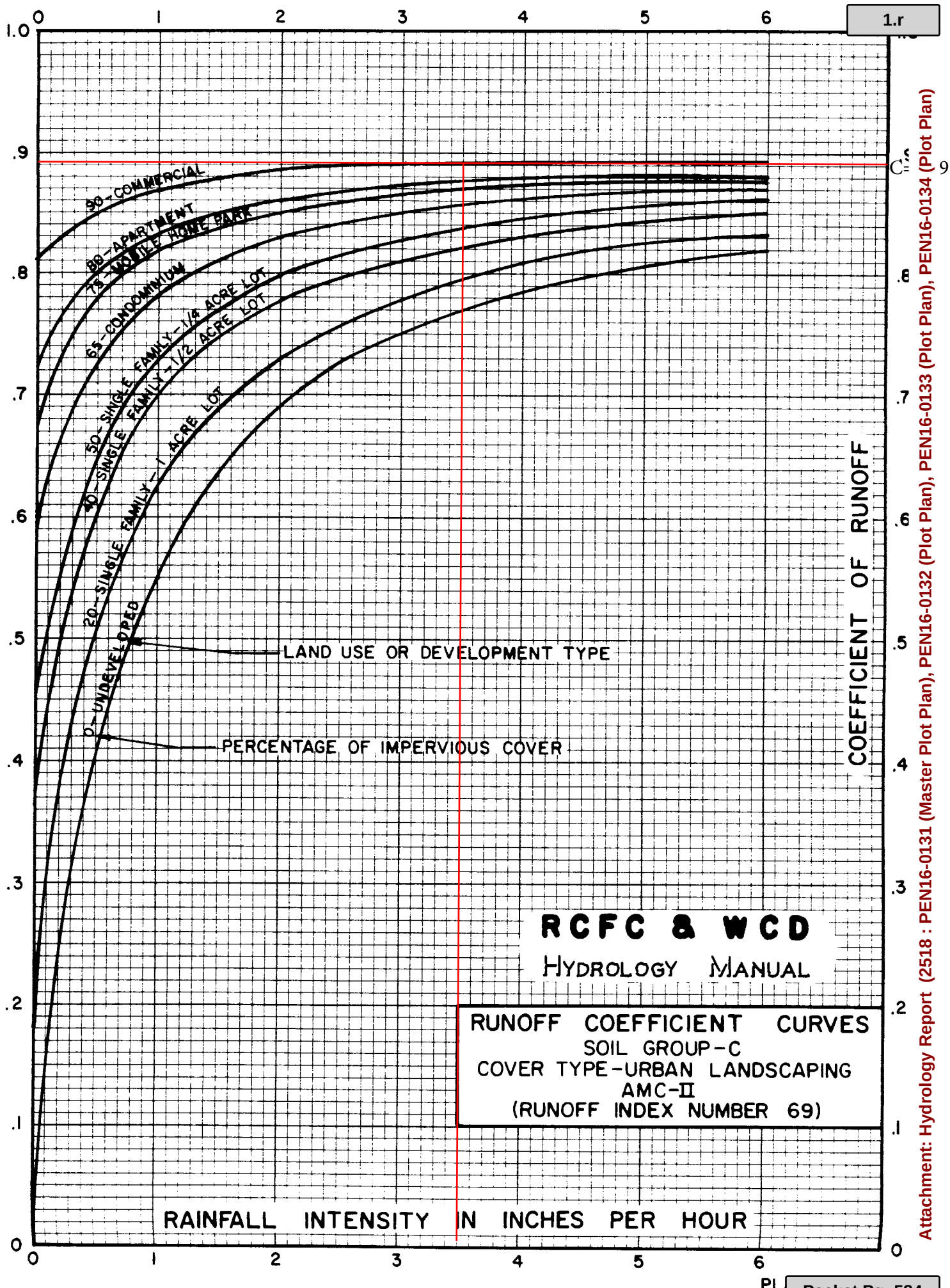
STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

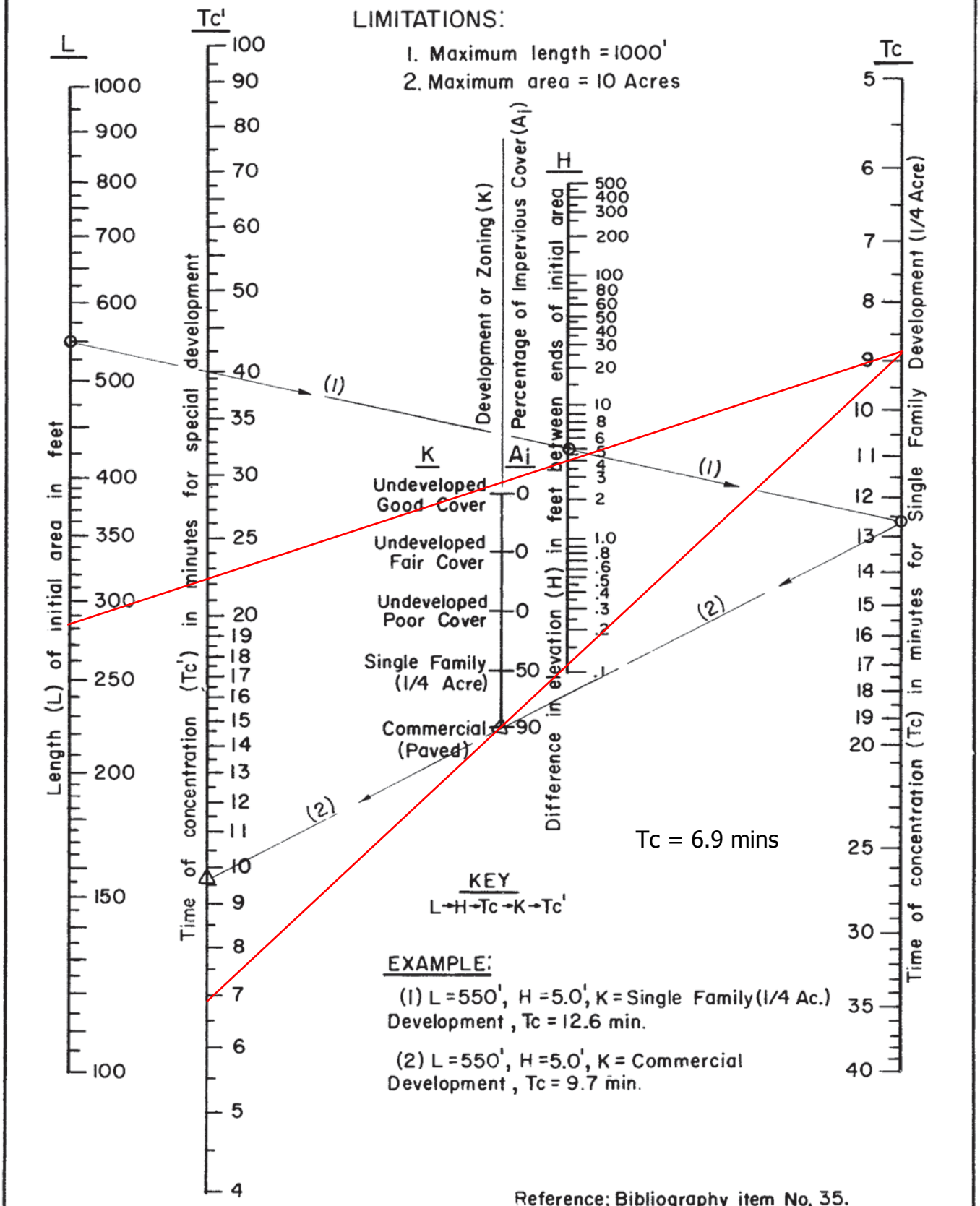
Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

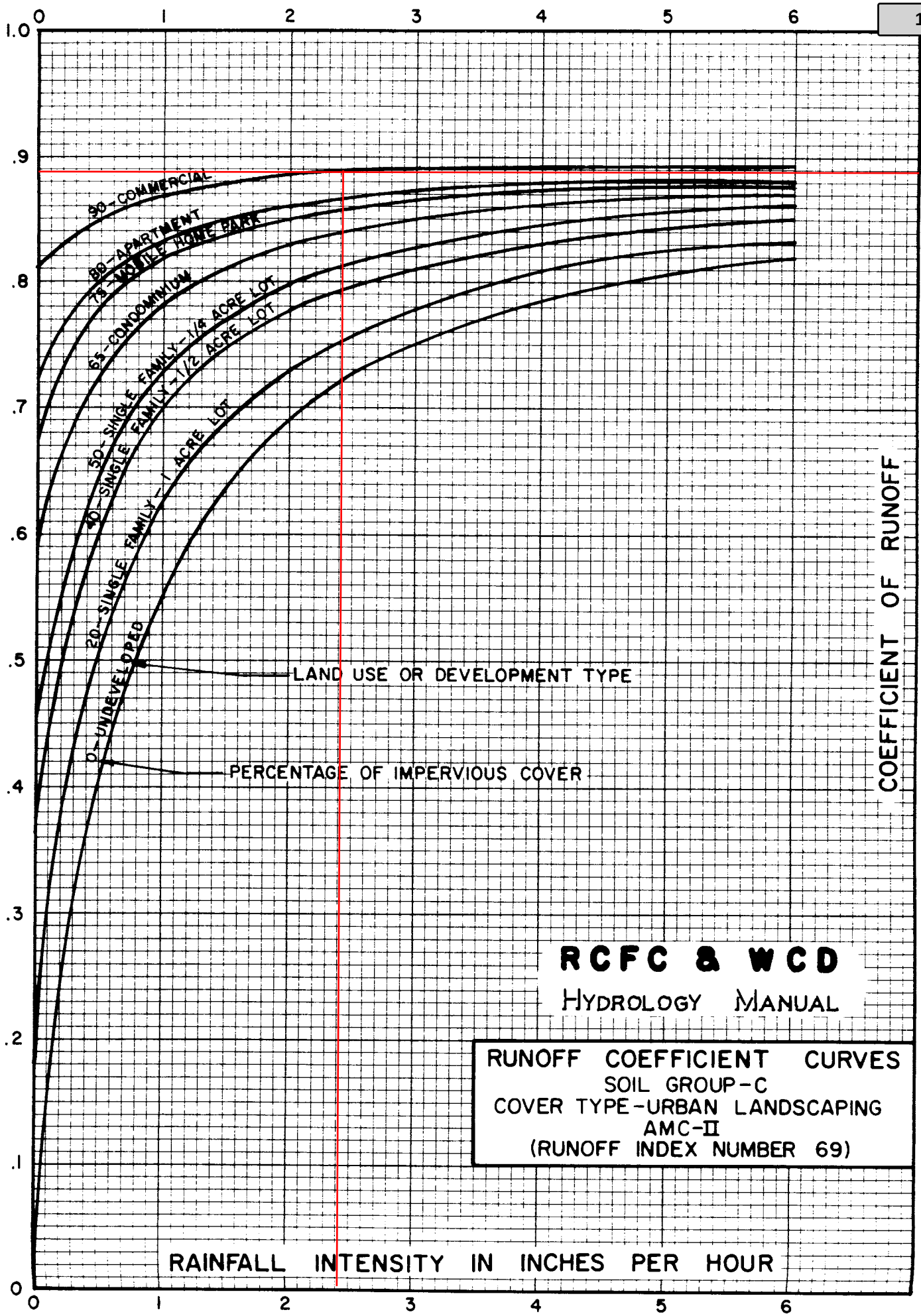
INTERPOLATED:
10 year event = 2.42in/hr
100 year event = 3.54in/hr

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

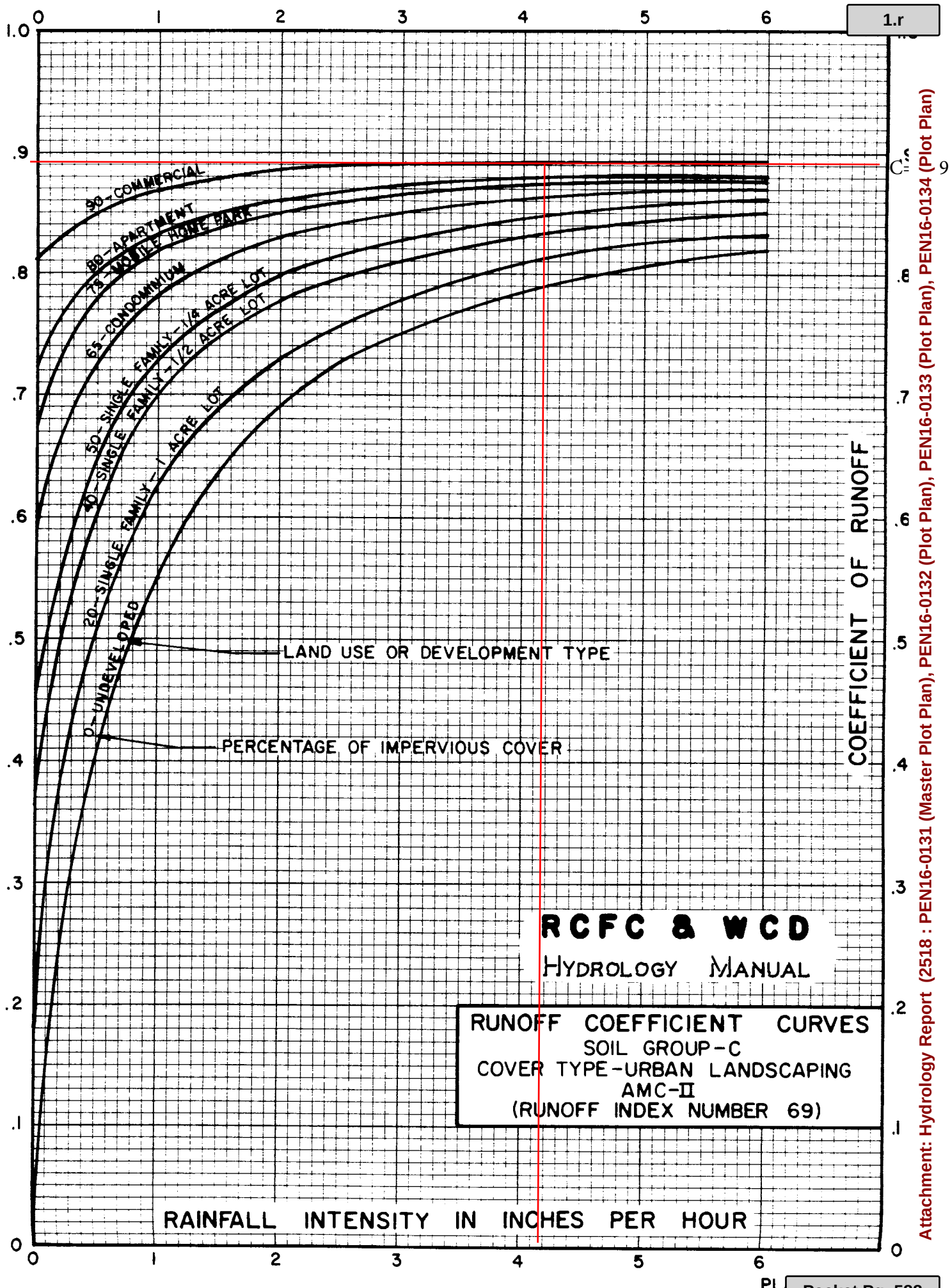
STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

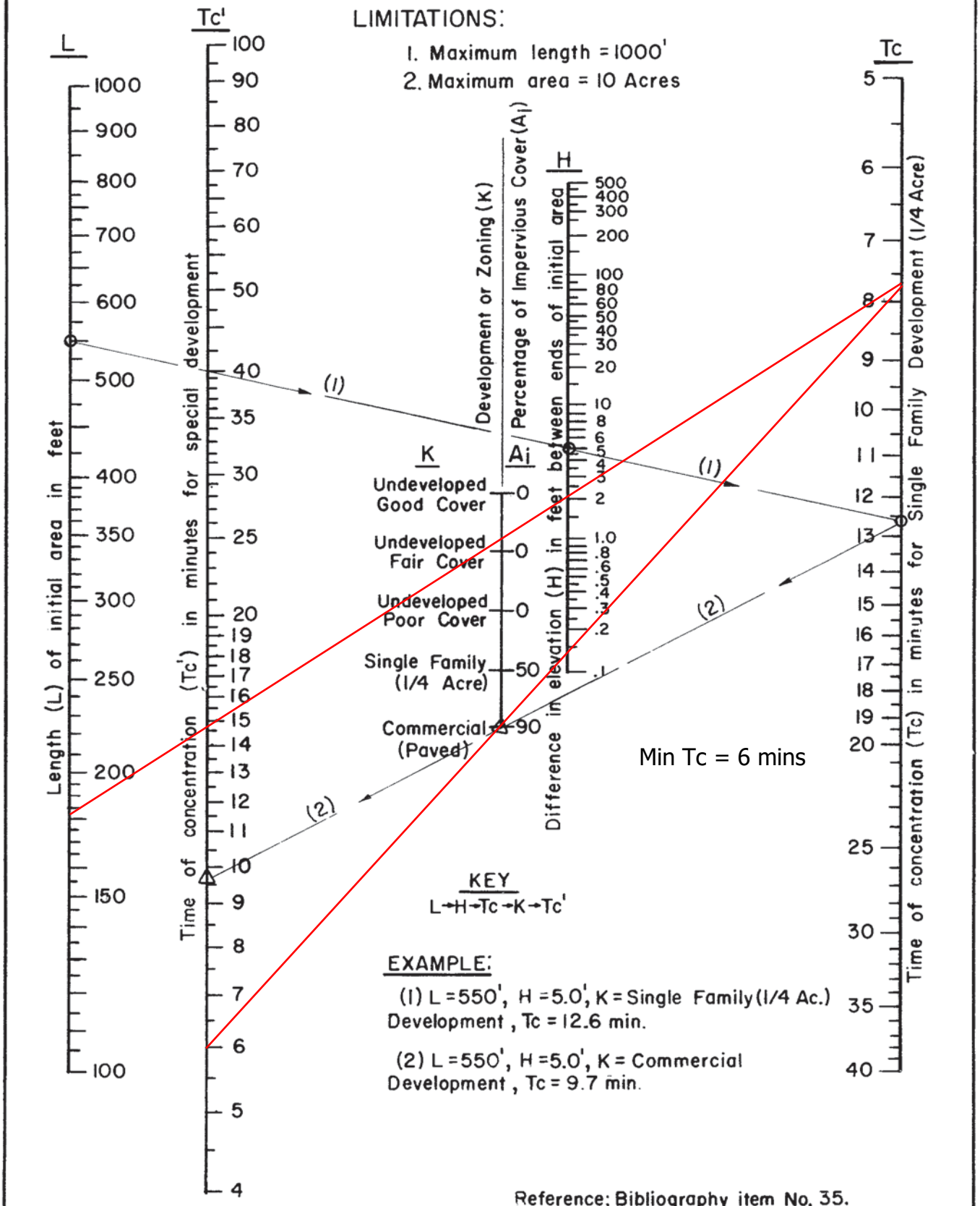
Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

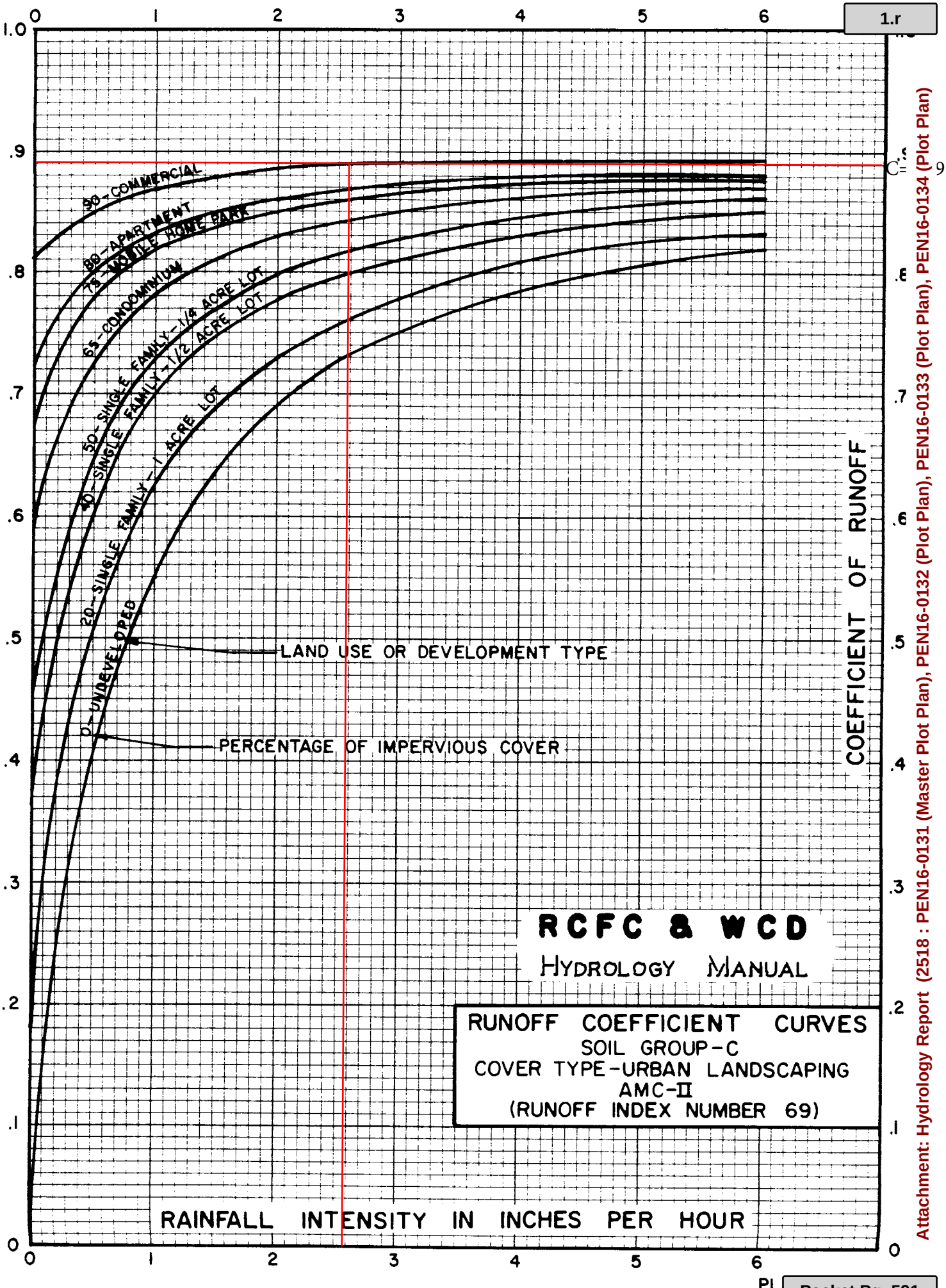
RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

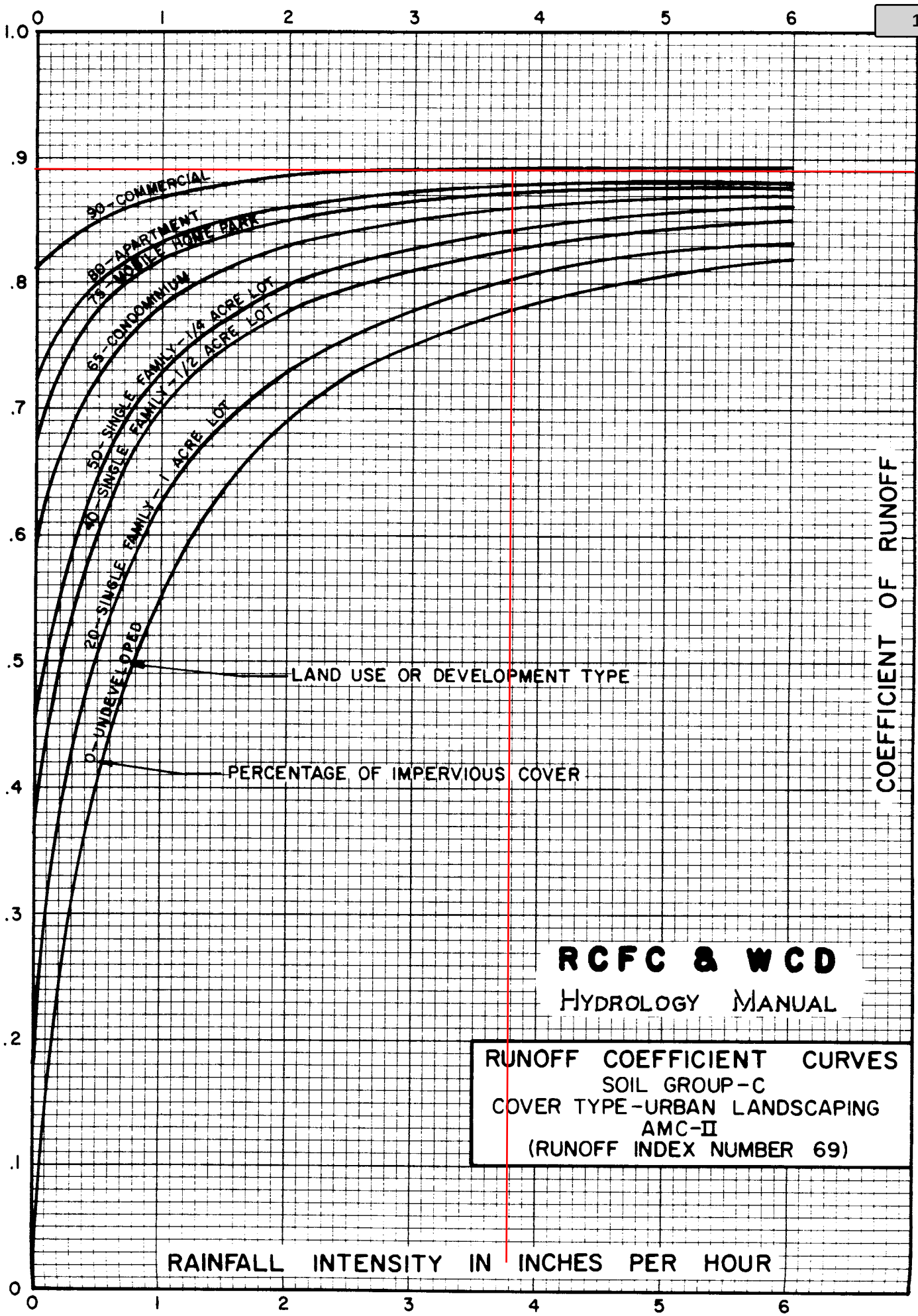
STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

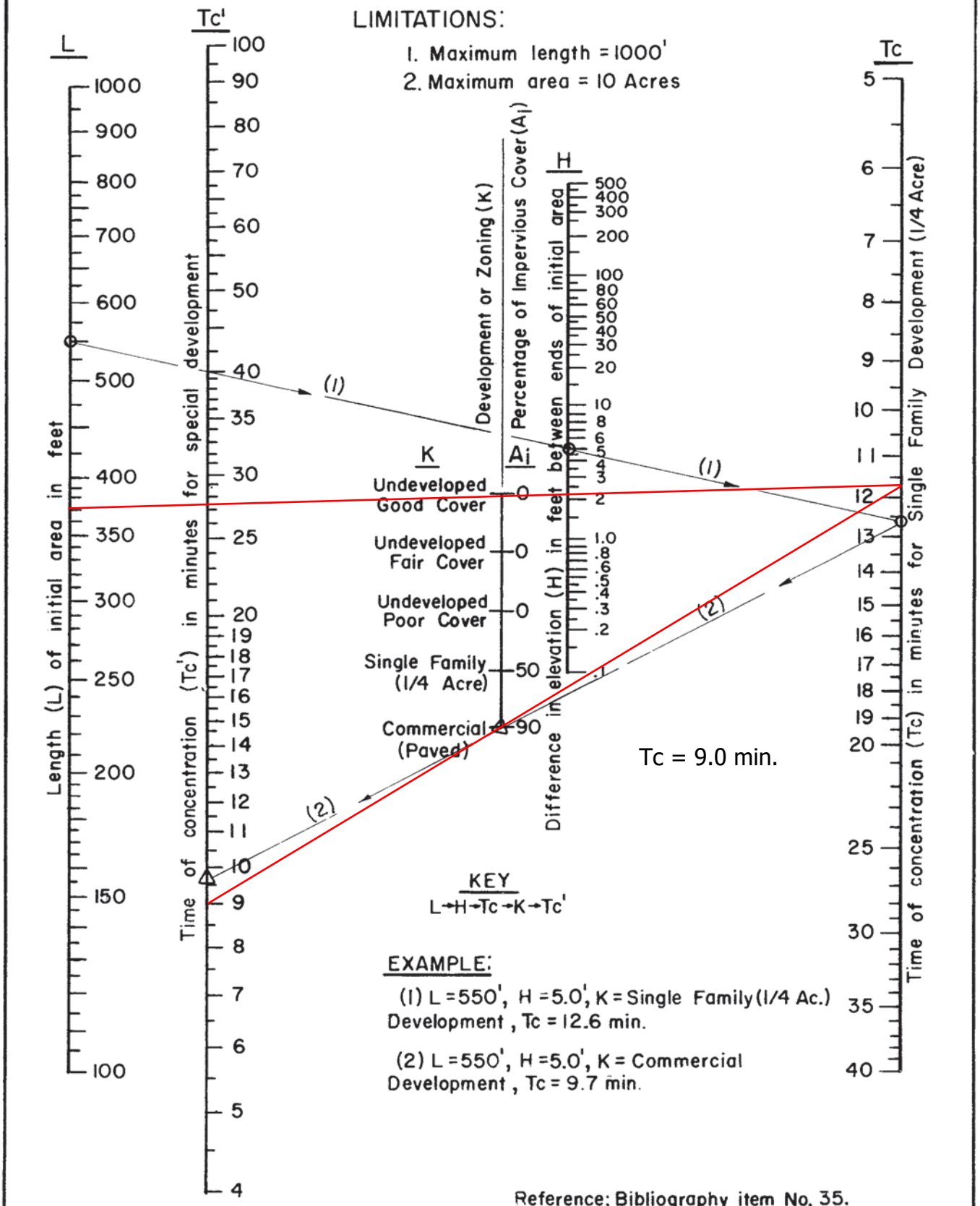
Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD

HYDROLOGY MANUAL

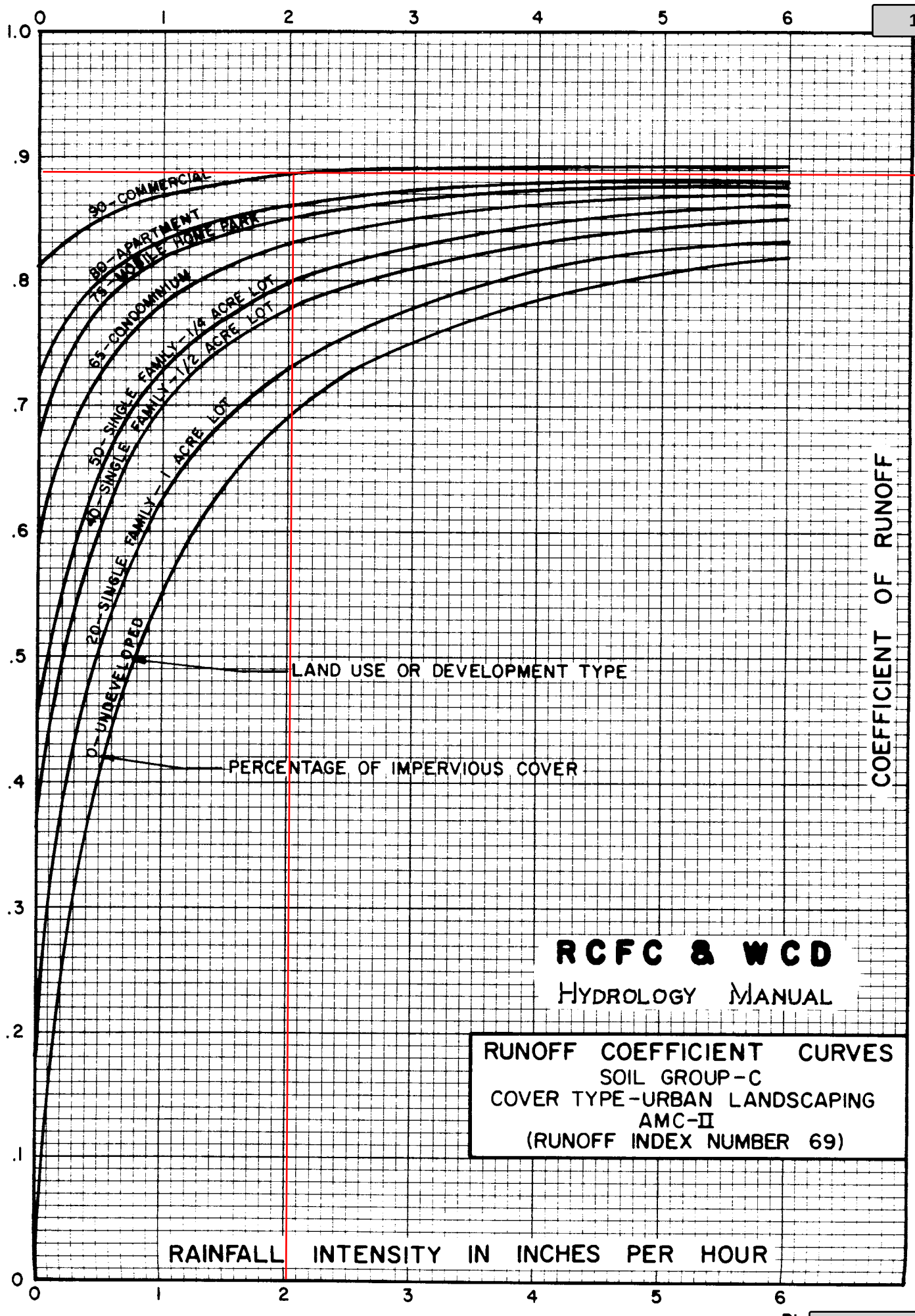
RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	FREQUENCY 100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

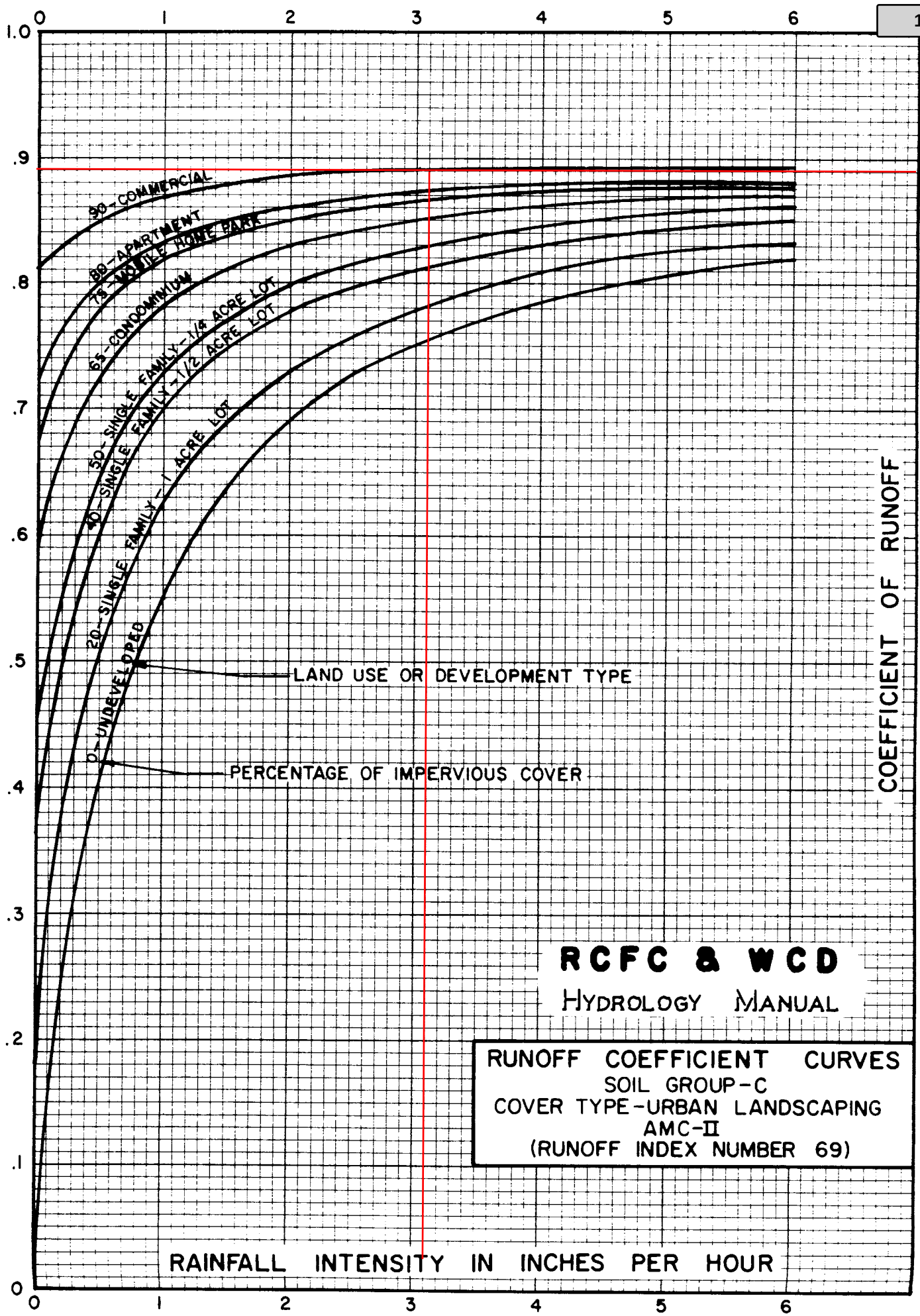
STANDARD INTENSITY-DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

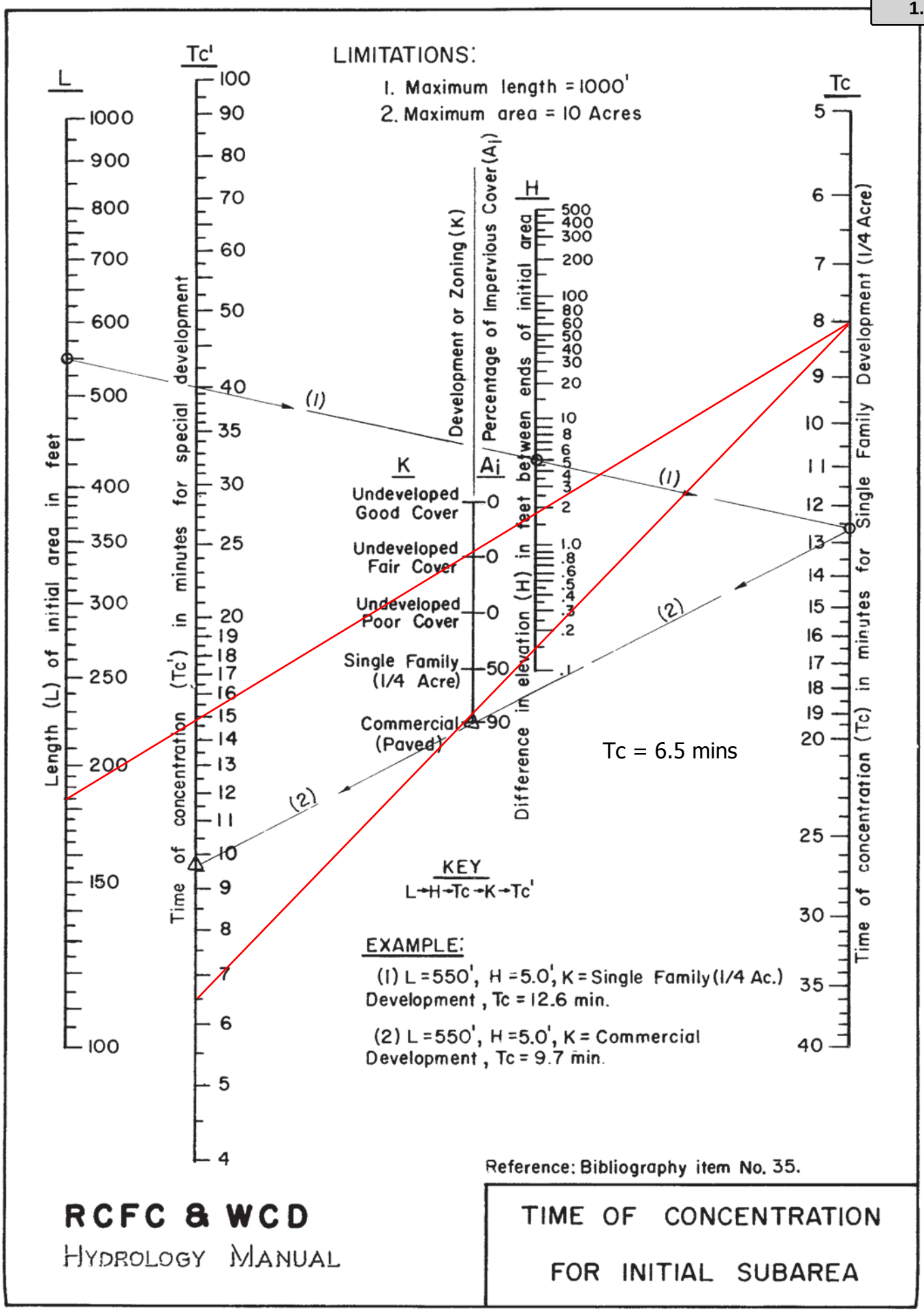
Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

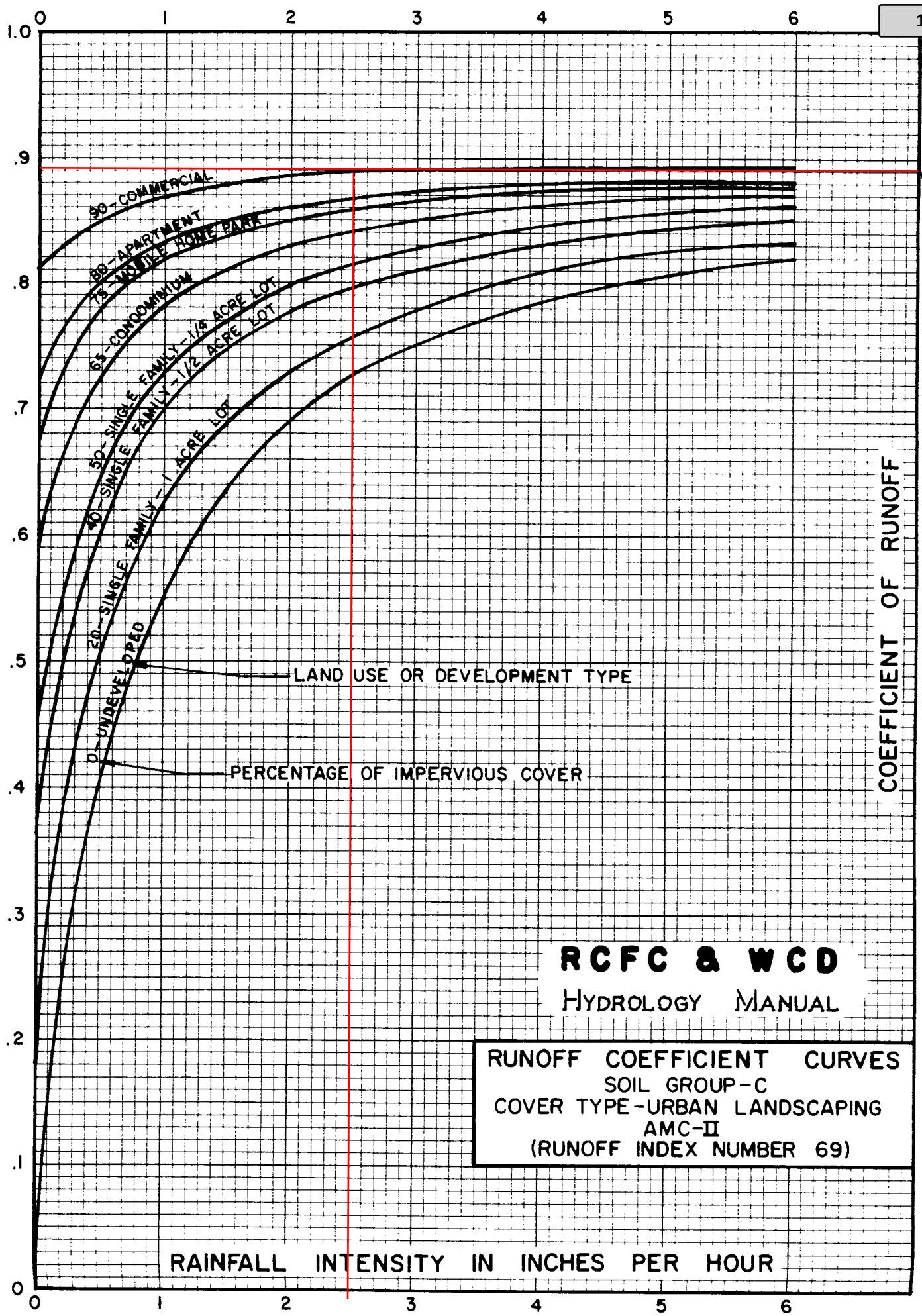
RAINFALL INTENSITY—INCHES PER HOUR

INTERPOLATED:
10 year event = 2.5 in/hr
100 year event = 3.65 in/hr

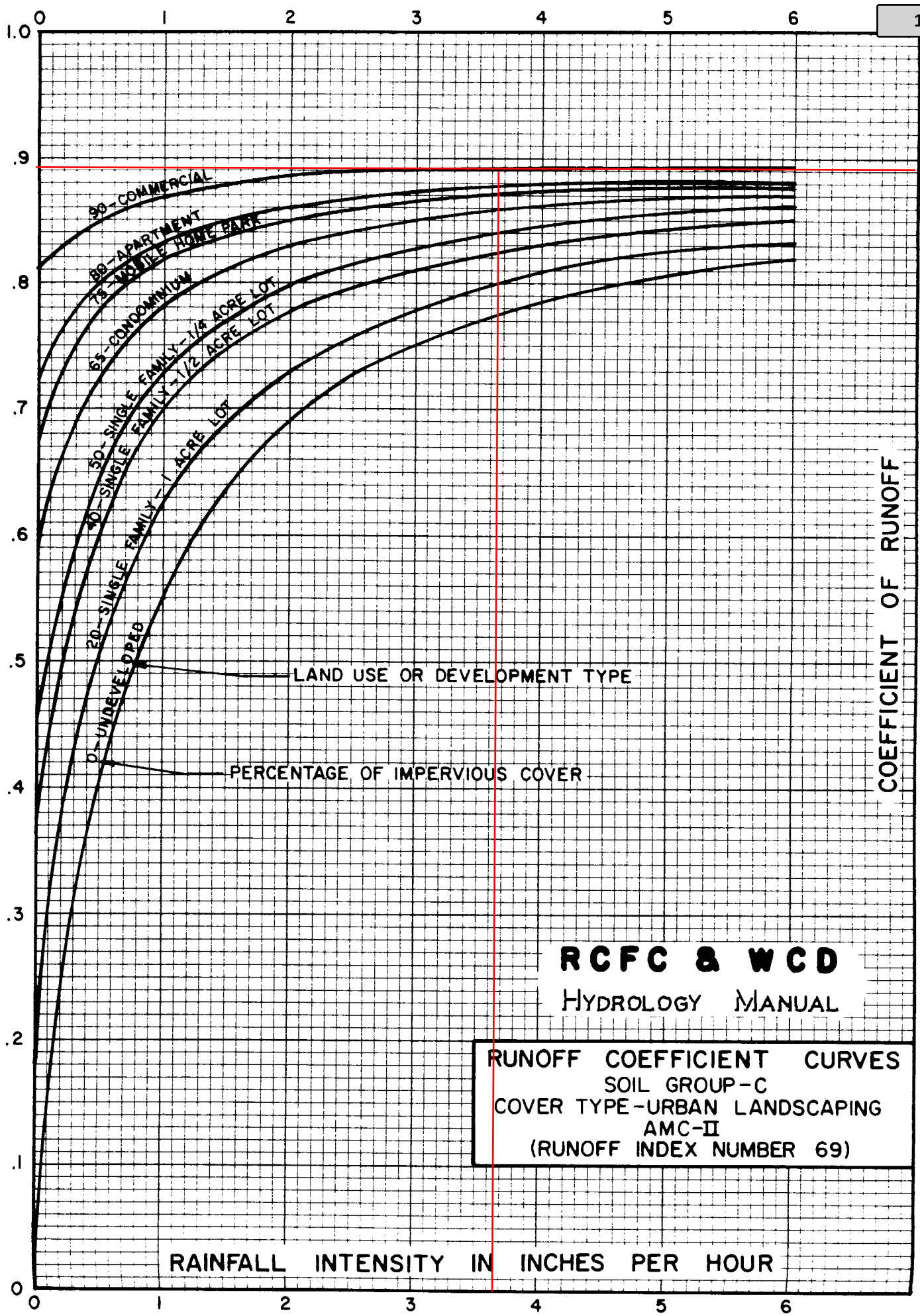
SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

STANDARD
INTENSITY—DURATION
CURVES DATA

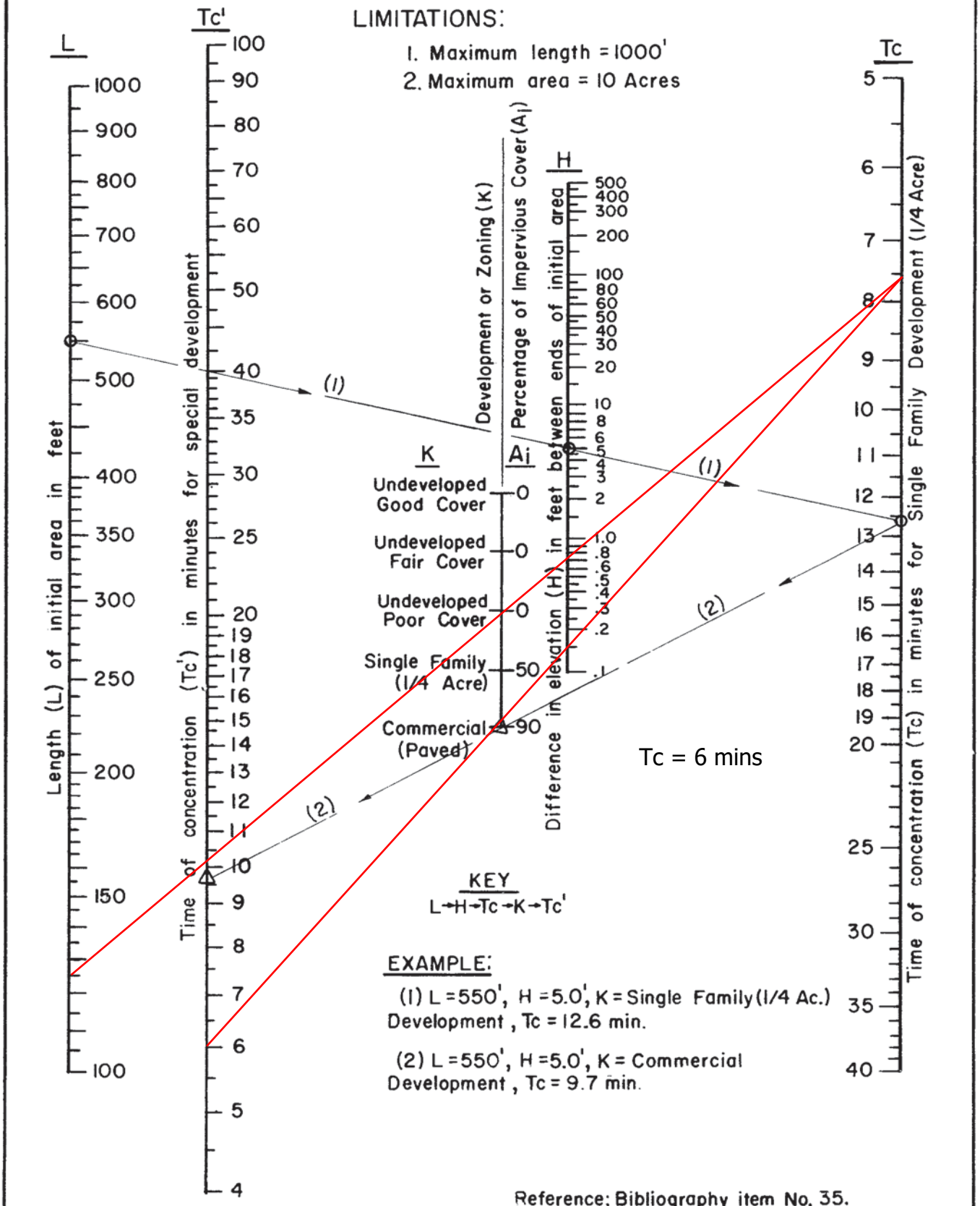
PLATE D-4.1 (6 of 6)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

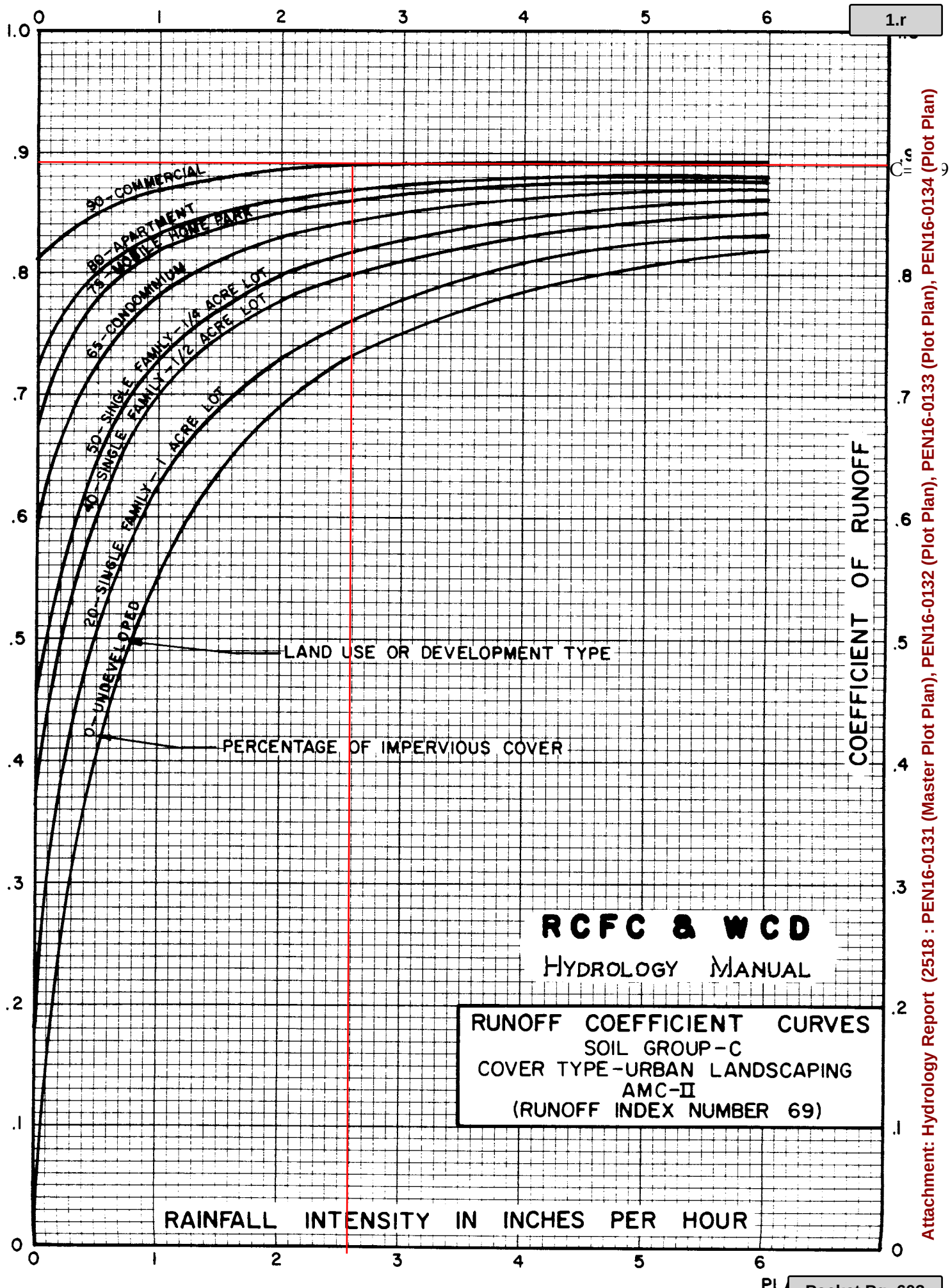
INTERPOLATED:
10 year event = 2.59 in/hr
100 year event = 3.79 in/hr

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

STANDARD
INTENSITY—DURATION
CURVES DATA

PLATE D-4.1 (6 of 6)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



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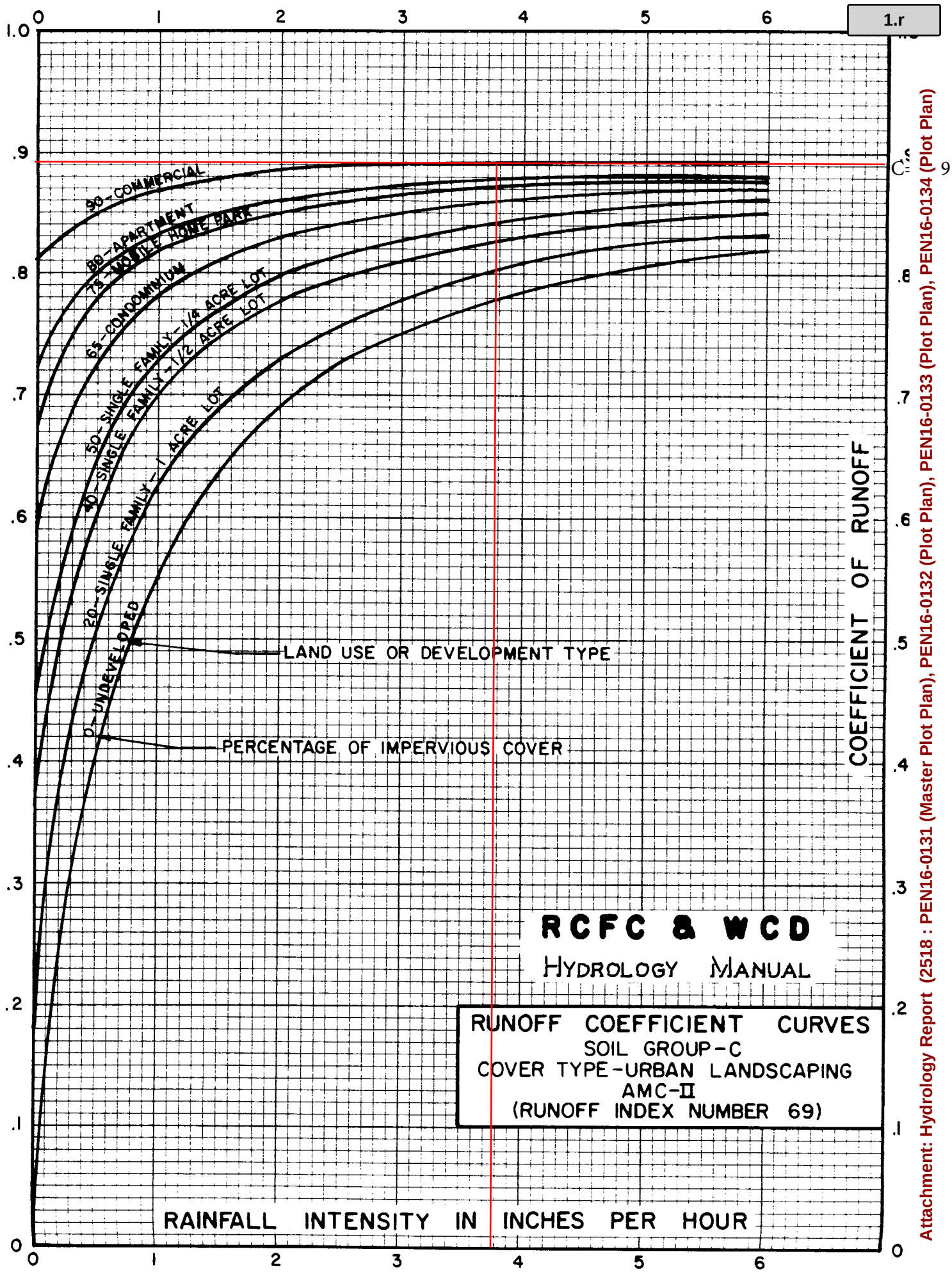
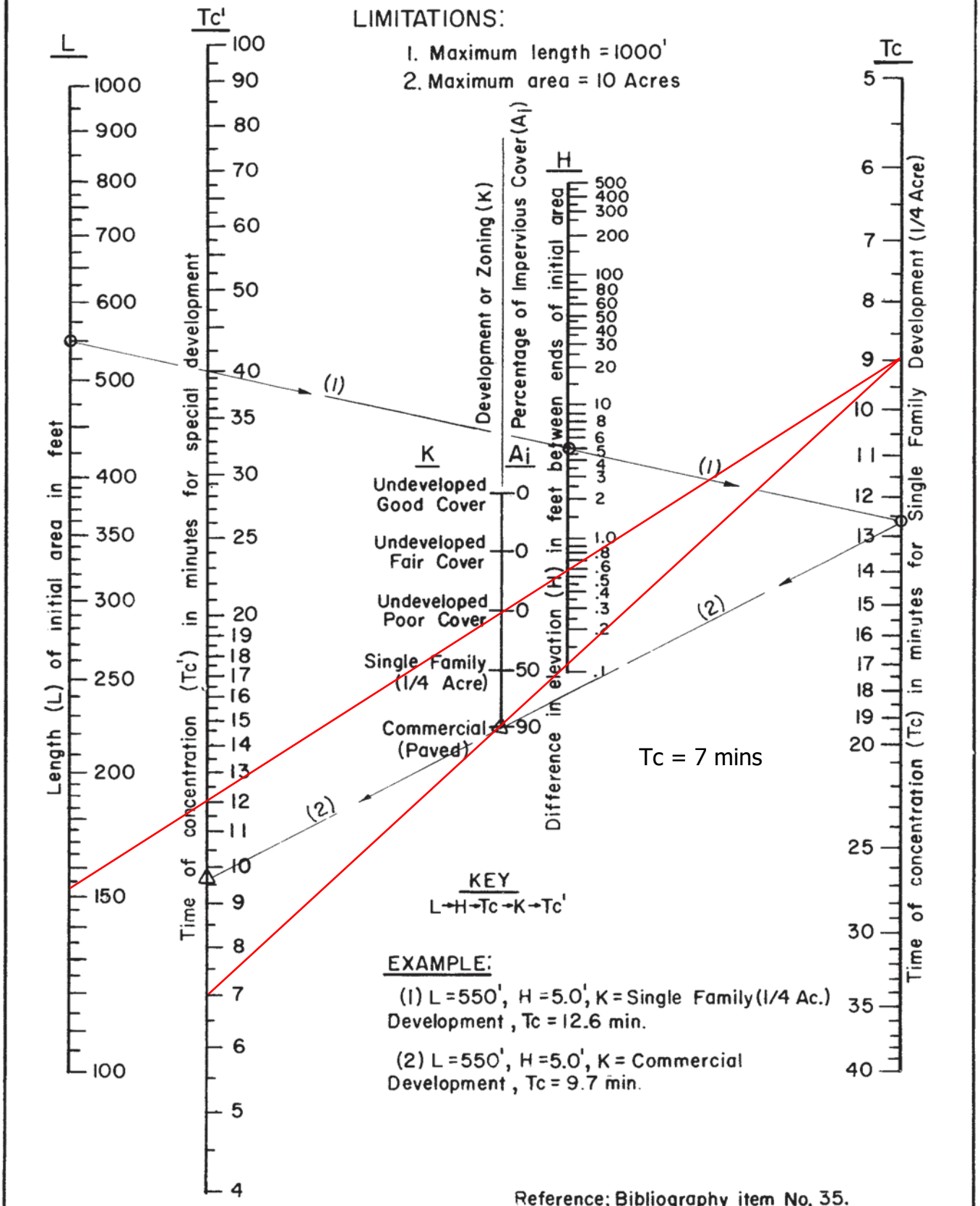


Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

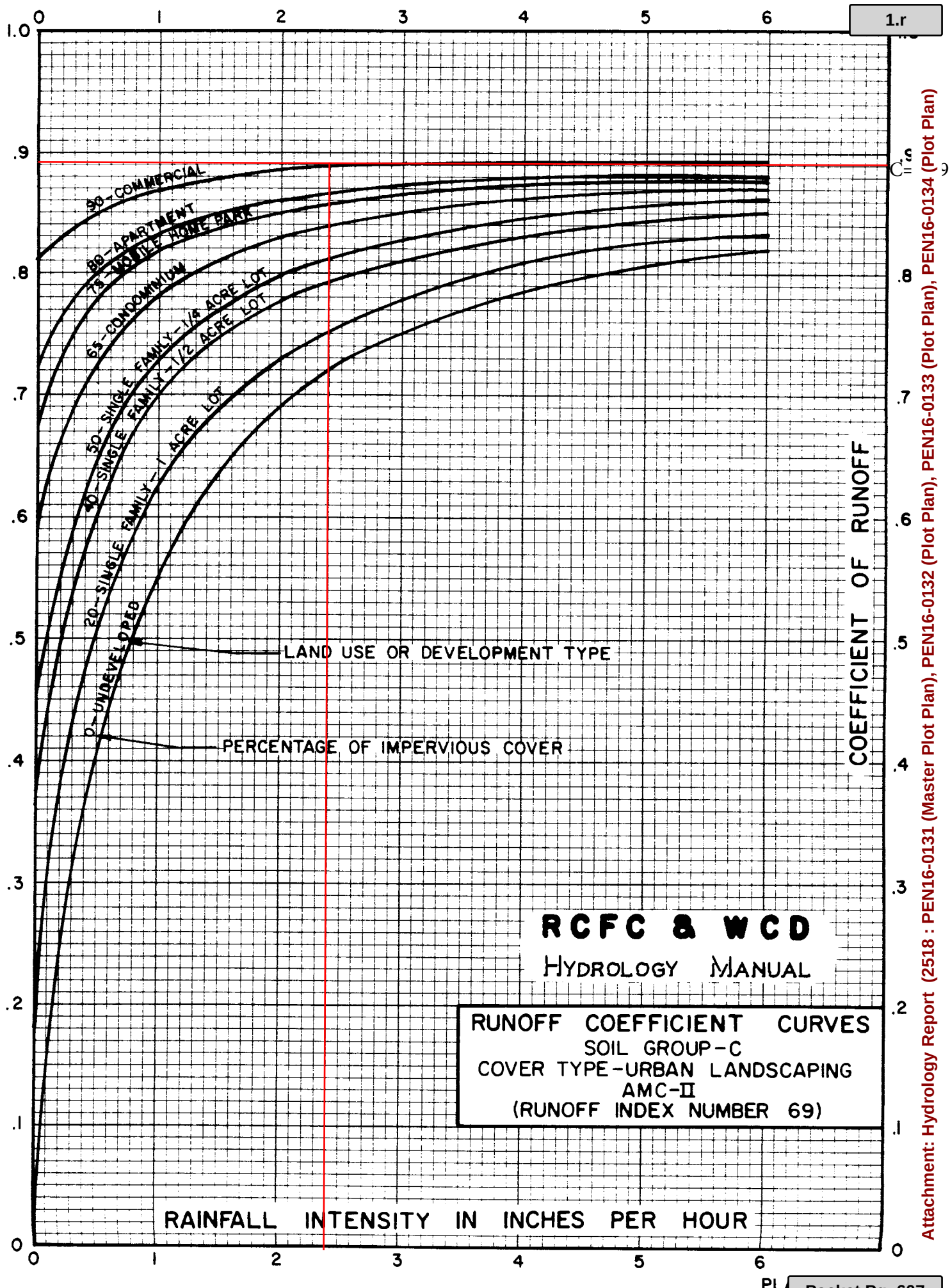
INTERPOLATED:
10 year event = 2.40 in/hr
100 year event = 3.51 in/hr

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

STANDARD
INTENSITY—DURATION
CURVES DATA

PLATE D-4.1 (6 of 6)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



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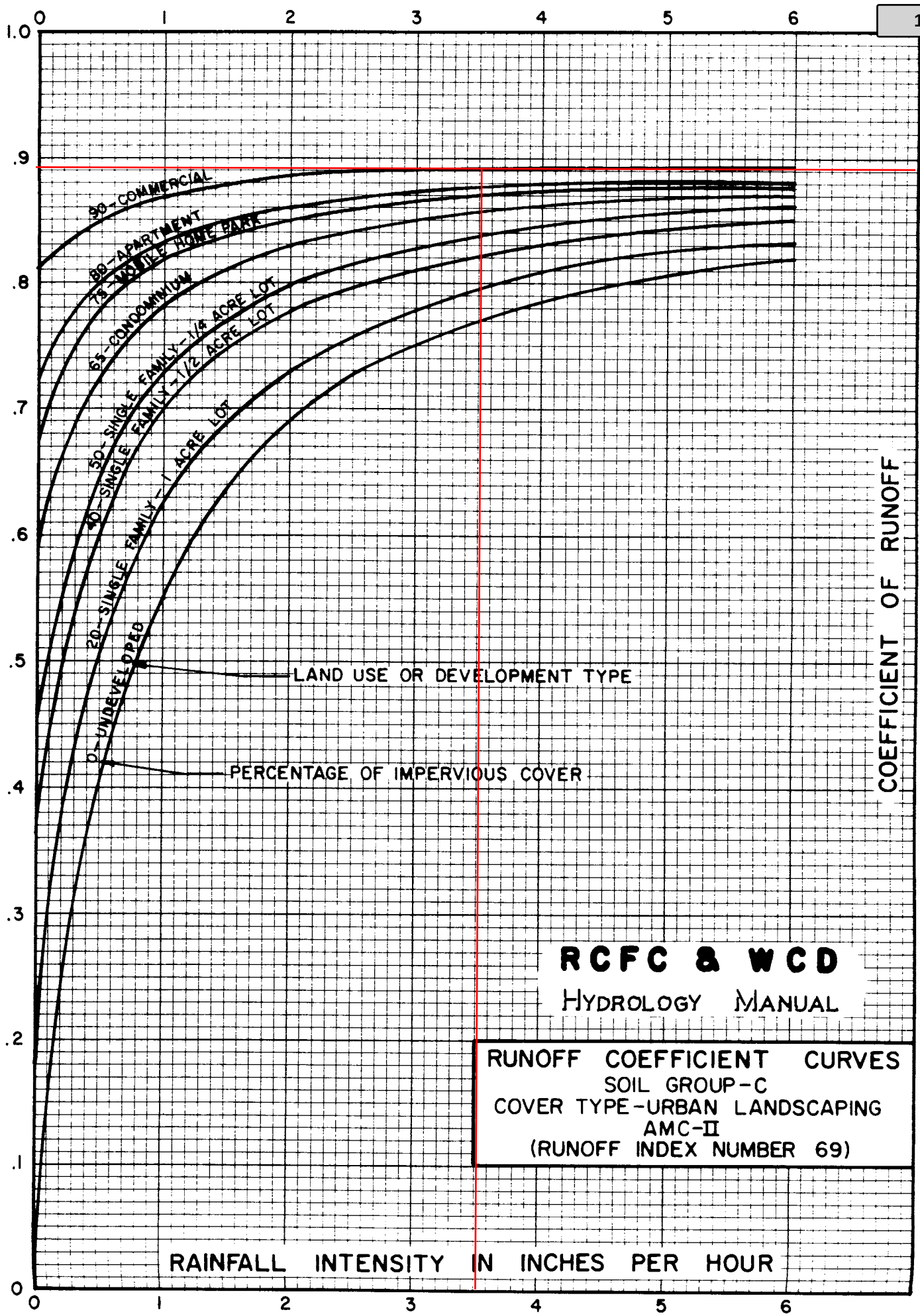
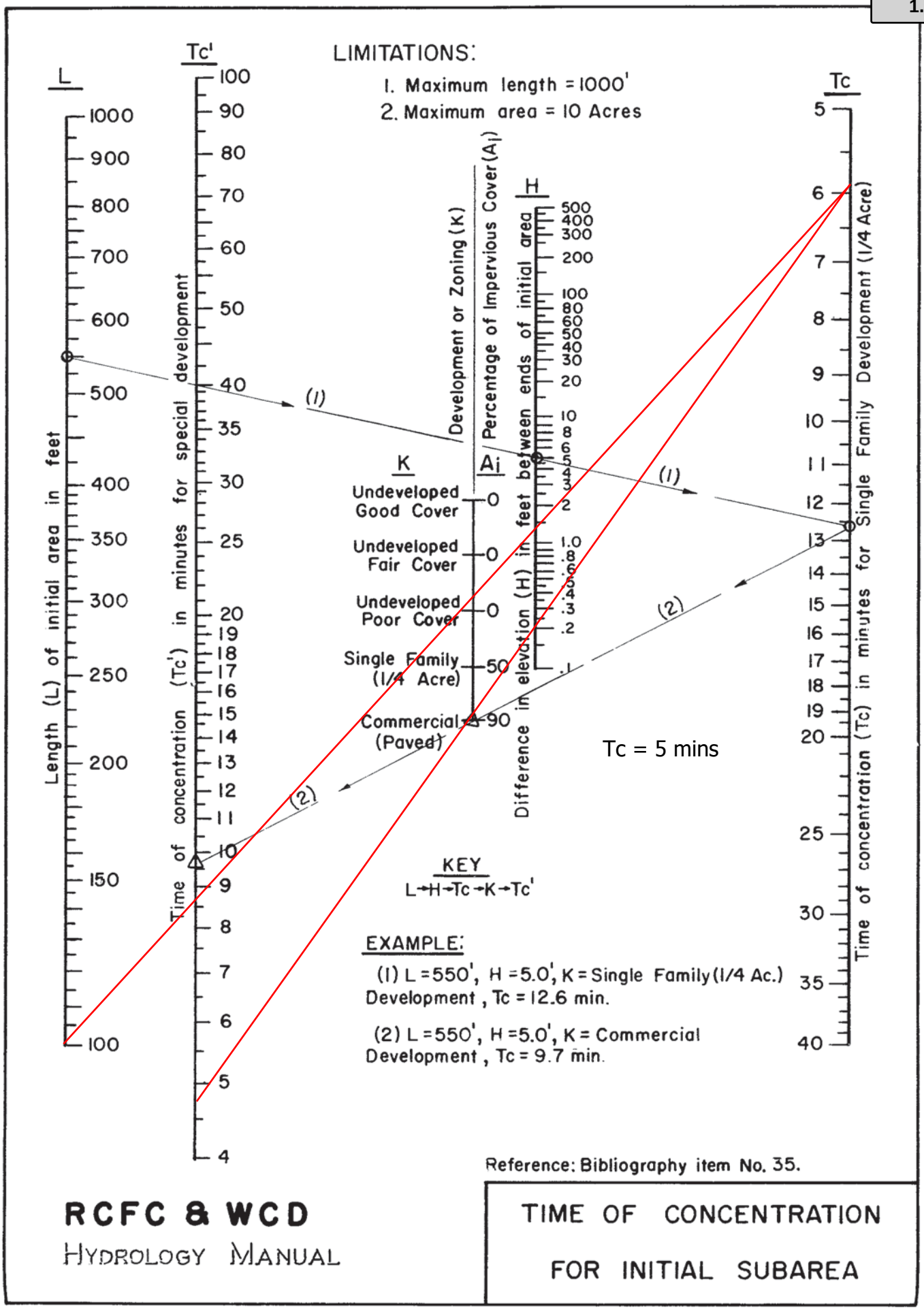


Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

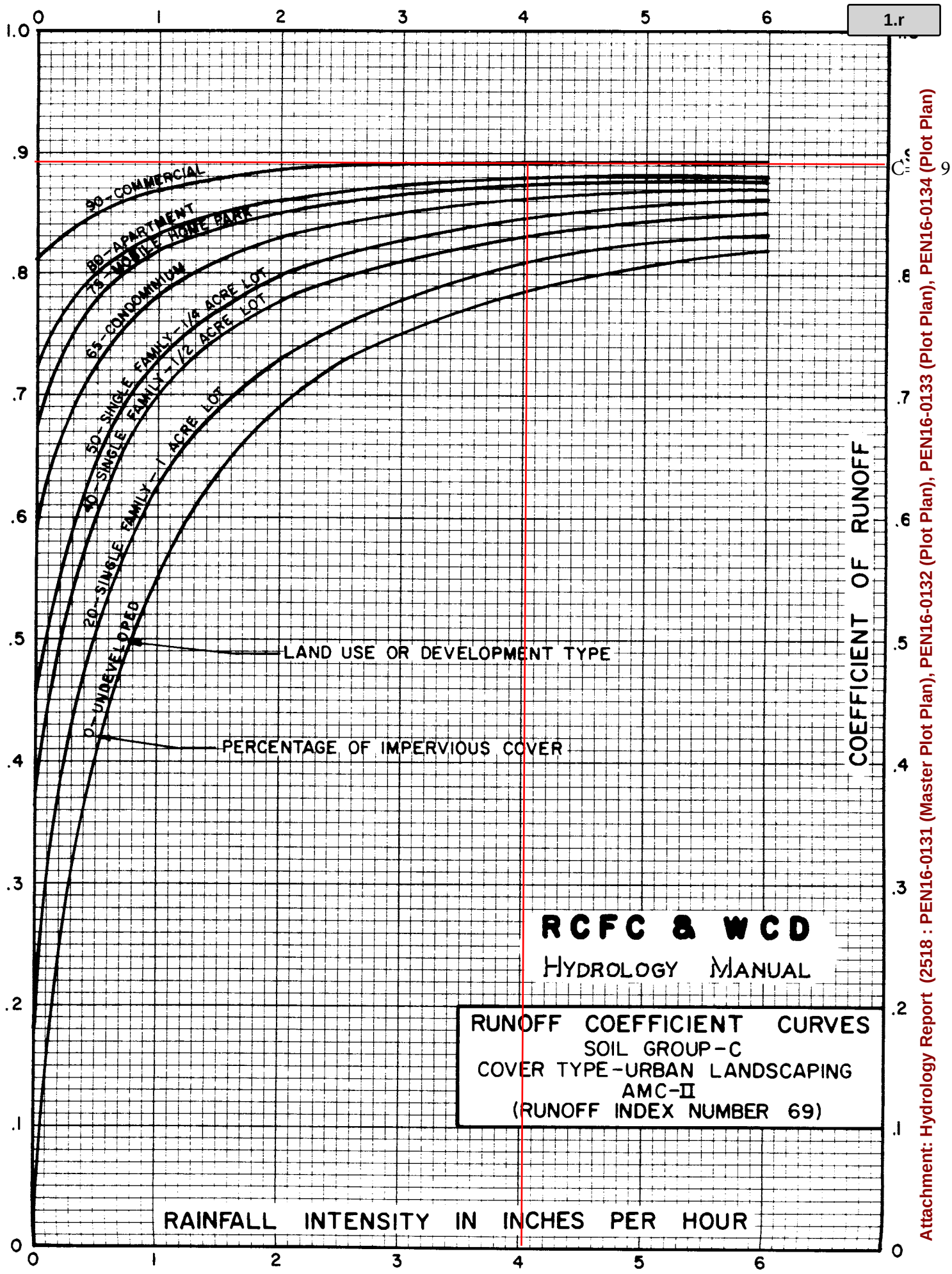
RAINFALL INTENSITY—INCHES PER HOUR

INTERPOLATED:
10 year event = 2.84 in/hr
100 year event = 4.16 in/hr

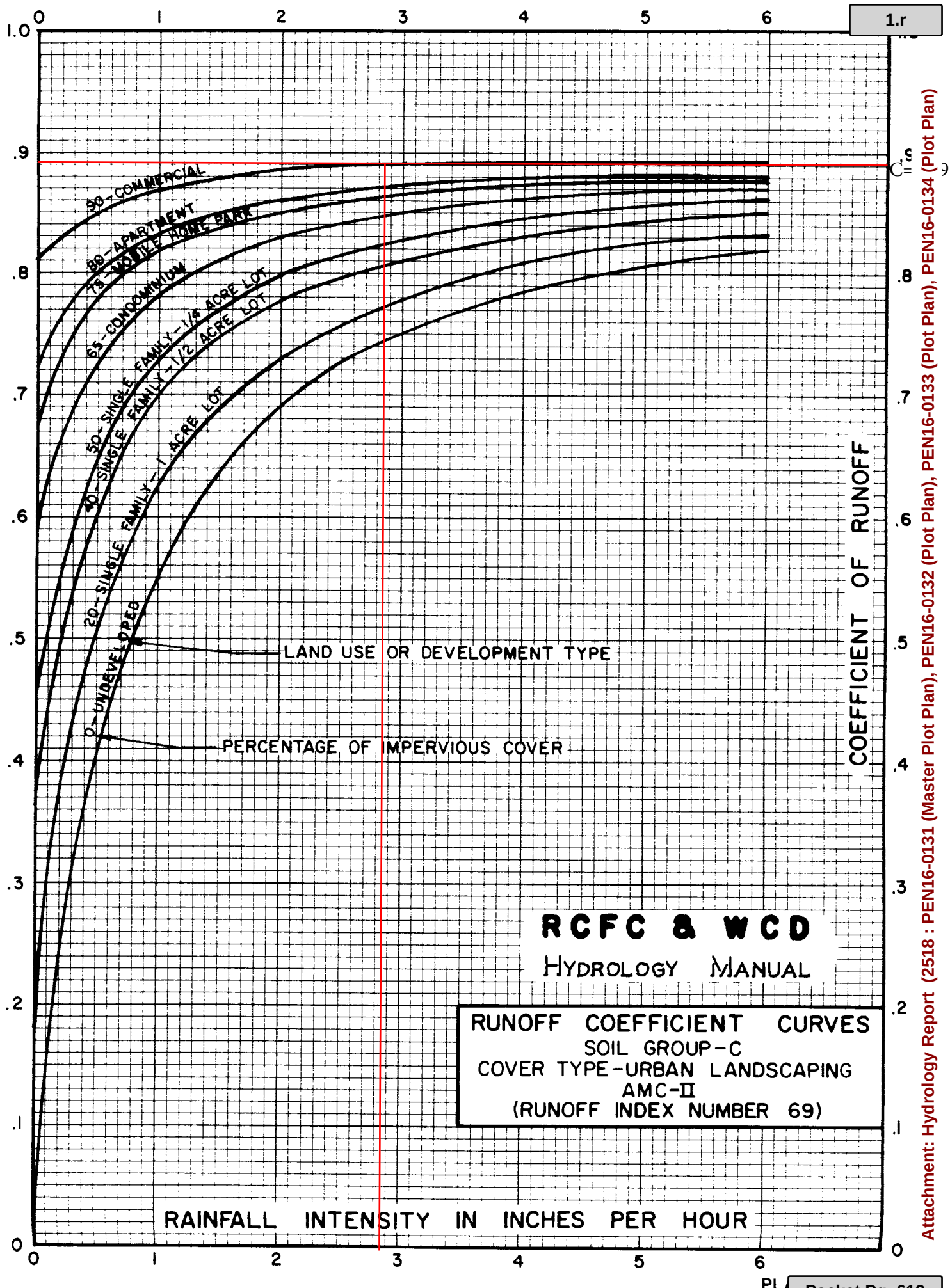
SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

STANDARD INTENSITY—DURATION CURVES DATA

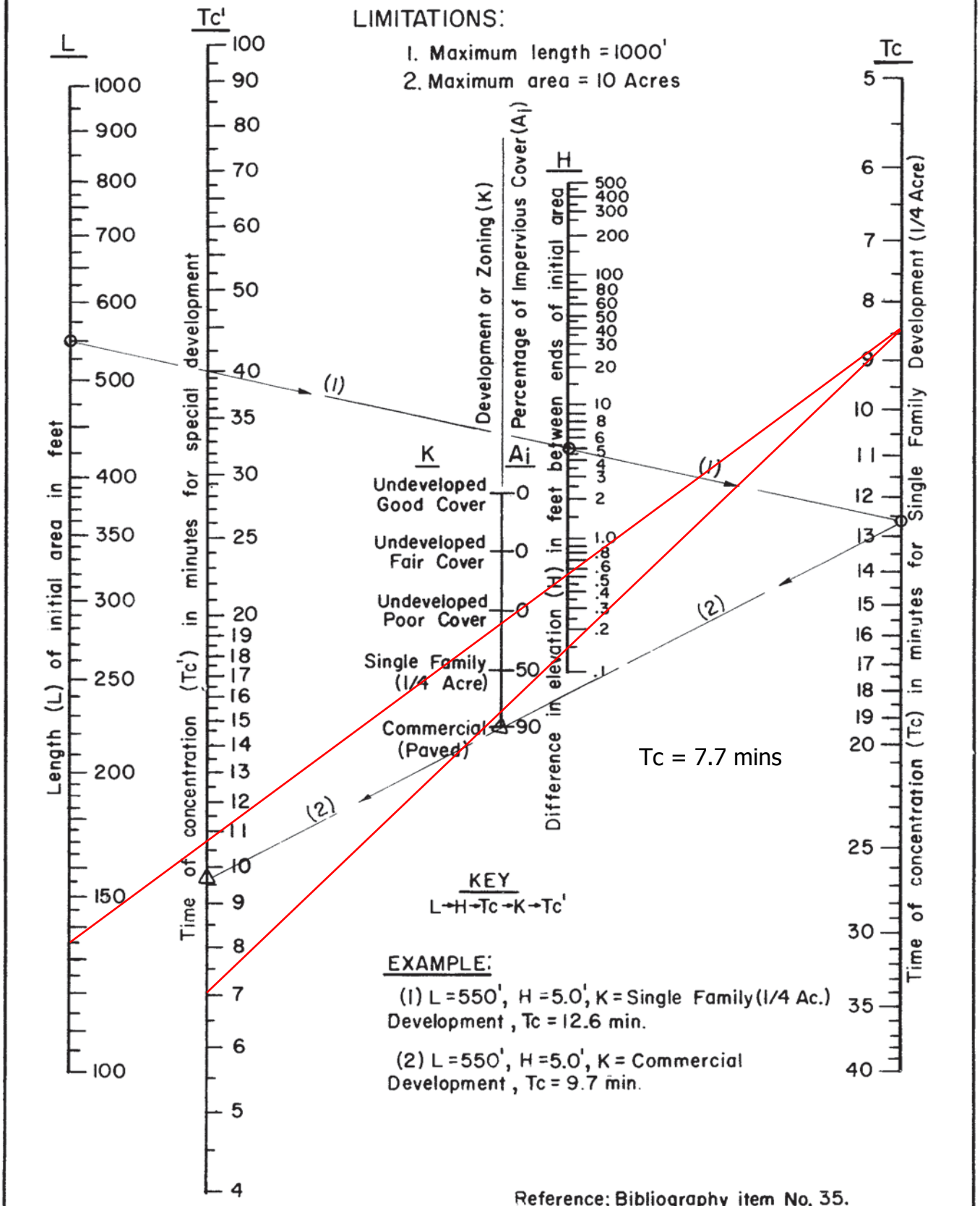
PLATE D-4.1 (6 of 6)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

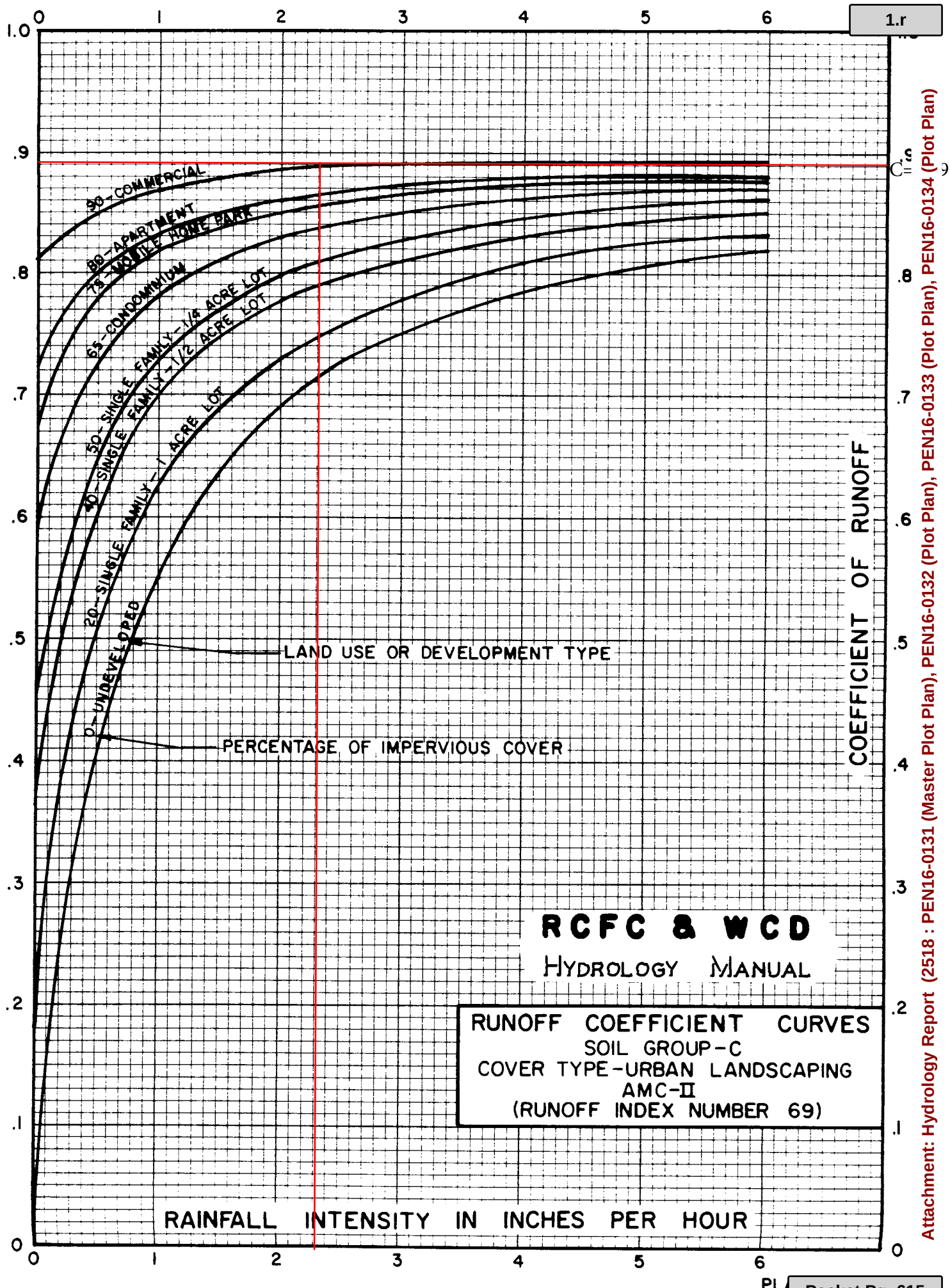
INTERPOLATED:
10 year event = 2.30 in/hr
100 year event = 3.36 in/hr

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

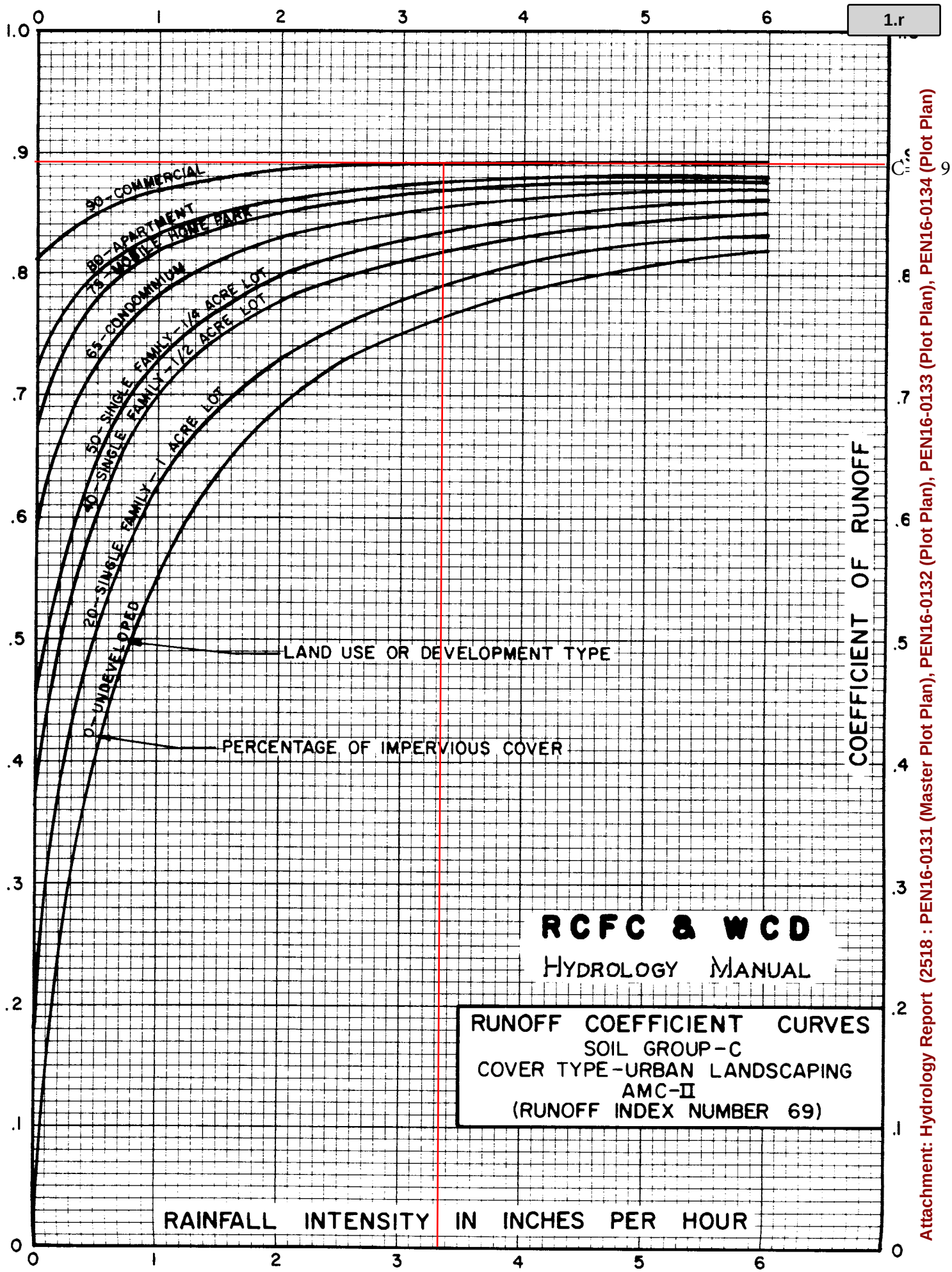
STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

PR-1D

TIME OF CONCENTRATION CALCULATION
KINEMATIC WAVE EQUATION PER THE NATIONALRESOURCE CONSERVATION SERVICES

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

Where,

Tc = Time of concentration, Hr
L = Length of flow path in feet
S = Slope of flow FT/FT
P2 = Precipitation in inches
City of Moreno Valley requires, (10 Yr , 1 hr) & (100Yr, 1 hr), Frequency
n = Manning's number per Caltrans Table 816.6A

$$TC = \frac{0.007\ (L * n)^{0.8}}{(P2^{0.5} X\ S^{0.4}}$$

L =	65
S =	0.0047
P10 Yr, 1 hr =	0.726
P100 Yr, 1 hr =	1.21
n =	0.15

Tc 10yr,1hr =	0.434	hr	=	26.01 mins
Tc 100 yr,1hr =	0.336	hr	=	20.15 mins

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

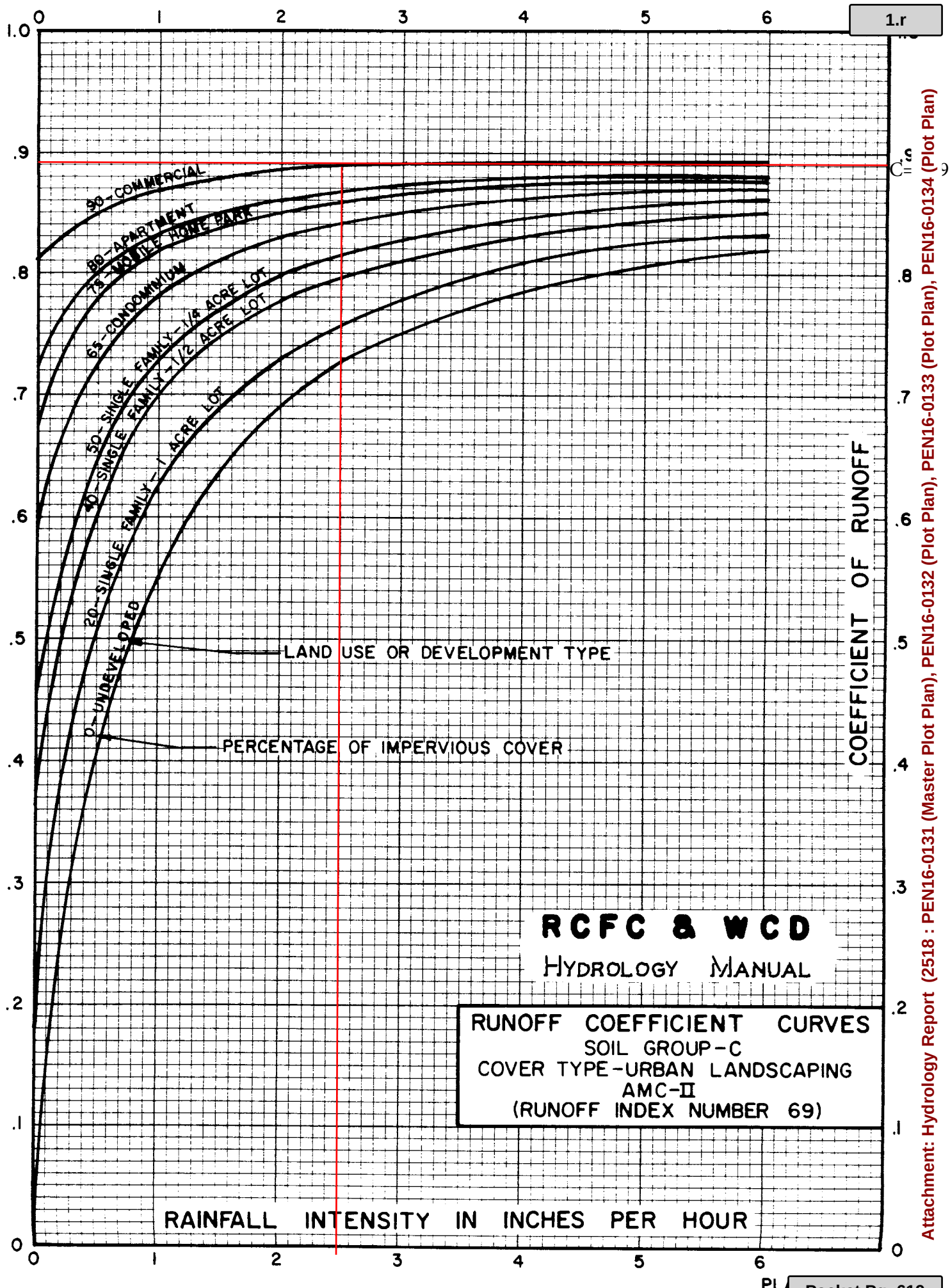
RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE =	.500		SLOPE =	.550	

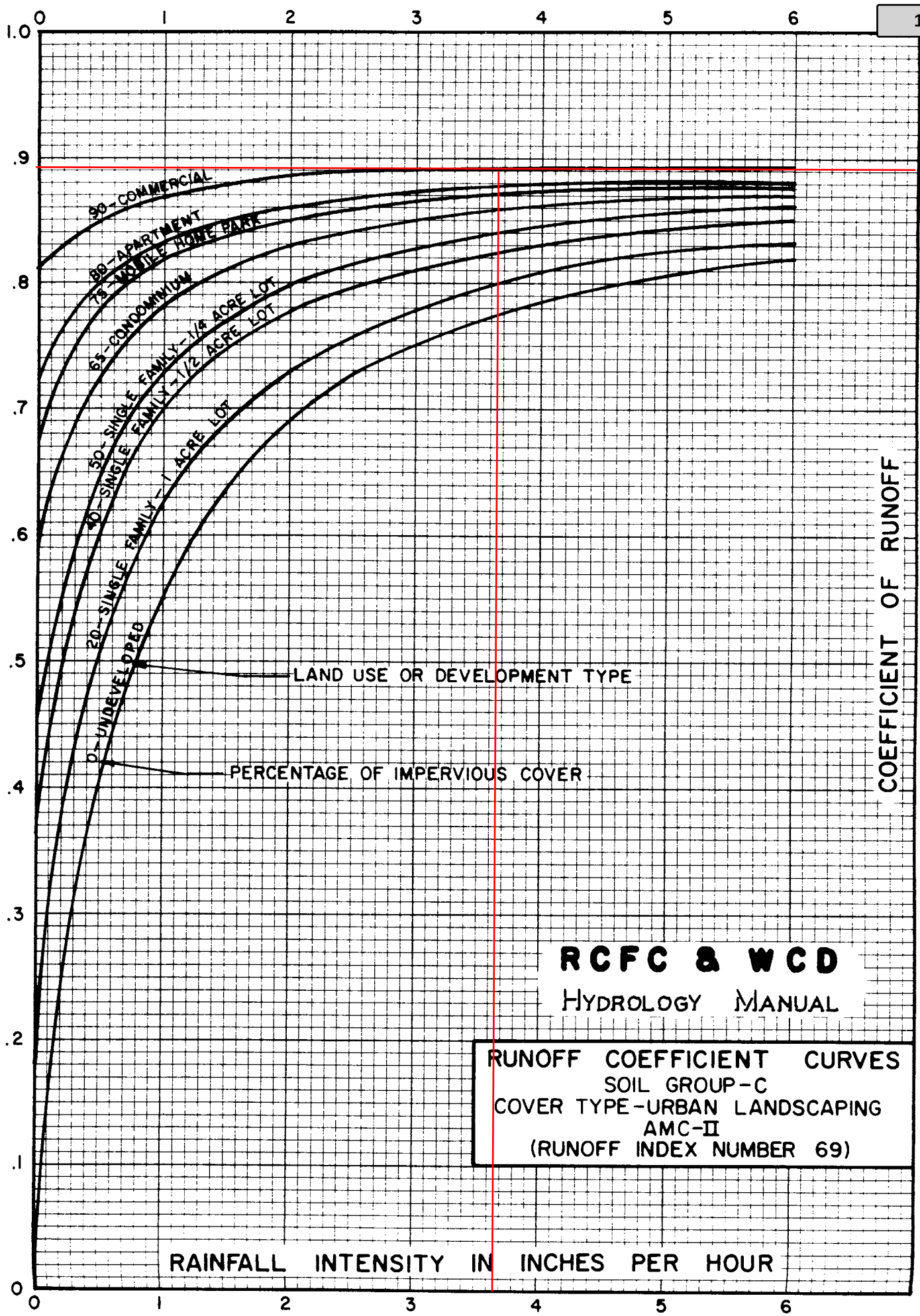
INTERPOLATION:
26.01 mins = 1.25 in/ hr for 10 year event
20.15 mins = 1.82 in/ hr for 100 year event

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1 (6 of 6)



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



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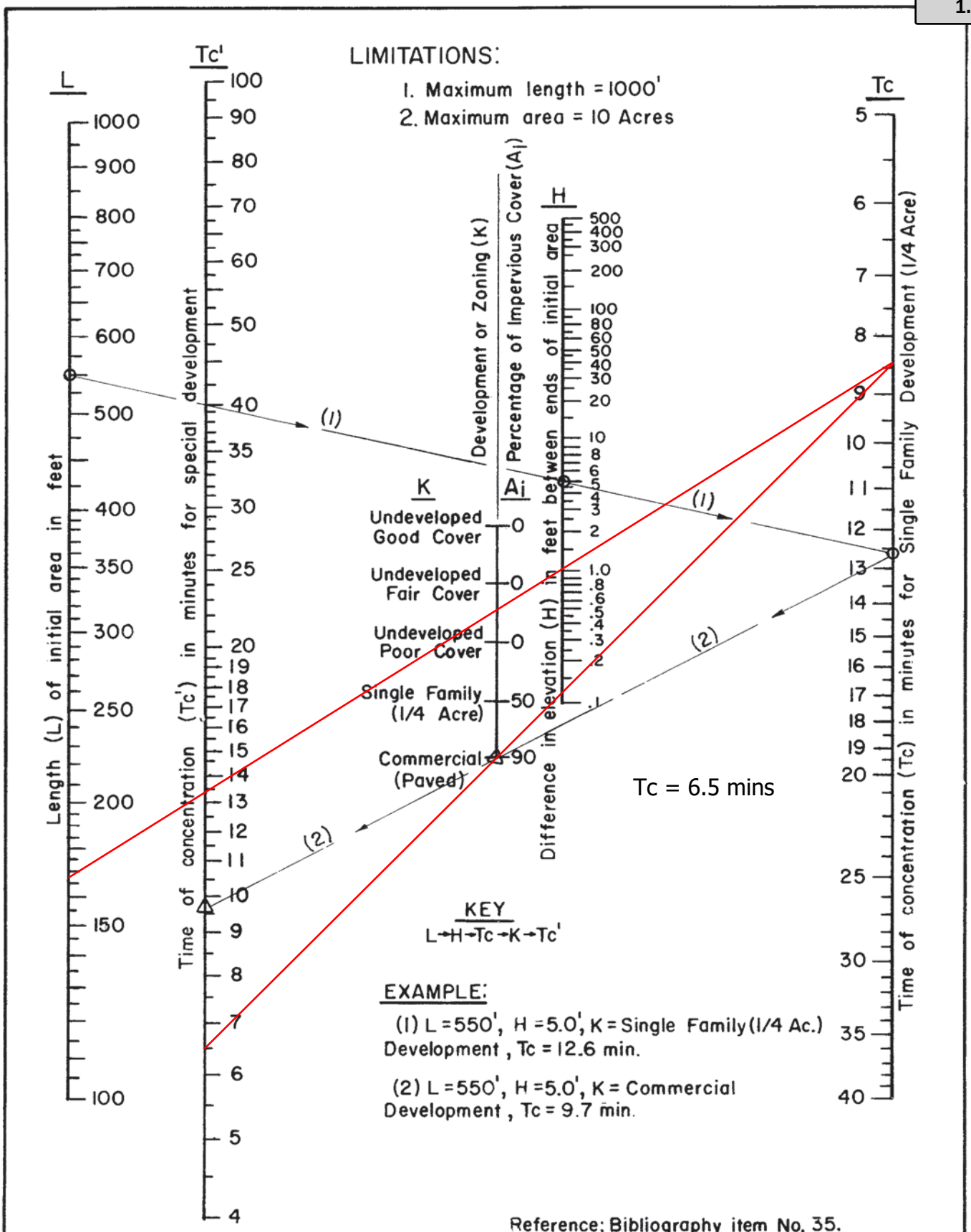

Reference: Bibliography item No. 35.

RCFC & WCD
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

PLATE D-3

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

RCFC & WCD
HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

SUNNYMEAD - MORENO			WOODCREST		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
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9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
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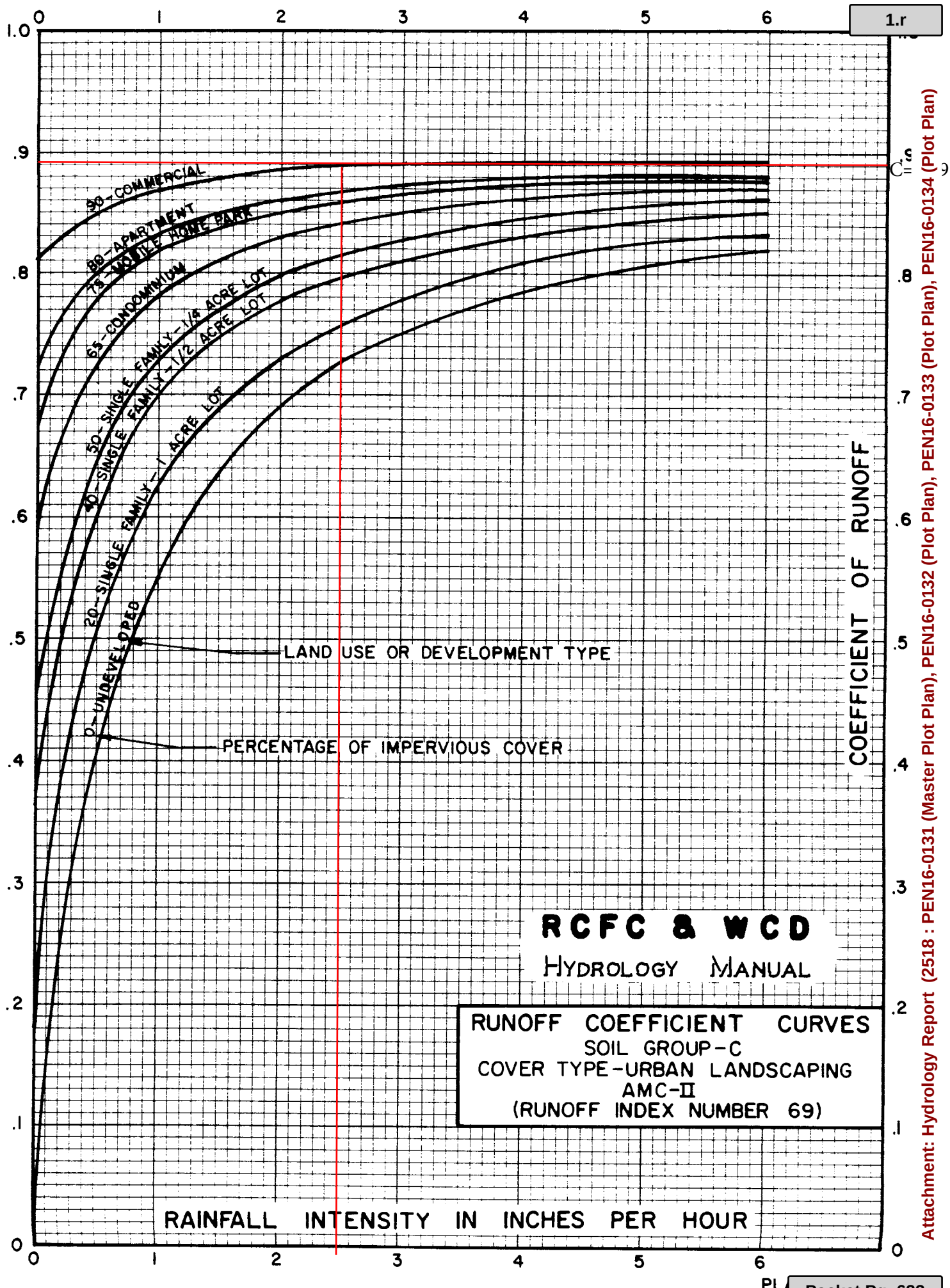
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

INTERPOLATION:
6.5 mins = 2.5 in/ hr for 10 year event
6.5 mins = 3.65 in/ hr for 100 year event

STANDARD INTENSITY – DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



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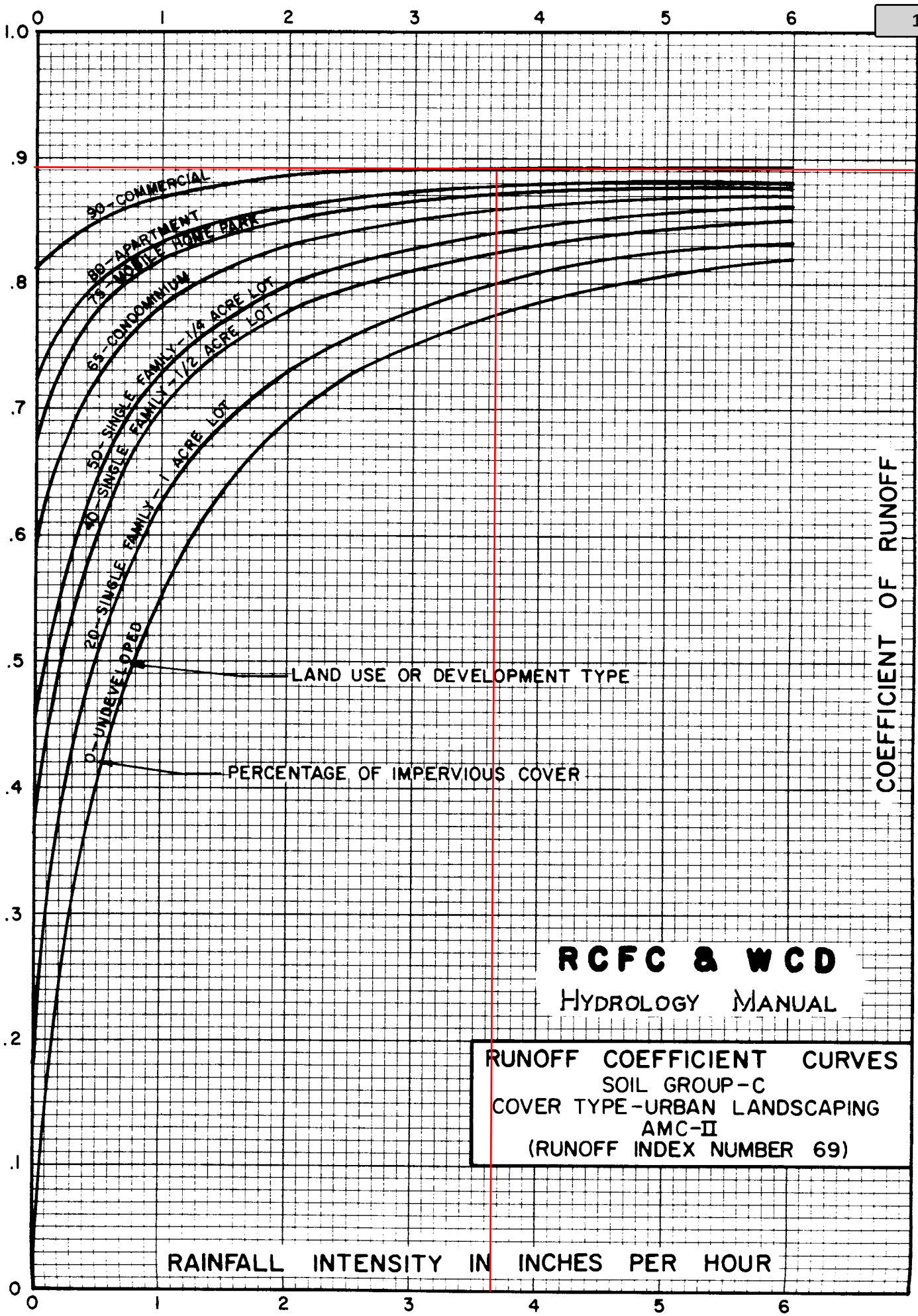

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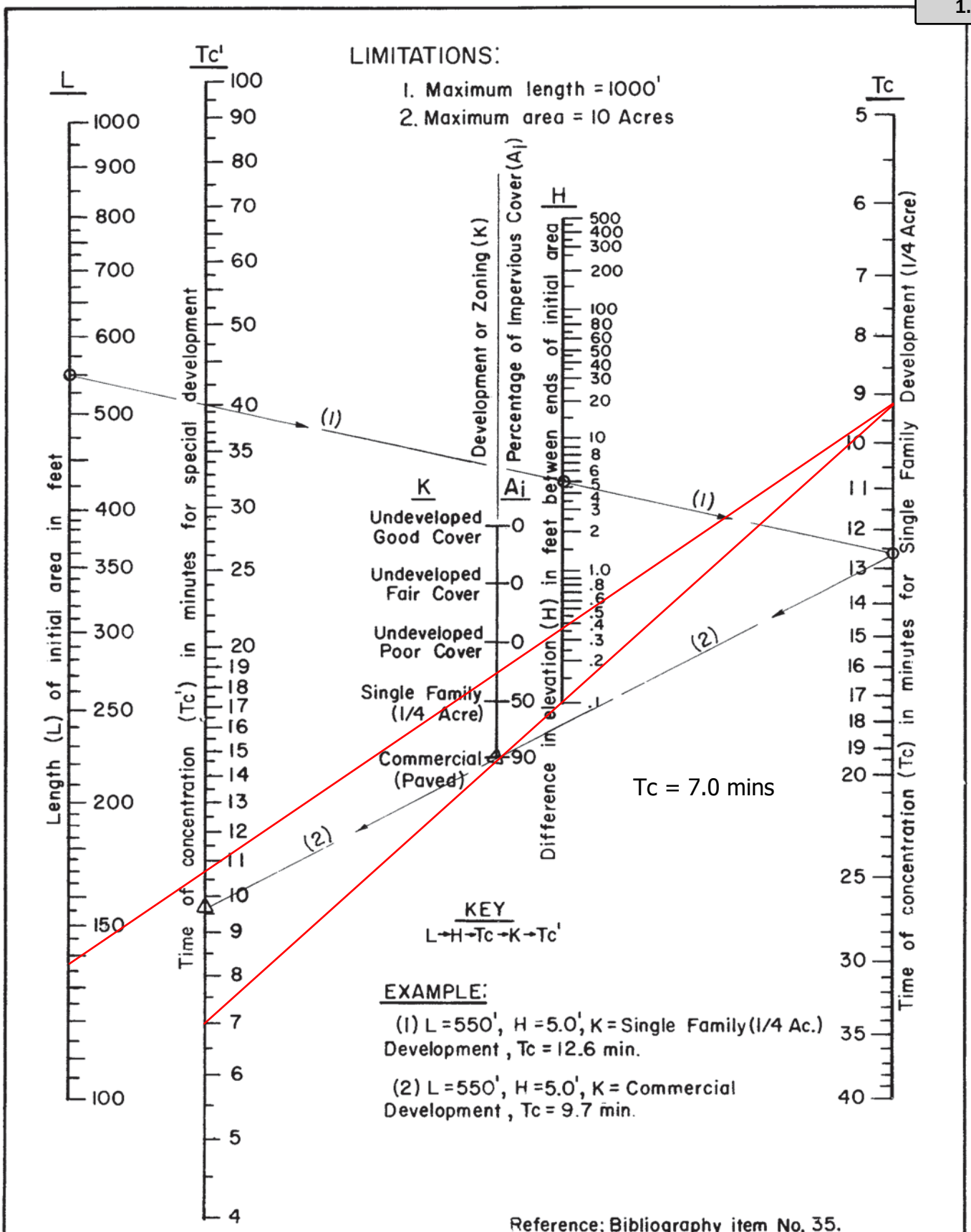

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RCFC & WCD

HYDROLOGY MANUAL

RAINFALL INTENSITY—INCHES PER HOUR

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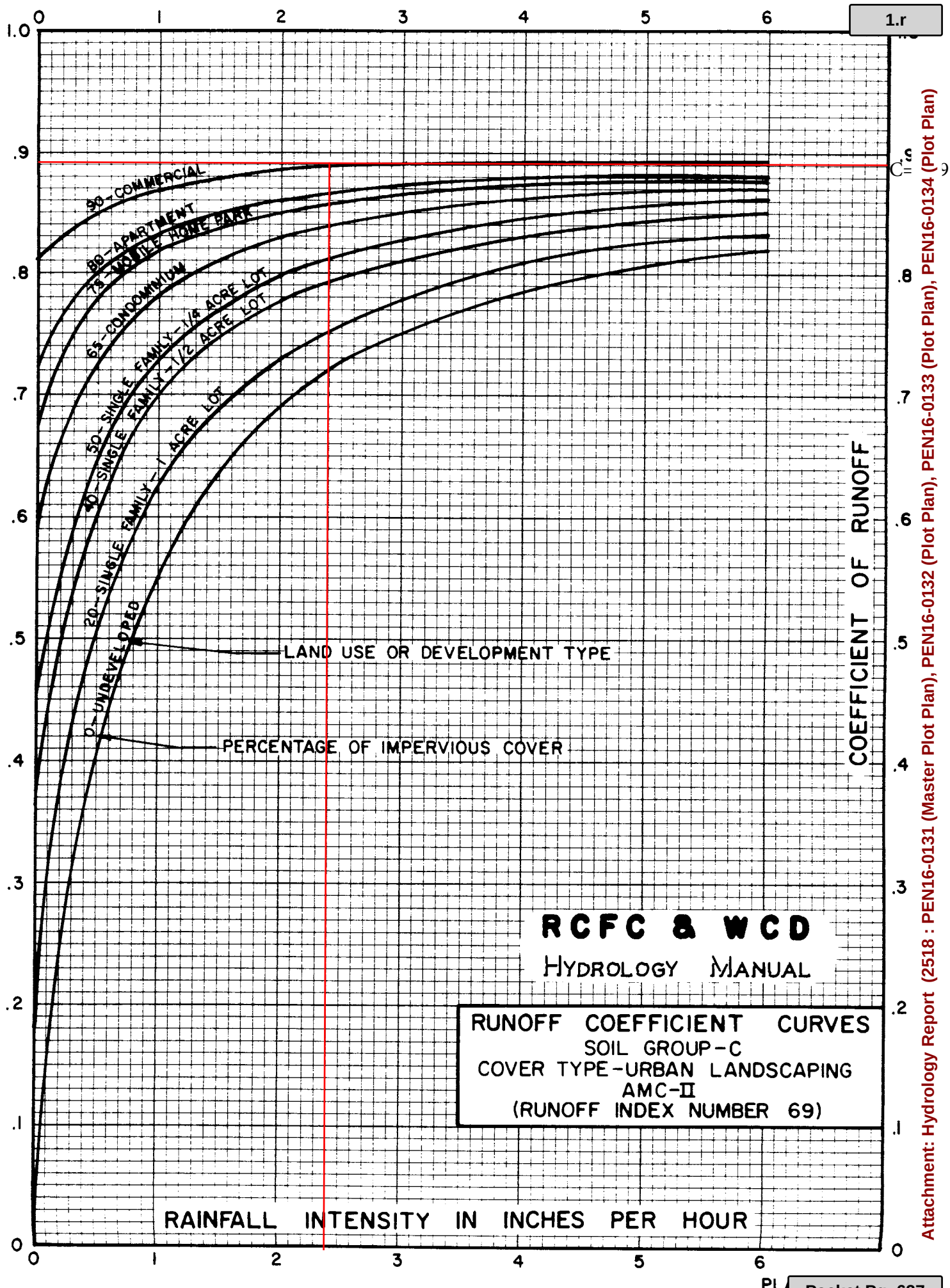
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.18	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11
SLOPE = .500			SLOPE = .550		

STANDARD INTENSITY—DURATION CURVES DATA

PLATE D-4.1 (6 of 6)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



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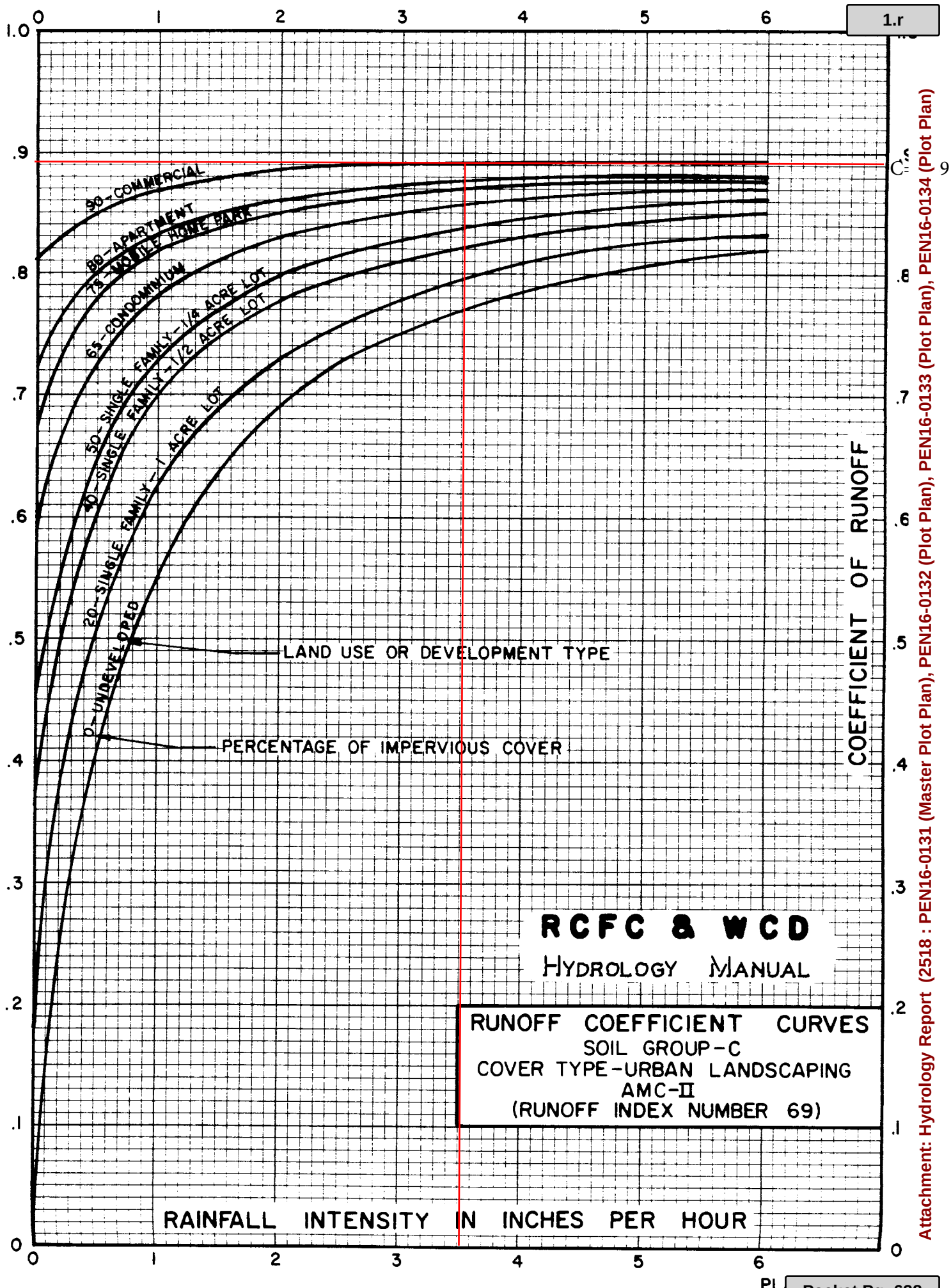


Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX

G

HYDROLOGY REPORT
FROM 1995

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

PSOMAS

Psomas and Associates
3901 Lime Street
Riverside, California 92501
909/787-8421

HYDROLOGY STUDY

FOR

PARCEL MAP 27732

MAY 1994

CITY OF MORENO VALLEY
COUNTY OF RIVERSIDE

Approved 8-18-95
Paul Lee

Need Wet Signature from Civil Engineer

Engineers
Surveyors
Planners

Costa Mesa
Riverside
Sacramento
Santa Monica

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

PSOMA

GENERAL DISCUSSION

Development of the proposed project into a commercial/industrial center will result into two drainage systems. The proposed drainage devices will accommodate flow from the 65 acre site and also off-site flows entering from the north and east.

The eastern drainage system consists of concrete channels and RCP storm drains. The system outlets through an existing 36" RCP culvert crossing under Imperial East Frontage Road.

The western drainage system consists of an earth swale which outlets into an existing 42" RCP culvert also crossing under Imperial East Frontage Road. A significant amount of this flow originates in the adjacent property to the north.

This report includes the 10 year and 100 year frequency hydrology calculations for both on-site and off-site drainage.

Need to show Existing Q_{10} & Q_{100} before this project developed

then we can tell the difference = is it acceptable for the additional runoff and concentrations of Q?

NOT NEEDED PER PAUL LAU

OK, because outlet controls the flows

Also Need Hydraulic ~~Study~~ reports & calcs. especially at the Ponding Area of the Caltrans 24" CMP & 36" pipe @ 215 FWY

Submitted 3/2/95 OK

PROJECT SITE
Edgemont
Box Springs (Siding)
Moreno Valley High Sch
Fire Station
Trailer Park
Reservoir
Sewage Disposal
West March
Arnold Heights
March Field
ESCHSCHOLTZIA AVE
CACTUS AVE
COTTONWOOD AVE
SHERMAN AVE
REPUBLIC AVE
ALESSANDRO BLVD
PIPELINE
OLD RAILROAD GRADE
ATCHISON TOPEKA & SANTA FE
SANTA FE FREEWAY
EDGEMONT AVE
ELSWORTH AVE
FREDRICK AVE
DRACAEA AVE
EUCALYPTUS AVE
GREVILLEA AVE
RIVERSIDE RACEWAY
PLUMMER ROAD
BOUNDARY
Alessandro
March
T. 3 S.
R. 4 W.
(SUNNYMEAD) 2551 I NW

LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

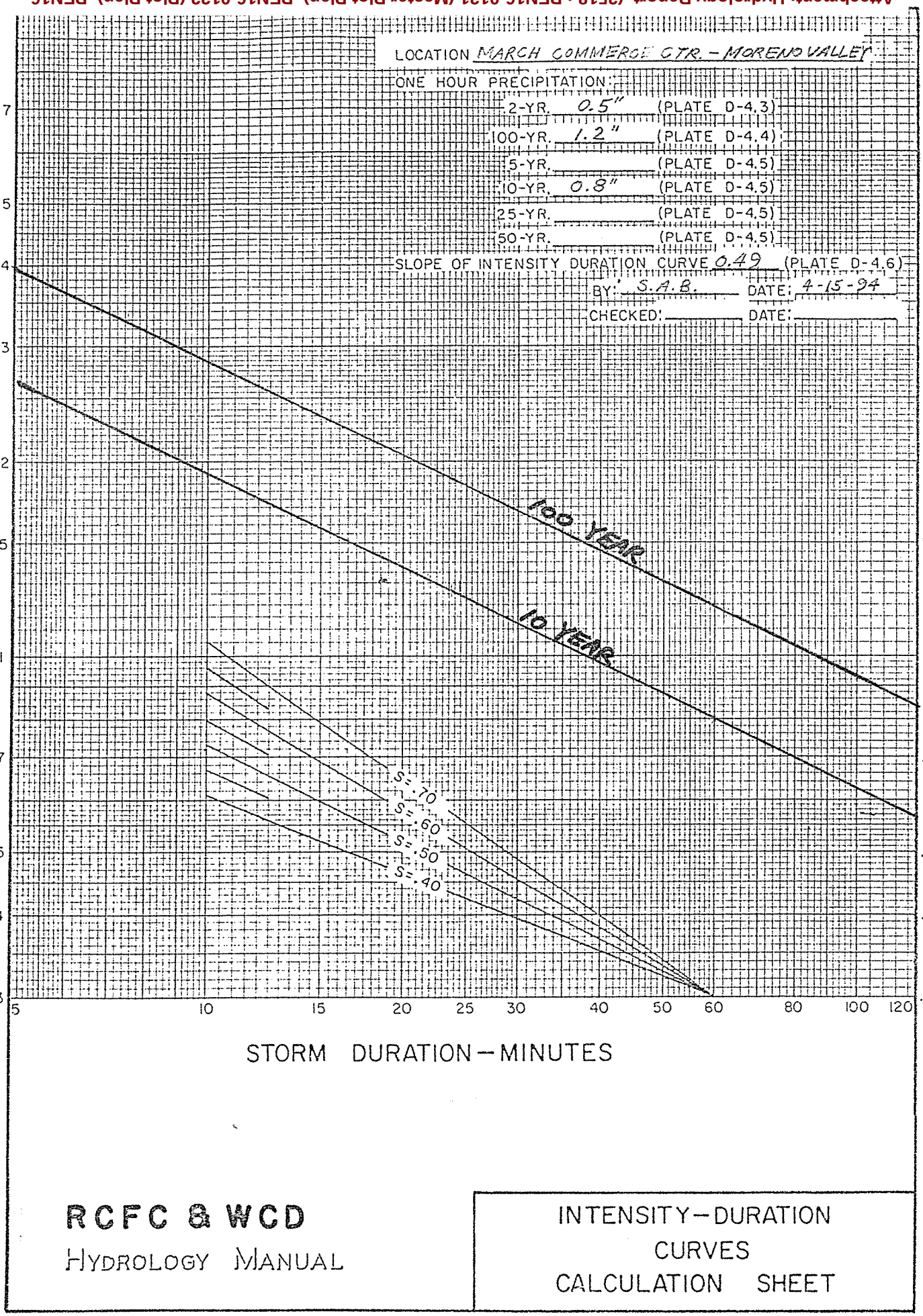
RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR RIVERSIDE–EAST



RCFC & WCD

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

PLATE D-4.7

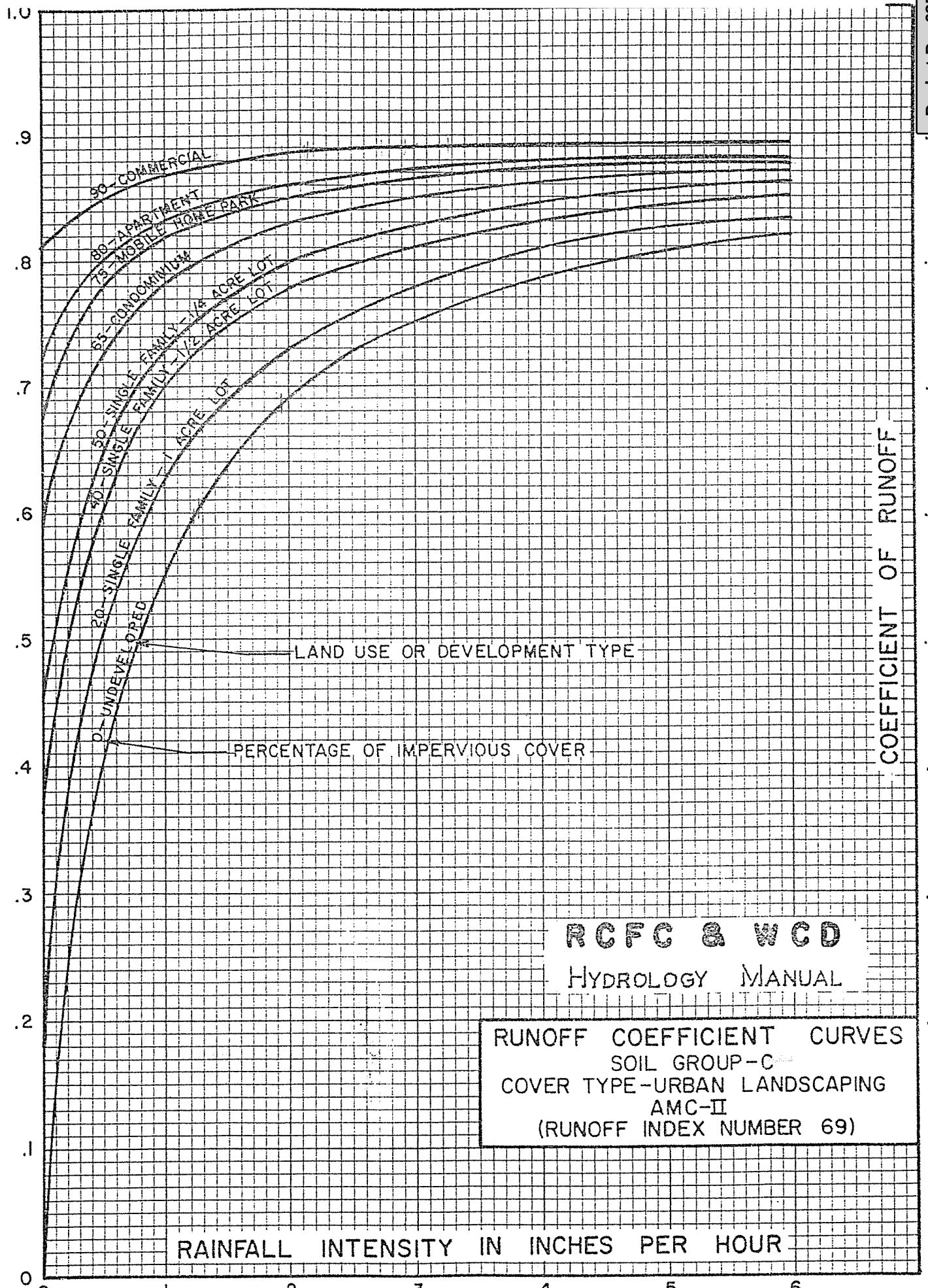

1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
0
1
2
3
4
5
6
90 - COMMERCIAL
80 - APARTMENT
75 - MOBILE HOME PARK
65 - CONDOMINIUM
50 - SINGLE FAMILY - 1/4 ACRE LOT
40 - SINGLE FAMILY - 1/2 ACRE LOT
20 - SINGLE FAMILY - 1 ACRE LOT
0 - UNDEVELOPED
LAND USE OR DEVELOPMENT TYPE
PERCENTAGE OF IMPERVIOUS COVER
COEFFICIENT OF RUNOFF
RAINFALL INTENSITY IN INCHES PER HOUR
RCFC & WCD
HYDROLOGY MANUAL
RUNOFF COEFFICIENT CURVES
SOIL GROUP - C
COVER TYPE - URBAN LANDSCAPING
AMC - II
(RUNOFF INDEX NUMBER 69)

PLATE D-5.3

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

Sheet No. 1 of 6 Sh

PROJECT MARCH COMMERCE CENTER - OFF-SITE HYDROLOGY
P.M. No. 27732

Calculated by Steve Raine 4/1- DATE

FREQUENCY 100 YEARS

Checked by ---------- DATE

DRAINAGE AREA	Soil & Development	A Acres	I In/hr.	C	ΔQ CFS	Σ Q CFS	SLOPE	SECTION	V FPS	L FT.	T MIN.	Σ T	REMARKS
A-1	C/L S.F. & Comm.	5.1	2.73	0.86	12.0				H=11.9	910	10.8	10.8	INITIAL AREA
						12.0							
A-2	C/Comm.	2.0	3.27	0.89	5.8				H=5.4	360	7.5	7.5	INITIAL AREA
						5.8							
A-3	C/Comm.	4.5	2.92	0.89	11.7				H=8.4	630	9.6	9.6	INITIAL AREA
						11.7							
A-4	C/Comm.	7.1	2.84	0.89	17.9				H=13.0	800	10.1	10.1	INITIAL AREA
A-5	" "	22.0	2.15	0.89	42.1	17.9	0.0044	NATURAL VALLEY CH.	V=2.0	950	7.9	18.0	
						60.0							

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

Sheet No. 2 of 6 Sheets

PROJECT MARCH COMMERCE CENTER - OFF-SITE HYDROLOGY
P.M. No. 27732

Calculated by Steve Baine 4/14/ DATE

FREQUENCY 10 YEARS

Checked by ---------- DATE

DRAINAGE AREA	Soil & Development	A Acres	I In/hr.	C	ΔQ CFS	ΣQ CFS	SLOPE	SECTION	v FPS	L FT.	T MIN.	ΣT	REMARKS
A-1	C/ SF 1/4 Ac C & COMM	5.1	1.84	0.84	7.9				H=11.9	910	10.8		
						7.9						10.8	INITIAL AREA
A-2	C/ COMM	2.0	2.20	0.89	3.9				H=5.4	360	7.5		
						3.9						7.5	INITIAL AREA
A-3	C/COMM	4.5	1.96	0.89	7.8				H=8.4	630	9.6		
						7.8						9.6	INITIAL AREA
A-4	C/COMM	7.1	1.92	0.88	12.0				H=8.0	800	10.1		
						12.0	0.0044	NATURAL VALLEY CH.	V=1.8	950	8.8	10.1	INITIAL AREA
A-5	"	22.0	1.42	0.88	27.5								
						39.5						18.9	

OK

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

Sheet No. 3 of 6 Sh

P.M. No. 27732

PROJECT MARCH COMMERCE CENTER: ON-SITE HYDROLOGY
EAST DRAINAGE AREA TO 36" RCP CULVERT

Calculated by Steve Raine 4/22 DATE

FREQUENCY 100 YEARS

Checked by ---------- DATE

DRAINAGE AREA	Soil & Development	A Acres	I In/hr.	C	ΔQ CFS	Σ Q CFS	SLOPE	SECTION	v FPS	L FT.	T MIN.	Σ T	REMARKS
OFF-SITE (SE ALESSANDRO)	C/SF V4 Ac COMM				0.6			STREET					ALESSANDRO BLVD. STREET FLOW FROM EAST
						0.6			H=6.3	700	10.6		
A-1	C/COMM.	5.0	2.77	0.89	12.3	12.9		STREET				10.6	
									H=8	650	9.7		
A-2	C/COMM.	6.6	2.90	0.89	17.0							9.7	INITIAL AREA
						17.0	0.0038	GRADED SWALE	V=1.8	980	9.1		
A-3	"	17.8	2.12	0.89	33.6							18.8	
OFF-SITE (NE GOLDENCREST)	"				1.4	50.6		STREET				18.8	GOLDENCREST DR. STREET FLOW FROM EAS
						52.0		C.B.					
									H=1.7	450	10.7		
A-4	C/COMM	4.0	2.76	0.89	9.8							10.7	INITIAL AREA
						9.8		STREET					
OFF-SITE (SE GOLDENCREST)	"				6.5							10.7	GOLDENCREST DR. STREET FLOW FROM EAS
						16.3		C.B.					
											10.8		
OFF-SITE (NORTH OF ALESSANDRO)	C/COMM		2.73		12.0							10.8	18" CMP FLOW FROM NORT
						12.0	AVG 0.0073	18" RCP/ TRAP CHNL	6.4 AVG	340	0.9		
OFF-SITE (P.M. 23092)	C/COMM		2.64 / 3.27		5.8							11.7	CONFLUENCE GUTTER FLOW FROM EAST
						16.7	AVG 0.0073	TRAP CHNL	5.5	740	2.2	13.9	CONFLUENCE TRAP. CHANNEL FLOW FROM
OFF-SITE (P.M. 21626)	C/COMM		2.43 / 2.92		11.7	26.4	AVG 0.0073	30" RCP	6.6	990	2.5	16.4	CONFLUENCE = 52.0 +
CONFLUENCE @ U.S.			2.26			89.3	0.0030	36" RCP	12.6	790	1.0	19.8	$16.3\left(\frac{2.12}{2.76}\right) + 26.4\left(\frac{2.12}{2.26}\right)$
			2.06										CACTUS AVE.
OFF-SITE (NE CACTUS)	C/COMM				2.4								STREET FLOW FROM EAST
									H=6	600	9.8		
A-5	"	1.0	2.88	0.89	2.6	92.9	0.0030	36" RCP	13.1	150	0.2		CONFL. = $89.3 + 5.0\left(\frac{2.06}{2.88}\right)$
			2.05									20.0	
									H=3.6	560	10.3		
A-6	C/COMM	3.1	2.79	0.89	7.7	98.6	0.0030	TRAP. CHANNEL	6.2	870	2.3		CONFL. = $92.9 + 7.7\left(\frac{2.05}{2.79}\right)$
			1.94									22.3	
									H=10.7	840	10.4		
A-7	C/COMM	6.9	2.66	0.89	16.3	110.5	0.0030	TRAP. CHANNEL	6.4	130	0.3		CONFL. = $98.6 + 16.3\left(\frac{1.}{2.}\right)$
A-8	C/UNDEV.	6.7	1.93	0.685	8.9	119.4	0.0030	36" RCP CULVERT				22.6	FLOW INTO 36" CULVERT

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

P.M. NO. 27732

PROJECT MARCH COMMERCE CENTER : ON-SITE HYDROLOGY (CONT'D)
WEST DRAINAGE AREA TO 42" RCP CULVERT

FREQUENCY 100 YEARS

Calculated by Steve Baine 4/23 DATE

Checked by ---------- DATE

DRAINAGE AREA	Soil & Development	A Acres	I in/hr.	C	ΔQ CFS	Σ Q CFS	SLOPE	SECTION	v FPS	L FT.	T MIN.	Σ T	REMARKS
								NATURAL SWALE			18.0		
OFF-SITE (NW OF SITE)	C/COMM				60.0	60.0	0.005	GRADED SWALE	2.8	750	4.5	18.0	SEE OFF-SITE STUDY
A-9	C/COMM	24.8	1.93	0.885	42.4	102.4	0.007	24" CMP/ SWALE	30 AVG	100	0	22.5	
A-10	C/UNDEVEL.	2.0	1.93	0.685	2.6	105.0		42" RCP CULVERT				22.5	FLOW INTO 42" RCP CUL

OK

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

RCFC & WCD HYDROLOGY MANUAL
RATIONAL METHOD CALCULATION FORM

Sheet No. 5 of 6 Sh

P.M. NO. 27732

PROJECT MARCH COMMERCE CENTER: ON-SITE HYDROLOGY
EAST DRAINAGE AREA

Calculated by Steve Raine 4/22 DATE

FREQUENCY 10 YEARS

Checked by ---------- DATE

DRAINAGE AREA	Soil & Development	A Acres	I in/hr.	C	ΔQ CFS	Σ Q CFS	SLOPE	SECTION	v FPS	L FT.	T MIN.	Σ T	REMARKS
OFF-SITE (SE ALESSANDRO)	C/ SF 1/4 AC COMM				0.4			STREET					ALESSANDRO BLVD. STREET FLOW FROM EAST
A-1	C/COMM	5.0	1.78	0.88	7.8	0.4			H=6.3'	700	10.6		
						8.2		STREET				10.6	
A-2	C/COMM	6.6	1.94	0.885	11.3				H=8'	650	9.7		
A-3	"	17.8	1.38	0.88	21.6	11.3	0.0038	GRADED SWALE	1.6	980	10.2	9.7	
OFF-SITE (NE GOLDENCREST)	"				0.9	32.9		STREET				19.9	
						33.8		CB					GOLDENCREST DR. STREET FLOW FROM EAST
A-4	C/COMM	4.0	1.86	0.88	6.5				H=1.7	450	10.7		
OFF-SITE (SE GOLDENCREST)	"				4.4	6.5		STREET				10.7	INITIAL AREA
						10.9		CB				10.7	GOLDENCREST DR. STREET FLOW FROM EAST
OFF-SITE (NORTH OF ALESSANDRO)	C/COMM		1.84		7.9						10.8		
OFF-SITE (P.M. 23092)	"		1.74 / 2.20		3.9	7.9	AVG 0.0073	18"RCP/ TRAPCHNL	4.5	340	1.3	10.8	18" CMP FLOW FROM NO.
OFF-SITE (P.M. 21626)	"		1.60 / 1.96		7.8	11.0	AVG 0.0073	TRAP. CHANNEL	5.0	740	2.5	12.1	CONFLUENCE GUTTER FLOW FROM EAST
			1.43			17.4	AVG 0.0073	30" RCP	4.4	990	3.8	14.6	CONFLUENCE TRAPEZOIDAL CHANNEL FLOW FR
CONFLUENCE @ J.S.												18.4	
			1.33			58.7	0.0030	36"RCP	8.3	790	1.6		CONF. = 33.8 + 10.9 (1.38/1.86)
OFF-SITE (NE CACTUS)	C/COMM				1.7							21.5	+ 17.4 (1.38/1.43), ΣT = 19.9
A-5	"	1.0	1.93	0.885	1.7				H=6'	600	9.8		CACTUS AVE. STREET FLOW FROM EAST
			1.32			61.0	0.0030	36"RCP	8.6	150	0.3		CONFL. = 58.7 + 3.4 (4.3/7.9)
A-6	C/COMM	3.1	1.88	0.88	5.1				H=3.6	560	10.3	21.8	
			1.24			64.5	0.0030	TRAP. CHANNEL	5.6	870	2.6		CONFL. = 61.0 + 5.1 (1.3/1.8)
A-7	C/COMM	6.9	1.88	0.88	11.4				H=10.7	840	10.4	24.4	
A-8	C/UNDEV.	6.7	1.23	0.60	4.9	72.0	0.0030	TRAP. CHANNEL	5.7	130	0.4		CONFL. = 64.5 + 11.4 (1.4/1.8)
						76.9						24.8	FLOW INT

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

RCFC & WCD HYDROLOGY MANUAL

RATIONAL METHOD CALCULATION FORM

P.M. NO. 27732

Sheet No. 6 of 6 Sh

PROJECT MARCH COMMERCE CENTER: ON-SITE HYDROLOGY STUDY
WEST DRAINAGE AREA

Calculated by Steve Baine 4/22/2 DATE

FREQUENCY 10 YEARS

Checked by ---------- DATE

DRAINAGE AREA	Soil & Development	A Acres	I In/hr.	C	ΔQ CFS	ΣQ CFS	SLOPE	SECTION	V FPS	L FT.	T MIN.	ΣT	REMARKS
								NATURAL SWALE			18.9		
OFF-SITE (NW OF SITE)	C/COMM				39.5	39.5	0.005	GRADED SWALE	2.6	750	4.8	18.9	SEE OFF-SITE STUDY
A-9	C/COMM	24.8	1.27	0.875	27.6	67.1	0.007	24"CMP/ SWALE	30AVG	100	0	23.7	
A-10	C/UNDEVEL.	2.0	1.27	0.60	1.5	68.6		42"RCP CULVERT				23.7	FLOW INTO 42" RCP CULVE

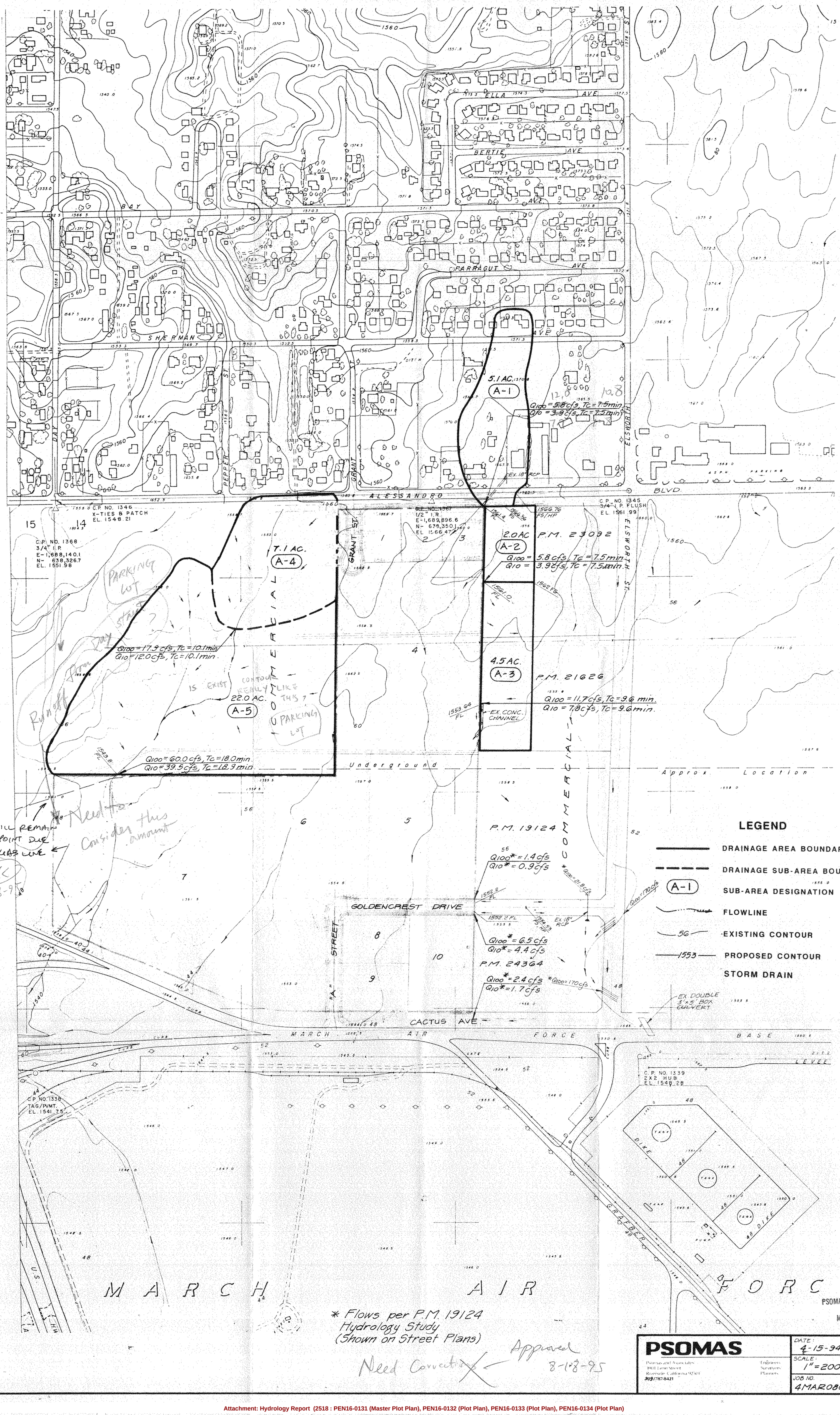
OK

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

OFF-SITE HYDROLOGY MAP

FOR

PARCEL MAP NO.27732



LEGEND

- DRAINAGE AREA BOUNDARY
- DRAINAGE SUB-AREA BOUNDARY
- A-1 SUB-AREA DESIGNATION
- FLOWLINE
- 56 EXISTING CONTOUR
- 1553 PROPOSED CONTOUR
- STORM DRAIN

* Flows per P.M. 19124 Hydrology Study (Shown on Street Plans)

PSOMAS & ASSOCIATES

MAY 1 1 1994

PSOMAS	DATE: 4-15-94	SHEET NO. 1
Psomas and Associates, 3961 Lime Street, Riverside, California 92501, 909/787-8421 — Engineers, Surveyors, Planners	SCALE: 1"=200'	OF 2
	JOB NO. 4MAR0801	

Packet Pg. 642

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

ON-SITE HYDROLOGY MAP

FOR

PARCEL MAP NO. 27732

TOTAL AREAS

Eastern Drainage Area = 57.8 Ac.
Western Drainage Area = 55.6 Ac.
Northern Drainage Area = 5.0 Ac.

SCALE: 1" = 100'

LEGEND

- DRAINAGE AREA BOUNDARY
- DRAINAGE SUB-AREA BOUNDARY
- (A-1) SUB-AREA DESIGNATION
- FLOWLINE
- 56 EXISTING CONTOUR
- 1553 PROPOSED CONTOUR
- STORM DRAIN

100 50 0 100 200
GRAPHIC SCALE: 1"=100'

* Q100 = 0.6 cfs
* Q10 = 0.4 cfs

Q100 = 12.9 cfs, Tc = 10.6 min.
Q10 = 8.2 cfs, Tc = 10.6 min.

EXIST. 18" CMP

** Q100 = 12.0 cfs, Tc = 10.8 min.
** Q10 = 7.9 cfs, Tc = 10.8 min.

ALESSANDRO BOULEVARD

GRANT STREET

A-1 5.0 Ac.

℄ 18" S.D.

** Q100 = 5.8 cfs, Tc = 7.5 min.
** Q10 = 3.9 cfs, Tc = 7.5 min.

Q100 = 16.7 cfs, Tc = 11.7 min.
Q10 = 11.0 cfs, Tc = 12.1 min.

A-2 6.6 Ac.

LINE "B"

Q100 = 17.0 cfs, Tc = 9.7 min.
Q10 = 11.3 cfs, Tc = 9.7 min.

℄ 24" RCP

** Q100 = 11.7 cfs, Tc = 9.6 min.
** Q10 = 7.8 cfs, Tc = 9.6 min.

Q100 = 26.4 cfs, Tc = 13.9 min.
Q10 = 17.4 cfs, Tc = 14.6 min.

A-3 17.8 Ac.

℄ 36" RCP

Q100 = 52.0 cfs, Tc = 18.8 min.
Q10 = 33.8 cfs, Tc = 19.9 min.

Q100 = 89.3 cfs, Tc = 18.8 min.
Q10 = 58.7 cfs, Tc = 19.9 min.

℄ 33" RCP

℄ 42" RCP

* Q100 = 1.4 cfs
* Q10 = 0.9 cfs

** Q100 = 60.0 cfs, Tc = 18.0 min.
** Q10 = 39.5 cfs, Tc = 18.9 min.

delineate 100 yr flood plain on ECS sheet 1

A-9 24.8 Ac.

Q100 = 102.4 cfs, Tc = 22.5 min.
Q10 = 67.1 cfs, Tc = 23.7 min.

Overflow Q100 = 62.0 cfs
Q10 = 0 cfs

IMPERIAL HWY

EAST FRONTAGE ROAD

EXIST. 24" CMP (REMOVED BY CAL TRANS)

Q100 = 104.6 cfs, Tc = 22.5 min.
Q10 = 68.4 cfs, Tc = 23.7 min.
QCAP = 87.9 cfs

A-10 1.7 Ac.

EXIST. 42" RCP CULVERT

CARRY OVER Q100 = 45.3 cfs
Q10 = 3.0 cfs

6.7 Ac. A-8

EXIST. 18" RCP (REMOVED BY CAL TRANS)

Q100 = 16.3 cfs, Tc = 10.4 min.
Q10 = 11.4 cfs, Tc = 10.4 min.

6.7 Ac. A-7

Q100 = 98.9 cfs, Tc = 19.8 min.
Q10 = 61.0 cfs, Tc = 21.5 min.

Q100 = 98.6 cfs, Tc = 20.0 min.
Q10 = 64.5 cfs = Tc = 21.8 min.

S = 0.0030

℄ TRAPEZODIAL CONC. CHANNEL (B=3.0', Z=1', D=4.0')

LINE "A"

Q100 = 119.0 cfs, Tc = 22.6 min.
Q10 = 76.7 cfs, Tc = 24.8 min.
QCAP = 73.7 cfs (WS=1545.0)

CACTUS AVENUE

GOLDENCREST DRIVE

"A" STREET

A-4 4.0 Ac.

℄ 48" SD

A-6 3.1 Ac.

℄ 48" RCP

A-5 1.0 Ac.

Q100 = 16.3 cfs, Tc = 10.7 min.
Q10 = 10.9 cfs, Tc = 10.7 min.

** Q100 = 6.5 cfs
** Q10 = 4.4 cfs

Q100 = 2.6 cfs, Tc = 9.8 min.
Q10 = 1.7 cfs, Tc = 9.8 min.

Q100 = 7.7 cfs, Tc = 10.3 min.
Q10 = 5.1 cfs, Tc = 10.3 min.

* Flows per P.M. 19124 Hydrology Study (Shown on Street Plans)
** Flows Per Off-Site Hydrology Study

CITY OF MORENO VALLEY
* Q100 = 2.4 cfs
* Q10 = 1.7 cfs
PLAN CHECK
CHECK # 2
DEPT. PW/CD
CHECKER Paul
DATE 12-13-95
X APPROVED
DATE: RESUBMIT 2 APRIL 1994 REVISED BLUELINES AND THIS CHECKPRINT

PSOMAS

Psomas and Associates
3901 Lime Street
Riverside, California 92501
909/787-8421

Engineers
Surveyors
Planners

SCALE: 1" = 100'
PROJECT NUMBER 4MAR0801
SHEET 2 OF 2

HYDRAULIC CALCS

P.M. 27732

need to sign and stamp this calc.

PSOMAS & ASSOC.
8/2/95
S. BAINE

Approved 12-13-95

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-
1.r
Packet Pg. 645

PSOMAS

Job No. 4MAR0801 Sheet 1 of 2

☐ Santa Monica 310/450-1217
☐ Costa Mesa 714/751-7373
☒ Riverside 909/787-8421
☐ Sacramento 916/929-7100

Project Name MARCH COMMERCE CENTER - P.M. 27732
Prepared By Steve Baine Date 7/27/95
Reviewed By _____ Date _____
Revised By _____ Date _____

HYDRAULIC CALCULATIONS

EXISTING 36" R.C.P. CULVERT

(UNDER IMPERIAL EAST FRONTAGE ROAD)

Why 1545 as a control elevation? you can raise the W.S. to get more Q to squeeze through the 36" RCP (higher Velocity, of course)

$Q_{100} = 119.0$ cfs

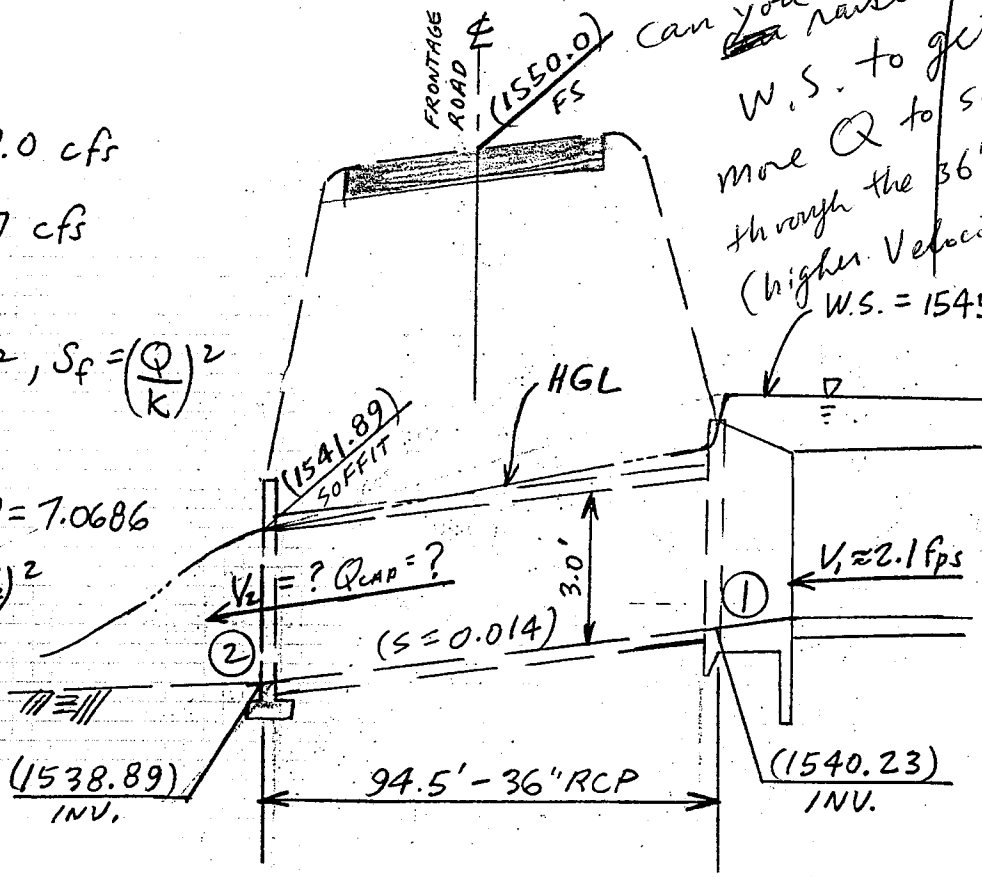
$Q_{10} = 76.7$ cfs

$Q = K S_f^{1/2}$, $S_f = \left(\frac{Q}{K}\right)^2$

$K = 666.9$

$Q = AV$, $A = 7.0686$

$S_f = \left(\frac{7.0686 V_2}{666.9}\right)^2 = 0.000112 V_2^2$



NO because of existing elevation

FLOW CAPACITY OF 36" CULVERT:

WS ≈ 1545.0 (where water overflows to the 42" north culvert)

Energy Equation: $\frac{V_1^2}{2g} + 1545.0 = 1538.89 + 3.0 + \frac{V_2^2}{2g} + \frac{0.2\Delta V^2}{2g} + 94.5 S_f$

$\approx \frac{0.2 V_2^2}{2g}$

$3.18 = 0.0292 V_2^2$

$V_2 = 10.43$ fps

This V is not extremely high yet! can be increased!

$Q_{CAP} = 73.7$ cfs

FLOW CARRY OVER

$Q_{100} = 119.0 - 73.7 = 45.3$ cfs

$Q_{10} = 76.7 - 73.7 = 3.0$ cfs

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

PSOMAS

Job No. 4MAR0801 Sheet 2 of 2

☐ Santa Monica 310/450-1217
☐ Costa Mesa 714/751-7373
☒ Riverside 909/787-8421
☐ Sacramento 916/929-7100

Project Name MARCH COMMERCE CENTER - P.M. 27732
Prepared By Steve Baine Date 7/27/95
Reviewed By _____ Date _____
Revised By _____ Date _____

HYDRAULIC CALCULATIONS (CONT'D)

EXISTING 42" RCP CULVERT

(UNDER IMPERIAL EAST FRONTAGE ROAD)

carry-over

$Q_{100} = 104.6 \text{ cfs} + 45.3 \text{ cfs} = 149.9 \text{ cfs}$

$Q_{10} = 68.4 \text{ cfs} + 3.0 \text{ cfs} = 71.4 \text{ cfs}$

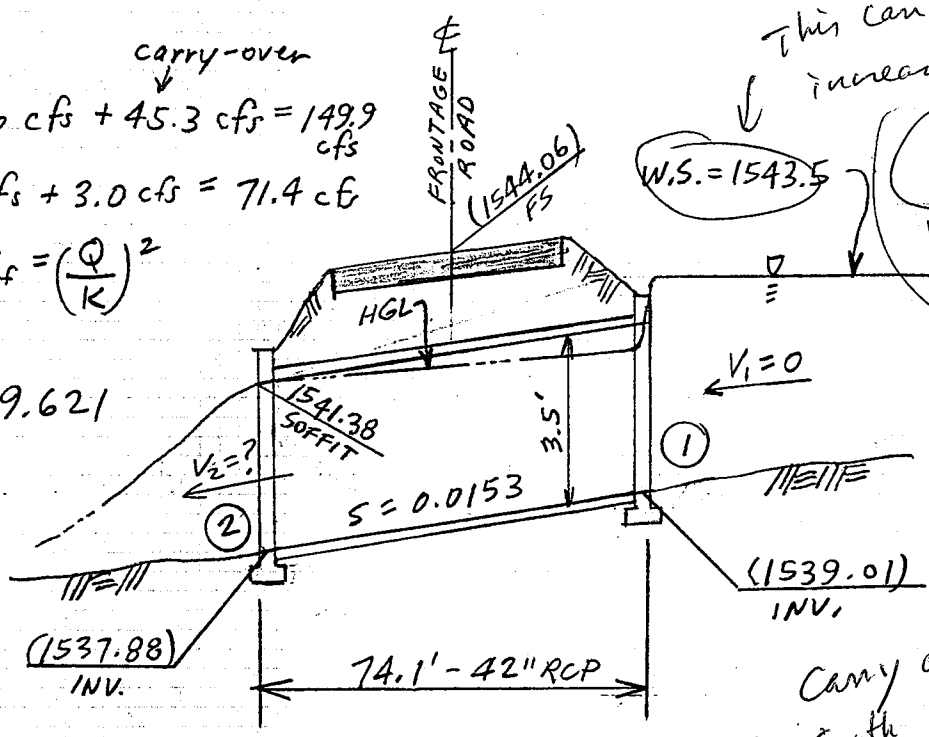
$Q = K S_f^{1/2}$, $S_f = \left(\frac{Q}{K}\right)^2$

$K = 1006$

$Q = AV$, $A = 9.621$

$S_f = \left(\frac{9.621 V}{1006}\right)^2$

$= 9.15 \times 10^{-5} V^2$



FLOW CAPACITY OF 36" CULVERT

W.S. ≈ 1543.5 (where water overflows frontage road) (further north)

Energy Equation:

$$\frac{V_1^2}{2g} + 1543.5 = 1537.88 + 3.5 + \frac{V_2^2}{2g} + \frac{0.2 V_2^2}{2g} + 74.1 S_f$$

$V_1 \approx 0$

$2.12 = 0.0254 V_2^2$

$V_2 = 9.13$ fps

$Q_{CAP} = 87.9$ cfs

FLOW CARRY-OVER (OVER FRONTAGE ROAD)

$Q_{100} = 149.9 - 87.9 = 62.0$ cfs

$Q_{10} = 71.4 - 87.9 = 0$ cfs

Only Q_{100} has overflow

OK Please ~~re-design~~.

NO ~~No~~ — situation

Overflow of the frontage Road is a

LINE "A" - 10 YEAR STORM

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

F0515P
WATER SURFACE PROFILE LISTING
4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED CHANNEL & STORM DRAIN - EASTERN DRAINAGE AREA
BY: STEVE BAINE, DATE: 7-27-95, FILE:MARLINEA.DAT

Need to revise cad calc because of channel X-section (need 1.5=1 sl instead of

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1015.00	1540.28	4.720	1545.000	76.7	2.10	0.069	1545.069	0.01	2.140	4.00	3.00	1.00	0	0.00
42.50	0.00306					.000144	0.01		2.188			1.00		
1057.50	1540.41	4.590	1545.000	76.7	2.20	0.075	1545.075	0.00	2.140	4.00	3.00	1.00	0	0.00
JUNCT STR	0.00000					.000142	0.00					1.00		
1057.50	1540.41	4.600	1545.010	71.9	2.06	0.066	1545.076	0.01	2.066	4.00	3.00	1.00	0	0.00
46.29	0.00291					.000141	0.01		2.142			1.00		
1103.79	1540.54	4.465	1545.010	71.9	2.16	0.072	1545.082	0.01	2.066	4.00	3.00	1.00	0	0.00
18.94	0.00291					.000155	0.00		2.142			1.00		
1122.73	1540.60	4.410	1545.010	71.9	2.20	0.075	1545.085	0.00	2.066	4.00	3.00	1.00	0	0.00
29.77	0.00302					.000166	0.00		2.122			1.00		
1152.50	1540.69	4.320	1545.010	71.9	2.27	0.080	1545.090	0.00	2.066	4.00	3.00	1.00	0	0.00
JUNCT STR	0.00000					.000155	0.00					1.00		
1152.50	1540.69	4.340	1545.030	64.5	2.02	0.064	1545.094	0.00	1.946	4.00	3.00	1.00	0	0.00
42.77	0.00300					.000146	0.01		2.008			1.00		
1195.27	1540.82	4.212	1545.030	64.5	2.12	0.070	1545.100	0.00	1.946	4.00	3.00	1.00	0	0.00
41.69	0.00300					.000166	0.01		2.008			1.00		
1236.96	1540.94	4.087	1545.030	64.5	2.23	0.077	1545.107	0.00	1.946	4.00	3.00	1.00	0	0.00
40.66	0.00300					.000188	0.01		2.008			1.00		
1277.62	1541.06	3.965	1545.030	64.5	2.34	0.085	1545.115	0.00	1.946	4.00	3.00	1.00	0	0.00
39.65	0.00300					.000213	0.01		2.008			1.00		
1317.27	1541.18	3.846	1545.030	64.5	2.45	0.093	1545.123	0.00	1.946	4.00	3.00	1.00	0	0.00
38.66	0.00300					.000242	0.01		2.008			1.00		

The Channel Height as shown on plan is 3.5 not 4

No need a bigger section is more conserv. and indeed to lower W.S.

big

OK

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

F0515P
WATER SURFACE PROFILE LISTING
4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED CHANNEL & STORM DRAIN - EASTERN DRAINAGE AREA
BY: STEVE BAINE, DATE: 7-27-95, FILE:MARLINEA.DAT

should be 3.5 OK

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
1355.93	1541.30	3.730	1545.030	64.5	2.57	0.103	1545.133	0.00	1.946		4.00	3.00	1.00	0	0.00
37.70	0.00300					.000275	0.01		2.008			1.00			
1393.63	1541.41	3.617	1545.030	64.5	2.69	0.113	1545.143	0.00	1.946		4.00	3.00	1.00	0	0.00
36.76	0.00300					.000312	0.01		2.008			1.00			
1430.39	1541.52	3.507	1545.030	64.5	2.83	0.124	1545.154	0.00	1.946		4.00	3.00	1.00	0	0.00
35.87	0.00300					.000355	0.01		2.008			1.00			
1466.26	1541.63	3.400	1545.031	64.5	2.96	0.136	1545.167	0.00	1.946		4.00	3.00	1.00	0	0.00
34.98	0.00300					.000403	0.01		2.008			1.00			
1501.24	1541.74	3.296	1545.032	64.5	3.11	0.150	1545.182	0.00	1.946		4.00	3.00	1.00	0	0.00
34.14	0.00300					.000457	0.02		2.008			1.00			
1535.38	1541.84	3.194	1545.032	64.5	3.26	0.165	1545.197	0.00	1.946		4.00	3.00	1.00	0	0.00
33.33	0.00300					.000519	0.02		2.008			1.00			
1568.71	1541.94	3.095	1545.033	64.5	3.42	0.182	1545.215	0.00	1.946		4.00	3.00	1.00	0	0.00
32.55	0.00300					.000590	0.02		2.008			1.00			
1601.26	1542.03	2.998	1545.033	64.5	3.59	0.200	1545.233	0.00	1.946		4.00	3.00	1.00	0	0.00
31.80	0.00300					.000671	0.02		2.008			1.00			
1633.06	1542.13	2.904	1545.035	64.5	3.76	0.220	1545.255	0.00	1.946		4.00	3.00	1.00	0	0.00
31.11	0.00300					.000761	0.02		2.008			1.00			
1664.17	1542.22	2.813	1545.037	64.5	3.95	0.242	1545.279	0.00	1.946		4.00	3.00	1.00	0	0.00
30.46	0.00300					.000866	0.03		2.008			1.00			
1694.63	1542.31	2.723	1545.038	64.5	4.14	0.266	1545.304	0.00	1.946		4.00	3.00	1.00	0	0.00
29.88	0.00300					.000983	0.03		2.008			1.00			

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

F0515P
WATER SURFACE PROFILE LISTING
4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED CHANNEL & STORM DRAIN - EASTERN DRAINAGE AREA
BY: STEVE BAINE, DATE: 7-27-95, FILE:MARLINEA.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1724.51	1542.41	2.637	1545.042	64.5	4.34	0.292	1545.334	0.00	1.946		4.00	3.00	1.00	0	0.00
29.36	0.00300					.001118	0.03			2.008			1.00		
1753.87	1542.49	2.552	1545.045	64.5	4.55	0.322	1545.367	0.00	1.946		4.00	3.00	1.00	0	0.00
28.96	0.00300					.001271	0.04			2.008			1.00		
1782.83	1542.58	2.470	1545.050	64.5	4.77	0.354	1545.404	0.00	1.946		4.00	3.00	1.00	0	0.00
28.71	0.00300					.001445	0.04			2.008			1.00		
1811.54	1542.67	2.390	1545.056	64.5	5.01	0.389	1545.445	0.00	1.946		4.00	3.00	1.00	0	0.00
28.70	0.00300					.001642	0.05			2.008			1.00		
1840.24	1542.75	2.312	1545.064	64.5	5.25	0.428	1545.492	0.00	1.946		4.00	3.00	1.00	0	0.00
29.10	0.00300					.001867	0.05			2.008			1.00		
1869.34	1542.84	2.236	1545.075	64.5	5.51	0.471	1545.546	0.00	1.946		4.00	3.00	1.00	0	0.00
25.02	0.00300					.002107	0.05			2.008			1.00		
1894.36	1542.91	2.171	1545.085	64.5	5.75	0.513	1545.598	0.00	1.946		4.00	3.00	1.00	0	0.00
HYDRAULIC JUMP													1.00		
1894.36	1542.91	1.734	1544.648	64.5	7.86	0.959	1545.607	0.00	1.946		4.00	3.00	1.00	0	0.00
12.74	0.00300					.005572	0.07			2.008			1.00		
1907.10	1542.95	1.675	1544.627	64.5	8.24	1.054	1545.681	0.00	1.946		4.00	3.00	1.00	0	0.00
14.20	0.00300					.006344	0.09			2.008			1.00		
1921.30	1543.00	1.617	1544.612	64.5	8.64	1.160	1545.772	0.00	1.946		4.00	3.00	1.00	0	0.00
14.12	0.00300					.007229	0.10			2.008			1.00		
1935.42	1543.04	1.560	1544.597	64.5	9.06	1.275	1545.872	0.00	1.946		4.00	3.00	1.00	0	0.00
13.92	0.00300					.008238	0.11			2.008			1.00		

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

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WATER SURFACE PROFILE LISTING

4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED CHANNEL & STORM DRAIN - EASTERN DRAINAGE AREA
BY: STEVE BAINE, DATE: 7-27-95, FILE:MARLINEA.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1949.34	1543.08	1.506	1544.585	64.5	9.51	1.403	1545.988	0.00	1.946		4.00	3.00	1.00	0	0.00
13.66	0.00300					.009390	0.13			2.008			1.00		
1963.00	1543.12	1.453	1544.573	64.5	9.97	1.543	1546.116	0.00	1.946		4.00	3.00	1.00	0	0.00
TRANS STR	0.00333					.009362	0.11						1.00		
1975.00	1543.16	1.716	1544.876	64.5	9.40	1.372	1546.248	0.00	2.007		5.50	4.00	0.00	0	0.00
WALL EXIT													0.00		
1975.00	1543.16	2.424	1545.584	64.5	8.10	1.018	1546.602	0.00	2.424		4.00	0.00	0.00	0	0.00
6.95	0.00300					.004087	0.03			2.756			0.00		
1981.95	1543.18	2.524	1545.705	64.5	7.72	0.925	1546.630	0.00	2.424		4.00	0.00	0.00	0	0.00
34.93	0.00300					.003624	0.13			2.756			0.00		
2016.88	1543.29	2.630	1545.916	64.5	7.36	0.841	1546.757	0.00	2.424		4.00	0.00	0.00	0	0.00
41.52	0.00300					.003327	0.14			2.756			0.00		
2058.40	1543.41	2.677	1546.087	64.5	7.22	0.809	1546.896	0.00	2.424		4.00	0.00	0.00	0	0.00
JUNCT STR	0.00182					.002729	0.02						0.00		
2063.90	1543.42	2.975	1546.395	61.0	6.09	0.575	1546.970	0.00	2.354		4.00	0.00	0.00	0	0.00
23.49	0.00298					.002238	0.05			2.652			0.00		
2087.39	1543.49	2.945	1546.435	61.0	6.15	0.587	1547.022	0.00	2.354		4.00	0.00	0.00	0	0.00
88.63	0.00305					.002375	0.21			2.631			0.00		
2176.02	1543.76	2.838	1546.598	61.0	6.40	0.636	1547.234	0.00	2.354		4.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.002353	0.00						0.00		
2176.02	1543.76	2.921	1546.681	59.8	6.08	0.574	1547.255	0.00	2.330		4.00	0.00	0.00	0	0.00
81.20	0.00321					.002353	0.19			2.548			0.00		

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

Where is STA 2240.00 where there is a GIB?

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WATER SURFACE PROFILE LISTING
4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED CHANNEL & STORM DRAIN - EASTERN DRAINAGE AREA
BY: STEVE BAINE, DATE: 7-27-95, FILE:MARLINEA.DAT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
2257.22	1544.02	2.794	1546.815	59.8	6.38	0.632	1547.447	0.00	2.330	4.00	0.00	0.00	0	0.00
30.98	0.00321					.002537	0.08		2.548			0.00		
2288.20	1544.12	2.752	1546.872	59.8	6.49	0.653	1547.525	0.00	2.330	4.00	0.00	0.00	0	0.00
23.54	0.00212					.002562	0.06		2.975			0.00		
2311.74	1544.17	2.773	1546.943	59.8	6.43	0.642	1547.585	0.00	2.330	4.00	0.00	0.00	0	0.00
116.59	0.00183					.002401	0.28		3.185			0.00		
2428.33	1544.38	2.898	1547.281	59.8	6.13	0.584	1547.865	0.00	2.330	4.00	0.00	0.00	0	0.00
260.78	0.00183					.002148	0.56		3.185			0.00		
2689.11	1544.86	3.034	1547.895	59.8	5.85	0.531	1548.426	0.00	2.330	4.00	0.00	0.00	0	0.00
59.88	0.00183					.002018	0.12		3.185			0.00		
2748.99	1544.97	3.051	1548.021	59.8	5.81	0.525	1548.546	0.00	2.330	4.00	0.00	0.00	0	0.00
14.25	0.00210					.002007	0.03		2.987			0.00		
2763.24	1545.00	3.050	1548.050	59.8	5.82	0.525	1548.575	0.00	2.330	4.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.001935	0.00					0.00		
2763.24	1545.00	3.104	1548.104	58.7	5.61	0.489	1548.593	0.00	2.308	4.00	0.00	0.00	0	0.00
55.59	0.00198					.001866	0.10		3.020			0.00		
2818.83	1545.11	3.096	1548.206	58.7	5.62	0.491	1548.697	0.00	2.308	4.00	0.00	0.00	0	0.00
383.21	0.00198					.001903	0.73		3.016			0.00		
3202.04	1545.87	3.050	1548.920	58.7	5.71	0.506	1549.426	0.00	2.308	4.00	0.00	0.00	0	0.00
28.08	0.00214					.001940	0.05		2.922			0.00		
3230.12	1545.93	3.042	1548.972	58.7	5.72	0.509	1549.481	0.00	2.308	4.00	0.00	0.00	0	0.00
JUNCT STR	0.00143					.001754	0.01					0.00		

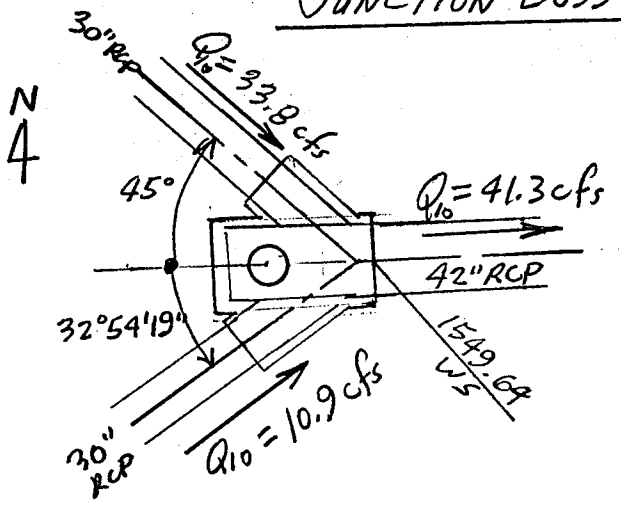
what is STA 26400 ??

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

F0515P
WATER SURFACE PROFILE LISTING
PAGE 6

4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED CHANNEL & STORM DRAIN - EASTERN DRAINAGE AREA
BY: STEVE BAINE, DATE: 7-27-95, FILE:MARLINEA.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH				ZR		
3237.12	1545.94	3.470	1549.410	41.3	4.30	0.287	1549.697	0.00	2.000		3.50	0.00	0.00	0	0.00
36.45	0.00192					.001551	0.06			2.687			0.00		
3273.57	1546.01	3.457	1549.467	41.3	4.30	0.287	1549.754	0.00	2.000		3.50	0.00	0.00	0	0.00
114.57	0.00201					.001513	0.17			2.635			0.00		
3388.14	1546.24	3.397	1549.637	41.3	4.33	0.291	1549.928	0.00	2.000		3.50	0.00	0.00	0	0.00



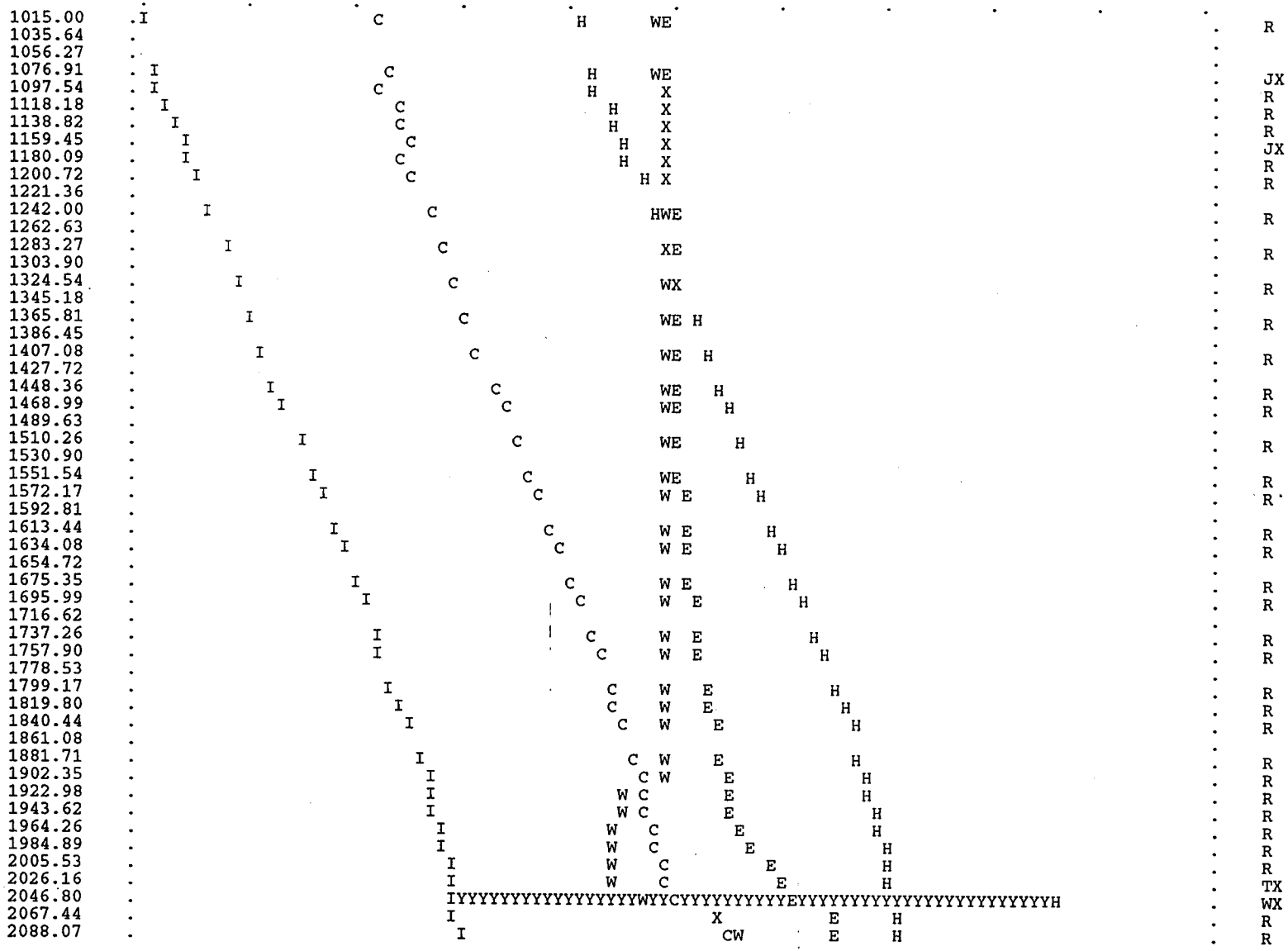
$$\Delta y = \frac{Q_{42"} V_{42"} - Q_{30"N} V_{30"N} \cos 45° - Q_{30"N} V_{30"N} \cos 32°54'19"}{32.2\ (A)}$$

$$\Delta y = \frac{41.3(4.33) - 33.8(6.89)\cos 45° - 10.9(2.22)\cos 32°54'19"}{32.2\ (9.53)}$$

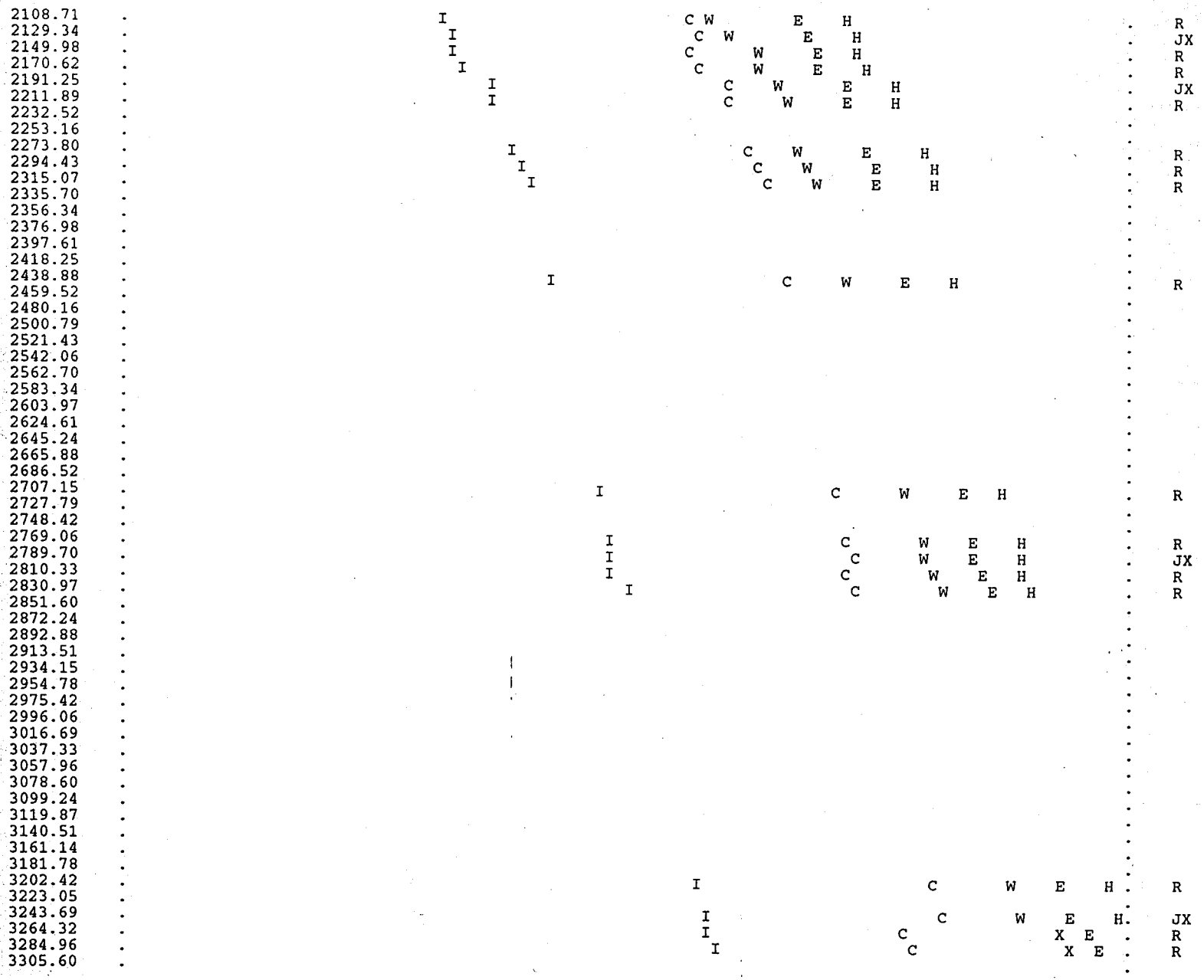
$$\Delta y = -0.02 \approx 0$$

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED STORM DRAIN - EASTERN DRAINAGE AREA FILE:MARLINEA.DAT
BY: STEVE BAINE, DATE: 7-25-95



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-



Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

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    3326.23    .                                                                                  .
    3346.87    .                                                                                  .
    3367.50    .                                                                                  .
    3388.14    .                                                  I                   C       WHE .    R
               .         .         .         .         .         .         .         .         .         .
           1540.28   1541.24   1542.21   1543.17   1544.14   1545.10   1546.07   1547.03   1548.00   1548.96   1549.93
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N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

LINE "B" - 10 YEAR STORM

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

F0515P
WATER SURFACE PROFILE LISTING

4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED STORM DRAIN - LINE "B" (ALONG E'LY P.L.)
BY: STEVE BAINE, DATE: 7-25-95, FILE:MARLINEB.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH				ZR		
3171.76	1546.44	3.000	1549.440	17.4	2.46	0.094	1549.534	0.00	1.334		3.00	0.00	0.00	0	0.00
0.00	0.00703					.000676	0.00			1.150			0.00		
3171.76	1546.44	3.000	1549.440	17.4	2.46	0.094	1549.534	0.00	1.334		3.00	0.00	0.00	0	0.00
12.80	0.00703					.000635	0.01			1.150			0.00		
3184.56	1546.53	2.916	1549.446	17.4	2.48	0.096	1549.542	0.00	1.334		3.00	0.00	0.00	0	0.00
17.05	0.00528					.000595	0.01			1.241			0.00		
3201.61	1546.62	2.833	1549.453	17.4	2.52	0.098	1549.551	0.00	1.334		3.00	0.00	0.00	0	0.00
37.77	0.00540					.000600	0.02			1.234			0.00		
3239.38	1546.82	2.642	1549.466	17.4	2.64	0.108	1549.574	0.00	1.334		3.00	0.00	0.00	0	0.00
28.39	0.00540					.000638	0.02			1.234			0.00		
3267.77	1546.98	2.496	1549.473	17.4	2.77	0.119	1549.592	0.00	1.334		3.00	0.00	0.00	0	0.00
24.05	0.00540					.000697	0.02			1.234			0.00		
3291.82	1547.11	2.371	1549.478	17.4	2.90	0.131	1549.609	0.00	1.334		3.00	0.00	0.00	0	0.00
21.15	0.00540					.000770	0.02			1.234			0.00		
3312.97	1547.22	2.260	1549.481	17.4	3.05	0.144	1549.625	0.00	1.334		3.00	0.00	0.00	0	0.00
19.06	0.00540					.000856	0.02			1.234			0.00		
3332.03	1547.32	2.159	1549.483	17.4	3.19	0.158	1549.641	0.00	1.334		3.00	0.00	0.00	0	0.00
17.15	0.00540					.000957	0.02			1.234			0.00		
3349.18	1547.42	2.067	1549.484	17.4	3.35	0.174	1549.658	0.00	1.334		3.00	0.00	0.00	0	0.00
15.86	0.00540					.001074	0.02			1.234			0.00		
3365.04	1547.50	1.981	1549.483	17.4	3.51	0.192	1549.675	0.00	1.334		3.00	0.00	0.00	0	0.00
14.75	0.00540					.001208	0.02			1.234			0.00		

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

F0515P
WATER SURFACE PROFILE LISTING

4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED STORM DRAIN - LINE "B" (ALONG E'LY P.L.)
BY: STEVE BAINE, DATE: 7-25-95, FILE:MARLINEB.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3379.79	1547.58	1.900	1549.482	17.4	3.68	0.211	1549.693	0.00	1.334		3.00	0.00	0.00	0	0.00
13.36	0.00540					.001362	0.02			1.234			0.00		
3393.15	1547.65	1.825	1549.479	17.4	3.86	0.232	1549.711	0.00	1.334		3.00	0.00	0.00	0	0.00
12.39	0.00540					.001539	0.02			1.234			0.00		
3405.54	1547.72	1.754	1549.475	17.4	4.05	0.255	1549.730	0.00	1.334		3.00	0.00	0.00	0	0.00
11.61	0.00540					.001740	0.02			1.234			0.00		
3417.15	1547.78	1.686	1549.470	17.4	4.25	0.281	1549.751	0.00	1.334		3.00	0.00	0.00	0	0.00
10.48	0.00540					.001970	0.02			1.234			0.00		
3427.63	1547.84	1.622	1549.462	17.4	4.46	0.309	1549.771	0.00	1.334		3.00	0.00	0.00	0	0.00
9.20	0.00540					.002234	0.02			1.234			0.00		
3436.83	1547.89	1.562	1549.452	17.4	4.68	0.340	1549.792	0.00	1.334		3.00	0.00	0.00	0	0.00
8.40	0.00540					.002534	0.02			1.234			0.00		
3445.23	1547.94	1.504	1549.439	17.4	4.90	0.373	1549.812	0.00	1.334		3.00	0.00	0.00	0	0.00
7.00	0.00540					.002877	0.02			1.234			0.00		
3452.23	1547.97	1.449	1549.422	17.4	5.14	0.411	1549.833	0.00	1.334		3.00	0.00	0.00	0	0.00
1.03	0.00540					.003273	0.00			1.234			0.00		
3453.26	1547.98	1.396	1549.375	17.4	5.40	0.453	1549.828	0.00	1.334		3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
3453.26	1547.98	1.234	1549.213	17.4	6.35	0.626	1549.839	0.00	1.334		3.00	0.00	0.00	0	0.00
439.76	0.00540					.005413	2.38			1.234			0.00		
3893.02	1550.35	1.234	1551.587	17.4	6.35	0.626	1552.213	0.00	1.334		3.00	0.00	0.00	0	0.00
59.61	0.00540					.005365	0.32			1.234			0.00		

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

F0515P
WATER SURFACE PROFILE LISTING

4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED STORM DRAIN - LINE "B" (ALONG E'LY P.L.)
BY: STEVE BAINE, DATE: 7-25-95, FILE:MARLINEB.DAT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
3952.63	1550.68	1.240	1551.915	17.4	6.31	0.618	1552.533	0.00	1.334	3.00	0.00	0.00	0	0.00
27.47	0.00540					.004992	0.14		1.234			0.00		
3980.10	1550.82	1.285	1552.108	17.4	6.01	0.562	1552.670	0.00	1.334	3.00	0.00	0.00	0	0.00
3.12	0.00540					.004380	0.01		1.234			0.00		
3983.22	1550.84	1.334	1552.174	17.4	5.73	0.510	1552.684	0.00	1.334	3.00	0.00	0.00	0	0.00
JUNCT STR	0.00500					.003119	0.02					0.00		
3989.22	1550.87	1.747	1552.617	11.0	3.78	0.222	1552.839	0.00	1.189	2.00	0.00	0.00	0	0.00
96.17	0.00299					.002239	0.22		1.470			0.00		
4085.39	1551.16	1.652	1552.810	11.0	3.96	0.244	1553.054	0.00	1.189	2.00	0.00	0.00	0	0.00
105.85	0.00299					.002450	0.26		1.470			0.00		
4191.24	1551.47	1.570	1553.045	11.0	4.16	0.268	1553.313	0.00	1.189	2.00	0.00	0.00	0	0.00
162.75	0.00299					.002711	0.44		1.470			0.00		
4353.99	1551.96	1.497	1553.459	11.0	4.36	0.295	1553.754	0.00	1.189	2.00	0.00	0.00	0	0.00
139.95	0.00299					.002906	0.41		1.470			0.00		
4493.94	1552.38	1.475	1553.856	11.0	4.43	0.305	1554.161	0.00	1.189	2.00	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		
4493.94	1552.38	0.947	1553.328	11.0	7.51	0.875	1554.203	0.00	1.189	2.00	0.00	0.00	0	0.00
0.24	0.00299					.011398	0.00		1.470			0.00		
4494.18	1552.38	0.947	1553.330	11.0	7.51	0.875	1554.205	0.00	1.189	2.00	0.00	0.00	0	0.00
5.82	0.00299					.012175	0.07		1.470			0.00		
4500.00	1552.40	0.913	1553.313	11.0	7.87	0.963	1554.276	0.00	1.189	2.00	0.00	0.00	0	0.00
71.39	0.01282					.012956	0.92		0.913			0.00		

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

F0515P
WATER SURFACE PROFILE LISTING

4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED STORM DRAIN - LINE "B" (ALONG E'LY P.L.)
BY: STEVE BAINE, DATE: 7-25-95, FILE:MARLINEB.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
4571.39	1553.31	0.913	1554.228	11.0	7.87	0.963	1555.191	0.00	1.189		2.00	0.00	0.00	0	0.00
84.92	0.01282					.012880	1.09			0.913			0.00		
4656.31	1554.40	0.916	1555.319	11.0	7.84	0.955	1556.274	0.00	1.189		2.00	0.00	0.00	0	0.00
66.83	0.01282					.012032	0.80			0.913			0.00		
4723.14	1555.26	0.950	1556.210	11.0	7.47	0.867	1557.077	0.00	1.189		2.00	0.00	0.00	0	0.00
JUNCT STR	0.09500					.014459	0.09						0.00		
4729.14	1555.83	0.808	1556.638	7.9	8.14	1.030	1557.668	0.00	1.089		1.50	0.00	0.00	0	0.00
9.75	0.01284					.018575	0.18			0.890			0.00		
4738.89	1555.96	0.784	1556.739	7.9	8.45	1.109	1557.848	0.00	1.089		1.50	0.00	0.00	0	0.00
10.29	0.01284					.020808	0.21			0.890			0.00		
4749.18	1556.09	0.755	1556.842	7.9	8.87	1.221	1558.063	0.00	1.089		1.50	0.00	0.00	0	0.00
8.73	0.01284					.023620	0.21			0.890			0.00		
4757.91	1556.20	0.727	1556.926	7.9	9.29	1.341	1558.267	0.00	1.089		1.50	0.00	0.00	0	0.00
7.67	0.01284					.026822	0.21			0.890			0.00		
4765.58	1556.30	0.700	1556.998	7.9	9.75	1.477	1558.475	0.00	1.089		1.50	0.00	0.00	0	0.00
6.95	0.01284					.030488	0.21			0.890			0.00		
4772.53	1556.39	0.675	1557.062	7.9	10.23	1.626	1558.688	0.00	1.089		1.50	0.00	0.00	0	0.00
6.34	0.01284					.034689	0.22			0.890			0.00		
4778.87	1556.47	0.651	1557.120	7.9	10.73	1.789	1558.909	0.00	1.089		1.50	0.00	0.00	0	0.00
5.84	0.01284					.039488	0.23			0.890			0.00		
4784.71	1556.54	0.628	1557.172	7.9	11.25	1.967	1559.139	0.00	1.089		1.50	0.00	0.00	0	0.00
5.43	0.01284					.044973	0.24			0.890			0.00		

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F0515P
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4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED STORM DRAIN - LINE "B" (ALONG E'LY P.L.)
BY: STEVE BAINE, DATE: 7-25-95, FILE:MARLINEB.DAT

STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
4790.14	1556.61	0.606	1557.219	7.9	11.81	2.165	1559.384	0.00	1.089	1.50	0.00	0.00	0	0.00
5.09	0.01284					.051248	0.26		0.890			0.00		
4795.23	1556.68	0.585	1557.264	7.9	12.38	2.381	1559.645	0.00	1.089	1.50	0.00	0.00	0	0.00
4.77	0.01284					.058419	0.28		0.890			0.00		
4800.00	1556.74	0.565	1557.305	7.9	12.97	2.613	1559.918	0.00	1.089	1.50	0.00	0.00	0	0.00
1.31	0.07400					.061955	0.08		0.540			0.00		
4801.31	1556.84	0.566	1557.403	7.9	12.93	2.596	1559.999	0.00	1.089	1.50	0.00	0.00	0	0.00
13.40	0.07400					.057868	0.78		0.540			0.00		
4814.71	1557.83	0.586	1558.415	7.9	12.34	2.366	1560.781	0.00	1.089	1.50	0.00	0.00	0	0.00
8.34	0.07400					.050751	0.42		0.540			0.00		
4823.05	1558.45	0.607	1559.053	7.9	11.76	2.146	1561.199	0.00	1.089	1.50	0.00	0.00	0	0.00
5.85	0.07400					.044562	0.26		0.540			0.00		
4828.90	1558.88	0.630	1559.509	7.9	11.22	1.955	1561.464	0.00	1.089	1.50	0.00	0.00	0	0.00
4.44	0.07400					.039152	0.17		0.540			0.00		
4833.34	1559.21	0.653	1559.860	7.9	10.69	1.775	1561.635	0.00	1.089	1.50	0.00	0.00	0	0.00
3.46	0.07400					.034392	0.12		0.540			0.00		
4836.80	1559.46	0.677	1560.141	7.9	10.19	1.613	1561.754	0.00	1.089	1.50	0.00	0.00	0	0.00
2.78	0.07400					.030225	0.08		0.540			0.00		
4839.58	1559.67	0.702	1560.371	7.9	9.72	1.466	1561.837	0.00	1.089	1.50	0.00	0.00	0	0.00
2.25	0.07400					.026589	0.06		0.540			0.00		
4841.83	1559.84	0.729	1560.564	7.9	9.27	1.335	1561.899	0.00	1.089	1.50	0.00	0.00	0	0.00
1.86	0.07400					.023401	0.04		0.540			0.00		

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4MAR0801 - MARCH COMMERCE CENTER P.M.# 27732
PROPOSED STORM DRAIN - LINE "B" (ALONG E'LY P.L.)
BY: STEVE BAINE, DATE: 7-25-95, FILE:MARLINEB.DAT

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
4843.69	1559.97	0.756	1560.729	7.9	8.84	1.213	1561.942	0.00	1.089		1.50	0.00	0.00	0	0.00
1.50	0.07400					.020613	0.03			0.540			0.00		
4845.19	1560.08	0.786	1560.870	7.9	8.42	1.101	1561.971	0.00	1.089		1.50	0.00	0.00	0	0.00
1.26	0.07400					.018176	0.02			0.540			0.00		
4846.45	1560.18	0.816	1560.993	7.9	8.04	1.003	1561.996	0.00	1.089		1.50	0.00	0.00	0	0.00
1.02	0.07400					.016031	0.02			0.540			0.00		
4847.47	1560.25	0.848	1561.101	7.9	7.66	0.912	1562.013	0.00	1.089		1.50	0.00	0.00	0	0.00
0.82	0.07400					.014159	0.01			0.540			0.00		
4848.29	1560.31	0.882	1561.195	7.9	7.30	0.828	1562.023	0.00	1.089		1.50	0.00	0.00	0	0.00
0.63	0.07400					.012524	0.01			0.540			0.00		
4848.92	1560.36	0.918	1561.278	7.9	6.96	0.752	1562.030	0.00	1.089		1.50	0.00	0.00	0	0.00
0.49	0.07400					.011093	0.01			0.540			0.00		
4849.41	1560.40	0.956	1561.352	7.9	6.64	0.684	1562.036	0.00	1.089		1.50	0.00	0.00	0	0.00
0.33	0.07400					.009845	0.00			0.540			0.00		
4849.74	1560.42	0.997	1561.418	7.9	6.33	0.622	1562.040	0.00	1.089		1.50	0.00	0.00	0	0.00
0.19	0.07400					.008759	0.00			0.540			0.00		
4849.93	1560.44	1.041	1561.476	7.9	6.04	0.566	1562.042	0.00	1.089		1.50	0.00	0.00	0	0.00
0.07	0.07400					.007803	0.00			0.540			0.00		
4850.00	1560.44	1.089	1561.529	7.9	5.75	0.513	1562.042	0.00	1.089		1.50	0.00	0.00	0	0.00
1.72	0.00440					.006975	0.01			1.500			0.00		
4851.72	1560.45	1.140	1561.588	7.9	5.48	0.467	1562.055	0.00	1.089		1.50	0.00	0.00	0	0.00
7.25	0.00440					.006272	0.05			1.500			0.00		

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STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
4858.97	1560.48	1.196	1561.675	7.9	5.22	0.424	1562.099	0.00	1.089		1.50	0.00	0.00	0	0.00
19.77	0.00440					.005683	0.11			1.500			0.00		
4878.74	1560.57	1.260	1561.826	7.9	4.98	0.386	1562.212	0.00	1.089		1.50	0.00	0.00	0	0.00
49.72	0.00440					.005220	0.26			1.500			0.00		
4928.46	1560.78	1.336	1562.121	7.9	4.75	0.350	1562.471	0.00	1.089		1.50	0.00	0.00	0	0.00
64.85	0.00440					.004959	0.32			1.500			0.00		
4993.31	1561.07	1.392	1562.462	7.9	4.62	0.331	1562.793	0.00	1.089		1.50	0.00	0.00	0	0.00
75.86	0.00435					.004929	0.37			1.500			0.00		
5069.17	1561.40	1.451	1562.851	7.9	4.52	0.317	1563.168	0.00	1.089		1.50	0.00	0.00	0	0.00

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

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PROPOSED STORM DRAIN - LINE "B" (ALONG E'LY P.L.)
BY: STEVE BAINE, DATE: 7-25-95, FILE:MARLINEB.DAT

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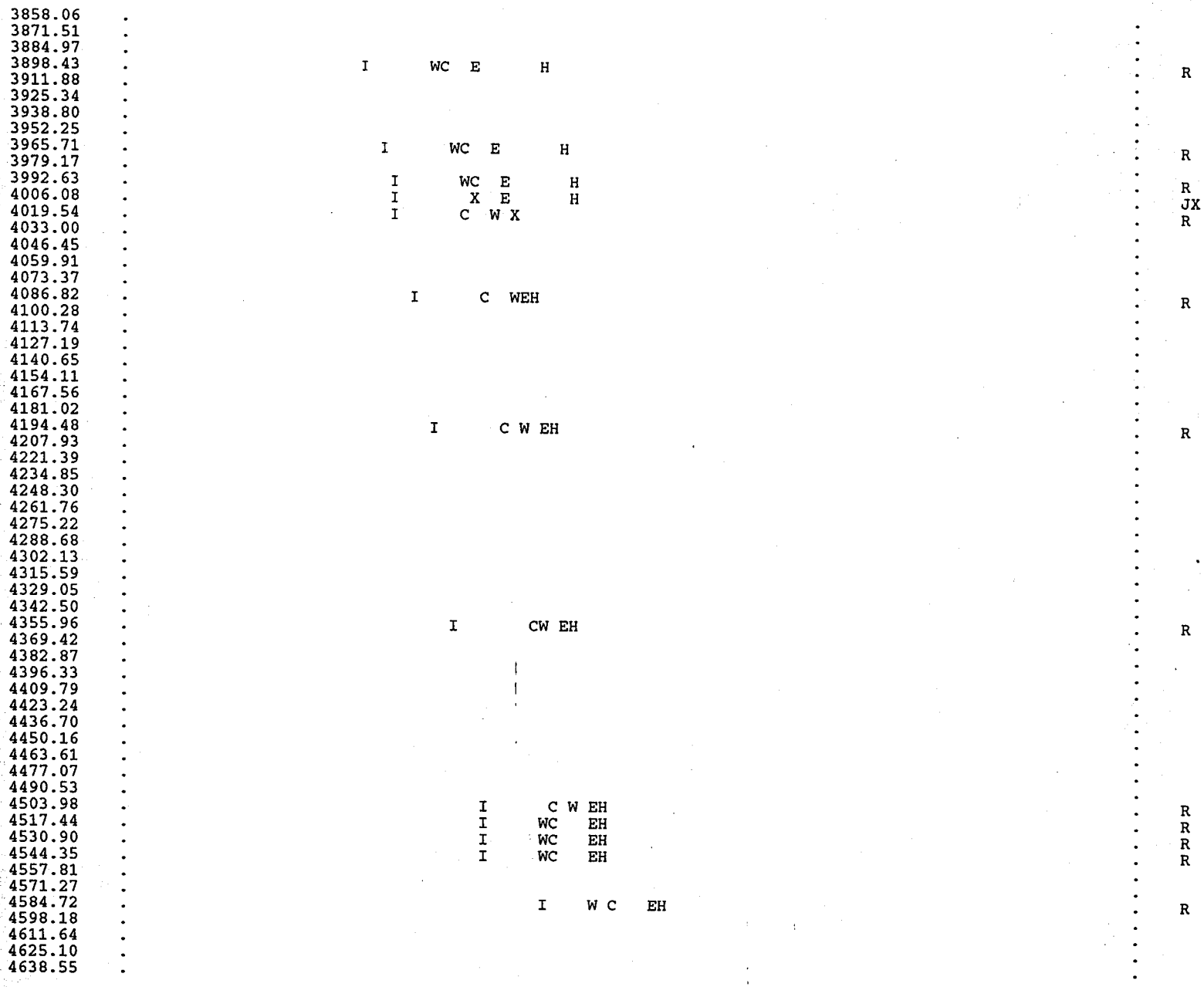

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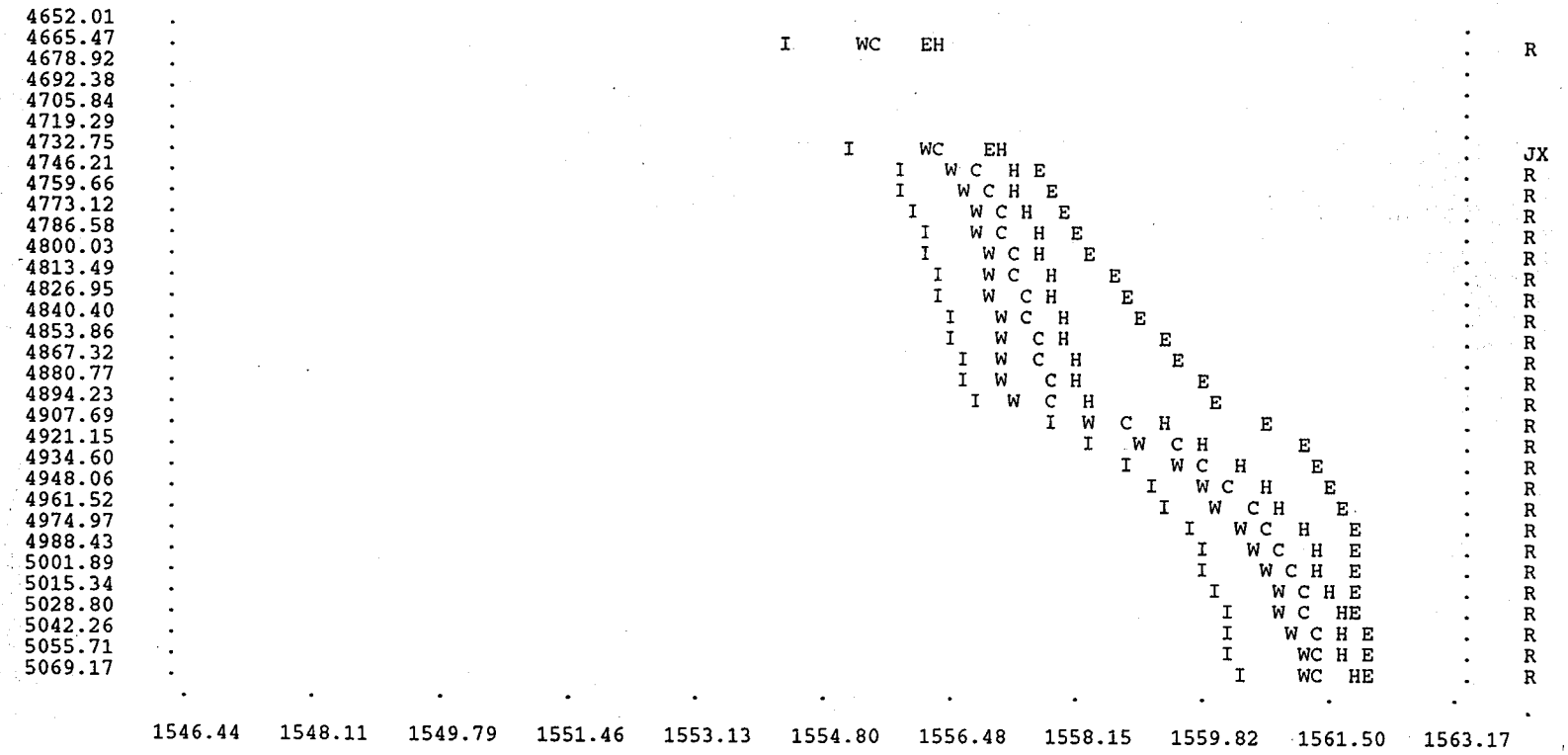

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

HYDRAULIC GRADE LINE CALCULATION SHEET

Sht. 1 of

PROJECT P.M. 27732

LINE 30" LATERALS

STA. 33+89.89 LINE "A"

Los Angeles County Flood Control District

CALCULATED BY Steve Bain

*Conduit unseals when D is less than d

DATE 7/27/95

STA.	ELEV. INV.	D*	ELEV. H.G.L.	SECTION	d	A	Q	V	$\frac{v^2}{2g}$	K	S_f	Av. S_f	L	h_f	h_b	h_j	h_E	ELEV. E.G.L.
		NORTH		LATERAL														
0+00.00	1546.24	3.40	1549.64	42" RCP MAIN	3.5	9.54	41.3	4.33	0.29	1006								1549.93
0+01.75	1546.63	2.99	1549.62	30" RCP	2.5	4.91	33.8	6.88	0.74	410.1	0.0068					0.43		1550.36
0+48.08	1547.10	2.84	1549.94	30" RCP	2.5	4.91	33.8	6.88	0.74	410.1	0.0068	0.0068	46.33	0.32				1550.68
0+48.08	1547.10	3.73	1550.83	C.B.			33.8	.0	0								0.15	1550.83
T.C. =	1551.1																	
		SOUTH		LATERAL														
0+00	1546.24	3.40	1549.64	42" SD MAIN	3.5	9.54	41.3	4.33	0.29	1006								1549.93
0+01.75	1547.00	2.62	1549.62	30" RCP	2.5	4.91	10.9	2.22	0.077	410.1	0.0007					0.23		1549.70
0+13.90	1547.13	2.50	1549.63	30" RCP	2.5	4.91	10.9	2.22	0.077	410.1	0.0007	0.0007	12.15	0.01				1549.71
0+40.50	1547.41	2.23	1549.64	30" RCP	2.5	4.62	10.9	2.36	0.077		0.006	0.00065	26.6	0.02				1549.73
0+40.50	1547.41	2.34	1549.75	C.B.			10.9	0	0								0.02	1549.75
T.C. =	1551.1																	

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

APPENDIX

H

GEOTECHNICAL REPORT

GEOTECHNICAL • ENVIRONMENTAL • GEOLOGY • MATERIALS TESTING & INSPECTION • FORENSIC • LABORATORY

SALEM
engineering group, inc.

GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

SALEM PROJECT NO. 3-215-1091
NOVEMBER 25, 2015

PREPARED FOR:

MR. INO CRUZ
J&T BUSINESS MANAGEMENT
139 RADIO ROAD
CORONA, CA 92879

PREPARED BY:

SALEM ENGINEERING GROUP, INC.
11650 MISSION PARK DR., #108
RANCHO CUCAMONGA, CA 91730
P: (909) 980-6455
F: (909) 980-6435
www.salemeng.com

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

SALEM engineering group, inc.

11650 Mission Park Dr., #108
Rancho Cucamonga, CA 91730
Phone (909) 980-6455
Fax (909) 980-6435

November 25, 2015 Project No. 3-215-1091

Mr. Ino Cruz
J&T Business Management
139 Radio Road
Corona, CA 92879

SUBJECT: GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

Dear Mr. Cruz:

At your request and authorization, SALEM Engineering Group, Inc. (SALEM) has prepared this Geotechnical Engineering Investigation report for the Proposed Moreno Valley Cactus Center to be located at the subject site.

The accompanying report presents our findings, conclusions, and recommendations regarding the geotechnical aspects of designing and constructing the project as presently proposed. In our opinion, the proposed project is feasible from a geotechnical viewpoint provided our recommendations are incorporated into the design and construction of the project.

We appreciate the opportunity to assist you with this project. Should you have questions regarding this report or need additional information, please contact the undersigned at (909) 980-6455.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

Clarence Jiang, GE
Senior Geotechnical Engineer
RGE 2477

R. Sammy Salem, MS, PE, GE
Principal Engineer
RCE 52762 / RGE 2549

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

1. PURPOSE AND SCOPE

This report presents the results of our Geotechnical Engineering Investigation for the Proposed Moreno Valley Cactus Center to be located at the northeast corner of the intersection of Cactus Avenue and Commerce Center Drive in Moreno Valley, California (see Figure 1, Vicinity Map).

The purpose of our geotechnical engineering investigation was to observe and sample the subsurface conditions encountered at the site, and provide conclusions and recommendations relative to the geotechnical aspects of constructing the project as presently proposed.

The scope of this investigation included a field exploration, laboratory testing, engineering analysis and the preparation of this report. Our field exploration was performed on November 17, 2015 and included the drilling of sixteen (16) small-diameter soil borings to a maximum depth of 50 feet at the site. Additionally, six (6) percolation tests were performed at a depth of approximately 5 feet below existing grade for determination of the percolation rate. The locations of the soil borings and percolation tests are depicted on Figure 2, Site Plan. A detailed discussion of our field investigation, exploratory boring logs and percolation test results are presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to evaluate pertinent physical properties for engineering analyses. Appendix B presents the laboratory test results in tabular and graphic format.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions.

If project details vary significantly from those described herein, SALEM should be contacted to determine the necessity for review and possible revision of this report. Earthwork and Pavement Specifications are presented in Appendix C. If text of the report conflict with the specifications in Appendix C, the recommendations in the text of the report have precedence.

2. PROJECT DESCRIPTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structure are unavailable. On a preliminary basis, the development of the site will include construction of a total of six (6) commercial buildings and two (2) fuel pump canopies. The buildings will include a 2,080 square-foot car wash, a 3,800 square-foot

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convenience store, a 2,800 square-foot fast food restaurant #1, a 3,200 square-foot fast food restaurant #2, a 3,200 square-foot fast food restaurant #3, and a 48,140 square-foot warehouse/office building. The canopies will include a 6,165 square-foot 10-pump gasoline canopy and a 4-pump diesel canopy. On-site parking and landscaping are planned to be associated with the development. Maximum wall load is expected to be on the order of 3.5 kips per linear foot. Maximum column load is expected to be on the order of 100 kips. Floor slab bearing pressure is expected to be on the order of 150 psf.

Concrete and asphaltic concrete pavement for parking area, customers travel lanes, and truck lane are to be designed for standard duty and heavy-duty traffic loading based on an Equivalent Single Axle Load (ESAL) of 18 kips, a maximum load of 60,000 ESAL and a design life of 20 years. The pavement design recommendations provided herein are based on the State of California Department (CALTRANS) design manual.

Based on the initial site grading plan provided to us and our field observation, we anticipate that cuts and fills during earthwork will be minimal and limited to providing level pads and positive site drainage. In the event that changes occur in the nature or design of the project, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions of our report are modified. The site configuration and locations of proposed improvements are shown on the Site Plan, Figure 1.

3. SITE LOCATION AND DESCRIPTION

The site is rectangular in shape and encompasses approximately 6.3 acres. The subject site is located on the northeast corner of the intersection of Cactus Avenue and Commerce Center Drive in the City of Moreno Valley, California (see Vicinity Map, Figure 1). The site is currently vacant with sparse vegetation and weeds. The site is enclosed by a chain-linked fence. The site is predominantly surrounded by industrial and commercial developments. The site is relatively flat with no major changes in grade. The average elevation of the site is approximately 1,563 feet above mean sea level (AMSL), based on Google Earth Imagery.

4. FIELD EXPLORATION

Our field exploration consisted of site surface reconnaissance and subsurface exploration. The exploratory test borings (B-1 through B-16) were drilled on November 17, 2015 in the area shown on the Site Plan, Figure 2. The test borings were advanced with a 6½ -inch diameter hollow stem auger rotated by a truck-mounted Mobile B-61 drill rig. The test borings were extended to depths of 10 to 50 feet below existing grade.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by a field engineer and stratification lines were approximated on the basis of observations made at the time of drilling. Visual classification of the materials encountered in the test borings were generally made in accordance with the Unified Soil Classification System (ASTM D2487). A soil classification chart and key to sampling is presented on the Unified Soil Classification Chart, in Appendix "A." The logs of the test borings are presented in Appendix "A." The Boring Logs include the soil type, color, moisture content, dry density, and the applicable Unified Soil Classification System symbol. The location of the test borings were determined by measuring from features shown on the Site

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Plan, provided to us. Hence, accuracy can be implied only to the degree that this method warrants. The actual boundaries between different soil types may be gradual and soil conditions may vary. For a more detailed description of the materials encountered, the Boring Logs in Appendix "A" should be consulted.

Soil samples were obtained from the test borings at the depths shown on the logs of borings. The MCS samples were recovered and capped at both ends to preserve the samples at their natural moisture content; SPT samples were recovered and placed in a sealed bag to preserve their natural moisture content. The borings were backfilled with soil cuttings after completion of the drilling.

5. LABORATORY TESTING

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory-testing program was formulated with emphasis on the evaluation of natural moisture, density, shear strength, consolidation potential, expansion index, maximum density and optimum moisture determination, and gradation of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and the results of laboratory test are summarized in Appendix "B." This information, along with the field observations, was used to prepare the final boring logs in Appendix "A."

6. GEOLOGIC SETTING

The subject site is located within the Peninsular Range Geomorphic Province, an area characterized by active northeast trending strike slip faults, including the San Jacinto to the northwest, and the Elsinore to the southwest. The project site is situated between the Santa Rosa Mountains and the San Jacinto Mountains to the east; and Santa Ana Mountains to the west and south. The near-surface deposits in the vicinity of the subject site are comprised of recent alluvium consisting of unconsolidated sands, silt, and clays derived from erosion of local mountain ranges. Deposits encountered on the subject site during exploratory drilling are discussed in detail in this report.

7. GEOLOGIC HAZARDS

7.1 Faulting and Seismicity

The Peninsular Range has historically been a province of relatively high seismic activity. The nearest faults to the project site are associated with the San Jacinto Fault system located approximately 6.8 miles from the site. There are no known active fault traces in the project vicinity. Based on mapping and historical seismicity, the seismicity of the Peninsular Range has been generally considered high by the scientific community.

The project area is not within an Alquist-Priolo Earthquake Fault (Special Studies) Zone and will not require a special site investigation by an Engineering Geologist. Soils on site are classified as Site Class D in accordance with Chapter 16 of the California Building Code. The proposed structures are determined to be in Seismic Design Category D. To determine the distance of known active faults within 100 miles of the site, we used the United States Geological Survey (USGS) web-based application *2008 National Seismic Hazard Maps - Fault Parameters.* Site latitude is 33.9109° North; site longitude is 117.2734° West. The ten closest active faults are summarized below in Table 7.1.

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TABLE 7.1
REGIONAL FAULT SUMMARY

Fault Name	Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
San Jacinto; SBV+SJV+A+CC+B+SM	6.8	7.9
San Jacinto; SBV	7.6	7.1
San Jacinto; A+CC+B+SM	9.5	7.6
Elsinore; W+GI+T+J+CM	15.8	7.8
S. San Andreas; PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	16.2	8.2
S. San Andreas; PK+CH+CC+BB+NM+SM+NSB	16.7	8.0
Chino, alt 2	17.9	6.8
Elsinore; T+J+CM	18.1	7.6
Chino, alt 1	19.1	7.0
Elsinore; W	20.9	7.0

The faults tabulated above and numerous other faults in the region are sources of potential ground motion. However, earthquakes that might occur on other faults throughout California are also potential generators of significant ground motion and could subject the site to intense ground shaking.

7.2 Surface Fault Rupture

The site is not within a currently established State of California Earthquake Fault Zone for surface fault rupture hazards. No active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low.

7.3 Ground Shaking

We used the USGS web-based application *US Seismic Design Maps* to estimate the peak ground acceleration adjusted for site class effects (PGA_M). Because of the proximity to the subject site and the maximum probable events for these faults, it appears that a maximum probable event along the fault zones could produce a peak horizontal acceleration of approximately 0.520g (2% probability of being exceeded in 50 years). While listing PGA is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and soil conditions underlying the site.

7.4 Liquefaction

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. Primary factors that trigger liquefaction are: moderate to strong ground shaking (seismic source), relatively clean, loose granular soils (primarily poorly graded sands and silty sands), and saturated soil conditions (shallow groundwater). Due to the increasing overburden pressure with depth, liquefaction of granular soils is generally limited to the upper 50 feet of a soil profile. However, liquefaction has occurred in soils other than clean sand.

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The soils encountered within the depth of 50 feet on the project site consisted predominately of silty sand/sandy silt with trace clay, silty sand with varying amounts of clay, sandy silt with varying amounts of clay, clayey silt, silty sand/sand and sand. The historically highest groundwater is estimated to be at a depth of 10 feet below ground surface according to the County of Riverside Geologic Hazards Map (2004) and regional groundwater well data. Low to very low cohesion strength is associated with the sandy soil. A seismic hazard, which could cause damage to the proposed development during seismic shaking, is the post-liquefaction settlement of the liquefied sands. The potential for soil liquefaction during a seismic event was evaluated using LiqIT computer program (version 4.7.5) developed by GeoLogismiki of Greece. For the analysis, a maximum earthquake magnitude of 8.2 M_w and a peak horizontal ground surface acceleration of 0.52g (with a 2 percent probability of exceedance in 50 years) and a groundwater depth of 10 feet were considered appropriate for the liquefaction analysis. The liquefaction analysis indicated that the site soils had a low potential for liquefaction and the total liquefaction-induced settlement was calculated to be negligible.

7.5 Lateral Spreading

Lateral spreading is a phenomenon in which soils move laterally during seismic shaking and is often associated with liquefaction. The amount of movement depends on the soil strength, duration and intensity of seismic shaking, topography, and free face geometry. Due to the relatively flat site topography and low liquefaction potential, we judge the likelihood of lateral spreading to be low.

7.6 Landslides

There are no known landslides at the site, nor is the site in the path of any known or potential landslides. We do not consider the potential for a landslide to be a hazard to this project.

7.7 Tsunamis and Seiches

The site is not located within a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site. Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

8. SOIL AND GROUNDWATER CONDITIONS

8.1 Subsurface Conditions

The subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the soils within the depth of exploration consisted of alluvium deposits of medium dense to dense silty sand/sandy silt with trace clay, medium dense to very dense silty sand with varying amounts of clay, very stiff to hard sandy silt with varying amounts of clay, stiff clayey silt, dense silty sand/sand and sand.

Organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. The organic materials are not suitable to be used to support the proposed structures. Thicker organic material may be present onsite between our test borings. Verification of the extent of the organic material should be determined during site grading. Field and laboratory tests

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suggest that the deeper native soils are moderately strong and slightly compressible. These soils extended to the termination depth of our borings.

The soils were classified in the field during the drilling and sampling operations. The stratification lines were approximated by the field engineer on the basis of observations made at the time of drilling. The actual boundaries between different soil types may be gradual and soil conditions may vary. For a more detailed description of the materials encountered, the Boring Logs in Appendix "A" should be consulted. The Boring Logs include the soil type, color, moisture content, dry density, and the applicable Unified Soil Classification System symbol. The locations of the test borings were determined by measuring from feature shown on the Site Plan, provided to us. Hence, accuracy can be implied only to the degree that this method warrants.

8.2 Groundwater

The test boring locations were checked for the presence of groundwater during and after the drilling operations. Free groundwater was encountered during this investigation at a depth of approximately 29 feet below existing grades. The historically highest groundwater is estimated to be at a depth of 10 feet below ground surface according to the County of Riverside Geologic Hazards Map (2004) and regional groundwater well data. It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, localized pumping, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

8.3 Soil Corrosion Screening

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete and the soil. The 2011 Edition of ACI 318 (ACI 318) has established criteria for evaluation of sulfate and chloride levels and how they relate to cement reactivity with soil and/or water.

A soil sample was obtained from the project site and was tested for the evaluation of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts and soluble chloride. The water-soluble sulfate concentration in the saturation extract from the soil sample was detected to be 187 mg/kg. ACI 318 Tables 4.2.1 and 4.3.1 outline exposure categories, classes, and concrete requirements by exposure class. ACI 318 requirements for site concrete based upon soluble sulfate are summarized in Table 8.3 below.

TABLE 8.3
WATER SOLUBLE SULFATE EXPOSURE REQUIREMENTS

Water Soluble Sulfate (SO_4) in Soil, Percentage by Weight	Exposure Severity	Exposure Class	Maximum w/cm Ratio	Minimum Concrete Compressive Strength	Cementations Materials Type
0.0187	Not Applicable	S0	N/A	2,500 psi	No Restriction

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The water-soluble chloride concentration detected in saturation extract from the soil samples was 112 mg/kg. This level of chloride concentration is considered mildly to moderately corrosive. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, applicable manufacturer's recommendations for corrosion protection of buried metal pipe be closely followed.

8.4 Percolation Testing

Six percolation tests (P-1 through P-6) were performed within assumed infiltration areas and were conducted in accordance with in accordance with the guidelines established by the County of Riverside. The approximate locations of the percolation tests are shown on the attached Site Plan, Figure 2. Seven-inch diameter boreholes were advanced to the depths shown on the percolation test worksheets. The holes were pre-saturated a minimum of 18 hours and maximum of 24 hours before percolation testing commenced. Percolation rates were measured by filling the test holes with clean water and measuring the water drops at a certain time interval.

The percolation rate data are presented in tabular format at the end of this Report. The difference in the percolation rates are reflected by the varied type of soil materials at the bottom of the test holes. The test results are shown on the table below.

Test No.	Depth (feet)	Measured Percolation Rate (min/inch)	Tested Infiltration Rate* (inch/hour)	Soil Type
P-1	5	62.5	0.19	Silty Sand (SM) w/trace clay
P-2	5	41.7	0.32	Silty Sand (SM) w/trace clay
P-3	5	50.0	0.25	Silty Sand (SM) w/trace clay
P-4	5	125.0	0.07	Silty Sand (SM) w/trace clay
P-5	5	83.3	0.12	Silty Sand (SM) w/trace clay
P-6	5	83.3	0.17	Silty Sand (SM) w/trace clay

*** Tested infiltration Rate = (ΔH 60 r) / (Δt(r + 2H$_{avg}$))**

The soil infiltration or percolation rates are based on tests conducted with clear water. The infiltration/percolation rates may vary with time as a result of soil clogging from water impurities. The infiltration/percolation rates will deteriorate over time due to the soil conditions and an appropriate factor of safety (FS) may be applied. The owner or civil engineer may elect to use a lower FS for the design; however, more frequent maintenance will be expected. The soils may also become less permeable to impermeable if the soil is compacted. Thus, periodic maintenance consisting of clearing the bottom of the drainage system of clogged soils should be expected.

The infiltration/percolation rate may become slower if the surrounding soil is wet or saturated due to prolonged rainfalls. Additional percolation tests may be conducted at bottom of the drainage system during construction to verify the infiltration/percolation rate. Groundwater, if closer to the bottom of the drainage system, will also reduce the infiltration/percolation rate.

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The scope of our services did not include a groundwater study and was limited to the performance of percolation testing and soil profile description, and the submitted data only. Our services did not include those associated with septic system design. Neither did services include an Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands.

Any statements, or absence of statements, in this report or on any boring logs regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment. The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices. The work conducted through the course of this investigation, including the preparation of this report, has been performed in accordance with the generally accepted standards of geotechnical engineering practice, which existed in the geographic area at the time the report was written. No other warranty, express or implied, is made.

Please be advised that when performing percolation testing services in relatively small diameter borings, that the testing may not fully model the actual full scale long term performance of a given site. This is particularly true where percolation test data is to be used in the design of large infiltration system such as may be proposed for the site.

The measured percolation rate includes dispersion of the water at the sidewalls of the boring as well as into the underlying soils. Subsurface conditions, including percolation rates, can change over time as fine-grained soils migrate. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site is suitable for the proposed construction of improvements at the site as planned, provided the recommendations contained in this report are incorporated into the project design and construction. Conclusions and recommendations provided in this report are based on our review of available literature, analysis of data obtained from our field exploration and laboratory testing program, and our understanding of the proposed development at this time.

9.1.2 The primary geotechnical constraints identified in our investigation is the presence of organic and potentially compressible material at the site. Recommendations to mitigate the effects of these soils are provided in this report.

9.1.3 Slight to abundant organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. Thicker organic materials may be present onsite between our test boring locations. Verification of the extent of the organic materials should be determined during site grading. All organic materials in excess of 3 percent by volume are not suitable to support the proposed structures and should be removed and

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replaced with Engineered Fill. Moreover, undocumented fill materials are not suitable to support any future structures and should be replaced with Engineered Fill. The extent and consistency of the organic material or fills should be verified during site construction. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify the fill condition.

9.1.4 Site demolition activities shall include removal of all surface obstructions not intended to be incorporated into final site design. In addition, underground buried structures and/or utility lines encountered during demolition and construction should be properly removed and the resulting excavations backfilled with Engineered Fill. It is suspected that possible demolition activities of the existing structures may disturb the upper soils. After demolition activities, it is recommended that disturbed soils be removed and/or recompacted.

9.1.5 The upper 2 to 4 inches of the soils containing, vegetation, roots and other objectionable organic matter encountered at the time of grading should be stripped and removed from the surface. Deeper stripping may be required in localized areas. The stripped vegetation will not be suitable for use as Engineered Fill but may be stockpiled and reused in landscape or non-structural areas or exported from the site.

9.1.6 The near-surface onsite soils are moisture-sensitive and are moderately compressible (collapsible soil) under saturated conditions. Structures within the project vicinity have experienced excessive post-construction settlement, when the foundation soils become near saturated. The collapsible or weak soils should be removed and recompacted according to the recommendations in the Grading section of this report.

9.1.7 Based on the subsurface conditions at the site and the anticipated structural loading, we anticipate that the proposed buildings may be supported using conventional shallow foundations or deep foundations provided that the recommendations presented herein are incorporated in the design and construction of the project.

9.1.8 SALEM shall review the project grading and foundation plans prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required. If SALEM is not provided plans and specifications for review, we cannot assume any responsibility for the future performance of the project.

9.1.9 SALEM shall be present at the site during site demolition and preparation to observe site clearing/demolition, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.

9.1.10 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

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9.2 Seismic Design Criteria

9.2.1 For seismic design of the structures, and in accordance with the seismic provisions of the 2013 CBC, our recommended parameters are shown below. These parameters are based on Probabilistic Ground Motion of 2% Probability of Exceedance in 50 years. The Site Class was determined based on the results of our field exploration.

TABLE 9.2.1
2013 CBC SEISMIC DESIGN PARAMETERS

Seismic Item	Symbol	Value	2010 ASCE 7 or 2013 CBC Reference
Site Coordinates (Datum = NAD 83)		33.9109 Lat -117.2734 Lon	
Site Class	--	D	ASCE 7 Table 20.3
Soil Profile Name	--	Stiff Soil	ASCE 7 Table 20.3
Risk Category	--	II	CBC Table 1604.5
Site Coefficient for PGA	F_{PGA}	1.000	ASCE 7 Table 11.8-1
Peak Ground Acceleration (adjusted for Site Class effects)	PGA_M	0.682	ASCE 7 Equation 11.8-1
Seismic Design Category	SDC	D	ASCE 7 Table 11.6-1 & 2
Mapped Spectral Acceleration (Short period - 0.2 sec)	S_S	1.500 g	CBC Figure 1613.3.1(1-6)
Mapped Spectral Acceleration (1.0 sec. period)	S_1	0.600 g	CBC Figure 1613.3.1(1-6)
Site Class Modified Site Coefficient	F_a	1.000	CBC Table 1613.3.3(1)
Site Class Modified Site Coefficient	F_v	1.500	CBC Table 1613.3.3(2)
MCE Spectral Response Acceleration (Short period - 0.2 sec) $S_{MS} = F_a S_S$	S_{MS}	1.500 g	CBC Equation 16-37
MCE Spectral Response Acceleration (1.0 sec. period) $S_{M1} = F_v S_1$	S_{M1}	0.900 g	CBC Equation 16-38
Design Spectral Response Acceleration $S_{DS}=⅔S_{MS}$ (short period - 0.2 sec)	S_{DS}	1.000 g	CBC Equation 16-39
Design Spectral Response Acceleration $S_{D1}=⅔S_{M1}$ (1.0 sec. period)	S_{D1}	0.600 g	CBC Equation 16-40

9.2.2 Conformance to the criteria in the above table for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

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9.3 Soil and Excavation Characteristics

9.3.1 Based on the soil conditions encountered in our soil borings, the onsite soils can be excavated with moderate effort using conventional excavation equipment.

9.3.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable Occupational Safety and Health Administration (OSHA) rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.

9.3.3 The upper soils are moisture-sensitive and moderately collapsible under saturated conditions. These soils, in their present condition, possess moderate risk to construction in terms of possible post-construction movement of the foundations and floor systems if no mitigation measures are employed. Accordingly, measures are considered necessary to reduce anticipated expansion and collapse potential. As recommended in Section 9.5, the collapsible soils should be overexcavated and recompacted. Mitigation measures will not eliminate post-construction soil movement, but will reduce the soil movement. Success of the mitigation measures will depend on the thoroughness of the contractor in dealing with the soil conditions.

9.3.4 The near surface soils identified as part of our investigation are, generally, slightly moist to moist due to the absorption characteristics of the soil. Earthwork operations may encounter very moist unstable soils which may require removal to a stable bottom. Exposed native soils exposed as part of site grading operations shall not be allowed to dry out and should be kept continuously moist prior to placement of subsequent fill.

9.4 Materials for Fill

9.4.1 Excavated soils generated from cut operations at the site are suitable for use as general Engineered Fill in structural areas, provided they have an Expansion Index of 20 or less, do not contain deleterious matter, organic materials more than 3% or rock materials larger than 3 inches in maximum dimension

9.4.2 Import soil shall be well-graded, slightly cohesive silty fine sand or sandy silt, with relatively impervious characteristics when compacted. A clean sand or very sandy soil is not acceptable for this purpose. This material should be approved by the Engineer prior to use and should typically possess the soil characteristics summarized below in Table 9.4.2.

TABLE 9.4.2
IMPORT FILL REQUIREMENTS

Minimum Percent Passing No. 200 Sieve	20
Maximum Percent Passing No. 200 Sieve	50
Maximum Particle Size	3"
Maximum Plasticity Index	12
Maximum CBC Expansion Index	20

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9.4.3 The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since they have complete control of the project site.

9.4.4 Environmental characteristics and corrosion potential of import soil materials should also be considered.

9.4.5 Proposed import materials should be sampled, tested, and approved by SALEM prior to its transportation to the site.

9.5 Grading

9.5.1 A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Geotechnical Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section as well as other portions of this report.

9.5.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and geotechnical engineer in attendance.

9.5.3 Site preparation should begin with removal of existing surface/subsurface structures, underground utilities (as required), any existing uncertified fill, and debris. Excavations or depressions resulting from site clearing operations, or other existing excavations or depressions, should be restored with Engineered Fill in accordance with the recommendations of this report.

9.5.4 Organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. Thicker organic materials may be present onsite between our test boring locations. Verification of the extent of the organic materials should be determined during site grading. All organic materials in excess of 3 percent by volume are not suitable to support the proposed structures and should be replaced with Engineered Fill. Additionally, undocumented fill materials are not suitable to support any future structures and should be replaced with Engineered Fill. The extent and consistency of the organic material or fills should be verified during site construction. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify the fill condition.

9.5.5 Surface vegetation should be removed by stripping to a sufficient depth to remove organic-rich topsoil. The upper 2 to 4 inches of the soils containing, vegetation, roots and other objectionable organic matter encountered at the time of grading should be stripped and removed from the surface. Deeper stripping may be required in localized areas. The stripped vegetation will not be suitable for use as Engineered Fill but may be stockpiled and reused in landscape or non-structural areas or exported from the site.

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9.5.6 The upper 1.5 feet of soil (below soils containing vegetation, and roots) were very dry and loose, it is recommended that the overexcavation and recompaction within the proposed buildings be performed to a minimum depth of **two (2)** feet below existing grade or **one (1)** foot below proposed footing bottom, whichever is deeper. The overexcavation and recompaction should also extend laterally to a minimum of 5 feet beyond the outer edges of the proposed buildings.

9.5.7 Deeper overexcavation and recompaction should be performed within the Fast Food #1, Convenience Store and 10-Pump Canopy areas to remove all the organic materials. Based on the boring logs, the organic materials are present at depths of 3½ to 7 feet below existing grade.

9.5.8 Any fill materials encountered during grading should be removed and replaced with engineered fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction.

9.5.9 Prior to placement of fill soils, the upper 10 to 12 inches of native subgrade soils should be scarified, moisture-conditioned to no less than the optimum moisture content and recompacted to a minimum of 95 percent (90 percent for cohesive soils) of the maximum dry density based on ASTM D1557 Test Method.

9.5.10 All Engineered Fill (including scarified ground surfaces and backfill) should be placed in thin lifts to allow for adequate bonding and compaction (typically 6 to 8 inches in loose thickness).

9.5.11 Engineered Fill soils should be placed, moisture conditioned to near optimum moisture content, and compacted to at least 95% (90% for cohesive soils) relative compaction.

9.5.12 An integral part of satisfactory fill placement is the stability of the placed lift of soil. If placed materials exhibit excessive instability as determined by a SALEM field representative, the lift will be considered unacceptable and shall be remedied prior to placement of additional fill material. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

9.5.13 Within pavement areas, it is recommended that scarification, moisture conditioning and recompaction be performed to at least 12 inches below existing grade or finish grade, whichever is deeper. In addition, the upper 12 inches of final pavement subgrade, whether completed at-grade, by excavation, or by filling, should be uniformly moisture-conditioned to no less than the optimum moisture content and compacted to at least 95% (90% for cohesive soils) relative compaction.

9.5.14 Final pavement subgrade should be finished to a smooth, unyielding surface. We further recommend proof-rolling the subgrade with a loaded water truck (or similar equipment with high contact pressure) to verify the stability of the subgrade prior to placing aggregate base.

9.5.15 The most effective site preparation alternatives will depend on site conditions prior to grading. We should evaluate site conditions and provide supplemental recommendations immediately prior to grading, if necessary.

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9.5.16 We do not anticipate groundwater or seepage to adversely affect construction if conducted during the drier moths of the year (typically summer and fall). However, groundwater and soil moisture conditions could be significantly different during the wet season (typically winter and spring) as surface soil becomes wet; perched groundwater conditions may develop. Grading during this time period will likely encounter wet materials resulting in possible excavation and fill placement difficulties. Project site winterization consisting of placement of aggregate base and protecting exposed soils during construction should be performed. If the construction schedule requires grading operations during the wet season, we can provide additional recommendations as conditions warrant.

9.5.17 The wet soils may become non conducive to site grading as the upper soils yield under the weight of the construction equipment. Therefore, mitigation measures should be performed for stabilization. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material or placement of crushed rocks or aggregate base material; or mixing the soil with an approved lime or cement product.

The most common remedial measure of stabilizing the bottom of the excavation due to wet soil condition is to reduce the moisture of the soil to near the optimum moisture content by having the subgrade soils scarified and aerated or mixed with drier soils prior to compacting. However, the drying process may require an extended period of time and delay the construction operation. To expedite the stabilizing process, crushed rock may be utilized for stabilization provided this method is approved by the owner for the cost purpose. If the use of crushed rock is considered, it is recommended that the upper soft and wet soils be replaced by 6 to 24 inches of ¾-inch to 1-inch crushed rocks. The thickness of the rock layer depends on the severity of the soil instability. The recommended 6 to 24 inches of crushed rock material will provide a stable platform. It is further recommended that lighter compaction equipment be utilized for compacting the crushed rock. A layer of geofabric is recommended to be placed on top of the compacted crushed rock to minimize migration of soil particles into the voids of the crushed rock, resulting in soil movement. Although it is not required, the use of geogrid (e.g. Tensar BX 1100 or TX 140) below the crushed rock will enhance stability and reduce the required thickness of crushed rock necessary for stabilization. Our firm should be consulted prior to implementing remedial measures to provide appropriate recommendations.

9.6 Shallow Foundations

9.6.1 The site is suitable for use of conventional shallow foundations consisting of continuous footings and isolated pad footings bearing in properly compacted Engineered Fill.

9.6.2 The bearing wall footings considered for the structures should be continuous with a minimum width of 15 inches and extend to a minimum depth of 18 inches below the lowest adjacent grade. Isolated column footings should have a minimum width of 24 inches and extend a minimum depth of 18 inches below the lowest adjacent grade. The bottom of footing excavations should be maintained free of loose and disturbed soil. Footing concrete should be placed into a neat excavation.

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9.6.3 For design purposes, total settlement due to static loading on the order of 1.0 inches may be assumed for shallow footings. Differential settlement due to static loading, along a 20-foot exterior wall footing or between adjoining column footings, should be ½ inch, producing an angular distortion of 0.002. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. The footing excavations should not be allowed to dry out any time prior to pouring concrete.

9.6.4 Footings proportioned as recommended above may be designed for the maximum allowable soil bearing pressures shown in the table below.

Loading Condition	Allowable Bearing
Dead Load Only	2,500 psf
Dead-Plus-Live Load	3,000 psf
Total Load, Including Wind or Seismic Loads	4,000 psf

9.6.5 Resistance to lateral footing displacement can be computed using an allowable coefficient of friction factor of 0.38 acting between the base of foundations and the supporting native subgrade.

9.6.6 Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 360 pounds per cubic foot acting against the appropriate vertical native footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. An increase of one-third is permitted when using the alternate load combination in Section 1605.3.2 of the 2012 IBC/2013 CBC that includes wind or earthquake loads.

9.6.7 Underground utilities running parallel to footings should not be constructed in the zone of influence of footings. The zone of influence may be taken to be the area beneath the footing and within a 1:1 plane extending out and down from the bottom edge of the footing.

9.6.8 The foundation subgrade should be sprinkled as necessary to maintain a moist condition without significant shrinkage cracks as would be expected in any concrete placement. Prior to placing rebar reinforcement, foundation excavations should be evaluated by a representative of SALEM for appropriate support characteristics and moisture content. Moisture conditioning may be required for the materials exposed at footing bottom, particularly if foundation excavations are left open for an extended period.

9.7 Caisson Foundations

9.7.1 The caisson foundation should have a minimum depth of 10 feet below the lowest adjacent grade.

9.7.2 The caissons may be designed using an allowable sidewall friction of 250 psf. This value is for dead-plus-live loads. An allowable end bearing capacity of 5,000 psf may be used

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provided that the bottom of the caisson is cleaned with the use of a clean-out bucket or equivalent and inspected by our representative prior to placement of reinforcement and concrete. An increase of one-third is permitted when using the alternate load combination in Section 1605.3.2 that includes wind or earthquake loads.

9.7.3 Uplift loads can be resisted by caissons using an allowable sidewall friction of 200 psf of the surface area and the weight of the caisson.

9.7.4 The total settlement of the caisson footing is not expected to exceed 1 inch. Differential settlement should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied.

9.7.5 Lateral loads for caissons may be designed utilizing the Isolated Pole Formula and Specifications shown on Table 1804.2, Sections 1804.3.1 and 1808.2.2 of the California Building Code. The drilled caissons may be designed for a lateral capacity of 360 pounds per square foot per foot of depth below the lowest adjacent grade to a maximum of 5,400 psf. The lowest adjacent grade should all the ground surface within 5 feet of the caisson.

9.7.6 These values may be increased by one-third when using the alternative load combinations in Section 1605.3.2 of the IBC that include wind or earthquake loads. These values should not be doubled since the values given herein are higher than the tabular values shown on the Table 1804.2. The lateral loading criteria is based on the assumption that the load application is applied at the ground level, flexible cap connections applied and a minimum embedment depth of 10 feet.

9.7.7 Sandy soil and groundwater conditions were encountered at the site. Casing of the drilled caisson will be required if groundwater/seepage is encountered or the drilled hole has to be left open for an extended period of time.

9.8 Concrete Slabs-on-Grade

9.8.1 Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. We recommend that non-structural slabs-on-grade be at least 4 inches thick and underlain by six (6) inches of compacted granular aggregate subbase material compacted to at least 95% relative compaction.

9.8.2 Granular aggregate subbase material shall conform to ASTM D-2940, Latest Edition (Table 1, bases) with at least 95 percent passing a 1½-inch sieve and not more than 8% passing a No. 200 sieve to prevent capillary moisture rise.

9.8.3 We recommend reinforcing slabs, at a minimum, with No. 3 reinforcing bars placed 18 inches on center, each way.

9.8.4 Slabs subject to structural loading may be designed utilizing a modulus of subgrade reaction K of 140 pounds per square inch per inch. The K value was approximated based on inter-relationship of soil classification and bearing values (Portland Cement Association, Rocky Mountain Northwest).

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9.8.5 The spacing of crack control joints should be designed by the project structural engineer. In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs and 12 feet for 4-inch thick slabs.

9.8.6 Crack control joints should extend a minimum depth of one-fourth the slab thickness and should be constructed using saw-cuts or other methods as soon as practical after concrete placement. The exterior floors should be poured separately in order to act independently of the walls and foundation system.

9.8.7 It is recommended that the utility trenches within the structures be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the structures is recommended.

9.8.8 Moisture within the structures may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structures. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with manufacturer's recommendations and/or ASTM guidelines, whichever is more stringent. In addition, ventilation of the structures is recommended to reduce the accumulation of interior moisture.

9.8.9 In areas where it is desired to reduce floor dampness where moisture-sensitive coverings are anticipated, construction should have a suitable waterproof vapor retarder (a minimum of 15 mils thick polyethylene vapor retarder sheeting, Raven Industries "VaporBlock 15, Stego Industries 15 mil "StegoWrap" or W.R. Meadows Sealtight 15 mil "Perminator") incorporated into the floor slab design. The water vapor retarder should be decay resistant material complying with ASTM E96 not exceeding 0.04 perms, ASTM E154 and ASTM E1745 Class A. The vapor barrier should be placed between the concrete slab and the compacted granular aggregate subbase material. The water vapor retarder (vapor barrier) should be installed in accordance with ASTM Specification E 1643-94.

9.8.10 The concrete maybe placed directly on vapor retarder. The vapor retarder should be inspected prior to concrete placement. Cut or punctured retarder should be repaired using vapor retarder material lapped 6 inches beyond damaged areas and taped.

9.8.11 The recommendations of this report are intended to reduce the potential for cracking of slabs due to soil movement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to soil movement. This is common for project areas that contain expansive soils since designing to eliminate potential soil movement is cost prohibitive. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

9.8.12 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

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9.9 Lateral Earth Pressures and Frictional Resistance

9.9.1 Active, at-rest and passive unit lateral earth pressures against footings and walls are summarized in the table below:

Lateral Pressure Conditions	Ultimate Equivalent Fluid Pressure, pcf
Active Pressure, Drained	40
At-Rest Pressure, Drained	60
Passive Pressure	360
Related Parameters	
Allowable Coefficient of Friction	0.38
In-Place Soil Density (lbs/ft^3)	120

9.9.2 Active pressure applies to walls, which are free to rotate. At-rest pressure applies to walls, which are restrained against rotation. The preceding lateral earth pressures assume sufficient drainage behind retaining walls to prevent the build-up of hydrostatic pressure. The top one-foot of adjacent subgrade should be deleted from the passive pressure computation.

9.9.3 The foregoing values of lateral earth pressures represent ultimate soil values and a safety factor consistent with the design conditions should be included in their usage.

9.9.4 For stability against lateral sliding, which is resisted solely by the passive pressure, we recommend a minimum safety factor of 1.5.

9.9.5 For stability against lateral sliding, which is resisted by the combined passive and frictional resistance, a minimum safety factor of 2.0 is recommended.

9.9.6 For lateral stability against seismic loading conditions, we recommend a minimum safety factor of 1.1.

9.9.7 For dynamic seismic lateral loading the following equation shall be used:

Dynamic Seismic Lateral Loading Equation
Dynamic Seismic Lateral Load = $\frac{3}{8}\gamma K_h H^2$
Where: γ = In-Place Soil Density
K_h = Horizontal Acceleration = $\frac{2}{3}PGA_M$
H = Wall Height

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9.10 Retaining Walls

9.10.1 Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic-concrete or other suitable backfill to minimize surface drainage into the wall drain system. The gravel should conform to Class II permeable materials graded in accordance with the current CalTrans Standard Specifications.

9.10.2 Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

9.10.3 Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The top of the perforated pipe should be placed at or below the bottom of the adjacent floor slab or pavements. The pipe should be placed in the center line of the drainage blanket and should have a minimum diameter of 4 inches. Slots should be no wider than 1/8-inch in diameter, while perforations should be no more than ¼-inch in diameter.

9.10.4 If retaining walls are less than 5 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 2-inch minimum diameter holes (concrete walls) or unmortared head joints (masonry walls) and placed no higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to the CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

9.10.5 During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

9.11 Temporary Excavations

9.11.1 We anticipate that the majority of the sandy site soils will be classified as Cal-OSHA "Type C" soil when encountered in excavations during site development and construction. Excavation sloping, benching, the use of trench shields, and the placement of trench spoils should conform to the latest applicable Cal-OSHA standards. The contractor should have a Cal-OSHA-approved "competent person" onsite during excavation to evaluate trench conditions and make appropriate recommendations where necessary.

9.11.2 It is the contractor's responsibility to provide sufficient and safe excavation support as well as protecting nearby utilities, structures, and other improvements which may be damaged by earth movements. All onsite excavations must be conducted in such a manner that potential

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surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load.

9.11.3 Temporary excavations and slope faces should be protected from rainfall and erosion. Surface runoff should be directed away from excavations and slopes.

9.11.4 Open, unbraced excavations in undisturbed soils should be made according to the slopes presented in the following table:

RECOMMENDED EXCAVATION SLOPES

Depth of Excavation (ft)	Slope (Horizontal : Vertical)
0-5	1:1
5-10	2:1

9.11.5 If, due to space limitation, excavations near property lines or existing structures are performed in a vertical position, slot cuts, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavations and installation. A Specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction.

9.11.6 Braced shorings should be designed for a maximum pressure distribution of 30H, (where H is the depth of the excavation in feet). The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given herein. Equipment traffic should concurrently be limited to an area at least 3 feet from the shoring face or edge of the slope.

9.11.7 The excavation and shoring recommendations provided herein are based on soil characteristics derived from the borings within the area. Variations in soil conditions will likely be encountered during the excavations. SALEM Engineering Group, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation. Slope height, slope inclination, or excavation depth should in no case exceed those specified in local, state, or federal safety regulation, (e.g. OSHA) standards for excavations, 29 CFR part 1926, or Assessor's regulations.

9.12 Underground Utilities

9.12.1 Underground utility trenches should be backfilled with properly compacted material. The material excavated from the trenches should be adequate for use as backfill provided it does not contain deleterious matter, vegetation or rock larger than 3 inches in maximum dimension. Trench backfill should be placed in loose lifts not exceeding 8 inches and compacted to at least 95% (90% for cohesive soils) relative compaction at or above optimum moisture content.

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9.12.2 Bedding and pipe zone backfill typically extends from the bottom of the trench excavations to approximately 6 to 12 inches above the crown of the pipe. Pipe bedding and backfill material should conform to the requirements of the governing utility agency.

9.12.3 It is suggested that underground utilities crossing beneath new or existing structures be plugged at entry and exit locations to the buildings or structures to prevent water migration. Trench plugs can consist of on-site clay soils, if available, or sand cement slurry. The trench plugs should extend 2 feet beyond each side of individual perimeter foundations.

9.12.4 The contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

9.13 Surface Drainage

9.13.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change to important engineering properties. Proper drainage should be maintained at all times.

9.13.2 Site drainage should be collected and transferred away from improvements in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundations or retaining walls. Drainage should not be allowed to flow uncontrolled over any descending slope. The proposed structures should be provided with roof gutters. Discharge from downspouts, roof drains and scuppers are not permitted onto unprotected soils within five feet of the buildings perimeters. Planters which are located adjacent to foundations should be sealed or properly drained to prevent moisture intrusion into the materials providing foundation support. Landscape irrigation within 5 feet of the buildings perimeter footings should be kept to a minimum to just support vegetative life.

9.13.3 The ground immediately adjacent to the foundation shall be sloped away from buildings at a slope of not less than 5 percent for a minimum distance of 10 feet. Impervious surfaces within 10 feet of building's foundations shall be sloped a minimum of 2 percent away from buildings and drainage gradients maintained to carry all surface water to collection facilities and off site. These grades should be maintained for the life of the project.

9.14 Pavement Design

9.14.1 Based on site soil conditions, an R-value of 30 was used for the preliminary flexible asphaltic concrete pavement design. The R-value may be verified during grading of the pavement areas.

9.14.2 The pavement design recommendations provided herein are based on the State of California Department of Transportation (CALTRANS) design manual. The asphaltic concrete (flexible pavement) is based on a 20-year pavement life utilizing 1200 passenger vehicles, 10 single unit

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trucks, and 2 multi-unit trucks. The following table shows the recommended pavement sections for various traffic indices.

TABLE 9.13.2
ASPHALT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
5.0 (Parking and Vehicle Drive Areas)	3.0"	5.0"	12.0"
6.5 (Heavy Truck Areas)	3.5"	8.5"	12.0"
8.0 (Cactus Avenue)	5.0"	11.5"	12.0"
9.0 (Cactus Avenue)	5.0"	13.5"	12.0"
10.0 (Cactus Avenue)	6.0"	14.5"	12.0"
11.0 (Cactus Avenue)	7.0"	16.0"	12.0"

***95% compaction based on ASTM D1557 Test Method*
***95% (90% for cohesive soils) compaction based on ASTM D1557 Test Method*

9.14.3 The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

TABLE 9.13.3
PORTLAND CEMENT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Portland Cement Concrete*	Class II Aggregate Base**	Compacted Subgrade***
5.0 (Light Duty)	5.0"	4.0"	12.0"
6.5 (Heavy Duty)	6.5"	6.0"	12.0"

** Minimum Compressive Strength of 4,000 psi*
*** 95% compaction based on ASTM D1557 Test Method*
****95% (90% for cohesive soils) compaction based on ASTM D1557 Test Method*

10. PLAN REVIEW, CONSTRUCTION OBSERVATION AND TESTING

10.1 Plan and Specification Review

10.1.1 SALEM should review the project plans and specifications prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required.

10.2 Construction Observation and Testing Services

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10.2.1 The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for others interpretation of our recommendations, and therefore the future performance of the project.

10.2.2 SALEM should be present at the site during site preparation to observe site clearing, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.

10.2.3 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

11. LIMITATIONS AND CHANGED CONDITIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the test borings drilled at the approximate locations shown on the Site Plan, Figure 1. The report does not reflect variations which may occur between borings. The nature and extent of such variations may not become evident until construction is initiated.

If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-site observations during the excavation period and noting the characteristics of such variations. The findings and recommendations presented in this report are valid as of the present and for the proposed construction. If site conditions change due to natural processes or human intervention on the property or adjacent to the site, or changes occur in the nature or design of the project, or if there is a substantial time lapse between the submission of this report and the start of the work at the site, the conclusions and recommendations contained in our report will not be considered valid unless the changes are reviewed by SALEM and the conclusions of our report are modified or verified in writing.

The validity of the recommendations contained in this report is also dependent upon an adequate testing and observations program during the construction phase. Our firm assumes no responsibility for construction compliance with the design concepts or recommendations unless we have been retained to perform the on-site testing and review during construction. SALEM has prepared this report for the exclusive use of the owner and project design consultants.

SALEM does not practice in the field of corrosion engineering. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, that manufacturer's recommendations for corrosion protection be closely followed. Further, a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of concrete slabs and foundations in direct contact with native soil.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

The importation of soil and or aggregate materials to the site should be screened to determine the potential for corrosion to concrete and buried metal piping. The report has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (909) 980-6455.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

Ibrahim Ibrahim, MS, EIT
Geotechnical Staff Engineer

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Senior Geotechnical Engineer
RGE 2477

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CLARENCE T. JIANG
No. 2477
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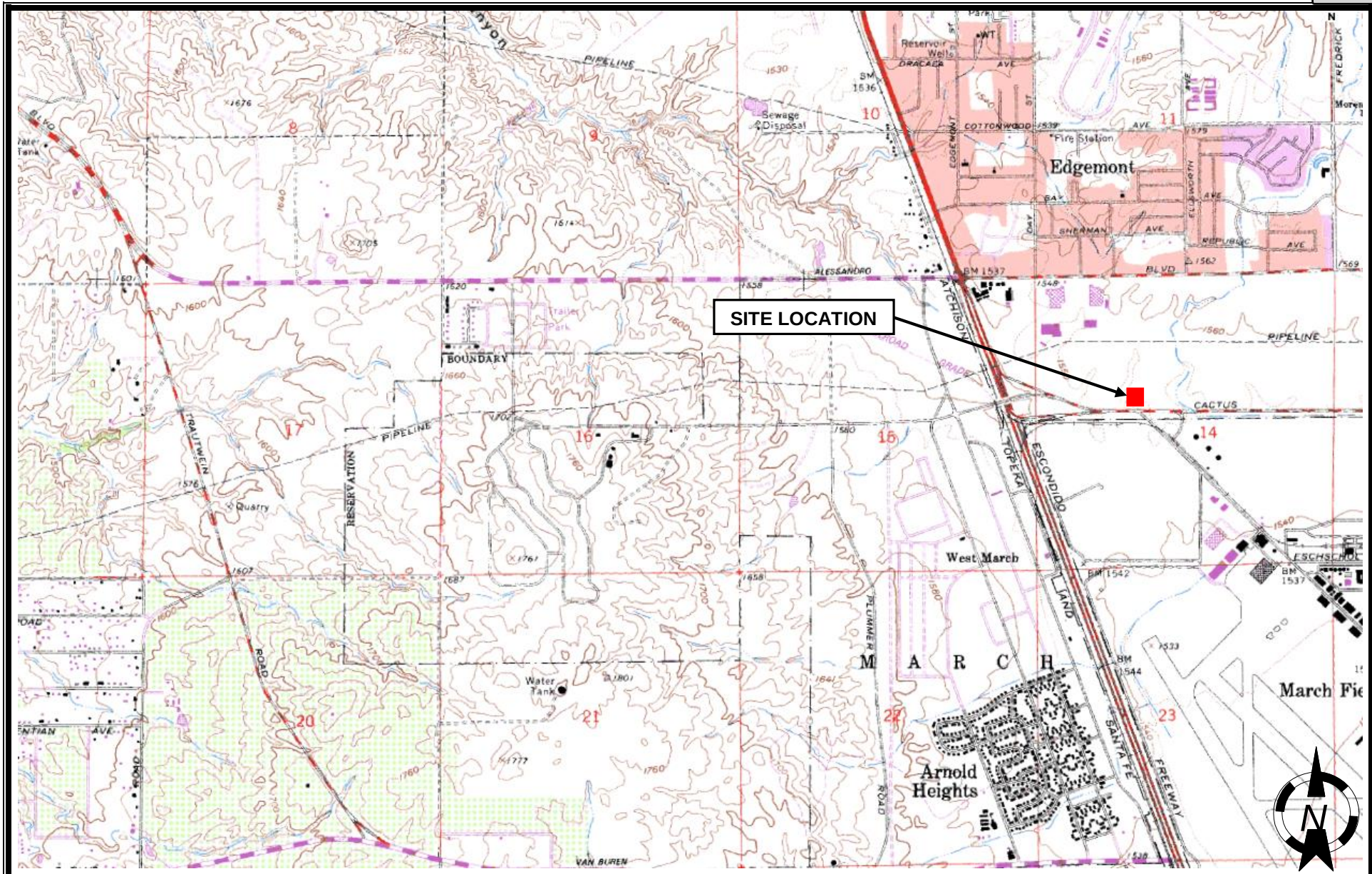
Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



Source Image: U.S. Geological Survey, Riverside East, Calif. 7.5' Quadrangle, 1967 (Photorevised 1980)

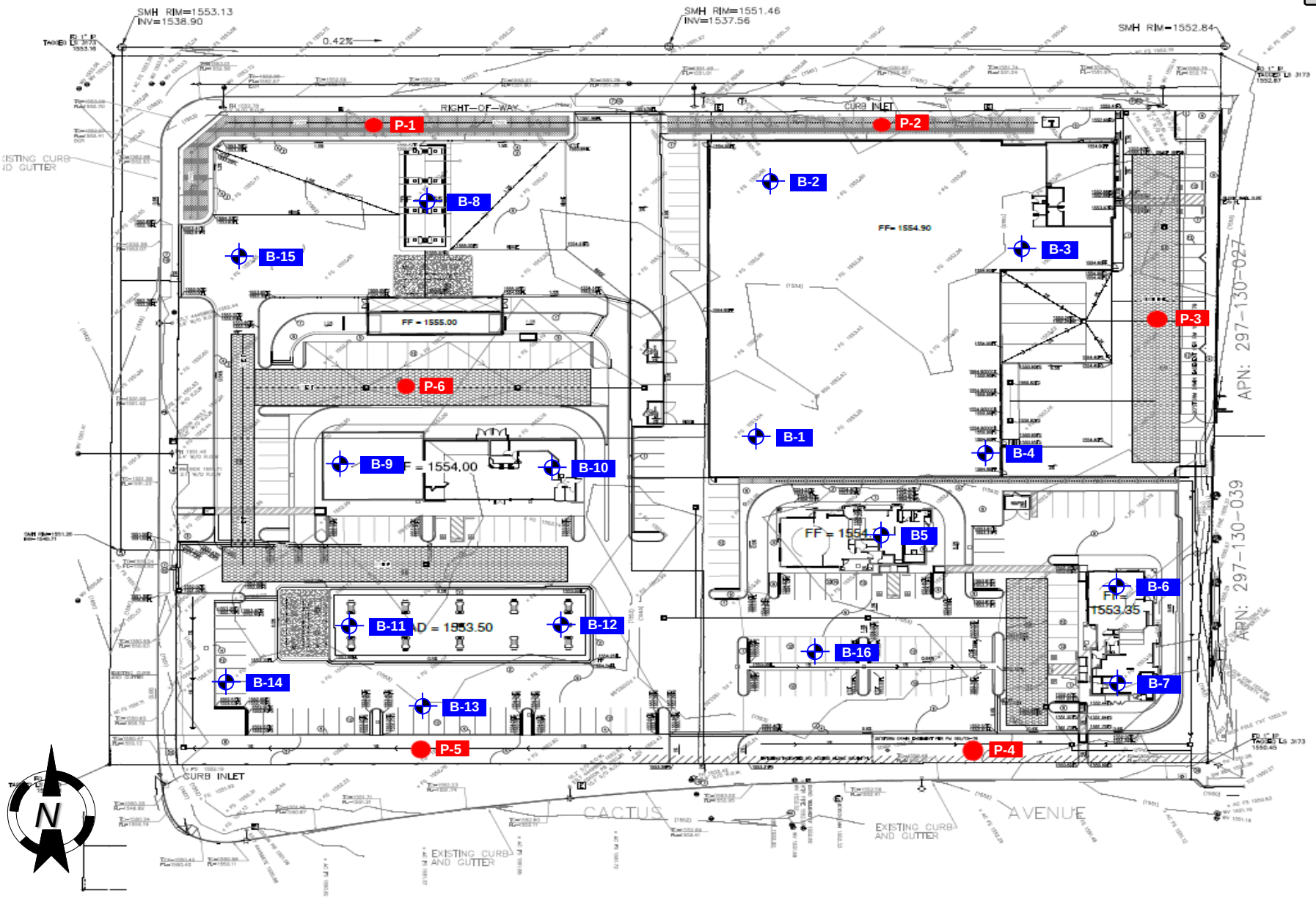
VICINITY MAP

GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Moreno Valley Cactus Center
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, California

SCALE:	DATE:
NOT TO SCALE	11/2015
DRAWN BY:	APPROVED BY:
AA	CJ
PROJECT NO.	FIGURE NO.
3-215-1091	1

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-



SITE PLAN

GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Moreno Valley Cactus Center
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, California

SCALE: NOT TO SCALE	DATE: 11/2015
DRAWN BY: AA	APPROVED BY: CJ
PROJECT NO. 3-215-1091	FIGURE NO. 2

LEGEND:
- B-1 Soil Boring Locations
- P-1 Percolation Test Locations
- All Locations Approximate

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

SALEM engineering group, inc.

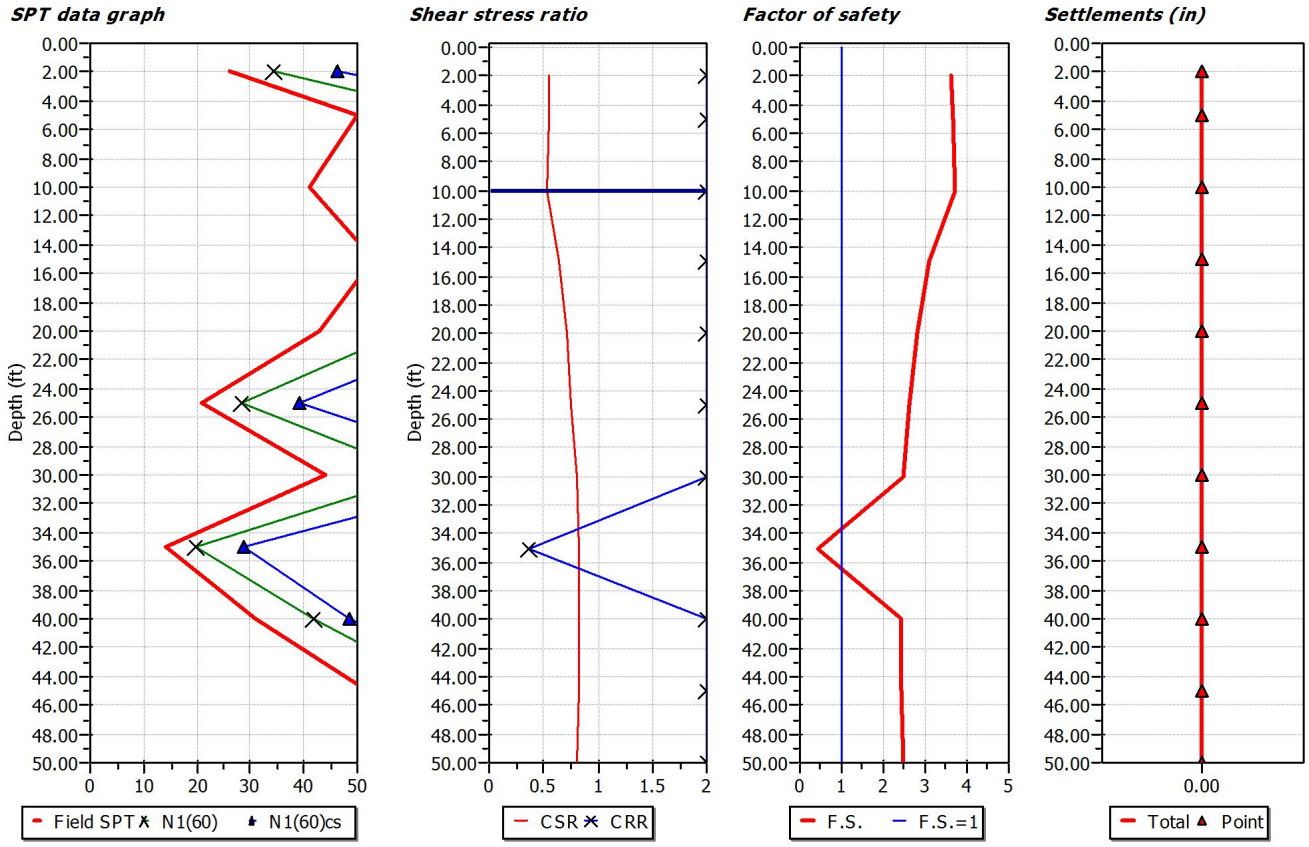
LIQUEFACTION ANALYSIS REPORT

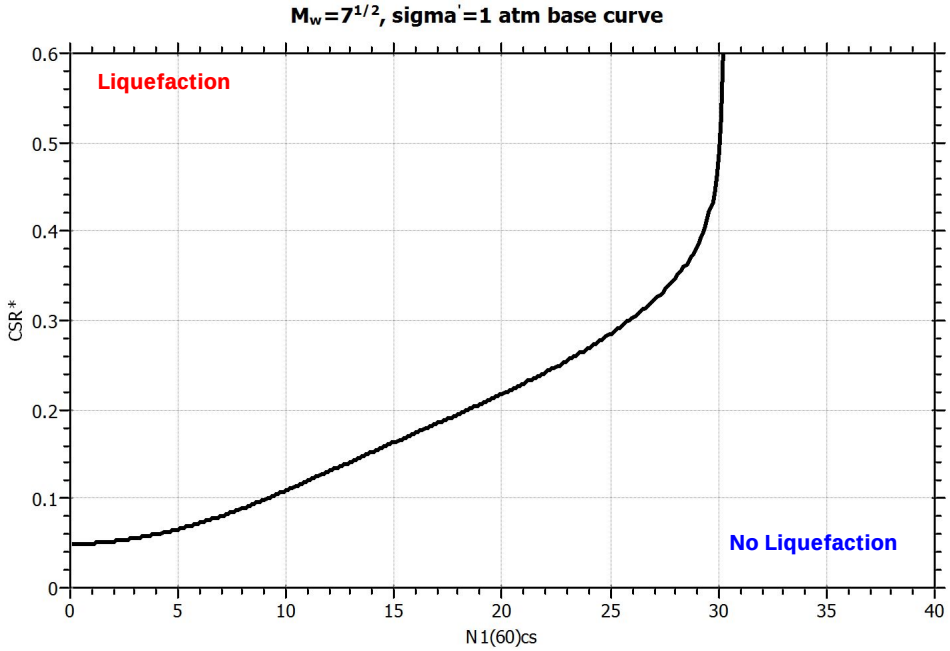
Project title : Proposed Moreno Valley Cactus Center

Project subtitle : 3-215-1091

Input parameters and analysis data

In-situ data type:	Standard Penetration Test	Depth to water table:	10.00 ft
Analysis type:	Deterministic	Earthquake magnitude M_w:	8.20
Analysis method:	NCEER 1998	Peak ground accelaration:	0.52 g
Fines correction method:	Idriss & Seed	User defined F.S.:	1.30





Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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:: Field input data ::

Point ID	Depth (ft)	Field N_{SPT} (blows/feet)	Unit weight (pcf)	Fines content (%)
1	2.00	26.00	120.00	49.00
2	5.00	50.00	120.00	45.00
3	10.00	41.00	120.00	39.00
4	15.00	53.00	120.00	45.00
5	20.00	43.00	120.00	29.00
6	25.00	21.00	120.00	50.00
7	30.00	44.00	120.00	54.00
8	35.00	14.00	120.00	73.00
9	40.00	31.00	120.00	19.00
10	45.00	52.00	120.00	25.00
11	50.00	52.00	120.00	25.00

Depth : Depth from free surface, at which SPT was performed (ft)
Field SPT : SPT blows measured at field (blows/feet)
Unit weight : Bulk unit weight of soil at test depth (pcf)
Fines content : Percentage of fines in soil (%)

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Point ID	Depth (ft)	Sigma (tsf)	u (tsf)	Sigma' (tsf)	r_d	CSR	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*
1	2.00	0.12	0.00	0.12	1.00	0.34	0.80	0.42	1.00	0.42
2	5.00	0.30	0.00	0.30	0.99	0.33	0.80	0.42	1.00	0.42
3	10.00	0.60	0.00	0.60	0.98	0.33	0.80	0.41	1.00	0.41
4	15.00	0.90	0.16	0.74	0.97	0.39	0.80	0.50	1.00	0.50
5	20.00	1.20	0.31	0.89	0.95	0.44	0.80	0.55	1.00	0.55
6	25.00	1.50	0.47	1.03	0.94	0.46	0.80	0.58	1.00	0.58
7	30.00	1.80	0.62	1.18	0.93	0.48	0.80	0.61	0.98	0.62
8	35.00	2.10	0.78	1.32	0.89	0.48	0.80	0.60	0.95	0.63
9	40.00	2.40	0.94	1.46	0.85	0.47	0.80	0.59	0.93	0.63
10	45.00	2.70	1.09	1.61	0.81	0.46	0.80	0.58	0.92	0.63
11	50.00	3.00	1.25	1.75	0.77	0.44	0.80	0.56	0.90	0.62

Depth : Depth from free surface, at which SPT was performed (ft)
Sigma : Total overburden pressure at test point, during earthquake (tsf)
u : Water pressure at test point, during earthquake (tsf)
Sigma' : Effective overburden pressure, during earthquake (tsf)
r_d : Nonlinear shear mass factor
CSR : Cyclic Stress Ratio
MSF : Magnitude Scaling Factor
$CSR_{eq,M=7.5}$ CSR adjusted for M=7.5
K_{sigma} Effective overburden stress factor
CSR^* CSR fully adjusted

:: Cyclic Resistance Ratio calculation $CRR_{7.5}$ ::

Point ID	Field SPT	C_n	C_e	C_b	C_r	C_s	$N_{1(60)}$	DeltaN	$N_{1(60)cs}$	$CRR_{7.5}$
1	26.00	1.70	0.86	1.00	0.75	1.20	34.25	11.85	46.10	2.00
2	50.00	1.70	0.90	1.00	0.75	1.20	69.05	18.81	87.86	2.00
3	41.00	1.32	0.97	1.00	0.85	1.20	53.62	15.72	69.34	2.00
4	53.00	1.18	1.04	1.00	0.95	1.20	74.53	19.91	94.44	2.00
5	43.00	1.08	1.11	1.00	0.95	1.20	59.03	13.27	72.30	2.00
6	21.00	1.01	1.18	1.00	0.95	1.20	28.41	10.68	39.10	2.00
7	44.00	0.94	1.25	1.00	1.00	1.20	62.15	17.43	79.58	2.00
8	14.00	0.89	1.32	1.00	1.00	1.20	19.70	8.94	28.64	0.37
9	31.00	0.84	1.33	1.00	1.00	1.20	41.90	6.48	48.38	2.00
10	52.00	0.81	1.33	1.00	1.00	1.20	67.06	12.00	79.06	2.00
11	52.00	0.77	1.33	1.00	1.00	1.20	64.25	11.68	75.93	2.00

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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:: Cyclic Resistance Ratio calculation $CRR_{7.5}$ ::

Point ID	Field SPT	C_n	C_e	C_b	C_r	C_s	$N_{1(60)}$	DeltaN	$N_{1(60)cs}$	$CRR_{7.5}$

C_n : Overburden corretion factor
C_e : Energy correction factor
C_b : Borehole diameter correction factor
C_r : Rod length correction factor
C_s : Liner correction factor
$N_{1(60)}$: Corrected N_{SPT}
DeltaN : Addition to corrected N_{SPT} value due to the presence of fines
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines
$CRR_{7.5)}$: Cyclic resistance ratio for M=7.5

:: Settlements calculation for saturated sands ::

Point ID	$N_{1(60)}$	N_1	FS_L	e_v (%)	Settle. (in)
1	46.10	38.42	3.64	0.00	0.00
2	87.86	73.22	3.66	0.00	0.00
3	69.34	57.78	3.71	0.00	0.00
4	94.44	78.70	3.10	0.00	0.00
5	72.30	60.25	2.81	0.00	0.00
6	39.10	32.58	2.64	0.00	0.00
7	79.58	66.32	2.48	0.00	0.00
8	28.64	23.87	0.45	1.80	0.00
9	48.38	40.32	2.43	0.00	0.00
10	79.06	65.89	2.44	0.00	0.00
11	75.93	63.27	2.48	0.00	0.00

Total settlement : 0.00

$N_{1,(60)}$: Stress normalized and corrected SPT blow count
N_1: Japanese equivalent corrected value
FS_L: Calculated factor of safety
e_v: Post-liquefaction volumentric strain (%)
Settle.: Calculated settlement (in)

:: Liquefaction potential according to Iwasaki ::

Point ID	F	w_z	I_L
1	0.00	9.70	0.00
2	0.00	9.24	0.00
3	0.00	8.48	0.00
4	0.00	7.71	0.00
5	0.00	6.95	0.00
6	0.00	6.19	0.00
7	0.00	5.43	0.00
8	0.55	4.67	3.91
9	0.00	3.90	0.00
10	0.00	3.14	0.00
11	0.00	2.38	0.00

Overall potential I_L : 3.91

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX

A

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

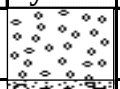
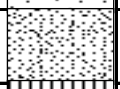
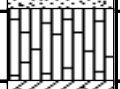
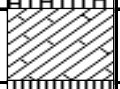
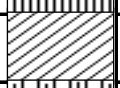
APPENDIX A
FIELD EXPLORATION

Fieldwork for our investigation (drilling) was conducted on November 17, 2015 and included a site visit, subsurface exploration, percolation tests, and soil sampling. The locations of the exploratory borings and percolation tests are shown on the Site Plan, Figure 2. Boring logs for our exploration are presented in figures following the text in this appendix. Borings were located in the field using existing reference points. Therefore, actual boring locations may deviate slightly.

In general, our borings were performed using a truck-mounted Mobile B-61 drill rig equipped with 6½ - inch Hollow-stem augers. Sampling in the borings was accomplished using a hydraulic 140-pound hammer with a 30-inch drop. Samples were obtained with a 3-inch outside-diameter (OD), split spoon (California Modified) sampler, and a 2-inch OD, Standard Penetration Test (SPT) sampler. The number of blows required to drive the sampler the last 12 inches (or fraction thereof) of the 18-inch sampling interval were recorded on the boring logs. The blow counts shown on the boring logs should not be interpreted as standard SPT "N" values; corrections have not been applied. Upon completion, the borings were backfilled with drill cuttings.

Subsurface conditions encountered in the exploratory borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488). This system uses the Unified Soil Classification System (USCS) for soil designations. The logs depict soil and geologic conditions encountered and depths at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, drill rig penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the field logs were revised based on subsequent laboratory testing.

Unified Soil Classification System

Major Divisions			Letter	Symbol	Description
Coarse-grained Soils More than ½ retained on the No. 200 Sieve	**Gravels** More than ½ coarse fraction retained on the No. 4 sieve	Clean Gravels	GW		Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP		Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM		Silty gravels, gravel-sand-silt mixtures.
			GC		Clayey gravels, gravel-sand-clay mixtures.
	Sands More than ½ passing through the No. 4 sieve	Clean Sands	SW		Well-graded sands and gravelly sands, little or no fines.
			SP		Poorly-graded sands and gravelly sands, little or no fines.
		Sands With Fines	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sandy-clay mixtures.
Fine-grained Soils More than ½ passing through the No. 200 Sieve	**Silts and Clays** Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL		Organic clays of medium to high plasticity.
	Silts and Clays Liquid Limit greater than 50%		MH		Inorganic silts, micaceous or diatomaceous fines sands or silts, elastic silts.
			CH		Inorganic clays of high plasticity, fat clays.
			OH		Organic clays of medium to high plasticity.
Highly Organic Soils			PT		Peat, muck, and other highly organic soils.

Consistency Classification

Granular Soils			*Cohesive Soils*		
Description - Blows Per Foot (Corrected)			Description - Blows Per Foot (Corrected)		
	MCS	SPT		MCS	SPT
Very loose	<5	<4	Very soft	<3	<2
Loose	5 – 15	4 – 10	Soft	3 – 5	2 – 4
Medium dense	16 – 40	11 – 30	Firm	6 – 10	5 – 8
Dense	41 – 65	31 – 50	Stiff	11 – 20	9 – 15
Very dense	>65	>50	Very Stiff	21 – 40	16 – 30
			Hard	>40	>30

MCS = Modified California Sampler

SPT = Standard Penetration Test Sampler

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-1

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-1
Logged By: SK
Initial: 36.5 feet
Depth to Water>
At Completion: 29.0 feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (ML) Dense; moist; brown; fine-medium grained; with trace clay.	126.3	6.0	MCS		42
5		**Silty SAND (SM)** Very dense; moist; brown; fine-medium grained; with trace clay.	128.5	9.1	MCS		50
10		Grades as above; dense; with more clay.	-	11.5	SPT		41
15		Grades as above; very dense; fine grained.	-	10.7	SPT		53
20		Grades as above; dense; fine-medium grained; with less clay.	-	10.3	SPT		43
25		**Sandy SILT (ML)** Very stiff; wet; brown; fine grained; with clay.	-	18.8	SPT		21

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 2

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-1

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-1
Logged By: SK
Initial: 36.5 feet
Depth to Water>
At Completion: 29.0 feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
30		Grades as above; hard; moist; perched groundwater encountered at 29 feet.	-	15.7	SPT		44
		Clayey SILT (ML) Stiff; very moist; brown; fine grained.					
35			-	24.1	SPT		14
		Sand (SP) Wet; mottled brown; coarse grained.					
40		**Silty SAND (SM)** Dense; moist; brown; medium-coarse grained; with trace clay.	-	16.8	SPT		31
45		Grades as above; very dense; moist.	-	12.8	SPT		52
		Grades as above.					
50		End of Borehole					

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 2 of 2

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-2

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-2
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	132.7	4.5	MCS		36		
5		**Silty SAND (SM)** Very dense; slightly moist; light brown; fine-medium grained; with trace clay.	118.4	5.8	MCS		50		
10		Grades as above; brown; fine grained; with trace clay.	-	11.3	SPT		51		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	11.9	SPT		31		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-3

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-3
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) dense; slightly moist; brown; fine-medium grained; with trace clay.	121.2	5.4	MCS		24
5		**Silty SAND (SM)** Very dense; slightly moist; light brown brown; fine-medium grained.	112.7	13.5	MCS		50
10		Grades as above; dense; brown; fine grained; with trace clay.		12.3	SPT		37
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.		10.1	SPT		47
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-4

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-4
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	123.5	4.2	MCS		20
5		**Silty SAND (SM)** Dense; moist; brown; fine-medium grained; with trace clay.	124.3	7.9	MCS		45
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	12.9	SPT		32
15		Grades as above.	-	11.7	SPT		44
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-5

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-5
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.7	5.9	MCS		41		
5		**Silty SAND (SM)** Very dense; moist; light brown; fine-medium grained; with trace clay.	132.0	6.7	MCS		50		
		Sandy SILT (ML) Hard; moist; brown; fine grained; with trace clay.							
10			-	12.5	SPT		41		
15		Grades as above.	-	10.9	SPT		43		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-6

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-6
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.7	5.9	MCS		41
5		**Silty SAND (SM)** Very dense; moist; light brown; fine-medium grained; with trace clay.	132.0	6.7	MCS		50
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	12.5	SPT		41
15		Grades as above.	-	10.9	SPT		43
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-7

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-7
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; moist; brown; fine-medium grained; with clay.	114.4	13.9	MCS		19		
5		**Silty SAND (SM)** Very dense; moist; brown; fine-medium grained; with less clay.	115.7	7.9	MCS		50		
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	13.2	SPT		35		
15		Grades as above.	-	12.0	SPT		40		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-8

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-8
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.5	5.8	MCS		45		
5		**Silty SAND (SM)** Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	124.0	6.0	MCS		37		
10		Grades as above; very dense; no clay.	-	5.4	SPT		66		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	13.5	SPT		36		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-9

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-9
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Silty SAND (SM/ML) Dense; moist; brown; fine-medium grained; with trace clay.	123.5	6.8	MCS		42
5		**Silty SAND (SM)** Dense; moist; dark gray/black; fine-medium; **with slight organic material.**	127.7	6.9	MCS		47
10		Grades as above; dense; no clay; no organic material.	-	9.6	SPT		33
15		**Sandy SILT (ML)** Very stiff; moist; brown; fine grained; with trace clay.	-	17.4	SPT		25
20		**Silty SAND (SM)** Wet; brown; fine-medium grained; with trace clay.					
		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-10

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-10
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	124.7	5.9	MCS		39		
5		**Silty SAND (SM)** Medium dense; moist; dark gray/black; fine-medium grained; **with abundant organic material.**	96.1	9.1	MCS		31		
10		Grades as above; dense; brown; no organic material.	-	9.4	SPT		48		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	10.0	SPT		34		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-11

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-11
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; moist; brown; fine-medium grained; with trace clay	129.1	6.1	MCS		39		
5		**Silty SAND (SM)** Medium dense; moist; dark gray/black; fine-medium grained; **with slight organic material.**	127.8	6.6	MCS		40		
10		Grades as above; dense; light brown; no organic material.	-	7.0	SPT		39		
15		**Sandy SILT (ML)** Very stiff; very moist; brown; fine grained; with trace clay.	-	16.4	SPT		20		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-12

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-12
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay	130.6	5.3	MCS		42
5		**Silty SAND (SM)** Very dense; slightly moist; brown; fine-medium grained; with trace clay.	120.8	5.9	MCS		50
10		Grades as above; moist.	-	10.6	SPT		64
15		**Silty SAND / SAND (SM/SP)** Dense; slightly moist; light brown; fine-medium grained.	-	2.4	SPT		34
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-13

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-13
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	135.1	5.8	MCS		45		
5		**Silty SAND (SM)** Dense; slightly moist; brown; fine-medium grained; with trace clay.	132.1	5.4	MCS		40		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-14

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-14
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	116.3	5.0	MCS		39		
5		**Silty SAND (SM)** Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	120.7	5.3	MCS		36		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-15

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-15
Logged By: SK
Initial: None
At Completion: None
Depth to Water>

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND (SM) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	116.8	4.7	MCS		38		
5		Grades as above.	121.3	5.0	MCS		36		
10		Grades as above.							
		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Boring No. B-16

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-16
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	119.1	4.8	MCS		33		
5		**Silty SAND (SM)** Medium dense; moist; brown; fine-medium grained; with trace clay.	118.3	7.2	MCS		31		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-1
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:00	9:30	5.0	N	0:30	4.00	4.12	1.44	30	20.8	12.0	10.6	11.3	0.39
9:30	10:00	5.0	N	0:30	4.12	4.21	1.08	30	27.8	10.6	9.5	10.0	0.32
10:00	10:30	5.0	N	0:30	4.21	4.28	0.84	30	35.7	9.5	8.6	9.1	0.27
10:30	11:00	5.0	N	0:30	4.28	4.34	0.72	30	41.7	8.6	7.9	8.3	0.25
11:00	11:30	5.0	N	0:30	4.34	4.39	0.60	30	50.0	7.9	7.3	7.6	0.22
11:30	12:00	5.0	N	0:30	4.39	4.43	0.48	30	62.5	7.3	6.8	7.1	0.19
12:00	12:30	5.0	N	0:30	4.43	4.47	0.48	30	62.5	6.8	6.4	6.6	0.20
12:30	13:00	5.0	N	0:30	4.47	4.51	0.48	30	62.5	6.4	5.9	6.1	0.21
Recommended for Design:										**Infiltration Rate**			**0.19**

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-2
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:05	9:35	5.0	N	0:30	3.80	3.98	2.16	30	13.9	14.4	12.2	13.3	0.50
9:35	10:05	5.0	N	0:30	3.98	4.11	1.56	30	19.2	12.2	10.7	11.5	0.41
10:05	10:35	5.0	N	0:30	4.11	4.21	1.20	30	25.0	10.7	9.5	10.1	0.36
10:35	11:05	5.0	N	0:30	4.21	4.30	1.08	30	27.8	9.5	8.4	8.9	0.35
11:05	11:35	5.0	N	0:30	4.30	4.38	0.96	30	31.3	8.4	7.4	7.9	0.35
11:35	12:05	5.0	N	0:30	4.38	4.45	0.84	30	35.7	7.4	6.6	7.0	0.34
12:05	12:35	5.0	N	0:30	4.45	4.51	0.72	30	41.7	6.6	5.9	6.2	0.32
12:35	13:05	5.0	N	0:30	4.51	4.57	0.72	30	41.7	5.9	5.2	5.5	0.35
Recommended for Design:										**Infiltration Rate**			**0.32**

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-3
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:10	9:40	5.0	N	0:30	3.95	4.07	1.44	30	20.8	12.6	11.2	11.9	0.37
9:40	10:10	5.0	N	0:30	4.07	4.16	1.08	30	27.8	11.2	10.1	10.6	0.31
10:10	10:40	5.0	N	0:30	4.16	4.24	0.96	30	31.3	10.1	9.1	9.6	0.30
10:40	11:10	5.0	N	0:30	4.24	4.31	0.84	30	35.7	9.1	8.3	8.7	0.28
11:10	11:40	5.0	N	0:30	4.31	4.37	0.72	30	41.7	8.3	7.6	7.9	0.26
11:40	12:10	5.0	N	0:30	4.37	4.43	0.72	30	41.7	7.6	6.8	7.2	0.28
12:10	12:40	5.0	N	0:30	4.43	4.48	0.60	30	50.0	6.8	6.2	6.5	0.25
12:40	13:10	5.0	N	0:30	4.48	4.53	0.60	30	50.0	6.2	5.6	5.9	0.27
Recommended for Design:										**Infiltration Rate**			**0.25**

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-4
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:15	9:45	5.0	N	0:30	3.95	4.02	0.84	30	35.7	12.6	11.8	12.2	0.21
9:45	10:15	5.0	N	0:30	4.02	4.07	0.60	30	50.0	11.8	11.2	11.5	0.16
10:15	10:45	5.0	N	0:30	4.07	4.11	0.48	30	62.5	11.2	10.7	10.9	0.13
10:45	11:15	5.0	N	0:30	4.11	4.14	0.36	30	83.3	10.7	10.3	10.5	0.10
11:15	11:45	5.0	N	0:30	4.14	4.17	0.36	30	83.3	10.3	10.0	10.1	0.11
11:45	12:15	5.0	N	0:30	4.17	4.19	0.24	30	125.0	10.0	9.7	9.8	0.07
12:15	12:45	5.0	N	0:30	4.19	4.21	0.24	30	125.0	9.7	9.5	9.6	0.07
12:45	13:15	5.0	N	0:30	4.21	4.23	0.24	30	125.0	9.5	9.2	9.4	0.08
Recommended for Design:										**Infiltration Rate**			**0.07**

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-5
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:20	9:50	5.0	N	0:30	3.98	4.07	1.08	30	27.8	12.2	11.2	11.7	0.28
9:50	10:20	5.0	N	0:30	4.07	4.13	0.72	30	41.7	11.2	10.4	10.8	0.20
10:20	10:50	5.0	N	0:30	4.13	4.18	0.60	30	50.0	10.4	9.8	10.1	0.18
10:50	11:20	5.0	N	0:30	4.18	4.22	0.48	30	62.5	9.8	9.4	9.6	0.15
11:20	11:50	5.0	N	0:30	4.22	4.26	0.48	30	62.5	9.4	8.9	9.1	0.15
11:50	12:20	5.0	N	0:30	4.26	4.29	0.36	30	83.3	8.9	8.5	8.7	0.12
12:20	12:50	5.0	N	0:30	4.29	4.32	0.36	30	83.3	8.5	8.2	8.3	0.12
12:50	13:20	5.0	N	0:30	4.32	4.35	0.36	30	83.3	8.2	7.8	8.0	0.13
Recommended for Design:										**Infiltration Rate**			**0.12**

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-6
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:25	9:55	5.0	N	0:30	4.12	4.24	1.44	30	20.8	10.6	9.1	9.8	0.43
9:55	10:25	5.0	N	0:30	4.24	4.32	0.96	30	31.3	9.1	8.2	8.6	0.32
10:25	10:55	5.0	N	0:30	4.32	4.38	0.72	30	41.7	8.2	7.4	7.8	0.26
10:55	11:25	5.0	N	0:30	4.38	4.43	0.60	30	50.0	7.4	6.8	7.1	0.24
11:25	11:55	5.0	N	0:30	4.43	4.47	0.48	30	62.5	6.8	6.4	6.6	0.20
11:55	12:25	5.0	N	0:30	4.47	4.51	0.48	30	62.5	6.4	5.9	6.1	0.21
12:25	12:55	5.0	N	0:30	4.51	4.54	0.36	30	83.3	5.9	5.5	5.7	0.17
12:55	13:25	5.0	N	0:30	4.54	4.57	0.36	30	83.3	5.5	5.2	5.3	0.18
Recommended for Design:										**Infiltration Rate**			**0.17**

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

APPENDIX

B

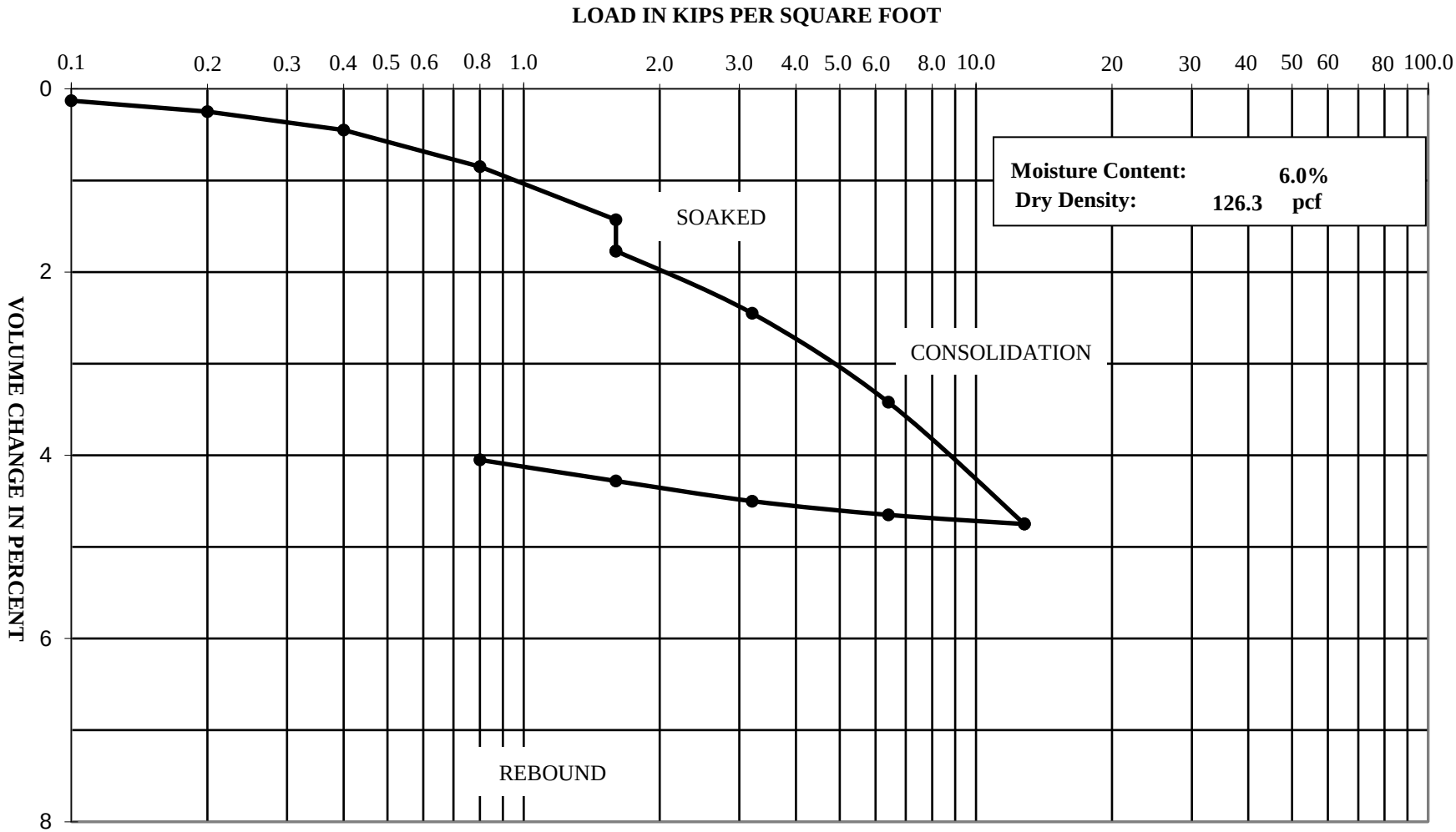
APPENDIX B
LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM), Caltrans, or other suggested procedures. Selected samples were tested for in-situ dry density and moisture content, corrosivity, consolidation, shear strength, expansion index, and grain size distribution. The results of the laboratory tests are summarized in the following figures.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

CONSOLIDATION - PRESSURE TEST DATA

ASTM D 2435



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

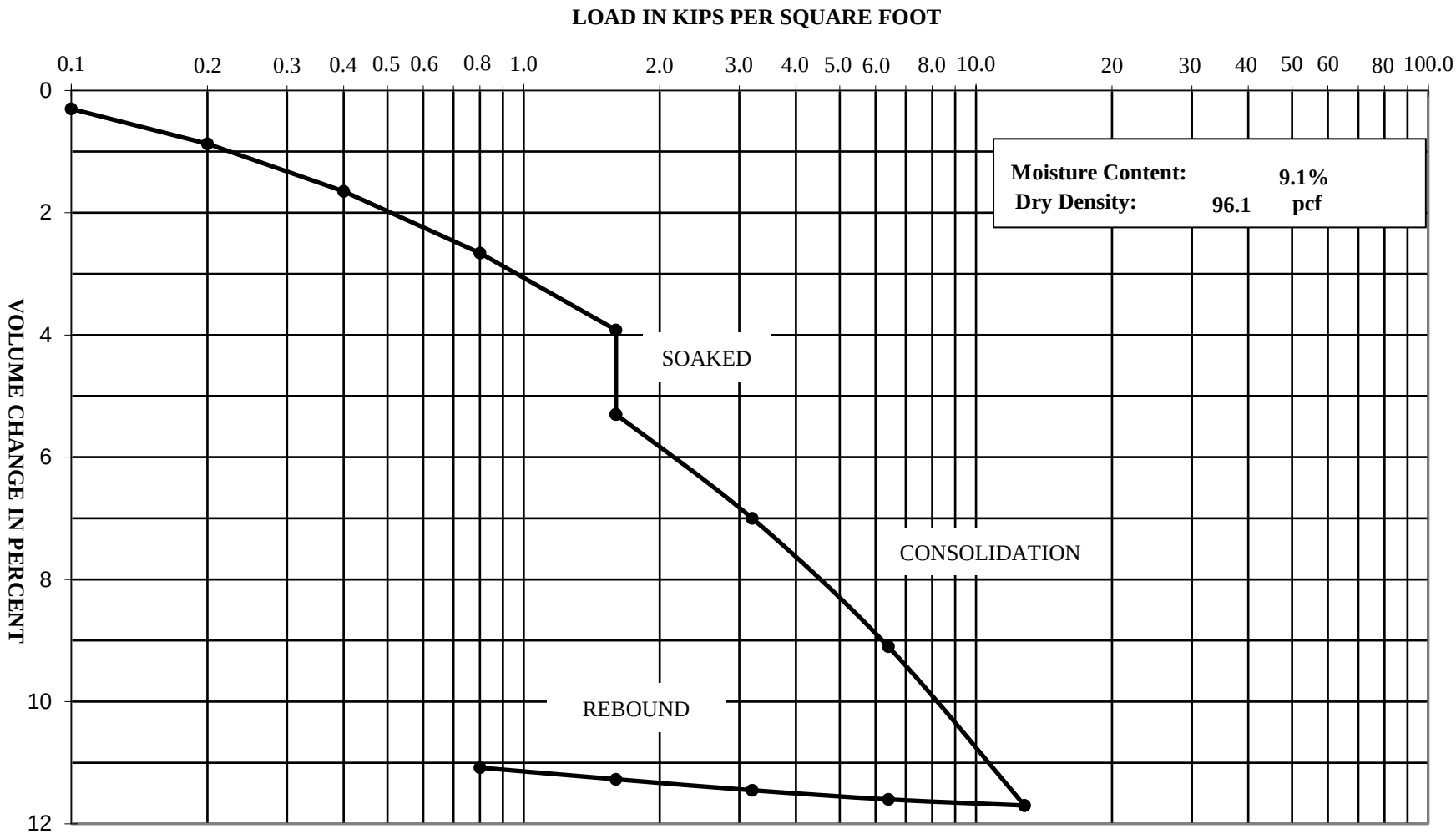
Project Number: 3-215-1091

Boring: B-1 @ 2'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

CONSOLIDATION - PRESSURE TEST DATA
ASTM D 2435



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

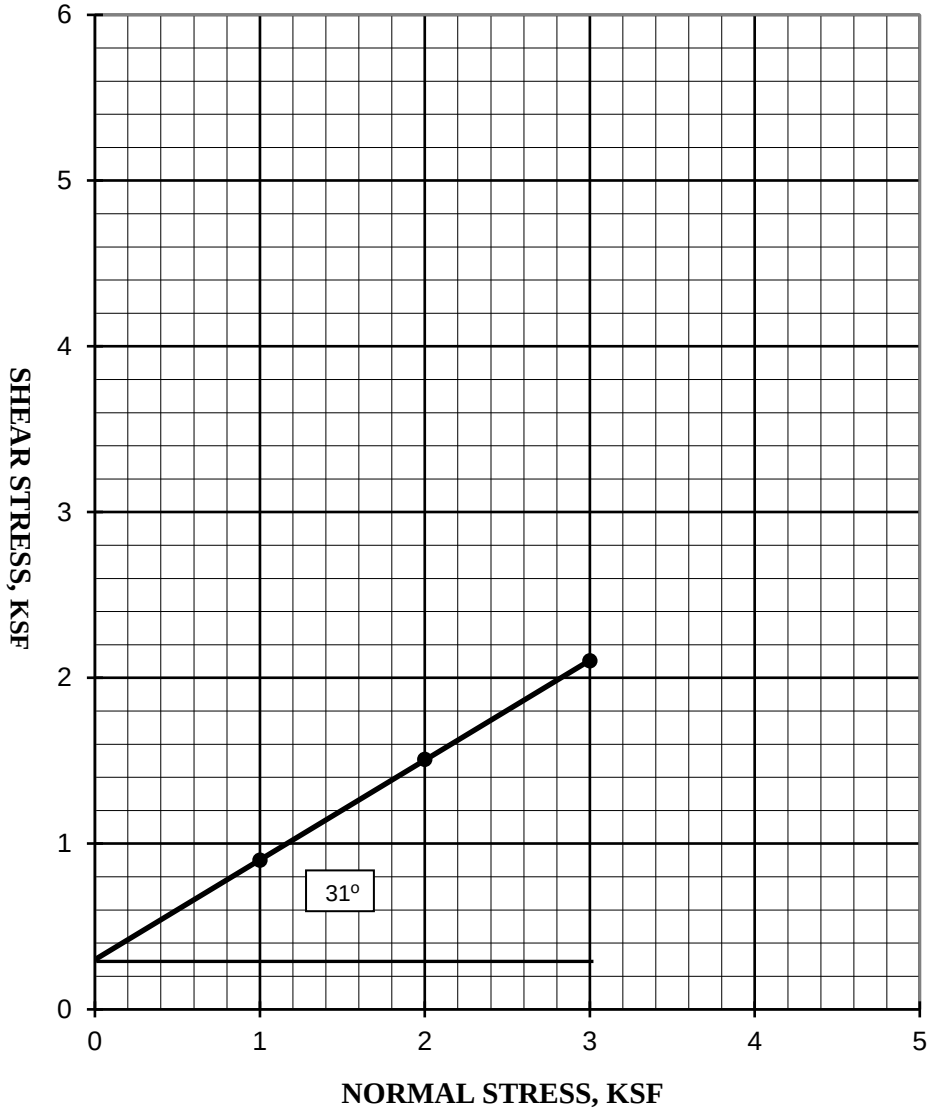
Project Number: 3-215-1091

Boring: B-10 @ 5'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

SHEAR STRENGTH DIAGRAM
(DIRECT SHEAR)
ASTM D - 3080



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 5'
Soil Type: Silty SAND (SM) with trace clay

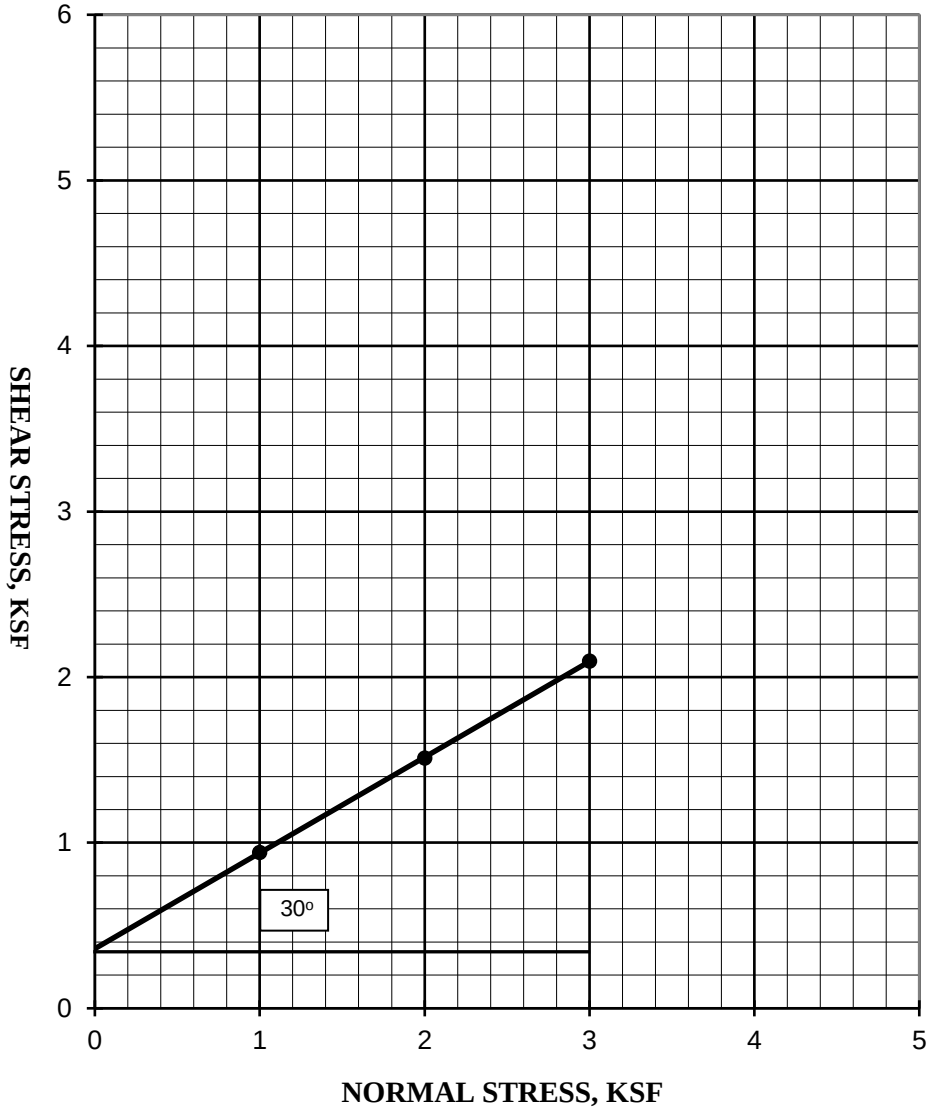
Friction Angle:	**31.0**	**degrees**
Cohesion:	**300**	**psf**

Moisture Content	**9.1%**
Dry Density	**128.5 pcf**

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

SHEAR STRENGTH DIAGRAM
(DIRECT SHEAR)
ASTM D - 3080



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-2 @ 2'
Soil Type: Silty SAND/Sandy SILT (SM/ML) with trace clay

Friction Angle:	**30.0**	**degrees**
Cohesion:	**360**	**psf**

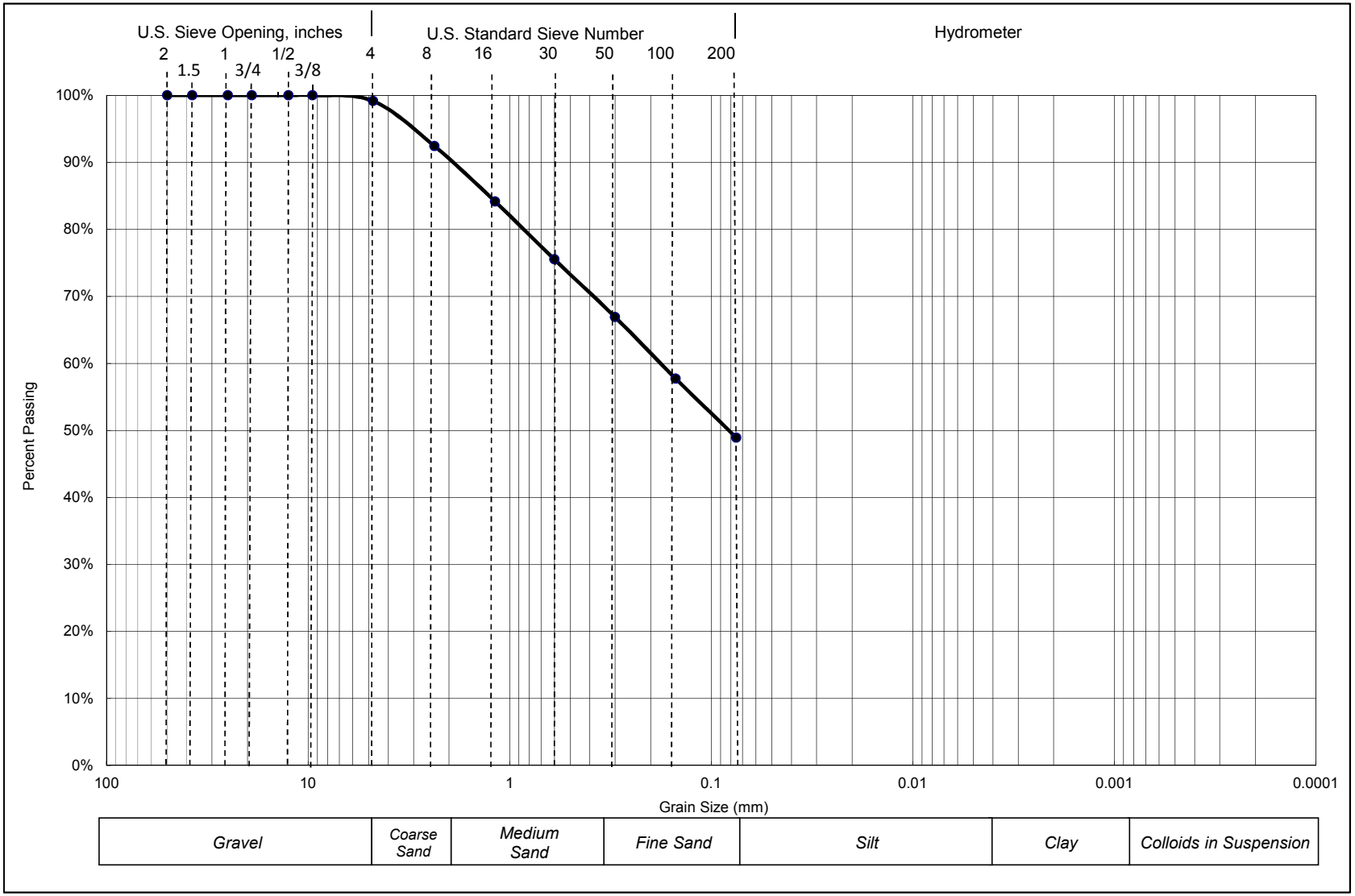
Moisture Content	**4.5%**
Dry Density	**132.7 pcf**

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 2'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

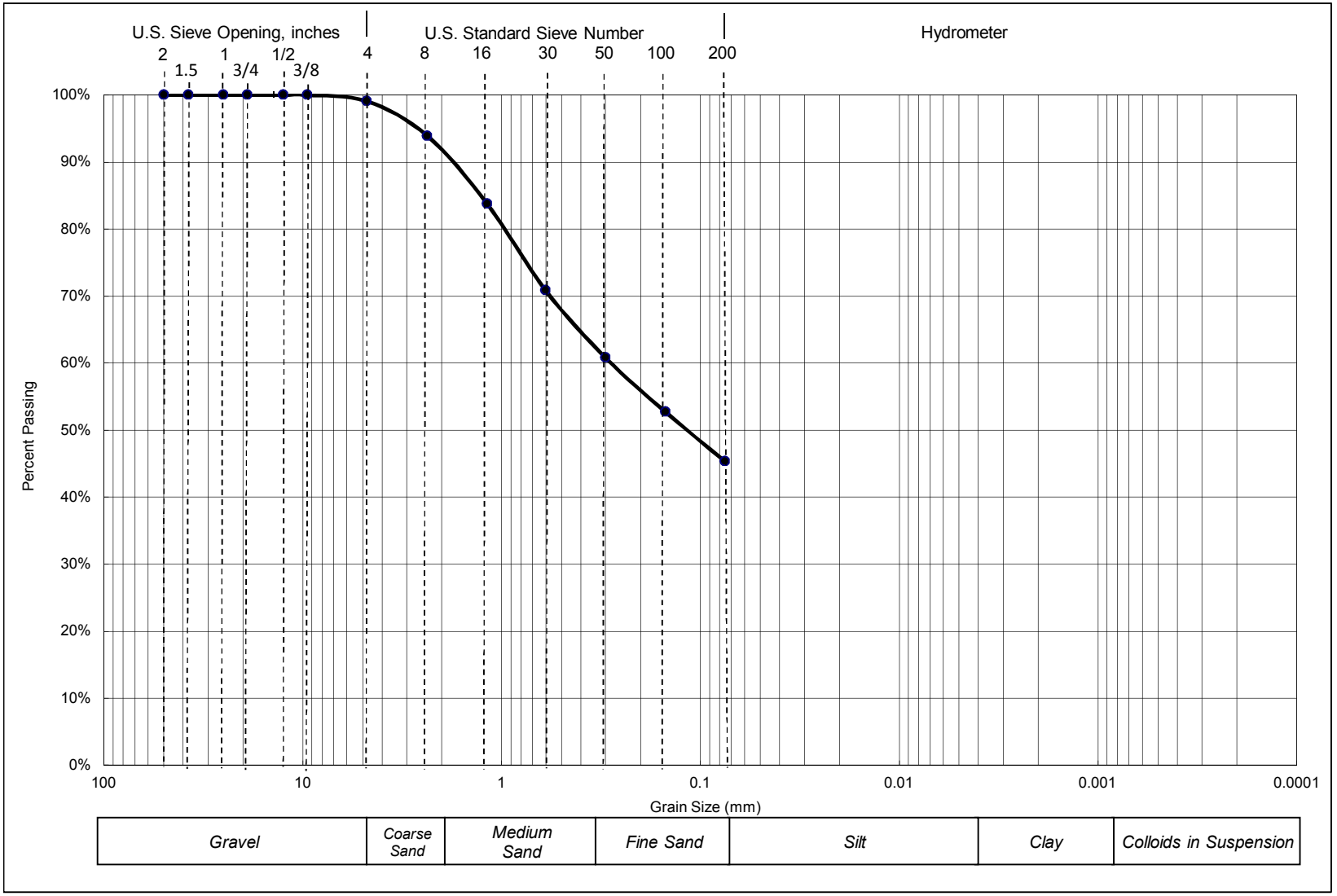
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.2%
No. 8	2.36	92.4%
No. 16	1.18	84.2%
No. 30	0.6	75.5%
No. 50	0.3	66.9%
No. 100	0.15	57.7%
No. 200	0.075	48.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 2'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 5'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

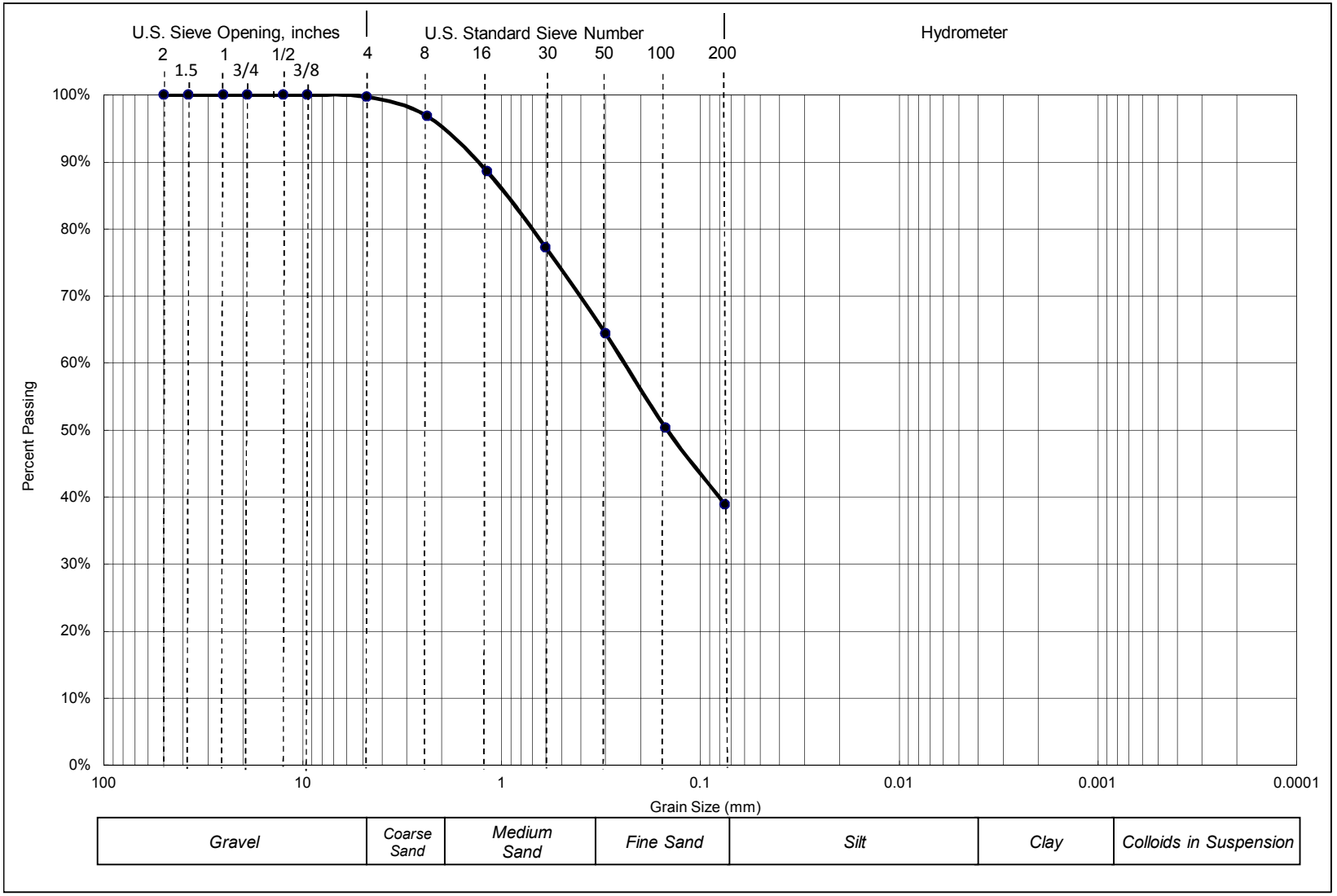
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.1%
No. 8	2.36	93.9%
No. 16	1.18	83.8%
No. 30	0.6	70.8%
No. 50	0.3	60.8%
No. 100	0.15	52.7%
No. 200	0.075	45.3%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 10'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

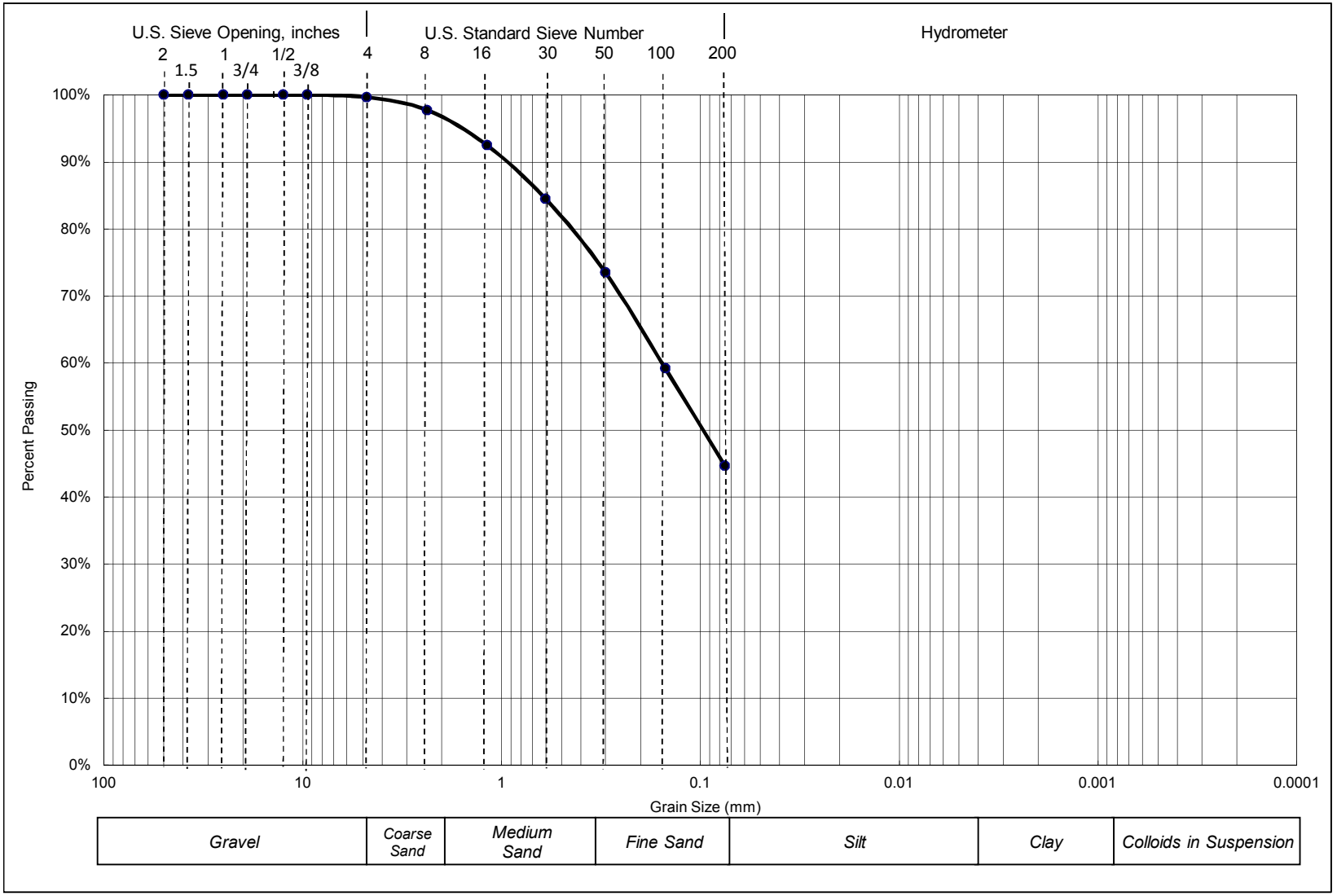
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	96.8%
No. 16	1.18	88.6%
No. 30	0.6	77.2%
No. 50	0.3	64.4%
No. 100	0.15	50.4%
No. 200	0.075	38.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 10'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 15'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

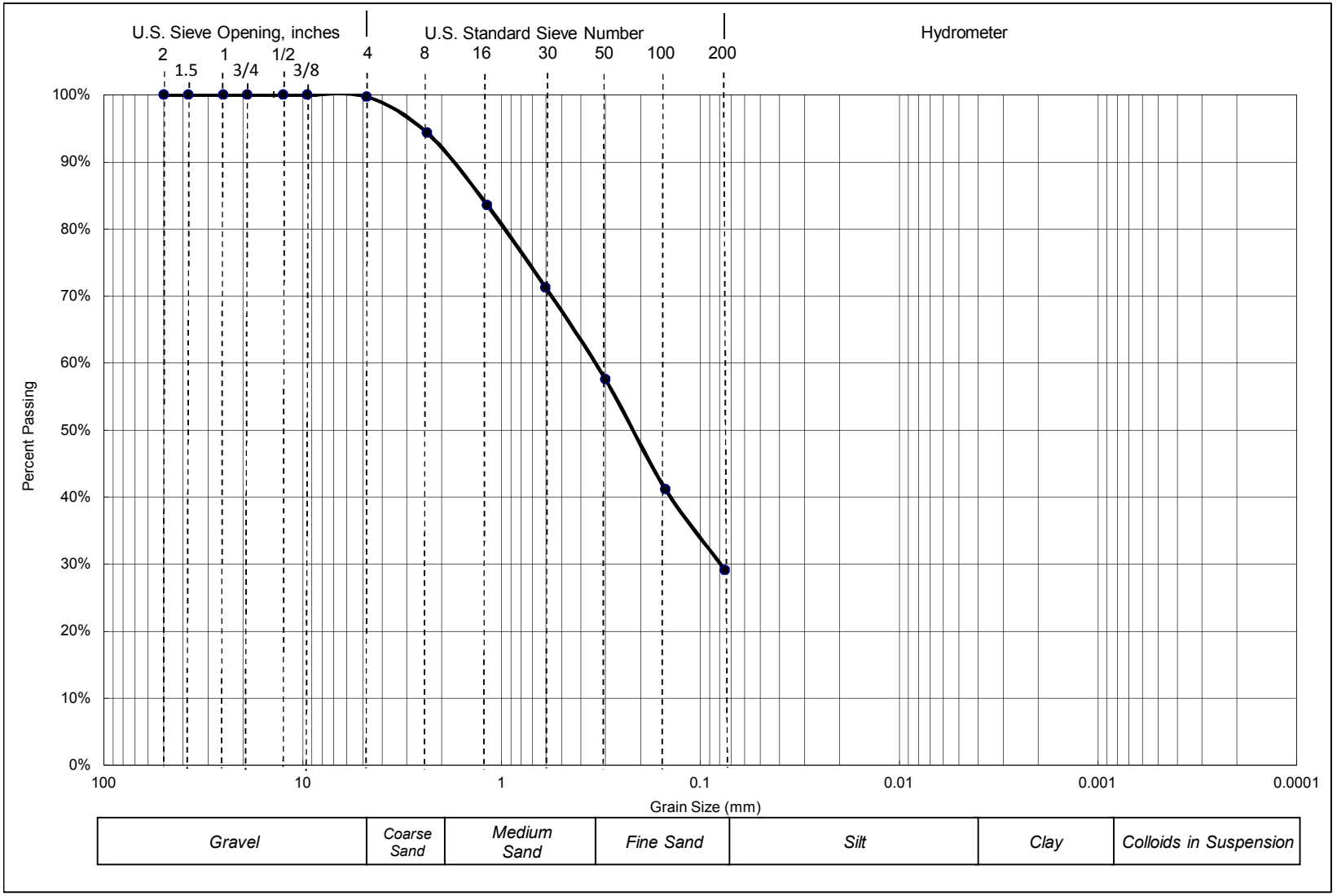
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	97.7%
No. 16	1.18	92.5%
No. 30	0.6	84.5%
No. 50	0.3	73.5%
No. 100	0.15	59.2%
No. 200	0.075	44.6%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 15'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 20'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	94.3%
No. 16	1.18	83.6%
No. 30	0.6	71.2%
No. 50	0.3	57.6%
No. 100	0.15	41.2%
No. 200	0.075	29.1%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 20'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

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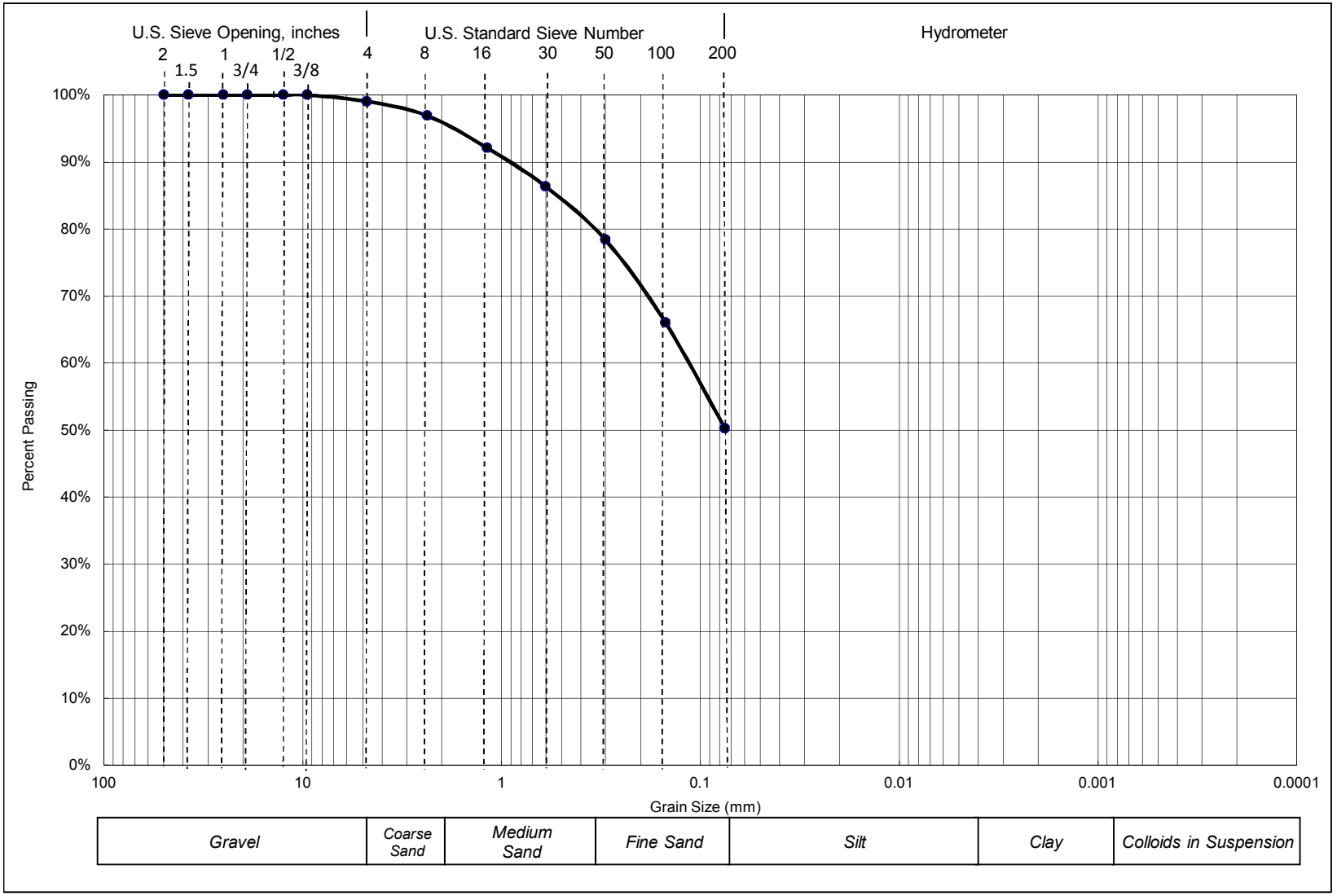


Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 25'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

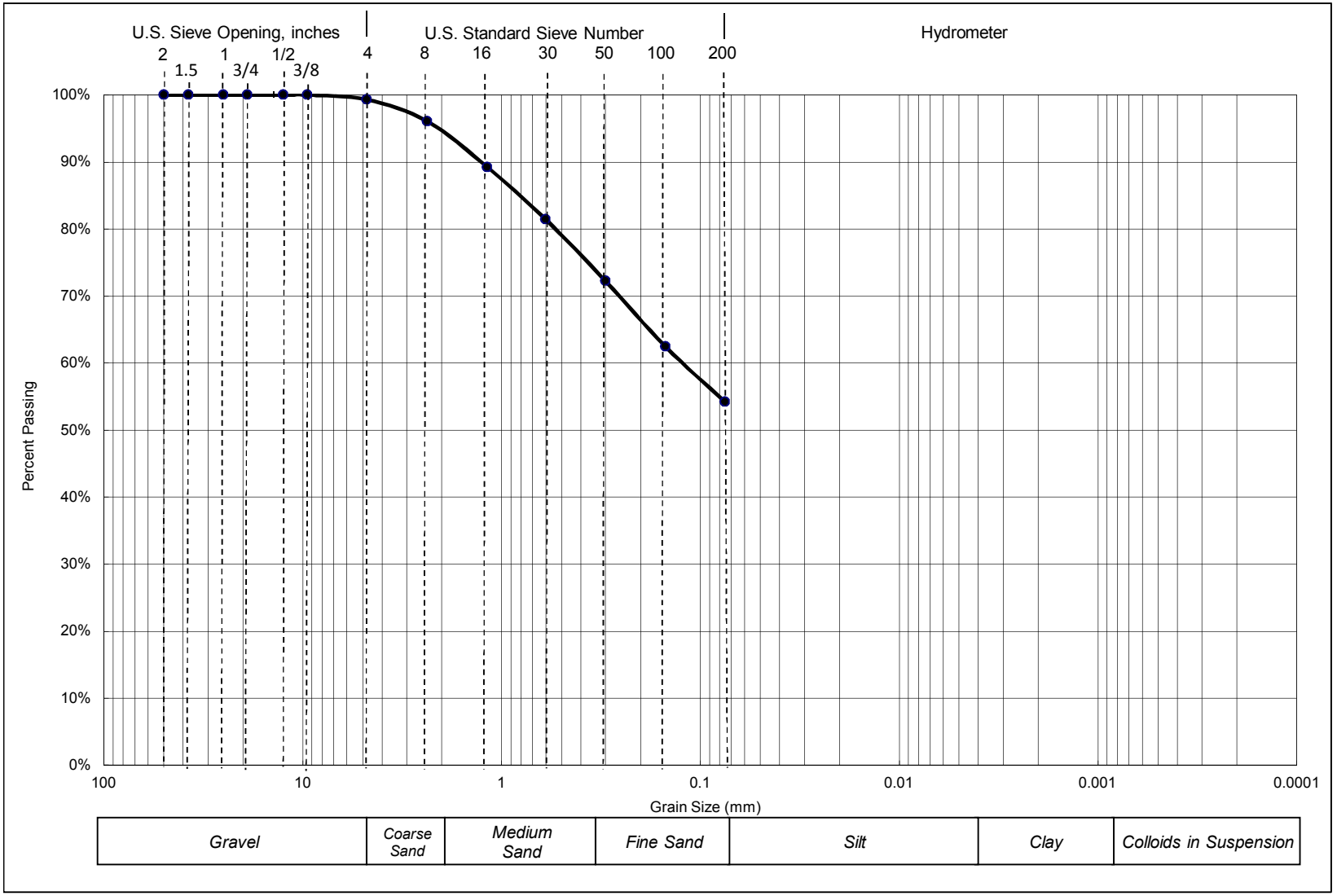
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.0%
No. 8	2.36	96.9%
No. 16	1.18	92.1%
No. 30	0.6	86.3%
No. 50	0.3	78.4%
No. 100	0.15	66.1%
No. 200	0.075	50.2%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 25'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 30'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

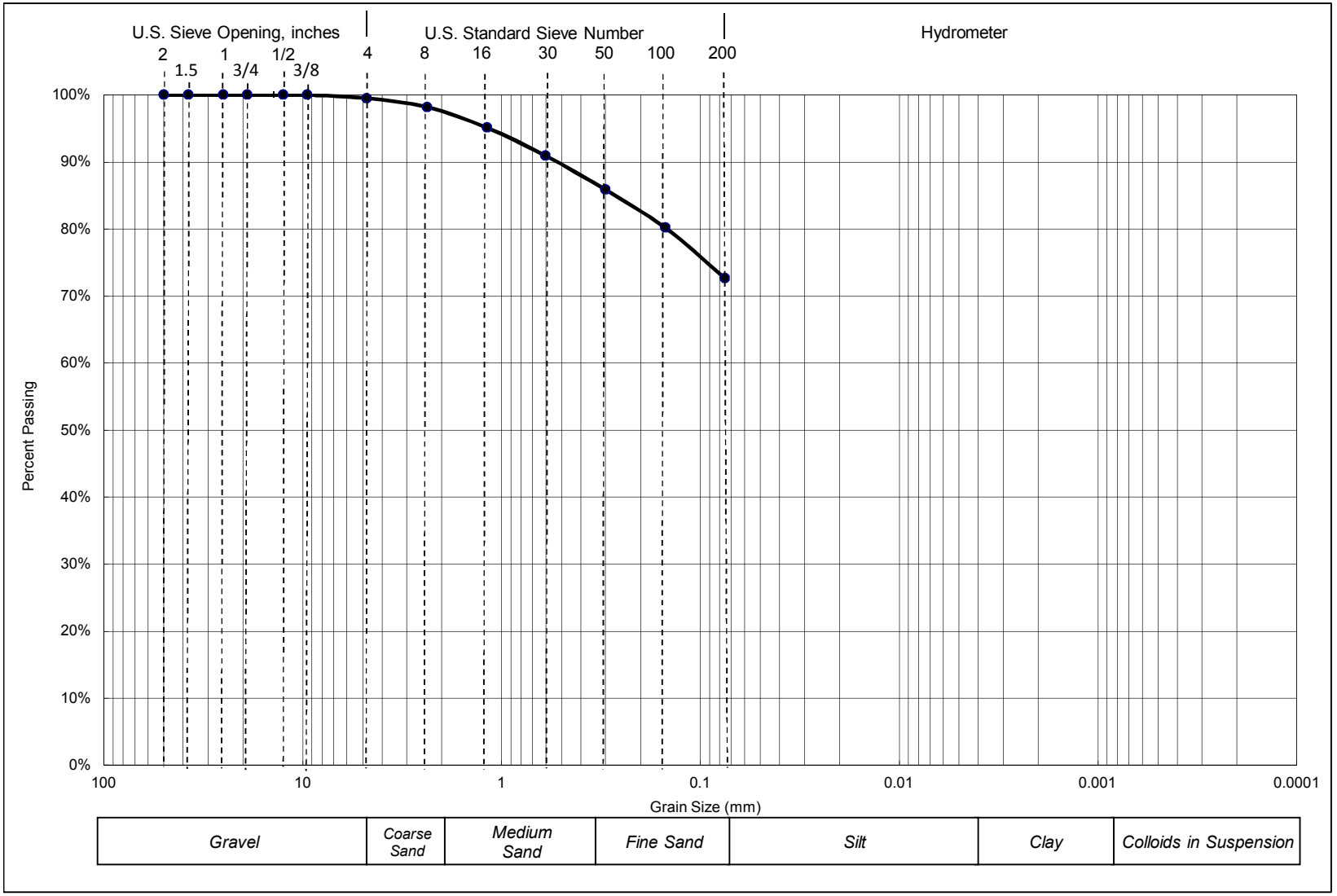
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.3%
No. 8	2.36	96.1%
No. 16	1.18	89.2%
No. 30	0.6	81.4%
No. 50	0.3	72.2%
No. 100	0.15	62.5%
No. 200	0.075	54.2%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 30'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 35'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

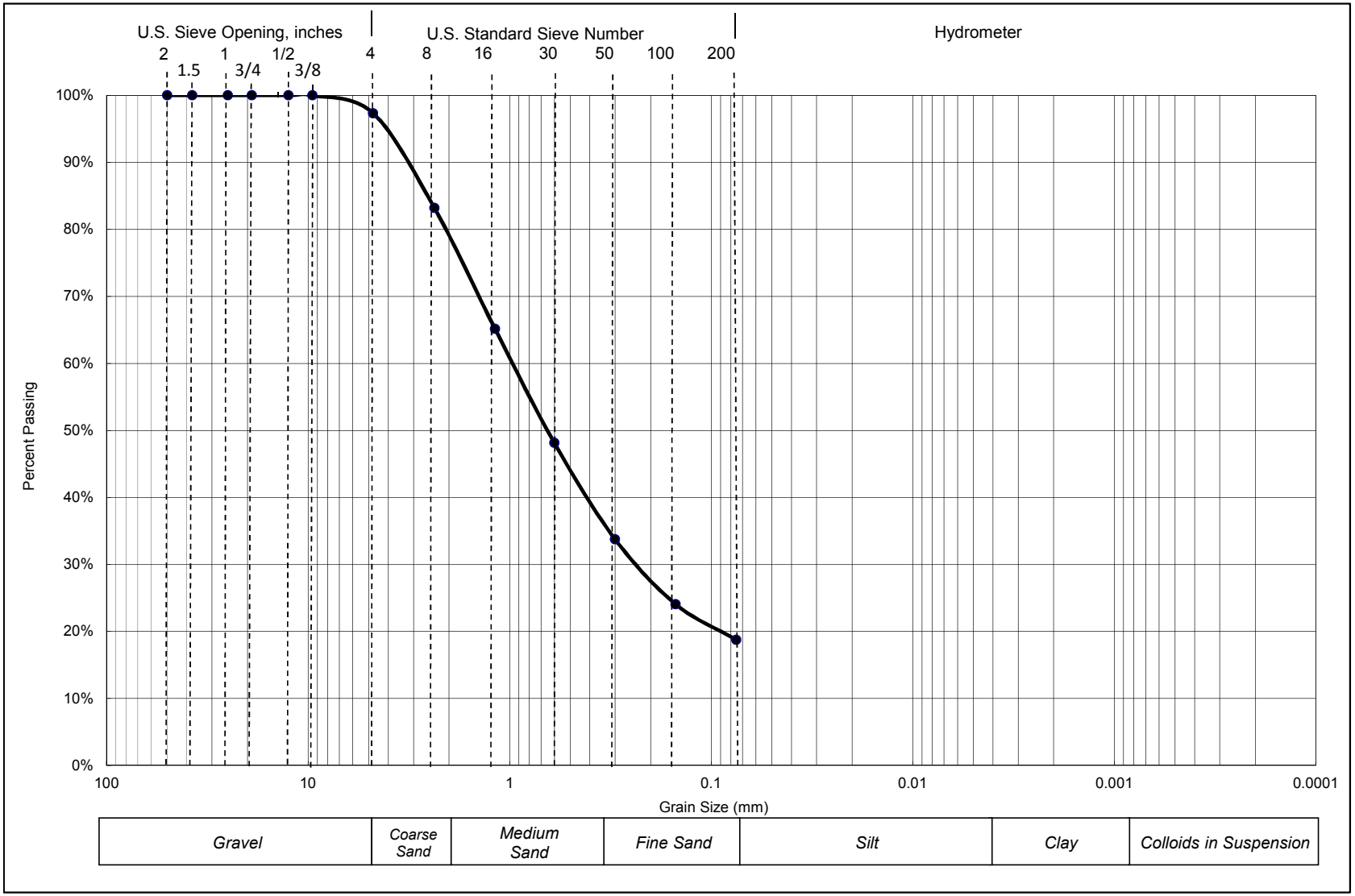
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.5%
No. 8	2.36	98.2%
No. 16	1.18	95.1%
No. 30	0.6	90.9%
No. 50	0.3	85.8%
No. 100	0.15	80.2%
No. 200	0.075	72.6%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 35'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 40'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

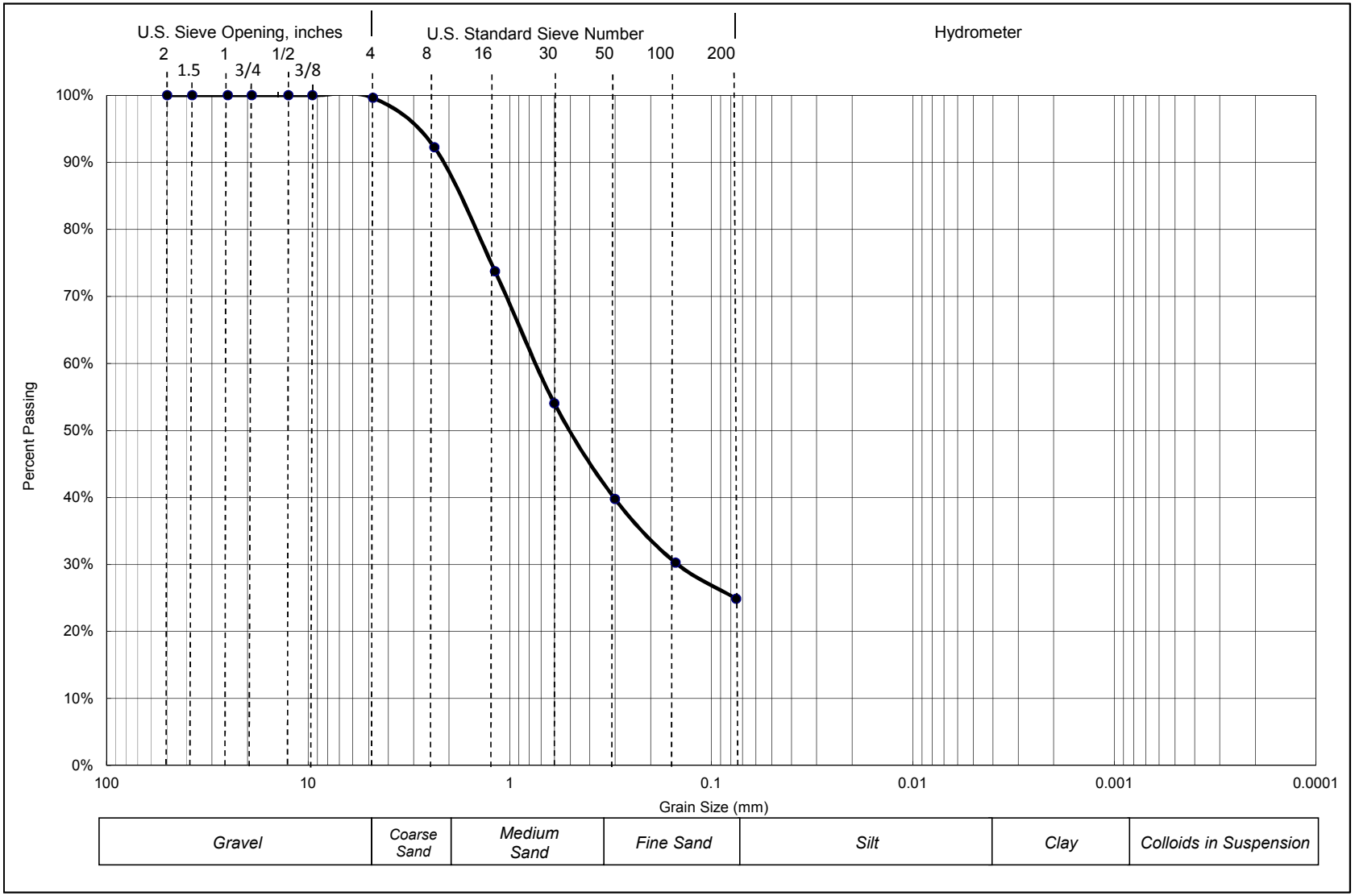
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	97.3%
No. 8	2.36	83.2%
No. 16	1.18	65.1%
No. 30	0.6	48.1%
No. 50	0.3	33.8%
No. 100	0.15	24.1%
No. 200	0.075	18.8%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 40'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 45'

SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.6%
No. 8	2.36	92.2%
No. 16	1.18	73.7%
No. 30	0.6	54.0%
No. 50	0.3	39.8%
No. 100	0.15	30.2%
No. 200	0.075	24.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 45'

SALEM engineering group, inc.

EXPANSION INDEX TEST
ASTM D 4829 / UBC Std. 29-2

Project Number: 3-215-1091
Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Date Tested: 11/20/15
Sample location/ Depth: B-1 @ 0' - 3'
Sample Number: 1
Soil Classification: Silty SAND/ Sandy SILT (SM/ML) with trace clay

Trial #	1	2	3
Weight of Soil & Mold, gms	615.4		
Weight of Mold, gms	186.7		
Weight of Soil, gms	428.7		
Wet Density, Lbs/cu.ft.	129.3		
Weight of Moisture Sample (Wet), gms	300.0		
Weight of Moisture Sample (Dry), gms	279.2		
Moisture Content, %	7.4		
Dry Density, Lbs/cu.ft.	120.3		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	50.3		

Time	Inital	30 min	1 hr	6 hrs	12 hrs	24 hrs
Dial Reading	0	--	--	--	--	0.0203

Expansion Index $_{measured}$ = 20.3
Expansion Index $_{50}$ = 20.4

Expansion Index = 20

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

SALEM engineering group

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

CHEMICAL ANALYSIS

SO_4 - Modified Caltrans 417 & Cl - Modified Caltrans 417/422

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Date: 11/20/15
Soil Classification: Silty SAND/ Sandy SILT (SM/ML) with trace clay

Sample Number	Sample Location	Soluble Sulfate SO_4-S	Soluble Chloride Cl	pH
1a.	B-1 @ 0' - 3'	205 mg/Kg	119 mg/Kg	7.4
1b.	B-1 @ 0' - 3'	186 mg/Kg	109 mg/Kg	7.4
1c.	B-1 @ 0' - 3'	170 mg/Kg	107 mg/Kg	7.4
Average:		**187 mg/Kg**	**112 mg/Kg**	**7.4**

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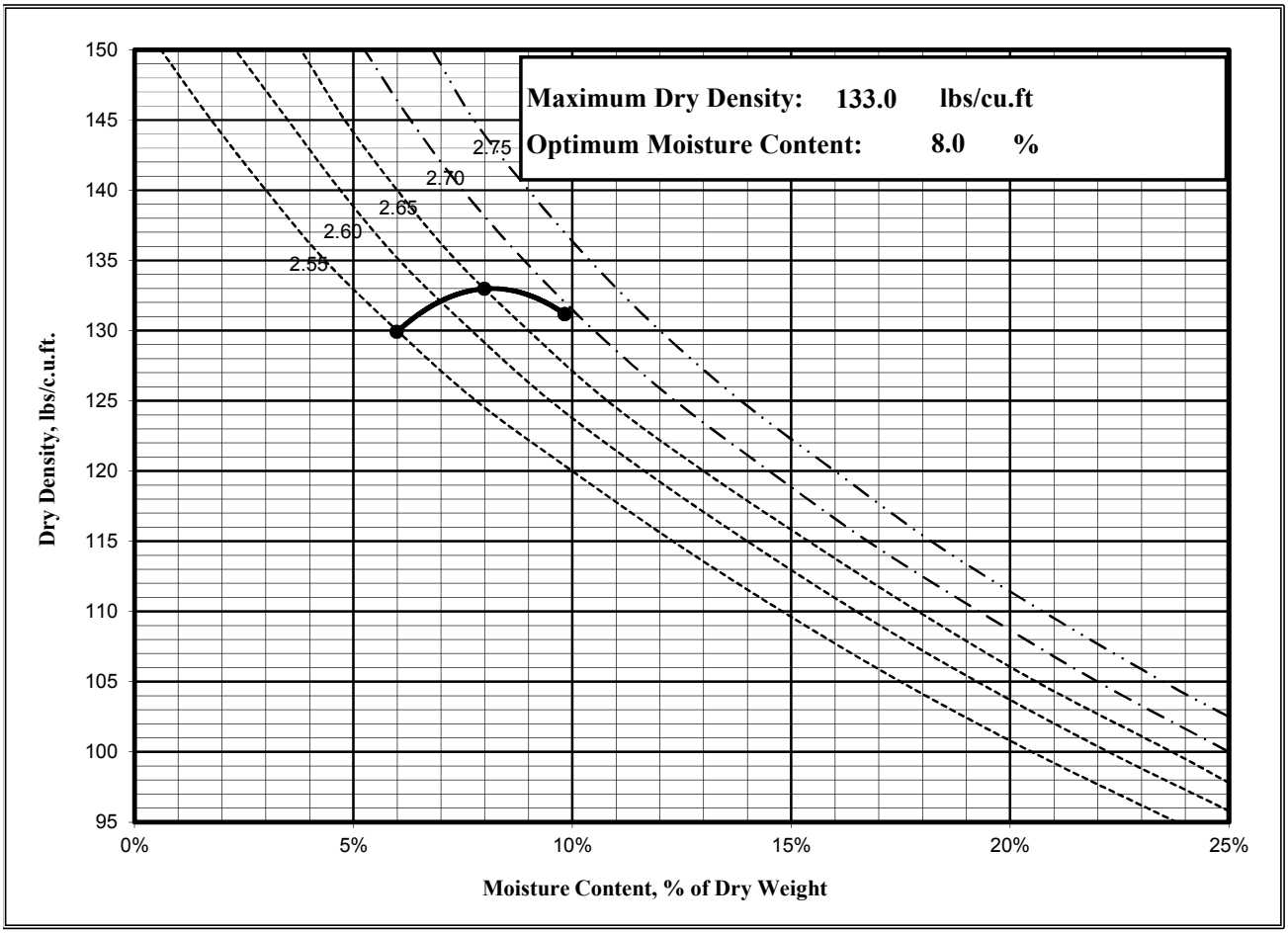
Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

LABORATORY COMPACTION CURVE

ASTM - D1557, D698

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Date Tested: 11/20/15
Sample Location: B-1 @ 0' - 3'
Soil Classification: Brown Silty SAND/ Sandy SILT (SM/ML) with trace clay
Sample/Curve Number: 1
Test Method: 1557 A

	1	2	3
Weight of Moist Specimen & Mold, gm	4428.3	4435.2	4338.8
Weight of Compaction Mold, gm	2259.1	2259.1	2259.1
Weight of Moist Specimen, gm	2169.2	2176.1	2079.7
Volume of mold, cu. ft.	0.0333	0.0333	0.0333
Wet Density, lbs/cu.ft.	143.6	144.1	137.7
Weight of Wet (Moisture) Sample, gm	200.0	200.0	200.0
Weight of Dry (Moisture) Sample, gm	185.2	182.1	188.7
Moisture Content, %	8.0%	9.8%	6.0%
Dry Density, lbs/cu.ft.	133.0	131.2	129.9



SALEM engineering group, inc.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX

C

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

APPENDIX C
GENERAL EARTHWORK AND PAVEMENT SPECIFICATIONS

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

1.0 SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including, but not limited to, the furnishing of all labor, tools and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans and disposal of excess materials.

2.0 PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of SALEM Engineering Group, Incorporated, hereinafter referred to as the Soils Engineer and/or Testing Agency. Attainment of design grades, when achieved, shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary adjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer, or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

3.0 TECHNICAL REQUIREMENTS: All compacted materials shall be densified to no less that 95 percent of relative compaction (90 percent for cohesive soils) based on ASTM D1557 Test Method (latest edition), UBC or CAL-216, or as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

4.0 SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the Geotechnical Engineering Report. The Contractor shall make his own interpretation of the data contained in the Geotechnical Engineering Report and the Contractor shall not be relieved of liability for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

5.0 DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or wind-blown materials attributable to his work. Site preparation shall consist of site clearing and grubbing and preparation of foundation materials for receiving fill.

6.0 CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter and all other matter determined by the Soils Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed improvement areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots greater than 1 inch in diameter. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations is not permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

7.0 SUBGRADE PREPARATION: Surfaces to receive Engineered Fill and/or building or slab loads shall be prepared as outlined above, scarified to a minimum of 12 inches, moisture-conditioned as necessary, and recompacted to 95 percent relative compaction (90 percent for cohesive soils).

Loose soil areas and/or areas of disturbed soil shall be moisture-conditioned as necessary and recompacted to 95 percent relative compaction (90 percent for cohesive soils). All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any fill material.

8.0 EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

9.0 FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence or approval of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills, provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

10.0 PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. Compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer. Both cut and fill shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

11.0 SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing, or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill is as specified.

12.0 DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to, is the most recent edition of the Standard Specifications of the State of California, Department of Transportation. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as determined by ASTM D1557 Test Method (latest edition) or California Test Method 216 (CAL-216), as applicable.

13.0 PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 95 percent (90 percent for cohesive soils) based upon ASTM D1557. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

14.0 AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class II material, ¾-inch or 1½-inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent based upon CAL-216. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

15.0 AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class II Subbase material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent based upon CAL-216, and it shall be spread and compacted in accordance with the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

16.0 ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10, unless otherwise stipulated or local conditions warrant more stringent grade. The mineral aggregate shall be Type A or B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39. The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

combination steel-wheel and pneumatic rollers, as described in the Standard Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

Attachment: Hydrology Report (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

STORM WATER POLLUTION PREVENTION PLAN

for

Cactus Commerce

Prepared for the
Legally Responsible Person (LRP):

Ino Cruz
139 Radio Road
Corona, CA 92879

Project Address:

NEC Cactus Ave and Commerce Center Drive
Hemet, CA 92582

Qualified SWPPP Practitioner (QSP):

TBD

SWPPP Prepared by:

Francisco V. Magos II
SALEM Engineering Group, Inc.
11650 Mission Park Drive, Suite 108
Rancho Cucamonga, CA 91730

SWPPP Preparation Date:

October 2016

Estimated Project Dates:

Start of Construction: 04/01/2017 **Completion of Construction:** 03/31/2018

RISK LEVEL 1

Waste Discharge Identification (WDID):_____

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Section 1 SWPPP Certification

1.1 SWPPP CERTIFICATION BY PREPARER

Project Name: Cactus Commerce

Project Number/ID: 3-716-1096 (SALEM Project No.)

"This Storm water Pollution Prevention Plan and Attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Orders No. 2009-009-DWQ as amended by Order 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

Qualified SWPPP Developer (QSD)

Signature: _____

Name: Francisco V. Magos II

Title: Civil Department Manager, QSD

Certificate #: 00612

Company: SALEM Engineering Group, Inc.

Address: 11650 Mission Park Drive, Suite 108, Rancho Cucamonga, CA 91730

Phone: (909) 980-6455

Fax: (909) 660-3297

Email: francisco@salem.net

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

1.2 SWPPP CERTIFICATION BY OWNER

Project Name: Cactus Commerce

Project Number/ID: 3-716-1096 (SALEM Project No.)

"I certify under penalty of law that this document and all Attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Legally Responsible Person (LRP)

Signature: _____

Name: Ino Cruz

Title: Senior Project Manager

Company: J & T Management, Inc.

Address: 139 Radio Road, Corona, CA 92879

Phone: (951) 280-3833

Email: ino@jntmgmt.com

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Section 2 SWPPP Amendments

2.1 SWPPP AMENDMENTS AND CERTIFICATION

The SWPPP should be amended when:

- There is a General Permit violation.
- There is a reduction or increase of the total acreage covered under the General Permit when a portion of the project is complete and/or conditions for termination of coverage have been met (General Permit Section II, C).
- Ownership of the project is transferred to a different entity.
- BMPs do not meet the objectives of reducing or eliminating pollutants in storm water discharges.
- There is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4);
- There is a change in the project duration that changes the project's risk level; or
- Deemed necessary by the QSD. The QSD has determined that the changes listed in Table 2.1 can be field determined by the QSP. All other changes shall be made by the QSD as formal amendments to the SWPPP.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is warranted. Updated PRDs shall be submitted electronically via SMARTS https://smarts.waterboards.ca.gov . The SWPPP shall be modified appropriately by the QSD, with revisions and amendments recorded in Appendix D. Amendments shall be logged in Section 2.2 and the certifications kept in Appendix D.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;
- The original BMP proposed, if any; and
- The new BMP proposed.

SWPPP amendments must be made by a QSD. The following changes have been designated by the QSD as "to be field determined" and constitute minor changes that the QSP may implement based on field conditions.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 2.1 List of Changes to be Field Determined

Candidate changes for field location or determination by QSP[1]	Check changes that can be field located or field determined by QSP
Increase quantity of an Erosion or Sediment Control Measure	✓
Relocate/Add stockpiles or stored materials	✓
Relocate or add toilets	✓
Relocate vehicle storage and/or fueling locations	✓
Relocate areas for waste storage	✓
Relocate water storage and/or water transfer location	✓
Changes to access points (entrance/exits)	✓
Change type of Erosion or Sediment Control Measure	✓
Changes the location of erosion or sediment control	✓
Minor changes to schedule or phases	✓
Changes in construction materials	✓
(1) Any field changes not identified for field location/determination by QSP must be approved by QSD	

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Amendment Number: ____

Project Name: Cactus Commerce

Project Number/ID: 3-716-1096 (SALEM Project No.)

QSD Certification of the SWPPP Amendment

"This Storm water Pollution Prevention Plan and attachments were prepared under my direction to meet the requirements of the California Construction General Permit (SWRCB Order No. 2009-009-DWQ as amended by 2010-0014-DWQ). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

Signature: _____ Date: _____

Name: Francisco V. Magos II

Title: Civil Department Manager, QSD

Certificate #: 00612

Phone: (909) 980-6455

LRP (or Approved Signatory) Certification of the SWPPP Amendment

"I certify under penalty of law that this document and all Attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature: _____ Date: _____

Name: Ino Cruz

Title: Senior Project Manager

Company: J & T Management, Inc.

Phone: (951)280-3833

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

2.2 SWPPP AMENDMENT LOG

Project Name: Cactus Commerce

Project Number/ID: 3-716-1096 (SALEM Project No.)

No.	Date	Brief Description of Amendment, include section and page number(1)	Prepared and Approved By
1			Name: QSD#:
2			Name: QSD#:
3			Name: QSD#:
4			Name: QSD#:
5			Name: QSD#:
6			Name: QSD#:
7			Name: QSD#:
8			Name: QSD#:
9			Name: QSD#:
10			Name: QSD#:

(1) Place amended sections in Appendix D

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Section 3 SWPPP Requirements

3.1 INTRODUCTION

The proposed project comprises of approximately 6.3 acres and is located on the northeast corner of Commerce Center Drive and Cactus Drive in Moreno Valley, California. The property is owned by and being developed by the J & T Management, Inc. The projects location is shown on the Site Map in Appendix B.

This Storm water Pollution Prevention Plan (SWPPP) is designed to comply with California's General Permit for Storm water Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ (NPDES No. CAS000002) issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the SWPPP Template provided in the California Storm water Quality Association Storm water *Best Management Practice Handbook Portal: Construction* (CASQA, 2010). In accordance with the General Permit, Section XIV, this SWPPP is designed to address the following:

- The control of pollutants and their sources, including sources of sediment associated with construction, construction site erosion and other activities associated with construction activity are controlled;
- Where not otherwise required to be under a Regional Water Quality Control Board (Regional Water Board) permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the Best Available Technology/Best Control Technology (BAT/BCT) standard;

Calculations and design details are shown in Appendix A.

3.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) shall be submitted to the State Water Board via the Storm water Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

1. Notice of Intent (NOI);
2. Risk Assessment (Construction Site Sediment and Receiving Water Risk Determination);
3. Site Map;
4. Annual Fee;
5. Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and
6. SWPPP.

Site Maps can be found in Appendix B. A copy of the submitted PRDs shall also be kept in Appendix C along with the Waste Discharge Identification (WDID) confirmation.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

3.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The discharger shall make the SWPPP available at the construction site during working hours (see Section 9.5 of CSMP for working hours) while construction is occurring and shall be made available upon request by a State or Municipal inspector. When the original SWPPP is retained by a crewmember in a construction vehicle and is not currently at the construction site, current copies of the BMPs and map/drawing will be left with the field crew and the original SWPPP shall be made available via a request by radio/telephone. (CGP Section XIV.C)

The SWPPP shall be implemented concurrently with the start of ground disturbing activities.

3.4 RETENTION OF RECORDS

Paper or electronic records of all storm water monitoring information and copies of all reports required by this SWPPP shall be retained and available for a minimum of three years after filing the Notice of Termination (NOT). These records shall be available at the Site until construction is complete. Records assisting in the determination of compliance with the General Permit shall be made available within a reasonable time, to the Regional Water Board, State Water Board or U.S. Environmental Protection Agency (EPA) upon request. Requests by the Regional Water Board for retention of records for a period longer than three years shall be adhered to.

3.5 REQUIRED NON-COMPLIANCE REPORTING

If a discharge violation occurs the QSP shall immediately notify the LRP and the LRP shall file a violation report electronically to the Regional Water Board within 30 days of identification of non-compliance using SMARTS. Corrective measures will be implemented immediately following the discharge or written notice of non-compliance from the Regional Water Board. Discharges and corrective actions will be documented on the NAL/NEL Exceedance Site Evaluation Report Form in CSMP Attachment 3 “Example Forms.”

The report to the LRP and to the Regional Water Board will contain the following items:

- The date, time, location, nature of operation and type of unauthorized discharge.
- The cause or nature of the notice or order.
- The control measures (BMPs) deployed before the discharge event, or prior to receiving notice or order.
- The date of deployment and type of control measures (BMPs) deployed after the discharge event, or after receiving the notice or order, including additional measures installed or planned to reduce or prevent re-occurrence.

3.6 ANNUAL REPORT

The General Permit requires that permittees prepare, certify, and electronically submit an Annual Report no later than September 1st of each year. Reporting requirements are identified in Section XVI of the General Permit. Annual reports will be filed using the SMARTS website and in accordance with information required by the on-line forms. Refer to Appendix F for sample Annual Reports forms. The Annual Report shall be retained and available for a minimum of three years after filing the NOT.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

3.7 CHANGES TO PERMIT COVERAGE

The General Permit allows for the reduction or increase of the total acreage covered under the General Permit when: a portion of the project is complete and/or conditions for termination of coverage have been met; when ownership of a portion of the project is purchased by a different entity; or when new acreage is added to the project.

Modified PRDs shall be filed electronically within 30 days of a reduction or increase in total disturbed area if a change in permit covered acreage is warranted. Updated PRDs shall be submitted electronically via SMARTS https://smarts.waterboards.ca.gov . The SWPPP shall be modified appropriately by the QSD, with revisions and amendments recorded in Appendix D. Amendments shall be logged in Section 2.2 and the certifications kept in Appendix D.

3.8 NOTICE OF TERMINATION

A Notice of Termination (NOT) must be submitted electronically by the LRP via SMARTS to terminate coverage under the General Permit. The NOT must include a final Site Map and representative photographs of the project site that demonstrate final stabilization has been achieved. The NOT shall be submitted within 90 days of completion of construction. The Regional Water Board will consider a construction site complete when the conditions of the General Permit, Section II.D have been met.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Section 4 Project Information

4.1 PROJECT AND SITE DESCRIPTION

4.1.1 Site Description

The project site is approximately 6.3 acres and is located at the northeast corner of Commerce Center Drive and Cactus Drive, in Moreno Valley, California. The project site is located approximately 0.4 miles east of Interstate 215 – Armed Forces Freeway and approximately 2.3 miles south of State Route 79. The site is bound to the north by Goldencrest Drive; to the east by existing commercial lot; to the south by Cactus Avenue; and to the west by Commerce Center Drive. The project is located at latitude 33°54'39.54"N and longitude 117°16'23.80"W and is identified on the Site Map in Appendix B.

4.1.2 Existing Conditions

As of the initial date of this SWPPP, the project site is undeveloped. The project site was previously rough graded for commercial use. There are existing street lights, curb inlets, fire hydrants, and curb and gutters along the outer perimeters of the property, though there are no sidewalks. There is a 20' storm drain easement along the southern and eastern borders of the property. Appendix B shows the Google Earth Imagery of the site and of the area nearby. There are no known historic sources of contamination at the site.

4.1.3 Existing Drainage

The project site is relatively flat. The elevation of the project site ranges from 1549 to 1554 feet above mean sea level (msl). The majority of the surface flows to three storm drain inlets on the site. There are three areas with possible ponding. The west portion of the property drains to the storm drain inlet on Commerce Center Drive. The southeast portion of the property flows to the storm drain inlet on Cactus Ave and the northern portion of the property sheet flows to the storm drain inlet on Goldencrest Drive. Storm water is conveyed through surface runoff or percolates into the ground. The site currently does not discharge to any receiving bodies of water, which are listed for water quality impairment on the most recent 303(d)-list for Region 5. The storm water percolates to the ground water or enters the storm drain system and is not considered direct discharges into a U.S. body of water, as defined by the State Water Board. Existing site topography, drainage patterns, and storm water conveyance systems are shown on the topographic survey in the construction documents.

4.1.4 Geology and Groundwater

The site is underlain with alluvium deposits of medium dense to dense silty sand/sandy silt with trace clay, medium dense to very dense silty sand. The sand is mixed with different percentages of clay, stiff clayey silt, dense silty sand/sand and sand. Groundwater has historically occurred at a depth of 10 ft., however, the groundwater was reached at 29 ft. below surface, per the geotechnical report in Appendix A.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

4.1.5 Project Description

The project is proposing to construct a commercial lot with two gas stations, a convenient store, three fast food restaurants, and a carwash. Project grading will occur on approximately 6.3 acres. The limits of grading and this SWPPP are shown on Figure 2 in Appendix B. Grading will include both cut and fill activities. Top soils will be temporarily stockpiled on-site for reuse in planter areas. Unsuitable and/or excess topsoil will be hauled off-site. Soil will be stockpiled on-site as shown on Figure 2 in Appendix B. The cut and fill values are determined on the approved grading plans. Construction activities will not be phased.

4.1.6 Developed Condition

The normal annual rainfall at the site is approximately 14 inches, as determined from the Precipitation Map 1900-1960 developed by the State of California and the Department of Forestry and Fire Protection in 2000.

Post construction surface drainage will be directed to the pervious pavers and bioretention basins throughout the property. From there the storm water will be filtrated and be piped to an existing storm drain pipeline along Cactus Avenue.

Post construction drainage patterns and conveyance systems are presented on Figure 2 in Appendix B.

The project will convert approximate 6.3 acres of undeveloped land to a proposed commercial area with impervious hardscape features. The increase in imperviousness of the site will increase the Average Annual Runoff volume from the site by 1.10 acre-feet. This information is presented in Table 4.1.

Table 4.1 Construction Site Estimates

Project Status	Runoff Coefficient	Site Area (acres)	Average Annual Rainfall (inches)	Average Annual Runoff (acre-feet)
Pre-Construction	0.71	6.3	14	5.44
Post-Construction	0.89	6.3	14	6.54

4.2 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account while preparing this SWPPP

- Regional Water Board requirements

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

4.3 STORM WATER RUN-ON FROM OFFSITE AREAS

There is no anticipated offsite run-on to this construction site because of existing curb and gutter along the perimeter of the site. Adjacent parcels are vacant and any storm water that may runoff to the site would percolate into the ground before entering the proposed project site.

4.4 CONSTRUCTION SITE SEDIMENT AND RECEIVING WATER RISK DETERMINATION

A construction site risk assessment has been performed for the project and the resultant risk level is Risk Level 1.

The risk level was determined though the use of the R, K, and LS values provided on the website: https://smarts.waterboards.ca.gov/. The risk level is based on project duration, location, proximity to impaired receiving waters and soil conditions. A copy of the Risk Level determination submitted on SMARTS with the PRDs is included in Appendix A.

Table 4.2 and Table 4.3 summarize the sediment and receiving water risk factors and document the sources of information used to derive the factors.

Table 4.2 Summary of Sediment Risk

RUSLE Factor	Value	Method for establishing value
R	35.55	US Environmental Protection Agency's Rainfall Erosivity Factor Calculator (U.S. Environmental Protection Agency, 2009)
K	0.24	U.S. Environmental Protection Agency's EMAP Risk Categories
LS	0.28	U.S. Environmental Protection Agency's EMAP Risk Categories
Total Predicted Sediment Loss (tons/acre)		**2.39**
Overall Sediment Risk Low Sediment Risk < 15 tons/ acre Medium Sediment Risk >= 15 and < 75 tons/acre High Sediment Risk >= 75 tons/acre		☒ **Low** ☐ **Medium** ☐ **High**

Runoff from the project site discharges into an existing public storm drainage system along the southern portion of the property.

Table 4.3 Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant[1]	TMDL for Sediment Related Pollutant[1]	Beneficial Uses of COLD, SPAWN, and MIGRATORY[1]
Canyon Lake	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Elsinore Lake	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No
Overall Receiving Water Risk			☒ **Low** ☐ **High**

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 4.3 Summary of Receiving Water Risk

Receiving Water Name	303(d) Listed for Sediment Related Pollutant(1)	TMDL for Sediment Related Pollutant(1)	Beneficial Uses of COLD, SPAWN, and MIGRATORY(1)
(1) If yes is selected for any option the Receiving Water Risk is High			

Since the Site Sediment Risk Factor is Low and the Receiving Water Risk Factor is Low, the Combined Risk Determination Worksheet calculates that the site is a **Risk Level 1**.

Risk Level 1 sites are subject to the narrative effluent limitations specified in the General Permit. The narrative effluent limitations require storm water discharges associated with construction activity to minimize or prevent pollutants in storm water and authorized non-storm water through the use of controls, structures, and best management practices. This SWPPP has been prepared to address Risk Level 1 requirements (General Permit Attachment C, see Appendix K).

4.5 CONSTRUCTION SCHEDULE

The site sediment risk was determined based on construction taking place between April 1, 2017 and March 31, 2018. If modification or extension of the schedule (start and end dates) is required, the LRP and/or QSP shall contact the QSD to update the Risk Determination, file the Change of Information on SMARTS, and any update any other required components of the SWPPP. The estimated schedule for planned work can be found in Appendix I.

4.6 POTENTIAL CONSTRUCTION ACTIVITY AND POLLUTANT SOURCES

Appendix G includes a list of construction activities and associated materials that are anticipated to be used onsite. These activities and associated materials will or could potentially contribute pollutants, other than sediment, to storm water runoff.

The anticipated activities and associated pollutants of the project were considered in the selection of the Best Management Practices in Section 5. Location of anticipated pollutants and associated BMPs are shown on the Site Map in Appendix B.

For sampling requirements for non-visible pollutants associated with construction activity please refer to Section 9.7.1. For a full and complete list of onsite pollutants, refer to the Material Safety Data Sheets (MSDS) retained at the on-site construction trailer.

4.7 IDENTIFICATION OF NON-STORM WATER DISCHARGES

Non-storm water discharges consist of discharges which do not originate from precipitation events. The General Permit provides allowances for specified non-storm water discharges that do not cause erosion or carry other pollutants.

Discharges of construction materials and wastes, such as fuel or paint, resulting from dumping, spills, or direct contact with rainwater or storm water runoff, are prohibited.

Non-storm water discharges into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP, or authorized under a separate NPDES permit, are prohibited.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Non-storm water discharges that are authorized from this project site include the following:

- None

The following discharge(s) have been authorized by (a) regional NPDES permit(s):

- None

Steps will be taken, including the implementation of appropriate BMPs, to ensure that unauthorized discharges are eliminated, controlled, disposed, or treated on-site.

4.8 REQUIRED SITE MAP INFORMATION

The construction project's Site Map(s) showing the project location, surface water boundaries, geographic features, construction site perimeter and general topography and other requirements identified in Attachment B of the General Permit is located in Appendix B. Table 4.4 identifies Map or Sheet Numbers where required elements are illustrated.

Table 4.4 Required Map Information

Included on Map/Plan Sheet No.	Required Element
Figure 1	The project's surrounding area (vicinity)
Figures 2 & 3	Site layout
Figures 2 & 3	Construction site boundaries
Figures 2 & 3	Drainage areas
Figures 2 & 3	Discharge locations
Figures 2 & 3	Sampling locations
Figures 2 & 3	Areas of soil disturbance (temporary and/or permanent)
Figures 3	Active areas of soil disturbance (cut and/or fill)
Figures 2 & 3	Locations of runoff BMPs
Figures 2 & 3	Locations of erosion control BMPs
Figures 2 & 3	Locations of sediment control BMPs
Figures 2 & 3	Locations of sensitive habitats, watercourses, or other features which are not to be disturbed (if applicable)
Figures 2 & 3	Locations of all post construction BMPs
Figures 2 & 3	Locations of storage areas for waste, vehicles, service, loading/unloading of materials, access (entrance/exits) points to construction site, fueling, and water storage, water transfer for dust control and compaction practices
Figures 2 & 3	Location of run-on BMPs
Figures 2 & 3	Location of spill kit and rain gauge

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Section 5 Best Management Practices

5.1 SCHEDULE FOR BMP IMPLEMENTATION

Table 5.1 BMP Implementation Schedule

	BMP	Implementation	Duration
Erosion Control	EC-1, Scheduling	Prior to Construction	Entirety of project
Sediment Control	SE-1, Silt Fence	Prior to Construction	Entirety of project
	SE-5, Fiber Rolls	During Construction	Entirety of project
	SE-7, Street weeping	During Construction	Weekly, entirety of project
	SE-10, Storm Drain Inlet Protection	Prior to Construction	Entirety of project
Tracking Control	TC-1, Stabilized Construction Entrance and Exit	Start of Construction	Entirety of project
Wind Erosion	WE-1, Wind Erosion Control	Start of Construction	Entirety of project

5.2 EROSION AND SEDIMENT CONTROL

Erosion and sediment controls are required by the General Permit to provide effective reduction or elimination of sediment related pollutants in storm water discharges and authorized non-storm water discharges from the Site. Applicable BMPs are identified in this section for erosion control, sediment control, tracking control, and wind erosion control.

5.2.1 Erosion Control

Erosion control, also referred to as soil stabilization, consists of source control measures that are designed to prevent soil particles from detaching and becoming transported in storm water runoff. Erosion control BMPs protect the soil surface by covering and/or binding soil particles.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

1. Preserve existing vegetation where required and when feasible.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

2. The area of soil disturbing operations shall be controlled such that the Contractor is able to implement erosion control BMPs quickly and effectively. Implement temporary erosion control measures at regular intervals throughout the defined rainy season to achieve and maintain the contract's disturbed soil area requirements. When the project's specifications require it, temporary erosion control will be implemented 20 days prior to the defined rainy season.
3. Stabilize non-active areas within 14 days of cessation of construction activities or sooner if stipulated by local requirements.
4. Control erosion in concentrated flow paths by applying erosion control blankets, check dams, erosion control seeding or alternate methods.
5. Prior to the completion of construction, apply permanent erosion control to remaining disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP.

The following temporary erosion control BMP selection table indicates the BMPs that shall be implemented to control erosion on the construction site. Fact Sheets for temporary erosion control BMPs are provided in Appendix H. The Site Map in Appendix B will prevail over narrative in the body of the SWPPP and guidance in the BMP Fact Sheets in Appendix H. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 5.2 Temporary Erosion Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP Used		If not used, state reason
			YES	NO	
EC-1	Scheduling	✓	✓		
EC-2	Preservation of Existing Vegetation	✓		✓	Not needed
EC-3	Hydraulic Mulch	✓[2]		✓	Not needed
EC-4	Hydroseed	✓[2]		✓	Not needed
EC-5	Soil Binders	✓[2]		✓	Not needed
EC-6	Straw Mulch	✓[2]		✓	Not needed
EC-7	Geotextiles and Mats	✓[2]		✓	Not needed
EC-8	Wood Mulching	✓[2]		✓	Not needed
EC-9	Earth Dike and Drainage Swales	✓[3]		✓	Not needed
EC-10	Velocity Dissipation Devices			✓	Not needed
EC-11	Slope Drains			✓	Not needed
EC-12	Stream Bank Stabilization			✓	Not needed
EC-14	Compost Blankets	✓[2]		✓	Not needed
EC-15	Soil Preparation-Roughening			✓	Not needed
EC-16	Non-Vegetated Stabilization	✓[2]		✓	Not needed
WE-1	Wind Erosion Control	✓	✓		
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD.
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements.
[3] Run-on from offsite shall be directed away from all disturbed areas, diversion of offsite flows may require design/analysis by a licensed civil engineer and/or additional environmental permitting

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1.s
Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

5.2.2 Sediment Controls

Sediment controls are temporary or permanent structural measures that are intended to complement the selected erosion control measures and reduce sediment discharges from active construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water.

The following sediment control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary sediment control BMPs are provided in Appendix H. The Site Map in Appendix B will prevail over narrative in the body of the SWPPP and guidance in the BMP Fact Sheets in Appendix H. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 5.3 Temporary Sediment Control BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
SE-1	Silt Fence	✓[2] [3]	✓		
SE-2	Sediment Basin			✓	Not needed
SE-3	Sediment Trap			✓	Not needed
SE-4	Check Dams			✓	Not needed
SE-5	Fiber Rolls	✓[2][3]	✓		
SE-6	Gravel Bag Berm	✓[3]		✓	As needed
SE-7	Street Sweeping	✓	✓		
SE-8	Sandbag Barrier			✓	Not needed
SE-9	Straw Bale Barrier			✓	Not needed
SE-10	Storm Drain Inlet Protection	✓ RL2&3	✓		
SE-11	ATS			✓	Not needed
SE-12	Temporary Silt Dike			✓	Not needed
SE-13	Compost Sock and Berm	✓[3]		✓	Not needed
SE-14	Biofilter Bags	✓[3]		✓	Not needed
TC-1	Stabilized Construction Entrance and Exit	✓	✓		
TC-2	Stabilized Construction Roadway			✓	Not needed
TC-3	Entrance Outlet Tire Wash			✓	Not needed
Alternate BMPs Used:					**If used, state reason:**

[1] Applicability to a specific project shall be determined by the QSD
[2] The QSD shall ensure implementation of one of the minimum measures listed or a combination thereof to achieve and maintain the Risk Level requirements
[3]Risk Level 2 &3 shall provide linear sediment control along toe of slope, face of slope, and at the grade breaks of exposed slope

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1.s
Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

5.3 NON-STORM WATER CONTROLS AND WASTE AND MATERIALS MANAGEMENT

5.3.1 Non-Storm water Controls

Non-storm water discharges into storm drainage systems or waterways, which are not authorized under the General Permit, are prohibited. Non-storm water discharges for which a separate NPDES permit is required by the local Regional Water Board are prohibited unless coverage under the separate NPDES permit has been obtained for the discharge. The selection of non-storm water BMPs is based on the list of construction activities with a potential for non-storm water discharges identified in Section 4.7 of this SWPPP.

The following non-storm water control BMP selection table indicates the BMPs that shall be implemented to control sediment on the construction site. Fact Sheets for temporary non-storm water control BMPs are provided in Appendix H. The Site Map in Appendix B will prevail over narrative in the body of the SWPPP and guidance in the BMP Fact Sheets in Appendix H. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 5.4 Temporary Non-Storm water BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
NS-1	Water Conservation Practices	✓	✓		
NS-2	Dewatering Operation			✓	Not needed
NS-3	Paving and Grinding Operation		✓		
NS-4	Temporary Stream Crossing			✓	Not needed
NS-5	Clear Water Diversion			✓	Not needed
NS-6	Illicit Connection- Illegal Discharge Connection	✓		✓	
NS-7	Potable Water Irrigation Discharge Detection			✓	
NS-8	Vehicle and Equipment Cleaning	✓	✓		
NS-9	Vehicle and Equipment Fueling	✓	✓		
NS-10	Vehicle and Equipment Maintenance	✓	✓		
NS-11	Pile Driving Operation			✓	Not needed
NS-12	Concrete Curing			✓	Not needed
NS-13	Concrete Finishing			✓	Not needed
NS-14	Material and Equipment Use Over Water			✓	Not needed
NS-15	Demolition Removal Adjacent to Water			✓	Not needed
NS-16	Temporary Batch Plants			✓	Not needed
Alternate BMPs Used:			**If used, state reason:**		

[1] Applicability to a specific project shall be determined by the QSD

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1.s

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5.3.2 Materials Management and Waste Management

Materials management control practices consist of implementing procedural and structural BMPs for handling, storing and using construction materials to prevent the release of those materials into storm water discharges. The amount and type of construction materials to be utilized at the Site will depend upon the type of construction and the length of the construction period. The materials may be used continuously, such as fuel for vehicles and equipment, or the materials may be used for a discrete period, such as soil binders for temporary stabilization.

Waste management consist of implementing procedural and structural BMPs for handling, storing and ensuring proper disposal of wastes to prevent the release of those wastes into storm water discharges. If applicable, waste management should be conducted in accordance with the Project's Construction Waste Management Plan.

Materials and waste management pollution control BMPs shall be implemented to minimize storm water contact with construction materials, wastes and service areas; and to prevent materials and wastes from being discharged off-site. The primary mechanisms for storm water contact that shall be addressed include:

- Direct contact with precipitation
- Contact with storm water run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the storm drain system through spills or dumping
- Extended contact with some materials and wastes, such as asphalt cold mix and treated wood products, which can leach pollutants into storm water.

A list of construction activities is provided in Appendix G. The following Materials and Waste Management BMP selection table indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. Fact Sheets for Materials and Waste Management BMPs are provided in Appendix H. The Site Map in Appendix B will prevail over narrative in the body of the SWPPP and guidance in the BMP Fact Sheets in Appendix H. The narrative in the body of the SWPPP prevails over guidance in the BMP Fact Sheets.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 5.5 Temporary Materials Management BMPs

CASQA Fact Sheet	BMP Name	Meets a Minimum Requirement[1]	BMP used		If not used, state reason
			YES	NO	
WM-01	Material Delivery and Storage	✓	✓		
WM-02	Material Use	✓	✓		
WM-03	Stockpile Management	✓	✓		
WM-04	Spill Preservation and Control	✓	✓		
WM-05	Solid Waste Management	✓	✓		
WM-06	Hazardous Waste Management	✓		✓	Not needed
WM-07	Contaminated Soil Management			✓	Not needed
WM-08	Concrete Waste Management	✓	✓		
WM-09	Sanitary-Septic Waste Management	✓	✓		
WM-10	Liquid Waste Management			✓	Not needed
Alternate BMPs Used:				**If used, state reason:**	

[1] Applicability to a specific project shall be determined by the QSD.

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5.4 POST CONSTRUCTION STORM WATER MANAGEMENT MEASURES

Post construction BMPs are permanent measures installed during construction, designed to reduce or eliminate pollutant discharges from the site after construction is completed.

This site is located in an area subject to a Phase I or Phase II Municipal Separate Storm Sewer System (MS4) permit approved Storm water Management Plan. ☒ Yes ☐ No

Post construction runoff reduction requirements have been satisfied through the MS4 program, this project is exempt from provision XIII A of the General Permit.

The following source control post construction BMPs to comply with General Permit Section XIII.B and local requirements have been identified for the site:

- Maintenance of (including removal and replacement of failed BMPs) the structural BMPs as set forth in Section 5 of this report and continuance of the non-structural BMP practices set forth therein.
- City streets will be maintained according to City of Moreno Valley standards by a contracted maintenance firm or by the City of Moreno Valley.
- Solid waste will be picked up on a regular weekly basis by the City of Moreno Valley Solid Waste Collectors. Trash will be placed in covered trash bins. Lids will be kept closed at all time except when trash is being deposited in the bin.
- Parking lots will be swept on regular basis.
- Parking lots will be inspected on a quarterly basis for oil leaks and drips.
- Employees will be educated to check their vehicles for oil drips and repair vehicles to stop dripping.
- Landscaping will be maintained by the Owner on a regular basis. Herbicides, pesticides, and fertilizers will be applied by trained employees and certified or under supervision or trained and certified employees at the application rates recommended by the product manufacturer.
- All landscaping material, chemical, and fertilizers will be stored indoors.
- All medical operations will be conducted indoors.
- Materials, equipment, and supplies will be delivered to the site in covered trucks that offload at the designated loading area and the materials, equipment, and supplies will be stored indoors.
- Routine building maintenance will not be conducted during rainfall events.
- Building maintenance activities will adhere to the BMPs set forth in this SWPPP.

The post construction BMPs that are described above shall be funded and maintained by the LRP.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Section 6 BMP Inspection and Maintenance

The General Permit requires routine weekly inspections of BMPs, along with inspections before, during, and after qualifying rain events. A BMP inspection checklist must be filled out for inspections and maintained on-site with the SWPPP. The inspection checklist includes the necessary information covered in Section 9.6. A blank inspection checklist can be found in CSMP Attachment 3"Example Forms". Completed checklists shall be kept in CSMP Attachment 2 "Monitoring Records.

BMPs shall be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions shall be implemented within 72 hours of identified deficiencies and associated amendments to the SWPPP shall be prepared by the QSD.

Specific details for maintenance, inspection, and repair of Construction Site BMPs can be found in the BMP Factsheets in Appendix H.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Section 7 Training

Section 9 identifies the QSP for the project. To promote storm water management awareness specific for this project, periodic training of job-site personnel shall be included as part of routine project meetings (e.g. daily/weekly tailgate safety meetings), or task specific trainings as needed.

The QSP shall be responsible for providing this information at the meetings, and subsequently completing the training logs shown in Appendix E, which identifies the site-specific storm water topics covered as well as the names of site personnel who attended the meeting. Tasks may be delegated to trained employees by the QSP provided adequate supervision and oversight is provided. Training shall correspond to the specific task delegated including: SWPPP implementation; BMP inspection and maintenance; and record keeping.

Documentation of training activities (formal and informal) is retained in SWPPP Appendix E. All training forms and documentation shall be retained in the onsite SWPPP binder and provided to the LRP for inclusion in the required Annual Report prior to September 1st of each year.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Section 8 Responsible Parties and Operators

8.1 RESPONSIBLE PARTIES

Legally Responsible Person (LRP)

Name: Ino Cruz

Title: Senior Project Manager

Company: J & T Management, Inc.

Address: 139 Radio Road, Corona, CA 92879

Phone: (951) 280-3833

Email: ino@jntmgmt.com

Qualified SWPPP Developer (QSD)

Name: Francisco V. Magos II

Title: Civil Department Manager, QSD

Certificate #: 00612

Company: SALEM Engineering Group, Inc.

Address: 11650 Mission Park Drive, Suite 108, Rancho Cucamonga, CA 91730

Phone: (909) 980-6455

Fax: (909) 660-3297

Email: francisco@salem.net

Contractor (if different than QSP)

Name: TBD

Title: TBD

Company: TBD

Address: TBD

Phone: TBD

Email: TBD

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Qualified SWPPP Practitioner (QSP)

Name: TBD

Title: TBD

Certificate #: TBD

Company: TBD

Address: TBD

Phone: TBD

Email: TBD

The QSP shall have primary responsibility and significant authority for the implementation, maintenance and inspection/monitoring of SWPPP requirements. The QSP will be available at all times throughout the duration of the project. Duties of the QSP include but are not limited to:

- Implementing all elements of the General Permit and SWPPP, including but not limited to:
  - Ensuring all BMPs are implemented, inspected, and properly maintained;
  - Performing non-storm water and storm water visual observations and inspections;
  - Performing non-storm water and storm sampling and analysis, as required;
  - Performing routine inspections and observations;
  - Implementing non-storm water management, and materials and waste management activities such as: monitoring discharges; general site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than storm water are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems; etc.;
- The QSP may delegate these inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.
- Ensuring elimination of unauthorized discharges.
- The QSPs shall be assigned authority by the LRP to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate with the Contractor(s) to assure all of the necessary corrections/repairs are made immediately and that the project complies with the SWPPP, the General Permit and approved plans at all times.
- Notifying the LRP or Authorized Signatory immediately of off-site discharges or other non-compliance events.

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CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)
AND
QUALIFIED SWPPP PRACTITIONER (QSP)

Francisco V. Magos II

Apr 24, 2015 - May 18, 2017

Certificate # 00612

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

California Stormwater Quality Association and
California Construction General Permit Training Team

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132

Section 9 Construction Site Monitoring Program

9.1 Purpose

This Construction Site Monitoring Program was developed to address the following objectives:

1. To demonstrate that the site is in compliance with the Discharge Prohibitions of the Construction General Permit;
2. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedance of water quality objectives;
3. To determine whether immediate corrective actions, additional Best Management Practices (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges;
4. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

9.2 Applicability of Permit Requirements

This project has been determined to be a Risk Level 1 project. The General Permit identifies the following types of monitoring as being applicable for a Risk Level 1 project.

- Visual inspections of Best Management Practices (BMPs);
- Visual monitoring of the site related to qualifying storm events;
- Visual monitoring of the site for non-storm water discharges;
- Sampling and analysis of construction site runoff for non-visible pollutants when applicable; and
- Sampling and analysis of construction site runoff as required by the Regional Water Board when applicable.

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

9.3. Weather and Rain Event Tracking

Visual monitoring and inspection requirements of the General Permit are triggered by a qualifying rain event (QRE). The General Permit defines a qualifying rain event as any event that produces ½ inch of precipitation. A minimum of 48 hours of dry weather will be used to distinguish between separate qualifying storm events.

9.3.1 Weather Tracking

The QSP should consult daily the National Oceanographic and Atmospheric Administration (NOAA) for the weather forecasts. These forecasts can be obtained at http://www.srh.noaa.gov/.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Weather reports of QRE should be printed and maintained within the SWPPP CSMP Attachment 1 “Weather Reports”.

Alternative methods and resources for determining the probability of precipitation must be approved by the QSD.

9.3.2 Rain Gauges

The Contractor shall install one rain gauge at the job site trailer on the project site. Locate the gauge in an open area away from obstructions such as trees or overhangs. Mount the gauge on a post at a height of 3 to 5 feet with the gauge extending several inches beyond the post. Make sure that the top of the gauge is level. Make sure the post is not in an area where rainwater can indirectly splash from sheds, equipment, trailers, etc.

The rain gauge(s) shall be read daily during normal site scheduled hours. The rain gauge should be read at approximately the same time every day and the date and time of each reading recorded. Log rain gauge readings in CSMP Attachment 1 “Weather Records”. Follow the rain gauge instructions to obtain accurate measurements.

Once the rain gauge reading has been recorded, accumulated rain shall be emptied and the gauge reset. Automatic recording and self emptying rain gauges may be used.

For comparison with the site rain gauge, the nearest appropriate governmental rain gauge(s) can be queried at http://cdec.water.ca.gov/cgi-progs/mapper.

9.4 Monitoring Locations

Monitoring locations are shown on the Site Maps in Appendix B. Monitoring locations are described in the Sections 9.6 and 9.7.

Whenever changes in the construction site might affect the appropriateness of sampling locations, the sampling locations shall be revised accordingly. All such revisions shall be implemented as soon as feasible and the SWPPP amended by the QSD. Temporary changes that result in a one-time additional sampling location do not require a SWPPP amendment.

9.5 Sample Collection Safety, Monitoring, and Monitoring Exemptions

To maintain sample integrity and prevent cross-contamination, sampling collection personnel will:

- Wear a clean pair of surgical gloves prior to the collection and handling of each sample at each location.
- Not contaminate the inside of the sample bottle by not allowing it to come into contact with any material other than the water sample.
- Discard sample bottles or sample lids that have been dropped onto the ground prior to sample collection.
- Not leave the cooler lid open for an extended period of time once samples are placed inside.
- Not sample near a running vehicle where exhaust fumes may impact the sample.

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- Not touch the exposed end of a sampling tube, if applicable.
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles
- Not eat, smoke, or drink during sample collection.
- Not sneeze or cough in the direction of an open sample bottle.
- Minimize the exposure of the samples to direct sunlight, as sunlight may cause biochemical transformation of the sample to take place.
- Decontaminate sampling equipment prior to sample collection using a TSP-soapy water wash, distilled water rinse, and final rinse with distilled water.
- Dispose of decontamination water/soaps appropriately; i.e., not discharge to the storm drain system or receiving water.

This project is not required to collect samples or conduct visual observations (inspections) under the following conditions:

- During dangerous weather conditions such as flooding and electrical storms.
- Outside of scheduled site business hours.

Scheduled site business hours are: 8am – 5pm, Monday – Friday.

If monitoring (visual monitoring or sample collection) of the site is unsafe because of the dangerous conditions noted above then the QSP shall document the conditions for why an exception to performing the monitoring was necessary. The exemption documentation shall be filed in CSMP Attachment 2 "Monitoring Records".

9.6 Visual Monitoring

Visual monitoring includes observations and inspections. Inspections of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Visual observations of the site are required to observe storm water drainage areas and to identify any spills, leaks, or uncontrolled pollutant sources.

Table 9.1 identifies the required frequency of visual observations and inspections. Inspections and observations will be conducted at the locations identified in Section 9.6.5.

Table 9.1 Summary of Visual Monitoring and Inspections

Type of Inspection	Frequency	Maintenance
Routine Inspections		
BMP Inspections		
EC-1 Scheduling	Daily/Weekly	Schedule activities to take advantage of weather conditions
EC-2 Preservation of Vegetation	Daily/Weekly	Visually ensure that existing vegetation if any is preserved.
EC-3 Hydro-Mulch	Daily/Weekly	Repair or replace any areas that have coverage compromised

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EC-4 Hydro-Seed	Daily/Weekly	Repair or replace any areas that have coverage compromised
EC-7 Geotextiles, Plastic Covers, & Erosion Control	Daily/Weekly	Repair or Replace torn plastic covers and blocked filter fabric
SE-1 Silt Fence	Daily/Weekly	If used, repair or replace as required to maintain
SE-2 De-Silting Basin	Daily/Weekly	If used, repair or replace as required (e.g. silt laden)
SE-4 Check Dams	Daily/Weekly	If used, repair or replace as required (e.g. silt laden)
SE-5 Fiber Rolls	Daily/Weekly	If used, repair or replace as required (e.g. silt laden)
SE-6 Gravel Bag Berm	Daily/Weekly	Replace if broken
SE-7 Street Sweeping and Vacuuming	Daily/Weekly	As needed to control tracking
SE-10 Inlet Protection	Daily/Weekly	Replace broken bags, ensure filter fabric is not clogged, clean any sediments that build up in front bags
WE-1 Wind Erosion Control	Daily/Weekly	As needed to control dust
TC-1 Stabilized Entrance/Exit	Daily/Weekly	If used, Clean as needed to ensure effective tracking control
NS-1 Water Conservation Practices	Daily/Weekly	Watch for wasted water, illegal street washing, equipment cleaning etc.
NS-3 Paving & Grinding Operations	Daily/Weekly	Ensure full containment of grindings and petro-chemical materials
NS-8 Vehicle & Equipment Cleaning	Daily/Weekly	Ensure adequate controls are in place
NS-9 Vehicle and Equipment Fueling	Daily/Weekly	Adequate control of refueling operations, no spills, if spill occurs, contain, clean and report
NS-10 Vehicle & Equipment Maintenance	Daily/Weekly	Ensure adequate controls are in place
NS-12 Concrete Curing	Daily/Weekly	Adequate control of curing processes, no spills of additives, curing agents
NS-13 Concrete Finishing	Daily/Weekly	Adequate control of concrete dust
WM-1 Material Delivery and Storage	Daily/Weekly	Keep all materials off the ground and covered during a rain event
WM-2 Material Use	Daily/Weekly	Keep all materials off the ground and covered during a rain event
WM-3 Stockpile Management	Daily/Weekly	Ensure stockpiles are controlled for dust and covered and protected using sediment and run-on diversion BMPs during a rain event
WM-4 Spill Prevention and Control	Daily/Weekly	Inspect for adequate containment and coverage, safe handling
WM-5 Solid Waste Management	Daily/Weekly	Ensure bins are: emptied regularly, covered during wind and rain events, used properly
WM-8 Concrete Waste Management	Daily/Weekly	Ensure adequate capacity (R&R @75%), location 50'+ from any inlets, no leakage, covered during a rain event
WM-9 Sanitary/Septic Waste Management	Daily/Weekly	Ensure regular maintenance, and adequate secondary containment controls
Non-Storm water Discharge Observations	Quarterly during daylight hours	

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Rain Event Triggered Inspections		
Site Inspections Prior to a QRE	Within 48 hours of a QRE [1]	
BMP Inspections During an Extended Storm Event	Every 24-hour period of a extended storm event [1]	
Site Inspections Following a QRE	Within 48 hours of a QRE [1]	
[1] Inspections are only required during scheduled site operating hours. Note however, these inspections are required daily regardless of the amount of precipitation.		

9.6.1 Routine Observations and Inspections

Routine site inspections and visual monitoring are necessary to ensure that the project is in compliance with the requirements of the Construction General Permit.

9.6.1.1 Routine BMP Inspections

Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

9.6.1.2 Non-Storm water Discharge Observations

Each drainage area will be inspected for the presence of or indications of prior unauthorized and authorized non-storm water discharges. Inspections will record:

- Presence or evidence of any non-storm water discharge (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

9.6.2 Rain-Event Triggered Observations and Inspections

Visual observations of the site and inspections of BMPs are required prior to a qualifying rain event (QRE); following a QRE, and every 24-hour period during a QRE. Pre-rain inspections will be conducted after consulting NOAA and determining that a precipitation event with a 50% or greater probability of precipitation has been predicted.

9.6.2.1 Visual Observations Prior to a Forecasted Qualifying Rain Event (QRE)

Within 48-hours prior to a QRE, a storm water visual monitoring site inspection will observe the following locations:

- Storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;

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- BMPs to identify if they have been properly implemented;
- Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

Consistent with guidance from the State Water Resources Control Board, pre-rain BMP inspections and visual monitoring will be triggered by a NOAA forecast that indicates a probability of precipitation of 50% or more in the project area.

9.6.2.2 BMP Inspections During an Extended Storm Event

During an extended rain event, BMP inspections will be conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

If the construction site is not accessible during the QRE, the visual inspections shall be performed at all relevant outfalls, discharge points, downstream locations. The inspections should record any projected maintenance activities.

9.6.2.2 Visual Observations Following a Qualifying Rain Event (QRE)

Within 48 hours following a QRE, a storm water visual monitoring site inspection will observe:

- Storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources;
- BMPs to identify if they have been properly designed, implemented, and effective;
- Need for additional BMPs;
- Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard; and
- Discharge of stored or contained rain water.

9.6.3 Visual Monitoring Procedures

Visual monitoring shall be conducted by the QSP or staff trained by and under the supervision of the QSP.

The name(s) and contact number(s) of the site visual monitoring personnel are listed below and their training qualifications are provided in Appendix K.

Assigned inspector: TBD Contact phone: TBD

Alternate inspector: TBD Contact phone: TBD

Storm water observations shall be documented on the *Visual Inspection Field Log Sheet* (see CSMP Attachment 3 “Example Forms”). BMP inspections shall be documented on the site specific BMP inspection checklist. Any photographs used to document observations will be referenced on storm water site inspection report. The completed reports will be kept in CSMP Attachment 2 “Monitoring Records”.

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9.6.4 Visual Monitoring Follow-Up and Reporting

Correction of deficiencies identified by the observations or inspections, including required repairs or maintenance of BMPs, shall be initiated and completed as soon as possible.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will be initiated within 72 hours of identification and be completed as soon as possible. When design changes to BMPs are required, the SWPPP shall be amended to reflect the changes.

Deficiencies identified in site inspection reports and correction of deficiencies will be tracked on the *Inspection Field Log Sheet* or *BMP Inspection Report* and shall be submitted to the QSP and shall be kept in CSMP Attachment 2 "Monitoring Records".

The QSP shall submit copies of the completed *Inspection Field Log Sheet* or *BMP Inspection Report* with the corrective actions to the QSD within 5 days of sampling (for field analyses) and within 30 days (for laboratory analyses) of the inspection.

Results of visual monitoring must be summarized and reported in the Annual Report.

9.6.5 Visual Monitoring Locations

The inspections and observations identified in Sections 9.6.1 and 9.6.2 will be conducted within the limits shown on the Site Map(s) in SWPPP Appendix B.

9.7 Water Quality Sampling and Analysis

9.7.1 Sampling and Analysis Plan for Non-Visible Pollutants in Storm water Runoff Discharges

The Sampling and Analysis Plan for Non-Visible Pollutants describes the sampling and analysis strategy and schedule for monitoring non-visible pollutants in storm water runoff discharges from the project site.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

The construction materials, wastes, or activities, as identified in Appendix G are potential sources of non-visible pollutants to storm water discharges from the project. Storage, use, and operational locations are shown on the Site Maps in Appendix B.

The following existing site features, as identified in Section 4.6, are potential sources of non-visible pollutants to storm water discharges from the project. Locations of existing site features contaminated with non-visible pollutants are shown on the Site Maps in Appendix B.

- None

The following soil amendments have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil and will be used on the project site. Locations of soil amendment application are shown on the Site Maps in Appendix B.

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- None

The project has the potential to receive storm water run-on from the following locations with the potential to contribute non-visible pollutants to storm water discharges from the project. Locations of such run-on to the project site are shown on the Site Maps in Appendix B.

- None

9.7.1.1 Sampling Schedule

Samples for the potential non-visible pollutant(s) and a sufficiently large unaffected background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during the site's scheduled hours and shall be collected regardless of the time of year and phase of the construction.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during site inspections conducted prior to or during a rain event.

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents storm water contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed, (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- During a construction activity, including but not limited to those in Section 2.6, there is a potential to contribute non-visible pollutants (1) during or within 24 hours prior to the rain event, (2) through BMPs that were observed to be breached, malfunctioning, or improperly implemented, or (3) by discharging non-visible pollutants to surface waters or a storm drain system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.
- Storm water runoff from an area contaminated by historical usage of the site has been observed to combine with storm water runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm drain system.

9.7.1.2 Sampling Locations

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, and personnel safety. Planned non-visible pollutant sampling locations shall be determined by construction activity and approved by the QSD. At a minimum, sampling locations shall be at all points of discharge shown on the Site Maps in Appendix B. Non-visible pollutant sampling locations shall be identified by the QSP on the pre-rain event inspection form and/or Rain Event Action Plan prior to a forecasted qualifying rain event.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.7.1.3 Monitoring Preparation

Non-visible pollutant samples will be collected by:

Contractor	☒ Yes	☐ No
Consultant	☐ Yes	☒ No
Laboratory	☐ Yes	☒ No

Samples on the project site will be collected by the following contractor sampling personnel:

Assigned inspector: TBD Contact phone: TBD

Alternate inspector: TBD Contact phone: TBD

An adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the project site will include, but are not limited to, clean powder-free nitrile gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, and *Effluent Sampling Field Log Sheets* and Chain of Custody (CoC) forms, which are provided in CSMP Attachment 3 "Example Forms".

Samples on the project site will be collected by the following consultant/laboratory or other ELAP certified laboratory selected by the Contractor:

Laboratory Name: TBD

Contact Name: TBD

Address: TBD

Phone: TBD

ELAP Certificate #: TBD

The QSP or his/her designee will contact the consultant/laboratory 24 hours prior to a predicted rain event or for an unpredicted event, as soon as a rain event begins if one of the triggering conditions is identified during an inspection to ensure that adequate sample collection personnel and supplies for monitoring non-visible pollutants are available and will be mobilized to collect samples on the project site in accordance with the sampling schedule.

9.7.1.4 Analytical Constituents

Table 9.11 lists the specific sources and types of potential non-visible pollutants on the project site and the water quality indicator constituent(s) for that pollutant.

Table 9.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Common Non-Visible Pollutants and Water Quality Indicator Constituents Worksheet	
General Work Activity/Potential Pollutants	**Water Quality Indicators of Potential Constituents** (Review product literature and Material Safety Data Sheets to confirm potential constituents)
Adhesives	COD, Phenols, SVOCs
Asphalt Work	VOCs
Cleaning	
Acids	pH
Bleaches	Residual chlorine
TSP	Phosphate
Solvents	VOCs, SVOCs
Detergents	MBAS
Concrete / Masonry Work	
Sealant (Methyl methacrylate)	SVOC
Curing compounds	VOCs, SVOCs, pH
Ash, slag, sand	pH, Al, Ca, Va, Zn
Drywall	Cu, Al, General Minerals
Framing / Carpentry	
Treated Wood	Cu, Cr, As, Zn
Particle board	Formaldehyde
Untreated wood	BOD
Grading / Earthworks	
Gypsum / Lime amendments	pH
Contaminated Soil	Constituents specific to known contaminants, check with Laboratory
Heating, Ventilation, Air Conditioning	Freon
Insulation	Al, Zn
Landscaping	
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Fertilizers	TKN, NO_3, BOD, COD, DOC, Sulfate, NH_3, Phosphate, Potassium
Aluminum sulfate	Al, TDS, Sulfate

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 9.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Common Non-Visible Pollutants and Water Quality Indicator Constituents Worksheet	
General Work Activity/Potential Pollutants	**Water Quality Indicators of Potential Constituents** (Review product literature and Material Safety Data Sheets to confirm potential constituents)
Liquid Waste	Constituents specific to materials, check with Laboratory
Painting	
Resins	COD, SVOCs
Thinners	COD, VOCs
Paint strippers	VOCs, SVOCs, metals
Lacquers, varnishes, enamels	COD, VOCs, SVOCs
Sealants	COD
Adhesives	Phenols, SVOCs
Planting / Vegetation Management	
Vegetation stockpiles	BOD
Fertilizers	TKN, NO_3, BOD, COD, DOC, sulfate, NH_3, Phosphate, Potassium
Pesticides/Herbicides	Product dependent, see label and check with Laboratory
Plumbing	
Solder, flux, pipe fitting	Cu, Pb, Sn, Zn
Pools and Fountains	Residual chlorine, Cu, chloramines
Removal of existing structures	Zn, VOCs, PCBs (see also other applicable activity categories, e.g., grading, painting)
Roofing	Cu, Pb, VOCs
Sanitary Waste Sewer line breaks and Portable Toilets (using clear fluid – blue fluid is visible if discharged)	BOD, Total/Fecal coliform
Soil Preparation / Amendments/Dust Control	
Polymer/Co-polymers	TKN, NO_3, BOD, COD, DOC, Sulfate, Ni
Lignin sulfate	TDS, alkalinity
Psyllium	COD, TOC

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Table 9.11 Potential Non-Visible Pollutants and Water Quality Indicator Constituents

Common Non-Visible Pollutants and Water Quality Indicator Constituents Worksheet	
General Work Activity/Potential Pollutants	**Water Quality Indicators of Potential Constituents** (Review product literature and Material Safety Data Sheets to confirm potential constituents)
Guar/Plant Gums	COD, TOC, Ni
Solid Waste (leakage)	BOD
Utility Line Testing and Flushing	Residual chlorine, chloramines
Vehicle and Equipment Use	
Batteries	Sulfuric acid; Pb, pH

Adapted from *Attachment S, Caltrans SWPPP/WPCP Preparation Manual, February 2003*, and *CASQA Construction BMP Handbook*, 2003

9.7.1.5 Sample Collection

Samples of discharge shall be collected at the designated non-visible pollutant sampling locations determined by observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples shall be collected and preserved in accordance with the methods identified in the Table, "Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants" provided in Section 9.7.1.6. Only the QSP, or personnel trained in water quality sampling under the direction of the QSP, shall collect samples.

Sample collection and handling requirements are described in Section 9.7.7.

9.7.1.6 Sample Analysis

Samples shall be analyzed using the analytical methods identified in the Table 9.12. Samples will be analyzed by the following laboratory or another ELAP certified laboratory selected by the Contractor:

Laboratory Name: TBD

Contact Name: TBD

Address: TBD

Phone: TBD

ELAP Certificate #: TBD

Samples will be delivered, picked up by the laboratory courier, or shipped to the laboratory.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Table 9.12 Sample Collection, Preservation and Analysis for Monitoring Non-Visible Pollutants

Constituent	Analytical Method	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
Lead Sulfate, Battery Acid	EPA 150.1 ph / EPA 300 Sulfate	500 ml	500 ml+ Plastic Container	Ice / refrigeration	10 ph / 10 Sulfate	14 days
Lead from Vehicle Batteries	EPA 6010b Lead	500 ml	500 ml+ Plastic Container	Nitric Acid	5 ppb	14 days
Solvents, VOC / SVOC	EPA 601/602 or EPA 624 0r EPA 625	40 ml	3 VOA	HCL	Several	14 days
Curing Compounds, non pigmented	SM 2310B/2320, EPA 150.1, 601, 602, 624, 625	1000 ml	500 ml Plastic	Ice / HCL	Several	ph 24 hrs / 14 Days
Sealants, COD	EPA 410.4	500 ml	500 ml Poly	H2SO4	10 mg/l	28 days
Fertilizer, Nitrates	EPA 300.0	100 ml	500 ml Poly	Non-Req	0,10	48 hrs
Notes:						

Packet Pg. 808

1.s

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.7.1.7 Data Evaluation and Reporting

The ELAP certified lab shall complete an evaluation of the water quality sample analytical results.

Runoff/downgradient results shall be compared with the associated upgradient/unaffected results. Should the runoff/downgradient sample show an increased level of the tested analyte relative to the unaffected background sample, which cannot be explained by run-on results, the BMPs, site conditions, and surrounding influences shall be assessed to determine the probable cause for the increase.

As determined by the site and data evaluation, appropriate BMPs shall be repaired or modified to mitigate discharges of non-visible pollutant concentrations. Any revisions to the BMPs shall be recorded as an amendment to the SWPPP.

The General Permit prohibits the storm water discharges that contain hazardous substances equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4. The results of any non-storm water discharge results that indicate the presence of a hazardous substance in excess of established reportable quantities shall be immediately reported to the Regional Water Board and other agencies as required by 40 C.F.R. §§ 117.3 and 302.4.

Results of non-visible pollutant monitoring shall be reported in the Annual Report.

9.7.2 Sampling and Analysis Plan for pH and Turbidity in Storm water Runoff Discharges

Sampling and analysis of runoff for pH and turbidity is not required for Risk Level 1 projects.

9.7.3 Additional Monitoring Following an NEL Exceedance

This project is not subject to NELs because it is a Risk Level 1 project.

9.7.4 Sampling and Analysis Plan for Non-Storm water Discharges

This project is not subject to the non-storm water sampling and analysis requirements of the General Permit because it is a Risk Level 1 project.

9.7.5 Sampling and Analysis Plan for Other Pollutants Required by the Regional Water Board

The Regional Water Board has not specified monitoring for additional pollutants.

9.7.6 Training of Sampling Personnel

Sampling personnel shall be trained to collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring program (SWAMP) 2008 Quality Assurance Program Plan (QAPrP). Training records of designated contractor sampling personnel are provided in Appendix K.

Name: TBD Contact phone: TBD

Training: TBD

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9.7.7 Sample Collection and Handling

9.7.7.1 Sample Collection

Samples shall be collected at the designated sampling locations shown on the Site Maps and listed in the preceding sections. Samples shall be collected, maintained and shipped in accordance with the SWAMP 2008 Quality Assurance Program Plan (QAPrP).

Grab samples shall be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel shall follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sites;
- Decontaminate all equipment (e.g. bucket, tubing) prior to sample collection using a trisodium phosphate water wash, distilled water rinse, and final rinse with distilled water. (Dispose of wash and rinse water appropriately, i.e., do not discharge to storm drain or receiving water). Do not decontaminate laboratory provided sample containers;
- Do not smoke during sampling events;
- Never sample near a running vehicle;
- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

i. For small streams and flow paths, simply dip the bottle facing upstream until full.
ii. For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
iii. For larger streams that cannot be safely waded, pole-samplers may be needed to safely access the representative flow.
iv. Avoid collecting samples from ponded, sluggish or stagnant water.
v. Avoid collecting samples directly downstream from a bridge as the samples can be affected by the bridge structure or runoff from the road surface.

Note, that depending upon the specific analytical test, some containers may contain preservatives. These containers should **never** be dipped into the stream, but filled indirectly from the collection container.

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.7.7.2 Sample Handling

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Sealed containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the *Effluent Sampling Field Log Sheet*; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice, or refrigerated, from sample collection through delivery to the laboratory. Place samples to be shipped inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage and secure cooler lids with packaging tape.

Ship samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

Ship samples to the following laboratory or other ELAP certified laboratory selected by the Contractor:

Laboratory Name: TBD

Contact Name: TBD

Address: TBD

Phone: TBD

ELAP Certificate #: TBD

9.7.7.3 Sample Documentation Procedures

All original data documented on sample bottle identification labels, *Effluent Sampling Field Log Sheet*, and CoCs shall be recorded using waterproof ink. These shall be considered accountable documents. If an error is made on an accountable document, the individual shall make corrections by lining through the error and entering the correct information. The erroneous information shall not be obliterated. All corrections shall be initialed and dated.

Duplicate samples shall be identified consistent with the numbering system for other samples to prevent the laboratory from identifying duplicate samples. Duplicate samples shall be identified in the Effluent Sampling Field Log Sheet.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel shall attach an identification label to each sample bottle. Sample identification shall uniquely identify each sample location.

Field Log Sheets: Sampling personnel shall complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel shall complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the sample(s) is turned over to the testing laboratory or courier.

9.8 Quality Assurance and Quality Control

An effective Quality Assurance and Quality Control (QA/QC) plan shall be implemented as part of the CSMP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

9.8.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, sample container identification numbers, and types of samples that were collected. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH and turbidity should also be recorded in the field log. A Visual Inspection Field Log and an Effluent Sampling Field Log Sheet are included in CSMP Attachment 3 “Example Forms”.

9.8.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section 9.7.7, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

9.8.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and
- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in CSMP Attachment 3 “Example Forms”.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.8.4 QA/QC Samples

QA/QC samples provide an indication of the accuracy and precision of the sample collection; sample handling; field measurements; and analytical laboratory methods. The following types of QA/QC will be conducted for this project:

☒ Field Duplicates at a frequency of 10 percent or 1 duplicate minimum per sampling event (Required for all sampling plans with field measurements or laboratory analysis)

☐ Equipment Blanks at a frequency of
(Only needed if equipment used to collect samples could add the pollutants to sample)

☐ Field Blanks at a frequency of
(Only required if sampling method calls for field blanks)

☐ Travel Blanks at a frequency of
(Required for sampling plans that include VOC laboratory analysis)

9.8.4.1 Field Duplicates

Field duplicates provide verification of laboratory or field analysis and sample collection. Duplicate samples shall be collected, handled, and analyzed using the same protocols as primary samples. The sample location where field duplicates are collected shall be randomly selected from the discharge locations. Duplicate samples shall be collected immediately after the primary sample has been collected. Duplicate samples must be collected in the same manner and as close in time as possible to the original sample. Duplicate samples shall not influence any evaluations or conclusion.

9.8.4.2 Equipment Blanks

Equipment blanks provide verification that equipment has not introduced a pollutant into the sample. Equipment blanks are typically collected when:

- New equipment is used;
- Equipment that has been cleaned after use at a contaminated site;
- Equipment that is not dedicated for surface water sampling is used; or
- Whenever a new lot of filters is used when sampling metals.

9.8.4.3 Field Blanks

Field blanks assess potential sample contamination levels that occur during field sampling activities. De-ioninzed water field blanks are taken to the field, transferred to the appropriate container, and treated the same as the corresponding sample type during the course of a sampling event.

9.8.4.4 Travel Blanks

Travel blanks assess the potential for cross-contamination of volatile constituents between sample containers during shipment from the field to the laboratory. De-ioninzed water blanks are taken along for the trip and held unopened in the same cooler with the VOC samples.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.8.5 Data Verification

After results are received from the analytical laboratory, the QSP shall verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification shall include:

- Check the CoC and laboratory reports.
  Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
  Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. The QSP should especially note data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.
- Check laboratory QA/QC results.
  EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. The QSP shall evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and, accordingly, confirm results and re-analyze samples where appropriate.
  Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including inspections and observations must be verified as soon as the field logs are received, typically at the end of the sampling event. Field data verification shall include:

- Check field logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent;
  Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the field logs; and
- Review notations of any errors and actions taken to correct the equipment or recording errors.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

9.9 Records Retention

All records of storm water monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least three years from the Notice of Termination or longer if required by the Regional Water Board.

Results of visual monitoring, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records are to be kept onsite while construction is ongoing. Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Rain gauge readings from site inspections;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exemption records;
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections;

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

CSMP Attachment 1: Weather Reports

Place printed NOAA weather forecasts in this Attachment.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

CSMP Attachment 2: Monitoring Records

Place completed BMP Inspection Forms, Visual Monitoring, Effluent Sampling and Receiving Water Field Logs, and Monitoring Exceptions in this Attachment.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

CSMP Attachment 3: Example Forms

- *Rain Gauge Log Sheet*
- *Visual Inspection Field Log Sheet*
- *BMP Inspection Report*
- *NAL or NEL Exceedance Evaluation Summary Report*
- *Chain of Custody Forms*

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Rain Gauge Log Sheet				
Construction Site Name: Cactus Commerce				
Project Number/ID: 3-716-1096 (SALEM Project No.)				
Date (mm/dd/yy)	Time (24-hr)	Initials	Rainfall Depth (Inches)	Notes:

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Risk Level 1, 2, 3 ***Visual Inspection Field Log Sheet***						
Date and Time of Inspection:				Report Date:		
Inspection Type:	☐ Weekly	☐ Before predicted rain	☐ During QRE	☐ Following QRE	☐ Contained storm water release	☐ Quarterly non-storm water
Site Information						
Construction Site Name: Cactus Commerce						
Construction stage and completed activities:				Approximate area of exposed site:		
Weather and Observations						
Date Rain Predicted to Occur:				Predicted % chance of rain:		
Estimate storm beginning: _____ (date and time)		Estimate storm duration:_____ (hours)		Estimate time since last storm: _____ (days or hours)		Rain gauge reading: _____ (inches)
Observations: If yes identify location						
Odors	Yes ☐	No ☐				
Floating material	Yes ☐	No ☐				
Suspended Material	Yes ☐	No ☐				
Sheen	Yes ☐	No ☐				
Discolorations	Yes ☐	No ☐				
Turbidity	Yes ☐	No ☐				
Site Inspections						
Outfalls or BMPs Evaluated			**Deficiencies Noted**			
(add additional sheets or attached detailed BMP Inspection Checklists)						
Photos Taken:	Yes ☐	No ☐	Photo Reference IDs:			
Corrective Actions Identified (note if SWPPP/REAP change is needed)						
Inspector Information						
Inspector Name:				Inspector Title:		
Signature:				Date:		

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

BMP INSPECTION REPORT

Date and Time of Inspection:			Date Report Written:	
Inspection Type: (Circle one)	Weekly *Complete Parts I,II,III and VII*	Pre-Storm *Complete Parts I,II,III,IV and VII*	During Rain Event *Complete Parts I, II, III, V, and VII*	Post-Storm *Complete Parts I,II,III,VI and VII*

Part I. General Information

Site Information

Construction Site Name: Cactus Commerce			
Construction stage and completed activities:			Approximate area of site that is exposed:
Photos Taken: (Circle one)	Yes	No	Photo Reference IDs:

Weather

Estimate storm beginning: (date and time)	Estimate storm duration: (hours)
Estimate time since last storm: (days or hours)	Rain gauge reading and location: (in)
Is a "Qualifying Event" predicted or did one occur (i.e., 0.5" rain with 48-hrs or greater between events)? (Y/N) If yes, summarize forecast:	

Exemption Documentation (explanation required if inspection could not be conducted). Visual inspections are not required outside of business hours or during dangerous weather conditions such as flooding or electrical storms.

Inspector Information

Inspector Name:	Inspector Title:
Signature:	Date:

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Part II. BMP Observations. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level _____ Sites	Failures or other short comings (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Construction Materials			
Inventory of products (excluding materials designed to be outdoors)			
Stockpiled construction materials not actively in use are covered and bermed			
All chemicals are stored in watertight containers with appropriate secondary containment, or in a completely enclosed storage shed			
Construction materials are minimally exposed to precipitation			
BMPs preventing the off-site tracking of materials are implemented and properly effective			
Good Housekeeping for Waste Management			
Wash/rinse water and materials are prevented from being disposed into the storm drain system			
Portable toilets are contained to prevent discharges of waste			
Sanitation facilities are clean and with no apparent for leaks and spills			
Equipment is in place to cover waste disposal containers at the end of business day and during rain events			
Discharges from waste disposal containers are prevented from discharging to the storm drain system / receiving water			
Stockpiled waste material is securely protected from wind and rain if not actively in use			
Procedures are in place for addressing hazardous and non-hazardous spills			
Appropriate spill response personnel are assigned and trained			
Equipment and materials for cleanup of spills is available onsite			
Washout areas (e.g., concrete) are contained appropriately to prevent discharge or infiltration into the underlying soil			
Good Housekeeping for Vehicle Storage and Maintenance			
Measures are in place to prevent oil, grease, or fuel from leaking into the ground, storm drains, or surface waters			
All equipment or vehicles are fueled, maintained, and stored in a designated area with appropriate BMPs			
Vehicle and equipment leaks are cleaned immediately and disposed of properly			

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Part II. BMP Observations Continued. Describe deficiencies in Part III.			
Minimum BMPs for Risk Level _____ Sites	Adequately designed, implemented and effective (yes, no, N/A)	Action Required (yes/no)	Action Implemented (Date)
Good Housekeeping for Landscape Materials			
Stockpiled landscape materials such as mulches and topsoil are contained and covered when not actively in use			
Erodible landscape material has not been applied 2 days before a forecasted rain event or during an event			
Erodible landscape materials are applied at quantities and rates in accordance with manufacturer recommendations			
Bagged erodible landscape materials are stored on pallets and covered			
Good Housekeeping for Air Deposition of Site Materials			
Good housekeeping measures are implemented onsite to control the air deposition of site materials and from site operations			
Non-Storm water Management			
Non-Storm water discharges are properly controlled			
Vehicles are washed in a manner to prevent non-storm water discharges to surface waters or drainage systems			
Streets are cleaned in a manner to prevent unauthorized non-storm water discharges to surface waters or drainage systems.			
Erosion Controls			
Wind erosion controls are effectively implemented			
Effective soil cover is provided for disturbed areas inactive (i.e., not scheduled to be disturbed for 14 days) as well as finished slopes, open space, utility backfill, and completed lots			
The use of plastic materials is limited in cases when a more sustainable, environmentally friendly alternative exists.			
Sediment Controls			
Perimeter controls are established and effective at controlling erosion and sediment discharges from the site			
Entrances and exits are stabilized to control erosion and sediment discharges from the site			
Sediment basins are properly maintained			
Linear sediment control along toe of slope, face of slope an at			

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

grade breaks (Risk Level 2 & 3 Only)			
Limit construction activity to and from site to entrances and exits that employ effective controls to prevent offsite tracking			
Ensure all storm, drain inlets and perimeter controls, runoff control BMPs and pollutants controls at entrances and exits are maintained and protected from activities the reduce their effectiveness.			
Inspect all immediate access roads daily (Risk Level 2 & 3 Only)			
Run-On and Run-Off Controls			
Run-on to the site is effectively managed and directed away from all disturbed areas.			
Other			
Are the project SWPPP and BMP plan up to date, available on-site and being properly implemented?			

Part III. Descriptions of BMP Deficiencies		
Deficiency	**Repairs Implemented: Note - Repairs must begin within 72 hours of identification and, complete repairs as soon as possible.**	
	Start Date	**Action**
1.		
2.		
3.		
4.		

Part IV. Additional Pre-Storm Observations. Note the presence or absence of floating and suspended materials, sheen, discoloration, turbidity, odors, and source(s) of pollutants(s).	
	Yes, No, N/A
Do storm water storage and containment areas have adequate freeboard? If no, complete Part III.	
Are drainage areas free of spills, leaks, or uncontrolled pollutant sources? If no, complete Part VII and describe below.	
Notes:	

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Are storm water storage and containment areas free of leaks? If no, complete Parts III and/or VII and describe below.	
Notes:	

Part V. Additional During Storm Observations. **If BMPs cannot be inspected during inclement weather, list the results of visual inspections at all relevant outfalls, discharge points, and downstream locations. Note odors or visible sheen on the surface of discharges. Complete Part VII (Corrective Actions) as needed.**

Outfall, Discharge Point, or Other Downstream Location	
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description
Location	Description

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Part VI. Additional Post-Storm Observations. Visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event, and observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Complete Part VII (Corrective Actions) as needed.	
Discharge Location, Storage or Containment Area	**Visual Observation**

Part VII. Additional Corrective Actions Required. Identify additional corrective actions not included with BMP Deficiencies (Part III) above. Note if SWPPP change is required.	
Required Actions	**Implementation Date**

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

NAL or NEL Exceedance Evaluation Summary Report	Page __ of __
Project Name	*Cactus Commerce*
Project WDID	TBD
Project Location	*Moreno Valley, CA*
Date of Exceedance	
Type of Exceedance	**NAL Daily Average** ☐ **pH** ☐ **Turbidity** **NEL Daily Average** ☐ **pH** ☐ **Turbidity** ☐ **Other (specify) _____**
Measurement or Analytical Method	☐ **Field meter** **(Sensitivity: _____)** ☐ **Lab method (specify) _____** **(Reporting Limit: _____)** **(MDL: _____)**
Calculated Daily Average	☐ **pH _ pH units** ☐ **Turbidity __ NTU**
Rain Gauge Measurement	**_____ inches**
Compliance Storm Event	**_____ inches (5-year, 24-hour event)**
Visual Observations on Day of Exceedance	

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

NAL or NEL Exceedance Evaluation Summary Report	Page __ of __
Description of BMPs in Place at Time of Event	
Initial Assessment of Cause	
Corrective Actions Taken (deployed after exceedance)	
Additional Corrective Actions Proposed	
Report Completed By	_____ **(Print Name, Title)**
Signature	_____

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

CHAIN-OF-CUSTODY **DATE:** **Lab ID:**

DESTINATION LAB: ATTN: **ADDRESS:** **Office Phone:** **Cell Phone:**							REQUESTED ANALYSIS				Notes:
SAMPLED BY:											
Contact:											
Project Name: Cactus Commerce											
Client Sample ID	**Sample Date**	**Sample Time**	**Sample Matrix**	**Container #**	**Container Type**	**Container Pres.**					

SENDER COMMENTS:	**RELINQUISHED BY**	
	Signature:	
	Print:	
	Company:	
	Date:	TIME:
LABORATORY COMMENTS:	**RECEIVED BY**	
	Signature:	
	Print:	
	Company:	
	Date:	TIME:

Section 10 References

1. Project Plans and Specifications Titled Grading Plans Cactus Commerce – Moreno Valley dated November 11, 2016], prepared by SALEM Engineering Group, Inc.
2. State Water Resources Control Board (2010). Order 2009-0009-DWQ as amended by 2010-0014-DWQ, NPDES General Permit No. CAS000002: National Pollutant Discharges Elimination System (NPDES) California General Permit for Storm Water Discharge Associated with Construction and Land Disturbing Activities. Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/storm water/construction.shtml.
3. CASQA 2009, *Storm water BMP Handbook Portal: Construction*, November 2009, www.casqa.org
4. Geotechnical Engineering Investigation Report No. 3-215-1091 prepared by SALEM Engineering Group, Inc dated November 25, 2015.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix A: Calculations

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Facility Information

- Start Date: 04/01/2017
- End Date: 03/31/2018
- Latitude: 33.9104
- Longitude: -117.2741

Erosivity Index Calculator Results

An erosivity index value Of **35.55** has been determined for the construction period of **04/01/2017** - **03/31/2018**.

A rainfall erosivity factor of 5.0 or greater has been calculated for your site and period of construction. **You do NOT qualify for a waiver from NPDES permitting requirements**.

Start Over

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

K FACTOR	SCALE: NTS	DATE: OCT. 2016	SALEM engineering group, inc.
CACTUS COMMERCE NEC CACTUS AVE & COMMERCE CENTER MORENO VALLEY, CA 92553	DRAWN BY: LCD	APPROVED BY: FVM	
	PROJECT NO. 03-716-1096	FIGURE NO. 1	

LS FACTOR	SCALE: NTS	DATE: OCT. 2016
CACTUS COMMERCE NEC CACTUS AVE & COMMERCE CENTER MORENO VALLEY, CA 92553	DRAWN BY: LCD	APPROVED BY: FVM
	PROJECT NO. 03-716-1096	FIGURE NO. 1

SALEM
engineering group, inc.

	A	B	C
1	**Sediment Risk Factor Worksheet**		**Entry**
2	**A) R Factor**		
3	Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30) (Wischmeier and Smith, 1958). The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R values calculated for more than 1000 locations in the Western U.S. Refer to the link below to determine the R factor for the project site.		
4	http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm		
5	**R Factor Value**		35.55
6	**B) K Factor (weighted average, by area, for all site soils)**		
7	The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. Fine-textured soils that are high in clay have low K values (about 0.05 to 0.15) because the particles are resistant to detachment. Coarse-textured soils, such as sandy soils, also have low K values (about 0.05 to 0.2) because of high infiltration resulting in low runoff even though these particles are easily detached. Medium-textured soils, such as a silt loam, have moderate K values (about 0.25 to 0.45) because they are moderately susceptible to particle detachment and they produce runoff at moderate rates. Soils having a high silt content are especially susceptible to erosion and have high K values, which can exceed 0.45 and can be as large as 0.65. Silt-size particles are easily detached and tend to crust, producing high rates and large volumes of runoff. Use Site-specific data must be submitted.		
8	Site-specific K factor guidance		
9	**K Factor Value**		0.24
10	**C) LS Factor (weighted average, by area, for all slopes)**		
11	The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. Use the LS table located in separate tab of this spreadsheet to determine LS factors. Estimate the weighted LS for the site prior to construction.		
12	LS Table		
13	**LS Factor Value**		0.28
14			
15	**Watershed Erosion Estimate (=RxKxLS) in tons/acre**		2.38896
16	**Site Sediment Risk Factor**		**Low**
17	Low Sediment Risk: < 15 tons/acre		
18	Medium Sediment Risk: >=15 and <75 tons/acre		
19	High Sediment Risk: >= 75 tons/acre		
20			

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Receiving Water (RW) Risk Factor Worksheet	Entry	Score
A. Watershed Characteristics	**yes/no**	
A.1. Does the disturbed area discharge (either directly or indirectly) to a **303(d)-listed waterbody impaired by sediment** (For help with impaired waterbodies please visit the link below) or has a **USEPA approved TMDL implementation plan for sediment**?: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml **OR** A.2. Does the disturbed area discharge to a waterbody with designated beneficial uses of SPAWN & COLD & MIGRATORY? (For help please review the appropriate Regional Board Basin Plan) http://www.waterboards.ca.gov/waterboards_map.shtml	**no**	**Low**

Region 1 Basin Plan

Region 2 Basin Plan

Region 3 Basin Plan

Region 4 Basin Plan

Region 5 Basin Plan

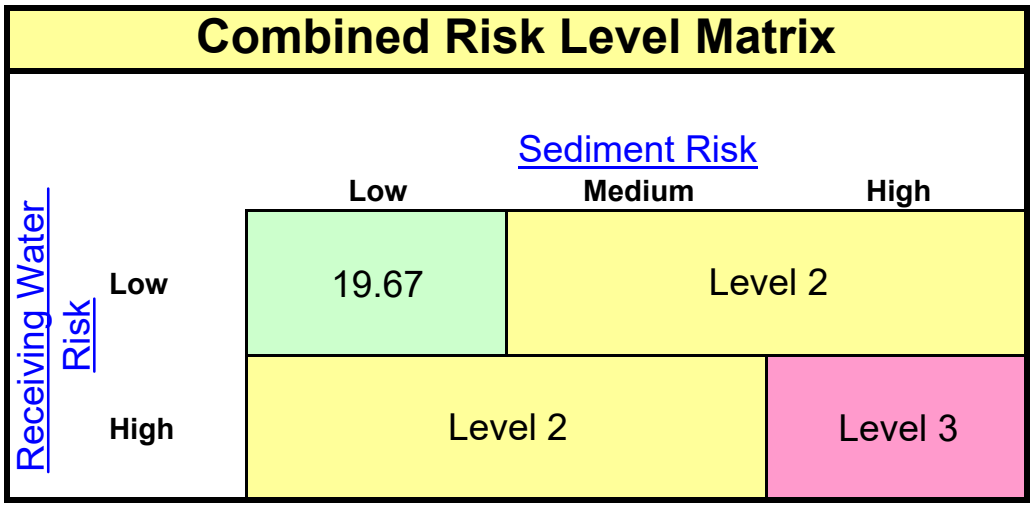
Region 6 Basin Plan

Region 7 Basin Plan

Region 8 Basin Plan

Region 9 Basin Plan

Combined Risk Level Matrix



Project Sediment Risk: Low

Project RW Risk: Low

Project Combined Risk: Level 1

Appendix B: Site Maps

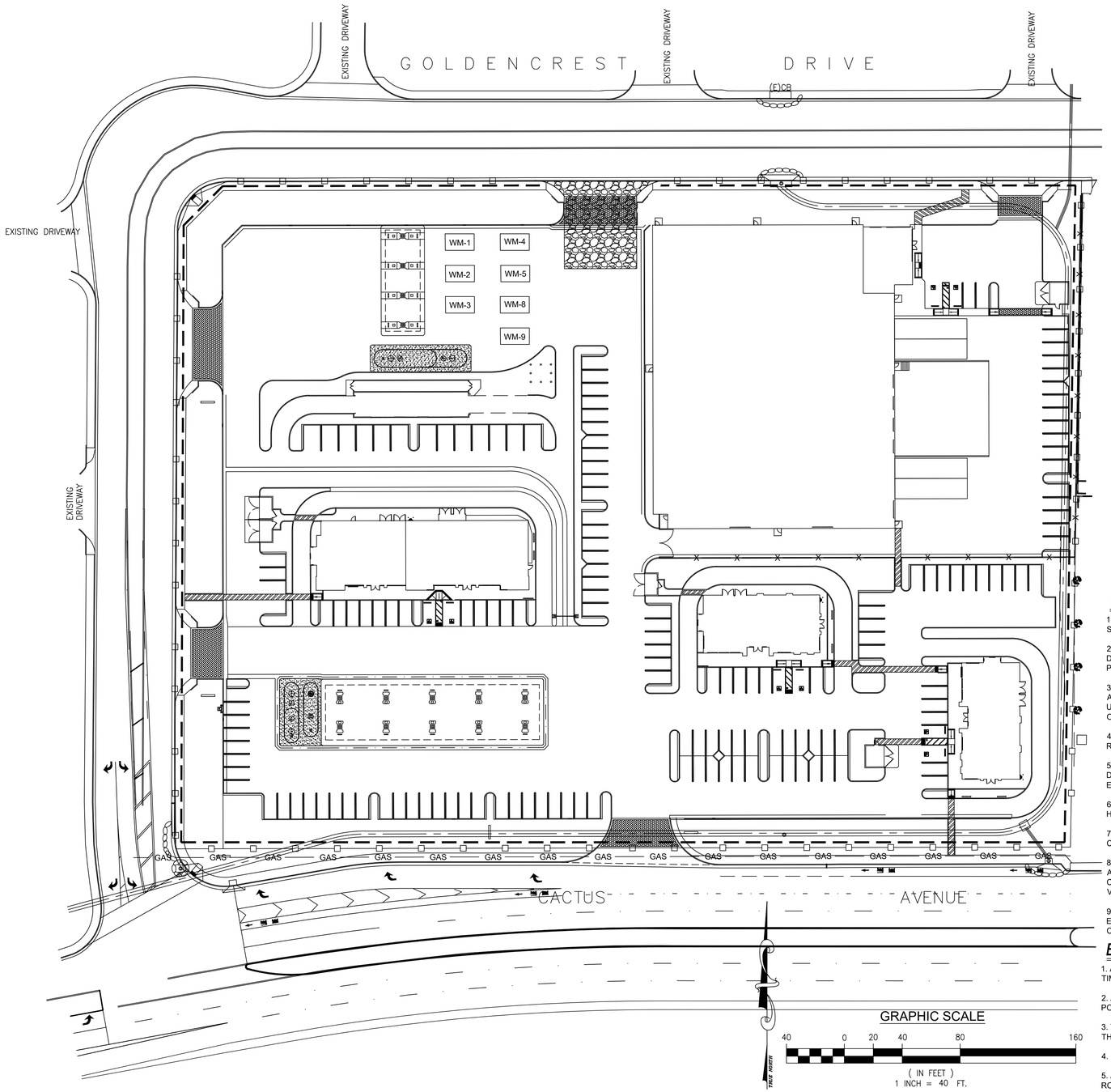
Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

VICINITY MAP	SCALE: NTS	DATE: OCT. 2016
CACTUS COMMERCE NEC COMMERCE CTR DR & CACTUS AVE MORENO VALLEY, CA 92553	DRAWN BY: TB	APPROVED BY: FVM
	PROJECT NO. 03-716-1096	FIGURE NO. 1A

SALEM
engineering group, inc.

LOCATION MAP	SCALE: NTS	DATE: OCT. 2016
CACTUS COMMERCE NEC COMMERCE CTR DR & CACTUS AVE MORENO VALLEY, CA 92553	DRAWN BY: TB	APPROVED BY: FVM
	PROJECT NO. 03-716-1096	FIGURE NO. 1B

SALEM
engineering group, inc.



SEQUENCE OF CONSTRUCTION

1. INSTALL STABILIZED CONSTRUCTION ENTRANCES AND PERIMETER CONTROLS.
2. REVEGETATE PERIMETER SLOPES AND AREAS NOT WITHIN THE CONSTRUCTION AREA.
3. INSTALL UNDERGROUND UTILITIES INCLUDING WATER, SEWER, AND STORM DRAIN.
4. PROVIDE INLET BLOCKING OR FILTERING AT EACH INLET PRIOR TO CONNECTION TO PUBLIC SYSTEM.
5. INSTALL CURB AND GUTTER.
6. GRAVEL BAG ROADS PER THE DETAILS PROVIDED.
7. PROVIDE PERIMETER CONTROLS AROUND LOTS, AS NEEDED.
8. BEGIN BUILDING AND DRIVEWAY CONSTRUCTION PER THE PLOT PLANS.
9. BEGIN REMOVING SEDIMENT CONTROLS ALONG THE PERIMETER AND IN THE STREETS AS CONTRIBUTORY AREAS BECOME STABILIZED OR MANAGED THROUGH REVEGETATION OR SEDIMENT CONTROLS.
10. BEGIN FINAL LANDSCAPING.
11. REMOVE REMAINING TEMPORARY SEDIMENT AND EROSION CONTROLS AS REMAINING AREAS BECOME STABILIZED AND BEGIN THE POST-CONSTRUCTION MAINTENANCE PLAN.

NOTES

CONSTRUCTION SITE ENTRANCE SHALL BE PER CALIFORNIA STORMWATER BMP HANDBOOK, STANDARD TC-1 (www.cabmphandbooks.com), MODIFIED AS FOLLOWS:

METAL SHAKER PLATES WILL BE REQUIRED AT ALL LOCATIONS UNLESS SPECIFICALLY WAIVED BY THE ENGINEERING INSPECTOR DUE TO SITE CONSTRAINTS.
THE ROCK SIZE SHALL BE 2" MINUS.
A FENCE, BARRICADE OR OTHER DEVICE APPROVED BY THE ENGINEERING INSPECTOR SHALL BE USED TO RESTRICT CONSTRUCTION TRAFFIC TO THE CONSTRUCTION ENTRANCE.

LEGEND

DESCRIPTION	QUANTITY	SYMBOL
STABILIZED CONSTRUCTION ENTRANCE/EXIT (TC-1)	290 SF	
FIBER ROLLS	2,033 LF	
SILT FENCE	2,057 LF	
PROPOSED ON-SITE STORM DRAINS (PVT)		
STORM DRAIN INLET PROTECTION	5 EA	
MATERIAL DELIVERY & STORAGE AREA	1 EA	WM-1
MATERIAL USE	1 EA	WM-2
STOCKPILE MANAGEMENT	1 EA	WM-3
SPILL PREVENTION & CONTROL	1 EA	WM-4
SOLID WASTE MANAGEMENT	1 EA	WM-5
CONCRETE WASHOUT	1 EA	WM-8
SANITARY WASTE MANAGEMENT	1 EA	WM-9
WIND EROSION CONTROL (WE-1)	1 EA	
STREET SWEEPING (SE-7)	1 EA	
VEHICLE & EQUIPMENT CLEANING (NS-8)	1 EA	
VEHICLE & EQUIPMENT FUELING (NS-9)	1 EA	
VEHICLE & EQUIPMENT MAINTENANCE (NS-10)	1 EA	

EROSION CONTROL GRADING REQUIREMENTS

1. ALL EARTHWORK PERFORMED TO CONSTRUCT EROSION CONTROL MEASURES SHALL CONFORM TO CITY GRADING REGULATIONS.
2. YARDAGE SHOWN ON THE PLANS ARE APPROXIMATE ESTIMATES OF WORK TO BE DONE AND THE CONTRACTOR SHALL VERIFY FIELD CONDITIONS AND QUANTITIES PRIOR TO COMMENCING WORK.
3. THE CONTRACTOR SHALL MAKE PROVISION FOR CONTRIBUTORY DRAINAGE AT ALL TIMES
UNTIL WORK IS ACCEPTED BY THE CITY. THE EROSION CONTROL DEVICES SHOWN ON PLANS SHALL REMAIN IN OPERABLE CONDITION BY THE CONTRACTOR.
4. EXISTING STRUCTURES AND DEBRIS FOUND WITHIN WORK AREA SHALL BE REMOVED FROM SITE AND DISPOSED OF BY THE CONTRACTOR.
5. ROCK DISPOSAL AREAS ARE SHOWN ON PLANS. NO ROCK GREATER THAN 12" IN DIAMETER WILL BE PLACED IN THE FILL, UNLESS APPROVED BY THE SOILS ENGINEER.
6. FILL PLACED OVER EXISTING SLOPING TERRAIN SHALL BE SUPPORTED ON HORIZONTAL BENCH CUT INTO COMPETENT MATERIAL.
7. ANY MODIFICATIONS TO PLAN SHALL REQUIRE THE APPROVAL OF A REGISTERED CIVIL ENGINEER.
8. FILL SHALL BE COMPACTED TO 95 % OF MAXIMUM DENSITY AS DETERMINED BY A.S.T.M. SOIL
COMPACTION TEST D1557. ONE FIELD TEST TO BE MADE FOR EACH TWO FOOT OF VERTICAL LIFT.
9. THE SOIL ENGINEER SHALL PROVIDE SUFFICIENT INSPECTION OF EARTHWORK TO ENSURE
COMPLIANCE WITH THE APPROVED PLANS AND APPLICABLE CODES.

EROSION CONTROL MAINTENANCE AND INSPECTION

1. A STANDBY CREW FOR EMERGENCY WORK SHALL BE AVAILABLE DURING THE RAINY SEASON AT ALL TIMES. CONTACT THE CONTRACTOR AT (___) _____ IN CASE OF EMERGENCY.
2. ALL SILT AND DEBRIS SHALL BE REMOVED FROM ALL DEVICES WHENEVER SUCH MAY POSE A POTENTIAL HAZARD DOWNSTREAM.
3. THE PLACEMENT OF ADDITIONAL DEVICES TO REDUCE EROSION DAMAGE IS AT THE DISCRETION OF THE CITY INSPECTOR.
4. PLANTING AND IRRIGATION OF SLOPES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
5. A PREVENTIVE PROGRAM TO PROTECT SLOPES FROM POTENTIAL DAMAGE FROM BURROWING RODENTS IS REQUIRED. CONTRACTOR SHALL PERIOD/CALLY INSPECT SLOPES FOR EVIDENCE OF BURROWING RODENTS.

STORM WATER POLLUTION CONTROL REQUIREMENTS

1. ERODED SEDIMENTS AND OTHER POLLUTANTS SHALL BE RETAINED ON SITE AND SHALL NOT BE TRANSPORTED FROM THE SITE VIA SHEET FLOW, SWALES, AREA DRAINS, NATURAL DRAINAGE COURSES OR WIND.
2. STOCKPILES OF EARTH AND OTHER CONSTRUCTION RELATED MATERIALS SHALL BE PROTECTED.
3. FUELS, OILS, SOLVENTS, AND OTHER TOXIC MATERIALS SHALL BE STORED IN ACCORDANCE WITH THEIR LISTING AND ARE NOT TO CONTAMINATE THE SOIL, AND SURFACE WATERS ALL APPROVED STORAGE CONTAINERS ARE TO BE PROTECTED FROM THE WEATHER. SPILLS MUST BE CLEANED UP IMMEDIATELY AND DISPOSED OF IN A PROPER MANNER. SPILLS SHALL NOT BE WASHED INTO THE DRAINAGE SYSTEM.
4. EXCESS OR WASTE CONCRETE SHALL NOT BE WASHED INTO THE PUBLIC RIGHT-OF-WAY OR ANY OTHER DRAINAGE SYSTEM, PROVISIONS SHALL BE MADE TO RETAIN CONCRETE WASHES ON SITE UNTIL THEY CAN BE DISPOSED OF AS SOLID WASTE.
5. TRASH AND CONSTRUCTION RELATED SOLID WASTES SHALL BE DEPOSITED INTO A COVERED RECEPTACLE TO PREVENT CONTAMINATIONS OF RAINWATER AND DISPERSAL BY WIND.
6. SEDIMENTS AND OTHER MATERIALS SHALL NOT BE TRACKED FROM THE SITE BY VEHICLE TRAFFIC. THE CONSTRUCTION ENTRANCE ROADWAYS SHALL BE STABILIZED SO AS TO INHIBIT SEDIMENTS FROM BEING DEPOSITED INTO THE PUBLIC RIGHT-OF-WAY. ACCIDENTAL DEPOSITIONS SHALL BE SWEPT UP IMMEDIATELY AND SHALL NOT BE WASHED DOWN BY RAIN OR OTHER MEANS.
7. ANY SLOPES WITH DISTURBED SOILS OR DENUDED OF VEGETATION SHALL BE STABILIZED SO AS TO INHIBIT EROSION BY WIND AND WATER.
8. THE CASQA STORMWATER BMP HANDBOOK, LATEST REVISED EDITION, SHALL APPLY DURING CONSTRUCTION (ADDITIONAL MEASURES SHALL BE REQUIRED IF DEEMED APPROPRIATE BY THE CITY):

PA15-0032
PA16-0004

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

REVIEW BY CITY STAFF

OFFICE	INITIAL	DATE
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PRGM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:
MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #43526

APPROVED:
AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL
No. 73,227 Exp. 12/31/16

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:
FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2016)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

EROSION CONTROL

SHEET 1 OF 1
CITY ID No

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan))

Appendix C: Permit Registration Documents (PRDs)

Permit Registration Documents included in this Appendix

Y/N	Permit Registration Document
Y	Notice of Intent
Y	Copy of Annual Fee Receipt
Y	Certification
N	Risk Assessment, see Appendix A
N	Site Map, see Appendix B

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix D: Amendments and Changes to PRDs

Record all amendments in the Amendment Log in Section 2.2. Place all revisions, amendments, and certifications in this appendix.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix E: Training Reporting Form

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Trained Contractor Personnel Log

Storm water Management Training Log and Documentation

Project Name: Proposed Shopping Center - Hemet

Project Number/ID: 3-716-0698 (SALEM Project No.)

Storm water Management Topic: (check as appropriate)

- ☐ Erosion Control
- ☐ Sediment Control
- ☐ Wind Erosion Control
- ☐ Tracking Control
- ☐ Non-Storm water Management
- ☐ Waste Management and Materials Pollution Control
- ☐ Storm water Sampling
- ☐ Other _____

Specific Training Objective: _____

Location: _____ Date: _____

Instructor: _____ Telephone: _____

Course Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name	Company	Phone

As needed, add proof of external training (e.g., course completion certificates, credentials for QSP, QSD).

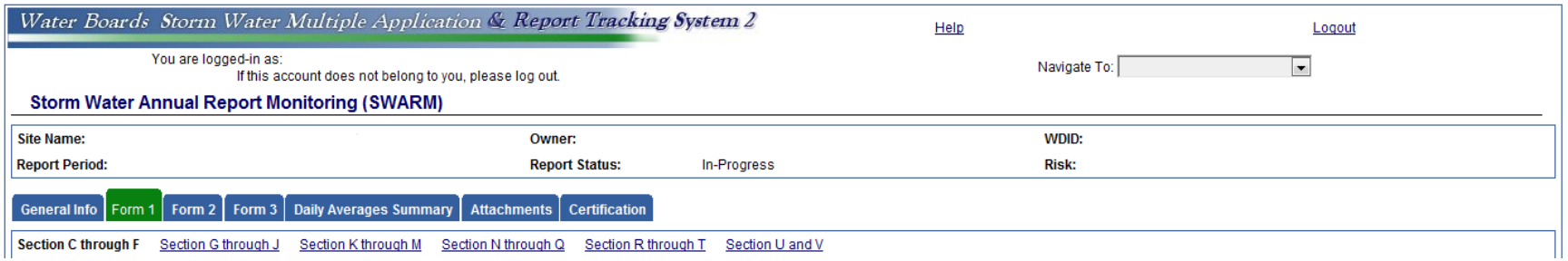
Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix F: Sample Annual Report Forms

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Sample Annual Report Form 1

Form 1 must be completed using the SMARTS website.



C. <u>Storm water Pollution Prevention Plan</u> (SWPPP) [CGP Section XIV]

a. Has a SWPPP been prepared by a Qualified SWPPP Developer (QSD) for the construction project?

☒ Yes ☐ No

If No, explain: _____

b. Does the SWPPP include a Construction Site Monitoring Program (CSMP) section/element?

☒ Yes ☐ No

If No, explain: _____

c. Are these documents kept onsite?

☐-Yes ☐-No

If No, explain: _____

D. <u>Good Site Management "Housekeeping"</u> [CGP Attachment C, Section B]

1. Were required good site management "housekeeping" measures for <u>construction materials</u> fully implemented onsite?

☐-Yes ☐-No

If No, explain: _____

a. Was an inventory of the products used and/or expected to be used conducted?

☐-Yes ☐-No

If No, explain: _____

2. Were required good site management "housekeeping" measures for waste management fully implemented onsite?

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

☐-Yes ☐-No

If No, explain: _____

a. Is there a spill response and implementation element of the SWPPP?

☐-Yes ☐-No

If No, explain: _____

3. Were required good site management "housekeeping" measures for vehicle storage and maintenance fully implemented onsite?

☐-Yes ☐-No

If No, explain: _____

4. Were required good site management "housekeeping" measures for landscape materials fully implemented onsite?

☐-Yes ☐-No

If No, explain: _____

5. Was a list of potential pollutant sources developed?

☐-Yes ☐-No

If No, explain: _____

6. Were good site management "housekeeping" measures to control air deposition of site material and from site operations implemented onsite?

☐-Yes ☐-No

If No, explain: _____

E. Non-Storm Water Management [CGP Attachment C, Section C]

1. Were measures to control all non-storm water discharges during construction implemented?

☐-Yes ☐-No

If No, explain: _____

2. Were vehicles washed in such a manner as to prevent non-storm water discharges to surface waters or to MS4 drainage systems?

☐-Yes ☐-No

If No, explain: _____

3. Were streets cleaned in such a manner as to prevent unauthorized non-storm water discharges from reaching surface waters or MS4 drainage systems?

☐-Yes ☐-No

If No, explain: _____

F. **Erosion Controls [CGP Attachment C, Section D]**

1. Were required erosion controls fully implemented on you site?
   ☐-Yes ☐-No
   If No, explain: _____

G. **Sediment Controls [CGP Attachment C, Section E]**

1. Were required sediment controls fully implemented on you site?
   ☐-Yes ☐-No
   If No, explain: _____

H. **Run-On and Run-Off Controls [CGP Attachment C, Section F]**

1. Was all site run-on and run-off effectively managed?
   ☐-Yes ☐-No
   If No, explain: _____

I. **Inspection, Maintenance and Repair [CGP Attachment C, Section G]**

1. Were all site inspections, maintenance, and repairs performed or supervised by a Qualified SWPPP Practitioner (QSP)?
   ☐-Yes ☐-No
   If No, explain: _____
2. Were site inspections conducted weekly and at least once each 24-hour period during extended storm events?
   ☐-Yes ☐-No
   If No, explain: _____
3. Were post rain event inspections conducted?
   ☐-Yes ☐-No
   If No, explain: _____
4. Do your inspection forms/checklists meet the minimum criteria listed in **CGP Attachment C, Section G.5**?
   ☐-Yes ☐-No
   If No, explain: _____
5. During any site inspection, were BMP inadequacies noticed?
   ☐-Yes ☐-No
   If yes, provide description if **Form 3**)
   If No, explain: _____

6. If BMP inadequacies were observed, did BMP repairs/replacement occur within 72 hours?
   ☐-Yes ☐-No
   If No, explain: _____

J. <u>Visual Monitoring</u> [CGP Attachment C, Section 1.3]

1. Were all storm water discharges that occurred at all discharge locations observed within 2 business days (48 hours) after each qualifying rain event (producing precipitation of ½ inch or more at the time of discharge?
   ☐-Yes ☐-No
   If No, explain: _____
   Were all storm water discharges that occurred from storage or containment systems visually observed prior to discharge?
   ☐-Yes ☐-No
   If No, explain: _____
2. Were all storm water discharges that occurred from storage or containment systems visually observed prior to discharge?
   ☐-Yes ☐-No
   If No, explain: _____
3. Were the time, date, and rain gauge reading recorded for each qualifying rain event?
   ☐-Yes ☐-No
   If No, explain: _____
4. Within 2 business days (48 hours) prior to each predicted qualifying rain event, were visual inspections conducted in compliance with **CGP Attachment C, Section 1.3.e & f?**
   ☐-Yes ☐-No
   If No, explain: _____
5. Are visual inspection records retained onsite?
   ☐-Yes ☐-No
   If No, explain: _____

K. <u>Non-Storm Water Discharge Monitoring</u> [CGP Attachment C, Section 1.6]

1. Were all drainage areas monitored for authorized/unauthorized non-storm water discharges quarterly? (Complete **Form 2)**
   ☐-Yes ☐-No
   If No, explain: _____
2. Did visual observations indicate any authorized/unauthorized non-storm discharges?
   ☐-Yes ☐-No If **No**, skip to next Section.
   If No, explain: _____

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

3. Were effluent samples taken of the authorized/unauthorized non-storm discharge? (Analytical data must be entered in the **RAY DATA** tab in SMARTS)
   ☐-Yes ☐-No If **No**, skip to next Section.
4. Were the effluent samples sent to a laboratory certified for such analyses by the State Department of Health Services?
   ☐-Yes ☐-No
   If No, explain:
5. Were unauthorized non-storm discharges eliminated?
   ☐-Yes ☐-No
   If No, explain: _____

L. <u>Non-Visible Pollutant Monitoring</u> [CGP Attachment C, Section 1.7]

1. Were any breaches, malfunctions, leakages, or spills observed during a visual inspection?
   ☐-Yes ☐-No If **No**, skip to next Section.
   If No, explain: _____
2. How many potential discharges of non-visible pollutants were identified? _____
3. For each discharge event (of non-visible pollutants), were samples collected in compliance with **CGP Attachment C, Section I.7.d**? (Analytical data must be entered in the **RAW DATA** tab in SMARTS)
   ☐-Yes ☐-No
   If No, explain: _____
4. For each discharge event was a comparison sample collected (uncontaminated ample that did not come into contact with the pollutant)? (Analytical data must be entered in the **RAW DATA** tab in SMARTS)
   ☐-Yes ☐-No
   If No, explain: _____

M. <u>Records</u> [CGP Attachment C, Section 1.9]

1. Are all records of all storm water monitoring information retained on-site?
   ☐-Yes ☐-No
   If No, explain: _____

N. **Training**

1. Was a Qualified SWPPP Practitioner (QSP) in reasonable charge of SWPPP implementation?
   ☐-Yes ☐-No
   If Yes, provide Name and Certificate Number: _____
   If No, explain: _____
2. Were all individuals conducting BMP installation, inspection, maintenance and repairs trained appropriately?
   ☐-Yes ☐-No
   If No, explain: _____
3. Are complete training records kept on-site and available upon request?
   ☐-Yes ☐-No
   If No, explain: _____

ANNUAL REPORT CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

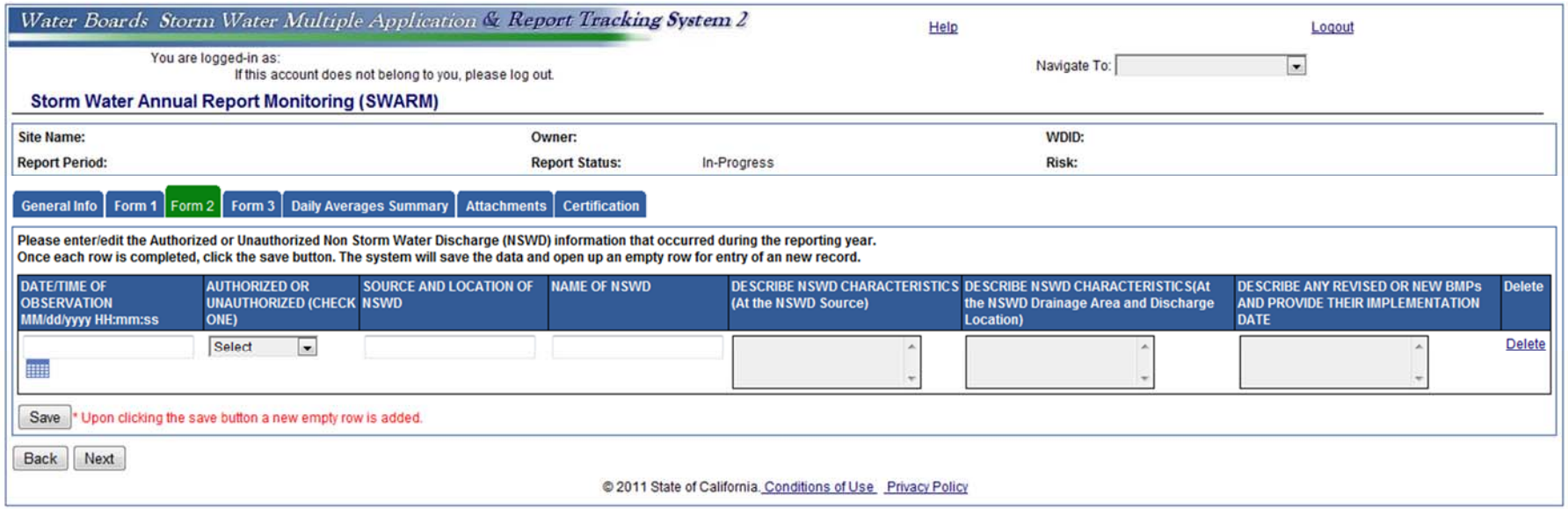
Printed Name: _____

Signature: _____ Date: _____

Title: _____

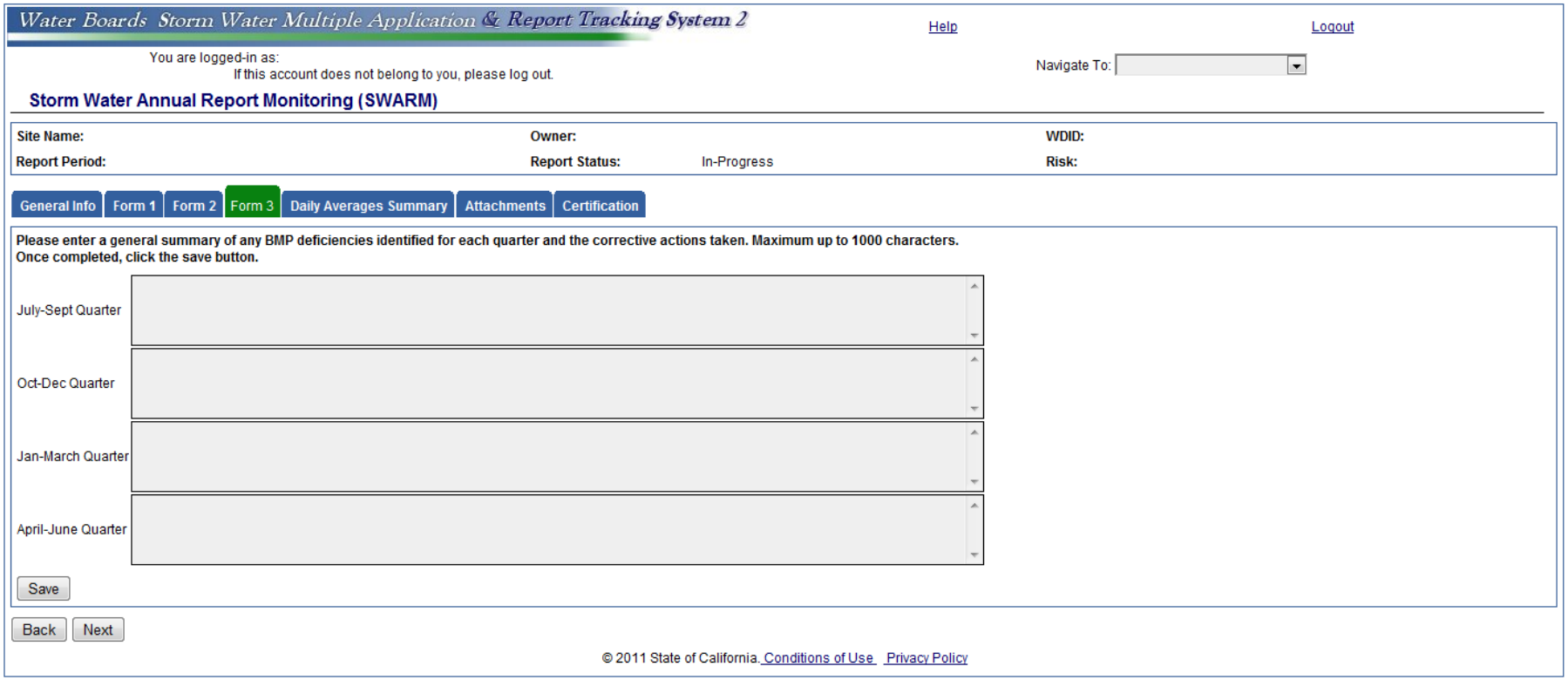
Sample Annual Report Form 2

Form 2 must be completed using the SMARTS website.



Sample Annual Report Form 3

Form 3 must be completed using the SMARTS website.



Appendix G: Construction Activities, Materials Used, and Associated Pollutants

Table G.1 Construction Activities and Associated Pollutants

Phase	Activity	Associated Materials or Pollutants
Demolition, Grading and Land Development	• Saw cut, crush and remove existing concrete improvements • Saw cut, break up and remove existing asphalt pavement • Remove trees, stump and roots • Remove turf and vegetation • Distribute material at designated areas • Deliver and empty trash bins • Deliver and service portable outhouses to site • Deliver materials to site and store in containers • Deliver equipment to site • Park equipment during off-hours, refuel, check fluid levels, grease, service and repair (oil, hydraulics, cooling fluid, brake fluid, power steering fluid, etc.) • Import Fill Material • Excavate and compact areas	• Construction equipment fluids • Concrete rubble and dust • Saw cut wastewater • Sediment from erosion • Spills • Septic spills, cleaning fluids, and washout • Trash • Fueling drips and spills (gasoline, diesel) • Operating fluid drips and spills (oil, hydraulic, coolant, brake, power steering, etc.) • Grease drips
Streets and Utilities Phase	• Excavate trenches • Install pipelines, laterals, and conduit • Install manholes and utility structures • Install inlets, cleanouts, valves, and conductors • Backfill and compact trenches • Install trench surface restoration • Excavate and compact subgrade • Install and compact base materials • Apply paint binder • Install forms and guide wires • Install asphalt concrete and concrete improvements • Install emulsion sealer • Paint pavement striping and markings	• Construction equipment fluids • Concrete paste and curing compound • Concrete and grout washout • Joint and form lubricants • Paints, thinners, solvents, • Sediments • Shavings from conduit material and sawdust • Trash • Wastewater and chlorinated water

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

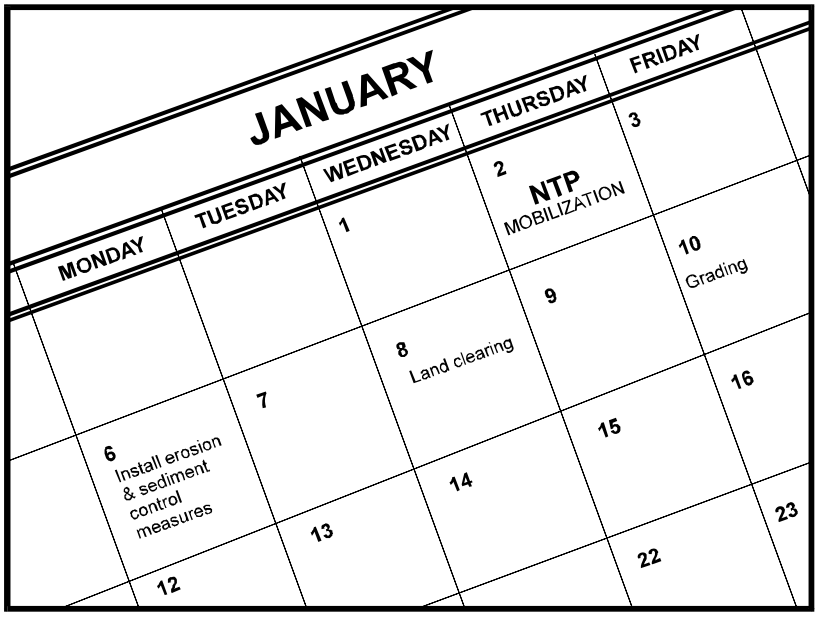
Table G.1 Construction Activities and Associated Pollutants		
Phase	**Activity**	**Associated Materials or Pollutants**
Vertical Construction Phase	• Excavate building foundations • Distribute excavated materials as on-site fill • Construct foundation, building walls, and roof • Install building plumbing • Construct building exterior covering and interior • Install insulation and finish system • Apply trim accessories, primer, sealer, and weather resistant barrier coating • Install windows, electrical wiring, cabinets, and flooring • Install building HVAC • Texture walls, paint interiors and building • Touch-up painting and clean exposed finished surfaces	• Construction equipment fluids • Sediments • Concrete, grout, and stucco washout • Adhesives, cleaners, and sealants • Solder, lead, and heavy metal shavings and • Cutting oil and welding slag • Steel and aluminum grindings • Roofing and flooring material trash • Sheetrock dust and sawdust • Insullation fibers • Ceramic tile dust and wash off water • Paints, lacquers, varnishes, thinners, stripping agents, sanding dush, stripping residue, paint washout, spills • Freon spills • Trash
Landscaping and Site Stabilization Phase	• Deliver materials to site • Deliver mulch material to site • Excavate trenches • Install water irrigation pipelines, valves, emitters and bubblers • Install controller electrical service and valve control wires • Install valve boxes • Backfill and compact trenches • Blow lines and test system • Plant shrubs and trees • Hydroseed, as required	• Residue from materials • Mulches • Construction equipment fluids • Sediments • Shavings from conduit material • Wastewater and chlorinated water • PVC pipe dust, primer, and glue • Fertilizers • Herbicides • Trash

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix H:CASQA Storm water BMP Handbook Portal: Construction Fact Sheets

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Scheduling EC-1

Inspection and Maintenance

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

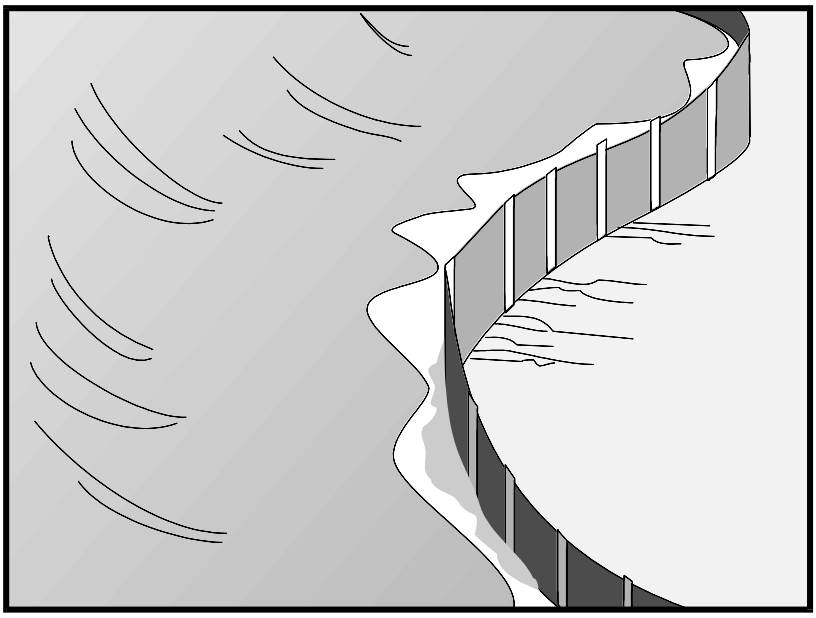
References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-10 Storm Drain Inlet Protection
SE-12 Temporary Silt Dike
SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Silt Fence SE-1

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

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Silt Fence SE-1

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

<u>Standard Silt Fence</u>

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the

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toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
    - Minimal soil disturbance.
    - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
    - Uniform installation.
    - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

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Silt Fence SE-1

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

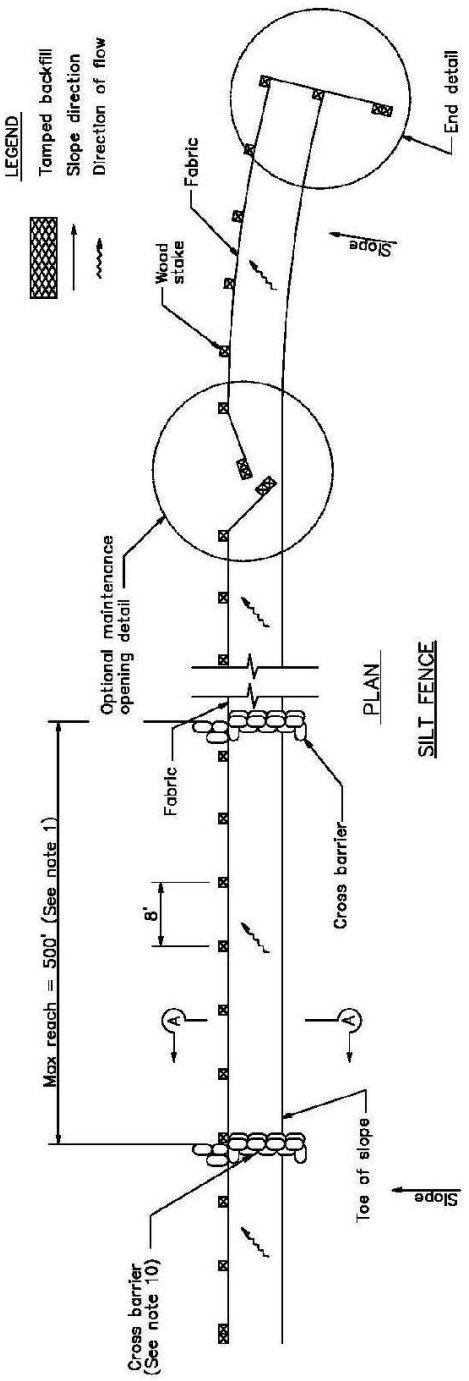
U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

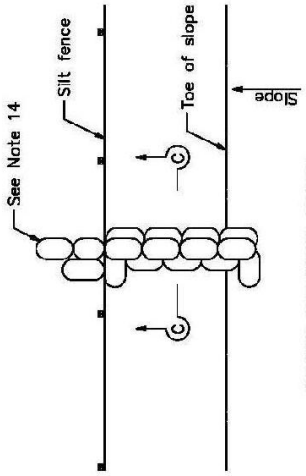
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

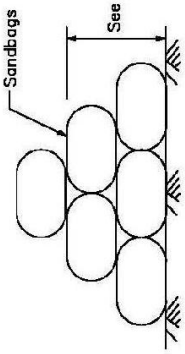
Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Silt Fence SE-1





CROSS BARRIER DETAIL



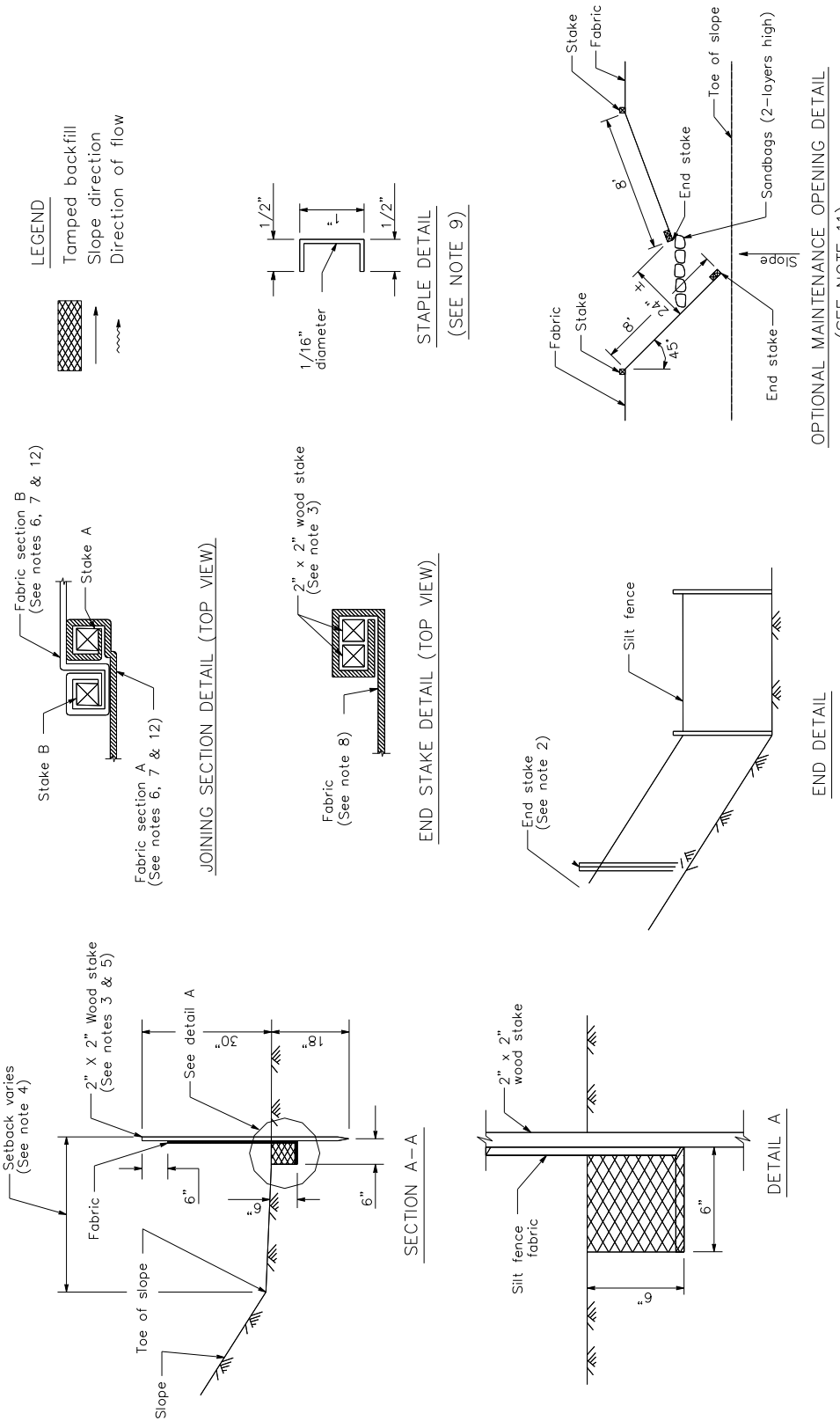
SECTION C–C

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.

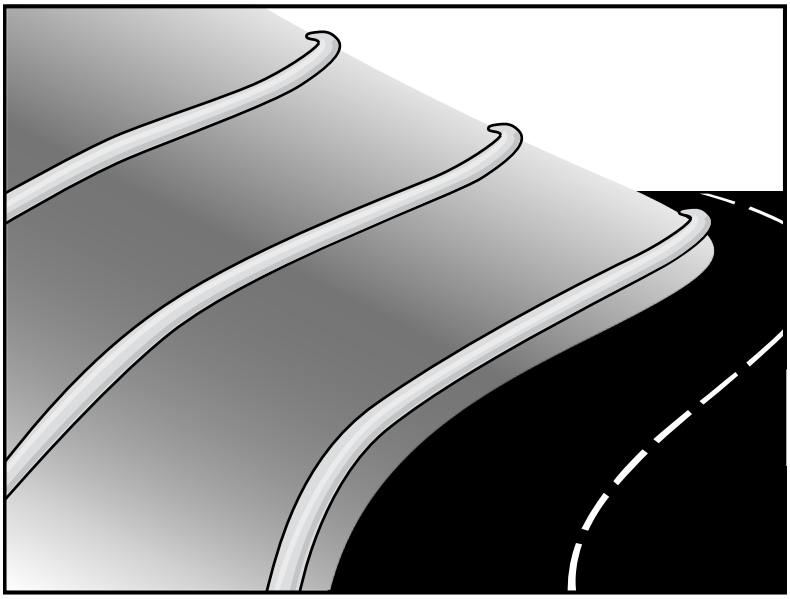
Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Silt Fence SE-1



Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Fiber Rolls SE-5



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Fiber Rolls SE-5

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Fiber Rolls SE-5

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

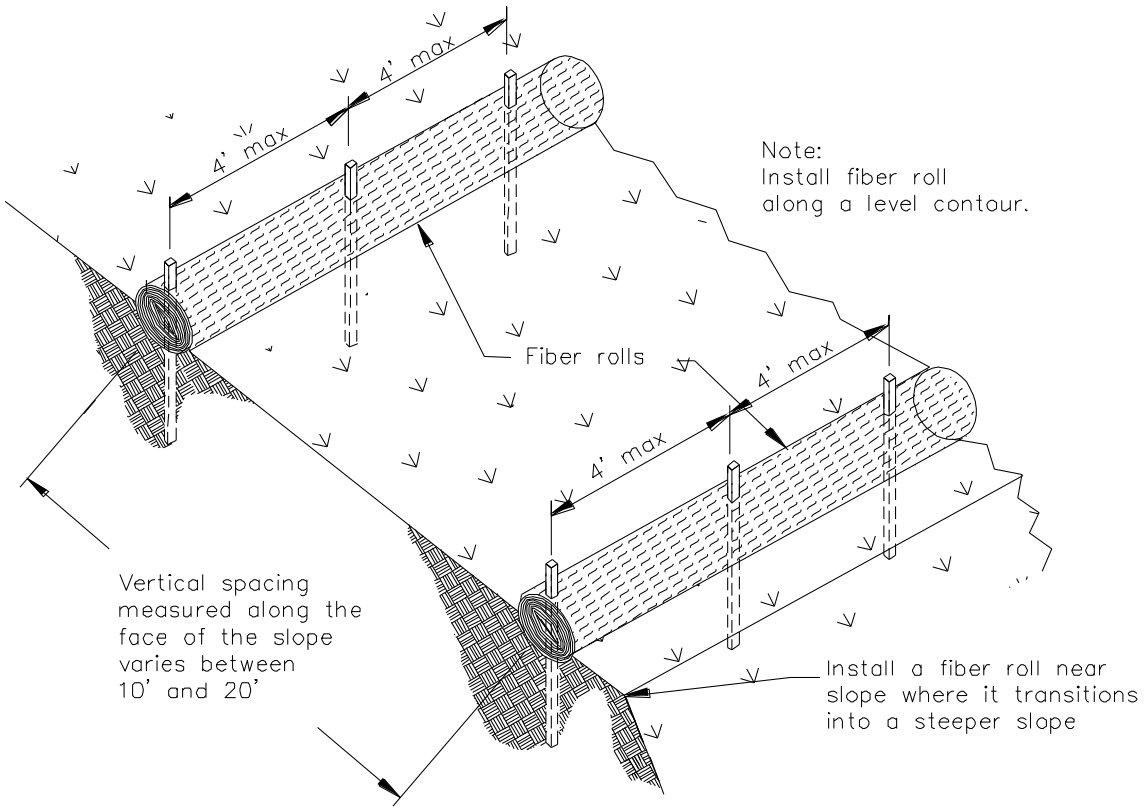
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

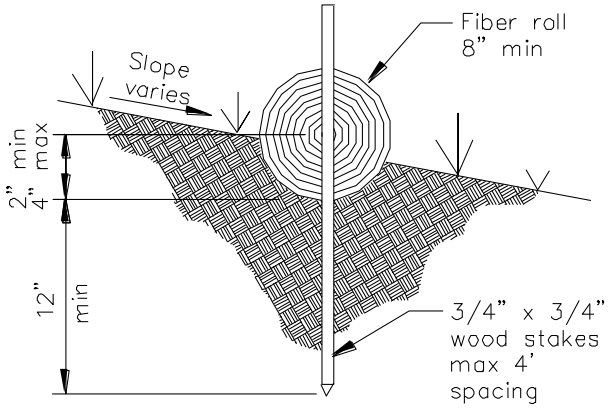
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Fiber Rolls SE-5



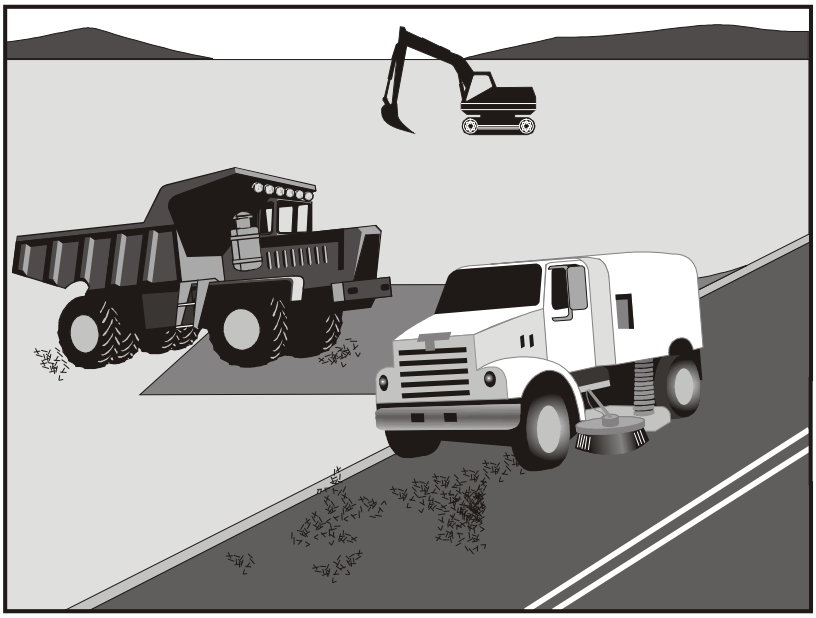
TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Street Sweeping and Vacuuming SE-7



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Street Sweeping and Vacuuming SE-7

- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

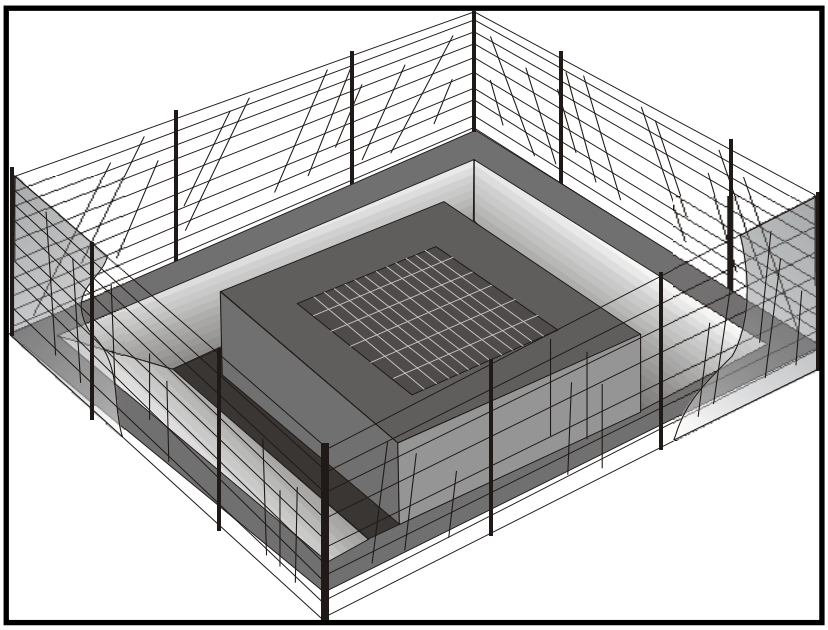
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
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Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-14 Biofilter Bags

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10

- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.
- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10

- Six types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
  - Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
  - Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence -*** Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap -*** Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag -*** Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.

  2. Leave room upstream of barrier for water to pond and sediment to settle.

  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.

  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter -*** Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.

  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.

  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary) –*** Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

  1. Construct in a gently sloping area.
  2. Biofilter bags should be placed around inlets to intercept runoff flows.
  3. All bag joints should overlap by 6 in.
  4. Leave room upstream for water to pond and for sediment to settle out.
  5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

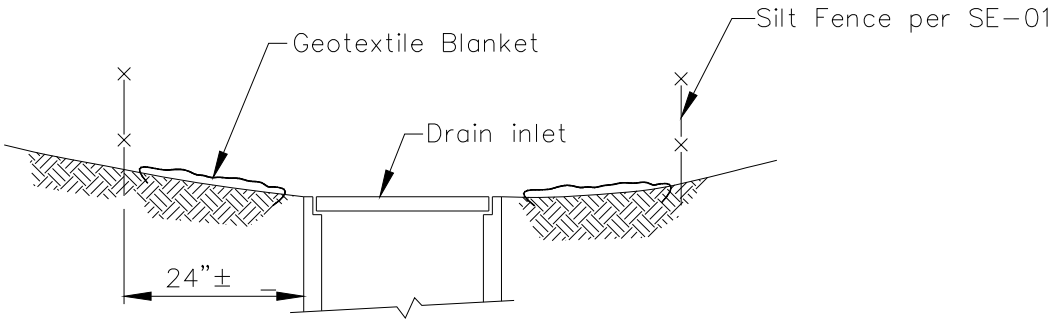
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

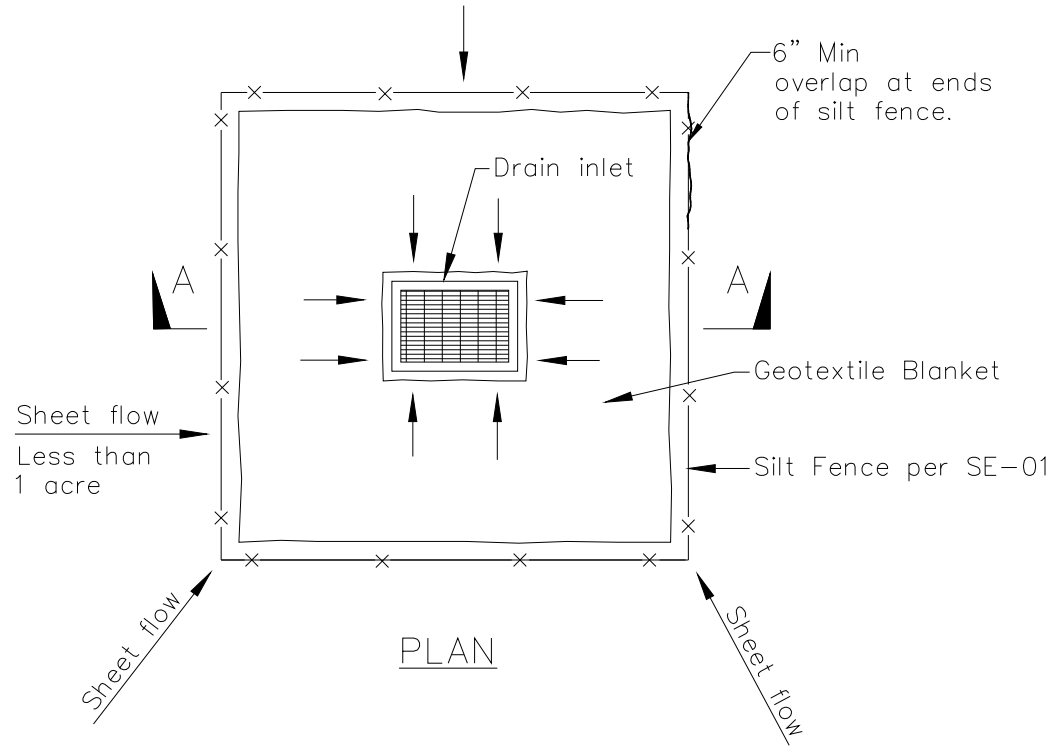
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10



SECTION A–A



PLAN

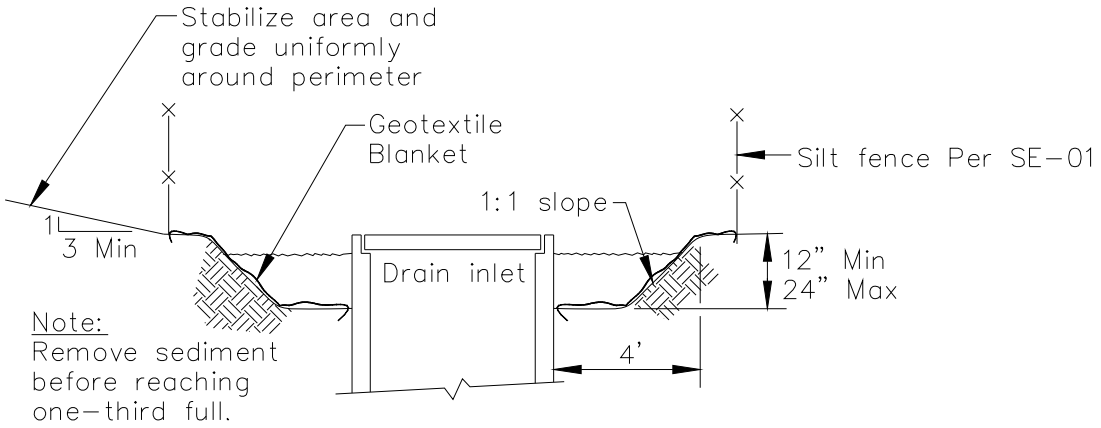
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

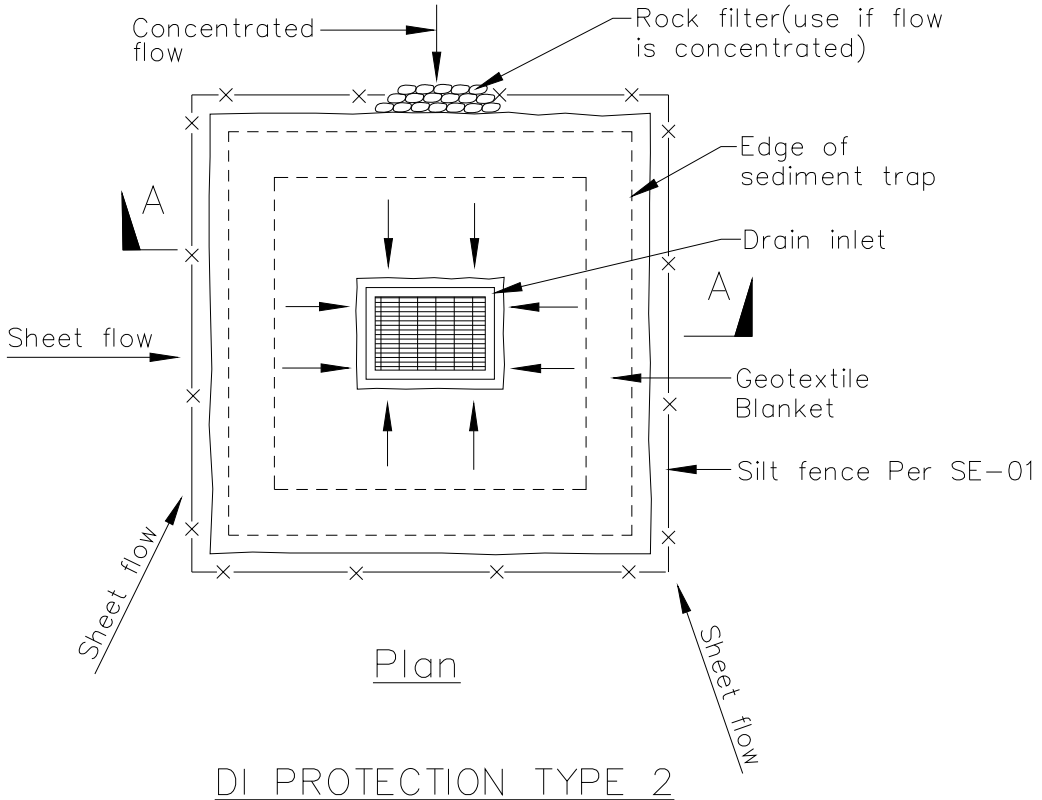
1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10



Section A–A



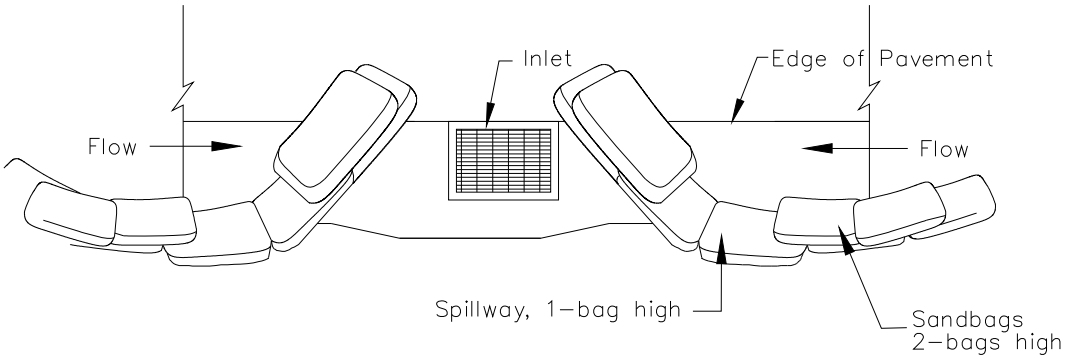
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

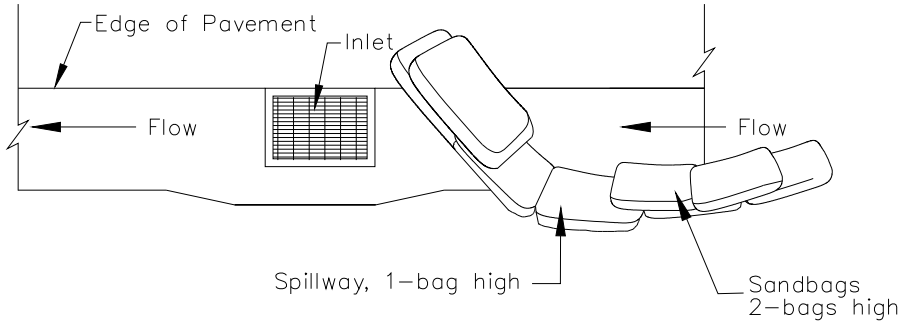
Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10



TYPICAL PROTECTION FOR INLET ON SUMP



TYPICAL PROTECTION FOR INLET ON GRADE

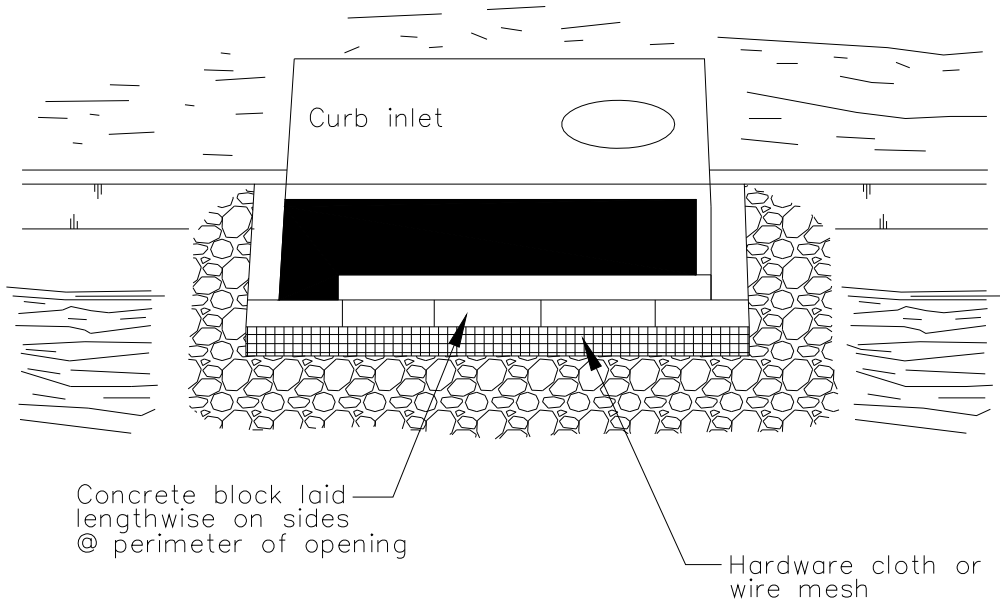
NOTES:

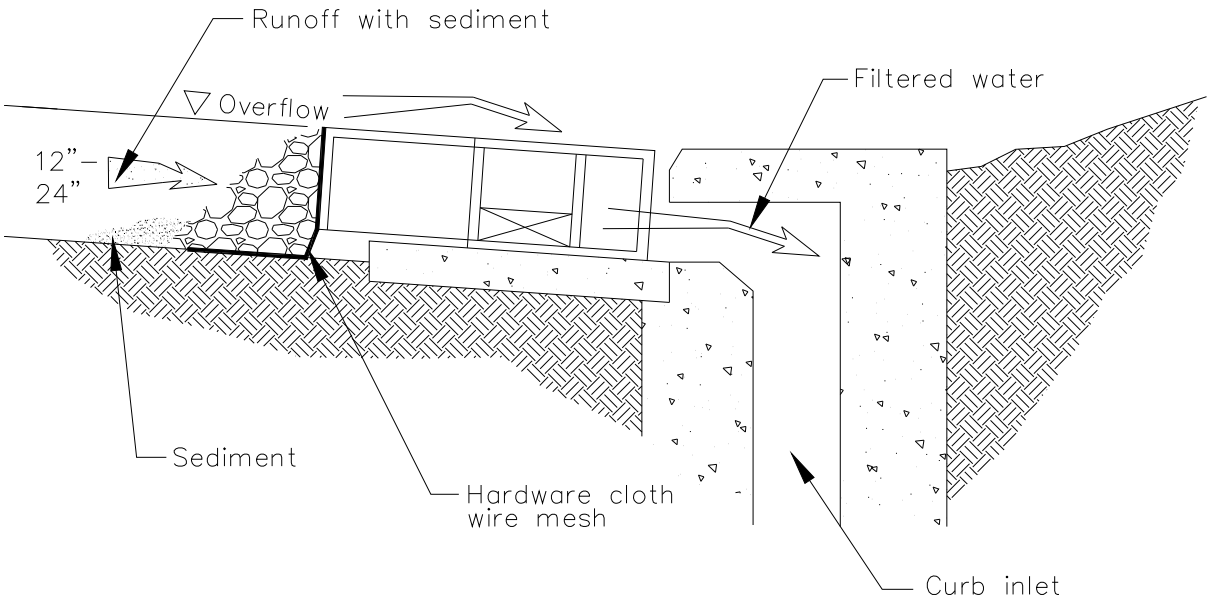
1. Intended for short–term use.
2. Use to inhibit non–storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

DI PROTECTION TYPE 3
NOT TO SCALE

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Storm Drain Inlet Protection SE-10

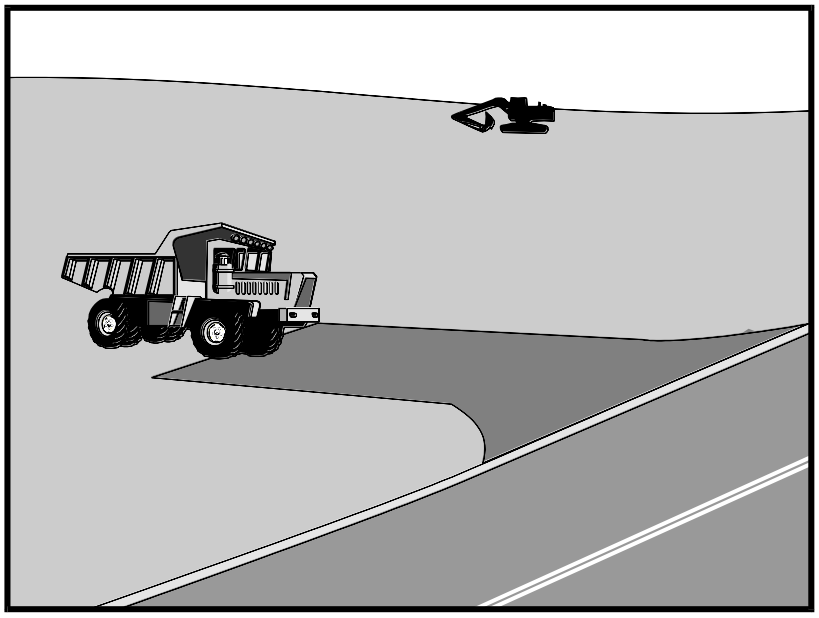




DI PROTECTION – TYPE 4
NOT TO SCALE

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stabilized Construction Entrance/Exit TC-1

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

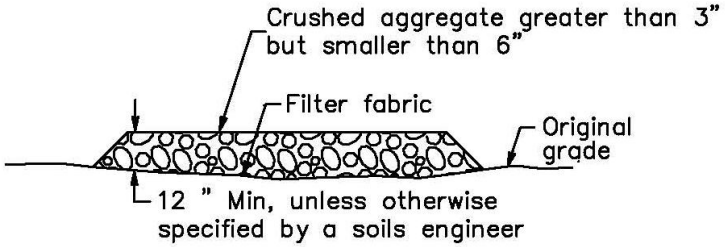
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

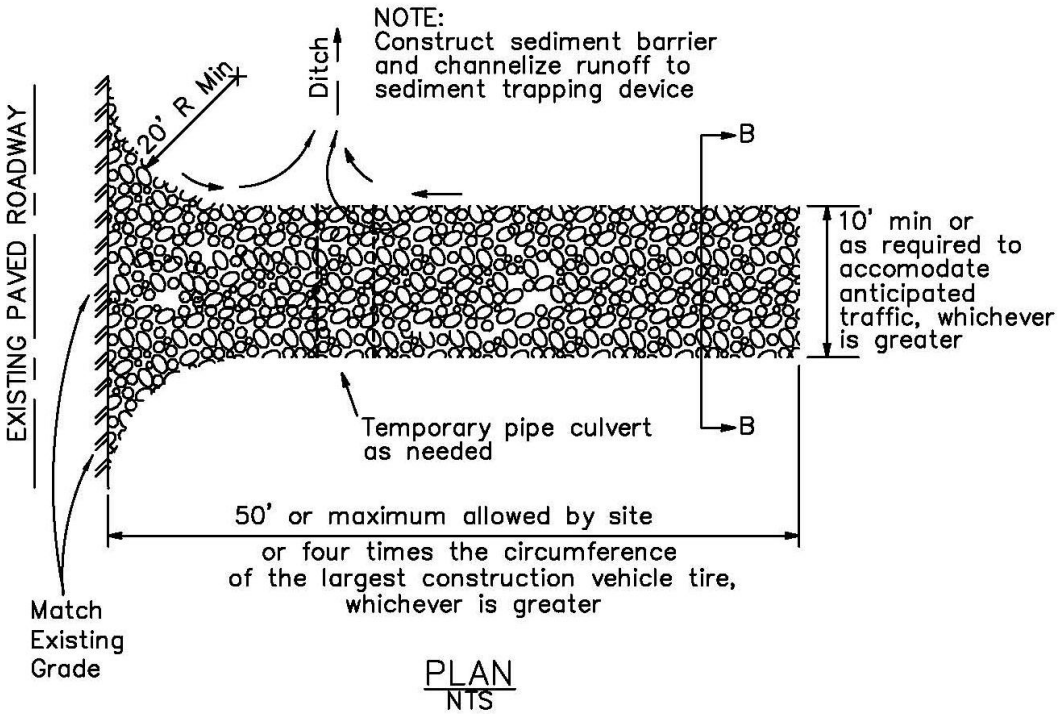
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stabilized Construction Entrance/Exit TC-1



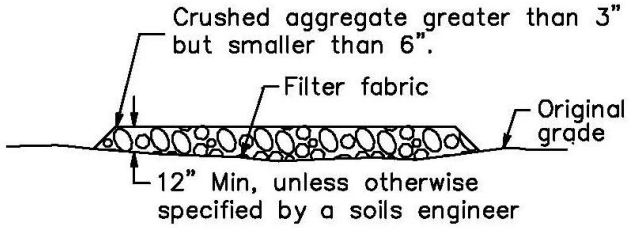
SECTION B–B
NTS



PLAN
NTS

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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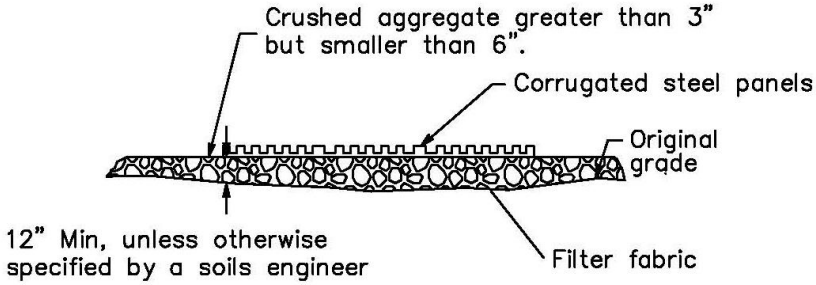
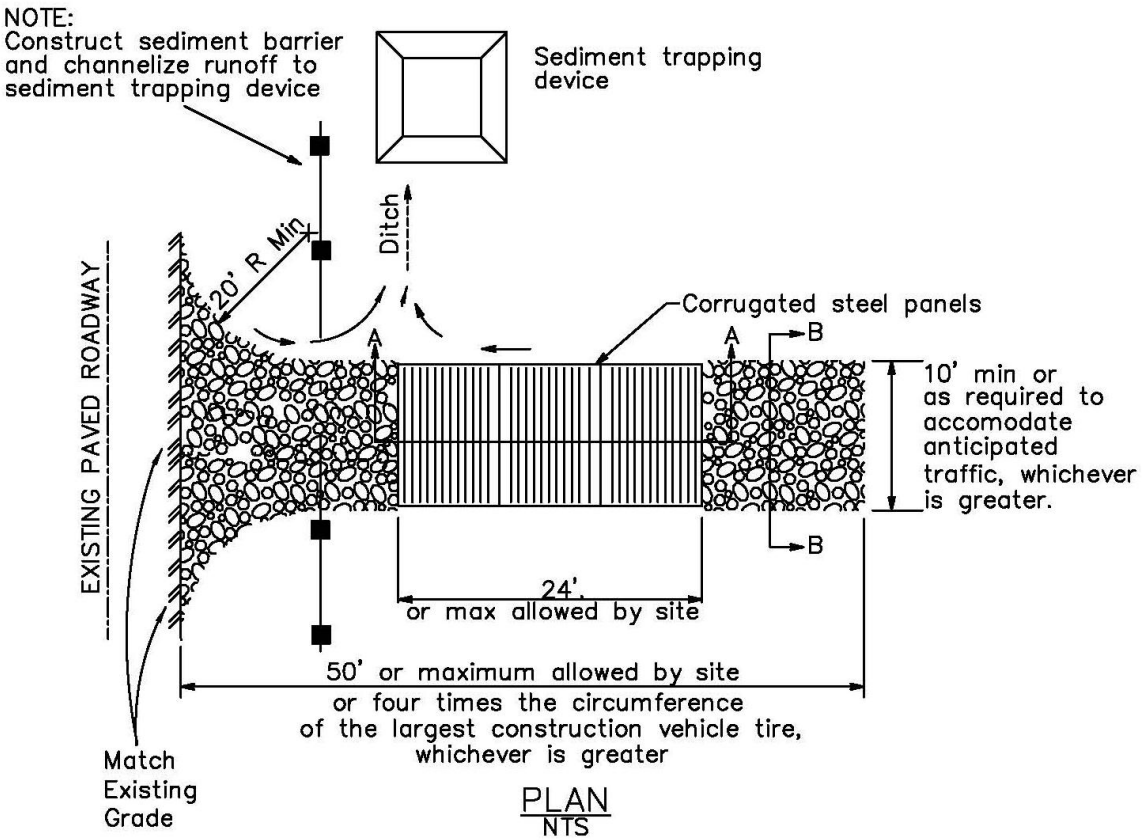


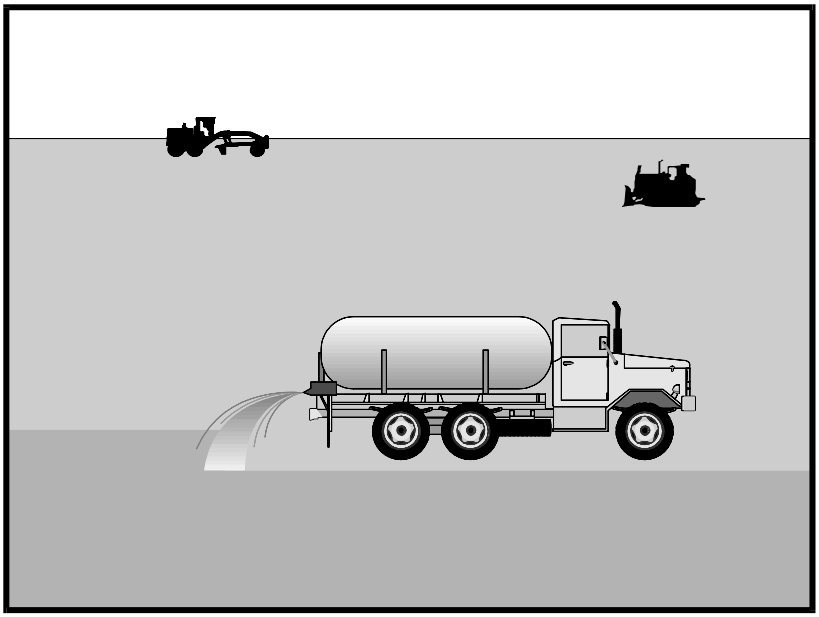
SECTION A–A
NOT TO SCALE



PLAN
NTS

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Wind Erosion Control WE-1

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	x	x	x	x	x			x
Disturbed Areas Subject to Traffic			x	x	x	x		x
Material Stockpiles		x	x	x			x	x
Demolition			x			x	x	
Clearing/ Excavation			x	x				x
Truck Traffic on Unpaved Roads			x	x	x	x	x	
Tracking					x	x		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

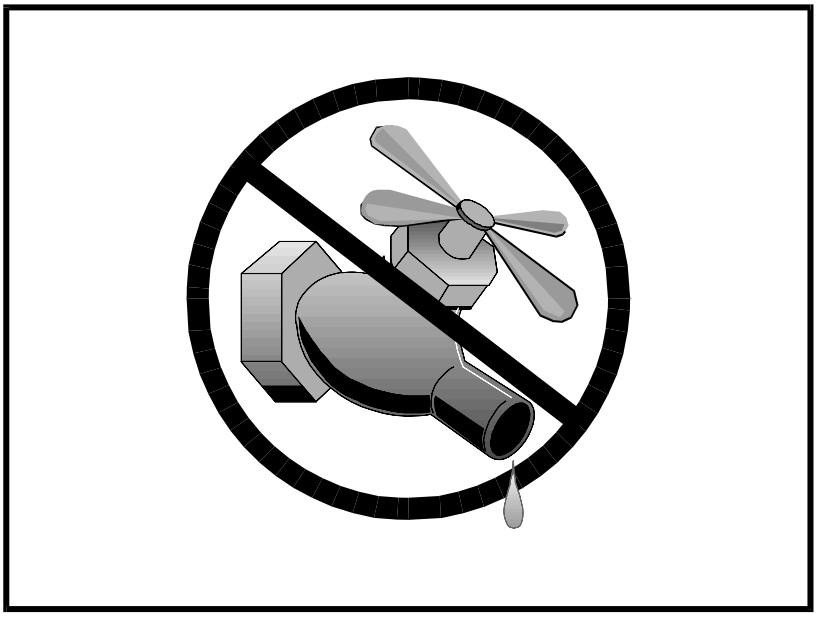
Wind Erosion Control WE-1

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Water Conservation Practices NS-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.
- Direct construction water runoff to areas where it can soak

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

into the ground or be collected and reused.

- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

Inspection and Maintenance

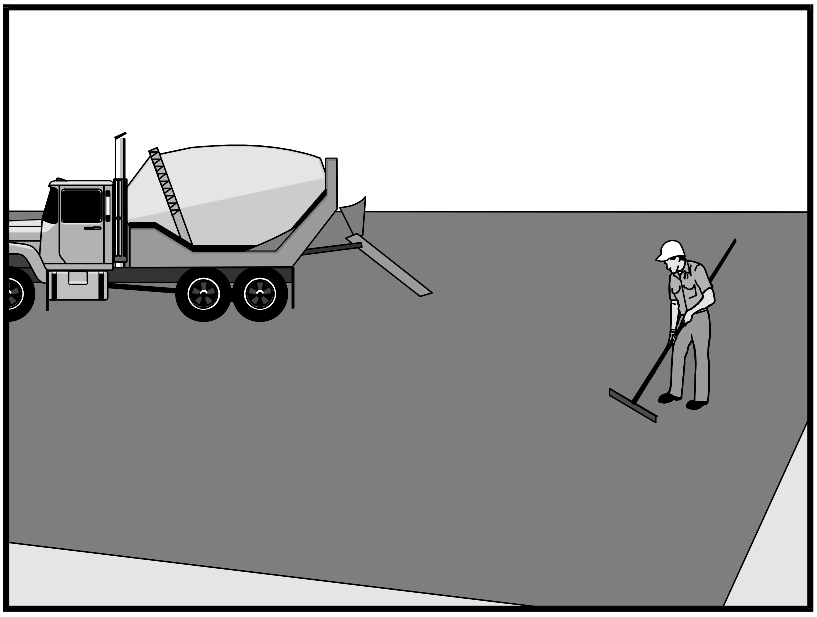
- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Paving and Grinding Operations NS-3



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☒

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Paving and Grinding Operations NS-3

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Paving and Grinding Operations NS-3

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).

- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Paving and Grinding Operations NS-3

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

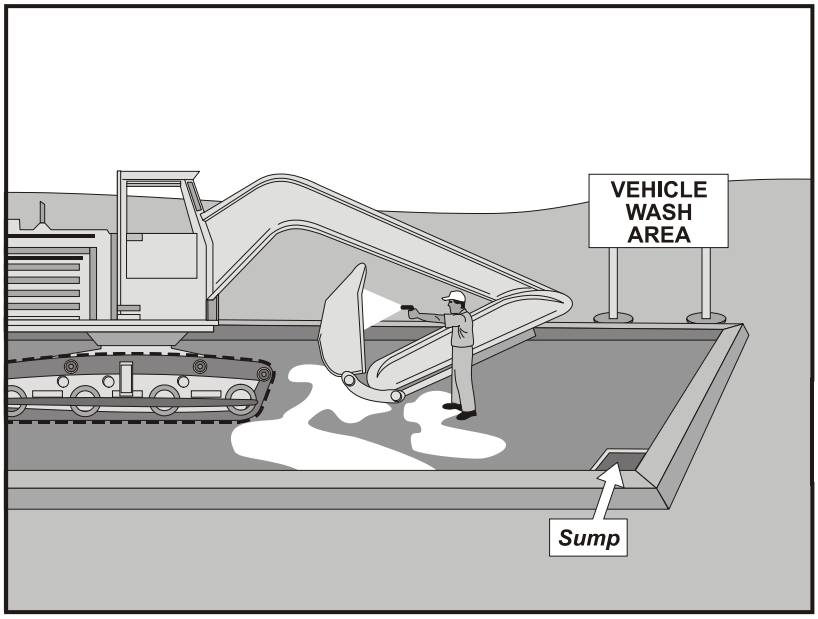
Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Vehicle and Equipment Cleaning NS-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

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Vehicle and Equipment Cleaning NS-8

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

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Vehicle and Equipment Cleaning NS-8

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

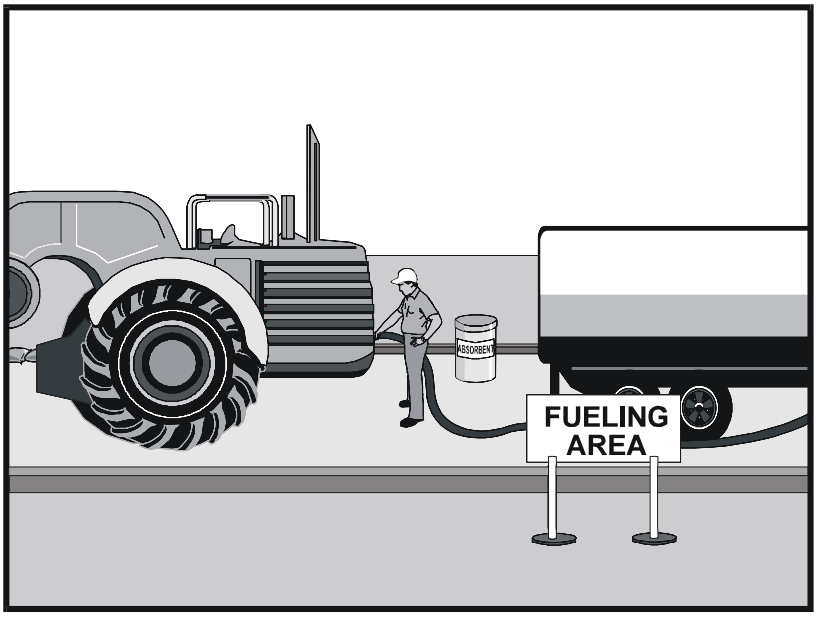
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Vehicle and Equipment Fueling NS-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

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Vehicle and Equipment Fueling NS-9

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

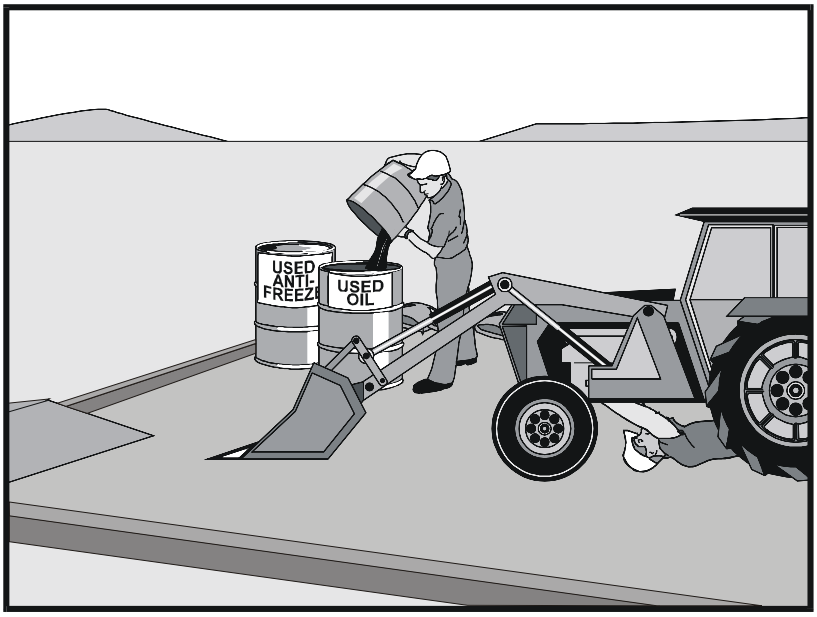
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Vehicle & Equipment Maintenance NS-10



Categories

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Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

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Vehicle & Equipment Maintenance NS-10

Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

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Vehicle & Equipment Maintenance NS-10

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

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Vehicle & Equipment Maintenance NS-10

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

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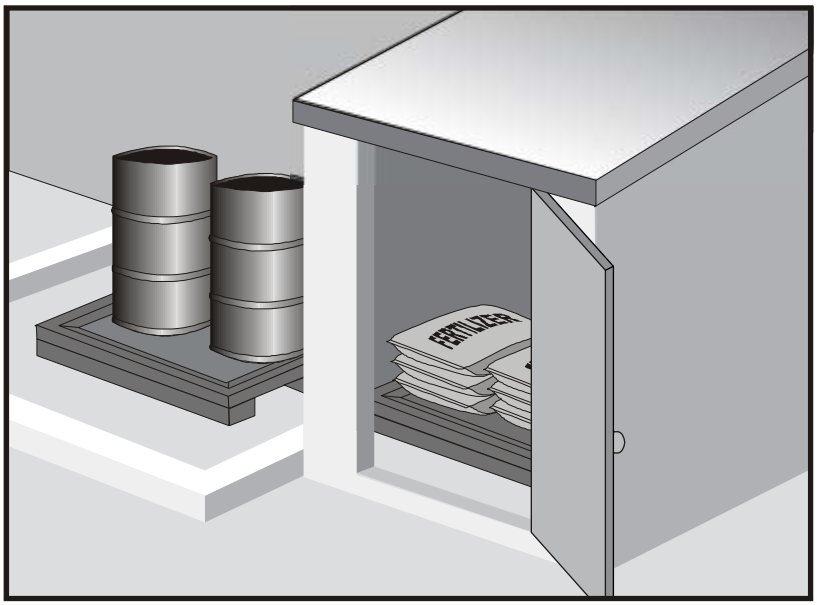
Material Delivery and Storage WM-1



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Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

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Material Delivery and Storage WM-1

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

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Material Delivery and Storage WM-1

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Material Delivery and Storage WM-1

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

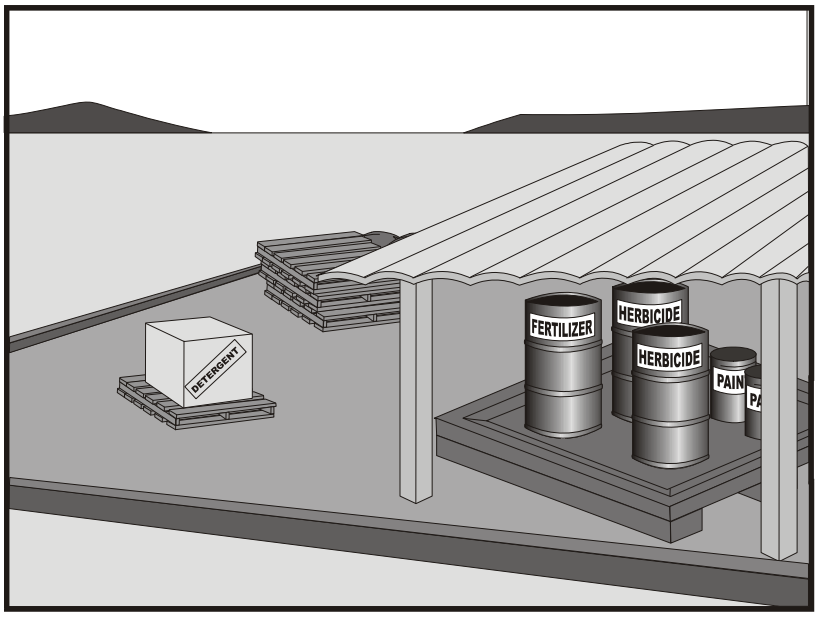
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Material Use WM-2



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Material Use WM-2

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

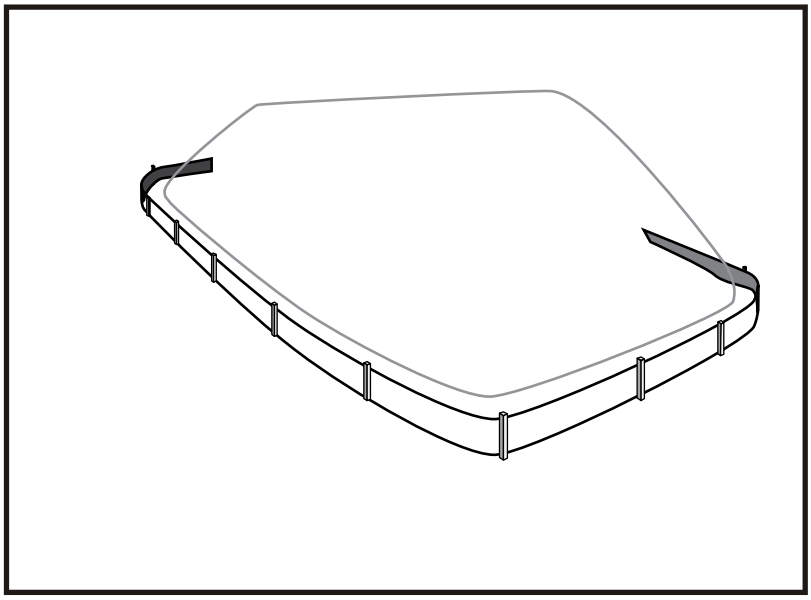
Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stockpile Management WM-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called “cold mix” asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of plastic materials should be avoided when feasible and photodegradable plastics should not be used.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stockpile Management WM-3

- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater run-on using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Cover and project soil stockpiles with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Consider temporary vegetation for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Provide covers and protect these stockpiles with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cover cold mix stockpiles and place them on plastic sheeting (or comparable material) and surround the stockpiles with a berm all times.

Stockpiles of fly ash, stucco, hydrated lime

- Cover stockpiles of materials that may raise the pH of runoff (i.e., basic materials) with plastic and surround the stockpiles with a berm at all times.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Stockpile Management WM-3

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate)

- Cover treated wood with plastic sheeting (or comparable material) and surround with a berm at all times.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

Inspection and Maintenance

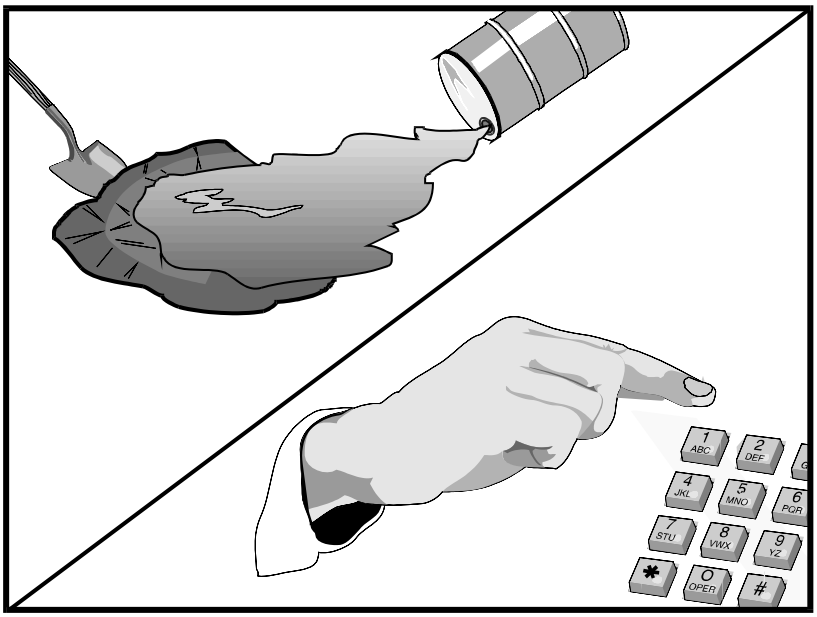
- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Spill Prevention and Control WM-4



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ Primary Objective

☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Spill Prevention and Control WM-4

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Spill Prevention and Control WM-4

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Spill Prevention and Control WM-4

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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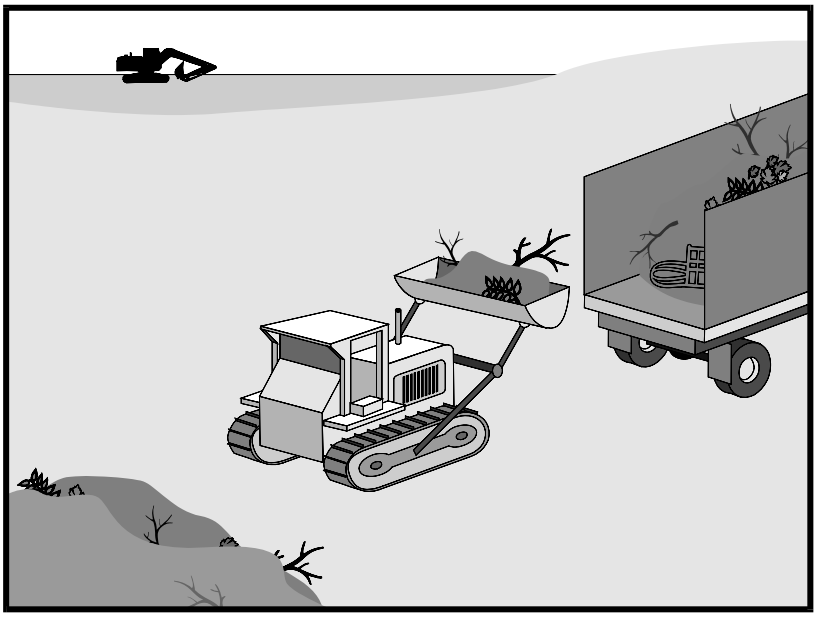
Solid Waste Management WM-5



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WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

References

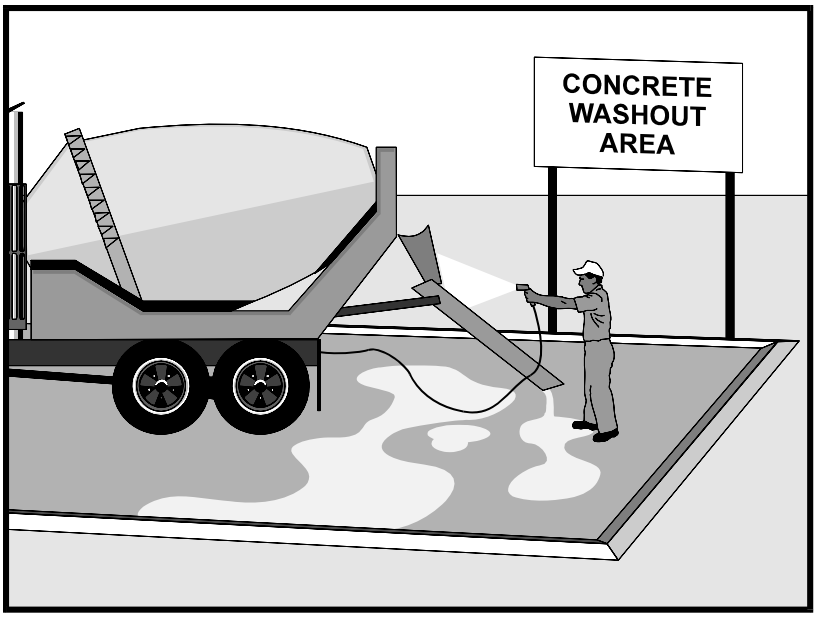
Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Concrete Waste Management WM-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Concrete Waste Management WM-8

- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washout should be lined so there is no discharge into the underlying soil.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Concrete Waste Management WM-8

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a “roll-off”; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-0ff concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

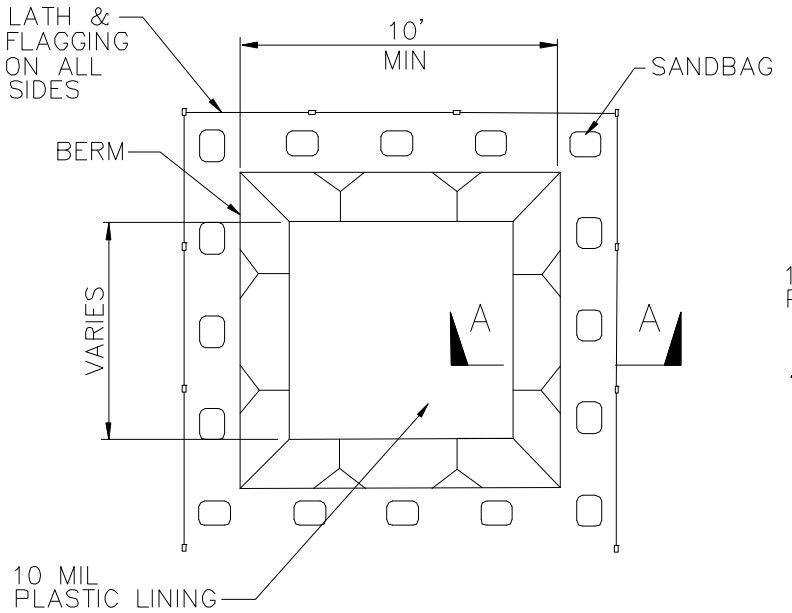
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

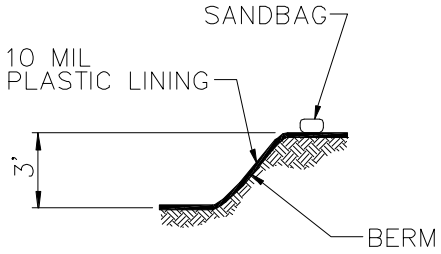
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

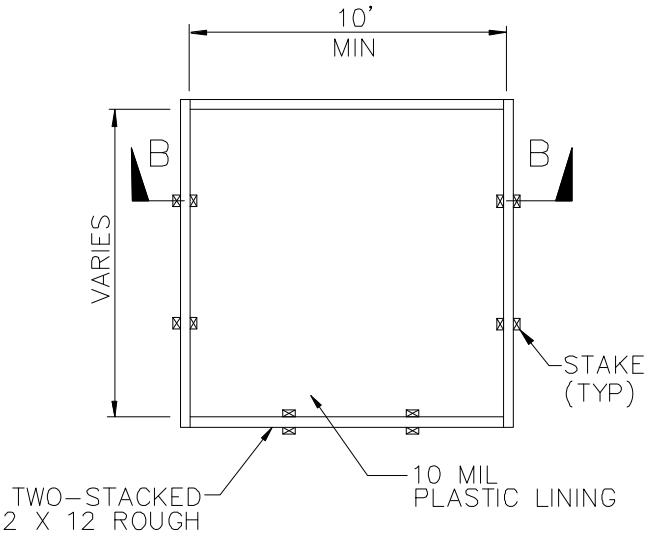
Concrete Waste Management WM-8



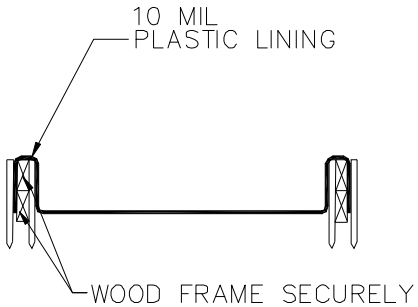
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



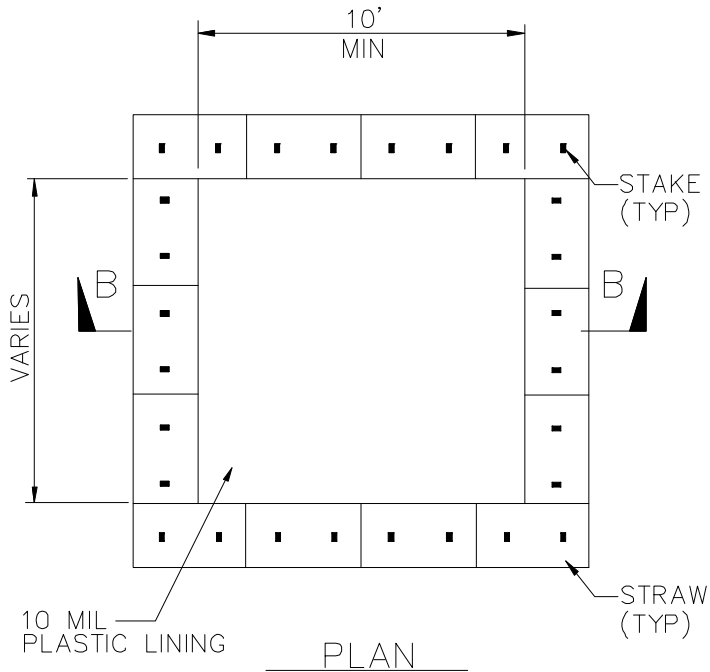
SECTION B–B
NOT TO SCALE

NOTES

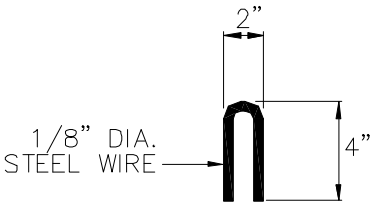
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

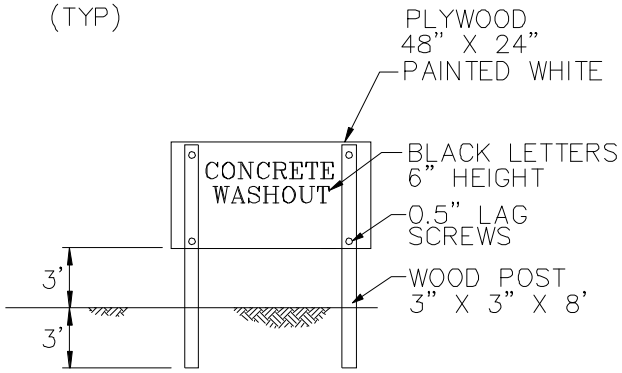
Concrete Waste Management WM-8



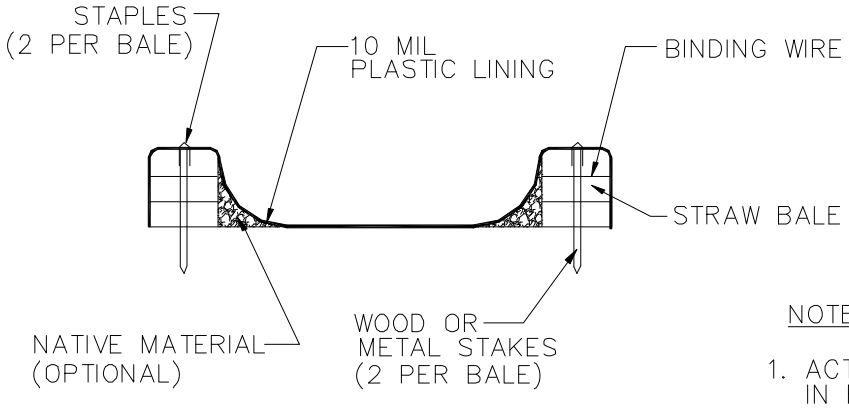
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)



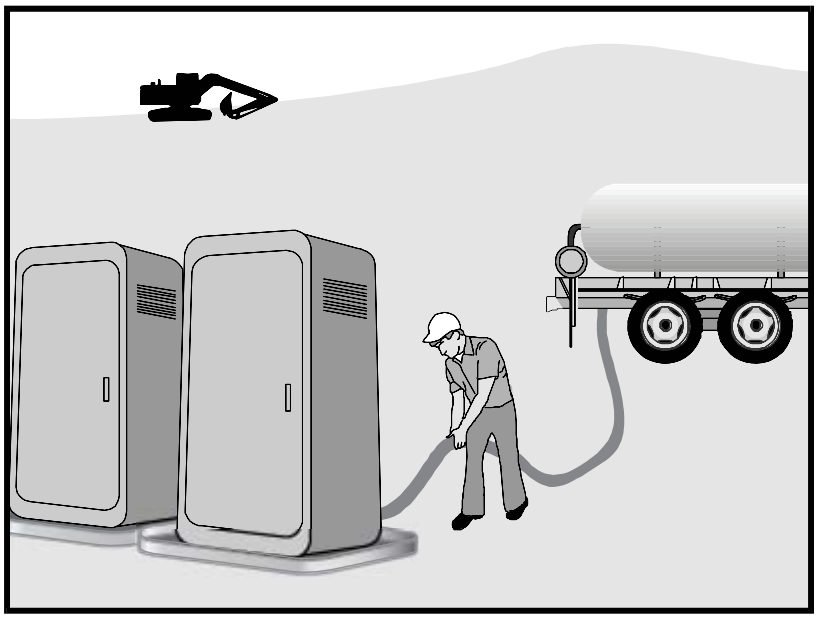
SECTION B–B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Sanitary/Septic Waste Management WM-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Category
☒ Secondary Category

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Sanitary/Septic Waste Management WM-9

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Sanitary/Septic Waste Management WM-9

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix I: Construction Schedule

Place construction schedule in this appendix.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix J: Contractors and Subcontractors

Place list of subcontractors in this appendix.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Appendix K: Construction General Permit Attachment C - Risk Level 1 Requirements

The State Water Resources Control Board National Pollutant Discharge Elimination System (NPDES) Construction General Permit, 2009-0009-DWQ as amended by 2010-0014-DWQ can be found at the following web site:

http://www.swrcb.ca.gov/water_issues/programs/storm water/constpermits.shtml

Attachment C Risk Level 1 Requirements from the Construction General Permit are included in this appendix.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

ATTACHMENT C
RISK LEVEL 1 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. Narrative – Risk Level 1 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. Numeric – Risk Level 1 dischargers are not subject to a numeric effluent standard.

B. Good Site Management "Housekeeping"

1. Risk Level 1 dischargers shall implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 1 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 1 dischargers shall implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:

a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

d. Cover waste disposal containers at the end of every business day and during a rain event.

e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

g. Implement procedures that effectively address hazardous and non-hazardous spills.

h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require that:

i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly; and

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 1 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 1 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 1 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 1 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 1 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

C. Non-Storm Water Management

1. Risk Level 1 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 1 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 1 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

D. Erosion Control

1. Risk Level 1 dischargers shall implement effective wind erosion control.

2. Risk Level 1 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 1 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 1 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 1 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

F. Run-on and Runoff Controls

Risk Level 1 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 1 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment.

2. Risk Level 1 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended

[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.

storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 1 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 1 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 1 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector's name, title, and signature.

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H. Rain Event Action Plan

Not required for Risk Level 1 dischargers.

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Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

I. Risk Level 1 Monitoring and Reporting Requirements

Table 1- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
1	X	X		X	X		

1. **Construction Site Monitoring Program Requirements**

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Programs to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

   a. To demonstrate that the site is in compliance with the Discharge Prohibitions;

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives;

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges; and

d. To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 1 - Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 1 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 1 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 1 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 1 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 1 dischargers shall visually observe (inspect):

i. All storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. All BMPs to identify whether they have been properly implemented in accordance with the SWPPP. If needed, the discharger shall implement appropriate corrective actions.

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iii. Any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in e.i and e.iii above, Risk Level 1 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 1 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 1 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 1 – Visual Observation Exemptions**

a. Risk Level 1 dischargers shall be prepared to conduct visual observation (inspections) until the minimum requirements of Section I.3 above are completed. Risk Level 1 dischargers are not required to conduct visual observation (inspections) under the following conditions:

i. During dangerous weather conditions such as flooding and electrical storms.

ii. Outside of scheduled site business hours.

b. If no required visual observations (inspections) are collected due to these exceptions, Risk Level 1 dischargers shall include an explanation in their SWPPP and in the Annual Report documenting why the visual observations (inspections) were not conducted.

5. **Risk Level 1 – Monitoring Methods**

Risk Level 1 dischargers shall include a description of the visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures in the CSMP.

6. **Risk Level 1 – Non-Storm Water Discharge Monitoring Requirements**

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

a. Visual Monitoring Requirements:

i. Risk Level 1 dischargers shall visually observe (inspect) each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

ii. Risk Level 1 dischargers shall conduct one visual observation (inspection) quarterly in each of the following periods: January-March, April-June, July-September, and October-December. Visual observation (inspections) are only required during daylight hours (sunrise to sunset).

iii. Risk Level 1 dischargers shall ensure that visual observations (inspections) document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.), and source. Risk Level 1 dischargers shall maintain on-site records indicating the personnel performing the visual observation (inspections), the dates and approximate time each drainage area and non-storm water discharge was observed, and the response taken to eliminate unauthorized non-storm water discharges and to reduce or prevent pollutants from contacting non-storm water discharges.

7. **Risk Level 1 – Non-Visible Pollutant Monitoring Requirements**

a. Risk Level 1 dischargers shall collect one or more samples during any breach, malfunction, leakage, or spill observed during a visual inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water.

b. Risk Level 1 dischargers shall ensure that water samples are large enough to characterize the site conditions.

c. Risk Level 1 dischargers shall collect samples at all discharge locations that can be safely accessed.

d. Risk Level 1 dischargers shall collect samples during the first two hours of discharge from rain events that occur during business hours and which generate runoff.

e. Risk Level 1 dischargers shall analyze samples for all non-visible pollutant parameters (if applicable) - parameters indicating the

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

presence of pollutants identified in the pollutant source assessment required (Risk Level 1 dischargers shall modify their CSMPs to address these additional parameters in accordance with any updated SWPPP pollutant source assessment).

f. Risk Level 1 dischargers shall collect a sample of storm water that has not come in contact with the disturbed soil or the materials stored or used on-site (uncontaminated sample) for comparison with the discharge sample.

g. Risk Level 1 dischargers shall compare the uncontaminated sample to the samples of discharge using field analysis or through laboratory analysis.[2]

h. Risk Level 1 dischargers shall keep all field /or analytical data in the SWPPP document.

8. **Risk Level 1 – Particle Size Analysis for Project Risk Justification**

Risk Level 1 dischargers justifying an alternative project risk shall report a soil particle size analysis used to determine the RUSLE K-Factor. ASTM D-422 (Standard Test Method for Particle-Size Analysis of Soils), as revised, shall be used to determine the percentages of sand, very fine sand, silt, and clay on the site.

9. **Risk Level 1 – Records**

Risk Level 1 dischargers shall retain records of all storm water monitoring information and copies of all reports (including Annual Reports) for a period of at least three years. Risk Level 1 dischargers shall retain all records on-site while construction is ongoing. These records include:

a. The date, place, time of facility inspections, sampling, visual observation (inspections), and/or measurements, including precipitation.

b. The individual(s) who performed the facility inspections, sampling, visual observation (inspections), and or measurements.

c. The date and approximate time of analyses.

d. The individual(s) who performed the analyses.

[2] For laboratory analysis, all sampling, sample preservation, and analyses must be conducted according to test procedures under 40 CFR Part 136. Field discharge samples shall be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

e. A summary of all analytical results from the last three years, the method detection limits and reporting units, and the analytical techniques or methods used.

f. Rain gauge readings from site inspections.

g. Quality assurance/quality control records and results.

h. Non-storm water discharge inspections and visual observation (inspections) and storm water discharge visual observation records (see Sections I.3 and I.6 above).

i. Visual observation and sample collection exception records (see Section I.4 above).

j. The records of any corrective actions and follow-up activities that resulted from analytical results, visual observation (inspections), or inspections.

Attachment: Storm Water Pollution Prevention Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan),

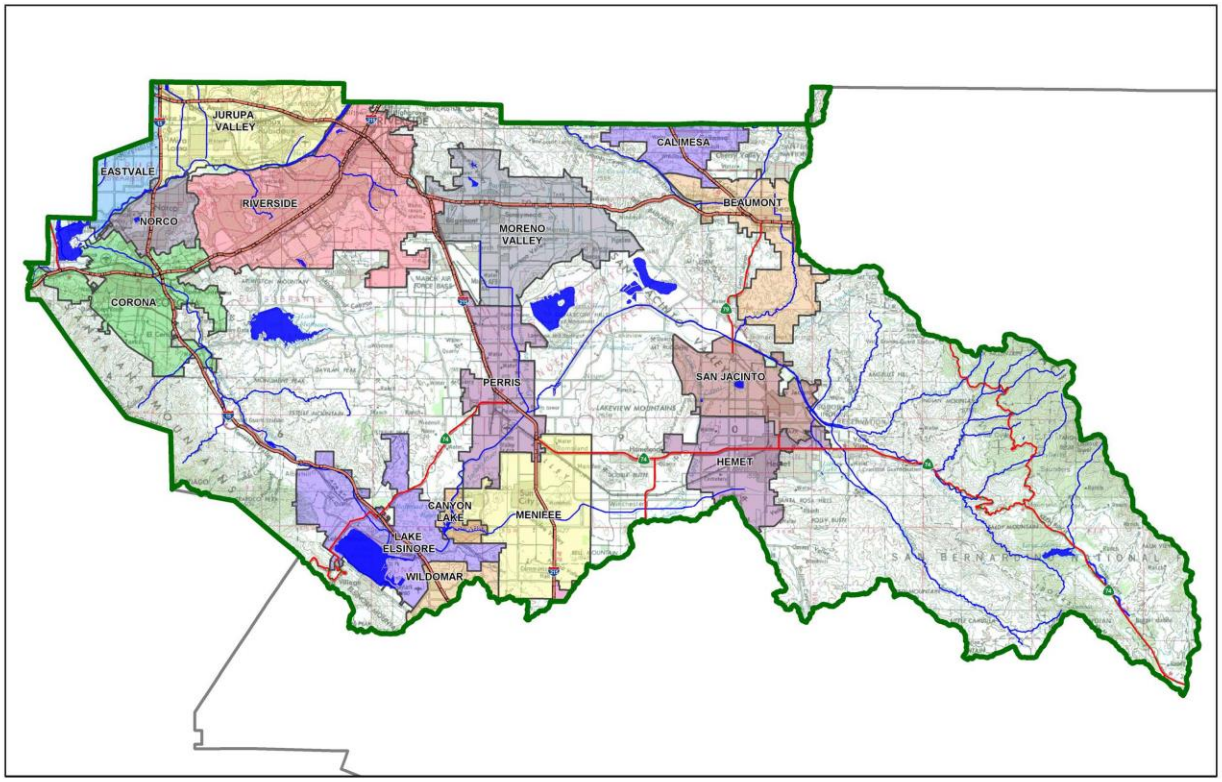
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: CACTUS COMMERCE

Development No: TBD

Design Review/Case No: TBD



☒ **Preliminary**
☐ **Final**

Original Date Prepared: 02/02/2017

Revision Date(s):

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

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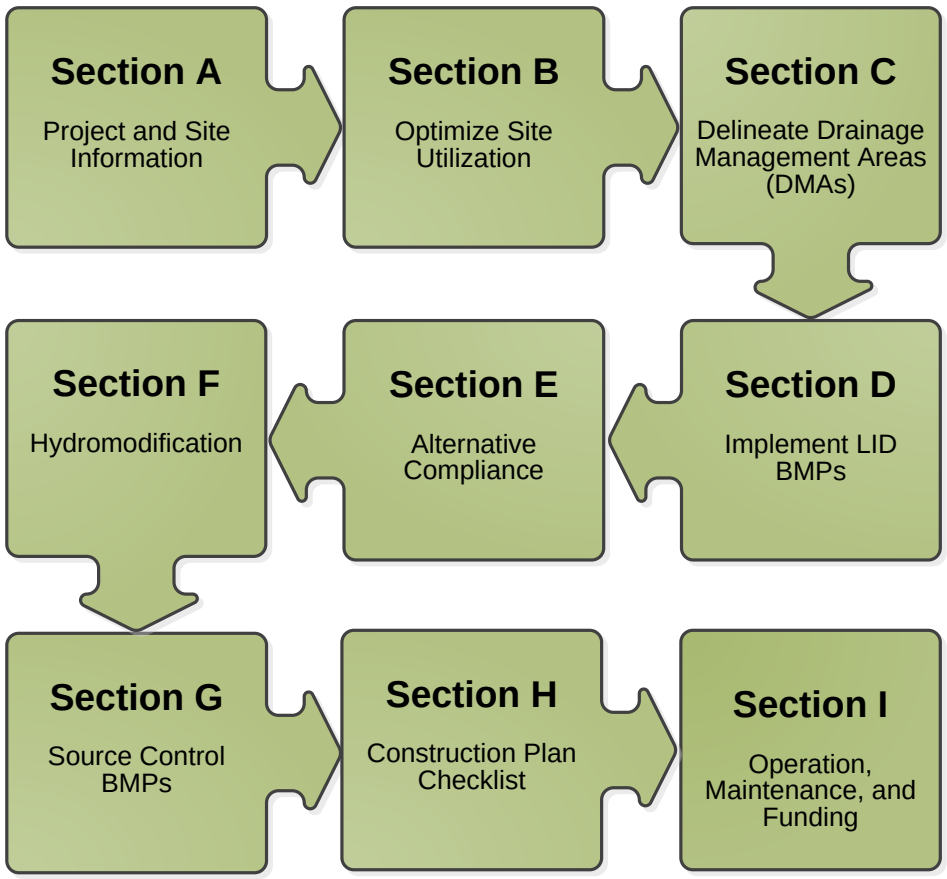
(909) 980-6455

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **P6K Portfolio MVCP, LLC, a Delaware Limited Liability Company** by Salem Engineering Group, Inc. for the **Cactus Commerce** project.

This WQMP is intended to comply with the requirements of City of Moreno Valley for Water Quality Ordinance which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Moreno Valley Water Quality Ordinance (Municipal Code Section R8-2010-0033).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Hagop Kofdarali	Managing Member .
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature	Date
Francisco V. Magos II	Civil Department Manager
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Commercial
Planning Area:	BPX – BUSINESS PARK MIXED USE
Community Name:	BPX – BUSINESS PARK MIXED USE
Development Name:	Cactus Commerce
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°54'39.54"N, 117°16'23.80"W	
Project Watershed and Sub-Watershed: Santa Ana Watershed, Perris Reservoir Sub-Watershed	
Gross Acres: 6.31 Acres	
APN(s): 297-130-052, 053, 054	
Map Book and Page No.: Parcels 8, 9, 10 of Parcel Map No. 27732 in the City of Moreno Valley, County of Riverside, State of California, and Book 195 Pages 75-79 shown by Map on file in the Office of the County Recorder.	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Commercial
Proposed or Potential SIC Code(s)	4225, 5399, 5541, 5812, 7542
Area of Impervious Project Footprint (SF)	167,590
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	151,158
Does the project consist of offsite road improvements?	☒ Y ☐ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	
What is the Water Quality Design Storm Depth for the project?	0.622

A.1 Maps and Site Plans

The existing site is 6.31 acres of undeveloped land located on the northeast corner of Cactus Avenue and Commerce Center Drive. The proposed site includes the development of gas stations, retail shops, restaurants, a convenience store, warehouse, and car wash.

Appendix 1 includes maps showing Drainage Management Areas, drainage paths, locations of the drainage facilities as well as the layout of the proposed development.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Canyon Lake	Nutrients, Pathogens	MUN, AGR, GWR, REC1. REC2, WARM, WILD	N/A
Elsinore Lake	Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs, Sediment Toxicity, Unknown Toxicity	MUN*, REC1, REC2, WARM, WILD	N/A
Temescal Creek, Reach 6	Indicator Bacteria	GWR, REC1, REC2, WARM, WILD	N/A
Santa Ana River, Reach 4	Pathogens	GWR, REC1, REC2, WARM, WILD	N/A

* MUN applies upstream of Orange Avenue (Redlands); downstream, water is excepted from MUN

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☐ Y	☒ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☒ Y	☐ N
Other *(please list in the space below as required)*	☐ Y	☒ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Section B: Optimize Site Utilization (LID Principles)

The major constrains for this project were low permeability of the soil and flat terrain. LID BMPS were implemented in the development of the site. Due to the regulations implemented by the City of Moreno Valley, the site was designed to store the runoff for a 10 and 100 year 1 hour storm. A mix use of pervious pavers and biotreatment basins were strategically located to allow the perforated pipe to collect the filtrated storm runoff to an existing storm drain line located along Cactus Avenue.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

No, the existing site is a vacant flat dirt pad. Water absorbs underground and sheet flows to storm drain inlets. The development will propose a carwash, gas station, convenience store, warehouse, and a drive thru restaurant. Pervious pavers and biotreatment basins will be incorporated into the construction to treat the water.

Did you identify and protect existing vegetation? If so, how? If not, why?

No, the existing site is a vacant graded pad. No existing vegetation on site.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

No, the infiltration rates for the site are minimal, per the geotechnical report, Appendix 3. Therefore, biotreatment basins and pervious pavers were included in the proposed design.

Did you identify and minimize impervious area? If so, how? If not, why?

Yes, the development will propose pervious pavers and Biotreatment basins.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, the site was graded to direct runoff to adjacent pervious areas. Pervious pavers and biotreatment basins were placed to capture the runoff.

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Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
A1	Roof	1680	Type D
A2	Concrete/Asphalt	26205	Type D
A3	Landscape	1450	Type D
A4	Biotreatment Basin	5134	Type D
B1	Roof	3863	Type D
B2	Concrete/Asphalt	13272	Type D
B3	Landscape	2945	Type D
B4	Biotreatment Basin	2741	Type D
C1	Roof	4988	Type D
C2	Concrete/Asphalt	15298	Type D
C3	Landscape	1659	Type D
C4	Biotreatment Basin	955	Type D
D1	Roof	5611	Type D
D2	Concrete/Asphalt	36213	Type D
D3	Landscape	7198	Type D
D4	Biotreatment Basin	2394	Type D
E1	Roof	16146	Type D
E2	Concrete/Asphalt	6366	Type D
E3	Landscape	2209	Type D
E4	Biotreatment Basin	648	Type D
F1	Roof	8902	Type D
F2	Concrete/Asphalt	12744	Type D
F3	Landscape	3563	Type D
F4	Biotreatment Basin	1548	Type D
G1	Roof	13602	Type D
G2	Concrete/Asphalt	8113	Type D
G3	Landscape	151	Type D
G4	Biotreatment Basin	1980	Type D
H2	Concrete/Asphalt	14350	Type D
H3	Landscape	744	Type D
H4	Biotreatment Basin	443	Type D
I2	Concrete/Asphalt	4589	Type D
I3	Landscape	348	Type D
I4	Biotreatment Basin	332	Type D
J2	Concrete/Asphalt	10425	Type D

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J3	Landscape	2111	Type D
J4	Biotreatment Basin	285	Type D
K2	Concrete/Asphalt	1909	Type D
K3	Landscape	25	Type D
K4	Biotreatment Basin	202	Type D
L1	Roof	1689	Type D
L2	Concrete/Asphalt	7039	Type D
L3	Landscape	2085	Type D
L4	Biotreatment Basin	637	Type D
M2	Concrete/Asphalt	3799	Type D
M3	Landscape	313	Type D
M4	Biotreatment Basin	281	Type D
N1	Roof	1574	Type D
N2	Concrete/Asphalt	8419	Type D
N3	Landscape	4940	Type D
N4	Biotreatment Basin	419	Type D

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)

N/A

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet)	Storm Depth (inches)	DMA Name / ID	[C] from Table C.4 =	Required Retention Depth (inches)
		[A]	[B]		[C]	[D]

N/A

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					**Receiving Self-Retaining DMA**		
DMA Name/ ID	Area (square feet)	Post-project surface type	Impervious fraction	Product		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]

N/A

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Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
A1, A2, A3	Biotreatment Basin / A4
B1, B2, B3	Biotreatment Basin / B4
C1, C2, C3	Biotreatment Basin / C4
D1, D2, D3	Biotreatment Basin / D4
E1, E2, E3	Biotreatment Basin / E4
F1, F2, F3	Biotreatment Basin / F4
G1, G2, G3	Biotreatment Basin / G4
H2, H3	Biotreatment Basin / H4
I2, I3	Biotreatment Basin / I4
J2, J3	Biotreatment Basin / J4
K2, K3	Biotreatment Basin / K4
L1, L2, L3	Biotreatment Basin / L4
M2, M3	Biotreatment Basin / M4
N1, N2, N3	Biotreatment Basin / N4

The percolation tests from the geotechnical report show infiltration to be infeasible, therefore, perforated pipes are used for the biotreatment basins and the permeable paving blocks to filtrate the stormwater prior to discharging it into the existing storm drain main.

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Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	X	
If Yes, list affected DMAs: all of them		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

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D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☐The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 1.19 AC

Type of Landscaping (Conservation Design or Active Turf): *Conservation Design*

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 4.74 AC

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: 1.17

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 5.55 AC

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
5.55	1.19

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Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 500

Project Type: Commercial

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 4.74

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 135.96

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: 644

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
644	500

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

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Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3: N/A

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
N/A	N/A

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☒ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

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D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
A4	☐	☐	☐	☒	☐
B4	☐	☐	☐	☒	☐
C5	☐	☐	☐	☒	☐
D4	☐	☐	☐	☒	☐
E4	☐	☐	☐	☒	☐
F4	☐	☐	☐	☒	☐
G5	☐	☐	☐	☒	☐
H5	☐	☐	☐	☒	☐
I5	☐	☐	☐	☒	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

N/A

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D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First, calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type /ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
A1	1,680	Roofs	1	0.89	1498.6	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A2	26,205	Concrete/ Asphalt	1	0.892	23374.9			
A3	1,450	Landscape	0.1	0.110458	160.2			
A4	5,134	Biotreatment Basin	0.1	0.110458	567.1			
	34469				25600.8	0.62	1327	6725.5
B1	3,863	Roofs	1	0.89	3445.8	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B2	13,272	Concrete/ Asphalt	1	0.892	11838.6			
B3	2,945	Landscape	0.1	0.110458	325.3			
B4	2,741	Biotreatment Basin	0.1	0.110458	302.8			
	22821				15912.5	0.62	824.8	3590.7
C1	4,988	Roofs	1	0.89	4449.3	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
C2	15,298	Concrete/ Asphalt	1	0.892	13645.8			
C3	1,659	Landscape	0.1	0.110458	183.2			
C4	955	Biotreatment Basin	0.1	0.110458	105.5			
	22900				18383.8	0.62	952.9	1289

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D1	5,611	Roofs	1	0.89	5005	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D2	36,213	Concrete/ Asphalt	1	0.892	32302			
D3	7,198	Landscape	0.1	0.110458	795.1			
D4	2,394	Biotreatment Basin	0.1	0.110458	264.4			
	51416				38366.5	0.62	1988.7	3231.9
E1	16,146	Roofs	1	0.89	14402.2	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
E2	6,366	Concrete/ Asphalt	1	0.892	5678.5			
E3	2,209	Landscape	0.1	0.110458	244			
E4	648	Biotreatment Basin	0.1	0.110458	71.6			
	25369				20396.3	0.62	1057.2	1062.7
F1	8,902	Roofs	1	0.89	7940.6	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
F2	12,744	Concrete/ Asphalt	1	0.892	11367.6			
F3	3,563	Landscape	0.1	0.110458	393.6			
F4	1,548	Biotreatment Basin	0.1	0.110458	171			
	26757				19872.8	0.62	1030.1	1981.4
G1	13,602	Roofs	1	0.89	12133	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
G2	8,113	Concrete/ Asphalt	1	0.892	7237.7			
G3	151	Landscape	0.1	0.110458	16.7			
G4	1,980	Biotreatment Basin	0.1	0.110458	218.7			
	23846				19605.2	0.62	1016.2	2673
H2	14,350	Concrete/ Asphalt	1	0.89	12800	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
H3	744	Landscape	0.1	0.110458	82.2			
H4	443	Biotreatment Basin	0.1	0.110458	48.9			
	15537				12931.3	0.62	670.3	729
I2	4,589	Concrete/ Asphalt	1	0.89	4093.4	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
I3	348	Landscape	0.1	0.110458	38.4			
I4	332	Biotreatment Basin	0.1	0.110458	36.7			
	5269				4168.5	0.62	216.1	448.2

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J2	10,425	Concrete/ Asphalt	1	0.89	9299.1	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
J3	2,111	Landscape	0.1	0.110458	233.2			
J4	285	Biotreatment Basin	0.1	0.110458	31.5			
	12821				9563.8	0.62	495.7	513
K2	1,909	Concrete/ Asphalt	1	0.89	1702.8	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
K3	25	Landscape	0.1	0.110458	2.8			
K4	202	Biotreatment Basin	0.1	0.110458	22.3			
	2136				1727.9	0.62	89.6	272.7
L1	1,689	Roofs	1	0.89	1506.6	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
L2	7,039	Concrete/ Asphalt	1	0.892	6278.8			
L3	2,085	Landscape	0.1	0.110458	230.3			
L4	637	Biotreatment Basin	0.1	0.110458	70.4			
	11450				8086.1	0.62	419.1	860
M2	3,799	Concrete/ Asphalt	1	0.89	3388.7	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
M3	313	Landscape	0.1	0.110458	34.6			
M4	281	Biotreatment Basin	0.1	0.110458	31			
	4393				3454.3	0.62	179	379.4
N1	1,574	Roofs	1	0.89	1404	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
N2	8,419	Concrete/ Asphalt	1	0.892	7509.7			
N3	4,940	Landscape	0.1	0.110458	545.7			
N4	419	Biotreatment Basin	0.1	0.110458	46.3			
	15352				9505.7	0.62	492.7	565.7

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

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Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☐ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☐	☐	☐	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

E.2 Stormwater Credits

N/A

E.3 Sizing Criteria

N/A

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.2 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A	N/A	N/A

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration			
Volume (Cubic Feet)			

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☒ Y ☐ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

East of the property near the 215 FWY.

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-site drain inlets	• Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	• Maintain and periodically repaint or replace inlet markings • Provide stormwater pollution prevention information to new site owners, lessees, or operators. • See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com • Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Landscape/Outdoor	• Preserve existing native trees, shrubs and	• Maintain landscaping using minimum or

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Pesticide Use	ground cover to the maximum extent possible. • Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. • Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. • Consider using pest-resistant plants, especially adjacent to hardscape. • To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	no pesticides. • See applicable operational BMPs in "What you should know for… Landscape and Gardening" at http://www.rivcocob.org/ords/800/859.pdf • Provide IPM information to new owners, lessees and operators.
Food Service	• For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. • Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	• See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater Provide this brochure to new site owners, lessees, and operators.
Refuse areas	• State how site refuse will be handled and provide supporting detail to what is shown on plans. • State the signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	• State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Vehicle and Equipment Cleaning	• If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	• Describe operational measures to implement the following (if applicable): • Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ • Car dealerships and similar may rinse cars with water only.
Fuel Dispensing Areas		• The property owner shall dry sweep the fueling area routinely. • See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Loading Docks		• Move loaded and unloaded items indoors

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

		as soon as possible. • See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Fire Sprinkler Test Water	• Provide a means to drain fire sprinkler test water o the sanitary sewer.	• See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Miscellaneous Drain	• Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. • Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. • Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. • Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. • Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. • Include Controls for other sources as specified by local reviewer.	
Plazas, sidewalks, and parking lots		• Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
A4	Biotreatment Basin	Appendix 2
B4	Biotreatment Basin	Appendix 2
C4	Biotreatment Basin	Appendix 2
D4	Biotreatment Basin	Appendix 2

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

E4	Biotreatment Basin	Appendix 2
F4	Biotreatment Basin	Appendix 2
G4	Biotreatment Basin	Appendix 2
H4	Biotreatment Basin	Appendix 2
I4	Biotreatment Basin	Appendix 2
J4	Biotreatment Basin	Appendix 2
K4	Biotreatment Basin	Appendix 2
L4	Biotreatment Basin	Appendix 2
M4	Biotreatment Basin	Appendix 2
N4	Biotreatment Basin	Appendix 2

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: J & T Management is responsible for BMP Operation and Maintenance

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

VICINITY MAP	SCALE: NTS	DATE: OCT. 2016
CACTUS COMMERCE NEC COMMERCE CTR DR & CACTUS AVE MORENO VALLEY, CA 92553	DRAWN BY: TB	APPROVED BY: FVM
	PROJECT NO. 03-716-1096	FIGURE NO. 1A

SALEM
engineering group, inc.

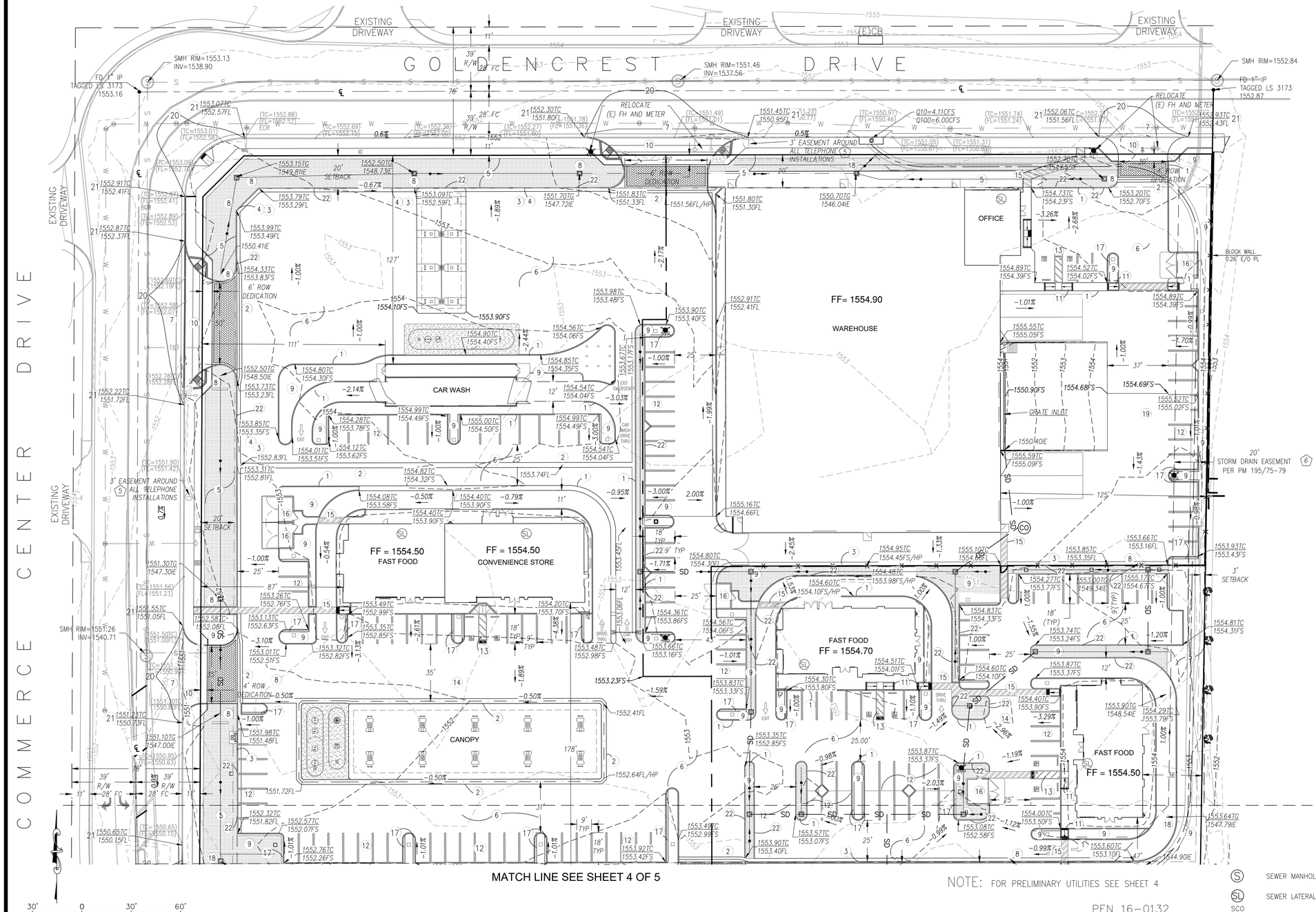
LOCATION MAP	SCALE: NTS	DATE: OCT. 2016
CACTUS COMMERCE NEC COMMERCE CTR DR & CACTUS AVE MORENO VALLEY, CA 92553	DRAWN BY: TB	APPROVED BY: FVM
	PROJECT NO. 03-716-1096	FIGURE NO. 1B

SALEM
engineering group, inc.

Appendix 2: Construction Plans

Grading and Drainage Plans

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-



MATCH LINE SEE SHEET 4 OF 5

NOTE: FOR PRELIMINARY UTILITIES SEE SHEET 4

CONSTRUCTION NOTES

1	CONSTRUCT 6" CURB ONLY PER CITY STANDARD MVSI-121A-0
2	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL 2, SHEET 2
3	CONSTRUCT CURB & GUTTER PER CITY STANDARD MVSI-120A-0
4	2' WIDE CURB OPENING AT EVERY 20 FEET PER DETAIL 3, SHEET 2
5	CONSTRUCT BIO-RETENTION WITH UNDER DRAIN PER DETAIL 9, SHEET 2
6	CONSTRUCT 3" AC / 5" AB CAR TRAFFIC; 3.5" AC / 8.5" AB TRUCK TRAFFIC
7	JOIN EXISTING IMPROVEMENT. VERIFY ELEVATION PRIOR TO CONSTRUCTION.
8	INSTALL 24"X24" NDS DRAIN PER DETAIL 5, SHEET 2
9	CONSTRUCT LANDSCAPE PER LANDSCAPE PLAN
10	CONSTRUCT DRIVEWAY PER CITY STANDARD MVSI-112C-0
11	CONSTRUCT ADA RAMP
12	STRIPE PARKING STALL PER ARCHITECTURAL PLAN
13	STRIPE ADA PARKING STALL PER ADA STANDARD
14	CONSTRUCT PAVERS PER DETAIL 4, SHEET 2
15	PATH OF TRAVEL
16	CONSTRUCT TRASH ENCLOSURE PER ARCHITECTURAL PLAN
17	2' STEP-OUT (TYP)
18	INSTALL 36"X36" NDS DRAIN PER DETAIL 5, SHEET 2
19	PAVEDRAIN SYSTEM PER DETAIL 10 & 11, SHEET 2
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING

LEGEND

- BOUNDARY LINE
- CENTER LINE
- PROPERTY LINE
- CHAIN-LINK FENCE
- GAS LINE
- SEWER LINE
- WATER LINE
- PROPOSED PERFORATED PIPE
- WATER VALVE
- THRUST BLOCK
- END CAP W/THRUST BLOCK
- BIO-RETENTION
- PATH OF TRAVEL
- EXISTING LIGHT
- EXISTING STREET LIGHT
- EXISTING BACKFLOW PREVENTER
- EXISTING WATER METER
- EXISTING SEWER MANHOLE
- POWER POLE
- GUY WIRE ANCHOR
- CATCH BASIN
- METER
- FIRE HYDRANT
- TRAFFIC SIGNAL
- PROPOSED FIRE LINE
- PROPOSED SEWER
- WATER SERVICE
- FIRE SERVICE
- PROPOSED STORMDRAIN
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED GRATE INLET
- PROPOSED STORMDRAIN CLEANOUT
- SEWER MANHOLE
- SEWER LATERAL
- SEWER CLEANOUT

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75-79.

REVIEW BY CITY STAFF

OFFICE	INITIAL	DATE
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PRGM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/
ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER
FRANCISCO V. MAGOS II
No. 73227
Exp. 12/31/18
CIVIL
STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

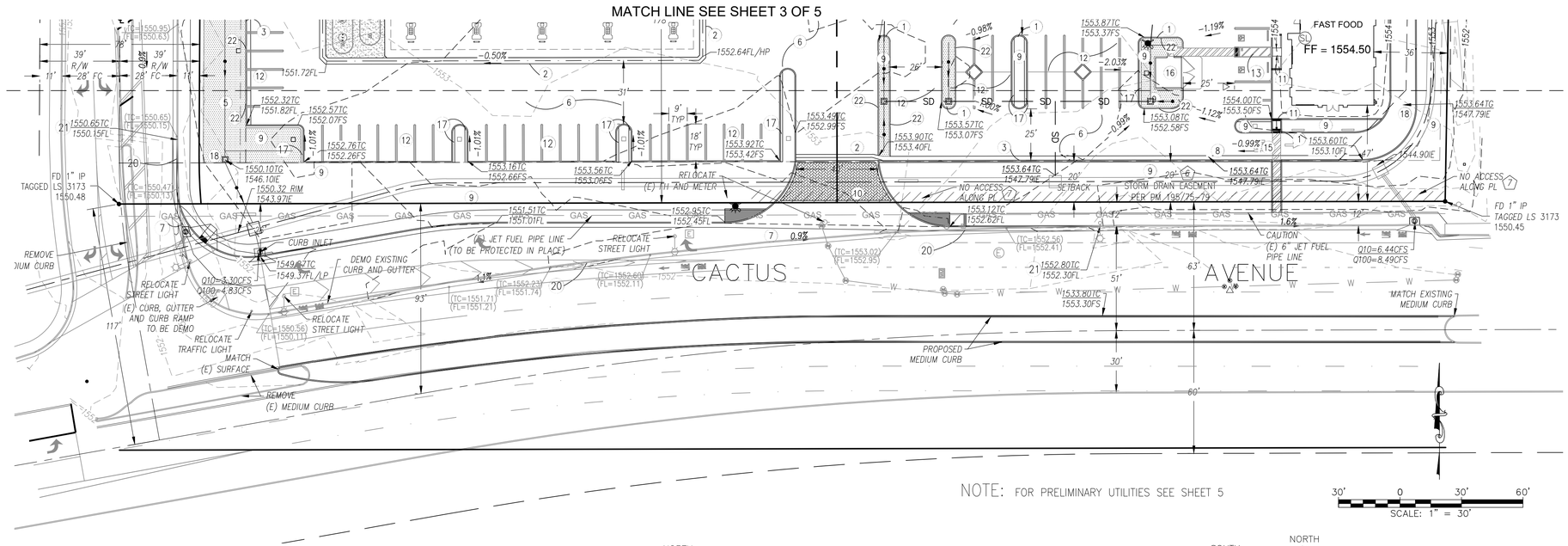
CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING PLAN

SHEET 3 OF 5
CITY ID No

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan))



CONSTRUCTION NOTES

1	CONSTRUCT 6" CURB ONLY PER CITY STANDARD MVSI-121A-0
2	CONSTRUCT 3' WIDE CONCRETE GUTTER PER DETAIL 2, SHEET 2
3	CONSTRUCT CURB & GUTTER PER CITY STANDARD MVSI-120A-0
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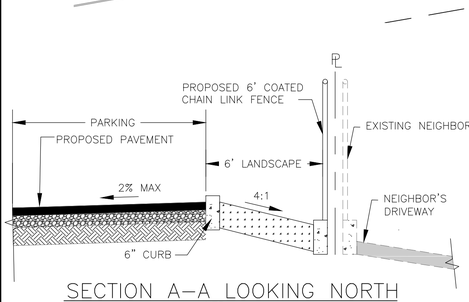
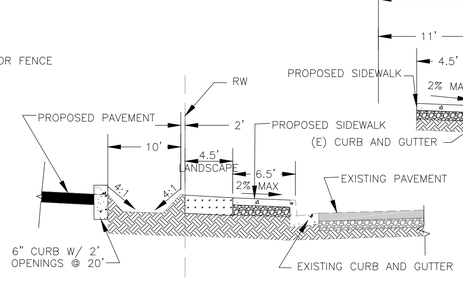
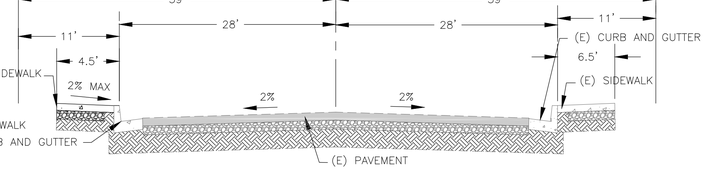
20	DEMO EXISTING CURB AND GUTTER
21	MATCHING EXISTING CURB AND GUTTER
22	1' CURB OPENING



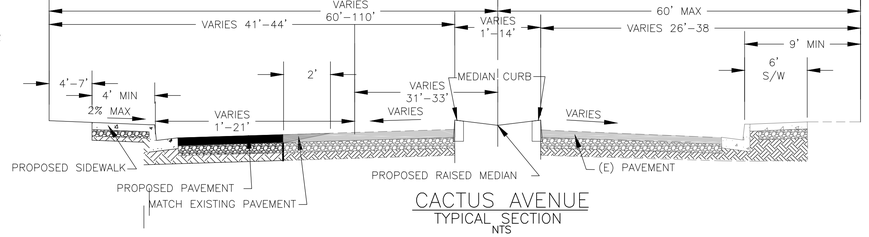
SECTION A–A LOOKING NORTH
NTS



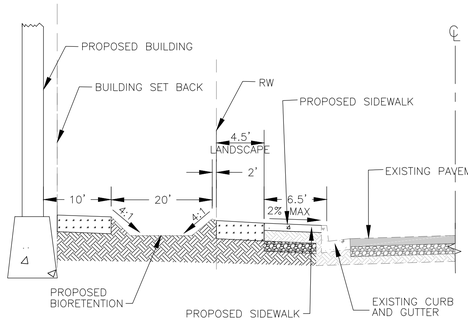
SECTION C–C LOOKING WEST
NTS



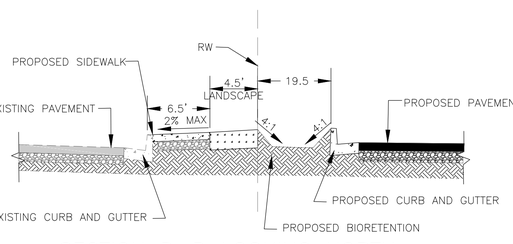
GOLDENCREST AVENUE LOOKING WEST
TYPICAL SECTION PER MVSI-106A-0
NTS



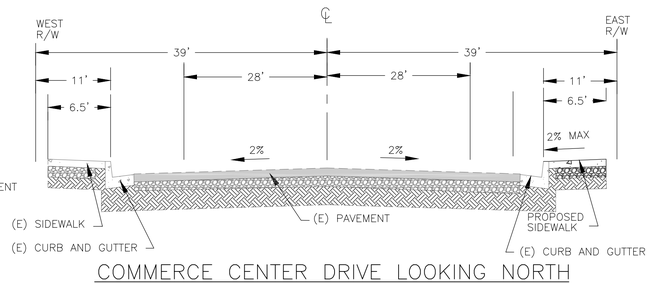
CACTUS AVENUE
TYPICAL SECTION
NTS



SECTION B–B LOOKING WEST
NTS



SECTION D–D LOOKING NORTH
NTS



COMMERCE CENTER DRIVE LOOKING NORTH
TYPICAL SECTION PER MVSIA-0
NTS

LEGEND

	BOUNDARY LINE	PP	POWER POLE
	CENTER LINE		GUY WIRE ANCHOR
	PROPERTY LINE		CATCH BASIN
X X	CHAIN-LINK FENCE	M	METER
GAS	GAS LINE		FIRE HYDRANT
S	SEWER LINE		TRAFFIC SIGNAL
W	WATER LINE	F F	PROPOSED FIRE LINE
	PROPOSED PERFORATED PIPE	S	PROPOSED SEWER
	BIO-RETENTION	W	WATER SERVICE
	PATH OF TRAVEL	F	FIRE SERVICE
SL	SEWER LATERAL	SD	PROPOSED STORMDRAIN
SCO	SEWER CLEANOUT		EXISTING RIGHT-OF-WAY
	EXISTING LIGHT		PROPOSED RIGHT-OF-WAY
	EXISTING STREET LIGHT		PROPOSED GRATE INLET
BP	EXISTING BACKFLOW PREVENTER	CO	PROPOSED STORMDRAIN CLEANOUT
WM	EXISTING WATER METER		END CAP W/THRUST BLOCK
SMH	EXISTING SEWER MANHOLE		WATER VALVE
			THRUST BLOCK

PEN 16-0132
(PA16-0004)

PRELIMINARY

BENCHMARK	BASIS OF BEARING
BENCHMARK: M62-69 BRASS DISK IN TOP OF CONCRETE POST BETWEEN ALESSANDRO BOULEVARD AND SHERMAN Elev. 1551.102 FEET	THE BASIS OF BEARING IS PER THE CENTERLINE OF COMMERCE CENTER DRIVE, BEING N00°16'33"E AS SHOWN ON PARCEL MAP NO. 27732, ON FILE IN BOOK 195, PAGES 75–79.

REVIEW BY CITY STAFF		
OFFICE	INITIAL	DATE
ENGINEERING DIVISION MANAGER		
LAND DEVELOPMENT		
PLANNING		
TRANSPORTATION		
PARKS AND COMMUNITY SERVICES		
SPECIAL DISTRICTS		
STORM WATER MANAGEMENT PRGM		

MARK	DATE	INITIAL	DESCRIPTION	REC.	APPR	DATE
		E.O.R.	REVISION			

CITY OF MORENO VALLEY APPROVALS

RECOMMENDED:

MARGERY A. LAZARUS — DATE
INTERIM CAPITAL PROJECTS DIVISION MANAGER/ ASSISTANT CITY ENGINEER
R.C.E. #C43526

APPROVED:

AHMAD R. ANSARI — DATE
PUBLIC WORKS DIRECTOR/CITY ENGINEER
R.C.E. #C51318

ENGINEER OF RECORD'S SEAL

REGISTERED PROFESSIONAL ENGINEER FRANCISCO V. MAGOS II No. 73,227 Exp. 12/31/18 CIVIL STATE OF CALIFORNIA

SALEM ENGINEERING GROUP, INC
11650 MISSION PARK DRIVE, SUITE 108
RANCHO CUCAMONGA, CA 91730
PHONE: (909) 980-6455
FAX: (909)980-6435

UNDER THE SUPERVISION OF:

FRANCISCO V. MAGOS II, PE — DATE
R.C.E. 75227 (EXP. 12/31/2018)

CITY OF MORENO VALLEY

PRELIMINARY GRADING PLAN
NEC CACTUS AVE & COMMERCE CENTER DRIVE
PARCELS 8, 9 10 OF PARCEL MAP NO. 27732

PRELIMINARY GRADING AND STREET SECTIONS

SHEET 4 OF 5

CITY ID No

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

GEOTECHNICAL • ENVIRONMENTAL • GEOLOGY • MATERIALS TESTING & INSPECTION • FORENSIC • LABORATORY

SALEM
engineering group, inc.

GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

SALEM PROJECT NO. 3-215-1091
NOVEMBER 25, 2015

PREPARED FOR:

MR. INO CRUZ
J&T BUSINESS MANAGEMENT
139 RADIO ROAD
CORONA, CA 92879

PREPARED BY:

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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

SALEM engineering group, inc.

11650 Mission Park Dr., #108
Rancho Cucamonga, CA 91730
Phone (909) 980-6455
Fax (909) 980-6435

November 25, 2015 Project No. 3-215-1091

Mr. Ino Cruz
J&T Business Management
139 Radio Road
Corona, CA 92879

SUBJECT: GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

Dear Mr. Cruz:

At your request and authorization, SALEM Engineering Group, Inc. (SALEM) has prepared this Geotechnical Engineering Investigation report for the Proposed Moreno Valley Cactus Center to be located at the subject site.

The accompanying report presents our findings, conclusions, and recommendations regarding the geotechnical aspects of designing and constructing the project as presently proposed. In our opinion, the proposed project is feasible from a geotechnical viewpoint provided our recommendations are incorporated into the design and construction of the project.

We appreciate the opportunity to assist you with this project. Should you have questions regarding this report or need additional information, please contact the undersigned at (909) 980-6455.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

Clarence Jiang, GE
Senior Geotechnical Engineer
RGE 2477

R. Sammy Salem, MS, PE, GE
Principal Engineer
RCE 52762 / RGE 2549

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

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- Percolation Test Results, P-1 through P-6

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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

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GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED MORENO VALLEY CACTUS CENTER
NEC CACTUS AVENUE & COMMERCE CENTER DRIVE
MORENO VALLEY, CALIFORNIA

1. PURPOSE AND SCOPE

This report presents the results of our Geotechnical Engineering Investigation for the Proposed Moreno Valley Cactus Center to be located at the northeast corner of the intersection of Cactus Avenue and Commerce Center Drive in Moreno Valley, California (see Figure 1, Vicinity Map).

The purpose of our geotechnical engineering investigation was to observe and sample the subsurface conditions encountered at the site, and provide conclusions and recommendations relative to the geotechnical aspects of constructing the project as presently proposed.

The scope of this investigation included a field exploration, laboratory testing, engineering analysis and the preparation of this report. Our field exploration was performed on November 17, 2015 and included the drilling of sixteen (16) small-diameter soil borings to a maximum depth of 50 feet at the site. Additionally, six (6) percolation tests were performed at a depth of approximately 5 feet below existing grade for determination of the percolation rate. The locations of the soil borings and percolation tests are depicted on Figure 2, Site Plan. A detailed discussion of our field investigation, exploratory boring logs and percolation test results are presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to evaluate pertinent physical properties for engineering analyses. Appendix B presents the laboratory test results in tabular and graphic format.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions.

If project details vary significantly from those described herein, SALEM should be contacted to determine the necessity for review and possible revision of this report. Earthwork and Pavement Specifications are presented in Appendix C. If text of the report conflict with the specifications in Appendix C, the recommendations in the text of the report have precedence.

2. PROJECT DESCRIPTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structure are unavailable. On a preliminary basis, the development of the site will include construction of a total of six (6) commercial buildings and two (2) fuel pump canopies. The buildings will include a 2,080 square-foot car wash, a 3,800 square-foot

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

convenience store, a 2,800 square-foot fast food restaurant #1, a 3,200 square-foot fast food restaurant #2, a 3,200 square-foot fast food restaurant #3, and a 48,140 square-foot warehouse/office building. The canopies will include a 6,165 square-foot 10-pump gasoline canopy and a 4-pump diesel canopy. On-site parking and landscaping are planned to be associated with the development. Maximum wall load is expected to be on the order of 3.5 kips per linear foot. Maximum column load is expected to be on the order of 100 kips. Floor slab bearing pressure is expected to be on the order of 150 psf.

Concrete and asphaltic concrete pavement for parking area, customers travel lanes, and truck lane are to be designed for standard duty and heavy-duty traffic loading based on an Equivalent Single Axle Load (ESAL) of 18 kips, a maximum load of 60,000 ESAL and a design life of 20 years. The pavement design recommendations provided herein are based on the State of California Department (CALTRANS) design manual.

Based on the initial site grading plan provided to us and our field observation, we anticipate that cuts and fills during earthwork will be minimal and limited to providing level pads and positive site drainage. In the event that changes occur in the nature or design of the project, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions of our report are modified. The site configuration and locations of proposed improvements are shown on the Site Plan, Figure 1.

3. SITE LOCATION AND DESCRIPTION

The site is rectangular in shape and encompasses approximately 6.3 acres. The subject site is located on the northeast corner of the intersection of Cactus Avenue and Commerce Center Drive in the City of Moreno Valley, California (see Vicinity Map, Figure 1). The site is currently vacant with sparse vegetation and weeds. The site is enclosed by a chain-linked fence. The site is predominantly surrounded by industrial and commercial developments. The site is relatively flat with no major changes in grade. The average elevation of the site is approximately 1,563 feet above mean sea level (AMSL), based on Google Earth Imagery.

4. FIELD EXPLORATION

Our field exploration consisted of site surface reconnaissance and subsurface exploration. The exploratory test borings (B-1 through B-16) were drilled on November 17, 2015 in the area shown on the Site Plan, Figure 2. The test borings were advanced with a 6½ -inch diameter hollow stem auger rotated by a truck-mounted Mobile B-61 drill rig. The test borings were extended to depths of 10 to 50 feet below existing grade.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by a field engineer and stratification lines were approximated on the basis of observations made at the time of drilling. Visual classification of the materials encountered in the test borings were generally made in accordance with the Unified Soil Classification System (ASTM D2487). A soil classification chart and key to sampling is presented on the Unified Soil Classification Chart, in Appendix "A." The logs of the test borings are presented in Appendix "A." The Boring Logs include the soil type, color, moisture content, dry density, and the applicable Unified Soil Classification System symbol. The location of the test borings were determined by measuring from features shown on the Site

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Plan, provided to us. Hence, accuracy can be implied only to the degree that this method warrants. The actual boundaries between different soil types may be gradual and soil conditions may vary. For a more detailed description of the materials encountered, the Boring Logs in Appendix "A" should be consulted.

Soil samples were obtained from the test borings at the depths shown on the logs of borings. The MCS samples were recovered and capped at both ends to preserve the samples at their natural moisture content; SPT samples were recovered and placed in a sealed bag to preserve their natural moisture content. The borings were backfilled with soil cuttings after completion of the drilling.

5. LABORATORY TESTING

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory-testing program was formulated with emphasis on the evaluation of natural moisture, density, shear strength, consolidation potential, expansion index, maximum density and optimum moisture determination, and gradation of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and the results of laboratory test are summarized in Appendix "B." This information, along with the field observations, was used to prepare the final boring logs in Appendix "A."

6. GEOLOGIC SETTING

The subject site is located within the Peninsular Range Geomorphic Province, an area characterized by active northeast trending strike slip faults, including the San Jacinto to the northwest, and the Elsinore to the southwest. The project site is situated between the Santa Rosa Mountains and the San Jacinto Mountains to the east; and Santa Ana Mountains to the west and south. The near-surface deposits in the vicinity of the subject site are comprised of recent alluvium consisting of unconsolidated sands, silt, and clays derived from erosion of local mountain ranges. Deposits encountered on the subject site during exploratory drilling are discussed in detail in this report.

7. GEOLOGIC HAZARDS

7.1 Faulting and Seismicity

The Peninsular Range has historically been a province of relatively high seismic activity. The nearest faults to the project site are associated with the San Jacinto Fault system located approximately 6.8 miles from the site. There are no known active fault traces in the project vicinity. Based on mapping and historical seismicity, the seismicity of the Peninsular Range has been generally considered high by the scientific community.

The project area is not within an Alquist-Priolo Earthquake Fault (Special Studies) Zone and will not require a special site investigation by an Engineering Geologist. Soils on site are classified as Site Class D in accordance with Chapter 16 of the California Building Code. The proposed structures are determined to be in Seismic Design Category D. To determine the distance of known active faults within 100 miles of the site, we used the United States Geological Survey (USGS) web-based application *2008 National Seismic Hazard Maps - Fault Parameters.* Site latitude is 33.9109° North; site longitude is 117.2734° West. The ten closest active faults are summarized below in Table 7.1.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

TABLE 7.1
REGIONAL FAULT SUMMARY

Fault Name	Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
San Jacinto; SBV+SJV+A+CC+B+SM	6.8	7.9
San Jacinto; SBV	7.6	7.1
San Jacinto; A+CC+B+SM	9.5	7.6
Elsinore; W+GI+T+J+CM	15.8	7.8
S. San Andreas; PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	16.2	8.2
S. San Andreas; PK+CH+CC+BB+NM+SM+NSB	16.7	8.0
Chino, alt 2	17.9	6.8
Elsinore; T+J+CM	18.1	7.6
Chino, alt 1	19.1	7.0
Elsinore; W	20.9	7.0

The faults tabulated above and numerous other faults in the region are sources of potential ground motion. However, earthquakes that might occur on other faults throughout California are also potential generators of significant ground motion and could subject the site to intense ground shaking.

7.2 Surface Fault Rupture

The site is not within a currently established State of California Earthquake Fault Zone for surface fault rupture hazards. No active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low.

7.3 Ground Shaking

We used the USGS web-based application *US Seismic Design Maps* to estimate the peak ground acceleration adjusted for site class effects (PGA_M). Because of the proximity to the subject site and the maximum probable events for these faults, it appears that a maximum probable event along the fault zones could produce a peak horizontal acceleration of approximately 0.520g (2% probability of being exceeded in 50 years). While listing PGA is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and soil conditions underlying the site.

7.4 Liquefaction

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. Primary factors that trigger liquefaction are: moderate to strong ground shaking (seismic source), relatively clean, loose granular soils (primarily poorly graded sands and silty sands), and saturated soil conditions (shallow groundwater). Due to the increasing overburden pressure with depth, liquefaction of granular soils is generally limited to the upper 50 feet of a soil profile. However, liquefaction has occurred in soils other than clean sand.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

The soils encountered within the depth of 50 feet on the project site consisted predominately of silty sand/sandy silt with trace clay, silty sand with varying amounts of clay, sandy silt with varying amounts of clay, clayey silt, silty sand/sand and sand. The historically highest groundwater is estimated to be at a depth of 10 feet below ground surface according to the County of Riverside Geologic Hazards Map (2004) and regional groundwater well data. Low to very low cohesion strength is associated with the sandy soil. A seismic hazard, which could cause damage to the proposed development during seismic shaking, is the post-liquefaction settlement of the liquefied sands. The potential for soil liquefaction during a seismic event was evaluated using LiqIT computer program (version 4.7.5) developed by GeoLogismiki of Greece. For the analysis, a maximum earthquake magnitude of 8.2 M_w and a peak horizontal ground surface acceleration of 0.52g (with a 2 percent probability of exceedance in 50 years) and a groundwater depth of 10 feet were considered appropriate for the liquefaction analysis. The liquefaction analysis indicated that the site soils had a low potential for liquefaction and the total liquefaction-induced settlement was calculated to be negligible.

7.5 Lateral Spreading

Lateral spreading is a phenomenon in which soils move laterally during seismic shaking and is often associated with liquefaction. The amount of movement depends on the soil strength, duration and intensity of seismic shaking, topography, and free face geometry. Due to the relatively flat site topography and low liquefaction potential, we judge the likelihood of lateral spreading to be low.

7.6 Landslides

There are no known landslides at the site, nor is the site in the path of any known or potential landslides. We do not consider the potential for a landslide to be a hazard to this project.

7.7 Tsunamis and Seiches

The site is not located within a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site. Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

8. SOIL AND GROUNDWATER CONDITIONS

8.1 Subsurface Conditions

The subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the soils within the depth of exploration consisted of alluvium deposits of medium dense to dense silty sand/sandy silt with trace clay, medium dense to very dense silty sand with varying amounts of clay, very stiff to hard sandy silt with varying amounts of clay, stiff clayey silt, dense silty sand/sand and sand.

Organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. The organic materials are not suitable to be used to support the proposed structures. Thicker organic material may be present onsite between our test borings. Verification of the extent of the organic material should be determined during site grading. Field and laboratory tests

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

suggest that the deeper native soils are moderately strong and slightly compressible. These soils extended to the termination depth of our borings.

The soils were classified in the field during the drilling and sampling operations. The stratification lines were approximated by the field engineer on the basis of observations made at the time of drilling. The actual boundaries between different soil types may be gradual and soil conditions may vary. For a more detailed description of the materials encountered, the Boring Logs in Appendix "A" should be consulted. The Boring Logs include the soil type, color, moisture content, dry density, and the applicable Unified Soil Classification System symbol. The locations of the test borings were determined by measuring from feature shown on the Site Plan, provided to us. Hence, accuracy can be implied only to the degree that this method warrants.

8.2 Groundwater

The test boring locations were checked for the presence of groundwater during and after the drilling operations. Free groundwater was encountered during this investigation at a depth of approximately 29 feet below existing grades. The historically highest groundwater is estimated to be at a depth of 10 feet below ground surface according to the County of Riverside Geologic Hazards Map (2004) and regional groundwater well data. It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, localized pumping, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

8.3 Soil Corrosion Screening

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete and the soil. The 2011 Edition of ACI 318 (ACI 318) has established criteria for evaluation of sulfate and chloride levels and how they relate to cement reactivity with soil and/or water.

A soil sample was obtained from the project site and was tested for the evaluation of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts and soluble chloride. The water-soluble sulfate concentration in the saturation extract from the soil sample was detected to be 187 mg/kg. ACI 318 Tables 4.2.1 and 4.3.1 outline exposure categories, classes, and concrete requirements by exposure class. ACI 318 requirements for site concrete based upon soluble sulfate are summarized in Table 8.3 below.

TABLE 8.3
WATER SOLUBLE SULFATE EXPOSURE REQUIREMENTS

Water Soluble Sulfate (SO_4) in Soil, Percentage by Weight	Exposure Severity	Exposure Class	Maximum w/cm Ratio	Minimum Concrete Compressive Strength	Cementations Materials Type
0.0187	Not Applicable	S0	N/A	2,500 psi	No Restriction

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

The water-soluble chloride concentration detected in saturation extract from the soil samples was 112 mg/kg. This level of chloride concentration is considered mildly to moderately corrosive. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, applicable manufacturer's recommendations for corrosion protection of buried metal pipe be closely followed.

8.4 Percolation Testing

Six percolation tests (P-1 through P-6) were performed within assumed infiltration areas and were conducted in accordance with in accordance with the guidelines established by the County of Riverside. The approximate locations of the percolation tests are shown on the attached Site Plan, Figure 2. Seven-inch diameter boreholes were advanced to the depths shown on the percolation test worksheets. The holes were pre-saturated a minimum of 18 hours and maximum of 24 hours before percolation testing commenced. Percolation rates were measured by filling the test holes with clean water and measuring the water drops at a certain time interval.

The percolation rate data are presented in tabular format at the end of this Report. The difference in the percolation rates are reflected by the varied type of soil materials at the bottom of the test holes. The test results are shown on the table below.

Test No.	Depth (feet)	Measured Percolation Rate (min/inch)	Tested Infiltration Rate* (inch/hour)	Soil Type
P-1	5	62.5	0.19	Silty Sand (SM) w/trace clay
P-2	5	41.7	0.32	Silty Sand (SM) w/trace clay
P-3	5	50.0	0.25	Silty Sand (SM) w/trace clay
P-4	5	125.0	0.07	Silty Sand (SM) w/trace clay
P-5	5	83.3	0.12	Silty Sand (SM) w/trace clay
P-6	5	83.3	0.17	Silty Sand (SM) w/trace clay

*** Tested infiltration Rate = (ΔH 60 r) / (Δt(r + 2H_{avg}))**

The soil infiltration or percolation rates are based on tests conducted with clear water. The infiltration/percolation rates may vary with time as a result of soil clogging from water impurities. The infiltration/percolation rates will deteriorate over time due to the soil conditions and an appropriate factor of safety (FS) may be applied. The owner or civil engineer may elect to use a lower FS for the design; however, more frequent maintenance will be expected. The soils may also become less permeable to impermeable if the soil is compacted. Thus, periodic maintenance consisting of clearing the bottom of the drainage system of clogged soils should be expected.

The infiltration/percolation rate may become slower if the surrounding soil is wet or saturated due to prolonged rainfalls. Additional percolation tests may be conducted at bottom of the drainage system during construction to verify the infiltration/percolation rate. Groundwater, if closer to the bottom of the drainage system, will also reduce the infiltration/percolation rate.

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The scope of our services did not include a groundwater study and was limited to the performance of percolation testing and soil profile description, and the submitted data only. Our services did not include those associated with septic system design. Neither did services include an Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands.

Any statements, or absence of statements, in this report or on any boring logs regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment. The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices. The work conducted through the course of this investigation, including the preparation of this report, has been performed in accordance with the generally accepted standards of geotechnical engineering practice, which existed in the geographic area at the time the report was written. No other warranty, express or implied, is made.

Please be advised that when performing percolation testing services in relatively small diameter borings, that the testing may not fully model the actual full scale long term performance of a given site. This is particularly true where percolation test data is to be used in the design of large infiltration system such as may be proposed for the site.

The measured percolation rate includes dispersion of the water at the sidewalls of the boring as well as into the underlying soils. Subsurface conditions, including percolation rates, can change over time as fine-grained soils migrate. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site is suitable for the proposed construction of improvements at the site as planned, provided the recommendations contained in this report are incorporated into the project design and construction. Conclusions and recommendations provided in this report are based on our review of available literature, analysis of data obtained from our field exploration and laboratory testing program, and our understanding of the proposed development at this time.

9.1.2 The primary geotechnical constraints identified in our investigation is the presence of organic and potentially compressible material at the site. Recommendations to mitigate the effects of these soils are provided in this report.

9.1.3 Slight to abundant organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. Thicker organic materials may be present onsite between our test boring locations. Verification of the extent of the organic materials should be determined during site grading. All organic materials in excess of 3 percent by volume are not suitable to support the proposed structures and should be removed and

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replaced with Engineered Fill. Moreover, undocumented fill materials are not suitable to support any future structures and should be replaced with Engineered Fill. The extent and consistency of the organic material or fills should be verified during site construction. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify the fill condition.

9.1.4 Site demolition activities shall include removal of all surface obstructions not intended to be incorporated into final site design. In addition, underground buried structures and/or utility lines encountered during demolition and construction should be properly removed and the resulting excavations backfilled with Engineered Fill. It is suspected that possible demolition activities of the existing structures may disturb the upper soils. After demolition activities, it is recommended that disturbed soils be removed and/or recompacted.

9.1.5 The upper 2 to 4 inches of the soils containing, vegetation, roots and other objectionable organic matter encountered at the time of grading should be stripped and removed from the surface. Deeper stripping may be required in localized areas. The stripped vegetation will not be suitable for use as Engineered Fill but may be stockpiled and reused in landscape or non-structural areas or exported from the site.

9.1.6 The near-surface onsite soils are moisture-sensitive and are moderately compressible (collapsible soil) under saturated conditions. Structures within the project vicinity have experienced excessive post-construction settlement, when the foundation soils become near saturated. The collapsible or weak soils should be removed and recompacted according to the recommendations in the Grading section of this report.

9.1.7 Based on the subsurface conditions at the site and the anticipated structural loading, we anticipate that the proposed buildings may be supported using conventional shallow foundations or deep foundations provided that the recommendations presented herein are incorporated in the design and construction of the project.

9.1.8 SALEM shall review the project grading and foundation plans prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required. If SALEM is not provided plans and specifications for review, we cannot assume any responsibility for the future performance of the project.

9.1.9 SALEM shall be present at the site during site demolition and preparation to observe site clearing/demolition, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.

9.1.10 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

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9.2 Seismic Design Criteria

9.2.1 For seismic design of the structures, and in accordance with the seismic provisions of the 2013 CBC, our recommended parameters are shown below. These parameters are based on Probabilistic Ground Motion of 2% Probability of Exceedance in 50 years. The Site Class was determined based on the results of our field exploration.

TABLE 9.2.1
2013 CBC SEISMIC DESIGN PARAMETERS

Seismic Item	Symbol	Value	2010 ASCE 7 or 2013 CBC Reference
Site Coordinates (Datum = NAD 83)		33.9109 Lat -117.2734 Lon	
Site Class	--	D	ASCE 7 Table 20.3
Soil Profile Name	--	Stiff Soil	ASCE 7 Table 20.3
Risk Category	--	II	CBC Table 1604.5
Site Coefficient for PGA	F_{PGA}	1.000	ASCE 7 Table 11.8-1
Peak Ground Acceleration (adjusted for Site Class effects)	PGA_M	0.682	ASCE 7 Equation 11.8-1
Seismic Design Category	SDC	D	ASCE 7 Table 11.6-1 & 2
Mapped Spectral Acceleration (Short period - 0.2 sec)	S_S	1.500 g	CBC Figure 1613.3.1(1-6)
Mapped Spectral Acceleration (1.0 sec. period)	S_1	0.600 g	CBC Figure 1613.3.1(1-6)
Site Class Modified Site Coefficient	F_a	1.000	CBC Table 1613.3.3(1)
Site Class Modified Site Coefficient	F_v	1.500	CBC Table 1613.3.3(2)
MCE Spectral Response Acceleration (Short period - 0.2 sec) $S_{MS} = F_a S_S$	S_{MS}	1.500 g	CBC Equation 16-37
MCE Spectral Response Acceleration (1.0 sec. period) $S_{M1} = F_v S_1$	S_{M1}	0.900 g	CBC Equation 16-38
Design Spectral Response Acceleration $S_{DS}=⅔S_{MS}$ (short period - 0.2 sec)	S_{DS}	1.000 g	CBC Equation 16-39
Design Spectral Response Acceleration $S_{D1}=⅔S_{M1}$ (1.0 sec. period)	S_{D1}	0.600 g	CBC Equation 16-40

9.2.2 Conformance to the criteria in the above table for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

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9.3 Soil and Excavation Characteristics

9.3.1 Based on the soil conditions encountered in our soil borings, the onsite soils can be excavated with moderate effort using conventional excavation equipment.

9.3.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable Occupational Safety and Health Administration (OSHA) rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.

9.3.3 The upper soils are moisture-sensitive and moderately collapsible under saturated conditions. These soils, in their present condition, possess moderate risk to construction in terms of possible post-construction movement of the foundations and floor systems if no mitigation measures are employed. Accordingly, measures are considered necessary to reduce anticipated expansion and collapse potential. As recommended in Section 9.5, the collapsible soils should be overexcavated and recompacted. Mitigation measures will not eliminate post-construction soil movement, but will reduce the soil movement. Success of the mitigation measures will depend on the thoroughness of the contractor in dealing with the soil conditions.

9.3.4 The near surface soils identified as part of our investigation are, generally, slightly moist to moist due to the absorption characteristics of the soil. Earthwork operations may encounter very moist unstable soils which may require removal to a stable bottom. Exposed native soils exposed as part of site grading operations shall not be allowed to dry out and should be kept continuously moist prior to placement of subsequent fill.

9.4 Materials for Fill

9.4.1 Excavated soils generated from cut operations at the site are suitable for use as general Engineered Fill in structural areas, provided they have an Expansion Index of 20 or less, do not contain deleterious matter, organic materials more than 3% or rock materials larger than 3 inches in maximum dimension

9.4.2 Import soil shall be well-graded, slightly cohesive silty fine sand or sandy silt, with relatively impervious characteristics when compacted. A clean sand or very sandy soil is not acceptable for this purpose. This material should be approved by the Engineer prior to use and should typically possess the soil characteristics summarized below in Table 9.4.2.

TABLE 9.4.2
IMPORT FILL REQUIREMENTS

Minimum Percent Passing No. 200 Sieve	20
Maximum Percent Passing No. 200 Sieve	50
Maximum Particle Size	3"
Maximum Plasticity Index	12
Maximum CBC Expansion Index	20

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9.4.3 The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since they have complete control of the project site.

9.4.4 Environmental characteristics and corrosion potential of import soil materials should also be considered.

9.4.5 Proposed import materials should be sampled, tested, and approved by SALEM prior to its transportation to the site.

9.5 Grading

9.5.1 A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Geotechnical Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section as well as other portions of this report.

9.5.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and geotechnical engineer in attendance.

9.5.3 Site preparation should begin with removal of existing surface/subsurface structures, underground utilities (as required), any existing uncertified fill, and debris. Excavations or depressions resulting from site clearing operations, or other existing excavations or depressions, should be restored with Engineered Fill in accordance with the recommendations of this report.

9.5.4 Organic materials were encountered in test borings B-9, B-10, and B-11 at depths of approximately between 3½ to 7 feet. Thicker organic materials may be present onsite between our test boring locations. Verification of the extent of the organic materials should be determined during site grading. All organic materials in excess of 3 percent by volume are not suitable to support the proposed structures and should be replaced with Engineered Fill. Additionally, undocumented fill materials are not suitable to support any future structures and should be replaced with Engineered Fill. The extent and consistency of the organic material or fills should be verified during site construction. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify the fill condition.

9.5.5 Surface vegetation should be removed by stripping to a sufficient depth to remove organic-rich topsoil. The upper 2 to 4 inches of the soils containing, vegetation, roots and other objectionable organic matter encountered at the time of grading should be stripped and removed from the surface. Deeper stripping may be required in localized areas. The stripped vegetation will not be suitable for use as Engineered Fill but may be stockpiled and reused in landscape or non-structural areas or exported from the site.

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9.5.6 The upper 1.5 feet of soil (below soils containing vegetation, and roots) were very dry and loose, it is recommended that the overexcavation and recompaction within the proposed buildings be performed to a minimum depth of **two (2)** feet below existing grade or **one (1)** foot below proposed footing bottom, whichever is deeper. The overexcavation and recompaction should also extend laterally to a minimum of 5 feet beyond the outer edges of the proposed buildings.

9.5.7 Deeper overexcavation and recompaction should be performed within the Fast Food #1, Convenience Store and 10-Pump Canopy areas to remove all the organic materials. Based on the boring logs, the organic materials are present at depths of 3½ to 7 feet below existing grade.

9.5.8 Any fill materials encountered during grading should be removed and replaced with engineered fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction.

9.5.9 Prior to placement of fill soils, the upper 10 to 12 inches of native subgrade soils should be scarified, moisture-conditioned to no less than the optimum moisture content and recompacted to a minimum of 95 percent (90 percent for cohesive soils) of the maximum dry density based on ASTM D1557 Test Method.

9.5.10 All Engineered Fill (including scarified ground surfaces and backfill) should be placed in thin lifts to allow for adequate bonding and compaction (typically 6 to 8 inches in loose thickness).

9.5.11 Engineered Fill soils should be placed, moisture conditioned to near optimum moisture content, and compacted to at least 95% (90% for cohesive soils) relative compaction.

9.5.12 An integral part of satisfactory fill placement is the stability of the placed lift of soil. If placed materials exhibit excessive instability as determined by a SALEM field representative, the lift will be considered unacceptable and shall be remedied prior to placement of additional fill material. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

9.5.13 Within pavement areas, it is recommended that scarification, moisture conditioning and recompaction be performed to at least 12 inches below existing grade or finish grade, whichever is deeper. In addition, the upper 12 inches of final pavement subgrade, whether completed at-grade, by excavation, or by filling, should be uniformly moisture-conditioned to no less than the optimum moisture content and compacted to at least 95% (90% for cohesive soils) relative compaction.

9.5.14 Final pavement subgrade should be finished to a smooth, unyielding surface. We further recommend proof-rolling the subgrade with a loaded water truck (or similar equipment with high contact pressure) to verify the stability of the subgrade prior to placing aggregate base.

9.5.15 The most effective site preparation alternatives will depend on site conditions prior to grading. We should evaluate site conditions and provide supplemental recommendations immediately prior to grading, if necessary.

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9.5.16 We do not anticipate groundwater or seepage to adversely affect construction if conducted during the drier moths of the year (typically summer and fall). However, groundwater and soil moisture conditions could be significantly different during the wet season (typically winter and spring) as surface soil becomes wet; perched groundwater conditions may develop. Grading during this time period will likely encounter wet materials resulting in possible excavation and fill placement difficulties. Project site winterization consisting of placement of aggregate base and protecting exposed soils during construction should be performed. If the construction schedule requires grading operations during the wet season, we can provide additional recommendations as conditions warrant.

9.5.17 The wet soils may become non conducive to site grading as the upper soils yield under the weight of the construction equipment. Therefore, mitigation measures should be performed for stabilization. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material or placement of crushed rocks or aggregate base material; or mixing the soil with an approved lime or cement product.

The most common remedial measure of stabilizing the bottom of the excavation due to wet soil condition is to reduce the moisture of the soil to near the optimum moisture content by having the subgrade soils scarified and aerated or mixed with drier soils prior to compacting. However, the drying process may require an extended period of time and delay the construction operation. To expedite the stabilizing process, crushed rock may be utilized for stabilization provided this method is approved by the owner for the cost purpose. If the use of crushed rock is considered, it is recommended that the upper soft and wet soils be replaced by 6 to 24 inches of ¾-inch to 1-inch crushed rocks. The thickness of the rock layer depends on the severity of the soil instability. The recommended 6 to 24 inches of crushed rock material will provide a stable platform. It is further recommended that lighter compaction equipment be utilized for compacting the crushed rock. A layer of geofabric is recommended to be placed on top of the compacted crushed rock to minimize migration of soil particles into the voids of the crushed rock, resulting in soil movement. Although it is not required, the use of geogrid (e.g. Tensar BX 1100 or TX 140) below the crushed rock will enhance stability and reduce the required thickness of crushed rock necessary for stabilization. Our firm should be consulted prior to implementing remedial measures to provide appropriate recommendations.

9.6 Shallow Foundations

9.6.1 The site is suitable for use of conventional shallow foundations consisting of continuous footings and isolated pad footings bearing in properly compacted Engineered Fill.

9.6.2 The bearing wall footings considered for the structures should be continuous with a minimum width of 15 inches and extend to a minimum depth of 18 inches below the lowest adjacent grade. Isolated column footings should have a minimum width of 24 inches and extend a minimum depth of 18 inches below the lowest adjacent grade. The bottom of footing excavations should be maintained free of loose and disturbed soil. Footing concrete should be placed into a neat excavation.

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9.6.3 For design purposes, total settlement due to static loading on the order of 1.0 inches may be assumed for shallow footings. Differential settlement due to static loading, along a 20-foot exterior wall footing or between adjoining column footings, should be ½ inch, producing an angular distortion of 0.002. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. The footing excavations should not be allowed to dry out any time prior to pouring concrete.

9.6.4 Footings proportioned as recommended above may be designed for the maximum allowable soil bearing pressures shown in the table below.

Loading Condition	Allowable Bearing
Dead Load Only	2,500 psf
Dead-Plus-Live Load	3,000 psf
Total Load, Including Wind or Seismic Loads	4,000 psf

9.6.5 Resistance to lateral footing displacement can be computed using an allowable coefficient of friction factor of 0.38 acting between the base of foundations and the supporting native subgrade.

9.6.6 Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 360 pounds per cubic foot acting against the appropriate vertical native footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. An increase of one-third is permitted when using the alternate load combination in Section 1605.3.2 of the 2012 IBC/2013 CBC that includes wind or earthquake loads.

9.6.7 Underground utilities running parallel to footings should not be constructed in the zone of influence of footings. The zone of influence may be taken to be the area beneath the footing and within a 1:1 plane extending out and down from the bottom edge of the footing.

9.6.8 The foundation subgrade should be sprinkled as necessary to maintain a moist condition without significant shrinkage cracks as would be expected in any concrete placement. Prior to placing rebar reinforcement, foundation excavations should be evaluated by a representative of SALEM for appropriate support characteristics and moisture content. Moisture conditioning may be required for the materials exposed at footing bottom, particularly if foundation excavations are left open for an extended period.

9.7 Caisson Foundations

9.7.1 The caisson foundation should have a minimum depth of 10 feet below the lowest adjacent grade.

9.7.2 The caissons may be designed using an allowable sidewall friction of 250 psf. This value is for dead-plus-live loads. An allowable end bearing capacity of 5,000 psf may be used

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provided that the bottom of the caisson is cleaned with the use of a clean-out bucket or equivalent and inspected by our representative prior to placement of reinforcement and concrete. An increase of one-third is permitted when using the alternate load combination in Section 1605.3.2 that includes wind or earthquake loads.

9.7.3 Uplift loads can be resisted by caissons using an allowable sidewall friction of 200 psf of the surface area and the weight of the caisson.

9.7.4 The total settlement of the caisson footing is not expected to exceed 1 inch. Differential settlement should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied.

9.7.5 Lateral loads for caissons may be designed utilizing the Isolated Pole Formula and Specifications shown on Table 1804.2, Sections 1804.3.1 and 1808.2.2 of the California Building Code. The drilled caissons may be designed for a lateral capacity of 360 pounds per square foot per foot of depth below the lowest adjacent grade to a maximum of 5,400 psf. The lowest adjacent grade should all the ground surface within 5 feet of the caisson.

9.7.6 These values may be increased by one-third when using the alternative load combinations in Section 1605.3.2 of the IBC that include wind or earthquake loads. These values should not be doubled since the values given herein are higher than the tabular values shown on the Table 1804.2. The lateral loading criteria is based on the assumption that the load application is applied at the ground level, flexible cap connections applied and a minimum embedment depth of 10 feet.

9.7.7 Sandy soil and groundwater conditions were encountered at the site. Casing of the drilled caisson will be required if groundwater/seepage is encountered or the drilled hole has to be left open for an extended period of time.

9.8 Concrete Slabs-on-Grade

9.8.1 Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. We recommend that non-structural slabs-on-grade be at least 4 inches thick and underlain by six (6) inches of compacted granular aggregate subbase material compacted to at least 95% relative compaction.

9.8.2 Granular aggregate subbase material shall conform to ASTM D-2940, Latest Edition (Table 1, bases) with at least 95 percent passing a 1½-inch sieve and not more than 8% passing a No. 200 sieve to prevent capillary moisture rise.

9.8.3 We recommend reinforcing slabs, at a minimum, with No. 3 reinforcing bars placed 18 inches on center, each way.

9.8.4 Slabs subject to structural loading may be designed utilizing a modulus of subgrade reaction K of 140 pounds per square inch per inch. The K value was approximated based on inter-relationship of soil classification and bearing values (Portland Cement Association, Rocky Mountain Northwest).

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9.8.5 The spacing of crack control joints should be designed by the project structural engineer. In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs and 12 feet for 4-inch thick slabs.

9.8.6 Crack control joints should extend a minimum depth of one-fourth the slab thickness and should be constructed using saw-cuts or other methods as soon as practical after concrete placement. The exterior floors should be poured separately in order to act independently of the walls and foundation system.

9.8.7 It is recommended that the utility trenches within the structures be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the structures is recommended.

9.8.8 Moisture within the structures may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structures. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with manufacturer's recommendations and/or ASTM guidelines, whichever is more stringent. In addition, ventilation of the structures is recommended to reduce the accumulation of interior moisture.

9.8.9 In areas where it is desired to reduce floor dampness where moisture-sensitive coverings are anticipated, construction should have a suitable waterproof vapor retarder (a minimum of 15 mils thick polyethylene vapor retarder sheeting, Raven Industries "VaporBlock 15, Stego Industries 15 mil "StegoWrap" or W.R. Meadows Sealtight 15 mil "Perminator") incorporated into the floor slab design. The water vapor retarder should be decay resistant material complying with ASTM E96 not exceeding 0.04 perms, ASTM E154 and ASTM E1745 Class A. The vapor barrier should be placed between the concrete slab and the compacted granular aggregate subbase material. The water vapor retarder (vapor barrier) should be installed in accordance with ASTM Specification E 1643-94.

9.8.10 The concrete maybe placed directly on vapor retarder. The vapor retarder should be inspected prior to concrete placement. Cut or punctured retarder should be repaired using vapor retarder material lapped 6 inches beyond damaged areas and taped.

9.8.11 The recommendations of this report are intended to reduce the potential for cracking of slabs due to soil movement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to soil movement. This is common for project areas that contain expansive soils since designing to eliminate potential soil movement is cost prohibitive. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

9.8.12 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

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9.9 Lateral Earth Pressures and Frictional Resistance

9.9.1 Active, at-rest and passive unit lateral earth pressures against footings and walls are summarized in the table below:

Lateral Pressure Conditions	Ultimate Equivalent Fluid Pressure, pcf
Active Pressure, Drained	40
At-Rest Pressure, Drained	60
Passive Pressure	360
Related Parameters	
Allowable Coefficient of Friction	0.38
In-Place Soil Density (lbs/ft^3)	120

9.9.2 Active pressure applies to walls, which are free to rotate. At-rest pressure applies to walls, which are restrained against rotation. The preceding lateral earth pressures assume sufficient drainage behind retaining walls to prevent the build-up of hydrostatic pressure. The top one-foot of adjacent subgrade should be deleted from the passive pressure computation.

9.9.3 The foregoing values of lateral earth pressures represent ultimate soil values and a safety factor consistent with the design conditions should be included in their usage.

9.9.4 For stability against lateral sliding, which is resisted solely by the passive pressure, we recommend a minimum safety factor of 1.5.

9.9.5 For stability against lateral sliding, which is resisted by the combined passive and frictional resistance, a minimum safety factor of 2.0 is recommended.

9.9.6 For lateral stability against seismic loading conditions, we recommend a minimum safety factor of 1.1.

9.9.7 For dynamic seismic lateral loading the following equation shall be used:

Dynamic Seismic Lateral Loading Equation
Dynamic Seismic Lateral Load = $\frac{3}{8}\gamma K_h H^2$
Where: γ = In-Place Soil Density
K_h = Horizontal Acceleration = $\frac{2}{3}PGA_M$
H = Wall Height

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9.10 Retaining Walls

9.10.1 Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic-concrete or other suitable backfill to minimize surface drainage into the wall drain system. The gravel should conform to Class II permeable materials graded in accordance with the current CalTrans Standard Specifications.

9.10.2 Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

9.10.3 Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The top of the perforated pipe should be placed at or below the bottom of the adjacent floor slab or pavements. The pipe should be placed in the center line of the drainage blanket and should have a minimum diameter of 4 inches. Slots should be no wider than 1/8-inch in diameter, while perforations should be no more than ¼-inch in diameter.

9.10.4 If retaining walls are less than 5 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 2-inch minimum diameter holes (concrete walls) or unmortared head joints (masonry walls) and placed no higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to the CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

9.10.5 During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

9.11 Temporary Excavations

9.11.1 We anticipate that the majority of the sandy site soils will be classified as Cal-OSHA "Type C" soil when encountered in excavations during site development and construction. Excavation sloping, benching, the use of trench shields, and the placement of trench spoils should conform to the latest applicable Cal-OSHA standards. The contractor should have a Cal-OSHA-approved "competent person" onsite during excavation to evaluate trench conditions and make appropriate recommendations where necessary.

9.11.2 It is the contractor's responsibility to provide sufficient and safe excavation support as well as protecting nearby utilities, structures, and other improvements which may be damaged by earth movements. All onsite excavations must be conducted in such a manner that potential

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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load.

9.11.3 Temporary excavations and slope faces should be protected from rainfall and erosion. Surface runoff should be directed away from excavations and slopes.

9.11.4 Open, unbraced excavations in undisturbed soils should be made according to the slopes presented in the following table:

RECOMMENDED EXCAVATION SLOPES

Depth of Excavation (ft)	Slope (Horizontal : Vertical)
0-5	1:1
5-10	2:1

9.11.5 If, due to space limitation, excavations near property lines or existing structures are performed in a vertical position, slot cuts, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavations and installation. A Specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction.

9.11.6 Braced shorings should be designed for a maximum pressure distribution of 30H, (where H is the depth of the excavation in feet). The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given herein. Equipment traffic should concurrently be limited to an area at least 3 feet from the shoring face or edge of the slope.

9.11.7 The excavation and shoring recommendations provided herein are based on soil characteristics derived from the borings within the area. Variations in soil conditions will likely be encountered during the excavations. SALEM Engineering Group, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation. Slope height, slope inclination, or excavation depth should in no case exceed those specified in local, state, or federal safety regulation, (e.g. OSHA) standards for excavations, 29 CFR part 1926, or Assessor's regulations.

9.12 Underground Utilities

9.12.1 Underground utility trenches should be backfilled with properly compacted material. The material excavated from the trenches should be adequate for use as backfill provided it does not contain deleterious matter, vegetation or rock larger than 3 inches in maximum dimension. Trench backfill should be placed in loose lifts not exceeding 8 inches and compacted to at least 95% (90% for cohesive soils) relative compaction at or above optimum moisture content.

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9.12.2 Bedding and pipe zone backfill typically extends from the bottom of the trench excavations to approximately 6 to 12 inches above the crown of the pipe. Pipe bedding and backfill material should conform to the requirements of the governing utility agency.

9.12.3 It is suggested that underground utilities crossing beneath new or existing structures be plugged at entry and exit locations to the buildings or structures to prevent water migration. Trench plugs can consist of on-site clay soils, if available, or sand cement slurry. The trench plugs should extend 2 feet beyond each side of individual perimeter foundations.

9.12.4 The contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

9.13 Surface Drainage

9.13.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change to important engineering properties. Proper drainage should be maintained at all times.

9.13.2 Site drainage should be collected and transferred away from improvements in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundations or retaining walls. Drainage should not be allowed to flow uncontrolled over any descending slope. The proposed structures should be provided with roof gutters. Discharge from downspouts, roof drains and scuppers are not permitted onto unprotected soils within five feet of the buildings perimeters. Planters which are located adjacent to foundations should be sealed or properly drained to prevent moisture intrusion into the materials providing foundation support. Landscape irrigation within 5 feet of the buildings perimeter footings should be kept to a minimum to just support vegetative life.

9.13.3 The ground immediately adjacent to the foundation shall be sloped away from buildings at a slope of not less than 5 percent for a minimum distance of 10 feet. Impervious surfaces within 10 feet of building's foundations shall be sloped a minimum of 2 percent away from buildings and drainage gradients maintained to carry all surface water to collection facilities and off site. These grades should be maintained for the life of the project.

9.14 Pavement Design

9.14.1 Based on site soil conditions, an R-value of 30 was used for the preliminary flexible asphaltic concrete pavement design. The R-value may be verified during grading of the pavement areas.

9.14.2 The pavement design recommendations provided herein are based on the State of California Department of Transportation (CALTRANS) design manual. The asphaltic concrete (flexible pavement) is based on a 20-year pavement life utilizing 1200 passenger vehicles, 10 single unit

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

trucks, and 2 multi-unit trucks. The following table shows the recommended pavement sections for various traffic indices.

TABLE 9.13.2
ASPHALT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
5.0 (Parking and Vehicle Drive Areas)	3.0"	5.0"	12.0"
6.5 (Heavy Truck Areas)	3.5"	8.5"	12.0"
8.0 (Cactus Avenue)	5.0"	11.5"	12.0"
9.0 (Cactus Avenue)	5.0"	13.5"	12.0"
10.0 (Cactus Avenue)	6.0"	14.5"	12.0"
11.0 (Cactus Avenue)	7.0"	16.0"	12.0"

***95% compaction based on ASTM D1557 Test Method*
***95% (90% for cohesive soils) compaction based on ASTM D1557 Test Method*

9.14.3 The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

TABLE 9.13.3
PORTLAND CEMENT CONCRETE PAVEMENT THICKNESSES

Traffic Index	Portland Cement Concrete*	Class II Aggregate Base**	Compacted Subgrade***
5.0 (Light Duty)	5.0"	4.0"	12.0"
6.5 (Heavy Duty)	6.5"	6.0"	12.0"

** Minimum Compressive Strength of 4,000 psi*
*** 95% compaction based on ASTM D1557 Test Method*
****95% (90% for cohesive soils) compaction based on ASTM D1557 Test Method*

10. PLAN REVIEW, CONSTRUCTION OBSERVATION AND TESTING

10.1 Plan and Specification Review

10.1.1 SALEM should review the project plans and specifications prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required.

10.2 Construction Observation and Testing Services

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

10.2.1 The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for others interpretation of our recommendations, and therefore the future performance of the project.

10.2.2 SALEM should be present at the site during site preparation to observe site clearing, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.

10.2.3 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

11. LIMITATIONS AND CHANGED CONDITIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the test borings drilled at the approximate locations shown on the Site Plan, Figure 1. The report does not reflect variations which may occur between borings. The nature and extent of such variations may not become evident until construction is initiated.

If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-site observations during the excavation period and noting the characteristics of such variations. The findings and recommendations presented in this report are valid as of the present and for the proposed construction. If site conditions change due to natural processes or human intervention on the property or adjacent to the site, or changes occur in the nature or design of the project, or if there is a substantial time lapse between the submission of this report and the start of the work at the site, the conclusions and recommendations contained in our report will not be considered valid unless the changes are reviewed by SALEM and the conclusions of our report are modified or verified in writing.

The validity of the recommendations contained in this report is also dependent upon an adequate testing and observations program during the construction phase. Our firm assumes no responsibility for construction compliance with the design concepts or recommendations unless we have been retained to perform the on-site testing and review during construction. SALEM has prepared this report for the exclusive use of the owner and project design consultants.

SALEM does not practice in the field of corrosion engineering. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, that manufacturer's recommendations for corrosion protection be closely followed. Further, a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of concrete slabs and foundations in direct contact with native soil.

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The importation of soil and or aggregate materials to the site should be screened to determine the potential for corrosion to concrete and buried metal piping. The report has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (909) 980-6455.

Respectfully Submitted,

SALEM ENGINEERING GROUP, INC.

Ibrahim Ibrahim, MS, EIT
Geotechnical Staff Engineer

Clarence Jiang, GE
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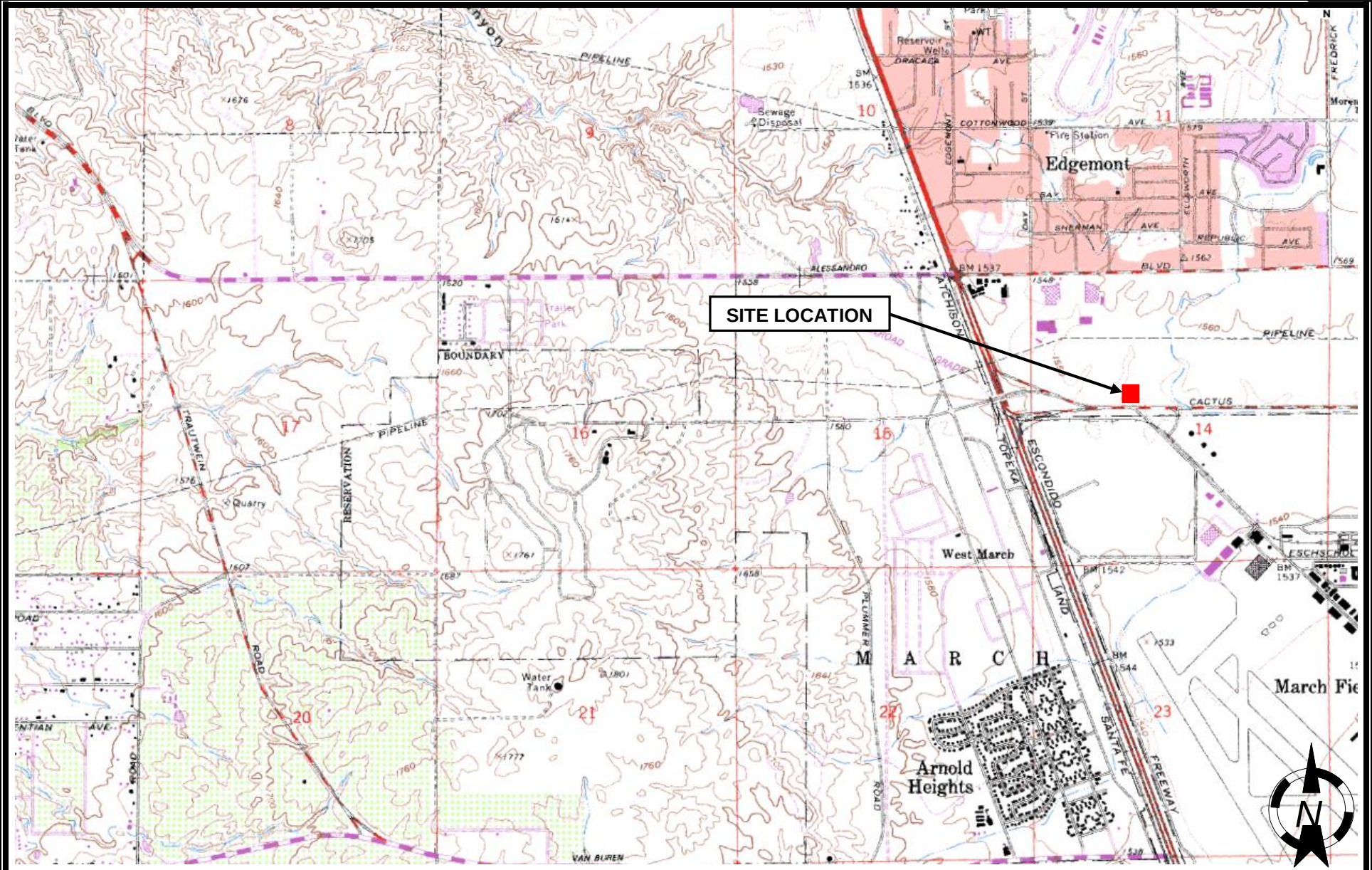
STATE OF CALIFORNIA

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-



Source Image: U.S. Geological Survey, Riverside East, Calif. 7.5' Quadrangle, 1967 (Photorevised 1980)

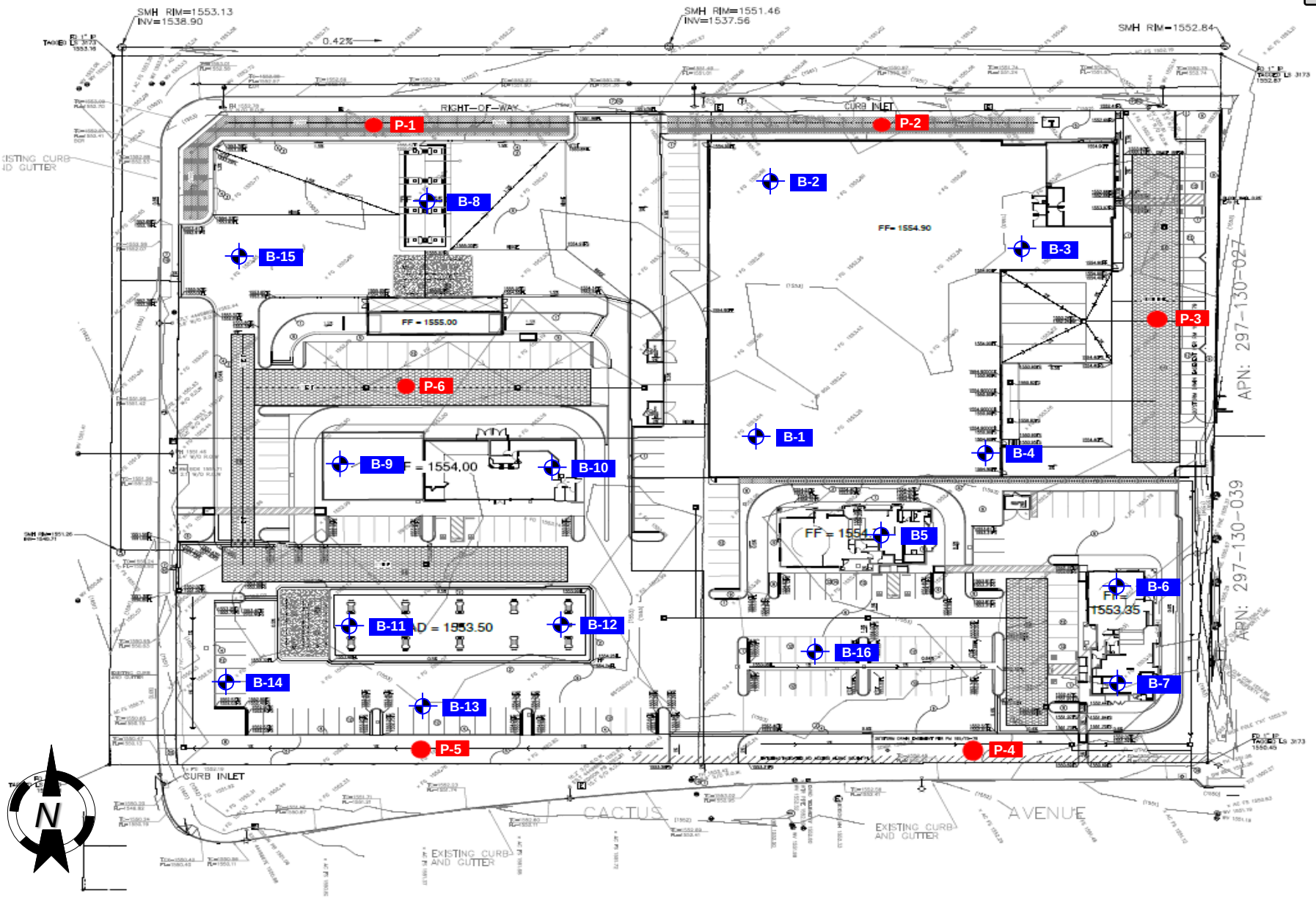
VICINITY MAP

GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Moreno Valley Cactus Center
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, California

SCALE:	DATE:
NOT TO SCALE	11/2015
DRAWN BY:	APPROVED BY:
AA	CJ
PROJECT NO.	FIGURE NO.
3-215-1091	1

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot



SITE PLAN

GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Moreno Valley Cactus Center
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, California

SCALE: NOT TO SCALE	DATE: 11/2015
DRAWN BY: AA	APPROVED BY: CJ
PROJECT NO. 3-215-1091	FIGURE NO. 2

LEGEND:
- B-1 Soil Boring Locations
- P-1 Percolation Test Locations
- All Locations Approximate

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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

SALEM engineering group, inc.

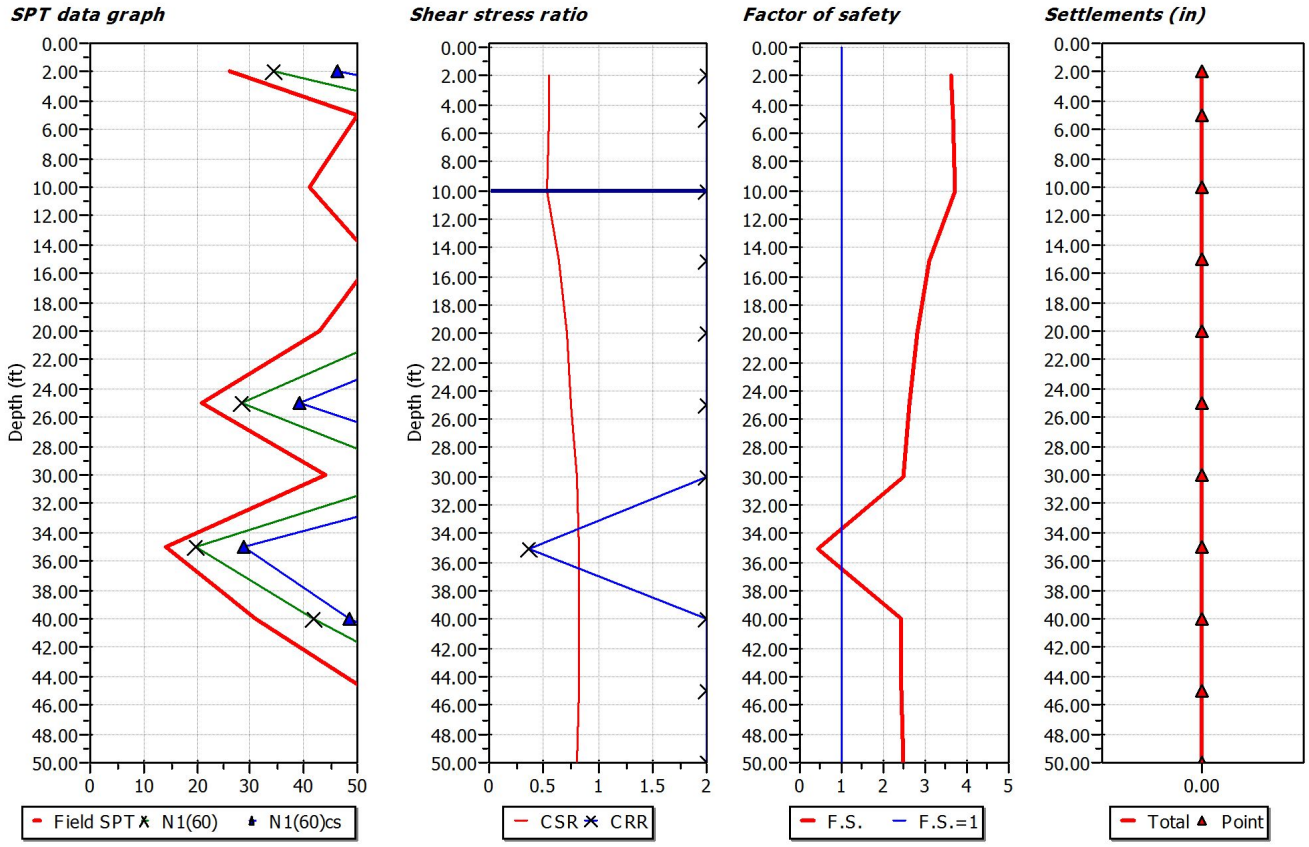
LIQUEFACTION ANALYSIS REPORT

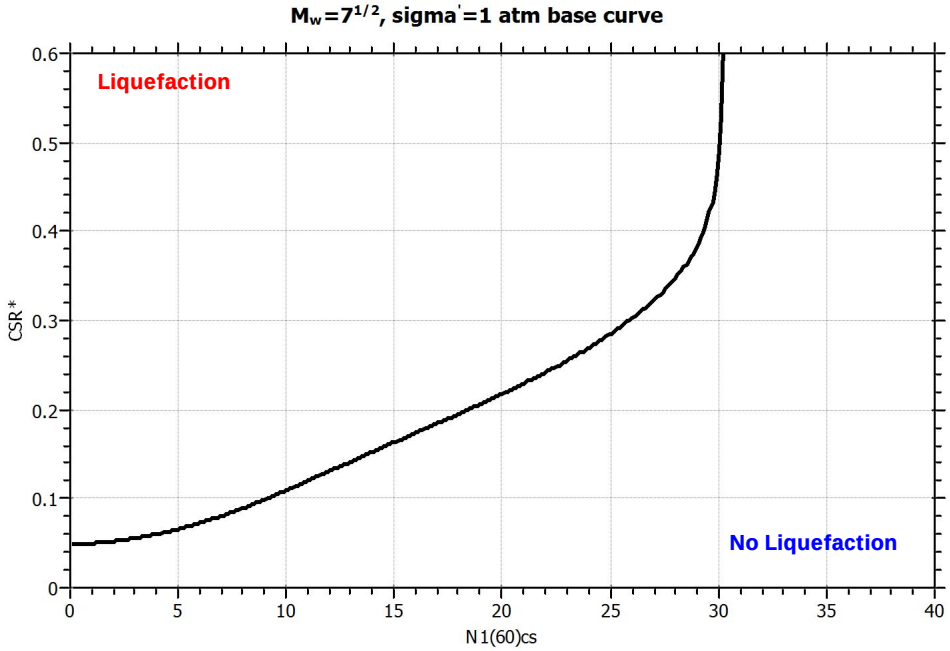
Project title : Proposed Moreno Valley Cactus Center

Project subtitle : 3-215-1091

Input parameters and analysis data

In-situ data type:	Standard Penetration Test	Depth to water table:	10.00 ft
Analysis type:	Deterministic	Earthquake magnitude M_w:	8.20
Analysis method:	NCEER 1998	Peak ground accelaration:	0.52 g
Fines correction method:	Idriss & Seed	User defined F.S.:	1.30





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:: Field input data ::

Point ID	Depth (ft)	Field N_{SPT} (blows/feet)	Unit weight (pcf)	Fines content (%)
1	2.00	26.00	120.00	49.00
2	5.00	50.00	120.00	45.00
3	10.00	41.00	120.00	39.00
4	15.00	53.00	120.00	45.00
5	20.00	43.00	120.00	29.00
6	25.00	21.00	120.00	50.00
7	30.00	44.00	120.00	54.00
8	35.00	14.00	120.00	73.00
9	40.00	31.00	120.00	19.00
10	45.00	52.00	120.00	25.00
11	50.00	52.00	120.00	25.00

Depth : Depth from free surface, at which SPT was performed (ft)
Field SPT : SPT blows measured at field (blows/feet)
Unit weight : Bulk unit weight of soil at test depth (pcf)
Fines content : Percentage of fines in soil (%)

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Point ID	Depth (ft)	Sigma (tsf)	u (tsf)	Sigma' (tsf)	r_d	CSR	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*
1	2.00	0.12	0.00	0.12	1.00	0.34	0.80	0.42	1.00	0.42
2	5.00	0.30	0.00	0.30	0.99	0.33	0.80	0.42	1.00	0.42
3	10.00	0.60	0.00	0.60	0.98	0.33	0.80	0.41	1.00	0.41
4	15.00	0.90	0.16	0.74	0.97	0.39	0.80	0.50	1.00	0.50
5	20.00	1.20	0.31	0.89	0.95	0.44	0.80	0.55	1.00	0.55
6	25.00	1.50	0.47	1.03	0.94	0.46	0.80	0.58	1.00	0.58
7	30.00	1.80	0.62	1.18	0.93	0.48	0.80	0.61	0.98	0.62
8	35.00	2.10	0.78	1.32	0.89	0.48	0.80	0.60	0.95	0.63
9	40.00	2.40	0.94	1.46	0.85	0.47	0.80	0.59	0.93	0.63
10	45.00	2.70	1.09	1.61	0.81	0.46	0.80	0.58	0.92	0.63
11	50.00	3.00	1.25	1.75	0.77	0.44	0.80	0.56	0.90	0.62

Depth : Depth from free surface, at which SPT was performed (ft)
Sigma : Total overburden pressure at test point, during earthquake (tsf)
u : Water pressure at test point, during earthquake (tsf)
Sigma' : Effective overburden pressure, during earthquake (tsf)
r_d : Nonlinear shear mass factor
CSR : Cyclic Stress Ratio
MSF : Magnitude Scaling Factor
$CSR_{eq,M=7.5}$ CSR adjusted for M=7.5
K_{sigma} Effective overburden stress factor
CSR^* CSR fully adjusted

:: Cyclic Resistance Ratio calculation $CRR_{7.5}$ ::

Point ID	Field SPT	C_n	C_e	C_b	C_r	C_s	$N_{1(60)}$	DeltaN	$N_{1(60)cs}$	$CRR_{7.5}$
1	26.00	1.70	0.86	1.00	0.75	1.20	34.25	11.85	46.10	2.00
2	50.00	1.70	0.90	1.00	0.75	1.20	69.05	18.81	87.86	2.00
3	41.00	1.32	0.97	1.00	0.85	1.20	53.62	15.72	69.34	2.00
4	53.00	1.18	1.04	1.00	0.95	1.20	74.53	19.91	94.44	2.00
5	43.00	1.08	1.11	1.00	0.95	1.20	59.03	13.27	72.30	2.00
6	21.00	1.01	1.18	1.00	0.95	1.20	28.41	10.68	39.10	2.00
7	44.00	0.94	1.25	1.00	1.00	1.20	62.15	17.43	79.58	2.00
8	14.00	0.89	1.32	1.00	1.00	1.20	19.70	8.94	28.64	0.37
9	31.00	0.84	1.33	1.00	1.00	1.20	41.90	6.48	48.38	2.00
10	52.00	0.81	1.33	1.00	1.00	1.20	67.06	12.00	79.06	2.00
11	52.00	0.77	1.33	1.00	1.00	1.20	64.25	11.68	75.93	2.00

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:: Cyclic Resistance Ratio calculation $CRR_{7.5}$ ::

Point ID	Field SPT	C_n	C_e	C_b	C_r	C_s	$N_{1(60)}$	DeltaN	$N_{1(60)cs}$	$CRR_{7.5}$

C_n : Overburden corretion factor
C_e : Energy correction factor
C_b : Borehole diameter correction factor
C_r : Rod length correction factor
C_s : Liner correction factor
$N_{1(60)}$: Corrected N_{SPT}
DeltaN : Addition to corrected N_{SPT} value due to the presence of fines
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines
$CRR_{7.5)}$: Cyclic resistance ratio for M=7.5

:: Settlements calculation for saturated sands ::

Point ID	$N_{1(60)}$	N_1	FS_L	e_v (%)	Settle. (in)
1	46.10	38.42	3.64	0.00	0.00
2	87.86	73.22	3.66	0.00	0.00
3	69.34	57.78	3.71	0.00	0.00
4	94.44	78.70	3.10	0.00	0.00
5	72.30	60.25	2.81	0.00	0.00
6	39.10	32.58	2.64	0.00	0.00
7	79.58	66.32	2.48	0.00	0.00
8	28.64	23.87	0.45	1.80	0.00
9	48.38	40.32	2.43	0.00	0.00
10	79.06	65.89	2.44	0.00	0.00
11	75.93	63.27	2.48	0.00	0.00

Total settlement : 0.00

$N_{1,(60)}$: Stress normalized and corrected SPT blow count
N_1: Japanese equivalent corrected value
FS_L: Calculated factor of safety
e_v: Post-liquefaction volumentric strain (%)
Settle.: Calculated settlement (in)

:: Liquefaction potential according to Iwasaki ::

Point ID	F	w_z	I_L
1	0.00	9.70	0.00
2	0.00	9.24	0.00
3	0.00	8.48	0.00
4	0.00	7.71	0.00
5	0.00	6.95	0.00
6	0.00	6.19	0.00
7	0.00	5.43	0.00
8	0.55	4.67	3.91
9	0.00	3.90	0.00
10	0.00	3.14	0.00
11	0.00	2.38	0.00

Overall potential I_L : 3.91

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

APPENDIX

A

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

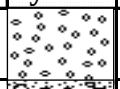
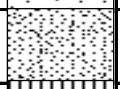
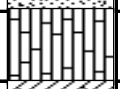
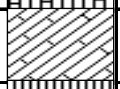
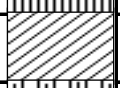
APPENDIX A
FIELD EXPLORATION

Fieldwork for our investigation (drilling) was conducted on November 17, 2015 and included a site visit, subsurface exploration, percolation tests, and soil sampling. The locations of the exploratory borings and percolation tests are shown on the Site Plan, Figure 2. Boring logs for our exploration are presented in figures following the text in this appendix. Borings were located in the field using existing reference points. Therefore, actual boring locations may deviate slightly.

In general, our borings were performed using a truck-mounted Mobile B-61 drill rig equipped with 6½ - inch Hollow-stem augers. Sampling in the borings was accomplished using a hydraulic 140-pound hammer with a 30-inch drop. Samples were obtained with a 3-inch outside-diameter (OD), split spoon (California Modified) sampler, and a 2-inch OD, Standard Penetration Test (SPT) sampler. The number of blows required to drive the sampler the last 12 inches (or fraction thereof) of the 18-inch sampling interval were recorded on the boring logs. The blow counts shown on the boring logs should not be interpreted as standard SPT "N" values; corrections have not been applied. Upon completion, the borings were backfilled with drill cuttings.

Subsurface conditions encountered in the exploratory borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488). This system uses the Unified Soil Classification System (USCS) for soil designations. The logs depict soil and geologic conditions encountered and depths at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, drill rig penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the field logs were revised based on subsequent laboratory testing.

Unified Soil Classification System

Major Divisions			Letter	Symbol	Description
Coarse-grained Soils More than ½ retained on the No. 200 Sieve	**Gravels** More than ½ coarse fraction retained on the No. 4 sieve	Clean Gravels	GW		Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP		Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM		Silty gravels, gravel-sand-silt mixtures.
			GC		Clayey gravels, gravel-sand-clay mixtures.
	Sands More than ½ passing through the No. 4 sieve	Clean Sands	SW		Well-graded sands and gravelly sands, little or no fines.
			SP		Poorly-graded sands and gravelly sands, little or no fines.
		Sands With Fines	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sandy-clay mixtures.
Fine-grained Soils More than ½ passing through the No. 200 Sieve	**Silts and Clays** Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL		Organic clays of medium to high plasticity.
	Silts and Clays Liquid Limit greater than 50%		MH		Inorganic silts, micaceous or diatomaceous fines sands or silts, elastic silts.
			CH		Inorganic clays of high plasticity, fat clays.
			OH		Organic clays of medium to high plasticity.
Highly Organic Soils			PT		Peat, muck, and other highly organic soils.

Consistency Classification

Granular Soils			*Cohesive Soils*		
Description - Blows Per Foot (Corrected)			Description - Blows Per Foot (Corrected)		
	MCS	SPT		MCS	SPT
Very loose	<5	<4	Very soft	<3	<2
Loose	5 - 15	4 - 10	Soft	3 - 5	2 - 4
Medium dense	16 - 40	11 - 30	Firm	6 - 10	5 - 8
Dense	41 - 65	31 - 50	Stiff	11 - 20	9 - 15
Very dense	>65	>50	Very Stiff	21 - 40	16 - 30
			Hard	>40	>30

MCS = Modified California Sampler

SPT = Standard Penetration Test Sampler

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-1

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-1
Logged By: SK
Initial: 36.5 feet
Depth to Water>
At Completion: 29.0 feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (ML) Dense; moist; brown; fine-medium grained; with trace clay.	126.3	6.0	MCS		42
5		**Silty SAND (SM)** Very dense; moist; brown; fine-medium grained; with trace clay.	128.5	9.1	MCS		50
10		Grades as above; dense; with more clay.	-	11.5	SPT		41
15		Grades as above; very dense; fine grained.	-	10.7	SPT		53
20		Grades as above; dense; fine-medium grained; with less clay.	-	10.3	SPT		43
25		**Sandy SILT (ML)** Very stiff; wet; brown; fine grained; with clay.	-	18.8	SPT		21

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 2

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-1

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-1
Logged By: SK
Initial: 36.5 feet
Depth to Water>
At Completion: 29.0 feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
30		Grades as above; hard; moist; perched groundwater encountered at 29 feet.	-	15.7	SPT		44
		Clayey SILT (ML) Stiff; very moist; brown; fine grained.					
35			-	24.1	SPT		14
		Sand (SP) Wet; mottled brown; coarse grained.					
40		**Silty SAND (SM)** Dense; moist; brown; medium-coarse grained; with trace clay.	-	16.8	SPT		31
45		Grades as above; very dense; moist.	-	12.8	SPT		52
		Grades as above.					
50		End of Borehole					

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 2 of 2

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-2

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-2
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	132.7	4.5	MCS		36		
		Silty SAND (SM) Very dense; slightly moist; light brown; fine-medium grained; with trace clay.	118.4	5.8	MCS		50		
10		Grades as above; brown; fine grained; with trace clay.	-	11.3	SPT		51		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	11.9	SPT		31		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-3

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-3
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
		Ground Surface							
0		**Silty SAND/Sandy SILT (SM/ML)** dense; slightly moist; brown; fine-medium grained; with trace clay.	121.2	5.4	MCS		24		
5		**Silty SAND (SM)** Very dense; slightly moist; light brown brown; fine-medium grained.	112.7	13.5	MCS		50		
10		Grades as above; dense; brown; fine grained; with trace clay.		12.3	SPT		37		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.		10.1	SPT		47		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-4

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-4
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	123.5	4.2	MCS		20		
5		**Silty SAND (SM)** Dense; moist; brown; fine-medium grained; with trace clay.	124.3	7.9	MCS		45		
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	12.9	SPT		32		
15		Grades as above.	-	11.7	SPT		44		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-5

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-5
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.7	5.9	MCS		41		
5		**Silty SAND (SM)** Very dense; moist; light brown; fine-medium grained; with trace clay.	132.0	6.7	MCS		50		
		Sandy SILT (ML) Hard; moist; brown; fine grained; with trace clay.							
10			-	12.5	SPT		41		
15		Grades as above.	-	10.9	SPT		43		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-6

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-6
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.7	5.9	MCS		41
5		**Silty SAND (SM)** Very dense; moist; light brown; fine-medium grained; with trace clay.	132.0	6.7	MCS		50
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	12.5	SPT		41
15		Grades as above.	-	10.9	SPT		43
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-7

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-7
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; moist; brown; fine-medium grained; with clay.	114.4	13.9	MCS		19		
5		**Silty SAND (SM)** Very dense; moist; brown; fine-medium grained; with less clay.	115.7	7.9	MCS		50		
10		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	13.2	SPT		35		
15		Grades as above.	-	12.0	SPT		40		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-8

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-8
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay.	129.5	5.8	MCS		45		
5		**Silty SAND (SM)** Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	124.0	6.0	MCS		37		
10		Grades as above; very dense; no clay.	-	5.4	SPT		66		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	13.5	SPT		36		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-9

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-9
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Silty SAND (SM/ML) Dense; moist; brown; fine-medium grained; with trace clay.	123.5	6.8	MCS		42		
5		**Silty SAND (SM)** Dense; moist; dark gray/black; fine-medium; **with slight organic material.**	127.7	6.9	MCS		47		
10		Grades as above; dense; no clay; no organic material.	-	9.6	SPT		33		
15		**Sandy SILT (ML)** Very stiff; moist; brown; fine grained; with trace clay.	-	17.4	SPT		25		
20		**Silty SAND (SM)** Wet; brown; fine-medium grained; with trace clay.							
		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-10

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-10
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	124.7	5.9	MCS		39		
5		**Silty SAND (SM)** Medium dense; moist; dark gray/black; fine-medium grained; **with abundant organic material.**	96.1	9.1	MCS		31		
10		Grades as above; dense; brown; no organic material.	-	9.4	SPT		48		
15		**Sandy SILT (ML)** Hard; moist; brown; fine grained; with trace clay.	-	10.0	SPT		34		
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.							
20		End of Borehole							
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-11

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-11
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Medium dense; moist; brown; fine-medium grained; with trace clay	129.1	6.1	MCS		39
5		**Silty SAND (SM)** Medium dense; moist; dark gray/black; fine-medium grained; **with slight organic material.**	127.8	6.6	MCS		40
10		Grades as above; dense; light brown; no organic material.	-	7.0	SPT		39
15		**Sandy SILT (ML)** Very stiff; very moist; brown; fine grained; with trace clay.	-	16.4	SPT		20
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-12

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-12
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count
0		Ground Surface					
		Silty SAND/Sandy SILT (SM/ML) Dense; slightly moist; brown; fine-medium grained; with trace clay	130.6	5.3	MCS		42
5		**Silty SAND (SM)** Very dense; slightly moist; brown; fine-medium grained; with trace clay.	120.8	5.9	MCS		50
10		Grades as above; moist.	-	10.6	SPT		64
15		**Silty SAND / SAND (SM/SP)** Dense; slightly moist; light brown; fine-medium grained.	-	2.4	SPT		34
		Silty SAND (SM) Moist; brown; fine-medium grained; with trace clay.					
20		End of Borehole					
25							

Penetration Test: 20 40 60 80

Water Level

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-13

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-13
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	135.1	5.8	MCS		45		
5		**Silty SAND (SM)** Dense; slightly moist; brown; fine-medium grained; with trace clay.	132.1	5.4	MCS		40		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-14

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-14
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	116.3	5.0	MCS		39		
5		**Silty SAND (SM)** Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	120.7	5.3	MCS		36		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-15

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A
Depth to Water>

Project No: 3-215-1091
Figure No.: A-15
Logged By: SK
Initial: None
At Completion: None

SUBSURFACE PROFILE			SAMPLE						
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND (SM) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	116.8	4.7	MCS		38		
5		Grades as above.	121.3	5.0	MCS		36		
10		Grades as above.							
		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Boring No. B-16

Project: Proposed Moreno Valley Cactus Center
Client: J&T Business Management
Location: NEC Cactus Avenue & Commerce Center Drive, Moreno Valley, CA
Grnd. Surf. Elev. (Ft. MSL) N/A

Project No: 3-215-1091
Figure No.: A-16
Logged By: SK
Initial: None
Depth to Water>
At Completion: None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sampler Type	Penetration	Blow Count	Penetration Test (20 40 60 80)	Water Level
0		Ground Surface							
		Silty SAND/Sandy SILT (SM/ML) Medium dense; slightly moist; brown; fine-medium grained; with trace clay.	119.1	4.8	MCS		33		
5		**Silty SAND (SM)** Medium dense; moist; brown; fine-medium grained; with trace clay.	118.3	7.2	MCS		31		
		Grades as above.							
10		End of Borehole							
15									
20									
25									

Drill Method: Hollow Stem Auger
Drill Rig: Mobile B-61
Driller: GP Drilling
Sheet: 1 of 1

Drill Date: 11/17/15
Borehole Size: 6.5 inches
Hammer Type: Auto Trip.
Weight & Drop: 140 lbs. / 30 in.

SALEM

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-1
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:00	9:30	5.0	N	0:30	4.00	4.12	1.44	30	20.8	12.0	10.6	11.3	0.39
9:30	10:00	5.0	N	0:30	4.12	4.21	1.08	30	27.8	10.6	9.5	10.0	0.32
10:00	10:30	5.0	N	0:30	4.21	4.28	0.84	30	35.7	9.5	8.6	9.1	0.27
10:30	11:00	5.0	N	0:30	4.28	4.34	0.72	30	41.7	8.6	7.9	8.3	0.25
11:00	11:30	5.0	N	0:30	4.34	4.39	0.60	30	50.0	7.9	7.3	7.6	0.22
11:30	12:00	5.0	N	0:30	4.39	4.43	0.48	30	62.5	7.3	6.8	7.1	0.19
12:00	12:30	5.0	N	0:30	4.43	4.47	0.48	30	62.5	6.8	6.4	6.6	0.20
12:30	13:00	5.0	N	0:30	4.47	4.51	0.48	30	62.5	6.4	5.9	6.1	0.21
Recommended for Design:										**Infiltration Rate**			**0.19**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-2
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:05	9:35	5.0	N	0:30	3.80	3.98	2.16	30	13.9	14.4	12.2	13.3	0.50
9:35	10:05	5.0	N	0:30	3.98	4.11	1.56	30	19.2	12.2	10.7	11.5	0.41
10:05	10:35	5.0	N	0:30	4.11	4.21	1.20	30	25.0	10.7	9.5	10.1	0.36
10:35	11:05	5.0	N	0:30	4.21	4.30	1.08	30	27.8	9.5	8.4	8.9	0.35
11:05	11:35	5.0	N	0:30	4.30	4.38	0.96	30	31.3	8.4	7.4	7.9	0.35
11:35	12:05	5.0	N	0:30	4.38	4.45	0.84	30	35.7	7.4	6.6	7.0	0.34
12:05	12:35	5.0	N	0:30	4.45	4.51	0.72	30	41.7	6.6	5.9	6.2	0.32
12:35	13:05	5.0	N	0:30	4.51	4.57	0.72	30	41.7	5.9	5.2	5.5	0.35
Recommended for Design:										**Infiltration Rate**			**0.32**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-3
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:10	9:40	5.0	N	0:30	3.95	4.07	1.44	30	20.8	12.6	11.2	11.9	0.37
9:40	10:10	5.0	N	0:30	4.07	4.16	1.08	30	27.8	11.2	10.1	10.6	0.31
10:10	10:40	5.0	N	0:30	4.16	4.24	0.96	30	31.3	10.1	9.1	9.6	0.30
10:40	11:10	5.0	N	0:30	4.24	4.31	0.84	30	35.7	9.1	8.3	8.7	0.28
11:10	11:40	5.0	N	0:30	4.31	4.37	0.72	30	41.7	8.3	7.6	7.9	0.26
11:40	12:10	5.0	N	0:30	4.37	4.43	0.72	30	41.7	7.6	6.8	7.2	0.28
12:10	12:40	5.0	N	0:30	4.43	4.48	0.60	30	50.0	6.8	6.2	6.5	0.25
12:40	13:10	5.0	N	0:30	4.48	4.53	0.60	30	50.0	6.2	5.6	5.9	0.27
Recommended for Design:										**Infiltration Rate**			**0.25**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-4
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:15	9:45	5.0	N	0:30	3.95	4.02	0.84	30	35.7	12.6	11.8	12.2	0.21
9:45	10:15	5.0	N	0:30	4.02	4.07	0.60	30	50.0	11.8	11.2	11.5	0.16
10:15	10:45	5.0	N	0:30	4.07	4.11	0.48	30	62.5	11.2	10.7	10.9	0.13
10:45	11:15	5.0	N	0:30	4.11	4.14	0.36	30	83.3	10.7	10.3	10.5	0.10
11:15	11:45	5.0	N	0:30	4.14	4.17	0.36	30	83.3	10.3	10.0	10.1	0.11
11:45	12:15	5.0	N	0:30	4.17	4.19	0.24	30	125.0	10.0	9.7	9.8	0.07
12:15	12:45	5.0	N	0:30	4.19	4.21	0.24	30	125.0	9.7	9.5	9.6	0.07
12:45	13:15	5.0	N	0:30	4.21	4.23	0.24	30	125.0	9.5	9.2	9.4	0.08
Recommended for Design:										**Infiltration Rate**			**0.07**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-5
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:20	9:50	5.0	N	0:30	3.98	4.07	1.08	30	27.8	12.2	11.2	11.7	0.28
9:50	10:20	5.0	N	0:30	4.07	4.13	0.72	30	41.7	11.2	10.4	10.8	0.20
10:20	10:50	5.0	N	0:30	4.13	4.18	0.60	30	50.0	10.4	9.8	10.1	0.18
10:50	11:20	5.0	N	0:30	4.18	4.22	0.48	30	62.5	9.8	9.4	9.6	0.15
11:20	11:50	5.0	N	0:30	4.22	4.26	0.48	30	62.5	9.4	8.9	9.1	0.15
11:50	12:20	5.0	N	0:30	4.26	4.29	0.36	30	83.3	8.9	8.5	8.7	0.12
12:20	12:50	5.0	N	0:30	4.29	4.32	0.36	30	83.3	8.5	8.2	8.3	0.12
12:50	13:20	5.0	N	0:30	4.32	4.35	0.36	30	83.3	8.2	7.8	8.0	0.13
Recommended for Design:										**Infiltration Rate**			**0.12**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

Percolation Test Worksheet

Project: **Proposed Moreno Valley Cactus Center**
NEC Cactus Avenue & Commerce Center Drive
Moreno Valley, CA

Job No.: 3-215-1091
Date Drilled: 11/17/2015
Soil Classification: Silty Sand (SM) w/trace clay

Hole Radius: 3.5 in.
Pipe Dia.: 3 in.
Totoal Depth of Hole: 60 in.

Test Hole No.: P-6
Tested by: II
Drilled Hole Depth: 5 ft.

Presoaking Date: 11/17/2015
Test Date: 11/18/2015

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Tested Infiltration Rate, It (in/hr)
9:25	9:55	5.0	N	0:30	4.12	4.24	1.44	30	20.8	10.6	9.1	9.8	0.43
9:55	10:25	5.0	N	0:30	4.24	4.32	0.96	30	31.3	9.1	8.2	8.6	0.32
10:25	10:55	5.0	N	0:30	4.32	4.38	0.72	30	41.7	8.2	7.4	7.8	0.26
10:55	11:25	5.0	N	0:30	4.38	4.43	0.60	30	50.0	7.4	6.8	7.1	0.24
11:25	11:55	5.0	N	0:30	4.43	4.47	0.48	30	62.5	6.8	6.4	6.6	0.20
11:55	12:25	5.0	N	0:30	4.47	4.51	0.48	30	62.5	6.4	5.9	6.1	0.21
12:25	12:55	5.0	N	0:30	4.51	4.54	0.36	30	83.3	5.9	5.5	5.7	0.17
12:55	13:25	5.0	N	0:30	4.54	4.57	0.36	30	83.3	5.5	5.2	5.3	0.18
Recommended for Design:										**Infiltration Rate**			**0.17**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

APPENDIX

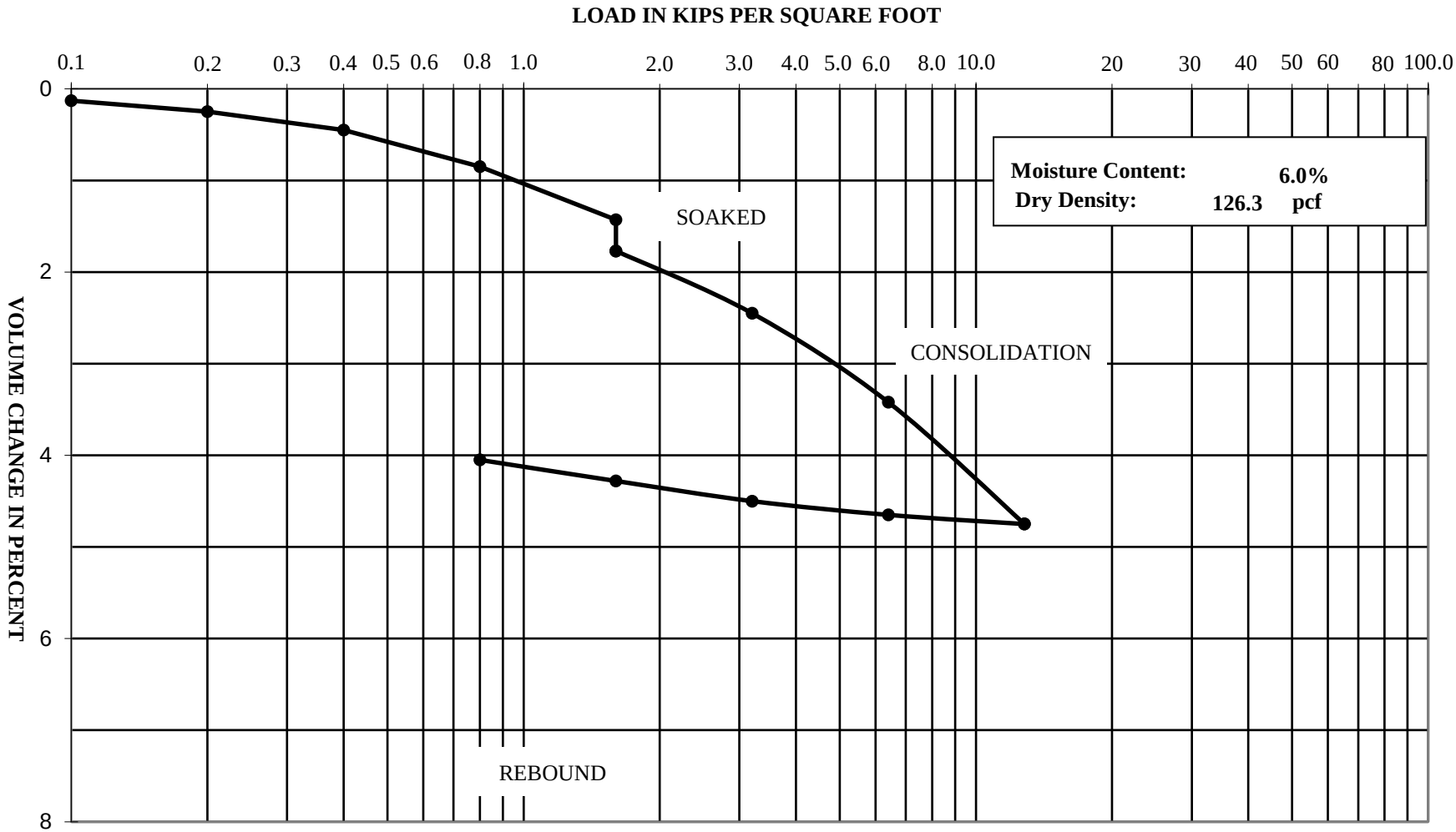
B

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM), Caltrans, or other suggested procedures. Selected samples were tested for in-situ dry density and moisture content, corrosivity, consolidation, shear strength, expansion index, and grain size distribution. The results of the laboratory tests are summarized in the following figures.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

CONSOLIDATION - PRESSURE TEST DATA
ASTM D 2435



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

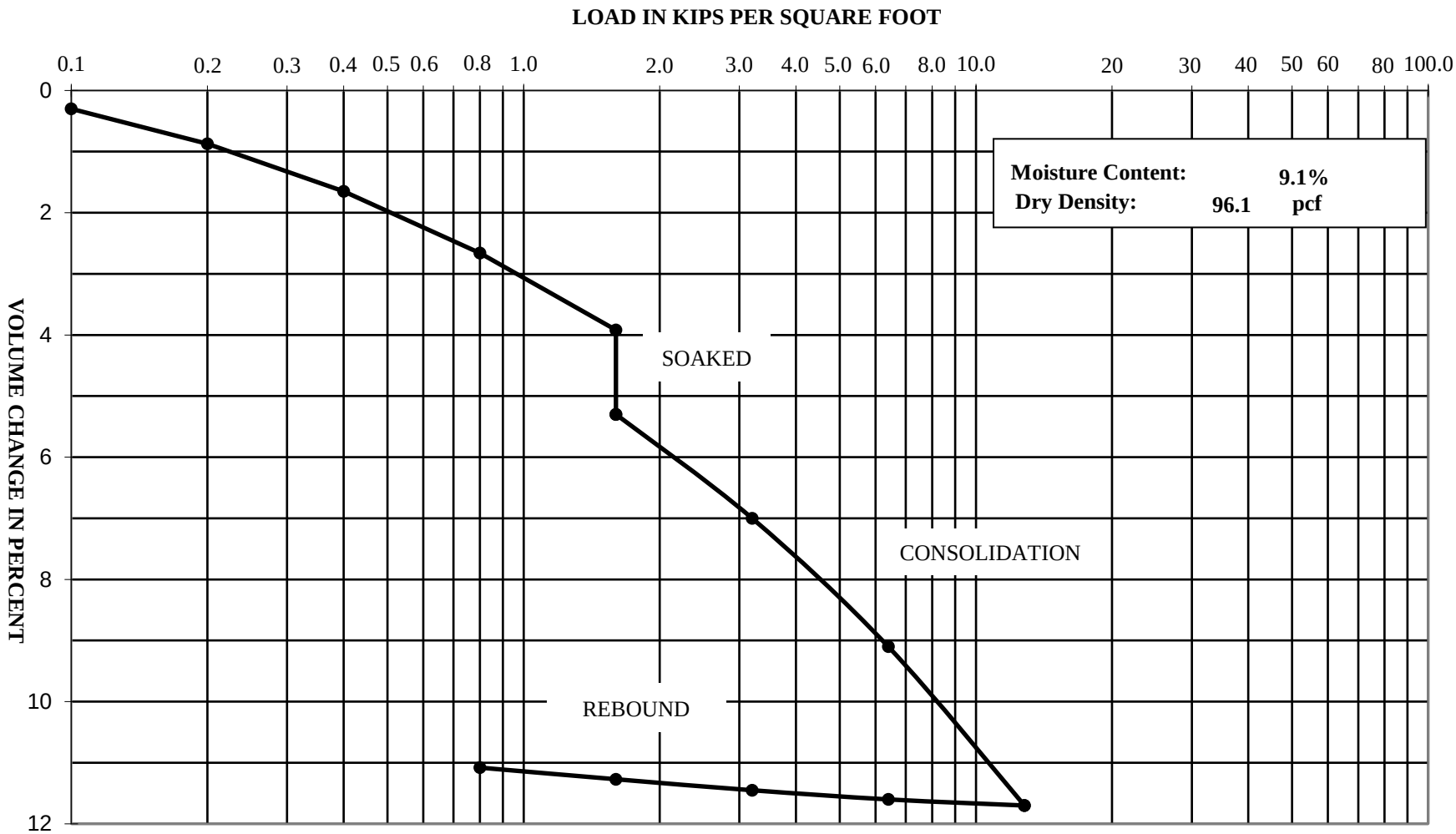
Project Number: 3-215-1091

Boring: B-1 @ 2'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

CONSOLIDATION - PRESSURE TEST DATA
ASTM D 2435



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

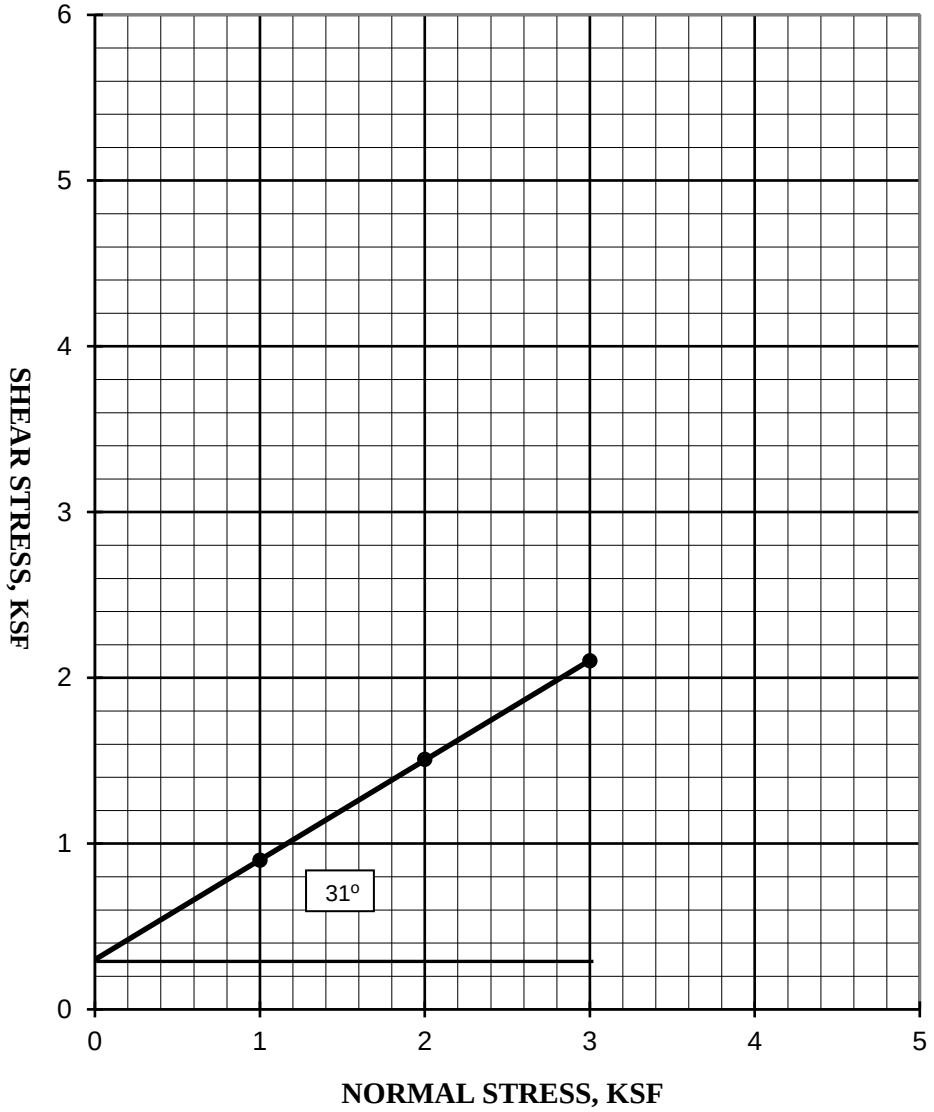
Project Number: 3-215-1091

Boring: B-10 @ 5'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

SHEAR STRENGTH DIAGRAM
(DIRECT SHEAR)
ASTM D - 3080



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 5'
Soil Type: Silty SAND (SM) with trace clay

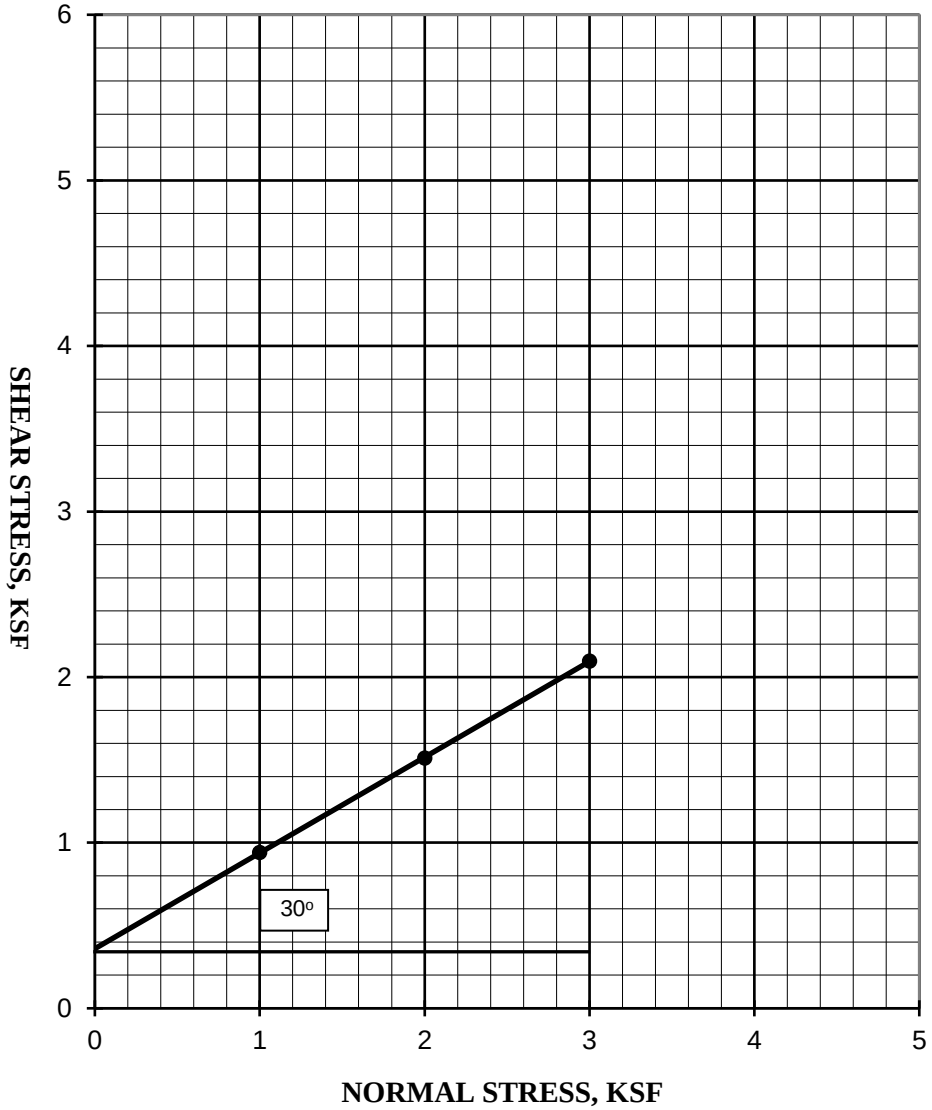
Friction Angle:	**31.0**	**degrees**
Cohesion:	**300**	**psf**

Moisture Content	**9.1%**
Dry Density	**128.5 pcf**

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

SHEAR STRENGTH DIAGRAM
(DIRECT SHEAR)
ASTM D - 3080



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-2 @ 2'
Soil Type: Silty SAND/Sandy SILT (SM/ML) with trace clay

Friction Angle:	**30.0**	**degrees**
Cohesion:	**360**	**psf**

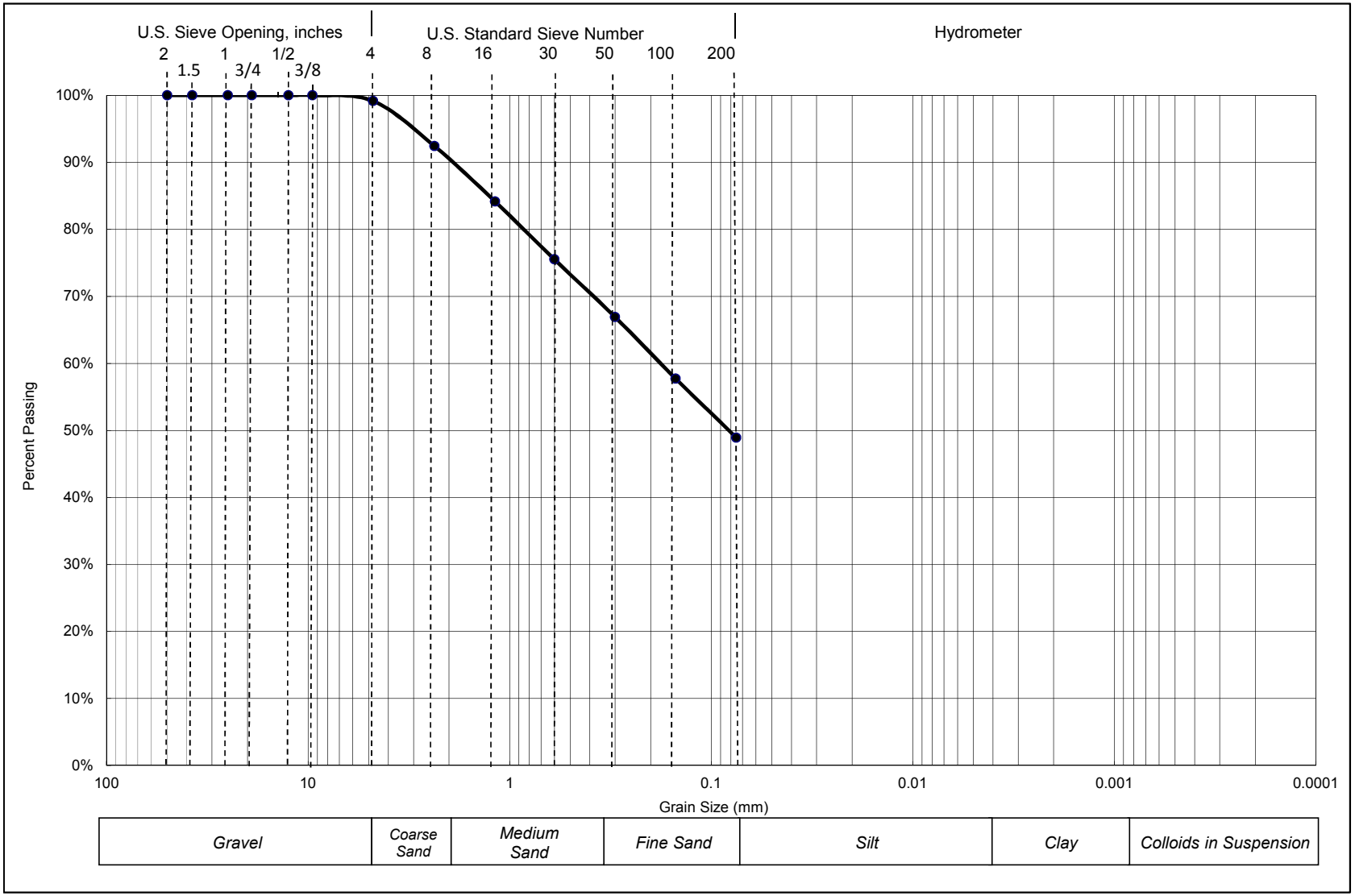
Moisture Content	**4.5%**
Dry Density	**132.7 pcf**

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 2'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

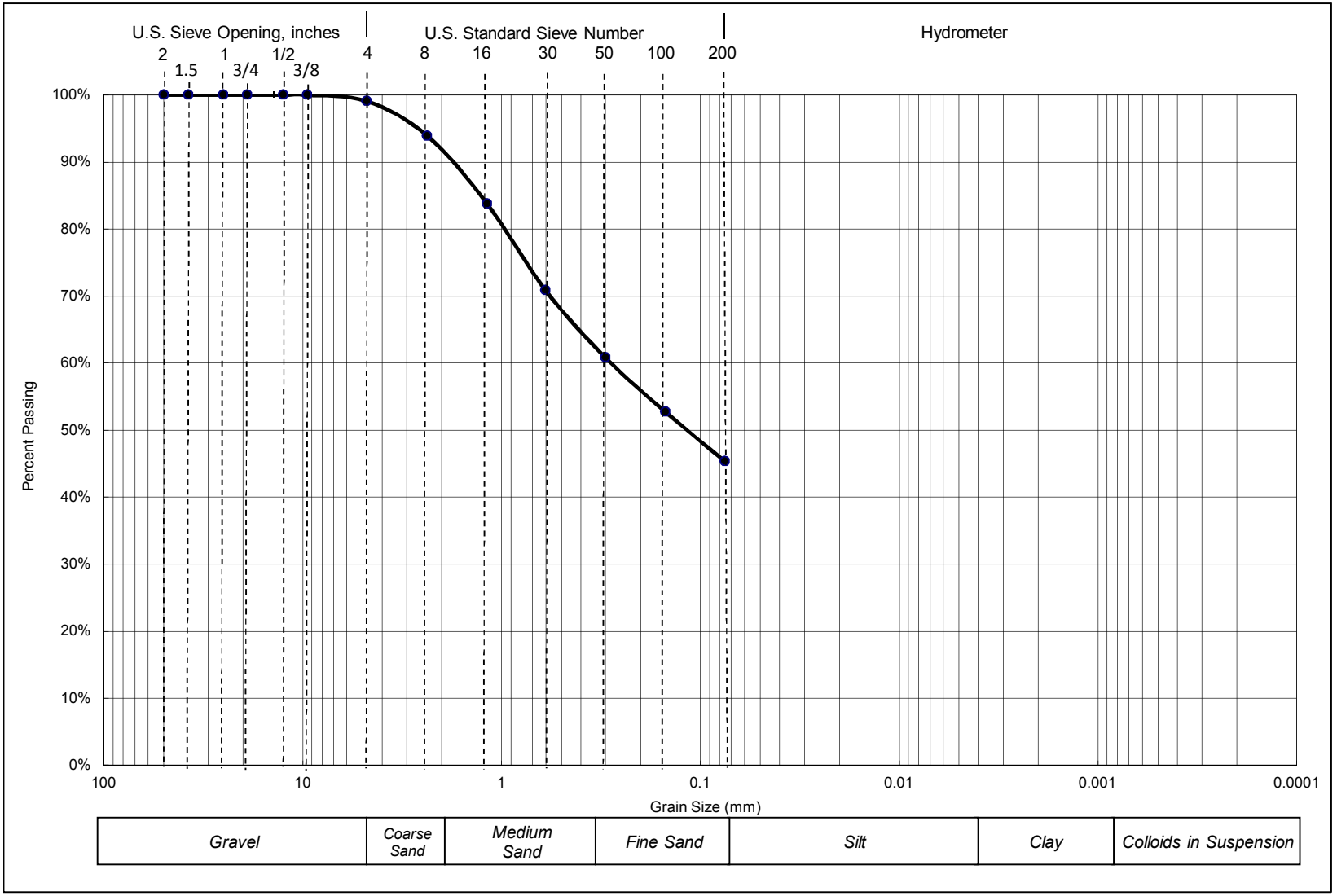
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.2%
No. 8	2.36	92.4%
No. 16	1.18	84.2%
No. 30	0.6	75.5%
No. 50	0.3	66.9%
No. 100	0.15	57.7%
No. 200	0.075	48.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 2'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 5'

SALEM engineering group, inc.

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.1%
No. 8	2.36	93.9%
No. 16	1.18	83.8%
No. 30	0.6	70.8%
No. 50	0.3	60.8%
No. 100	0.15	52.7%
No. 200	0.075	45.3%

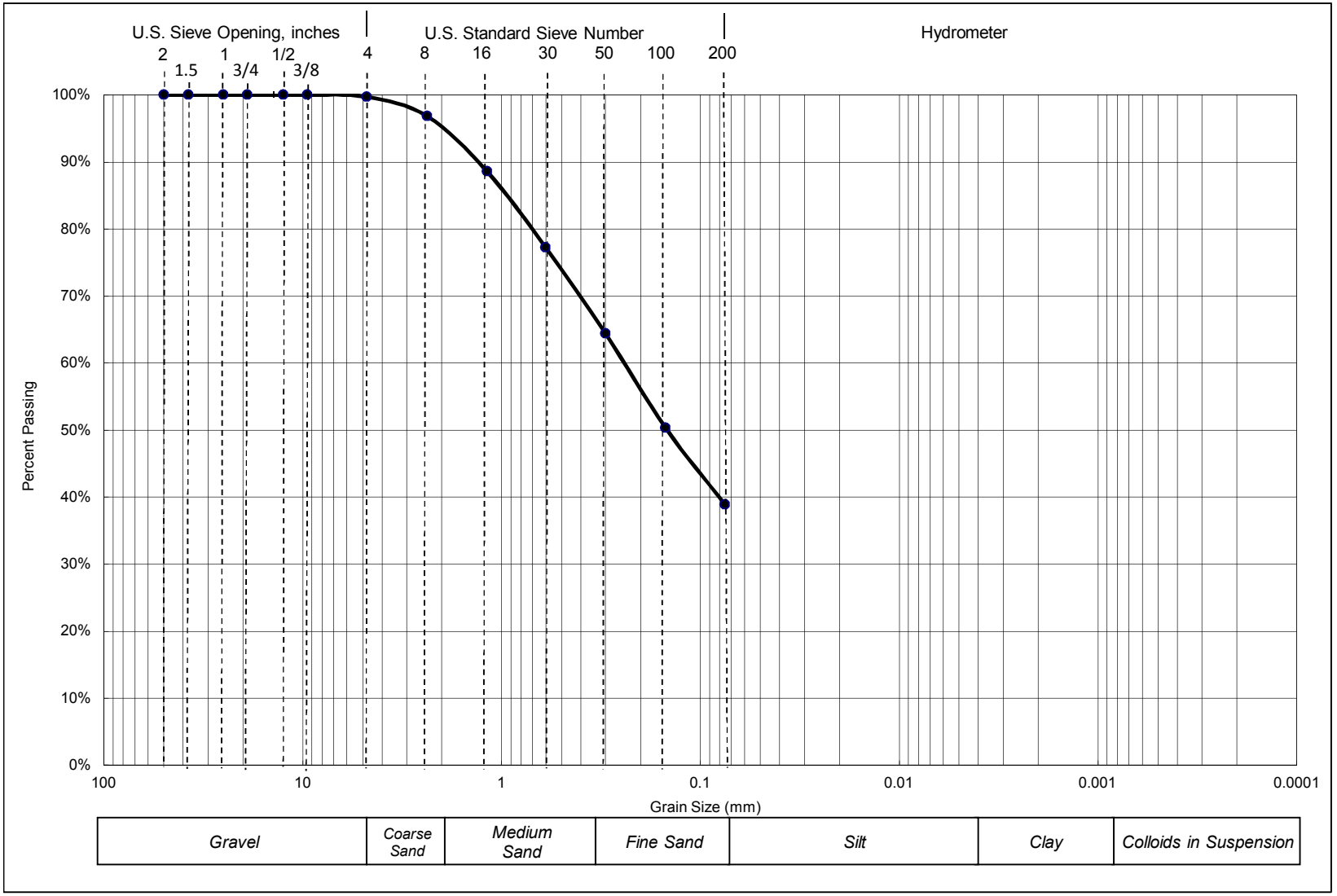
Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 5'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 10'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

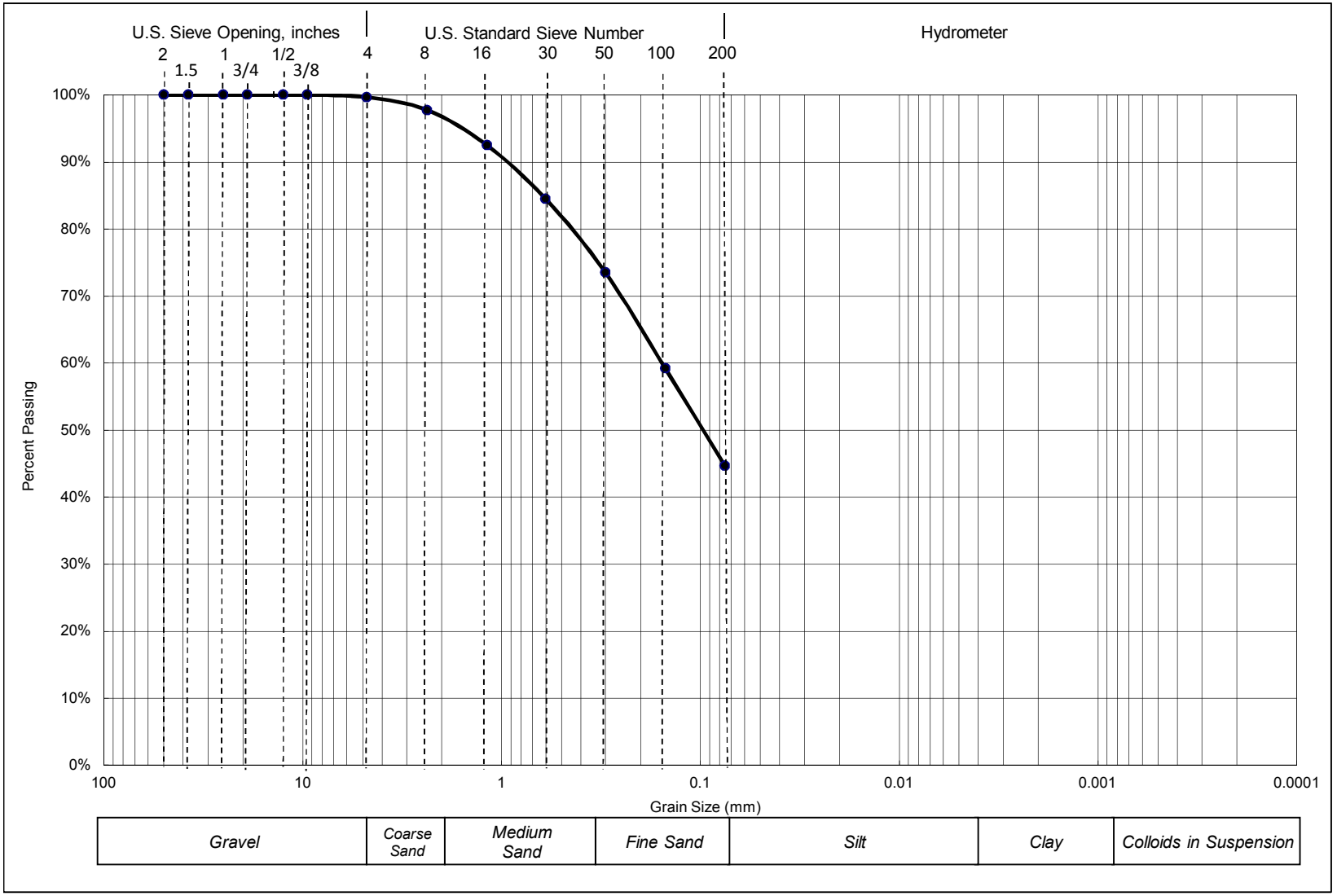
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	96.8%
No. 16	1.18	88.6%
No. 30	0.6	77.2%
No. 50	0.3	64.4%
No. 100	0.15	50.4%
No. 200	0.075	38.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 10'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 15'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

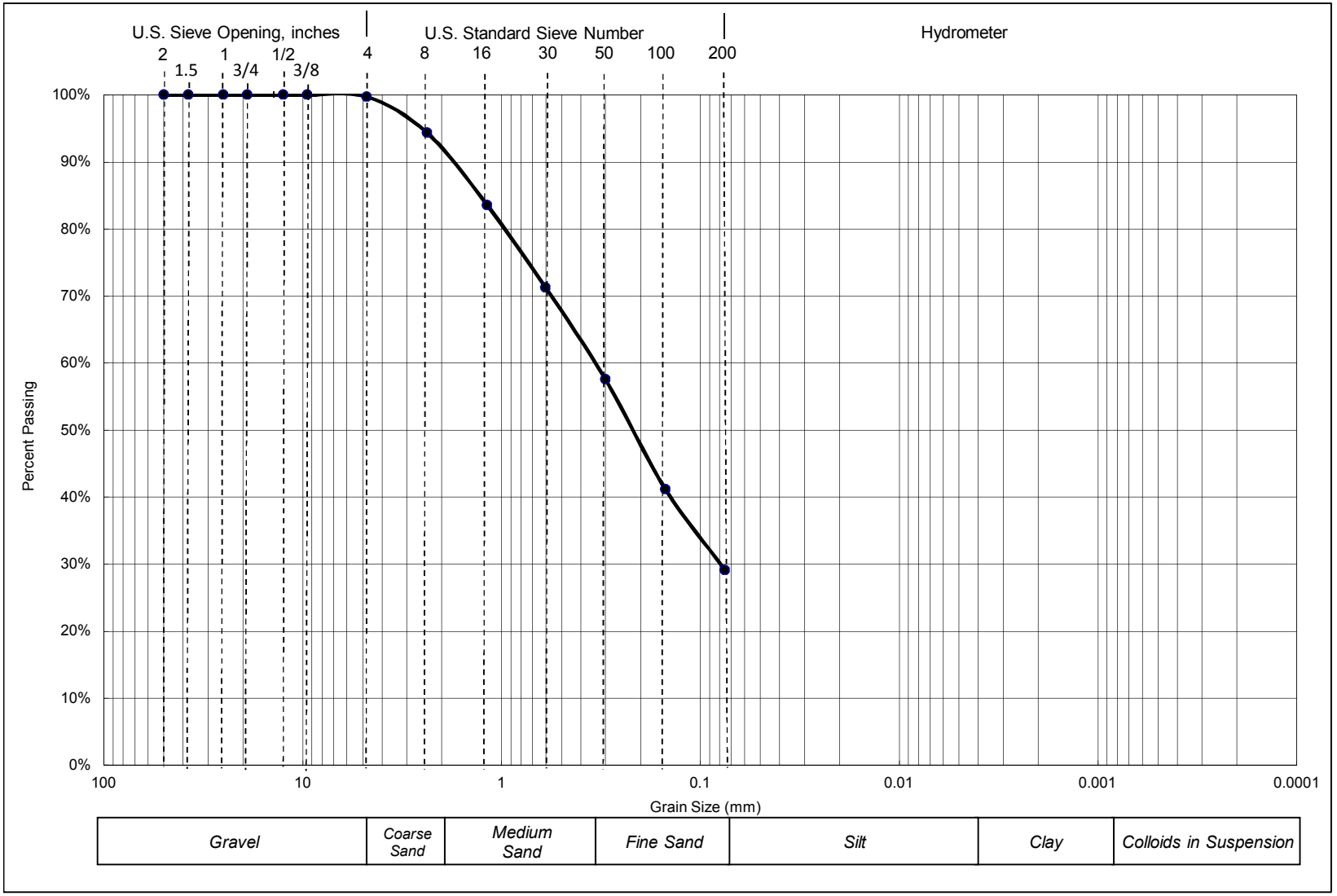
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	97.7%
No. 16	1.18	92.5%
No. 30	0.6	84.5%
No. 50	0.3	73.5%
No. 100	0.15	59.2%
No. 200	0.075	44.6%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 15'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 20'

SALEM engineering group, inc.

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.7%
No. 8	2.36	94.3%
No. 16	1.18	83.6%
No. 30	0.6	71.2%
No. 50	0.3	57.6%
No. 100	0.15	41.2%
No. 200	0.075	29.1%

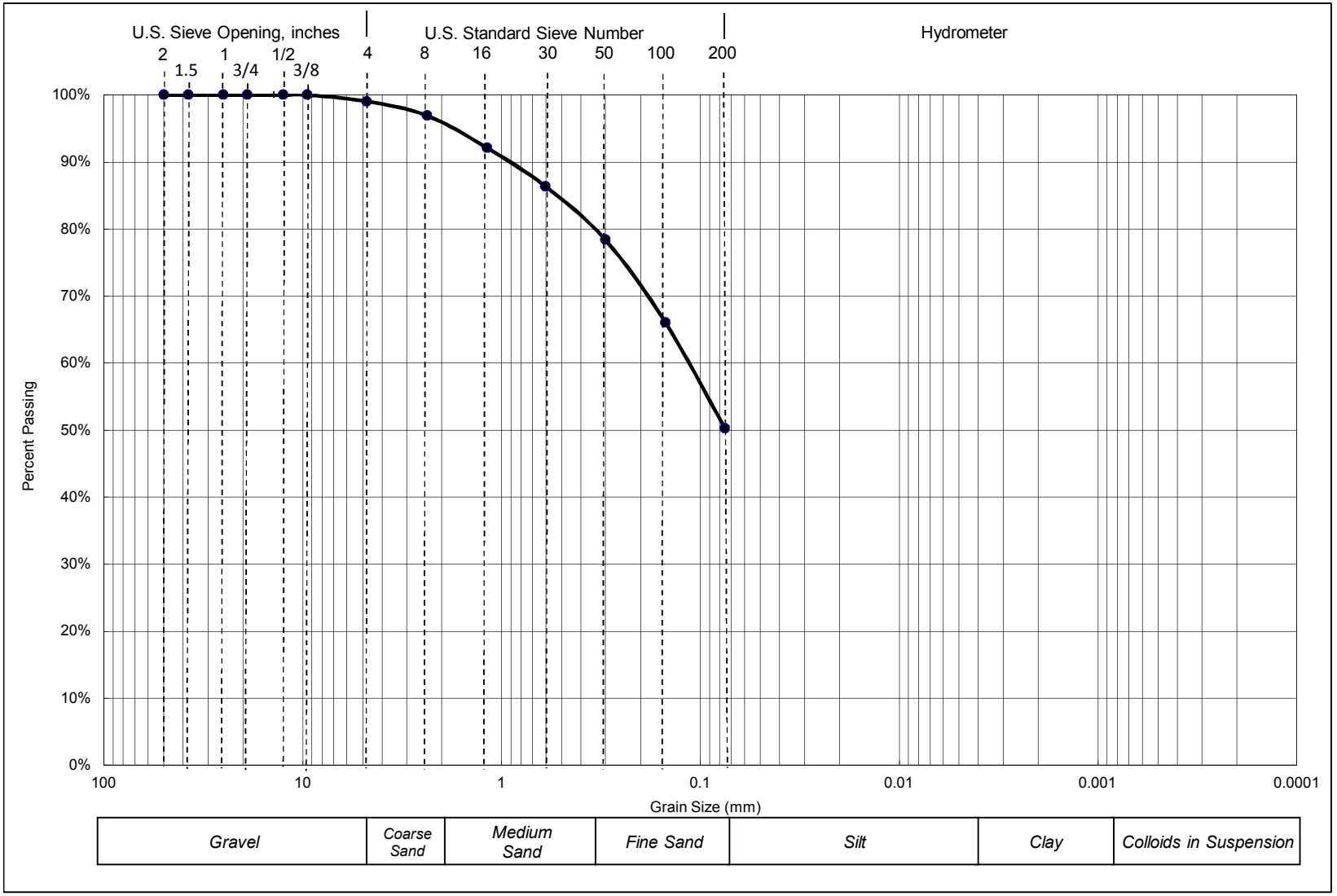
Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 20'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 25'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

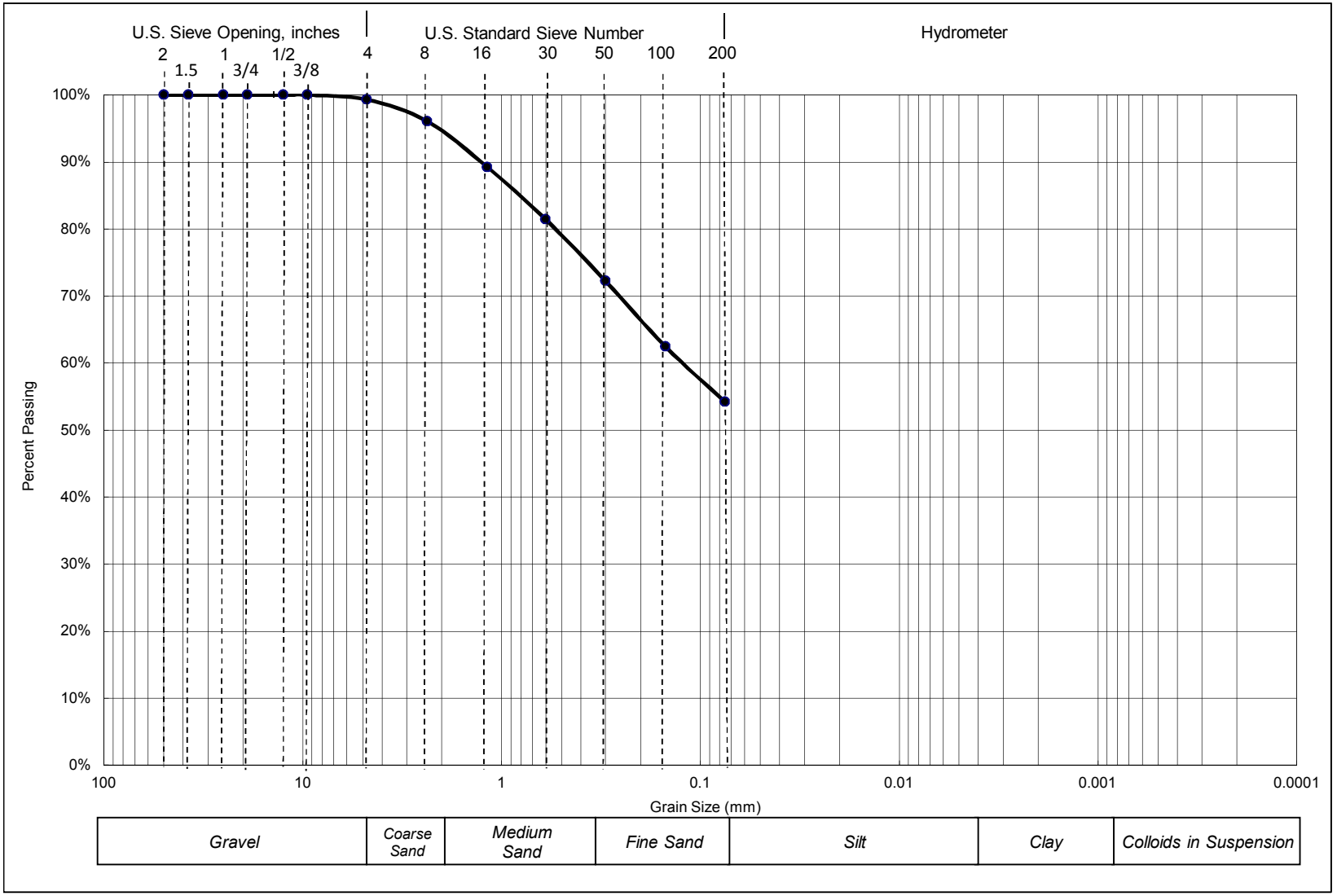
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.0%
No. 8	2.36	96.9%
No. 16	1.18	92.1%
No. 30	0.6	86.3%
No. 50	0.3	78.4%
No. 100	0.15	66.1%
No. 200	0.075	50.2%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 25'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 30'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.3%
No. 8	2.36	96.1%
No. 16	1.18	89.2%
No. 30	0.6	81.4%
No. 50	0.3	72.2%
No. 100	0.15	62.5%
No. 200	0.075	54.2%

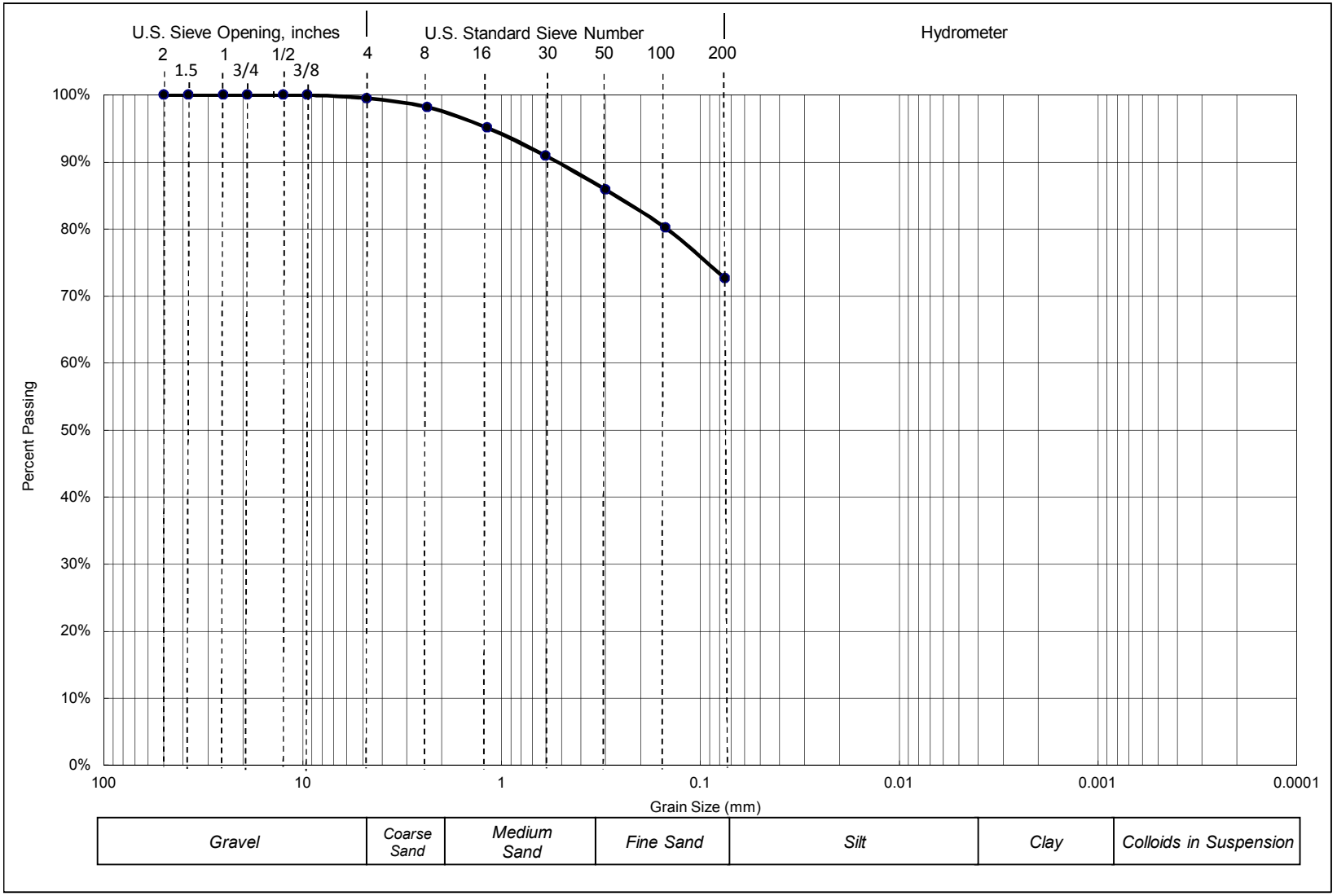
Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 30'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 35'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

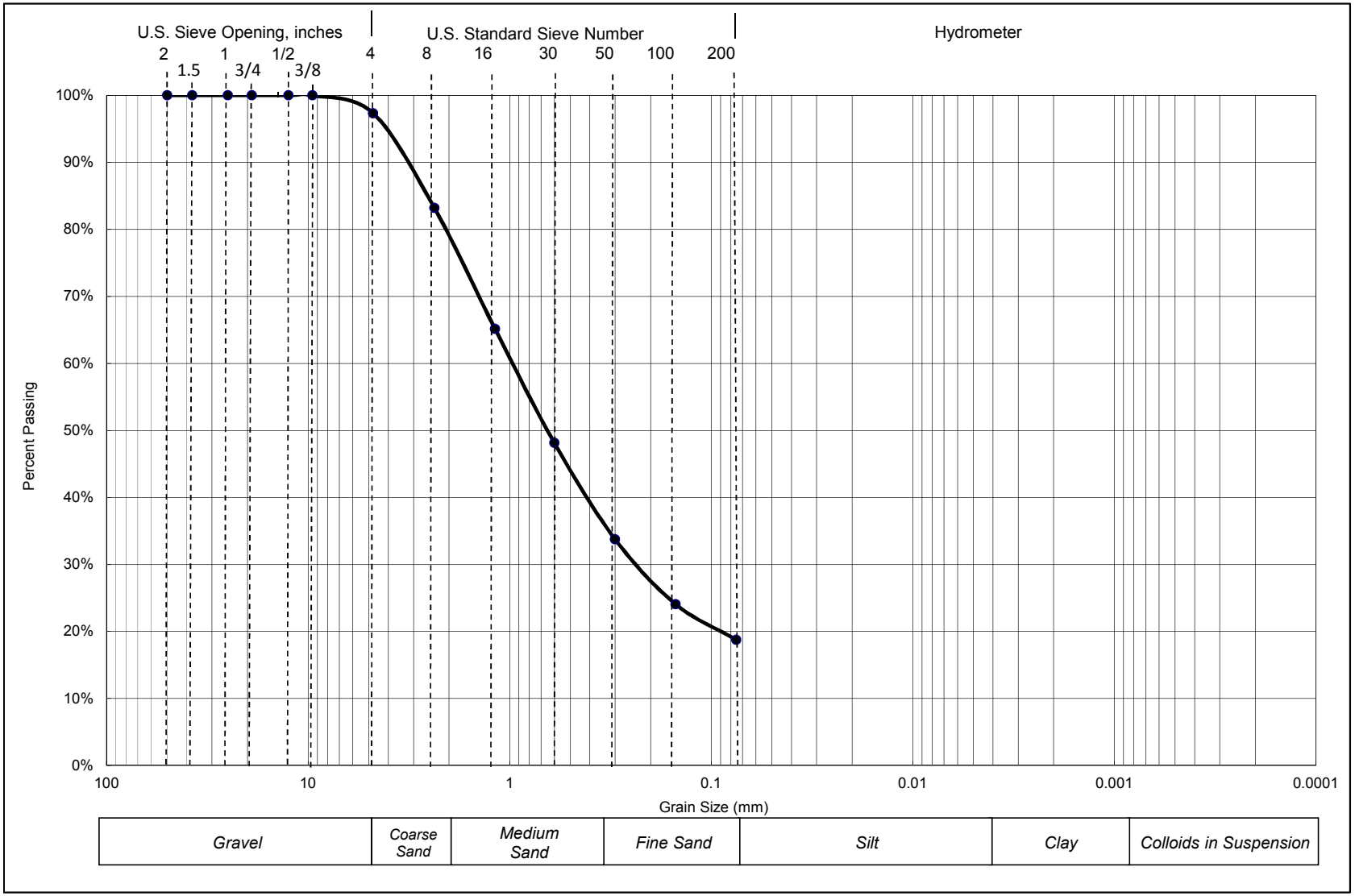
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.5%
No. 8	2.36	98.2%
No. 16	1.18	95.1%
No. 30	0.6	90.9%
No. 50	0.3	85.8%
No. 100	0.15	80.2%
No. 200	0.075	72.6%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 35'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 40'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

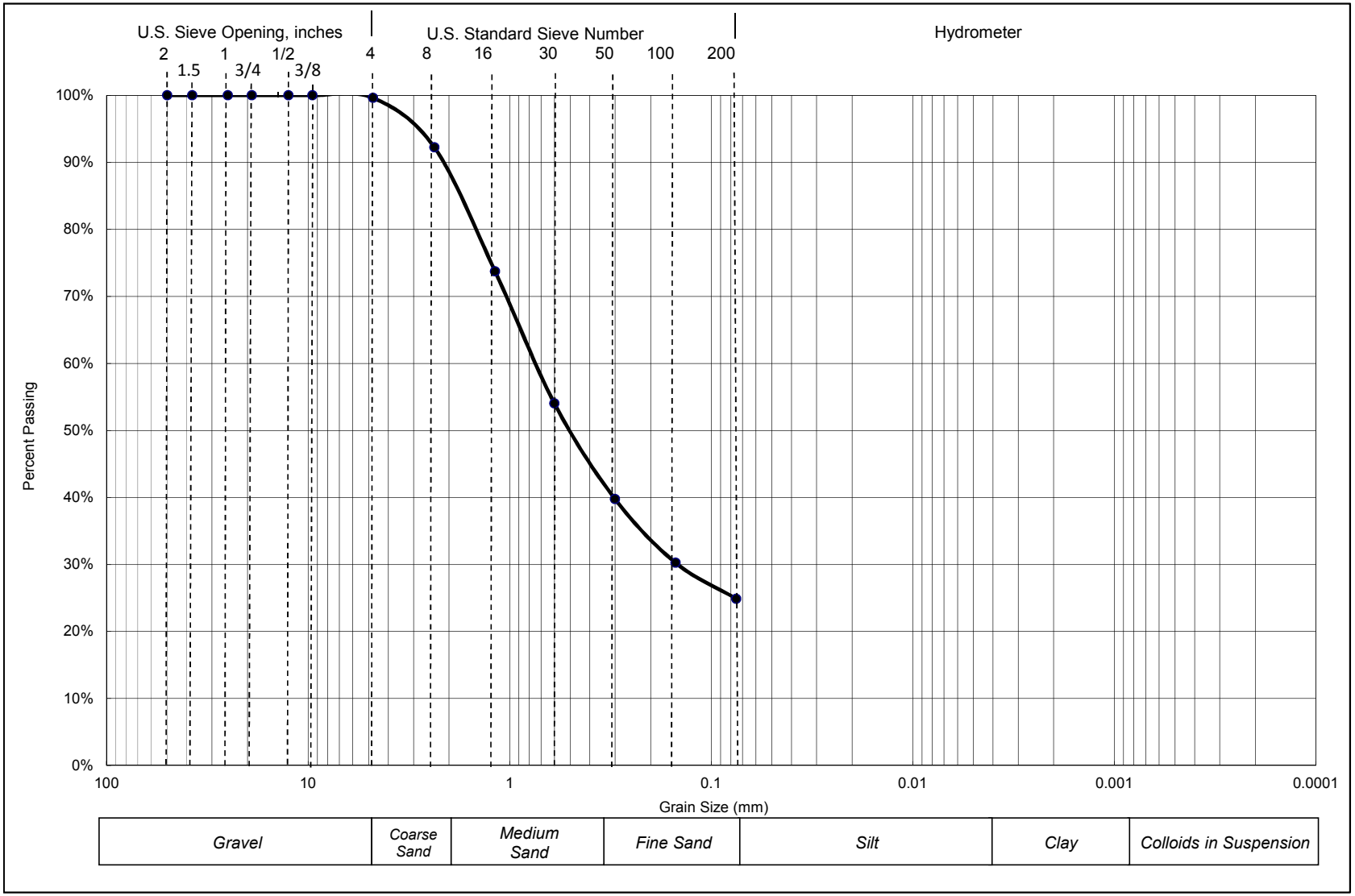
Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	97.3%
No. 8	2.36	83.2%
No. 16	1.18	65.1%
No. 30	0.6	48.1%
No. 50	0.3	33.8%
No. 100	0.15	24.1%
No. 200	0.075	18.8%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 40'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 422



Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA

Project Number: 3-215-1091

Boring: B-1 @ 45'

SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DRY SIEVE ANALYSIS (ASTM D422 without Hydrometer)

Sieve Size	Particle Size, mm	Percent Passing
1 1/2-in.	37.5	100.0%
1-in.	25	100.0%
3/4-in.	19	100.0%
1/2-in.	12.5	100.0%
3/8-in.	9.5	100.0%
No. 4	4.75	99.6%
No. 8	2.36	92.2%
No. 16	1.18	73.7%
No. 30	0.6	54.0%
No. 50	0.3	39.8%
No. 100	0.15	30.2%
No. 200	0.075	24.9%

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Boring: B-1 @ 45'

SALEM engineering group, inc.

EXPANSION INDEX TEST
ASTM D 4829 / UBC Std. 29-2

Project Number: 3-215-1091
Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Date Tested: 11/20/15
Sample location/ Depth: B-1 @ 0' - 3'
Sample Number: 1
Soil Classification: Silty SAND/ Sandy SILT (SM/ML) with trace clay

Trial #	1	2	3
Weight of Soil & Mold, gms	615.4		
Weight of Mold, gms	186.7		
Weight of Soil, gms	428.7		
Wet Density, Lbs/cu.ft.	129.3		
Weight of Moisture Sample (Wet), gms	300.0		
Weight of Moisture Sample (Dry), gms	279.2		
Moisture Content, %	7.4		
Dry Density, Lbs/cu.ft.	120.3		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	50.3		

Time	Inital	30 min	1 hr	6 hrs	12 hrs	24 hrs
Dial Reading	0	--	--	--	--	0.0203

Expansion Index $_{measured}$ = 20.3
Expansion Index $_{50}$ = 20.4

Expansion Index = 20

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

SALEM engineering group

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

CHEMICAL ANALYSIS

SO_4 - Modified Caltrans 417 & Cl - Modified Caltrans 417/422

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Date: 11/20/15
Soil Classification: Silty SAND/ Sandy SILT (SM/ML) with trace clay

Sample Number	Sample Location	Soluble Sulfate SO_4-S	Soluble Chloride Cl	pH
1a.	B-1 @ 0' - 3'	205 mg/Kg	119 mg/Kg	7.4
1b.	B-1 @ 0' - 3'	186 mg/Kg	109 mg/Kg	7.4
1c.	B-1 @ 0' - 3'	170 mg/Kg	107 mg/Kg	7.4
Average:		**187 mg/Kg**	**112 mg/Kg**	**7.4**

SALEM engineering group, inc.

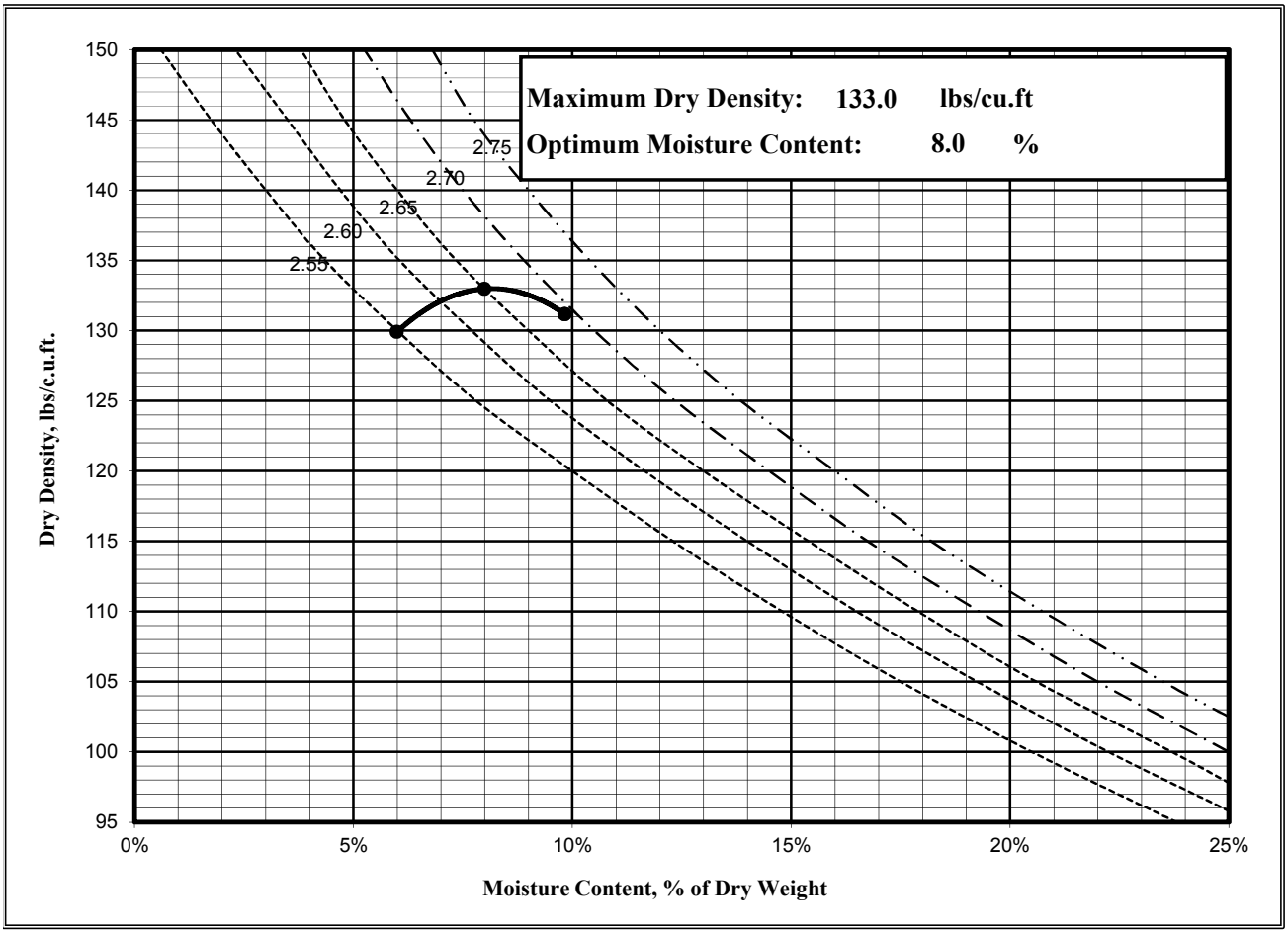
Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

LABORATORY COMPACTION CURVE

ASTM - D1557, D698

Moreno Valley Cactus Center, NEC Cactus Ave and Commerce Center Dr, Moreno Valley, CA
Project Number: 3-215-1091
Date Tested: 11/20/15
Sample Location: B-1 @ 0' - 3'
Soil Classification: Brown Silty SAND/ Sandy SILT (SM/ML) with trace clay
Sample/Curve Number: 1
Test Method: 1557 A

	1	2	3
Weight of Moist Specimen & Mold, gm	4428.3	4435.2	4338.8
Weight of Compaction Mold, gm	2259.1	2259.1	2259.1
Weight of Moist Specimen, gm	2169.2	2176.1	2079.7
Volume of mold, cu. ft.	0.0333	0.0333	0.0333
Wet Density, lbs/cu.ft.	143.6	144.1	137.7
Weight of Wet (Moisture) Sample, gm	200.0	200.0	200.0
Weight of Dry (Moisture) Sample, gm	185.2	182.1	188.7
Moisture Content, %	8.0%	9.8%	6.0%
Dry Density, lbs/cu.ft.	133.0	131.2	129.9



SALEM engineering group, inc.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

APPENDIX

C

APPENDIX C
GENERAL EARTHWORK AND PAVEMENT SPECIFICATIONS

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

1.0 SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including, but not limited to, the furnishing of all labor, tools and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans and disposal of excess materials.

2.0 PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of SALEM Engineering Group, Incorporated, hereinafter referred to as the Soils Engineer and/or Testing Agency. Attainment of design grades, when achieved, shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary adjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer, or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

3.0 TECHNICAL REQUIREMENTS: All compacted materials shall be densified to no less that 95 percent of relative compaction (90 percent for cohesive soils) based on ASTM D1557 Test Method (latest edition), UBC or CAL-216, or as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

4.0 SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the Geotechnical Engineering Report. The Contractor shall make his own interpretation of the data contained in the Geotechnical Engineering Report and the Contractor shall not be relieved of liability for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

5.0 DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or wind-blown materials attributable to his work. Site preparation shall consist of site clearing and grubbing and preparation of foundation materials for receiving fill.

6.0 CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter and all other matter determined by the Soils Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed improvement areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots greater than 1 inch in diameter. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations is not permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

7.0 SUBGRADE PREPARATION: Surfaces to receive Engineered Fill and/or building or slab loads shall be prepared as outlined above, scarified to a minimum of 12 inches, moisture-conditioned as necessary, and recompacted to 95 percent relative compaction (90 percent for cohesive soils).

Loose soil areas and/or areas of disturbed soil shall be moisture-conditioned as necessary and recompacted to 95 percent relative compaction (90 percent for cohesive soils). All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any fill material.

8.0 EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

9.0 FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence or approval of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills, provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

10.0 PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. Compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer. Both cut and fill shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

11.0 SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing, or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill is as specified.

12.0 DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to, is the most recent edition of the Standard Specifications of the State of California, Department of Transportation. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as determined by ASTM D1557 Test Method (latest edition) or California Test Method 216 (CAL-216), as applicable.

13.0 PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 95 percent (90 percent for cohesive soils) based upon ASTM D1557. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

14.0 AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class II material, ¾-inch or 1½-inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent based upon CAL-216. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

15.0 AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class II Subbase material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent based upon CAL-216, and it shall be spread and compacted in accordance with the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

16.0 ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10, unless otherwise stipulated or local conditions warrant more stringent grade. The mineral aggregate shall be Type A or B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39. The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

combination steel-wheel and pneumatic rollers, as described in the Standard Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

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WQMP Project Report

County of Riverside Stormwater Program

Santa Ana River Watershed Geodatabase

Wednesday, October 26, 2016

Note: The information provided in this report and on the Stormwater Geodatabase for the County of Riverside Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	297130053, 297130052, 297130027, 297130039, 297130054
Latitude/Longitude:	33.9109, -117.2733
Thomas Brothers Page:	717
Project Site Acreage:	8.23
Watershed(s):	**SANTA ANA, SANTA ANA**
This Project Site Resides in the following Hydrologic Unit (s) (HUC):	**HUC Name** - HUC Number **Perris Reservoir** - 180702020305
The HUCs Contribute stormwater to the following 303d listed water bodies and TMDLs which may include drainage from your proposed Project Site:	**WBID Name** - WBID Number **Canyon Lake (Railroad Canyon Reservoir)** - CAL8021100019990208151525 **Elsinore, Lake** - CAL8023100019990208151100
These 303d listed Water bodies and TMDLs have the following Pollutants of Concern (POC):	**Bacterial Indicators** - Pathogens **Nutrients** - Nutrients, Organic Enrichment/Low Dissolved Oxygen **Other Organics** - PCBs (Polychlorinated biphenyls) **Toxicity** - Sediment Toxicity, Unknown Toxicity
Is the Site subject to Hydromodification:	Yes
Limitations on Infiltration:	**Project Site Onsite Soils Group(s)** - C **Known Groundwater Contamination Plumes within 1000'** - No **Adjacent Water Supply Wells(s)** - No information available please contact your local water agency for more information. Your local contact agency is EASTERN MUNICIPAL W.D.. Your local wholesaler contact agency is METROPOLITAN WATER DISTRICT.
Environmentally Sensitive Areas within 200'(Fish and Wildlife Habitat/Species):	None
Environmentally Sensitive Areas within 200'(CVMSHCP):	None
Environmentally Sensitive Areas within 200'(WRMSHCP):	Burrowing Owl Survey Required Area
Groundwater elevation from Mean Sea Level:	1541
85th Percentile Design Storm Depth (in):	0.622
Groundwater Basin:	Perris-North
MSHCP/CVMSHCP Criteria Cell(s):	No Data
Retention Ordinance Information:	No Data
Studies and Reports Related to Project Site:	Comprehensive Nutrient Reduction Plan IBI Scores - Southern Cal RiversideBasin bulletin118_4-sc water_fact_3_7.11 8039-SAR-Hydromodification West San Jacinto GW Basin Management Plan Comprehensive Nutrient Reduction Plan IBI Scores - Southern Cal RiversideBasin bulletin118_4-sc water_fact_3_7.11 8039-SAR-Hydromodification West San Jacinto GW Basin Management Plan

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.088 (0.074-0.107)	0.117 (0.098-0.142)	0.157 (0.131-0.191)	0.191 (0.157-0.234)	0.239 (0.190-0.303)	0.277 (0.216-0.359)	0.317 (0.241-0.422)	0.361 (0.266-0.494)	0.422 (0.298-0.604)	0.472 (0.322-0.700)
10-min	0.126 (0.105-0.153)	0.168 (0.140-0.204)	0.225 (0.187-0.274)	0.274 (0.226-0.335)	0.342 (0.272-0.434)	0.397 (0.309-0.515)	0.455 (0.346-0.605)	0.517 (0.381-0.708)	0.605 (0.428-0.865)	0.677 (0.461-1.00)
15-min	0.153 (0.127-0.185)	0.203 (0.170-0.246)	0.272 (0.227-0.331)	0.331 (0.273-0.405)	0.414 (0.329-0.525)	0.480 (0.374-0.623)	0.550 (0.418-0.732)	0.625 (0.461-0.856)	0.732 (0.517-1.05)	0.819 (0.558-1.21)
30-min	0.237 (0.198-0.287)	0.316 (0.263-0.383)	0.423 (0.352-0.514)	0.514 (0.424-0.630)	0.642 (0.512-0.815)	0.746 (0.581-0.967)	0.855 (0.649-1.14)	0.971 (0.717-1.33)	1.14 (0.803-1.63)	1.27 (0.867-1.88)
60-min	0.335 (0.280-0.405)	0.446 (0.372-0.541)	0.598 (0.497-0.726)	0.726 (0.599-0.890)	0.908 (0.723-1.15)	1.05 (0.821-1.37)	1.21 (0.917-1.61)	1.37 (1.01-1.88)	1.61 (1.14-2.30)	1.80 (1.23-2.66)
2-hr	0.488 (0.408-0.591)	0.635 (0.529-0.769)	0.830 (0.691-1.01)	0.993 (0.819-1.22)	1.22 (0.970-1.54)	1.40 (1.09-1.81)	1.58 (1.20-2.10)	1.77 (1.30-2.42)	2.03 (1.44-2.91)	2.24 (1.53-3.33)
3-hr	0.597 (0.499-0.722)	0.770 (0.642-0.933)	1.00 (0.831-1.21)	1.19 (0.980-1.46)	1.45 (1.15-1.84)	1.65 (1.29-2.14)	1.86 (1.41-2.47)	2.07 (1.53-2.84)	2.37 (1.67-3.39)	2.60 (1.77-3.85)
6-hr	0.824 (0.688-0.996)	1.06 (0.882-1.28)	1.36 (1.14-1.66)	1.61 (1.33-1.98)	1.96 (1.56-2.48)	2.22 (1.73-2.88)	2.49 (1.89-3.31)	2.76 (2.04-3.78)	3.13 (2.21-4.48)	3.43 (2.33-5.08)
12-hr	1.07 (0.891-1.29)	1.38 (1.15-1.68)	1.79 (1.49-2.18)	2.13 (1.76-2.61)	2.59 (2.06-3.28)	2.94 (2.29-3.81)	3.29 (2.50-4.38)	3.65 (2.70-5.00)	4.15 (2.93-5.93)	4.53 (3.09-6.71)
24-hr	1.39 (1.23-1.60)	1.83 (1.62-2.11)	2.41 (2.12-2.79)	2.88 (2.52-3.36)	3.52 (2.98-4.24)	4.01 (3.33-4.93)	4.51 (3.65-5.68)	5.02 (3.96-6.50)	5.72 (4.33-7.70)	6.25 (4.58-8.72)
2-day	1.65 (1.46-1.90)	2.21 (1.95-2.55)	2.94 (2.60-3.41)	3.55 (3.10-4.14)	4.37 (3.70-5.27)	5.00 (4.15-6.16)	5.65 (4.58-7.12)	6.32 (4.98-8.18)	7.23 (5.47-9.74)	7.93 (5.81-11.1)
3-day	1.76 (1.55-2.02)	2.38 (2.11-2.75)	3.22 (2.83-3.72)	3.90 (3.41-4.55)	4.83 (4.09-5.82)	5.55 (4.61-6.83)	6.29 (5.10-7.93)	7.06 (5.57-9.14)	8.11 (6.14-10.9)	8.92 (6.53-12.4)
4-day	1.90 (1.68-2.19)	2.60 (2.30-3.00)	3.53 (3.11-4.09)	4.30 (3.76-5.02)	5.35 (4.53-6.45)	6.17 (5.12-7.59)	7.01 (5.68-8.83)	7.88 (6.21-10.2)	9.07 (6.87-12.2)	10.0 (7.33-13.9)
7-day	2.13 (1.88-2.45)	2.96 (2.61-3.41)	4.07 (3.58-4.71)	4.99 (4.36-5.82)	6.25 (5.29-7.54)	7.24 (6.01-8.91)	8.26 (6.69-10.4)	9.32 (7.35-12.1)	10.8 (8.16-14.5)	11.9 (8.73-16.6)
10-day	2.25 (1.99-2.59)	3.15 (2.79-3.64)	4.37 (3.85-5.06)	5.38 (4.71-6.28)	6.79 (5.75-8.18)	7.89 (6.54-9.70)	9.02 (7.31-11.4)	10.2 (8.05-13.2)	11.9 (8.97-16.0)	13.1 (9.62-18.3)
20-day	2.64 (2.34-3.05)	3.76 (3.32-4.34)	5.28 (4.66-6.11)	6.56 (5.74-7.66)	8.36 (7.08-10.1)	9.79 (8.12-12.0)	11.3 (9.14-14.2)	12.9 (10.1-16.6)	15.1 (11.4-20.3)	16.8 (12.3-23.4)
30-day	3.10 (2.75-3.58)	4.41 (3.90-5.09)	6.21 (5.47-7.18)	7.73 (6.76-9.02)	9.90 (8.38-11.9)	11.6 (9.66-14.3)	13.5 (10.9-17.0)	15.4 (12.2-20.0)	18.2 (13.8-24.5)	20.4 (14.9-28.4)
45-day	3.66 (3.24-4.22)	5.15 (4.55-5.95)	7.23 (6.37-8.37)	9.01 (7.88-10.5)	11.6 (9.81-14.0)	13.7 (11.3-16.8)	15.9 (12.9-20.0)	18.3 (14.4-23.6)	21.7 (16.4-29.2)	24.4 (17.9-34.0)
60-day	4.23 (3.74-4.88)	5.87 (5.19-6.78)	8.18 (7.21-9.47)	10.2 (8.90-11.9)	13.1 (11.1-15.8)	15.5 (12.8-19.0)	18.0 (14.6-22.7)	20.8 (16.4-26.9)	24.7 (18.7-33.3)	28.0 (20.5-39.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA A

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A1	*1,680*	*Roofs*	*1*	*0.89*	*1498.6*			
A2	*26,205*	*Concrete or Asphalt*	*1*	*0.892*	*23374.9*			
A3	*1,450*	*Ornamental Landscaping*	*0.1*	*0.110458*	*160.2*			
A4	*5,134*	*Ornamental Landscaping*	*0.1*	*0.110458*	*567.1*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA B

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
B1	3,863	Roofs	1	0.89	3445.8			
B2	13,272	Concrete or Asphalt	1	0.892	11838.6			
B3	2,945	Ornamental Landscaping	0.1	0.110458	325.3			
B4	2,741	Ornamental Landscaping	0.1	0.110458	302.8			
	22821	Total			15912.5	0.62	824.8	3590.7

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA C

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
C1	*4,988*	*Roofs*	*1*	*0.89*	*4449.3*			
C2	*15,298*	*Concrete or Asphalt*	*1*	*0.892*	*13645.8*			
C3	*1,659*	*Ornamental Landscaping*	*0.1*	*0.110458*	*183.2*			
C4	*955*	*Ornamental Landscaping*	*0.1*	*0.110458*	*105.5*			
	22900		***Total***		**18383.8**	**0.62**	***952.9***	***1289***

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA D

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D1	*5,611*	*Roofs*	*1*	*0.89*	*5005*			
D2	*36,213*	*Concrete or Asphalt*	*1*	*0.892*	*32302*			
D3	*7,198*	*Ornamental Landscaping*	*0.1*	*0.110458*	*795.1*			
D4	*2,394*	*Ornamental Landscaping*	*0.1*	*0.110458*	*264.4*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA E

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
E1	*16,146*	*Roofs*	*1*	*0.89*	*14402.2*			
E2	*6,366*	*Concrete or Asphalt*	*1*	*0.892*	*5678.5*			
E3	*2,209*	*Ornamental Landscaping*	*0.1*	*0.110458*	*244*			
E4	*648*	*Ornamental Landscaping*	*0.1*	*0.110458*	*71.6*			
	25369		***Total***		**20396.3**	**0.62**	***1057.2***	***1062.7***

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA F

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
F1	*8,902*	*Roofs*	*1*	*0.89*	*7940.6*			
F2	*12,744*	*Concrete or Asphalt*	*1*	*0.892*	*11367.6*			
F3	*3,563*	*Ornamental Landscaping*	*0.1*	*0.110458*	*393.6*			
F4	*1,548*	*Ornamental Landscaping*	*0.1*	*0.110458*	*171*			
	26757		***Total***		**19872.8**	**0.62**	***1030.1***	***1981.4***

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA G

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
G1	*13,602*	*Roofs*	*1*	*0.89*	*12133*			
G2	*8,113*	*Concrete or Asphalt*	*1*	*0.892*	*7236.8*			
G3	*151*	*Ornamental Landscaping*	*0.1*	*0.110458*	*16.7*			
G4	*1,980*	*Ornamental Landscaping*	*0.1*	*0.110458*	*218.7*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA H

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
H2	*14,350*	*Concrete or Asphalt*	*1*	*0.89*	*12800.2*			
H3	*744*	*Ornamental Landscaping*	*0.1*	*0.110458*	*82.2*			
H4	*443*	*Ornamental Landscaping*	*0.1*	*0.110458*	*48.9*			
	15537		***Total***		**12931.3**	**0.62**	***670.3***	***729***

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA I

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
I2	*4,589*	*Concrete or Asphalt*	*1*	*0.89*	*4093.4*			
I3	*348*	*Ornamental Landscaping*	*0.1*	*0.110458*	*38.4*			
I4	*332*	*Ornamental Landscaping*	*0.1*	*0.110458*	*36.7*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	SALEM ENGINEERING GROUP, INC.	Date	2/2/2017
Designed by	LCD	Case No	
Company Project Number/Name	3-716-1096 Cactus Commerce		

BMP Identification

BMP NAME / ID: DMA J

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
J2	*10,425*	*Concrete or Asphalt*	*1*	*0.89*	*9299.1*			
J3	*2,111*	*Ornamental Landscaping*	*0.1*	*0.110458*	*233.2*			
J4	*285*	*Ornamental Landscaping*	*0.1*	*0.110458*	*31.5*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA K

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
K2	*1,909*	*Concrete or Asphalt*	*1*	*0.89*	*1702.8*			
K3	*25*	*Ornamental Landscaping*	*0.1*	*0.110458*	*2.8*			
K4	*202*	*Ornamental Landscaping*	*0.1*	*0.110458*	*22.3*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA L

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
L1	*1,689*	*Roofs*	*1*	*0.89*	*1506.6*			
L2	*7,039*	*Concrete or Asphalt*	*1*	*0.892*	*6278.8*			
L3	*2,085*	*Ornamental Landscaping*	*0.1*	*0.110458*	*230.3*			
L4	*637*	*Ornamental Landscaping*	*0.1*	*0.110458*	*70.4*			
	11450		***Total***		**8086.1**	**0.62**	***419.1***	***860***

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA M

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
M2	*3,799*	*Concrete or Asphalt*	*1*	*0.89*	*3388.7*			
M3	*313*	*Ornamental Landscaping*	*0.1*	*0.110458*	*34.6*			
M4	*281*	*Ornamental Landscaping*	*0.1*	*0.110458*	*31*			
	4393		***Total***		**3454.3**	**0.62**	***179***	***379.4***

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: SALEM ENGINEERING GROUP, INC. Date: 2/2/2017

Designed by: LCD Case No:

Company Project Number/Name: 3-716-1096 Cactus Commerce

BMP Identification

BMP NAME / ID: DMA N

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.62 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
N1	*1,574*	*Roofs*	*1*	*0.89*	*1404*			
N2	*8,419*	*Concrete or Asphalt*	*1*	*0.892*	*7509.7*			
N3	*4,940*	*Ornamental Landscaping*	*0.1*	*0.110458*	*545.7*			
N4	*419*	*Ornamental Landscaping*	*0.1*	*0.110458*	*46.3*			
	15352		***Total***		**9505.7**	**0.62**	***492.7***	***565.7***

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID: DMA A	Legend:	Required Entries / Calculated Cells

Company Name: SALEM Engineering — Date: 2/2/2017

Designed by: LCD — County/City Case No.: PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T =	0.7912	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	1,327	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	18.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.31	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	1,013	ft^2
Proposed Surface Area	A=	5,134	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet

Describe Vegetation: Other

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID DMA B	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.5238	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	825	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	19.5	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.31	ft
Minimum Surface Area, A_m $A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	628	ft^2
Proposed Surface Area	A=	2,741	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	DMA C		Calculated Cells	

Company Name:	SALEM Engineering	Date:	2/2/2017	
Designed by:	LCD	County/City Case No.:	PEN16-	131

Design Volume

Enter the area tributary to this feature	A_T=	0.5257	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	926	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	5.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	686	ft^2
Proposed Surface Area	A=	955	ft^2
Minimum Required Length of Bioretention Facility, L	L =	137.2	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID DMA D	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	1.1803	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,989	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	17.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	1,474	ft^2
Proposed Surface Area	A=	2,394	ft^2
Minimum Required Length of Bioretention Facility, L	L =	86.7	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID: DMA E	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.5824	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,057	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	2.8	ft
Top Width of Bioretention Facility, excluding curb	w_T =	8.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.64	ft
Minimum Surface Area, A_m $A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	646	ft^2
Proposed Surface Area	A=	648	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	DMA F		Calculated Cells	

Company Name:	SALEM Engineering	Date:	2/2/2017	
Designed by:	LCD	County/City Case No.:	PEN16-	131

Design Volume

Enter the area tributary to this feature	A_T=	0.6142	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,030	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	10.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.28	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	805	ft^2
Proposed Surface Area	A=	1,548	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID: DMA G	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.7003	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,324	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	8.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	981	ft^2
Proposed Surface Area	A=	1,980	ft^2
Minimum Required Length of Bioretention Facility, L	L =	122.6	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID DMA H	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.204	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	670	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	2.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	4.5	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.65	ft
Minimum Surface Area, A_m			
$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	407	ft^2
Proposed Surface Area	A=	443	ft^2
Minimum Required Length of Bioretention Facility, L	L =	90.4	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID: DMA I	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.121	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	216	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	5.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	161	ft^2
Proposed Surface Area	A=	332	ft^2
Minimum Required Length of Bioretention Facility, L	L =	32.2	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:	Other		

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID: DMA J	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.2943	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	496	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	5.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.80	ft
Minimum Surface Area, A_m			
$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	276	ft^2
Proposed Surface Area	A=	285	ft^2
Minimum Required Length of Bioretention Facility, L	L =	55.2	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID: DMA K	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.049	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	90	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	6.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	67	ft^2
Proposed Surface Area	A=	202	ft^2
Minimum Required Length of Bioretention Facility, L	L =	11.2	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID DMA L	Legend:	Required Entries / Calculated Cells

Company Name:	SALEM Engineering	Date:	2/2/2017
Designed by:	LCD	County/City Case No.:	PEN16- 131

Design Volume

Enter the area tributary to this feature	A_T=	0.2629	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	419	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	7.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	311	ft^2
Proposed Surface Area	A=	637	ft^2
Minimum Required Length of Bioretention Facility, L	L =	44.4	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:	Other		

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	DMA M		Calculated Cells	

Company Name:	SALEM Engineering	Date:	2/2/2017	
Designed by:	LCD	County/City Case No.:	PEN16-	131

Design Volume

Enter the area tributary to this feature	A_T=	0.1008	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	179	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	13.5	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$	A_M =	133	ft^2
Proposed Surface Area	A=	281	ft^2
Minimum Required Length of Bioretention Facility, L	L =	9.9	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:	Other		

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	DMA N		Calculated Cells	

Company Name:	SALEM Engineering	Date:	2/2/2017	
Designed by:	LCD	County/City Case No.:	PEN16-	131

Design Volume

Enter the area tributary to this feature	A_T=	0.3524	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	493	ft^3

Type of Bioretention Facility Design

- ○ Side slopes required (parallel to parking spaces or adjacent to walkways)
- ◉ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	6.0	ft
Total Effective Depth, d_E			
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$	d_E =	1.35	ft
Minimum Surface Area, A_m			
$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	365	ft^2
Proposed Surface Area	A=	419	ft^2
Minimum Required Length of Bioretention Facility, L	L =	60.8	ft

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		1	%
6" Check Dam Spacing		25	feet
Describe Vegetation:		Other	

Notes: See landscape plans for vegetation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

CANYON LAKE FAST FACTS

Canyon Lake is a valuable drinking water source!

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Elsinore Valley Municipal Water District

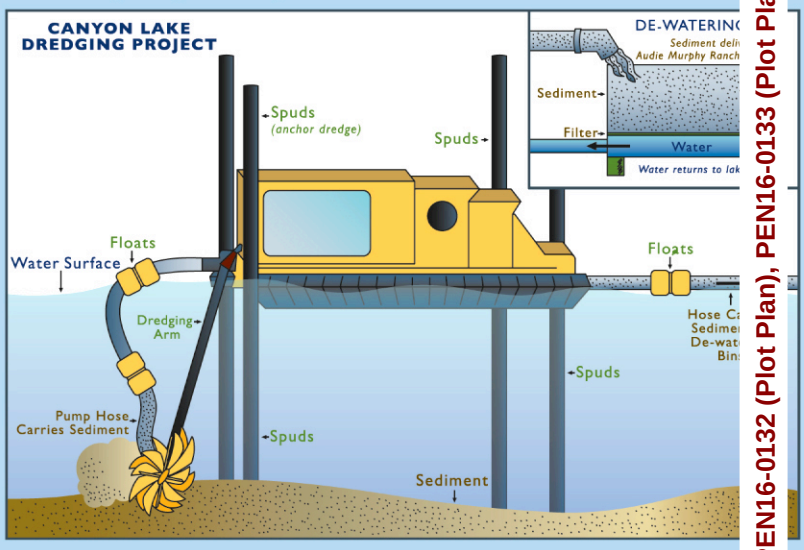
"Nessie" The Dredge Boosts Water Storage, Quality at Canyon Lake

In early 2005, Elsinore Valley Municipal Water District (EVMWD) along with other members of the Lake Elsinore and San Jaci Watersheds Authority (LESJWA) and the Canyon Lake Property Owners Association unveiled a state-of-the-art dredg machine that will increase water storage capacity and improve water quality in Canyon Lake.

Canyon Lake receives about two to three inches of sediment per year - 60 times the rate of a normal lake - leading to diminished water storage capacity and water quality.

Now a bright yellow presence on Canyon Lake, the dredging machine consists of a self-propelled floating platform with an engine-powered pump that will remove excess amounts of sediment from Canyon Lake over the next three to four years. The machine vacuums sediment from the lake bottom and uses a floating pipeline that carries it to dewatering bins for filtration and disposal.

"The Dredging Project benefits Canyon Lake and the entire Watershed by improving the storage capacity of the Lake, which will provide clean water for years to come," said District Board Member Ben Wicke.

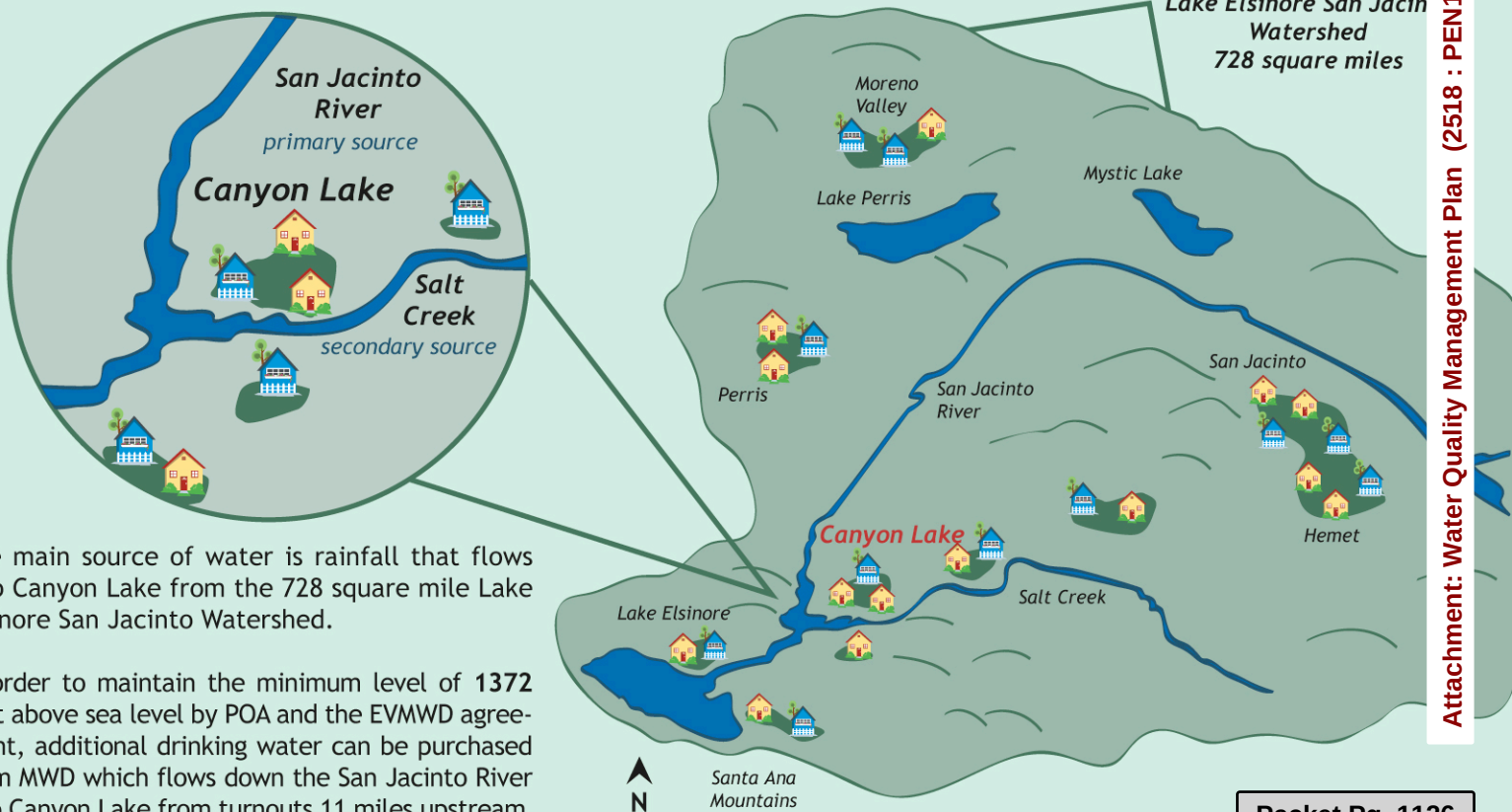


Water Supply Update

1. Who uses the water in Canyon Lake?

Canyon Lake is a drinking water reservoir and plays a very important role during periods of peak customer water dema EVMWD's Canyon Lake water filtration plant serves Canyon Lake residents and customers in the Elsinore Valley. Recreatic surface rights are leased by the Canyon Lake Property Owners's Association through an agreement with EVMWD.

2. What are the sources that supply water to Canyon Lake?



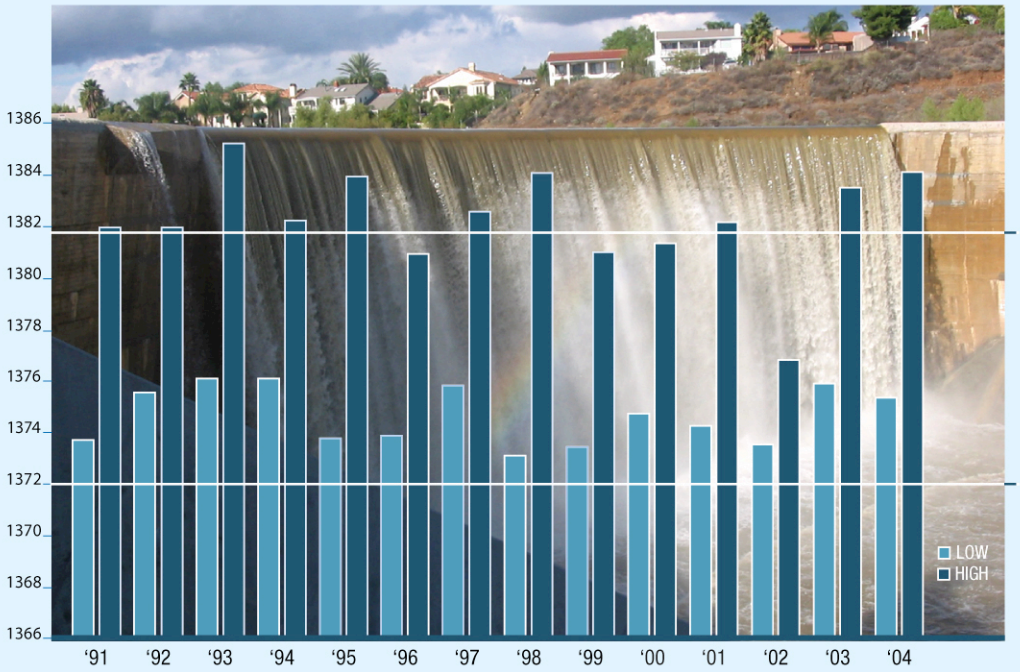
- The main source of water is rainfall that flows into Canyon Lake from the 728 square mile Lake Elsinore San Jacinto Watershed.
- In order to maintain the minimum level of **1372** feet above sea level by POA and the EVMWD agreement, additional drinking water can be purchased from MWD which flows down the San Jacinto River into Canyon Lake from turnouts 11 miles upstream.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

3. What triggers a MWD Water purchase for Canyon Lake?

If more drinking water is needed it is purchased from the Metropolitan Water District. MWD water is imported from Northern California or the Colorado River.

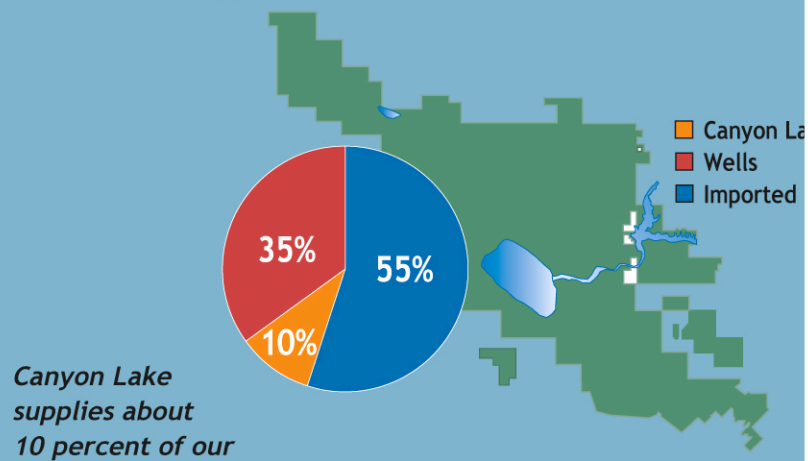
The minimum level to be maintained by agreement between EVMWD and the Canyon Lake POA is **1372** feet above sea level. The lake spills when the level reaches **1381.76** feet above sea level.



4. What is the Canyon Lake water treatment plant?

The Canyon Lake water treatment plant was first constructed in 1955, improved in 2003 and later expanded in 2005. EVMWD owns all water rights in Canyon Lake.

Water treated at this plant provides service to Canyon Lake as well as the rest of EVMWD's 96 square mile service area. Typically the plant runs about 6-8 months out of the year depending on demand and can treat up to 9 million gallons a day.

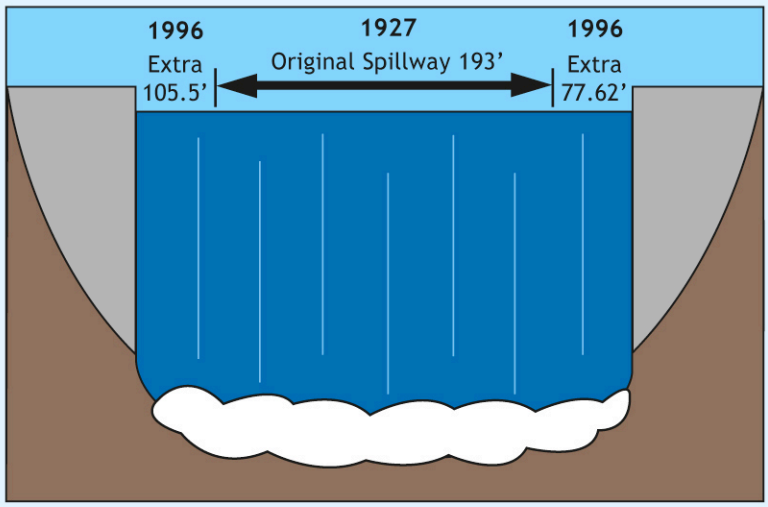


5. How does seasonal rainfall impact lake levels?

Canyon Lake holds approximately 12,000 acre feet of water. If rainfall causes the lake level to exceed that amount, water goes over the spillway, down the San Jacinto river to Lake Elsinore.

Flood gates at the base of the dam are also opened to reduce flooding impacts and bring the lake down to below the spillway. The spillway elevation is **1381.76** feet above sea level.

6. When was the dam modified and how often is it inspected?



- In 1996, EVMWD s approximately $9.1 milli upgrade and improve sa of the Canyon Lake dam
- The Canyon Lake designed to handle a f level of **1409** feet al sea level.
- 100 year flood flow lev **1397.50** feet above sea l
- The dam is inspe annually by the Calif Division of Safety of D and monthly by EVMWD staff.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

6k 7/05

www.evmwd.com

2005 Edition

Seasonal filling from the San Jacinto watershed has provided for customers' water needs year after year.

Elsinore Valley Municipal Water District
P.O. Box 3000
Lake Elsinore, CA 92530

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LAKE ELSINORE, CA
Permit No. 38

Water Quality in Canyon Lake

7. What kind of construction can you do on your property?

Construction of any type along lakefront property requires full approval from the POA and a hold harmless agreement from the POA and EVMWD. A hold harmless agreement is a legal document signed by EVMWD, the Canyon Lake POA and property owner that indemnifies EVMWD and the Canyon Lake POA from any responsibility for flooding or other damages that may occur.

Residential sea walls are required to be at an elevation of **1383** feet above sea level.

For swimming safety questions boating, fishing or any other recreational activities, please call the Canyon Lake POA at (951) 244-6841, ext. 510 or visit canyonlakepoa.com.

Water Quality Testing Frequency

- *Combine Bacteria* - Coliform, E. Coli, Enterocci
- *General Mineral* - Total Alkalinity, Calcium, Chloride, Copper, MBAS, Iron, Potassium, Magnesium, Manganese, pH, Sodium, Sulfate, Specific Conductance, TDS, Total Hardness, and Zinc.
- *General Physical* - PH, hardness, color
- *Inorganics & Nutrients* - Aluminum, Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Nitrate,Nitrite, Selenium, Silver, Fluoride, Antimony, Beryllium, Nickel, Thallium, Cyanide.
- *VOC = Volatile Organic Carbons* - Compounds that vaporize (become gas) at room temperature, some of which may cause short- and long-term adverse health effects.

* During water treatment plant operation, water is tested daily for Combined Bacteria and General Physical Conditions.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets** X	☐ **Locations of inlets.**	☐ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☐ **Maintain and periodically repaint or replace inlet markings.** ☐ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☐ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☐ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☐ B. **Interior floor drains and elevator shaft sump pumps**		☐ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☐ **Show self-retaining landscape areas, if any.** ☐ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☐ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☐ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☐ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☐ **Maintain landscaping using minimum or no pesticides.** ☐ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☐ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ E. **Pools, spas, ponds, decorative fountains, and other water features.**	☐ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	☐ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☒ F. **Food service**	☐ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ☐ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	☐ **Describe the location and features of the designated cleaning area.** ☐ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	☐ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☒ G. **Refuse areas**	☐ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☐ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ☐ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☐ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☐ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☐ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at** www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ J. **Vehicle and Equipment Cleaning**	☐ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	☐ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ☐ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ☐**Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ L. **Fuel Dispensing Areas**	☐ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ☐ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		☐ **The property owner shall dry sweep the fueling area routinely.** ☐ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ M. **Loading Docks**	❑ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		❑ **Move loaded and unloaded items indoors as soon as possible.** ❑ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ N. **Fire Sprinkler Test Water**		☐ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	☐ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ☐ **Boiler drain lines** ☐ **Condensate drain lines** ☐ **Rooftop equipment** ☐ **Drainage sumps** ☒ **Roofing, gutters, and trim.** ☐ **Other sources**		☐ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ☐ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ☐ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ☐ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ☐ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ P. **Plazas, sidewalks, and parking lots.**			☐ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

2010 INTEGRATED REPORT — 303(D) LISTED WATERS

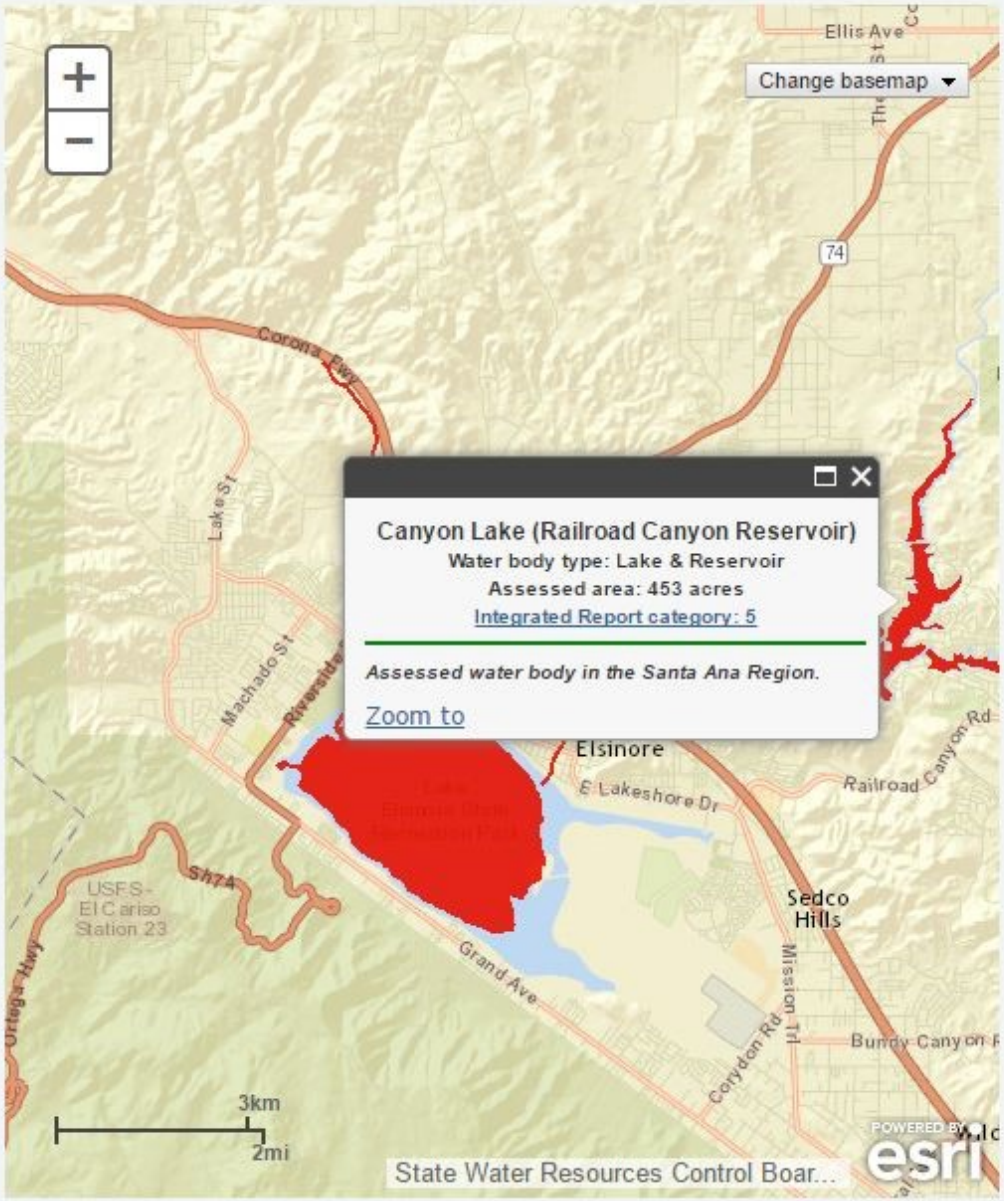
Zoom to county: All
Show county

Zoom to Regional Board: All
Show Regional Board

Map Help

Zoom to water body: *(Filter: All)*

Filter list by: | Reset list



Canyon Lake (Railroad Canyon Reservoir)
Water body type: Lake & Reservoir
Assessed area: 453 acres
Integrated Report category: 5

Assessed water body in the Santa Ana Region.

Zoom to

Canyon Lake (Railroad Canyon Reservoir) Close
Pollutant listings

Pollutants	Listing Decision	Report Link	Potential Sources	Schedule	*Comments*
Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)	20358	n/a	USEPA TMDL approval: 2005	
Pathogens	List on 303(d) list (TMDL required list)	20452	n/a	Est. TMDL completion: 2006	

This Webinar walks the user through the Integrated Report and its geospatial information system (GIS) map

- **Geographical Information Systems (GIS) Files**
  Update 12/23/11: The information presented on this map reflects the final USEPA-approved 2010 303(d) list. If you have any questions regarding the Integrated Report data and information, please email Lisa Holmes or call 916-341-5557. For any GIS-related questions, please email Stephanie Bucknam or call 916-558-17

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

2010 INTEGRATED REPORT — 303(D) LISTED WATERS

Zoom to county: All

Show county

Zoom to Regional Board: All

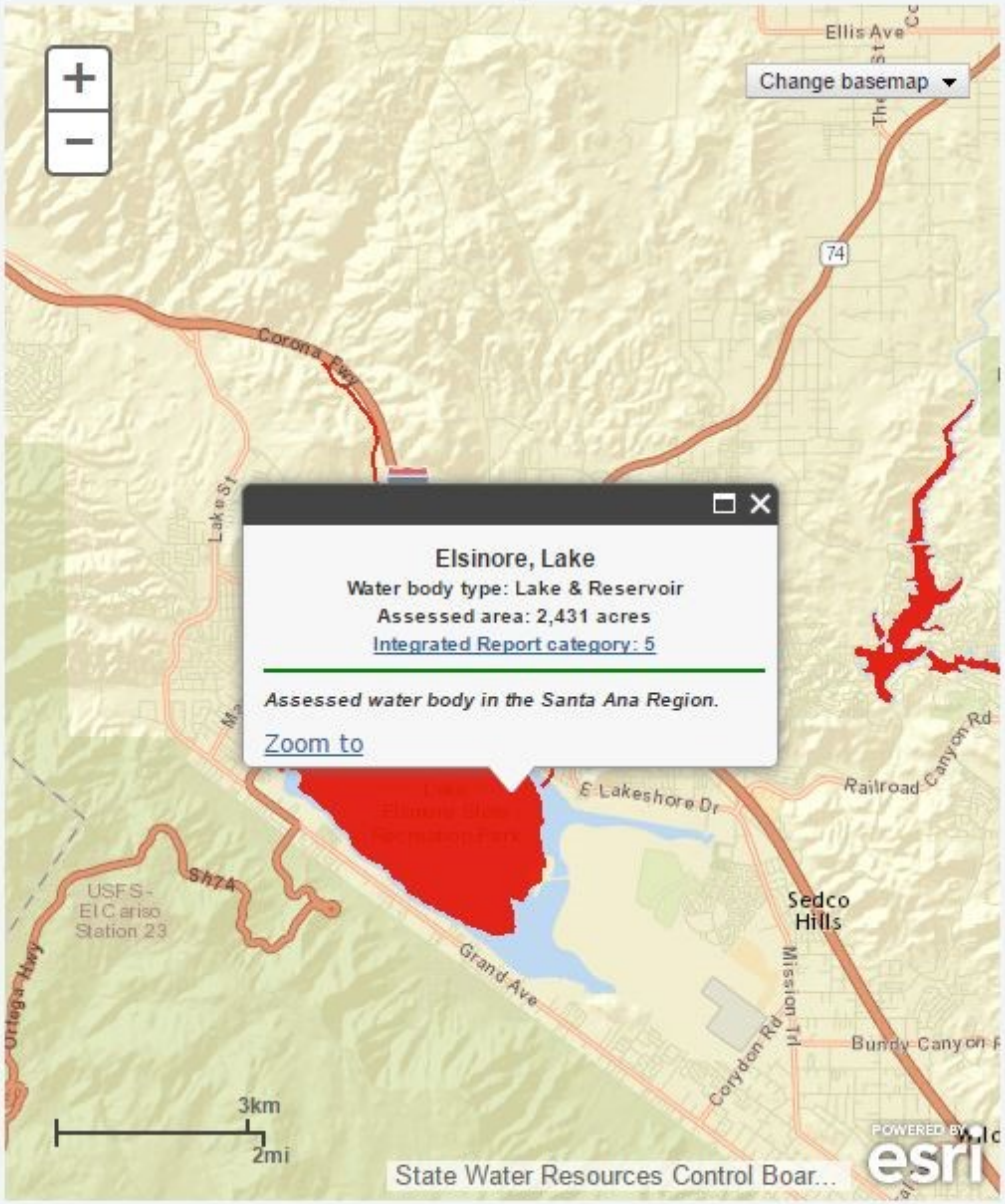
Show Regional Board

Map Help

Zoom to water body: *(Filter: All)*

Filter list by:

Reset list



Elsinore, Lake — *Pollutant listings* — Close

Pollutants	
	Listing Decision
	Report Link
	Potential Sources
	Schedule
	Comments
Nutrients	List on 303(d) list (being addressed by USEPA approved TMDL)
	20368
	n/a
	USEPA TMDL approval: 2005
Organic Enrichment/Low Dissolved Oxygen	List on 303(d) list (being addressed by USEPA approved TMDL)
	20369
	n/a
	USEPA TMDL approval: 2005
PCBs (Polychlorinated biphenyls)	List on 303(d) list (TMDL required list)
	19173
	n/a
	Est. TMDL completion: 2019
Sediment Toxicity	List on 303(d) list (TMDL required list)
	27875
	n/a
	Est. TMDL completion: 2021

This Webinar walks the user through the Integrated Report and its geospatial information system (GIS) map

- **Geographical Information Systems (GIS) Files**
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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

2010 INTEGRATED REPORT — 303(D) LISTED WATERS

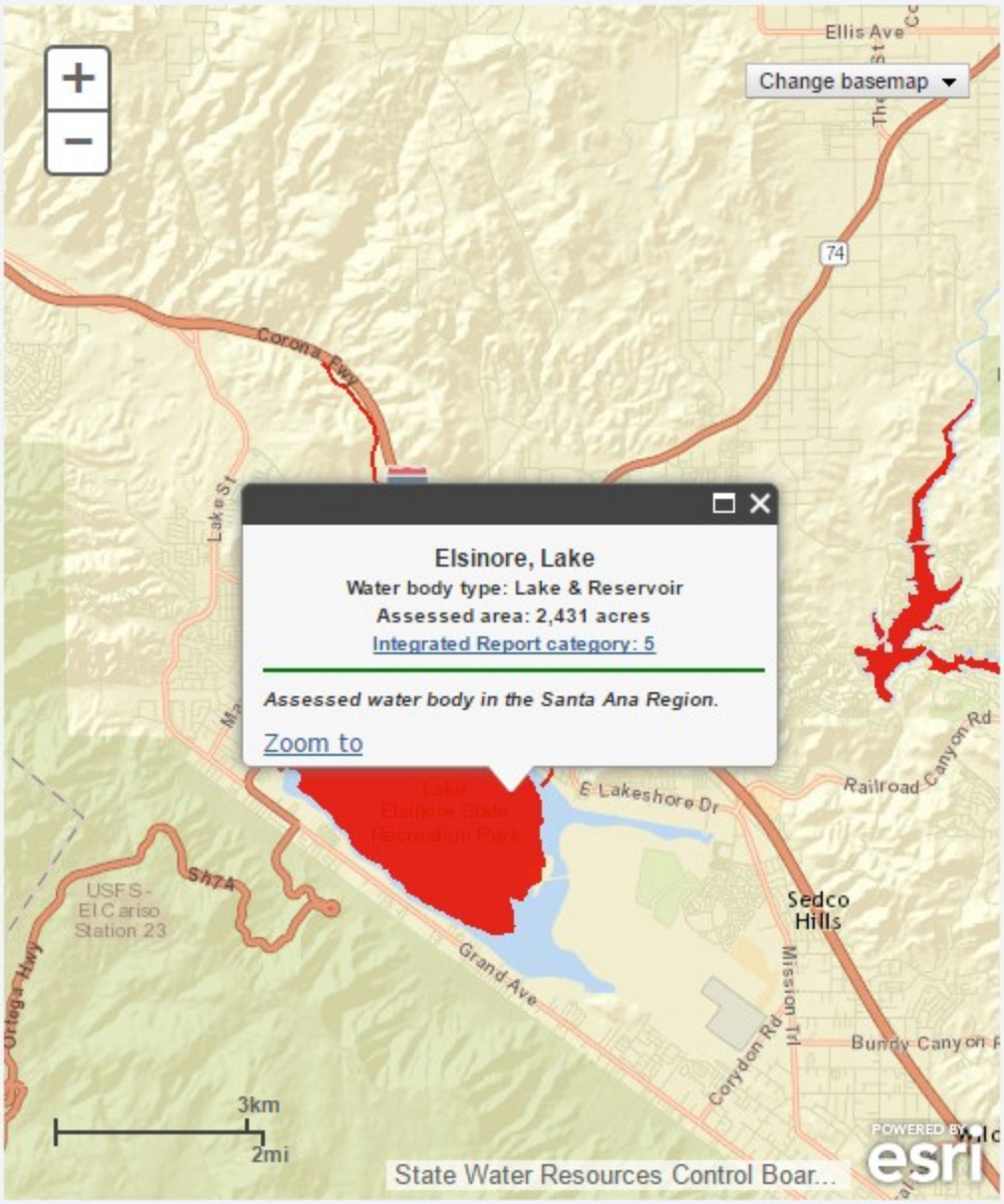
Zoom to county: All — Show county

Zoom to Regional Board: All — Show Regional Board

Map Help

Zoom to water body: *(Filter: All)*

Filter list by: | Reset list



Elsinore, Lake
Pollutant listings

Clos

Pollutants	Listing Decision / Report Link / Potential Sources / Schedule / *Comments*
Organic Enrichment/Low Dissolved Oxygen	List on 303(d) list (being addressed by USEPA approved TMDL)
	20369
	n/a
	USEPA TMDL approval: 2005
PCBs (Polychlorinated biphenyls)	List on 303(d) list (TMDL required list)
	19173
	n/a
	Est. TMDL completion: 2019
Sediment Toxicity	List on 303(d) list (TMDL required list)
	27875
	n/a
	Est. TMDL completion: 2021
Unknown Toxicity	Do Not Delist from 303(d) list (TMDL required list)
	28018
	n/a
	Est. TMDL completion: 2007

This Webinar walks the user through the Integrated Report and its geospatial information system (GIS) map

- **Geographical Information Systems (GIS) Files**
  Update 12/23/11: The information presented on this map reflects the final USEPA-approved 2010 303(d) list. If you have any questions regarding the Inte d Report data and information, please email Lisa Holmes or call 916-341-5557. For any GIS-related questions, please email Stephanie Bucknam or call 916 -170

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

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Treatment BMP Technology Report

April 2010

CTSW-RT-09-239.06

2010 Edition

California Department of Transportation
Division of Environmental Analysis
1120 N Street, Sacramento, California 95814

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APPENDIX B: Technology Fact Sheets B-1

APPENDIX C: Caltrans-Approved BMP Fact Sheets C-1

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1.0 INTRODUCTION

The Treatment BMP Technology Report represents part of the California Department of Transportation (the Department) BMP identification, evaluation, and approval process as described in Section 3.3.2 of the Storm Water Management Plan (SWMP) (CTSW-RT-02-008; Caltrans 2003). This report satisfies the requirement for a New Technology Report contained in the State Water Resources Control Board Order No. 99-06-DWQ. This report consolidates information for post-construction technologies in a standardized manner by using a fact sheet format. The BMP fact sheets summarize available design, construction, and performance information. The fact sheets result from a desktop evaluation of BMPs. Usually, a full-scale field evaluation (pilot testing) is required to collect sufficient information to determine if a BMP should be approved and under what conditions (siting constraints). The Department uses the fact sheets as a preliminary screening tool for selection of pilot BMPs when approved BMPs cannot meet project-specific treatment requirements due to siting constraints. BMPs selected for pilot testing are not automatically approved for statewide use. The SWMP includes procedures to (a) identify the need for Pilot BMPs and (b) propose them. Refer to the Caltrans Storm Water Quality Handbook: Project Planning and Design Guide (PPDG) for comprehensive information on this issue (Caltrans 2007).

Department-Approved Treatment BMPs:

- Biofiltration Systems
- Infiltration Devices
- Detention Devices
- Traction Sand Traps
- Dry Weather Flow Diversion
- Gross Solids Removal Devices (GSRDs)
- Media Filters
- Multi-Chambered Treatment Train
- Wet Basins

2.0 PURPOSE OF TREATMENT BMP TECHNOLOGY REPORT

This document is used by the Department to identify and evaluate treatment BMP technologies for potential use in the highway environment only. The Department does not evaluate BMPs for other situations or entities. This document is intended for internal use by the Department. Unless stated otherwise, vendor products discussed in this document are not approved for use by the Department and are not endorsed by Caltrans or the State of California.

3.0 IDENTIFYING AND EVALUATING NEW TECHNOLOGY

The Department prepares fact sheets based on an initial evaluation of identified treatment technologies. The Department may identify technologies in the course of performing reconnaissance studies for specific treatment needs, including non-proprietary BMPs used by other state departments of transportation. To identify proprietary treatment technologies, the Department relies on manufacturers to submit product information. To introduce products to the Department, manufacturers must contact the New Product Coordinator at (916) 227-7073 for submittal instructions. Fact sheets are updated when new information is submitted to the New Product Coordinator before the end of the reporting period (June 30th).

The Department evaluates identified technologies using several criteria (discussed in Section 3.1) and develops fact sheets of the BMPs for this report.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

3.1 Evaluation Criteria and Fact Sheet Content

BMP fact sheets are developed using a standard format to facilitate comparison among BMPs. Each fact sheet addresses a standard series of topics, including design, operations, maintenance, construction, treatment, advantages, and constraints. The Department, with input from universities, consultants, regulators, third parties, and manufacturers, continually reviews BMP information reported in literature. Appendix A describes the content of the fact sheets and the evaluation criteria for performance. More detailed information on the Department's current pilot studies resides in the Summary of Reports Prepared for the Monitoring and Research Program (Caltrans 2009).

3.2 Fact Sheet Organization and Treatment BMP Technology Approval

Completed BMP fact sheets are presented in Appendices B and C. Section 4 provides an alphabetical list of all the BMP categories to aid in locating fact sheets for specific types of BMPs.

Appendix B contains fact sheets for BMPs that are not approved by the Department. Favorable evaluations of BMPs can lead to pilot studies to gather cost and performance data. In most cases, a group of similar BMPs are represented on a single fact sheet.

Appendix C contains fact sheets for approved BMPs. Consult the PPDG for more details on the implementation of approved BMPs (Caltrans 2007).

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4.0 CATALOG OF TREATMENT BMPS

This alphabetical list includes all BMP technologies. Proprietary BMPs are listed on each fact sheet. The page numbers correspond to the location of the fact sheets in Appendices B and C.

Table 1. List of Treatment BMPs in Appendices

BMP Category	*Stormwater Technology*	*Page No.*
Bioretention		B-3
	Linear Bioretention Trench	B-5
	Tree Box Filter	B-7
Biofiltration		
	Strip	C-3
	Swale	C-5
Detention/Sedimentation		
Chemical Treatment		B-9
Electrocoagulation		B-11
Permanent Pool		B-13
	Wet Basin/Pond	C-27
	Vegetated Rock Filter	B-15
Plate and Tube Settlers		B-17
Temporary Pool		B-19
	Detention Basin	C-7
	Double Barrel	C-25
	Hold and Release	B-21
	Infiltration Chambers	B-23
	Skimmer	B-25
Disinfection		
Chemical Treatment		B-27
Ultraviolet		B-29
Drain Inlet Insert		
Baffle Box		B-31
Basket/Box	Baffled Filtration Box	B-33
	GSR Basket (Mechanically Removed)	B-35
Fabric		B-37
Media		B-39
Screen		B-41
Skimmer		B-43
Dry Weather Flow Diversion		C-9
Filtration		
Bed		B-45
	Austin Sand Filter	C-11
	Austin Filter with Alternative Media	B-47
	Delaware Sand Filter	C-13
	DC Sand Filter	B-49
	Infiltration Chambers	B-51
	Linear Filter Trench	B-53
	Media Filter Drain	B-55

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BMP Category	Stormwater Technology	Page No.
Cartridge/Canister		B-57
Fabric		B-59
Pressure		B-61
Hydrodynamic Separator		B-63
Infiltration		
Basin		C-15
Trench		C-17
Below Grade		B-65
	Linear Infiltration Trench	B-67
Porous Surface		
Asphalt Overlay		B-69
Asphalt Pavement		B-71
Concrete Pavement		B-73
Permeable Pavers/Cellular Confinement		B-75
Screening		
GSRD–Inclined Screen		C-19
GSRD–Linear Radial		C-21
Gross Solids Removal		B-77
Multi-Chambered Treatment Train		C-23
Water Quality Inlet		
Oil/Water Separator		B-79

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

5.0 REFERENCES

Caltrans. 2003. *Statewide Storm Water Management Plan* (SWMP). Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-008.

Caltrans. 2007. *Storm Water Quality Handbooks, Storm Water Planning and Design Guide*. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-07-172.19.1.

Caltrans. 2009. *Summary of Reports Prepared for the Monitoring and Research Program*. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-09-239.1.

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APPENDIX A: BMP FACT SHEET DESCRIPTION AND FORMAT

This appendix describes the content of the fact sheets in Appendices B and C. It also describes evaluation criteria for performance assessments. Each fact sheet is divided into a standard series of topics, which are described below in the order in which they occur in the fact sheets.

A.1 Header Information: BMP Category, Name and Quick Reference Symbols

The left side of the header contains a broad BMP category and more specific subcategory. If necessary, a more specific name is found on the right side. Reference symbols are located in the upper right corner of fact sheets. The symbols and the attributes they represent follow:

Special material handling requirements or potential toxicity

Power is required for this technology

Vactor equipment recommended for maintenance

Vector concern because of standing water

A.2 BMP Description

The BMP description provides a summary of the configuration of the BMP and a general overview of the treatment process, how the BMP operates, and considerations that need to be addressed to promote maximum treatment effectiveness and functionality.

A.3 Constituent Removal

This section identifies the constituents expected to be removed by the BMP when present at levels typical of Caltrans stormwater runoff. The groups of constituents examined were previously identified as pollutants of concern (Caltrans 2007).

A.3.1 Constituent Groups

Estimates of the technology's performance removal abilities are made for each of the following constituent groups:

- Sediment (total suspended solids [TSS])
- Total nitrogen

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- Total phosphorus
- Pesticides
- Total metals
- Dissolved metals
- Microbiological (including pathogens)
- Litter
- Biochemical oxygen demand (BOD)
- Total dissolved solids (TDS)

A.3.2 Constituent Removal

Unapproved BMPs

The fact sheets for BMPs that are not approved (Appendix B) report whether removal is expected for each of the 10 constituents (or constituent groups) listed in A.3.1. For a given constituent:

- A check mark is used if the removal efficiency is statistically significant or expected to be based on best professional judgment.
- A blank cell is used if there is insufficient data or the removal efficiency is not statistically significant.

Approved BMPs

The fact sheets for approved BMPs (Appendix C) report both constituent removal and level of confidence. The level of confidence reflects the certainty that the reported performance is applicable to typical Caltrans conditioning (e.g., influent concentrations). The level of confidence is based on the quality of monitoring studies. To ensure that data is of the highest quality, stormwater monitoring must be conducted according to scientific procedures, such as those listed in the *Stormwater Monitoring Protocols* (Caltrans 2003a), or equivalent protocols. The level of confidence assessments are defined as:

High: The constituent removal information came from either the Department's research or a study that met the Department's quality assurance and quality control monitoring protocols. Test conditions were typical of the Department's facilities and all of the following criteria were met:

- Full-scale field testing of a stabilized (erosion-free) post-construction transportation-related impervious drainage area
- Sampling and analysis in accordance to the *Guidance Manual: Stormwater Monitoring Protocols* (Caltrans 2003a), or other recognized protocol, such as that required for the International BMP Database (www.bmpdatabase.org)
- Testing at flow rates and volumes typical of Caltrans' drainage areas (areas vary, but usually are between 0.1 and 15 acres. Flow and volumes can be found by using Caltrans' Basin Sizer [www.owp.csus.edu/research/stormwatertools/])

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- Mean influent concentrations below the 90th percentile of statewide characterization data (see Table A-1)
- At least eight storm events over a minimum period of two years, but data must also demonstrate a statistically significant removal ($p \leq 0.1$), which may require monitoring additional storm events
- Particle size distribution (PSD) similar to the proposed field conditions (e.g., state whether or not traction sand was applied)
- A mean removal estimate that corroborates the performance claim

Further, the study report must include the following:

- Rainfall record for the study area or its vicinity during the evaluation period
- Operation and maintenance records and costs for the evaluation period

Table A-1. The 90th Percentile Concentrations of Select Constituents.

Constituent	Units	90th percentile*	Constituent	Units	90th percentile*
TDS	mg/L	200	Ammonia nitrogen	mg/L as N	1.4
TSS	mg/L	300	Total Kjeldahl Nitrogen (TKN)	mg/L as N	4.4
Oil & Grease	mg/L	6.6	Nitrate	mg/L as N	2
Copper (dissolved)	µg/L	30	Phosphorus (dissolved)	mg/L as P	0.37
Copper (total)	µg/L	80	Phosphorus (total)	mg/L as P	0.84
Lead (dissolved)	µg/L	7	Orthophosphate	mg/L as P	0.3
Lead (total)	µg/L	100	Diazinon	µg/L	0.4
Zinc (dissolved)	µg/L	140	Diuron	µg/L	11
Zinc (total)	µg/L	400	Glyphosate	µg/L	50
			Pyrene	µg/L	0.96

* 90th percentile is the concentration at which 90% of all measurements are below. These values were estimated from Appendix B of the *Caltrans Discharge Characterization Study Report*, CTSW-RT-06-065 (Caltrans 2003b).

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Alternatively, a high score is assigned to infiltration or reuse BMP technologies that provided "no discharge" to surface waters under design conditions. Constituent removal was assumed to be 100 percent removal although it was recognized that certain large storm events would not receive full treatment, and that infiltration may not provide complete removal of constituents for discharge to groundwater or subsequent re-entry to surface waters.

Medium: The criteria for a high level of confidence were not completely met; however, one of the following must apply:

- Statistically significant (p-value $\leq$ 0.1) constituent removal was established from independent stormwater field monitoring for at least one year
- Removal efficiency based on best professional evaluation of unit operations and processes that are well established for treatment of other waters
- Load reduction of nutrients or BOD due to partial infiltration
- Statistically significant (p-value $\leq$ 0.1) constituent removal was established from independent laboratory testing that follows the Technology Assessment Protocol – Ecology (TAPE) from Washington State (ECY 2008), and testing used a volume of water equivalent to one year of runoff for a typical installation. Alternatively, a laboratory loading using actual stormwater could be used as with the Tahoe Small Scale Research Facility (http://www.dot.ca.gov/hq/env/stormwater/ongoing/tahoe/index.htm).

Low: There are no available data or available data do not meet the above criteria for medium level of confidence assessment. For example, a manufacturer's performance claim, without supporting data, would get a low score.

Notes:

This section gives a brief explanation, if necessary, of the logic used to score approved BMP technologies for both removal efficiency and level of confidence.

A.4 Caltrans Evaluation Status [Appendix C Only]

This section documents the BMP's stage in the evaluation process.

A.5 Schematic

If appropriate, a schematic figure is provided to depict a typical installation, design plan, or a cross-section that identifies major components of the BMP.

A.6 Key Design Elements

This section identifies important design considerations that have been highlighted by vendors or discovered through testing. Ancillary facilities to be used in conjunction with each technology are also listed in this section. An example would be including a detention basin downstream of a chemical treatment technology to capture flocculated particles.

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A.7 Advantages and Constraints

These sections list additional advantages and constraints of the BMP that are not covered in the previous sections. Information presented may include impacts from hydrologic characteristics and weather conditions in California, experiences from actual installations, and expansion of particular points discussed in previous sections of the fact sheet.

A.8 Cost Effectiveness Relative to Detention Basins [Appendix C Only]

This section provides an assessment of cost and pollutant removal effectiveness of approved BMPs relative to that for detention basins. Use this section for general comparisons of overall cost effectiveness but not for cost effectiveness comparison for treatment of an individual constituent. Detention basins were chosen because they are common BMPs that have relatively well-established cost and performance information. Relative cost assessments include the cost to build, operate, and maintain each BMP. Two pieces of information are provided on BMP costs:

- General assessment of the BMP's overall costs compared to detention basins
- Level of confidence in the available data

A.8.1 Cost Effectiveness Assessment

The cost for each BMP was assessed in terms of its 20-year, present worth cost relative to detention basins. The baseline cost of a detention basin is \$673/m^3 of water quality volume (1999 dollars), as reported in Appendix D of the *BMP Retrofit Pilot Program* (Caltrans 2004, p. 14-14). The effectiveness of each BMP was also assessed in terms of its overall constituent removal expectations relative to a detention basin. A four-quadrant system was used as a tool to rate each BMP (e.g., ◪). One of the four quadrants is shaded based on the rating key (see Figure A-1). If the overall constituent removal was greater than that for detention basins, then the BMP was marked as having a greater benefit. Because of a multitude of constituents, this assessment is often based on the best professional judgment rather than on an overall numeric efficiency score.

Benefit ↑ **Cost** ↓		**Benefit** ↑ **Cost** ↑	
Benefit ↓ **Cost** ↓		**Benefit** ↓ **Cost** ↑	

Figure A-1. Rating Key for Cost Effectiveness.

Due to a lack of cost data for BMPs constructed in the highway environment, the relative cost to detention basins was estimated based on the size and complexity of the technology compared to a detention basin sized for the same drainage area. If annual cost data are available, the 4% discount rate over 20 years results in an annual cost multiplication factor of 13.59. The resulting 20-year, present worth cost is the average annual cost times the 13.59 multiplication factor plus the construction cost. Planning, design, and right-of-way costs are not included.

A.8.2 Level of Confidence

The level of confidence in the costs to build and operate a BMP depends on the type and quantity of information found in the literature. Use of cost information developed for municipal stormwater programs was not considered to be directly relevant to the Department's facilities.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

The right-of-way costs and construction costs of major highway transportation projects are typically much greater than the typical suburban street or arterial road that might be constructed by a municipal public works department. Furthermore, operations and maintenance costs of facilities along major freeways are typically much more expensive than similar municipal facilities because of limited access and the need for traffic control. The level of confidence was assessed in terms of being high, medium, or low. The criteria applied for defining the confidence level of the cost estimates were:

- *High:* Unit cost information was available from a facility constructed by the Department or a similar state's department of transportation.
- *Medium*: Cost information was available from several similar facilities constructed under municipal stormwater programs or conservative costs estimates indicate an obvious unit cost difference compared to a detention basin.
- *Low*: No cost information was available from a similar BMP facility that could be independently verified. Construction costs were extrapolated from available pricing information.

The level of confidence only applies to cost since the level of confidence in the benefit of the BMP is evaluated in the "Constituent Removal" section of the fact sheets.

A.9 Issues and Concerns

This section presents issues and concerns to be considered when evaluating the appropriateness of a BMP for any of the Department's facilities. This information is divided into two categories: maintenance and project development. Within each category is a standard set of topics.

A.9.1 Maintenance Issues

- *Requirements:* Summarizes major maintenance tasks required to keep the BMP functional.
- *Special Training:* Identifies special or unusual training required to perform the maintenance, if applicable.

A.9.2 Project Development Issues

- *Right-of-Way Requirements:* Identifies relative space required to install the BMP.
- *Siting Constraints:* Identifies unique siting considerations and limitations, such as soil types, slope of the land, distance from existing infrastructure or other natural features, power requirements, and regulatory requirements. Common siting constraints, such as maintenance access, are not listed.
- *Construction:* Identifies unique construction precautions and requirements, such as unwanted soil compaction, if applicable.

A.10 Design, Construction, Maintenance, and Cost Sources

This section lists design, construction, maintenance, and cost sources.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

A.11 Performance Demonstration Literature Sources [Appendix C Only]

This section provides the references from which performance was evaluated for approved BMPs. It also contains a limited number of additional performance references.

A.12 Certifications, Verifications, or Designations [Appendix C Only]

This section lists the abbreviated names of selected state or federal agencies or cooperatives that issue statements of performance based on third-party review of test results. Agency abbreviations that are used in the fact sheets are defined below, along with a brief explanation of the performance statements typically made by each agency.

TAPE: Technology Assessment Protocol, Ecology

The Washington State Department of Ecology (Ecology) uses TAPE to designate levels of allowed BMP use based on performance. The three designated use levels described below relate to the confidence that Ecology has in a technology's ability to meet various performance goals.

- PULD: The "pilot use level designation" allows limited installations of promising technologies for the purpose of data collections.
- CULD: The "conditional use level designation" allows widespread use within a time period in which testing must be completed to make a determination for GULD.
- GULD: The "general use level designation" indicates that the technology has been proven compliant with TAPE's performance goals.

There are six performance goals that could apply to the designated use level. Brief summaries follow:

- *Basic treatment*: Requires 80% removal of influent TSS between 100 and 200 mg/L and an effluent limit of 20 mg/L for influent TSS less than 100 mg/L.
- *Enhanced treatment or metals treatment*: Requires performance levels to be significantly higher than basic treatment. Influent metals must fall within 0.003 to 0.02 mg/L for dissolved copper and between 0.02 to 0.3 mg/L for dissolved zinc.
- *Phosphorus treatment*: Requires 50% reduction of phosphorus with an influent range of 0.1 to 0.5 mg/L.
- *Oil treatment*: Requires no discharge of visible sheen or of concentrations above 10 mg/L (composite) or 15 mg/L (grab).
- *Pretreatment*: Requires 50% reduction of TSS influent between 100 and 200 mg/L and an effluent limit of 50 mg/L for TSS influent below 100 mg/L.

ETV: Environmental Technology Verification, Environmental Protection Agency

The ETV verifies performance under specific conditions and explicitly states that performance under any other condition may be different. ETV reviews are performed by cooperative agreement with the National Sanitation Foundation (NSF International).

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

NJCAT: New Jersey Corporation for Advanced Technology

NJCAT provides technical review of field studies and provides performance verification statements. NJCAT works with the Technology Acceptance and Reciprocity Partnership (TARP), which has been endorsed by the states of California, Massachusetts, Maryland, New Jersey, Pennsylvania, and Virginia.

NJDEP: New Jersey Department of Environmental Protection

NJDEP certifies TSS removal based on NJCAT verification reports.

LA RWQCB: Los Angeles Regional Water Quality Control Board

LA RWQCB issues Full Capture Certifications for trash TMDL compliance.

TCEQ: Texas Committee on Environmental Quality

TCEQ approves BMPs that are appropriate for the protection of sole-source groundwater resources.

References

Caltrans. 2003a. *Caltrans Comprehensive Protocols Guidance Manual*. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-105.51.42.

Caltrans. 2003b. *Discharge Characterization Study Report*. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-065.

Caltrans. 2004. *BMP Retrofit Pilot Program Final Report*. Sacramento: Caltrans, Division of Environmental Analysis. p. 14-14. CTSW-RT-01-050.

Caltrans. 2007. *Storm Water Quality Handbooks, Storm Water Planning and Design Guide*. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Department of Ecology (ECY), Washington State. 2008. *Guidance for Evaluating Emerging Stormwater Treatment Technologies*. Publication number 02-10-037. Retrieved January 17, 2009 from http://www.ecy.wa.gov/pubs/0210037.pdf.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

APPENDIX B: TECHNOLOGY FACT SHEETS

This appendix presents fact sheets for technologies that have *not* been approved by the Department. Evaluation of these technologies is ongoing and may be revised in future reports. The evaluations presented were derived from a review of available information and best professional judgment was used where information was lacking.

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BMP Category	*Stormwater Technology*	*Page No.*
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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention

Description

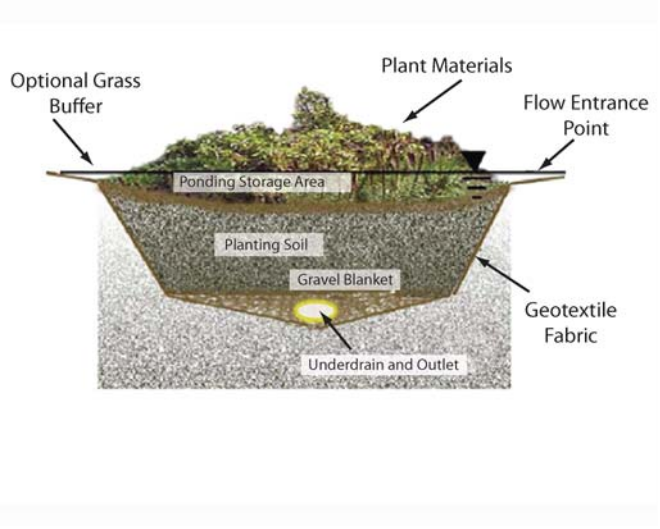
Bioretention cells consist of vegetated depressions that treat runoff by filtering through mulch and soil-based media. Physical straining, biological and chemical reactions in the mulch, root zone, and soil matrix, and infiltration into the underlying subsoil are the main treatment processes. Bioretention cells reduce peak discharge and runoff volume by detaining water through surface ponding and storage in soil and gravel layers, and by allowing it to infiltrate into the subsoil or dissipate through evapotranspiration.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	✓
Total Dissolved Solids (TDS)	

* Based on performance of conventional bioretention systems or best professional judgment. Blank cells indicate data not available or poor treatment performance. Small bioretention systems operating at relatively high loading rates and/or with shallow media or soil depth may not provide treatment as indicated.

Schematic



Source: Maryland Water Resources Research Center

Key Design Elements

- Bioretention area and depth
- Water quality flow
- Ponding depth
- Underground drain system
- Vegetation
- Bioretention media
- Liner, if high seasonal groundwater

Advantages

- Pollutant removal effectiveness is typically high
- Can provide an aesthetic vegetated appearance
- Reduces peak discharge and runoff volume
- Can fit into narrow right-of-way

Constraints

- In areas with prolonged dry periods, vegetation may require irrigation
- Vegetation may develop slowly in a biorentention facility, though filtering still occurs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Maintenance Issues

Requirements:

- Periodic replacement of mulch and planting media
- Maintenance of irrigation system, if used in dry areas

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Linear biotrench configuration is designed to fit narrow right-of-way

Siting Constraints:

May need irrigation in dry areas, depending on plant selection

Construction:

- Plant establishment period may be required
- Water should bypass until construction is complete and the BMP is stabilized

Design, Construction, Maintenance, and Cost Sources

US EPA. 1999. Stormwater Technology Fact Sheet: Bioretention. EPA 832-F-99-012.

Caltrans. 2003. SR-73 Stormwater BMP Replacement Project at CSF System 1149L Bioretention Area: Basis of Design Report. Division of Environmental Analysis. CTSW-RT-03-006.51.39.

Center for Watershed Protection. 2000. Bioretention as a Stormwater Treatment Practice. The Practice of Watershed Protection, Article 110, 548-550.

Engineering Technologies Associates (ETA). Design Manual for Use of Bioretention in Stormwater Management. Prepared for Prince George's County, Department of Environmental Resources, Maryland.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

Available Vendor Products

The names of vendor products that appear here are for information only. The vendor products listed below are NOT APPROVED FOR USE by the California Department of Transportation. Their appearance here IS NOT AN ENDORSEMENT OF THE PRODUCTS BY CALTRANS OR THE STATE OF CALIFORNIA.

- DeepRoot® Silva Cell
- TreePod® Biofilter
- Filterra® Bioretention System
- UrbanGreen™ Biofilter

Alternative Designs

- Bioretention Basin
- Linear Bioretention Trench

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

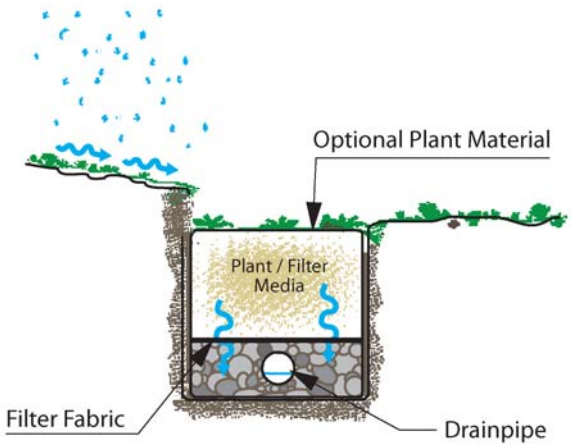
Bioretention

Linear Biorentention Trench

Description

Bioretention cells consist of vegetated depressions that treat runoff by filtering through mulch and soil-based media. Physical straining, biological and chemical reactions in the mulch, root zone, and soil matrix, and infiltration into the underlying subsoil are the main treatment processes. A linear bioretention trench is an adaptation of existing biofiltration designs, consisting of a trench that filters sheet flow runoff through vegetation and a planting soil. It is designed for the narrow right-of-way typical of roadside areas. Removal mechanisms include filtration, infiltration, and plant uptake. Biofiltration strips can be used as pretreatment.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	✓
Total Dissolved Solids (TDS)	

* Based on performance of conventional bioretention systems or best professional judgment. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Bioretention area and depth
- Water quality flow
- Ponding depth
- Underground drain system
- Vegetation
- Bioretention media
- Liner, if high seasonal groundwater

Advantages

- Fits in a narrow right-of-way
- Pollutant removal effectiveness is typically high
- Can provide an aesthetic vegetated appearance
- Reduces peak discharge and runoff volume

Constraints

- Vegetation may require irrigation in areas with prolonged dry periods
- Vegetation may develop slowly in a biorentention facility, though filtering still occurs
- If media clogs, resulting standing water may create mosquito habitat
- Avoid high groundwater
- Although narrow, could be a large footprint BMP depending on design constraints
- Maintenance activities may require traffic control

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Linear Biorentention Trench

Maintenance Issues

Requirements:

- Periodic replacement of mulch or planting media
- Maintenance of irrigation system, if used in dry areas

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Designed to fit in a narrow right-of-way

Siting Constraints:

- May need irrigation in dry areas, depending on plant selection
- Minimum head requirement of two feet

Construction:

- Vegetation establishment period may be required
- Water should bypass until construction is complete and the BMP is stabilized

Design, Construction, Maintenance, and Cost Sources

US EPA. 1999. Stormwater Technology Fact Sheet: Bioretention. EPA 832-F-99-012.

Caltrans. 2003. SR-73 Stormwater BMP Replacement Project at CSF System 1149L Bioretention Area: Basis of Design Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-006.51.39.

Center for Watershed Protection. 2000. Bioretention as a Stormwater Treatment Practice. The Practice of Watershed Protection, Article 110, 548-550.

Engineering Technologies Associates (ETA). Design Manual for Use of Bioretention in Stormwater Management. Prepared for Prince George's County, Department of Environmental Resources, Maryland.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Bioretention

Tree Box Filter

Description

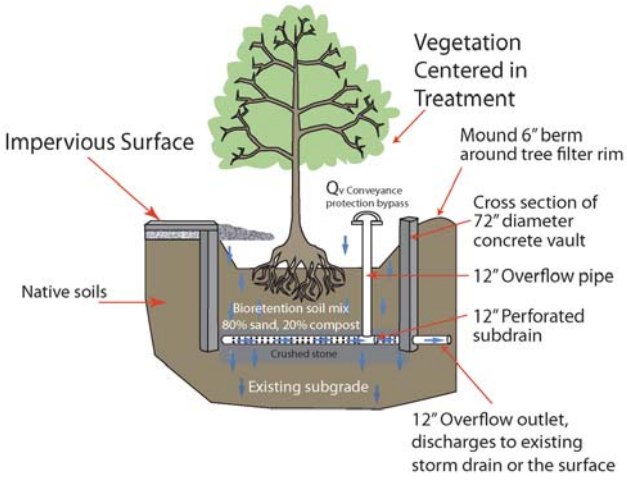
Bioretention cells consist of vegetated depressions that treat runoff by filtering through mulch and soil-based media. Physical straining, biological and chemical reactions in the mulch, root zone, and soil matrix, and infiltration into the underlying subsoil are the main treatment processes. Bioretention cells reduce peak discharge and runoff volume by detaining water through surface ponding and storage in soil and gravel layers, and by allowing it to infiltrate into the subsoil or dissipate through evapotranspiration. Tree box filters are mini bioretention systems that are typically installed along urban sidewalks.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on performance of conventional bioretention systems or best professional judgment. Blank cells indicate data not available or poor treatment performance. Small bioretention systems operating at relatively high loading rates and/or with shallow media or soil depth may not provide treatment as indicated.

Schematic



Source: University of New Hampshire Stormwater Center

Key Design Elements

- Bioretention area and depth
- Water quality flow
- Ponding depth
- Underground drain system
- Vegetation
- Bioretention media

Advantages

- Pollutant removal effectiveness is typically high
- Can provide an aesthetic vegetated appearance
- Reduces peak discharge and runoff volume
- Can fit into narrow right-of-way
- Small footprint bioretention devices such as tree box filters are most applicable in urban settings

Constraints

- In areas with prolonged dry periods, vegetation may require irrigation
- Vegetation may develop slowly in a biorentention facility, though filtering still occurs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Tree Box Filter

Maintenance Issues

Requirements:

- Periodic replacement of mulch and planting media
- Maintenance of irrigation system, if used in dry areas

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Tree box filters are small footprint devices that fit in sites where available space is limited

Siting Constraints:

May need irrigation in dry areas, depending on plant selection

Construction:

- Plant establishment period may be required
- Water should bypass until construction is complete and the BMP is stabilized

Design, Construction, Maintenance, and Cost Sources

US EPA. 1999. Stormwater Technology Fact Sheet: Bioretention. EPA 832-F-99-012.

Caltrans. 2003. SR-73 Stormwater BMP Replacement Project at CSF System 1149L Bioretention Area: Basis of Design Report. Division of Environmental Analysis. CTSW-RT-03-006.51.39.

Center for Watershed Protection. 2000. Bioretention as a Stormwater Treatment Practice. The Practice of Watershed Protection, Article 110, 548-550.

Engineering Technologies Associates (ETA). Design Manual for Use of Bioretention in Stormwater Management. Prepared for Prince George's County, Department of Environmental Resources, Maryland.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

University of New Hampshire (UNH). 2008. Tree Box Filter. University of New Hampshire Stormwater Center. Http://www.unh.edu/erg/cstev/fact_sheets/tree_filter_fact_sheet_08.pdf (accessed January 20, 2010).

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- TreePod® Biofilter
- Filterra® Bioretention System
- UrbanGreen™ Biofilter

Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

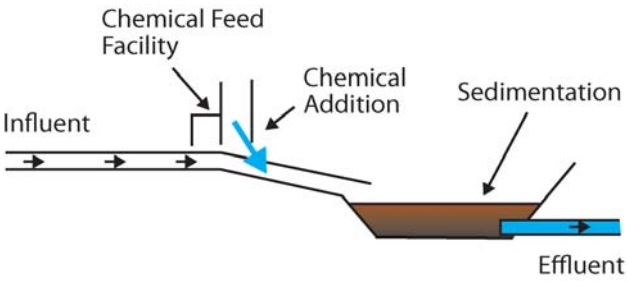
Detention/Sedimentation

Chemical Treatment

Description

Adding chemical coagulants to stormwater influent can enhance removal of particulates, associated contaminants, and dissolved nutrients in a detention system. Chemical treatment results in floc formation, which increases the settling velocity of particles and improves sedimentation removal efficiencies. The effectiveness of this system largely depends on the type of chemical added, time allowed for sedimentation, and the particle size, density, and settling velocity of the floc that is produced. Typical chemicals used include alum, chitosan, and polyacrylamide (PAM). These chemicals are added either in liquid form upstream of the detention or as a solid (gel block) that is placed in the flow path.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on expected improvement over conventional dry detention basin performance. Blank cells indicate data not available or poor treatment performance. Small systems with relatively short detention times may not provide treatment as indicated.

Key Design Elements

- Chemical dose
- Chemical feed and storage facilities
- Chemical mixing facilities
- Capture volume and depth
- Drain time
- Debris screen to protect effluent control
- Maintenance access
- High flow routing

Advantages

- Increases performance of existing detention basins
- The accumulation rate of floc in sediments of quiescent receiving waters can be low due to floc consolidation over time and incorporation of floc into existing sediment
- Chemical treatment can remove nutrients, heavy metals, and fecal coliforms
- Dry alum sludge has chemical characteristics suitable for general land or agricultural application
- Construction costs for stormwater treatment feed systems are largely independent of the drainage area to be treated and depend primarily upon the number of outfalls to be retrofitted

Constraints

- Treated waters may require pH adjustment
- Safety issues related to the chemical storage facility need to be considered
- Alum forms voluminous metal hydroxides that are difficult to dewater
- Appropriate mixing must be provided at the point of chemical addition
- Sludge removal method and frequency need to be considered
- The optimum dose may vary with each storm
- Potential toxicity due to overdosing
- Requires higher level of operator observation than for other BMPs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Detention/Sedimentation

Chemical Treatment

Maintenance Issues

Requirements:

- Chemical storage and dosing equipment must be inspected and maintained on a regular basis
- Effluent pH monitoring system must be maintained on a regular basis
- Sludge removal

Special Training:

- Training is required for maintenance of chemical addition and storage system
- Chemical handling

Project Development Issues

Right-of-Way Requirements:

- Small footprint for chemical addition system
- Downstream detention requirement increases footprint
- Other requirements as listed on the Detention Basin fact sheet (see Appendix C)

Siting Constraints:

- May require electrical power supply
- Space for a central housing unit and storage tank
- Need enough head for mixing
- Other requirements as listed on the Detention Basin fact sheet (see Appendix C)

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Harper H.H. Current Research and Trends in Alum Treatment of Stormwater Runoff. Environmental Research & Design, Inc.

Available Vendor Products

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None identified

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

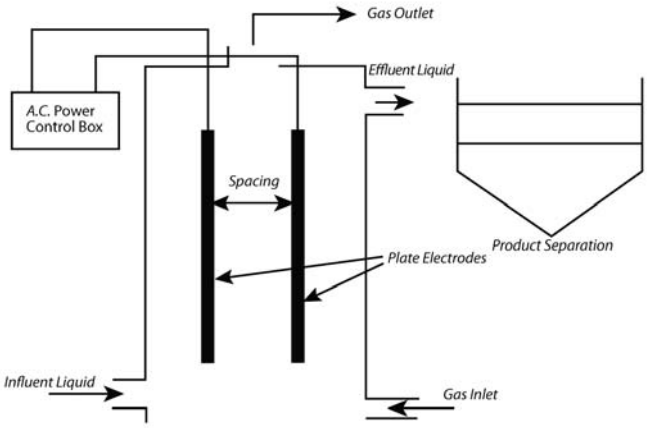
Detention/Sedimentation

Electrocoagulation

Description

Electrocoagulation (EC) systems are effective for removal of emulsified oils, total petroleum hydrocarbons (TPH), suspended solids, and heavy metals from exceptionally polluted industrial wastewater and stormwater runoff. EC technology is an alternative to the use of chemical coagulants such as alum, metal salts, or polymers and polyelectrolyte addition(s). The EC process removes pollutants from aqueous media by introducing highly charged metal hydroxide species that neutralize suspended solids and oil droplets and facilitate agglomeration or coagulation. EC treatment is typically followed by sedimentation or filtration processes to remove flocculated material.

Schematic



Source: EPA

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	✓
Litter	
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Actual treatment will depend on a number of variables including current density, conductivity, and pollutant load of influent, as well as the type of electrodes.

Key Design Elements

- Facilities required upstream to capture runoff and provide flood flow routing and bypass
- Mode of operation (batch or continuous)
- Power supply
- Design flow
- Electrical conductivity of influent water
- Sludge storage and disposal
- Need for pretreatment
- Cleaning/replacement needs for electrodes
- Maintenance access

Advantages

- Sludge formed by EC tends to be readily settleable and easy to de-water because it is composed mainly of metallic oxides/hydroxides
- Gas bubbles produced during electrolysis can carry the pollutant to the top of the solution where it can be more easily concentrated, collected, and removed
- Electrolytic processes in the EC cell are controlled electrically with no moving parts
- EC may be feasible where electricity is not available if solar panels are used (Note: A 50 gpm EC system requires 480 volt power supply)

Constraints

- Sacrificial electrodes are dissolved into wastewater streams as a result of oxidation, and need to be regularly replaced
- Use of electricity may be expensive
- Impermeable oxide film may be formed on the cathode leading to loss of efficiency of the EC unit
- High conductivity of the water suspension is required
- Treated waters may have high pH, which may require remediation
- Potential toxicity concerns due to overdosing
- Requires higher level of operator observation than other BMPs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Detention/Sedimentation

Electrocoagulation

Maintenance Issues

Requirements:

None identified

Special Training:

Requires training to maintain and operate equipment

Project Development Issues

Right-of-Way Requirements:

Space required for upstream capture and downstream sedimentation

Siting Constraints:

May require power nearby and, possibly, a sewer connection

Construction:

Significant capital costs and start-up/test requirements

Design, Construction, Maintenance, and Cost Sources

Beagles, A. 2004. Electrocoagulation - Science and Applications. http://www.eco-web.com/edi/index.htm (accessed October 19, 2009).

Available Vendor Products

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- E-Cell
- Kaselco EC
- FLUXCELL™
- Powell Water Systems EC

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

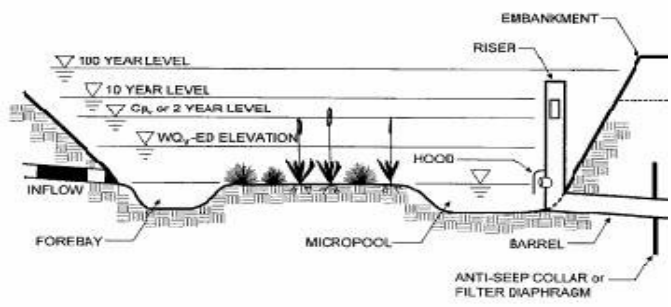
Detention/Sedimentation

Permanent Pool

Description

Detention systems provide treatment by detaining runoff to allow settling or sedimentation of particles under gravity. The effectiveness of these systems depends on the time allowed for sedimentation, the particle size, density, and settling velocity, and the extent to which contaminants are associated with the particulate fraction in the incoming water. In addition, systems with permanent pools support plant species that provide constituent removal by biological processes. The primary function of a permanent pool is energy dissipation and assuring a longer residence time for first flush of water. Examples of treatment systems with permanent pools include wet basins/ponds and constructed wetlands.

Schematic



Source: EPA

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on conventional wet basin performance. Blank cells indicate data not available or poor treatment performance. Small permanent pool systems operating at relatively high loading rates may not provide treatment as indicated.

Key Design Elements

- Capture volume and depth
- Drawdown time
- Permanent pool to capture volume ratio
- Sedimentation forebay
- Vegetation
- Debris screen to protect effluent control
- Maintenance access
- High flow routing
- Liner requirements

Advantages

- Recreational and aesthetic benefits
- Enhances wildlife habitat
- High removal efficiencies for many constituents
- Particularly advantageous to first flush of storms

Constraints

- Relatively high construction costs in comparison to other BMPs
- Wetland must have a source flow
- Species may restrict maintenance
- There are potential problems associated with mosquitoes
- The device may become a regulated wetland if not consistently maintained on an established schedule
- Wet basins are larger than extended detention basins because of the additional volume of the permanent pool

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Detention/Sedimentation

Permanent Pool

Maintenance Issues

Requirements:

- Active management of the hydrology and vegetation during the first few years is necessary for plant establishment
- Mosquito fish planting or other vector control methods are needed
- Vegetation thinning or removal may be necessary for vector control, wildlife may limit activities to a particular season
- Sensitive species inspections
- Sediment removal (hand removal has been found to be more cost-effective than mechanical removal)
- Removing standing water for the dry season may be required if not augmented by dry weather flow

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Space requirements are high for wet basins. The volume of the permanent pool should be at least three times the water quality volume

Siting Constraints:

- Soil should have a low infiltration rate or basin should be lined with a clay or geotextile liner so that water level is maintained in the basin
- Wet basins should be sited where a permanent pool of water can be maintained during the wet season
- Requires a minimum ten-foot separation between seasonal high groundwater and basin invert if a liner is not used

Construction:

- Plant establishment period is recommended
- Excavated soil surface should be suitable to support plant life
- If a pond liner is used, it must be carefully installed and maintained to avoid punctures

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-07-172.19.1.

King County. 2005. Surface Water Design Manual, King County Surface Water Management Division, Washington. http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf (accessed October 7, 2009).

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

Schueler, T. R. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. Washington, DC: Metropolitan Washington Council of Governments.

U.S. EPA. 1999. Wet Detention Pond Fact Sheet. EPA 832-F-99-048.

Available Vendor Products

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- Airmaster Aerator
- AquaMaster®
- Kasco® Marine
- StormTreat™
- Aqua Control
- MWS Linear HYBRID
- SolarBee

Alternative Designs

- Vegetated wet channel
- Wet basin/pond
- Constructed wetland

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Detention/Sedimentation

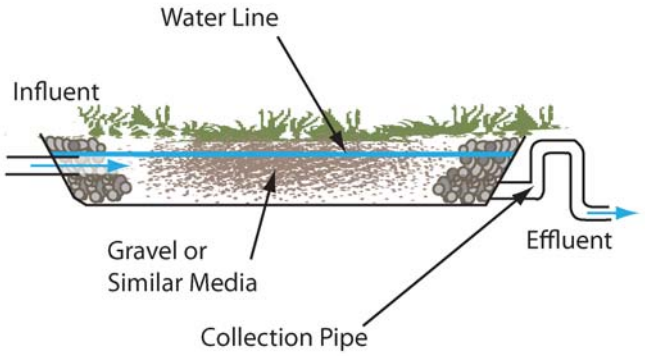
Permanent Pool

Vegetated Rock Filter

Description

Detention systems provide treatment by detaining runoff to allow settling of particles under gravity. The effectiveness of these systems depends on the time allowed for settling, the particle size, density, and settling velocity, and the extent to which contaminants are associated with the particulate fraction in the incoming water. In addition, systems with permanent pools support plant species that provide constituent removal by biological processes. The Vegetated Rock Filter (also called Subsurface Wetland) consists of a sealed, shallow basin or channel filled with substrate media and emergent aquatic plants. The substrate, typically gravel, rock, or other material, provides support for plant and algae. Treatment is primarily accomplished via settling, biological uptake by plants, and microbial breakdown. An alternative to a basin configuration is a linear trench configuration which is more suitable for roadside application.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on conventional wet basin performance. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- High flow routing
- Media type and depth
- Liner requirements
- Forebay or other pretreatment method
- Permanent pool to capture volume ratio
- Maintenance access

Advantages

- Enhances aesthetics and wildlife habitat
- High removal efficiencies for many constituents
- Particularly advantageous to first flush of storms
- Minimal vector concerns because permanent water level is below the surface

Constraints

- Relatively high construction costs compared to other BMPs
- Must have a continuous source flow to maintain plant community
- Wildlife may restrict maintenance
- May become a regulated wetland if not consistently maintained on an established schedule
- Larger than an extended detention basin because of the additional volume of the permanent pool
- Requires long-term maintenance to remove metals and persistent organics that accumulate in sediments
- Anaerobic conditions may increase biological availability of some metals (e.g. methyl mercury)

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention/Sedimentation
Permanent Pool
Vegetated Rock Filter

Maintenance Issues

Requirements:

- Active management of the hydrology and vegetation during the first few years is necessary for plant establishment
- Vegetation thinning or removal may be necessary, but wildlife may limit such activities to a particular season
- Sensitive species inspections
- Inspect the gravel bed annually for sediment build-up. Remove sediment periodically
- Check inlet and outlet devices for clogging during the rainy season

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Space requirements are high because of the volume of the permanent pool

Siting Constraints:

- Located on sites with less than two percent slope
- Soil should have a low infiltration rate or basin should be lined with a clay or geotextile liner so that water level is maintained in the basin
- Site where a permanent pool of water can be maintained
- Requires a minimum ten-foot separation between seasonal high groundwater and basin invert if a liner is not used

Construction:

- Plant establishment period is recommended
- Media surface should be suitable to support plant life
- If a pond liner is used, it must be carefully installed and maintained to avoid punctures

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-07-172.19.1.

King County. 2005. Surface Water Design Manual, King County Surface Water Management Division, Washington. http://your.kingcounty.gov/dnrp/library/water-and-land/stormwater/surface-water-design-manual/SWDM-2009.pdf (accessed October 7, 2009).

NCHRP. 2006. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

San Francisco Stormwater Design Guidelines Draft. 2009. http://sfwater.org/Files/FactSheets/DRAFT_AppenA.pdf (accessed November 18, 2009).

Schueler, T. R. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. Washington, DC: Metropolitan Washington Council of Governments.

US EPA. 1999. Wet Detention Pond Fact Sheet. EPA 832-F-99-048.

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

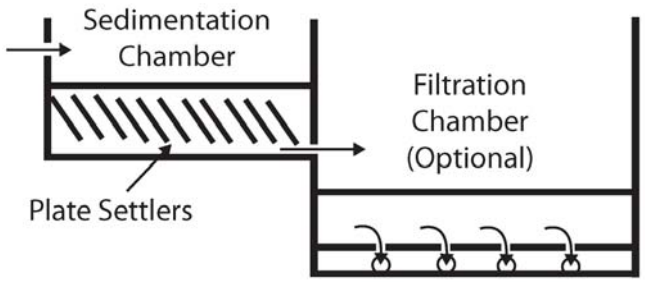
Detention/Sedimentation

Plate and Tube Settlers

Description

Plate and tube settlers typically consist of parallel plates or inclined tubes that permit solids to reach the plate or tube after only short distances of settling. This reduction in the distance particles must travel increases the rate of sedimentation. The effectiveness of these systems depends on the time allowed for sedimentation (controlled by the effective overflow rate), the particle size, density, and settling velocity, and the extent to which contaminants are associated with the particulate fraction in the incoming water. Sedimentation in the first chamber of an Austin sand filter or in a concrete detention basin can be improved by installing a plate or tube settler.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on conventional dry detention basin performance. Blank cells indicate data not available or poor treatment performance. Small plate and tube settlers operating at very high overflow rates may not provide treatment as indicated.

Key Design Elements

- Effective overflow rate
- Size and mounting of plates or tubes
- Sludge collection and removal facilities
- Pretreatment for litter
- Maintenance access
- High flow routing

Advantages

- Enhances particle removal of detention/sedimentation BMPs
- May reduce footprint of a detention/sedimentation BMP or Austin sand filter when used as pretreatment
- May decrease maintenance frequency of downstream filters

Constraints

- Maintenance is more difficult than in an open basin. May require confined space entry and hand cleaning of tubes or plates
- Water must be introduced so that it flows uniformly through the settlers
- Settled particulates can be resuspended if critical velocity is exceeded
- Requires litter removal before passing water through tubes or plates
- Other constraints as listed on the Detention Basin fact sheet (see Appendix C)

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention/Sedimentation

Plate and Tube Settlers

Maintenance Issues

Requirements:

- Cleaning and maintenance of the plate or tube settlers may require removal of the settler structure
- May require hand cleaning of tubes or plates
- Litter may get trapped in the settler structure

Special Training:

Training may be required for confined space entry

Project Development Issues

Right-of-Way Requirements:

Reduces right-of-way requirements for a detention basin or Austin sand filter when used as pretreatment

Siting Constraints:

Similar to siting constraints for a detention basin or Austin sand filter (see Appendix C)

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Terre Hill Concrete Products. www.terrestorm.com (accessed November 2, 2009).

Available Vendor Products

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- Hydro Quip IPS
- Lamella® Gravity Settler
- Terre Kleen™

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Detention/Sedimentation

Temporary Pool

Description

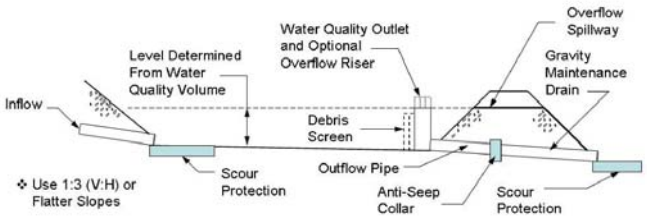
Detention systems provide treatment by detaining runoff to allow settling or sedimentation of particles under gravity. The effectiveness of these systems depends on the time allowed for sedimentation, the particle size, density, and settling velocity, and the extent to which contaminants are associated with the particulate fraction in the incoming water. Treatment systems with temporary pools, which are normally dry between events, include above ground dry detention ponds/basins and below grade storage.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on conventional dry detention basin performance. Blank cells indicate data not available or poor treatment performance. Small systems with relatively short detention times may not provide treatment as indicated.

Schematic



Source: Caltrans

Key Design Elements

- Capture volume and depth
- Drain time
- Debris screen to protect effluent control
- Maintenance access
- High flow routing

Advantages

- Relatively easy to operate and maintain
- Potential for substantial infiltration
- Can be sited more easily than Austin sand filters

Constraints

- Limited pollutant removal for fine particles, nutrients, and dissolved constituents
- Can only be placed in areas with sufficient hydraulic head
- If outlet clogs, resulting standing water may create mosquito habitat
- May require confined space entry for below grade storage
- May require liner in areas with high seasonal groundwater

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention/Sedimentation

Temporary Pool

Maintenance Issues

Requirements:

- Regular inspections for standing water, side slope stability, debris and sediment accumulation, and vegetative cover
- If vegetative cover is not established to acceptable thresholds, re-seeding or erosion control measures may need to be implemented
- Sediment removal

Special Training:

Training for confined space entry for below ground facilities

Project Development Issues

Right-of-Way Requirements:

Space requirements are relatively high

Siting Constraints:

- Site where there is sufficient hydraulic head to facilitate complete drainage
- Requires separation between seasonal high groundwater and basin invert if liner not used

Construction:

Minimize compaction of underlying soils to maintain infiltration capacity

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-07-172.19.1.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

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- Con/Storm™
- Extention Basin™
- StormTrap™
- Watermann™
- Corrugated Pipe (various suppliers)
- Faircloth Skimmer®
- Thirsty Duck
- Weir Guard™

Alternative Designs

- Hold & Release Detention
- Detention Basin
- Skimmer

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Detention/Sedimentation

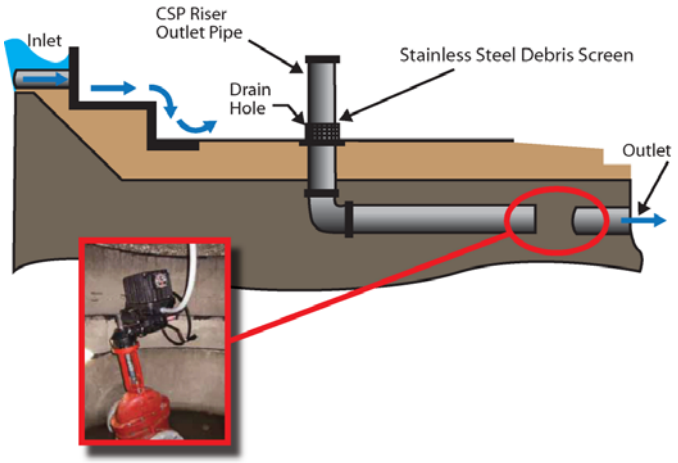
Temporary Pool

Hold and Release

Description

Detention systems provide treatment by detaining runoff to allow settling or sedimentation of particles under gravity. The effectiveness of these systems depends on the time allowed for sedimentation, the particle size, density, and settling velocity, and the extent to which contaminants are associated with the particulate fraction in the incoming water. Hold and release valves located on the outlet of the detention basin are used to provide a consistent detention time for a variety of storm sizes. Valves can be powered electrically or pneumatically. The timing of valve operations is adjusted by a logic controller and water depth sensors. Hold and release valves can also be used for infiltration basins in poorly infiltrating soils because they allow water that does not infiltrate to drain.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on field test results by Middleton and Barrett (2006) and removals observed for conventional dry detention basins. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Valve type and size
- Power and controls system for operating outlet bladder or valve
- Maintenance access

Advantages

- Treatment for TSS and total metals is comparable to sand filtration, but with lower footprint and head requirements
- Increased infiltration potential compared to conventional detention basins

Constraints

- Reliability unknown
- Electric valves require power supply
- Pneumatic valves require high pressure gas source
- Orifice clogging may cause standing water, resulting in mosquito habitat
- Requires inspection and maintenance of hold and release valves, controller, and power supply

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention/Sedimentation

Temporary Pool

Hold and Release

Maintenance Issues

Requirements:

- Valves and controller require inspection and periodic replacement. Determine inspection frequency during the first few years of operation
- Maintenance of battery sources and gas cylinders, if used

Special Training:

Training is required to inspect and maintain electric and pneumatic systems

Project Development Issues

Right-of-Way Requirements:

Similar to right-of-way requirements listed on the Detention Basin fact sheet (see Appendix C)

Siting Constraints:

- Equivalent to detention basin siting constraints
- Requires power supply

Construction:

Unknown

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2001. Detention Basin Optimization - Reconnaissance Study Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-029, pp. 3-7.

Caltrans. 2004. District 12 State Route 73 Pilot Program - Detention Basin Optimation and Retrofit. Basis of Design Report. CTSW-RT-04-090.09.1.

Middleton, J. R., J. F. Malina, and M. E. Barrett. 2006. Water Quality Performance of a Batch Type Stormwater Detention Basin. Center for Research in Water Resources On-Line Report 06-02. http://www.crwr.utexas.edu/reports/pdf/2006/rtp06-02.pdf (accessed November 6, 2009).

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Alternative Designs

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BMP Fact Sheet

Detention/Sedimentation

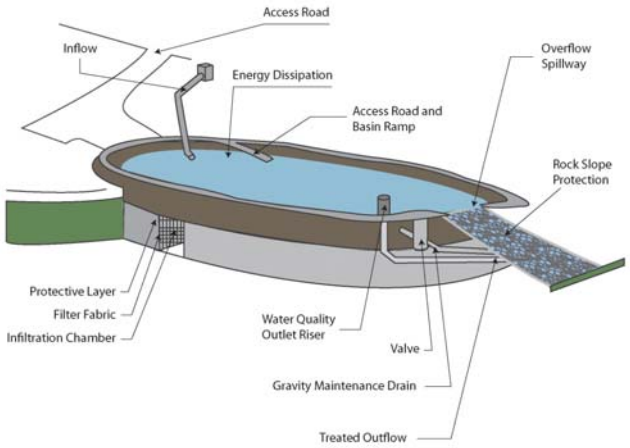
Temporary Pool

Infiltration Chambers

Description

Detention systems provide treatment by detaining runoff to allow settling of particles under gravity. The effectiveness of these systems depends on the time allowed for settling, the particle size, density, and settling velocity, and the extent to which contaminants are associated with the particulate fraction in the incoming water. Treatment systems with temporary pools, which are normally dry between events, include above ground dry detention ponds/basins and below grade temporary storage. Infiltration chambers is a concept developed by Caltrans to increase infiltration in conventional BMPs. The addition of infiltration chambers below the invert of earthen detention systems is expected to capture and infiltrate the first flush of stormwater runoff. These infiltration chambers can consist of gravel, high porosity storage media with a sand overlay, or native soil that has been amended to improve infiltration. In soils that infiltrate well, raising the riser orifice may provide the same treatment benefit as the installation of infiltration chambers.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on conventional dry detention basin performance. Blank cells indicate data not available or poor treatment performance. Small systems with relatively short detention times may not provide treatment as indicated.

Key Design Elements

- Soil type and permeability
- Infiltration chamber volume capacity
- Infiltration chamber material (high porosity storage media, gravel, amended soil, etc.)
- High flow routing
- Capture volume and depth
- Drain time
- Debris screen to protect effluent control
- Maintenance access

Advantages

- Potential for substantial infiltration, even in poorly infiltrating soils
- Expected to improve treatment of fine particles, nutrients, and dissolved constituents relative to conventional detention

Constraints

- Not suitable in areas with high seasonal groundwater
- Increases construction and rehabilitation costs relative to conventional detention basins
- If outlet clogs, resulting standing water may create mosquito habitat

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention/Sedimentation
Temporary Pool
Infiltration Chambers

Maintenance Issues

Requirements:

- Regular inspections for standing water, side slope stability, debris and sediment accumulation, and vegetative cover
- May require construction equipment to rehabilitate clogged system
- If vegetative cover is not established to acceptable thresholds, re-seeding or erosion control measures may need to be implemented
- Sediment removal

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Space requirements are the same as for conventional detention systems

Siting Constraints:

- Site where there is sufficient hydraulic head to facilitate drainage through the outlet riser
- Requires separation between seasonal high groundwater and basin invert

Construction:

- Minimize compaction of underlying soils to maintain infiltration capacity
- Bypass water until drainage area is stabilized

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-07-172.19.1.

Caltrans. 2008. Adding Infiltration Chambers to Approved Best Management Practices: Concept Development. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-TM-08-172-46.1.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

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Alternative Designs

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BMP Fact Sheet

Detention/Sedimentation

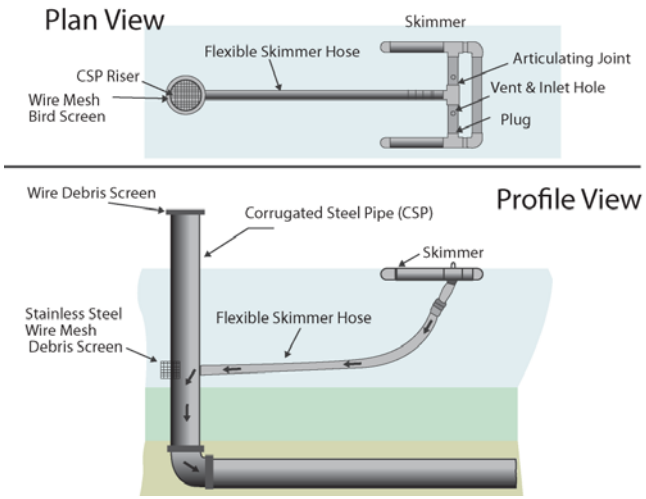
Temporary Pool

Skimmer

Description

Detention systems provide treatment by detaining runoff to allow settling or sedimentation of particles under gravity. The effectiveness of these systems depends on the time allowed for sedimentation, the particle size, density, and settling velocity, and the extent to which contaminants are associated with the particulate fraction in the incoming water. Treatment systems with temporary pools, which are normally dry between events, include above ground dry detention ponds/basins and below grade storage. A skimmer drains water from just below the water's surface in a detention basin to improve sedimentation. Captured water is decanted to create a longer flow path compared to basins that drain from the invert.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on conventional dry detention basin performance. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Means of removing water when skimmer is at its lowest position
- Orifice sizing of the skimmer
- Durability of materials used to construct skimmer
- Maintenance access

Advantages

- Potentially increased removal of suspended solids
- Can retain free oil and grease because clarified water is decanted from just below the water's surface

Constraints

- Limited pollutant removal for fine particles and dissolved constituents
- Secondary outlet may be required to drain water completely
- Prone to clogging by vegetation
- If clogged, resulting standing water can create mosquito habitat
- Frequent inspections may be required

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention/Sedimentation

Temporary Pool

Skimmer

Maintenance Issues

Requirements:

- Valves and controller require inspection and periodic replacement. Determine inspection frequency during the first few years of operation
- Maintenance includes removal of vegetation attached to skimmer to prevent clogging

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Similar to right-of-way requirements listed on the Detention Basin fact sheet (see Appendix C)

Siting Constraints:

Similar to siting constraints listed on the Detention Basin fact sheet (see Appendix C)

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2001. Detention Basin Optimization - Reconnaissance Study Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-029, pp. 3-7.

Caltrans. 2004. District 12 State Route 73 Pilot Program - Detention Basin Optimation and Retrofit. Basis of Design Report. CTSW-RT-04-090.09.1.

Jarrett, A. R. 2008. Controlling the Dewatering of Sedimentation Basins. Fact Sheet F253. Agricultural and Biological Engineering. College of Agricultural Sciences, Cooperative Extension. U.S. Department of Agriculture and Pennsylvania Counties Cooperating. University Park, PA.

Available Vendor Products

The names of vendor products that appear here are for information only. The vendor products listed below are NOT APPROVED FOR USE by the California Department of Transportation. Their appearance here IS NOT AN ENDORSEMENT OF THE PRODUCTS BY CALTRANS OR THE STATE OF CALIFORNIA.

Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Disinfection

Chemical Treatment

Description

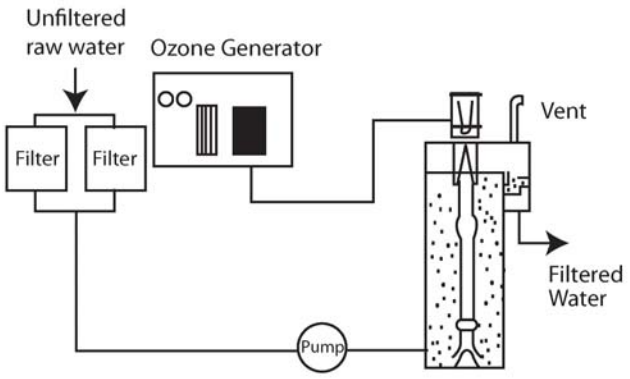
Chemical disinfection of stormwater can be achieved by the addition of a liquid (e.g., hypochlorous acid solution) or a gas (e.g., ozone). The basic treatment system consists of a chemical generation/storage system, a contact chamber, and a quenching chamber to remove residual chemical. For many years, chemical disinfection systems have been used successfully for inactivating pathogens and other microbial contaminants in drinking water and wastewater. For intermittent wet weather flow, a pretreatment device and an equalization/storage basin may be required.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	✓
Litter	
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on performance for drinking water and wastewater disinfection. Blank cells indicate data not available or poor treatment performance. Small disinfection systems operating at relatively high flow rates may not provide treatment as indicated.

Schematic



Source: UN Food and Agricultural Organization

Key Design Elements

- Chemical dose and contact time
- Chemical feed and storage facilities
- Mixing facilities
- Pretreatment to remove particles is required to achieve reliable disinfection
- Contact time must be provided in a contact basin or sedimentation basin downstream
- Quenching system may be required

Advantages

- Specific use guidelines available
- Proven effectiveness on microbial contaminants
- Mosquitoes are not an issue with chlorinated water
- Ozone is a strong disinfectant and has a limited number of by-products
- Low doses are required to complete disinfection
- Low residual ozone concentration in the treated effluent, minimizing impact on receiving waters
- Although ozone systems are complex, use of instrumentation makes the process automated and reliable

Constraints

- Declorination may be required to prevent harmful effects to receiving waters
- Pretreatment (e.g., removal of suspended solids, and oil and grease) required
- Requires special handling procedures and chemical storage tank on site
- Some organics may be converted to other (possibly more harmful) products
- Ozone must be produced on site because it cannot be stored
- Ozonation technology has a very high energy requirement
- Some ozonation by-products may be harmful to the receiving water
- Ozone escaping to the atmosphere may contribute to air pollution problems
- Ozone diffusers can be damaged easily by debris and sediments

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Disinfection

Chemical Treatment

Maintenance Issues

Requirements:

- Mechanical equipment must be maintained
- Chemicals must be replenished
- Chemical concentration must be monitored
- Check generators daily when in operation
- Manual start-up of the ozone generator is preferable because it needs to be purged before each start-up

Special Training:

- Needed for special materials handling
- Needed for inspection and maintenance of the chemical dosing system, mixing chamber, and other design elements
- Needed for operation and maintenance of gas feed system, ozone generator, and contact chamber

Project Development Issues

Right-of-Way Requirements:

- Space requirements will depend on size of contact chamber needed to accommodate design flow
- Pretreatment space required for sedimentation, filtration, and equalization of design flow

Siting Constraints:

- Restricted to sites with available power

Construction:

- Avoid sediments in the contact chamber during construction
- May have start-up and testing requirements

Design, Construction, Maintenance, and Cost Sources

James M. Montgomery Consulting Engineers. 1985. Water Treatment Principles and Design. New York: Wiley.

PCI-Wedeco Environmental Technologies. One Fairfield Crescent, West Caldwell, NJ 07006.

U.S. EPA. 1999. Alternative Disinfectants and Oxidants Guidance Manual. Office of Water. EPA 815-R-99-014.

Available Vendor Products

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- Biocide Fabric
- Klorigen™
- ClorTec®
- Osec®

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

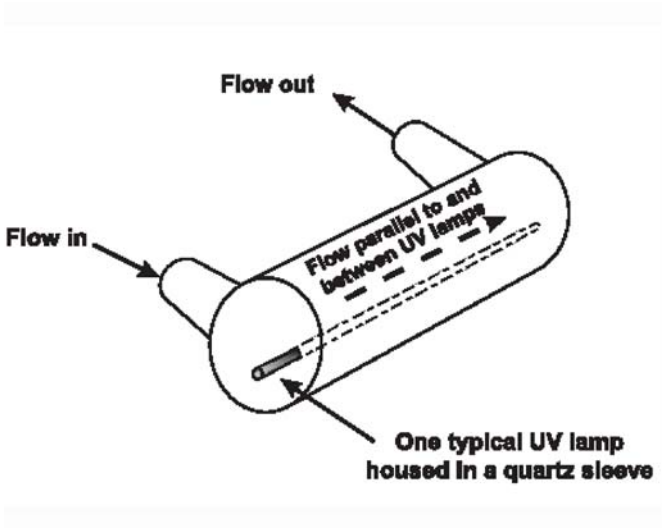
Disinfection

Ultraviolet

Description

Ultraviolet (UV) light disinfects water by altering the genetic material (i.e., DNA) in the cells of bacteria, viruses, and other microorganisms so that they can no longer reproduce or infect. In UV disinfection systems, the light is produced by germicidal lamps enclosed in a pressure vessel or submerged in a water channel. As the water flows past the UV lamps, the microorganisms are exposed to a lethal dose of UV energy. The UV dose is the product of the light intensity and contact time. The UV disinfection treatment is downstream of pretreatment BMPs, such as a Multiple Chamber Treatment Train (MCTT) or a media filter.

Schematic



Source: EPA

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	✓
Litter	
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on performance for dry weather flow treatment (City of Santa Monica). Blank cells indicate data not available or poor treatment performance. Small disinfection systems operating at relatively high flow rates may not provide treatment as indicated.

Key Design Elements

- Light intensity and contact time
- Hydraulic system for moving water past lamps
- Facilities for cleaning lamps
- Pretreatment to remove particles is required to achieve reliable disinfection

Advantages

- Natural process that disinfects without chemicals and has low maintenance requirements
- Automated operations and controls
- Compact system with a small footprint compared to other disinfection technologies
- Suitable for retrofit to existing BMPs
- No impact on other processes following UV treatment
- No chemical residual, minimizing impact to receiving waters

Constraints

- Pretreatment requirement may be substantial
- Clumping microorganisms can impact disinfection by harboring pathogens in the aggregates
- Specific design parameters vary for individual waters (UV transmittance)
- Under certain conditions, some organisms are capable of repairing damaged DNA and reverting back to an active state to reproduce (photoreactivation). This can be minimized by shielding the process stream or limiting the exposure of disinfected water to sunlight immediately following disinfection
- Organic and inorganic fouling usually occurs on UV lamp sleeves. Inorganic fouling, which is related to high lamp temperature, is the most difficult to clean because inorganics, such as iron and manganese, bind to the quartz sleeve

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Disinfection

Ultraviolet

Maintenance Issues

Requirements:

- Each lamp must be cleaned periodically-typically every two weeks for wastewater discharges, but probably less frequently for intermittent stormwater discharges
- Lamps have a short life span and may require frequent replacement
- Pumps must be maintained

Special Training:

Trained staff is required for mechanical equipment maintenance

Project Development Issues

Right-of-Way Requirements:

May be compact, but pretreatment space requirement may be large

Siting Constraints:

- Restricted to sites with power available nearby
- Requires a volume-capture BMP to provide flow control

Construction:

Significant start-up and testing requirements

Design, Construction, Maintenance, and Cost Sources

City of Santa Monica. 2009. Urban Runoff Water Quality Monitoring. http://www01.smgov.net/epd/scpr/EnvironmentalPubllicHealth/EPH8_UrbanRunoff.htm (accessed October 8, 2009).

Available Vendor Products

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- Aqua UltraViolet Viper Series
- Siemens Barrier® Series
- WEDECO TAK

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Drain Inlet Insert

Baffle Box

Description

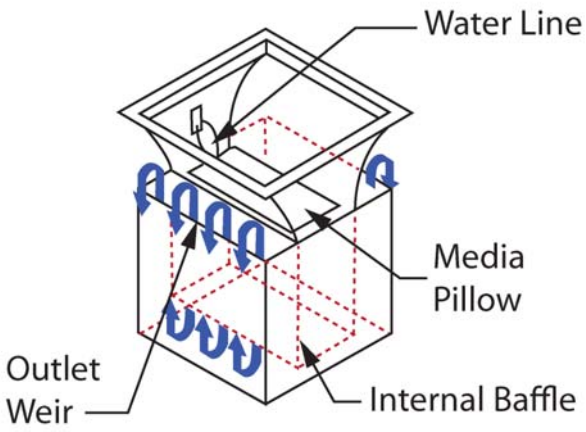
Drain inlets inserts, also known as catch basin or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. The effectiveness of drain inlet inserts depends on their design and on the frequency of maintenance to remove accumulated litter and sediment. Baffle type inserts utilize a series of baffles to force water to flow upwards before it is discharged, resulting in sedimentation of larger particles within the insert. Some inserts are designed to drop directly into existing drain inlets, while others may require attachment to drain inlet walls.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Some inserts may not provide treatment depending on size, configuration, and baffle specifications.

Schematic



Source: Caltrans

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass

Advantages

- Range of sizes can be retrofitted to storm drain requirements
- The device can be installed relatively easily in new and existing facilities without structural modification
- Suitable for areas with low volume traffic, such as Park and Ride lots

Constraints

- Standing water of some products may create mosquito habitat
- A Caltrans study (2004) discourages the use of drain inlet inserts along highway drain inlets due to safety considerations
- High flows may flush accumulated material
- Capacity (size of basket) is constrained by the size of the drain inlet to be retrofitted
- May require frequent monitoring and maintenance because of limited capacity
- Maintenance activities may require traffic control if the device is installed along the traveled way

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Drain Inlet Insert

Baffle Box

Maintenance Issues

Requirements:

- Frequent inspection and maintenance may be required
- Vector control or abatement may be required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Installed within a stormwater inlet

Siting Constraints:

- Requires a grated drop inlet
- A previous Caltrans study (2004) of drain inlet inserts suggests limiting deployment to maintenance stations due to safety considerations

Construction:

A watertight installation of the product is important to capture low flows

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

US EPA. 2002. Storm Water O&M Fact Sheet, Catch Basin Cleaning. EPA 832-F-99-011.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

University of Arkansas. 2003. Environmental Technology Verification Report of the Low-Cost Stormwater BMP Study. Civil Engineering Research Foundation (CERF) and the University of Arkansas.

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Hydro-Cartridge

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Drain Inlet Insert

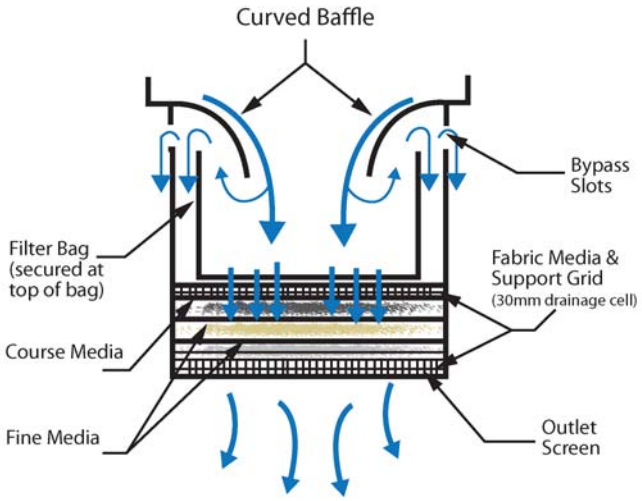
Basket/Box

Baffled Filtration Box

Description

Drain inlets inserts, also known as catch basin or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. The effectiveness of drain inlet inserts depends on their design and on the frequency of maintenance to remove accumulated litter and sediment. The baffled filtration box is a non-proprietary open-bottom filtration drain inlet insert that is designed to optimize sedimentation, filtration, and adsorption. A curved baffle directs flows into a filter bag made of a non-woven geotextile fabric. Surface filtration occurs as water flows through the geotextile. Sedimentation occurs as water flow exceeds the capacity of the fabric bag and spills over the sides. Water flowing through the fabric and overtopping the bag is further filtered by an arrangement of fabric and media at the bottom of the insert. Adsorption of different pollutants varies according to the media used. Overflow is allowed through bypass slots below the inlet.

Schematic



Source: Sacramento State, Office of Water Programs

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on laboratory testing by the Office of Water Programs at Sacramento State (unpublished preliminary results) and best professional judgment. Blank cells indicate data not available or poor treatment performance. Some inserts may not provide treatment depending on size, configuration, and media specifications.

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass to avoid flooding when the insert is full or clogged
- Geotextile type
- Media type, grain size, area, and depth

Advantages

- Range of sizes can be retrofitted to storm drain requirements
- Can be installed relatively easily in new and existing facilities without much structural modification
- Suitable for areas with low volume traffic, such as Park and Ride lots

Constraints

- Device can clog, resulting in standing water that may create mosquito habitat
- A Caltrans study (2004) discourages the use of drain inlet inserts along highway drain inlets due to safety considerations
- Accumulated solids may be flushed out by high flows
- Capacity is constrained by the size of the drain inlet to be retrofitted
- May require frequent monitoring and maintenance because of limited capacity and potential clogging issues
- Maintenance activities may require traffic control if the device is installed along the traveled way

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Drain Inlet Insert

Basket/Box

Baffled Filtration Box

Maintenance Issues

Requirements:

- Frequent inspection and maintenance may be required, depending on solids loading and media grain size/area
- Vector control or abatement may be required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Install within a stormwater inlet

Siting Constraints:

- Requires a grated drop inlet
- A previous Caltrans study (2004) of drain inlet inserts suggests limiting deployment to maintenance stations due to safety considerations

Construction:

A watertight installation of the product is important to capture low flows

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Drain Inlet Insert

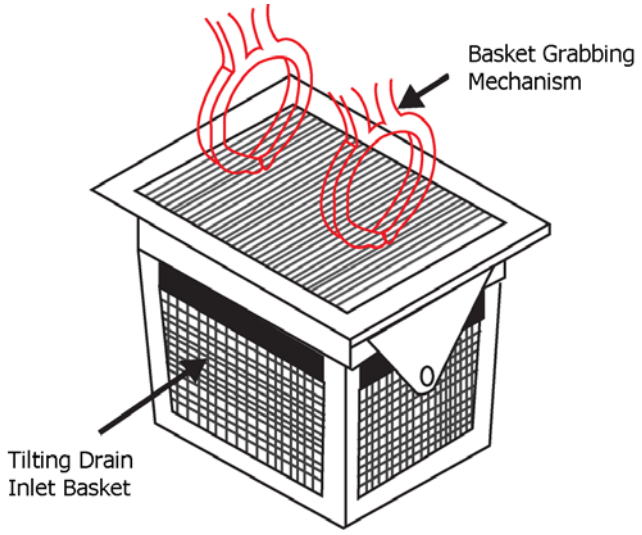
Basket/Box

GSR Basket (Mechanically Removed)

Description

Drain inlets inserts, also known as catch basin or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. The effectiveness of drain inlet inserts depends on their design and on the frequency of maintenance to remove accumulated litter and sediment. The GSR Basket is a non-proprietary concept developed by Caltrans that is similar to other basket inserts that rest on the sidewalls of standard drain inlets. This insert has an integrated drop inlet grate, and a unique design that allows for automated removal of the entire basket by mechanisms similar to those used by garbage trucks. Flood flow bypass would occur by overflowing the basket.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgement. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass to avoid flooding when the insert is full or clogged
- Screen type, area, and opening size
- Maintenance access

Advantages

- Maintenance can be simple and quick
- The device can be installed relatively easily in new and existing facilities without structural modification
- Suitable for areas with low traffic volumes, such as Park and Ride lots

Constraints

- Capacity (size of basket) is constrained by the size of the drain inlet to be retrofitted
- A Caltrans study (2004) discourages the use of drain inlet inserts along highway drain inlets due to safety considerations
- High flows may flush accumulated material
- May require frequent monitoring and maintenance because of limited capacity
- Maintenance activities may require traffic control if the device is installed along the traveled way

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Drain Inlet Insert

Basket/Box

GSR Basket (Mechanically Removed)

Maintenance Issues

Requirements:

- Frequent inspection and maintenance may be required if there is high solids loading (often caused by vegetation within the drainage area)
- Specially modified garbage trucks
- Vector control or abatement may be required

Special Training:

Operator training is necessary to operate mechanized removal equipment

Project Development Issues

Right-of-Way Requirements:

Install within a stormwater inlet

Siting Constraints:

- Requires a curb inlet
- A previous Caltrans study (2004) of drain inlet inserts suggests limiting deployment to maintenance stations due to safety considerations

Construction:

Replaces the inlet grate

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Drain Inlet Insert

Fabric

Description

Drain inlets inserts, also known as catch basin or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. The effectiveness of drain inlet inserts depends on their design and on the frequency of maintenance to remove accumulated litter and sediment. Inserts typically consist of a filtering medium such as fabric, sand, or other media. Fabric type inserts utilize a fabric bag to capture gross solids and provide filtration. Some inserts are designed to drop directly into existing drain inlets, while others may require attachment to drain inlet walls.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Some inserts may not provide treatment depending on size, configuration, and fabric specifications.

Schematic

Source: Delaware Department of Transportation

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass
- Fabric type, area, number of layers, and apparent opening size

Advantages

- Range of sizes can be retrofitted to storm drain requirements
- The device can be installed relatively easily in new and existing facilities without structural modification
- Suitable for areas with low volume traffic, such as Park and Ride lots

Constraints

- Device can clog resulting in standing water that may create mosquito habitat
- A Caltrans study (2004) discourages the use of drain inlet inserts along highway drain inlets due to safety considerations
- Accumulated solids may be flushed out by high flows
- Capacity is constrained by the size of the drain inlet to be retrofitted
- May require frequent monitoring and maintenance because of limited capacity and potential clogging issues
- Maintenance activities may require traffic control if the device is installed along the traveled way

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Drain Inlet Insert

Fabric

Maintenance Issues

Requirements:

- Frequent inspection and maintenance may be required, depending on solids loading, fabric type, and fabric area
- Vector control or abatement may be required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Installed within a stormwater inlet

Siting Constraints:

- Requires a grated drop inlet
- A previous Caltrans study (2004) of drain inlet inserts suggests limiting deployment to maintenance stations due to safety considerations

Construction:

A watertight installation of the product is important to capture low flows

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

US EPA. 2002. Storm Water O&M Fact Sheet, Catch Basin Cleaning. EPA 832-F-99-011.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

University of Arkansas. 2003. Environmental Technology Verification Report of the Low-Cost Stormwater BMP Study. Civil Engineering Research Foundation (CERF) and the University of Arkansas.

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- Catch-All
- DrainPac™
- FloGard+PLUS®
- Sewer Eco-Collar
- Ultra-Drain Guard®
- Drain Diaper™
- Ecosol™ RSF 100
- SeaLife Saver®
- StreamSaver™

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

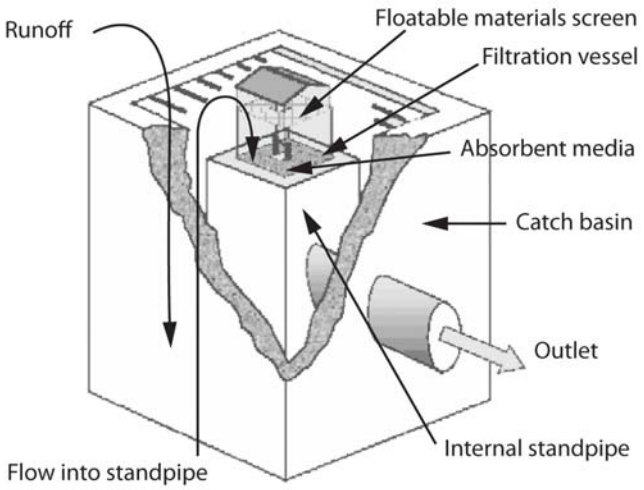
Drain Inlet Insert

Media

Description

Drain inlets inserts, also known as catch basin or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. The effectiveness of drain inlet inserts depends on their design and on the frequency of maintenance to remove accumulated litter and sediment. Inserts typically consist of a filtering medium such as fabric, sand, or other media. Media type inserts use granular inert or absorbent media in bags/pillows, canisters, or trays. Some inserts are designed to drop directly into existing drain inlets, while others may require attachment to drain inlet walls.

Schematic



Source: Connecticut Stormwater Quality Manual (2004).

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Some inserts may not provide treatment depending on size, configuration, and media specifications.

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass
- Media type, grain size, area, and depth

Advantages

- Range of sizes can be retrofitted to storm drain requirements
- The device can be installed relatively easily in new and existing facilities without structural modification
- Suitable for areas with low volume traffic, such as Park and Ride lots

Constraints

- Device can clog resulting in standing water that may create mosquito habitat
- A Caltrans study (2004) discourages the use of drain inlet inserts along highway drain inlets due to safety considerations
- Accumulated solids may be flushed out by high flows
- Capacity is constrained by the size of the drain inlet to be retrofitted
- May require frequent monitoring and maintenance because of limited capacity and potential clogging issues
- Maintenance activities may require traffic control if the device is installed along the traveled way

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Drain Inlet Insert

Media

Maintenance Issues

Requirements:

- Frequent inspection and maintenance may be required, depending on solids loading and media grain size/area
- Vector control or abatement may be required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Installed within a stormwater inlet

Siting Constraints:

- Requires a grated drop inlet
- A previous Caltrans study (2004) of drain inlet inserts suggests limiting deployment to maintenance stations due to safety considerations

Construction:

A watertight installation of the product is important to capture low flows

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

US EPA. 2002. Storm Water Technology Fact Sheet, Sorbent Materials in Storm Water Applications. EPA 832-F-02-020.

US EPA. 2002. Storm Water O&M Fact Sheet, Catch Basin Cleaning. EPA 832-F-99-011.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

University of Arkansas. 2003. Environmental Technology Verification Report of the Low-Cost Stormwater BMP Study. Civil Engineering Research Foundation (CERF) and the University of Arkansas.

Available Vendor Products

The names of vendor products that appear here are for information only. The vendor products listed below are NOT APPROVED FOR USE by the California Department of Transportation. Their appearance here IS NOT AN ENDORSEMENT OF THE PRODUCTS BY CALTRANS OR THE STATE OF CALIFORNIA.

- Aqua Filtration Unit
- Clean Way
- EcoSense™
- Envirosafe™
- Inceptor®
- Piranha
- SIFT Filter™
- StormBasin®/StormPod®
- Triton Curb Inlet Filter™
- Triton TT3 Filter™ (Trench Drain)
- Aqua-Guardian™
- Diamond-Flow™
- Enviro-Drain®
- Hydro-Kleen™
- Manhole Filter
- Raynfiltr®
- Storm PURE™
- Triton Catch Basin Filter™
- Triton T-DAM Filter™ (Trench Drain)
- Ultra-Urban® Filter

Alternative Designs

Baffled Filtration Box

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Drain Inlet Insert

Screen

Description

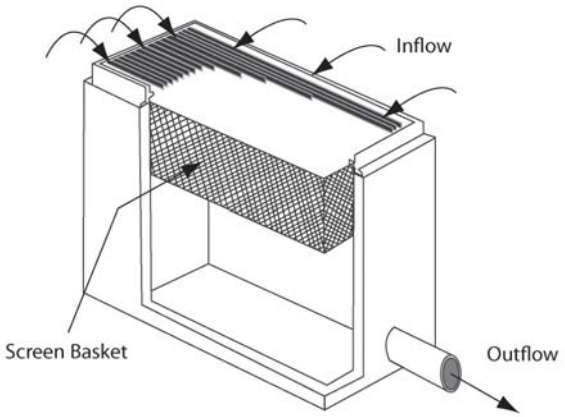
Drain inlets inserts, also known as catch basin or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. The effectiveness of drain inlet inserts depends on their design and on the frequency of maintenance to remove accumulated litter and sediment. Inserts typically consist of a filtering medium such as fabric, sand, or other media. Screen type inserts utilize one or more screens to filter out gross solids and coarse particulates. Some inserts are designed to drop directly into existing drain inlets, while others may require attachment to catch basin sidewalls.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Some inserts may not provide treatment depending on size, configuration, and screen specifications.

Schematic



Source: Caltrans

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass
- Screen type, area, and opening size

Advantages

- Range of sizes can be retrofitted to storm drain requirements
- Some configurations can be installed relatively easily in new and existing facilities without structural modification
- Suitable for areas with low volume traffic, such as Park and Ride lots

Constraints

- Capacity (size of basket) is constrained by the size of the drain inlet to be retrofitted
- A Caltrans study (2004) discourages the use of drain inlet inserts along highway drain inlets due to safety considerations
- Maintenance activities may require traffic control if the device is installed along the traveled way
- High flows may flush accumulated material
- May require frequent monitoring and maintenance because of limited capacity

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Drain Inlet Insert
Screen

Maintenance Issues

Requirements:

- Frequent inspection and maintenance may be required if there is high solids loading (often caused by vegetation within the drainage area)
- Vector control or abatement may be required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Installed within a stormwater inlet

Siting Constraints:

- Requires a curb inlet
- A previous Caltrans study (2004) of drain inlet inserts suggests limiting deployment to maintenance stations due to safety considerations

Construction:

- May require attachment to sidewalls
- A watertight installation is important to capture low flows

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

US EPA. 2002. Storm Water O&M Fact Sheet, Catch Basin Cleaning. EPA 832-F-99-011.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

University of Arkansas. 2003. Environmental Technology Verification Report of the Low-Cost Stormwater BMP Study. Civil Engineering Research Foundation (CERF) and the University of Arkansas.

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- ClearWater BMP
- Curb Inlet Basket
- Grate Inlet Skimmer Box
- HydroScreen
- SuperFlo II Downspout

Alternative Designs

GSR Basket

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

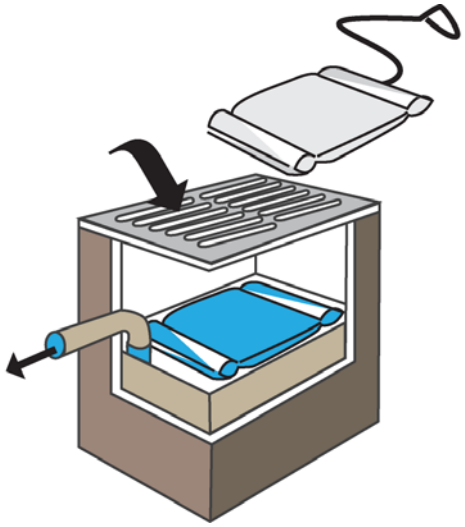
Drain Inlet Insert

Skimmer

Description

Drain inlets inserts, also known as catch basin or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. The effectiveness of drain inlet inserts depends on their design and on the frequency of maintenance to remove accumulated litter and sediment. Skimmer type inserts consist of a media pillow that floats directly on the water surface within a drain inlet and absorbs floating hydrocarbons. The hydrocarbons are transformed into manageable solid waste when captured by the media pillows.

Schematic



Source: EPA

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass
- Skimmer size and media type

Advantages

- May absorb hydrocarbons with minimal leaching, so skimmers can remain in place for long periods
- Can be installed relatively easily in new and existing facilities without structural modification
- Maintenance is quick and simple

Constraints

- Skimmers trap only hydrocarbons and do not contribute to sediment control
- A Caltrans study (2004) discourages the use of drain inlet inserts along highway drain inlets due to safety considerations
- Maintenance activities may require traffic control if the device is installed along the traveled way
- If a skimmer has absorbed to its maximum capacity, additional hydrocarbons will not be captured until the device is replaced

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Drain Inlet Insert

Skimmer

Maintenance Issues

Requirements:

- Must be inspected annually
- Maintenance consists of removing and replacing the skimmer
- Vector control or abatement may be required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Installed within a stormwater inlet

Siting Constraints:

A previous Caltrans study (2004) of drain inlet inserts suggests limiting deployment to maintenance stations due to safety considerations

Construction:

Simple installation

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

US EPA. 2002. Storm Water O&M Fact Sheet, Catch Basin Cleaning. EPA 832-F-99-011.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

University of Arkansas. 2003. Environmental Technology Verification Report of the Low-Cost Stormwater BMP Study. Civil Engineering Research Foundation (CERF) and the University of Arkansas.

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- AbTech Passive Skimmer
- Ultra-Passive Skimmer®
- StreamGuard Passive Skimmer

Alternative Designs

None identified

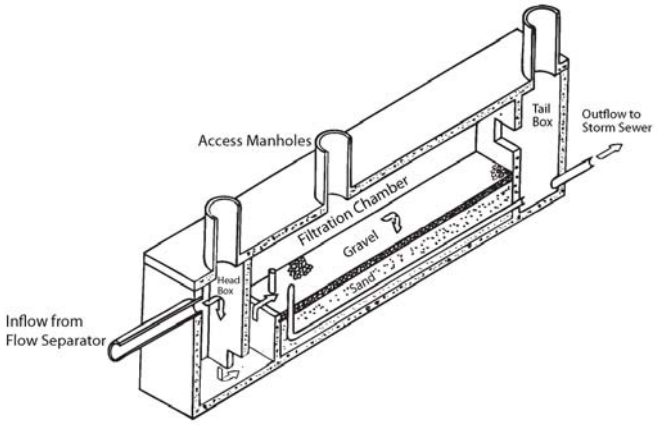
Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet
Filtration
Bed

Description

Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. In bed filters, stormwater flows through one or more layers of open-bed granular media before discharging through an underdrain system. The media can be inert, such as sand or gravel, or adsorptive, such as peat or a manufactured media. The effectiveness of the system depends on the loading rate on the filter, the type, size and porosity of the media, and the type and size distribution of the particles in the incoming stormwater. If the media is adsorptive, the water chemistry will also determine the effectiveness of the filter in removing dissolved constituents. Pretreatment may be necessary prior to filtration to prevent clogging and premature failure of the media.

Schematic



Source: EPA

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on performance of an Austin Sand Filter (see Appendix C). Blank cells indicate data not available or poor treatment performance. Small filtration devices operating at relatively high loading rates may not provide treatment as indicated.

Key Design Elements

- Flood flow routing and bypass
- Water quality design flow
- Media type, grain size, and area
- Pollutant storage capacity
- Need for pretreatment
- Maintenance access

Advantages

- Typically smaller than basin type BMPs
- Can be installed below grade
- Media can be selected to target specific constituents of concern

Constraints

- Media may be proprietary
- A permanent pool of water in the treatment vault of some configurations can provide mosquito breeding opportunities
- No infiltration and volume reduction, when constructed within a concrete vault
- Confined space entry
- Entry needs to be kept accessible
- Footprint increased if pretreatment required

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration Bed

Maintenance Issues

Requirements:

- Routine maintenance may include periodic sediment and debris removal as well as spent media replacement. Layered media may complicate maintenance
- Vector control or abatement may be required

Special Training:

- Requires training for media maintenance/replacement
- May require confined space entry training

Project Development Issues

Right-of-Way Requirements:

Space requirements depend on sizing criteria, typically smaller than for basins

Siting Constraints:

Head requirements for gravity drain

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-07-172.19.1.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

US EPA. 2002. Storm Water Technology Fact Sheet, Sorbent Materials in Storm Water Applications. EPA 832-F-02-020.

WSDOT. 2008. Highway Runoff Manual. Washington State Department of Transportation. Document Number M31-16.01.

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- Aqua-Filter™
- Aquip™

Alternative Designs

- Austin Filter
- DC Filter
- Media Filter Drain
- Delaware Filter
- Granular Activated Carbon Filter

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Filtration

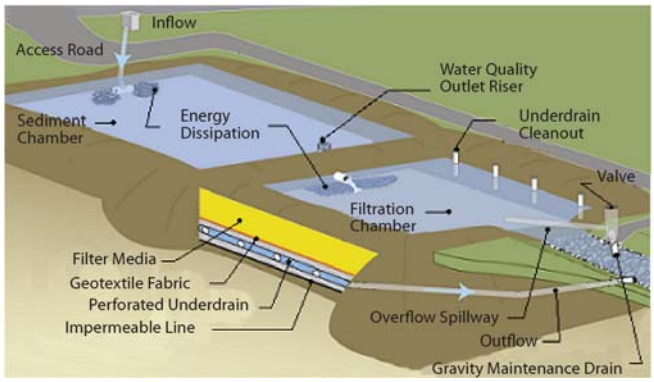
Bed

Austin Filter with Alternative Media

Description

Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. In bed filters, stormwater flows through one or more layers of open-bed granular media before discharging through an underdrain system. The effectiveness of the system depends on the loading rate on the filter, the type, size and porosity of the media, and the type and size distribution of the particles in the incoming stormwater. Conventional Austin Filters can be augmented with a layer of alternative media, such as an adsorptive manufactured media that removes fine particles and dissolved constituents. Alternative media tested by Caltrans includes activated alumina, iron-modified activated alumina, and limestone. A top layer of sand can reduce life-cycle costs because capturing particles on the sand layer prolongs the adsorptive life of the more expensive underlying media.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on the ongoing Highway 50 Activated Alumina Media Filter Pilot Study (Caltrans 2007) and best professional judgment. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Flood flow routing and bypass
- Media grain size, area, and depth
- Outlet orifice plate to control media contact time
- Maintenance access

Advantages

Effective constituent removal for suspended solids, fine particles, and total and dissolved phosphorus

Constraints

- Media may be proprietary
- If media clogs, resulting standing water may create mosquito habitat
- No infiltration and volume reduction when constructed within a concrete vault
- Media may need to be washed to avoid substantial pH changes and metals leaching
- Effluent may require monitoring during first year for elevated pH and dissolved metals

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Austin Filter with Alternative Media

Maintenance Issues

Requirements:

- Routine maintenance may include periodic sediment and debris removal as well as spent media replacement. Layered media may complicate maintenance
- Vector control or abatement may be required

Special Training:

Training is required for media handling, removal, and replacement

Project Development Issues

Right-of-Way Requirements:

Space requirements are similar to an Austin Sand Filter

Siting Constraints:

- Head requirement of about four feet
- Avoid locations with base flow because of clogging due to algae growth

Construction:

If exposed to construction site runoff, remove and replace media after drainage area has been completely stabilized

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Caltrans Tahoe Basin Highway 50 Activated Alumina Media Filter Pilot Study - Final Monitoring Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-06-157.02.1.

US EPA. Sand Filter Fact Sheet. Retrieved from www.epa.gov/owm/mtb/sandfltr.pdf (accessed November 6, 2009).

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

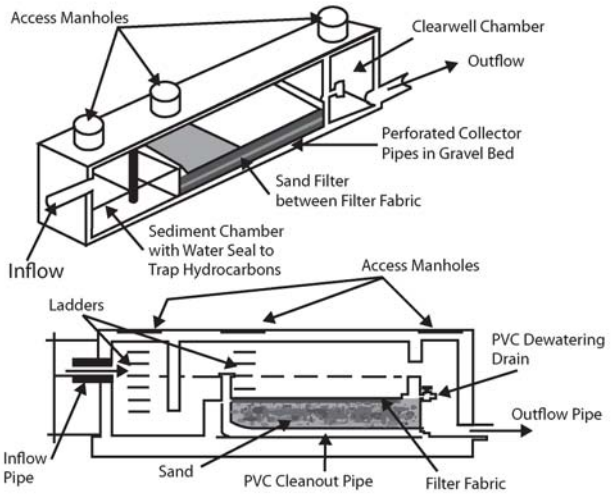
Filtration Bed

DC Sand Filter

Description

Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. In bed filters, stormwater flows through one or more layers of open-bed granular media before discharging through an underdrain system. The effectiveness of the system depends on the loading rate on the filter, the type, size and porosity of the media, and the type and size distribution of the particles in the incoming stormwater. DC Sand Filters are typically designed to handle runoff from completely impervious drainage areas of 0.4 hectares (1 acre) or less. This filter design incorporates three chambers. Runoff flows through a sedimentation chamber before it enters a filter chamber where it passes through an open sand bed. Filtered water is collected in a gravel underdrain and flows into a clearwell chamber before discharging.

Schematic



Source: EPA

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on Delaware Sand Filter performance (see Appendix C), and data presented by Young et al. (1996). Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Flood flow routing and bypass
- Media area and depth
- Media grain size

Advantages

- DC Sand Filters are installed in urban settings with covers appropriate for the intended above ground land use such as sidewalks or landscaping
- Performance is similar to the Delaware Sand Filter and Austin Sand Filter, but DC Sand Filters have a narrower footprint and require less head than Austin Sand Filters. They are also designed to receive concentrated flows at one end, whereas Delaware Sand Filters are designed for sheet flows along one side

Constraints

- Designed to treat impervious areas of one acre or less
- If media clogs, resulting standing water may create mosquito habitat
- No infiltration and volume reduction when constructed within a concrete vault
- Confined space entry
- Entry needs to be kept accessible
- The sedimentation basin holds a permanent pool of water that has the potential to provide breeding opportunities for mosquitoes

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

DC Sand Filter

Maintenance Issues

Requirements:

- Routine maintenance may include periodic sediment and debris removal as well as spent media replacement
- Vector control or abatement may be required

Special Training:

- Requires training for media maintenance/replacement
- Requires confined space entry training

Project Development Issues

Right-of-Way Requirements:

Space requirements are similar to Delaware Sand Filters

Siting Constraints:

- Do not site where runoff from bare soil or construction activities can enter filter
- Head requirements for gravity drain

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-07-172.19.1.

Connecticut Stormwater Quality Manual. 2004. http://www.ct.gov/dep/lib/dep/water_regulating_and_discharges/stormwater/manual/Table_of_Contents.pdf (accessed November 11, 2009).

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

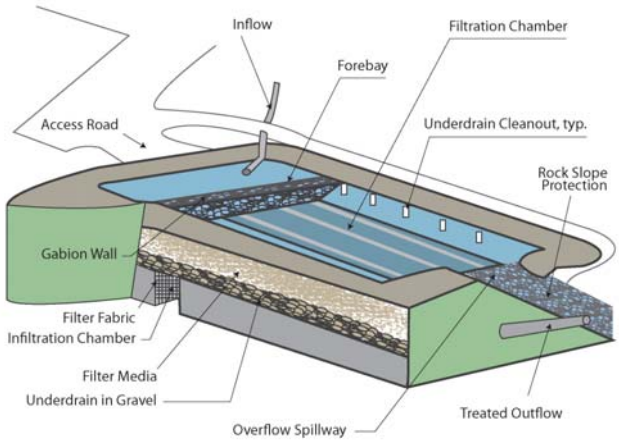
Filtration Bed

Infiltration Chambers

Description

Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. In bed filters, stormwater flows through one or more layers of open-bed granular media before discharging through an underdrain system. The effectiveness of the system depends on the loading rate on the filter, the type, size and porosity of the media, and the type and size distribution of the particles in the incoming stormwater. Infiltration chambers is a concept developed by Caltrans to increase infiltration in conventional BMPs. Addition of infiltration chambers below the invert of bed filters is expected to capture and infiltrate the first flush of stormwater runoff. These infiltration chambers can consist of gravel, high porosity storage media with a sand overlay, or native soil that has been amended to improve infiltration.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on performance of an Austin Sand Filter (see Appendix C). Blank cells indicate data not available or poor treatment performance. Small filtration devices operating at relatively high loading rates may not provide treatment as indicated.

Key Design Elements

- Soil type and permeability
- Infiltration chamber volume capacity
- Infiltration chamber material (high porosity storage media, gravel, amended soil, etc.)
- Flood flow routing and bypass
- Media grain size, area, and depth
- Outlet orifice plate to control media contact time
- Maintenance access

Advantages

- Potential for improved infiltration, even in poorly infiltrating soils
- Expected to improve treatment of fine particles, nutrients, and dissolved constituents relative to conventional sand filters

Constraints

- Not suitable in areas with high seasonal groundwater
- Increases construction and rehabilitation costs relative to conventional sand filters
- If media clogs, resulting standing water may create mosquito habitat

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Maintenance Issues

Requirements:

- Routine maintenance may include periodic sediment and debris removal as well as spent media replacement
- Vector control or abatement may be required
- May require construction equipment to rehabilitate clogged system
- Sediment removal

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Space requirements are the same as those for conventional filters

Siting Constraints:

- Site where there is sufficient hydraulic head to facilitate drainage through the sand bed
- Requires separation between seasonal high groundwater and basin invert
- Avoid locations with base flow because of possible clogging due to algae growth

Construction:

- If exposed to construction site runoff, remove and replace media after drainage area has been completely stabilized
- Minimize compaction of underlying soils to maintain infiltration capacity
- Bypass water until drainage area is stabilized

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Caltrans Tahoe Basin Highway 50 Activated Alumina Media Filter Pilot Study - Final Monitoring Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-06-157.02.1.

Caltrans. 2008. Adding Infiltration Chambers to Approved Best Management Practices: Concept Development. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-TM-08-172-46.1.

US EPA. Storm Water Technology Fact Sheet, Sand Filter. EPA 832-F-99-007.

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

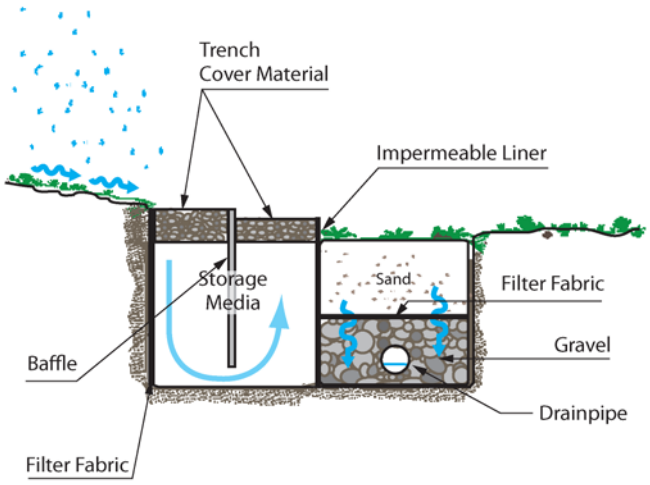
Filtration Bed

Linear Filter Trench

Description

Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. The Linear Filter Trench, a concept developed by Caltrans that is based on the Delaware Sand Filter, is intended for the narrow right-of-way that is typical of roadside areas. It consists of a sedimentation chamber with a permanent pool of water and a filter chamber with an underdrain. The Linear Filter Trench, however, would be constructed away from load-bearing areas so that trench construction can help reduce cost. A trench cover material on top of the sedimentation area prevents mosquito access to standing water. The use of a high-porosity storage media supports the overlay while maintaining the capture volume of the sedimentation chamber.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on performance of a Delaware Sand Filter (see Appendix C). Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Flood flow routing
- Water quality flow and detention time (if flow-based design)
- Storage volume and sand/gravel pore space (if volume-based design)
- Media type, grain size, and area
- Ponding depth above filter
- Traffic rating
- Maintenance access

Advantages

- Fits in a narrow right-of-way
- Lower construction costs than conventional below grade filters because of minimal use of concrete
- Can provide infiltration and volume reduction
- Can be constructed without pretreatment by a grass filter strip

Constraints

- The sedimentation chamber holds a permanent pool of water and has the potential to provide breeding opportunities for mosquitoes
- May require confined space entry
- Unknown maintenance frequency
- Maintenance activities may require traffic control

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration Bed

Linear Filter Trench

Maintenance Issues

Requirements:

- Disposal of accumulated trash and replacement of the upper few inches of sediment and sand when the filter clogs
- Vector control or abatement may be required

Special Training:

Requires training for media maintenance/replacement

Project Development Issues

Right-of-Way Requirements:

Designed to fit in a narrow right-of-way

Siting Constraints:

- Do not site where runoff from bare soil or construction activities will be allowed to impact the filter
- Minimum head requirement of two feet

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSWRT-07-172.19.1.

Horner, R. R. and Horner, C. R. 1995. Design, Construction, and Evaluation of a Sand Filter Stormwater Treatment System. Part III. Performance Monitoring. Report to Alaska Marine Lines, Seattle, WA.

US EPA. Sand Filter Fact Sheet. www.epa.gov/owm/mtb/sandfltr.pdf (accessed November 11, 2009).

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Available Vendor Products

The names of vendor products that appear here are for information only. The vendor products listed below are NOT APPROVED FOR USE by the California Department of Transportation. Their appearance here IS NOT AN ENDORSEMENT OF THE PRODUCTS BY CALTRANS OR THE STATE OF CALIFORNIA.

Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Filtration

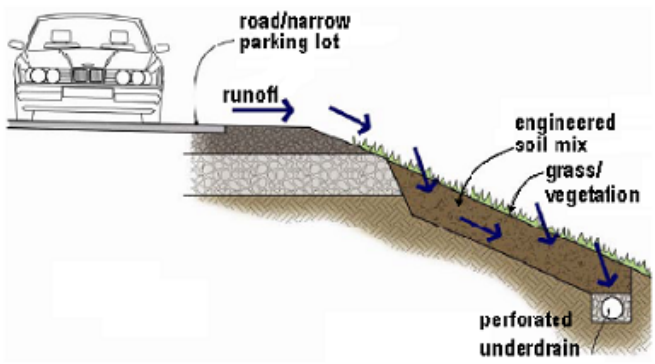
Bed

Media Filter Drain

Description

Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. In bed filters, stormwater flows through one or more layers of open-bed granular media before discharging through an underdrain system. The effectiveness of the system depends on the loading rate on the filter, the type, size and porosity of the media, and the type and size distribution of the particles in the incoming stormwater. The Media Filter Drain is a bed filtration system that can be integrated into slopes adjacent to roadways. The concept, developed by the State of Washington's Department of Transportation, is typically constructed to accept sheet flow along its length. Water passes into a porous, alkalinity-generating media that is placed in a shallow excavation running parallel to the roadway. An underdrain carries filtered water downstream.

Schematic



Source: Pierce County, Washington State

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	✓
Microbiological	
Litter	
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on monitoring by Washington State DOT (2008). Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Preferable lateral slopes less than 25% (4:1)
- Preferable longitudinal slope less than 5%
- Design water quality flow rate
- Bed mixture and dimensions
- Pretreatment needs by biofiltration strips
- Slope stability
- Underdrain
- Maintenance access

Advantages

- Fits in a narrow right-of-way
- No vector concerns, because water treatment is accomplished below surface

Constraints

- Requires sheet flow
- Not suitable for steep lateral and longitudinal slopes
- Vegetation may develop slowly, though filtering still occurs
- Media mix may require washing before installation
- Must avoid concentrated flows
- Maintenance activities may require traffic control

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration Bed

Media Filter Drain

Maintenance Issues

Requirements:

- Maintain uniform sheetflow distribution
- Periodic media maintenance

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Designed to fit in a narrow right-of-way

Siting Constraints:

Not advised in longitudinal slopes steeper than 5%, wetlands, wetland buffers, or unstable slopes

Construction:

Certain soil types may require perforated pipe in the underdrain trench to ensure proper flow through media bed

Design, Construction, Maintenance, and Cost Sources

Washington Department of Transportation (WA DOT). 2008. Highway Runoff Manual. M 31-16.01.

Available Vendor Products

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

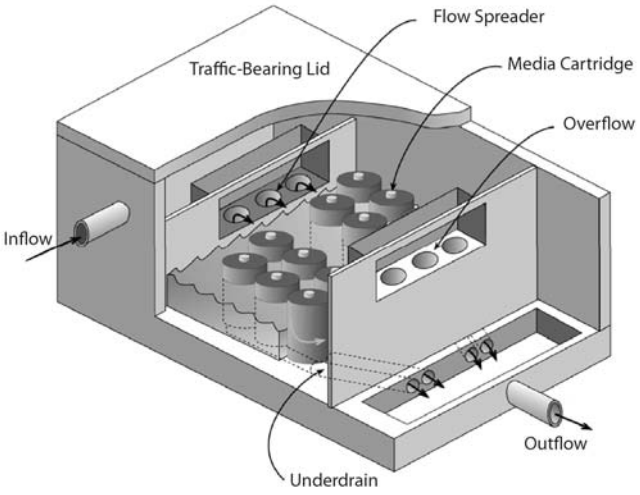
Filtration

Cartridge/Canister

Description

Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. In cartridge/canister systems, the filter media is placed inside cartridges or canisters that are typically enclosed in an underground vault. The media used can be inert, such as sand or gravel, or adsorptive, such as peat or a manufactured media. The effectiveness of these systems depends on the loading rate on the cartridges/canisters, the type, size and porosity of the media, and the type and size distribution of the particles in the incoming stormwater. If the media is adsorptive, the water chemistry will also determine the effectiveness of the filter in removing dissolved constituents. Pretreatment may be necessary prior to filtration to prevent clogging and premature failure of the media.

Schematic



Source: City of Medford, Oregon

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on performance of a StormFilter™ (Caltrans 2004), and best professional judgment. Blank cells indicate data not available or poor treatment performance. Cartridges/canisters operating at relatively high loading rates (about 2 gpm per square foot for each cartridge/canister) may not provide treatment as indicated.

Key Design Elements

- Flood flow routing and bypass
- Water quality design flow
- Flow restriction for maximum operational flow
- Media type, grain size, and area (determined by size, configuration, and number of cartridges/canisters)
- Pollutant storage capacity
- Need for pretreatment
- Maintenance access

Advantages

- Can be applied in confined urban areas and areas with limited space if placed in an underground vault
- Suitable for wide range of drainage areas
- Media can be selected to target specific constituents of concern

Constraints

- Can be expensive to construct
- Major maintenance may be costly due to the large number of filter canisters required
- Proprietary device
- Media may be proprietary
- Requires pretreatment
- A permanent pool of water in the treatment vault of some configurations can provide mosquito breeding opportunities
- Small storm events may not actuate the floats in some systems, and the water will reside in the unit until the next storm
- May require confined space entry
- Entry needs to be kept accessible

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration

Cartridge/Canister

Maintenance Issues

Requirements:

- Periodic sediment removal and canister replacement required
- Vector control or abatement may be required
- May require hand cleaning following removal of media canisters

Special Training:

- Training in use of equipment needed to remove media canisters and clean out pretreatment vault
- Must be trained to repair or replace any cartridge filter or part, or plan to contract for maintenance
- Training needed for confined space entry

Project Development Issues

Right-of-Way Requirements:

Space requirements depend on sizing criteria, but typically smaller than basins

Siting Constraints:

- Do not allow runoff from bare soil or construction activities to enter filter
- Sufficient hydraulic head is needed to operate filter

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Division of Environmental Analysis, Sacramento. CTSW-RT-01-050

US EPA. 2002. Storm Water Technology Fact Sheet, Sorbent Materials in Storm Water Applications. EPA 832-F-02-020.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

Available Vendor Products

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- BayFilter™
- Perk Filter™
- StormPlex™
- Up-Flo™
- Media Filtration System (MFS)
- Puristorm™
- VortFilter™

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Filtration

Fabric

Description

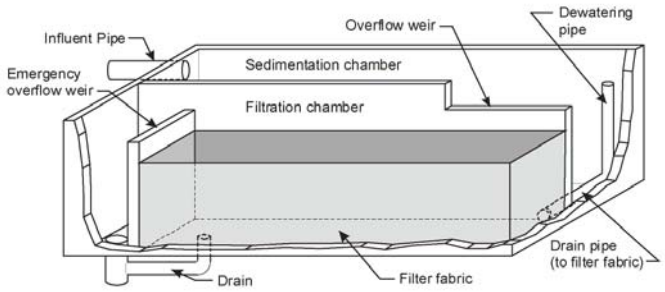
Filtration systems provide treatment by filtering out or straining particles and associated pollutants in the stormwater. In fabric filters, stormwater flows through fabric, typically in the form of a sequence of baffles. The effectiveness of the system depends on the loading rate on the fabric, the type, number of layers, and apparent opening size of the fabric, and the type and size distribution of the particles in the incoming stormwater. A fabric filtration system can be used as pretreatment for a subsurface detention or infiltration system.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Small filtration devices operating at relatively high loading rates may not provide treatment as indicated.

Schematic



Source: Caltrans

Key Design Elements

- Flood flow routing and bypass
- Fabric type, area, and apparent opening size
- Pollutant storage capacity
- Maintenance access

Advantages

- No negative aesthetic impact if installed below grade
- Can be used to provide pretreatment for other BMPs

Constraints

- May be difficult to achieve complete draining in a buried system
- Difficult to inspect and maintain because it is buried
- May require confined space entry
- Fabric panels may clog quickly
- A permanent pool of water in the treatment vault of some configurations can provide mosquito breeding opportunities

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration

Fabric

Maintenance Issues

Requirements:

- Replace fabric panels
- Because of site-specific loading, several wet season inspections may be required to determine maintenance frequency

Special Training:

Training needed for confined space entry

Project Development Issues

Right-of-Way Requirements:

Small footprint BMP

Siting Constraints:

May not be feasible in areas with high sediment and organic load because of premature clogging of fabric

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

None identified

Available Vendor Products

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- Stormfilter 400®
- Helix Filter
- Jellyfish™

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Filtration

Pressure

Description

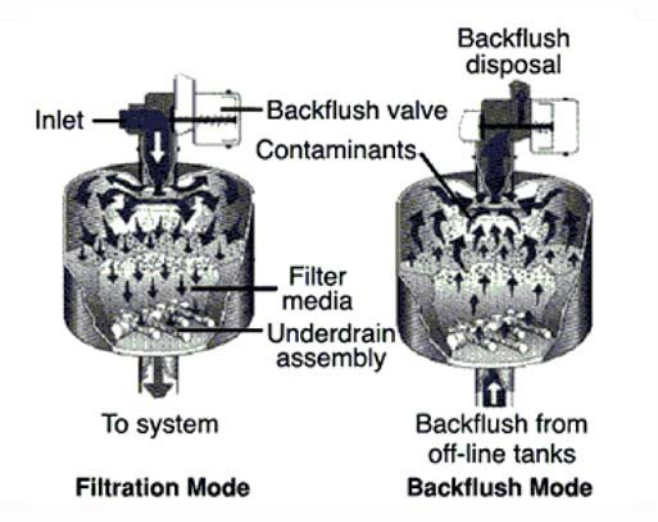
Filtration systems provide treatment by filtering out or straining particles and associated pollutants in stormwater. In pressurized filtration systems, an external pump is used to force water through a media, fabric, or micro-discs. The media can be inert, such as sand or gravel, or adsorptive, such as peat or a manufactured media. The effectiveness of the system depends on the loading rate on the media or fabric, the type, size and porosity of the media or fabric, and the type and size distribution of the particles in the incoming stormwater. If the media is adsorptive, the water chemistry will also determine the effectiveness of the filter to remove dissolved constituents. Pressure filtration is more common for construction site runoff than for post-construction.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance.

Schematic



Source: Virginia Cooperative Extension

Key Design Elements

- Facilities required upstream to capture runoff and provide pretreatment
- Power supply
- Flood flow routing and bypass
- Design flow
- Media type, grain size, and area
- Backwash cycle water storage and disposal
- Maintenance access

Advantages

- Using pressure rather than gravity to force water through a media bed allows a smaller footprint
- Backwashing cycle cleans sediment from the filter media as opposed to periodically excavating a portion of the media as required for slow-rate sand filters
- Pressure filter technology uses pumps, which allow more layout flexibility than gravity filtration systems

Constraints

- Connection to sewer or drying bed needed for backwashed wastewater
- Connection to a clean water tank is needed for backwashing
- Power supply required for pump
- More maintenance is needed for a pressure filter than for a gravity filter because of the use of mechanical equipment
- Requires a pretreatment system for litter and debris
- Requires a higher level of operator observation than that for other BMPs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration

Pressure

Maintenance Issues

Requirements:

- Mechanical equipment must be maintained
- Pretreatment may be necessary prior to filtration to prevent clogging and premature failure
- Pressure filters require backwashing, a process in which water is forced through the media bed in an opposite direction. The backwashed wastewater must be disposed if a sanitary sewer connection is not available

Special Training:

Crews need to be trained to operate and maintain equipment

Project Development Issues

Right-of-Way Requirements:

Total footprint may be high (including facilities required upstream to capture runoff and provide pretreatment)

Siting Constraints:

- Restricted to sites with available power nearby
- Space required for upstream pretreatment system
- Requires a sanitary sewer connection or dry beds

Construction:

Unknown

Design, Construction, Maintenance, and Cost Sources

US EPA. 2002. Storm Water Technology Fact Sheet, Sorbent Materials in Storm Water Applications. EPA 832-F-02-020.

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- Arkal Filter
- Purmutit® CD Series
- DynaSand®

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

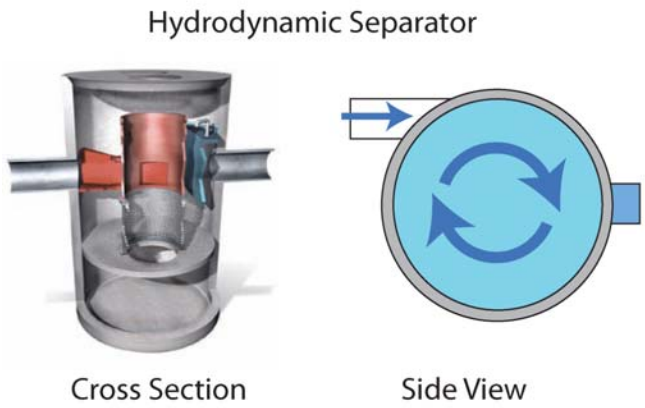
BMP Fact Sheet

Hydrodynamic Separator

Description

Hydrodynamic separators, also called vortex separators or swirl concentrators, are cylindrical structures in which water moves in a centrifugal fashion rather than in a straight line. Stormwater enters the separator tangentially and creates a swirling vortex flow pattern that allows larger particles to settle out by gravity around the outer edges of the main chamber. Differences between configurations include the nature and type of internal flow-modifying components and the location of inlets and outlets. Hydrodynamic separators are small footprint devices that can be used in small spaces. The effectiveness of these devices depends on the flow rate, the size and configuration of the device, and the sediment characteristics (i.e., type and size distribution of the particles) of the incoming stormwater.

Schematic



Source: University of New Hampshire Stormwater Center

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Treatment for separators operating at relatively high flow rates or with poor sediment retention ability may not be as indicated.

Key Design Elements

- Flood flow routing and bypass
- Water quality design flow
- Detention time
- Maximum operational flow
- Sediment storage capacity and ability to prevent scouring
- Maintenance access

Advantages

- Relatively limited head is needed to operate device
- Can be used to provide pretreatment for other BMPs

Constraints

- A permanent pool of water is often maintained in the unit, creating a breeding opportunity for mosquitoes
- Not effective for removing dissolved constituents or fine particles
- Can be a source of pollutants due to decomposition of previously captured material unless maintained regularly
- Maintenance activities may require traffic control if the device is installed along the traveled way
- Proprietary device

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Hydrodynamic Separator

Maintenance Issues

Requirements:

- Usually requires vactor truck
- Vector control or abatement may be required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Small footprint

Siting Constraints:

Low head requirement

Construction:

None Identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Connecticut Department of Environmental Protection. 2002. Stormwater Treatment Devices, Section 319 Project # 99-07, Final Report.

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

US EPA. 1999. Hydrodynamic Separators. Storm Water Technology Fact Sheet. EPA 832-F-99-017.

US EPA. 2004. The Use of Best Management Practices (BMPs) in Urban Watersheds. EPA/600/R-04/184.

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- Aqua-Swirl™
- Continuous Deflective Separation™ (CDS)
- EcoStorm Plus™
- Hydrofilter
- Storm Trooper®
- Terre Kleen™
- V2B1™
- VortSentry™
- Downstream Defender™
- EcoStorm™
- FloGard Dual-Vortex™
- Hydroguard
- Stormceptor®
- Unistorm™
- Vortechs®

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Infiltration

Below Grade

Description

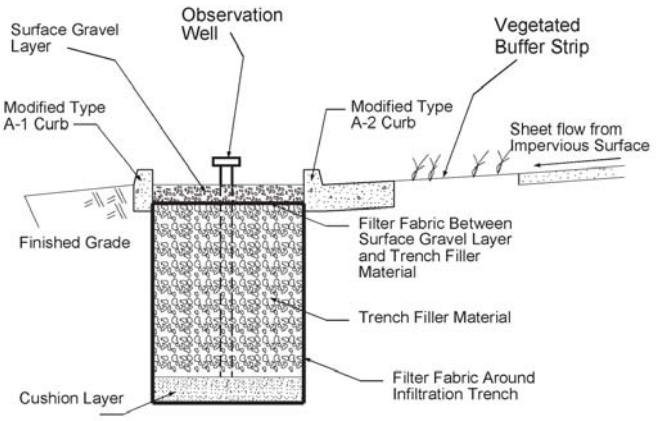
Infiltration BMPs provide treatment by allowing the stormwater runoff to infiltrate surrounding soils. Pollutants are filtered out as the water percolates through the soils. Infiltration BMPs are assumed to provide 100% treatment of the design water quality volume because no water is discharged to surface waters. An overflow mechanism is recommended in case of clogging.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	✓
Total Dissolved Solids (TDS)	✓

* Based on the assumption that most water is infiltrated and does not overflow, and litter is captured within the BMP. Removal ability reported in the literature is usually based on overflow discharge (Young et al. 1996).

Schematic



Source: Caltrans

Key Design Elements

- Water quality volume
- Permeability of soil
- Distance to groundwater
- Class V injection well determination may be required
- Overhead cover requirements and load-bearing capacity
- Maintenance access

Advantages

- When properly sized in suitable soils, infiltration BMPs eliminate surface discharge up to the design storm
- Below grade infiltration inhibits access for mosquitoes
- Underground BMPs have limited aesthetic impacts
- Caltrans modeling indicates that underlying soils are not likely to become hazardous within five or more years, and typical Caltrans concentrations will not likely impact groundwater quality (Caltrans 2007)

Constraints

- High rehabilitation cost when clogging occurs at the bottom of the trench
- Water percolation may impact structural integrity and stability
- Avoid high groundwater
- Avoid areas prone to spills of groundwater contaminants
- Potential EPA Class V injection well regulations
- Higher construction costs per capture volume than infiltration basins
- Although narrow, could be a large footprint BMP depending on design constraints

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Infiltration
Below Grade

Maintenance Issues

Requirements:

- Rehabilitation is required when the system clogs. Rehabilitation requires construction equipment
- Young et al. (1996) report that below grade infiltration (trenches, specifically) may require reconstruction every 10 years

Special Training:

Training in confined space entry

Project Development Issues

Right-of-Way Requirements:

- Space requirements are less than infiltration basins because of vertical side walls
- Pretreatment is recommended

Siting Constraints:

Permeable soils and adequate separation to groundwater

Construction:

- Avoid clogging the underlying soils by compaction from vehicles, or by fine particles introduced during or after construction
- Bypass water until drainage area is stabilized

Design, Construction, Maintenance, and Cost Sources

ASCE/WEF. 1998. Urban Runoff Quality Management. ASCE No. 87, WEF No. 23.

Caltrans. 2007. Mathematical Modeling of Fate and Transport of Aqueous Species in Stormflow Entering Infiltration Basin. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-06-168-17.2.

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

US EPA. 2003. When are Storm Water Discharges Regulated as Class V Wells? http://www.epa.gov/npdes/pubs/sw_class_v_wells_fs.pdf (accessed January 22, 2010).

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. US Department of Transportation.

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- Eljen In-Drain™
- Rainstore®
- StormTank™
- Cultec Contacter® and HVLV™ Recharger®
- EcoRain™
- SAGES™
- Terre Arch™
- VersiCell®
- Matrix™
- StormChamber™
- StormTech® Chambers
- D-Raintank®
- Rotondo Detention with Recharge
- Stormcell®
- Triton™ Chamber
- CUDO

Alternative Designs

- Infiltration Vault
- Infiltration Trench
- Linear Infiltration Filter Trench

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Infiltration

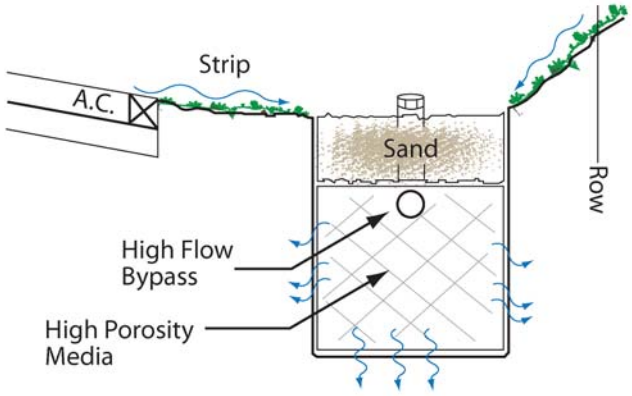
Below Grade

Linear Infiltration Filter Trench

Description

Infiltration BMPs provide treatment by allowing stormwater runoff to infiltrate surrounding soils. Pollutants are filtered out as the water travels through the soils. Infiltration BMPs are assumed to provide 100% treatment because the design water quality volume is not discharged to surface waters. An overflow mechanism is recommended in case of clogging. The Linear Infiltration Filter Trench is a non-proprietary design developed by Caltrans in which stormwater flows as sheet flow through a sand filter prior to infiltration. Treatment within the sand layer reduces clogging of the trench, inhibits mosquito access in areas where slow soil infiltration results in standing water, and may eliminate the need for pretreatment. The trench is backfilled with gravel or a high porosity media that is available from several suppliers.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	✓
Biochemical Oxygen Demand (BOD)	✓
Total Dissolved Solids (TDS)	✓

* Based on the assumption that most water is infiltrated and does not overflow, and that litter is captured within the BMP.

Key Design Elements

- Water quality volume
- Permeability of soil and sand
- Distance to groundwater
- Load-bearing capacity
- Maintenance access
- Ponding depth above the sand

Advantages

- Designed to fit a narrow right-of-way
- When properly sized in suitable soils, infiltration BMPs eliminate surface discharge up to the design storm
- Below grade infiltration inhibits access for mosquitoes
- Underground BMPs have limited aesthetic impact
- Caltrans modeling indicates that underlying soils are not likely to become hazardous within five or more years, and that typical Caltrans concentrations will not likely impact groundwater quality (Caltrans 2009)

Constraints

- High rehabilitation cost when clogging occurs at the bottom of the trench
- Water percolation may impact structural integrity and stability
- Avoid high groundwater
- Avoid areas prone to spills of groundwater contaminants
- Higher construction costs per capture volume than infiltration basins
- Although narrow, could be a large footprint BMP depending on design constraints

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Linear Infiltration Filter Trench

Maintenance Issues

Requirements:

- May require construction equipment to rehabilitate clogged system
- Young et al. (1996) report that below grade infiltration (trenches, specifically) may require reconstruction every 10 years

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

- Space requirements are less than infiltration basins because of vertical side walls
- Pretreatment is recommended

Siting Constraints:

Permeable soils and adequate separation to groundwater

Construction:

- Avoid clogging the underlying soils by compaction from vehicles or by fine particles introduced during or after construction
- Bypass water until drainage area is stabilized

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007a. Mathematical Modeling of Fate and Transport of Aqueous Species in Stormflow Entering Infiltration Basin. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-06-168-17.2.

Caltrans. 2007b. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Available Vendor Products

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Alternative Designs

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

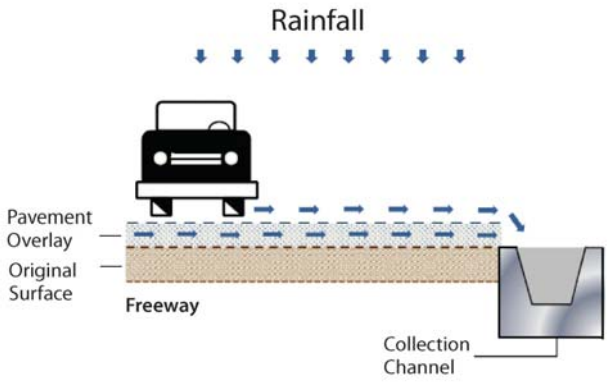
Porous Surface

Asphalt Overlay

Description

A porous asphalt overlay, also called a open graded or permeable friction course, is a layer of porous asphalt applied on top of conventional pavement. Stormwater drains through the porous asphalt layer to the conventional road surface below, and then travels along the boundary between the pavement types until it emerges as runoff at the edge of the pavement. The porous layer reduces traffic noise and improves safety by reducing splash and draining water away from the surface. Studies suggest that porous asphalt overlays may also provide water quality benefits by trapping particulates and by reducing the amount of pollutants washed from vehicles.

Schematic



Source: Caltrans

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	✓
Pesticides	
Total Metals	✓
Dissolved Metals	
Microbiological	
Litter	
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on removals found by Stanard et al. (2008). Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Load requirements
- Gradation of asphalt mix
- Thickness of porous layer

Advantages

- Reduces or eliminates space needed for other BMPs
- Increases road safety and reduces traffic noise
- Suitable for highway application

Constraints

- Not feasible where traction sand is applied
- More costly than traditional asphalt concrete
- Durability affected by temperature and traffic load
- Water quality benefit expected to deteriorate with overlay age due to clogging of pores

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Porous Surface

Asphalt Overlay

Maintenance Issues

Requirements:

- Inspect porous pavements annually
- Vacuum-style street sweepers are recommended, but not required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Requires no additional right-of-way

Siting Constraints:

May not be suitable in areas with highly erosive soils

Construction:

Construction requires special care and some changes to normal practices and scheduling

Design, Construction, Maintenance, and Cost Sources

National Asphalt Pavement Association (NAPA). 2008. http://www.hotmix.org (accessed October 19, 2009).

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

Stanard, C.E., M. E., Barrett, and R.J. Charbeneau. 2008. Stormwater Quality Benefits of a Permeable Friction Course. Center for Research in Water Resources. University of Texas. CEWR Online Report 08-03. http://www.utexas.edu/research/ctr/pdf_reports/0_5220_1.pdf (accessed January 22, 2010).

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None identified

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Porous Surface Asphalt Pavement

Description

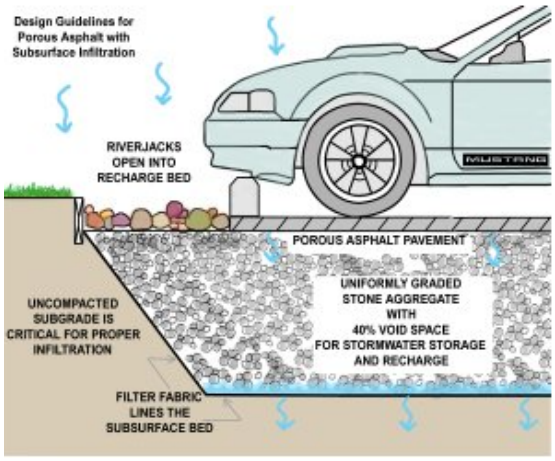
Porous asphalt pavement, with a life span of 20 years or more, provides stormwater storage and infiltration. Porous asphalt pavement is composed of a permeable asphalt surface placed over a granular "choke" course that is on top of a reservoir of large stone. The lower reservoir layer is designed for load requirements and water storage capacity. An overflow for the reservoir layer is recommended in case of insufficient infiltration. The pavement may also be designed to receive off-site runoff.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	
Biochemical Oxygen Demand (BOD)	✓
Total Dissolved Solids (TDS)	✓

* Removals are assumed to be due to 100% infiltration of the design water quality volume because no water is discharged to surface waters. Blank cells indicate data not available or poor treatment performance. Removals reported in literature are usually based on overflows from the reservoir course (UNH 2007).

Schematic



Source: Cahill Associates

Key Design Elements

- Water quality volume
- Permeability of soil
- Distance to groundwater
- Load requirements
- Gradation of asphalt mix

Advantages

- Eliminates surface discharge up to the design storm when properly sized in suitable soils
- Below grade infiltration inhibits access for mosquitoes
- Reduces or eliminates space needed for other BMPs
- Infiltration addresses all pollutants, except litter
- Caltrans modeling indicates that underlying soils will not likely become hazardous within five or more years, and typical Caltrans concentrations will not likely impact groundwater quality (Caltrans 2007)

Constraints

- Only suitable for low traffic areas, such as Park and Ride lots
- Low permeability in the subgrade will increase discharge through the over drain and decrease removal efficiency
- Not feasible where traction sand is applied
- More costly than traditional asphalt concrete
- Durability affected by temperature
- Potential contamination from spills
- Water quality benefit expected to deteriorate with pavement age due to clogging of pores in the porous asphalt

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Porous Surface
Asphalt Pavement

Maintenance Issues

Requirements:

- Inspect porous pavements annually
- Vacuum-style street sweepers are recommended, but not required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Requires no additional right-of-way

Siting Constraints:

- Similar to siting constraints for infiltration BMPs
- Some considerations are depth to groundwater, subgrade permeability, and soil type

Construction:

- Construction requires special care and some changes to normal practices and scheduling
- Minimize sub grade compaction to maintain soil permeability
- Before installation, erosion control should be in place until vegetation is established. Porous surface installation is recommended as the last item of construction

Design, Construction, Maintenance, and Cost Sources

Cahill Associates. 2006. Porous Asphalt with Subsurface Infiltration/Storage Bed. http://www.thcahill.com/pasphalt.html (accessed October 19, 2009).

Caltrans. 2007. Mathematical Modeling of Fate and Transport of Aqueous Species in Stormflow Entering Infiltration Basin. Sacramento: Caltrans-Division of Environmental Analysis. CTSW-RT-06-168-17.2.

National Asphalt Pavement Association (NAPA). 2008. http://www.hotmix.org (accessed October 19, 2009).

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

University of New Hampshire (UNH). 2007. 2007 Annual Report. University of New Hampshire, Stormwater Center. http://ciceet.unh.edu/unh_stormwater_report_2007/index.php (accessed October 19, 2009).

Yoko, G. 2005. From the Ground Up (Article #331). http://www.sldtonline.com/content/view/213/70 (accessed October 19, 2009).

Available Vendor Products

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None identified

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Porous Surface

Concrete Pavement

Description

Concrete porous surfaces allow infiltration into either storage basins or, more typically, into underlying soils. This unique cement-based concrete product with a porous structure is comprised of Portland cement, coarse aggregate rock, and water. The porous texture allows water to drain through it and into the underlying soils or reservoir. Because water infiltrates, hazards associated with standing water are less likely. An overflow mechanism is recommended in case of clogging of the underlying soils or reservoir. Suppliers of traditional concrete can usually mix and deliver porous concrete.

Schematic

Source: Puget Sound Partnership

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	
Biochemical Oxygen Demand (BOD)	✓
Total Dissolved Solids (TDS)	✓

* Removals are assumed to be due to 100% infiltration of the design water quality volume because no water is discharged to surface waters. Blank cells indicate data not available or poor treatment performance. Removals reported in literature are usually based on overflows from the reservoir course (UNH 2007).

Key Design Elements

- Water quality volume
- Permeability of soil
- Distance to groundwater
- Load requirements
- Gradation of concrete mix

Advantages

- Eliminates surface discharge up to the design storm when properly sized in suitable soils
- Below grade infiltration inhibits access for mosquitoes
- Reduces or eliminates space needed for other BMPs
- Infiltration addresses all pollutants, except litter
- Caltrans modeling indicates that underlying soils will not likely become hazardous within five or more years, and typical Caltrans concentrations will not likely impact groundwater quality (Caltrans 2007)

Constraints

- Only suitable for low traffic areas, such as Park and Ride lots
- Low permeability in the subgrade will increase discharge through the over drain and decrease removal efficiency
- Not feasible where traction sand is applied
- More costly than traditional asphalt concrete
- Potential contamination from spills
- Water quality benefit expected to deteriorate with pavement age due to clogging of pores in the porous concrete

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Porous Surface
Concrete Pavement

Maintenance Issues

Requirements:

- Inspect porous pavements annually
- Vacuum-style street sweepers are recommended, but not required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Requires no additional right-of-way

Siting Constraints:

- Similar to siting constraints for infiltration BMPs
- Some considerations are depth to groundwater, subgrade permeability, and soil type

Construction:

- Construction requires special care and some changes to normal practices and scheduling
- Minimize sub grade compaction to maintain soil permeability
- Before installation, erosion control should be in place until vegetation is established. Porous surface installation is recommended as the last item of construction.

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Mathematical Modeling of Fate and Transport of Aqueous Species in Stormflow Entering Infiltration Basin. Sacramento: Caltrans. Division of Environmental Analysis. CTSW-RT-06-168-17.2.

Sustainable Land Development Today. 2005. From the Ground Up (Article #331). www.sldtonline/content/view/213 (accessed October 30, 2009).

National Ready Mixed Concrete Association. 2008. www.perviouspavement.org (accessed October 30, 2009).

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

Portland Cement Association & National Ready Mixed Concrete Association. Pervious Concrete Pavements (brochure). www.cement.org and www.nrmca.org (accessed October 30, 2009).

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None identified

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Porous Surface

Permeable Pavers/Cellular Confinement

Description

Permeable pavers allow infiltration into either storage basins or, more typically, into underlying soils. Permeable pavers are fairly durable with a life span of approximately 20 years, and possibly more with proper maintenance. Typically built on an open-graded, crushed stone base, permeable pavers interlock or have a minimal sand-filled gap between them. As with most permeable surfaces, the lower reservoir layer is designed for load requirements and water storage capacity. An overflow mechanism for the underlying soils or reservoir is recommended in case of clogging. The pavement may also be designed to receive off-site runoff.

Schematic

Source: National Resource Conservation Service

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	✓
Total Phosphorus	✓
Pesticides	✓
Total Metals	✓
Dissolved Metals	✓
Microbiological	✓
Litter	
Biochemical Oxygen Demand (BOD)	✓
Total Dissolved Solids (TDS)	✓

* Removals are assumed to be due to 100% infiltration of the design water quality volume because no water is discharged to surface waters. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Water quality volume
- Permeability of soil
- Distance to groundwater
- Load requirements

Advantages

- Eliminates surface discharge up to the design storm when properly sized in suitable soils
- Below grade infiltration inhibits access for mosquitoes
- Reduces or eliminates space needed for other BMPs
- Infiltration addresses all pollutants, except litter
- Caltrans modeling indicates that underlying soils will not likely become hazardous within five or more years, and typical Caltrans concentrations will not likely impact groundwater quality (Caltrans 2007)

Constraints

- Only suitable for low traffic areas, such as Park and Ride lots
- Low permeability in the subgrade will increase discharge through the over drain and decrease removal efficiency
- Not feasible where traction sand is applied
- More costly than traditional asphalt concrete
- Potential contamination from spills

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Porous Surface

Permeable Pavers/Cellular Confinement

Maintenance Issues

Requirements:

- Inspect annually
- Vacuum-style street sweepers are recommended, but not required

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Requires no additional right-of-way

Siting Constraints:

- Similar to siting constraints for infiltration BMPs
- Some considerations are depth to groundwater, subgrade permeability, and soil type

Construction:

- Construction requires special care and some changes to normal practices and scheduling
- Minimize sub-grade compaction maintain soil permeability
- Before installation, erosion control should be in place until vegetation is established. Porous surface installation is recommended as the last item of construction.

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Mathematical Modeling of Fate and Transport of Aqueous Species in Stormflow Entering Infiltration Basin. Sacramento: Caltrans-Division of Environmental Analysis. CTSW-RT-06-168-17.2.

Interlocking Concrete Pavement Institute. 2005. http://www.icpi.org (accessed October 29, 2009).

NCHRP. 2006a. Low Impact Development Design Manual for Highway Runoff Control (LID Design Manual). National Cooperative Highway Research Program, Project 25-20(01).

NCHRP. 2006b. User's Guide for BMP/LID Selection (Guidelines Manual). National Cooperative Highway Research Program, Project 25-20(01).

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A large variety of products are available (too many to list)

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

Screening

Gross Solids Removal

Description

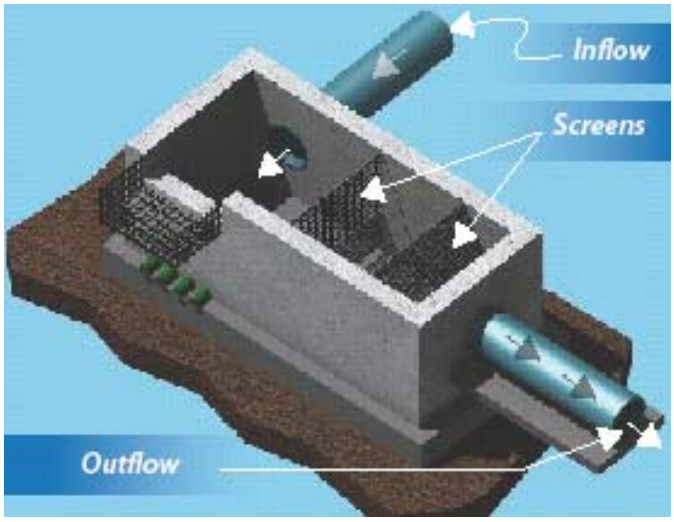
Gross solids, which consist of litter, debris, and vegetation, can be removed by passing the stormwater runoff through metal or fabric screens. Screens provide treatment by preventing solids larger than the screen opening from passing through. The effectiveness of screening systems depends on the flow rate, the type and opening size of the screen, and the type and size distribution of the gross solids in the incoming stormwater.

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance. Removal by small screening devices with insufficient storage capacity may not be as indicated.

Schematic



Source: Caltrans

Key Design Elements

- Flood flow routing and bypass
- Gross solids storage capacity
- Maintenance access
- Screen type and opening size

Advantages

- Can be retrofitted onto stormwater outfalls, pipe culverts, and channels of any shape
- Simple maintenance

Constraints

- Frequent maintenance or inspection may be required
- Requires access road for maintenance
- Maintenance activities may require traffic control if the device is installed along the traveled way

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Screening

Gross Solids Removal

Maintenance Issues

Requirements:

- Requires access road for maintenance
- Frequent inspections may be required to check on the nets or screens
- Requires mechanical (Vactor) cleaning, and may require hand cleaning for some trapped solids

Special Training:

Unknown

Project Development Issues

Right-of-Way Requirements:

Increases space requirements if used for pretreatment

Siting Constraints:

Little or no site development needed to implement

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

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- Bandalong Litter Trap
- Net Cassette™
- Nutrient Separating Baffle Box
- StormTEE®
- Gross Pollutant Trap (GPT)
- Netting TrashTrap™
- StormScreen™
- Trashmaster™

Alternative Designs

- GSRD - Inclined Screen
- GSRD - Linear Radial

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

BMP Fact Sheet

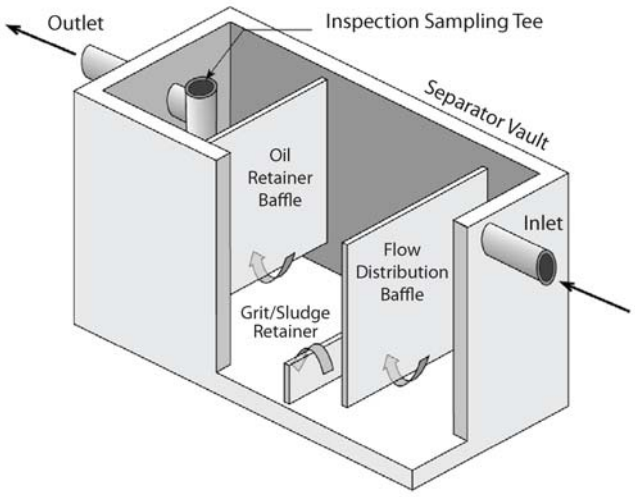
Water Quality Inlet

Oil/Water Separator

Description

Water quality inlets, also called oil/grit separators or oil/water separators, consist of a series of chambers that promote sedimentation of coarse materials and separation of free oil (as opposed to emulsified or dissolved oil) from stormwater. Most water quality inlets also contain screens to help retain larger or floating debris, and may include a coalescing unit that helps to promote oil/water separation. Water quality inlets typically capture only the first portion of runoff for treatment, and are generally used for pretreatment of runoff before discharging to other BMPs.

Schematic



Source: City of Medford, Oregon

Constituent Removal

Constituent Group	Removal*
Total Suspended Solids (TSS)	✓
Total Nitrogen	
Total Phosphorus	
Pesticides	
Total Metals	
Dissolved Metals	
Microbiological	
Litter	✓
Biochemical Oxygen Demand (BOD)	
Total Dissolved Solids (TDS)	

* Based on best professional judgment. Blank cells indicate data not available or poor treatment performance.

Key Design Elements

- Hydraulic capacity and pollutant storage capacity
- Provision for overflow or bypass
- Detention time
- Vector control if permanent pool present
- Maintenance access

Advantages

- Relatively small footprint
- Simple maintenance

Constraints

- Limited pollutant removal, especially for fine particles and dissolved constituents
- Vector concern if permanent pool present
- Can be a source of pollutants due to decomposition of previously captured material unless maintained regularly
- May require confined space entry

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Water Quality Inlet
Oil/Water Separator

Maintenance Issues

Requirements:

- Because of site-specific loading, several wet season inspections may be required to determine appropriate maintenance frequency
- Vactor equipment is recommended for cleaning, but is not required
- Vector control or abatement may be required

Special Training:

Training may be required for confined space entry

Project Development Issues

Right-of-Way Requirements:

Relatively small footprint

Siting Constraints:

- Minimal head requirement
- Effective oil removal by similar technologies usually requires influent concentrations above 50 mg/L (Caltrans 2004)

Construction:

None identified

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

US EPA. 1999. Storm Water Technology Fact Sheet, Water Quality Inlets. EPA 832-F-99-029.

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- ADS® Water Quality Unit
- BioSTORM™
- CrystalStream™
- First Flush - 1640FF
- Hanson Oil and Grit Separator Unit
- Kleerwater™
- SNOUT®
- VortClarex™
- BaySaver® BaySeparator
- Clara™
- EcoSep®
- Hancor®-Storm Water Quality Unit
- HD Q-Pac®
- PSI Separator
- StormVault™

Alternative Designs

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

APPENDIX C: CALTRANS-APPROVED BMP FACT SHEETS

Appendix C presents fact sheets for BMPs approved for installation on Caltrans facilities. Implementation of these BMPs should follow the guidelines in the Storm Water Management Plan and the Storm Water Project Planning and Design Guide (PPDG).

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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

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Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Biofiltration

Strip

Description

Biofiltration strips are relatively flat, vegetated areas that accept stormwater runoff as sheet flow. Removal mechanisms include sedimentation, filtration, and infiltration. Strips can be used as pretreatment to infiltration trenches and basins, and sand filters. They can also be used in treatment trains with other BMPs.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	◒	●
Total Nitrogen	◒	◒
Total Phosphorus	○	◒
Pesticides	○	○
Total Metals	●	●
Dissolved Metals	◒	●
Microbiological	◒	◒
Litter	NA	
Biochemical Oxygen Demand (BOD)	○	○
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

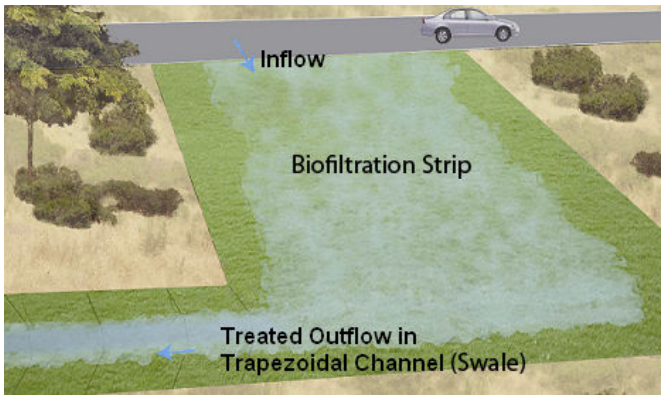
Notes:

Three biofiltration strips were sited, constructed, and monitored as part of the Caltrans BMP Retrofit Pilot Program (2004). Total nitrogen load removal is mostly dependent on infiltration losses. Phosphorus concentrations increased but infiltration compensated so that there was no net export of phosphorus load. This may be due to the vegetation selection of salt grass, which can uptake phosphorus and excrete it on its leaves. Phosphorus removal efficiency may be higher with alternative vegetation. BOD ratings are based on metadata compiled by Young et al. (1996). Pesticide ratings are based on the "Evaluation of Factors Controlling Herbicide Runoff to Surface Water" report (Caltrans 2005). Load removal analysis has been performed for a variety of roadside conditions (Caltrans 2008). Microbiological ratings are based on Rifai (2006) and Clary (2008).

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Maximize flow paths to maximize treatment
- Specify vegetation that occurs naturally to minimize establishment and maintenance costs
- Size the strips as long (in direction of flow) and flat as the site will reasonably allow, up to sheet flow boundaries (maximum length of biofiltration strips is approximately 100 ft)
- Minimum of 70% vegetation coverage
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Biofiltration

Strip

Maintenance Issues

Requirements:

- Regular inspections for side slope stability, debris and sediment accumulation, vegetative cover, and presence of burrowing animals
- If acceptable cover is not achieved, re-seeding or some type of erosion control will be needed

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Large footprint, but can be placed on fill slopes and occupy the clear recovery zone

Siting Constraints:

- Requires sheet flow, so site in areas where sheet flow predominates
- Climate and soil conducive to sustainable plant growth

Construction:

Minimize soil compaction

Advantages

- High removal efficiencies for total suspended solids and total metals
- Generally inexpensive relative to other BMPs
- Potential for substantial infiltration

Constraints

- Soil may need to be conditioned to allow vegetation to establish
- Climate may preclude vegetation establishment

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Performance Demonstrations Literature Sources

Barrett, M. E. 2008. Comparison of BMP Performance Using the International BMP Database. Journal of Irrigation and Drainage Engineering, 134(5), 556-561.

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Caltrans. 2005. Evaluation of Factors Controlling Herbicide Runoff to Surface Water. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-084-73.04.

Caltrans. 2008. Roadside Vegetated Treatment Sites (RVTS) Study Final Summary Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-08-208-03-1.

Clary, J., J. E. Jones, E. R. Urbonas, M. M. Quigley, E. Strecker, and T. Wagner. 2008. Can Stormwater BMPs Remove Bacteria? New Findings from the International Stormwater BMP Database. Stormwater Magazine, 9(3). http://www.stormh2o.com/may-2008/bacterm/may-2008/bacterial-research-bmps.aspx

Read, J., T. Wevill, T. Fletcher, and A. Deletic. 2008. Variation Among Plant Species in Pollutant Removal from Stormwater in Biofiltration Systems. Water Research, 42, 893-902.

Rifai, H. 2006. Study on the Effectiveness of BMPs to Control Bacteria Loads. Austin, TX: Texas Commission on Environmental Quality.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Biofiltration

Swale

Description

Biofiltration swales are vegetated conveyance channels that concentrate flow. Removal mechanisms include filtration, infiltration, and sedimentation. Swales can be integrated into treatment trains with other type of BMPs.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	◒	●
Total Nitrogen	◒	◒
Total Phosphorus	○	◒
Pesticides	○	○
Total Metals	◒	●
Dissolved Metals	◒	●
Microbiological	○	◒
Litter	NA	
Biochemical Oxygen Demand (BOD)	○	○
Total Dissolved Solids (TDS)	○	○

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

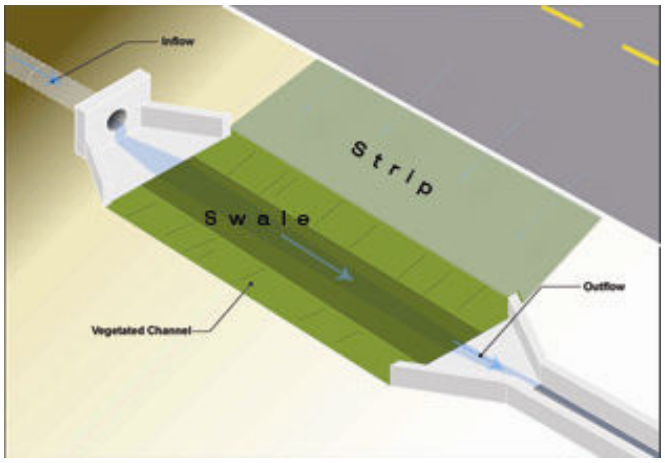
Notes:

Six biofiltration swales were sited, constructed, and monitored as part of the Caltrans BMP Retrofit Pilot Program (Caltrans 2004). Total nitrogen load removal is highly dependent on infiltration losses. Phosphorus concentrations increased but infiltration compensated so that there was no net export of phosphorus load. This may be due to the vegetation selection of salt grass, which can uptake phosphorus and excrete it on its leaves. Phosphorus removal efficiency may be higher with alternative vegetation, though analysis of the international BMP database by Barrett (2008) suggests a low removal rate. BOD ratings are based on metadata compiled by Young et al. (1996). Pesticide ratings are based on the findings in the "Evaluation of Factors Controlling Herbicide Runoff to Surface Water" report (Caltrans 2005).

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Length slope and width as quantified by the hydraulic residence time
- Specify vegetation that occurs naturally to minimize establishment and maintenance costs
- Minimum vegetation cover
- Energy dissipaters
- Side slopes constructed of narrow berms are not recommended because they are prone to damage by gophers or other burrowing animals
- Scour velocity
- Check dams may enhance infiltration
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Based on retrofit costs. Cost for new construction may be substantially lower.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Biofiltration

Swale

Maintenance Issues

Requirements:

- Regular inspections for side slope stability, debris and sediment accumulation, vegetation height, vegetative cover, and presence of burrowing animals
- If acceptable cover is not achieved, re-seeding or some type of erosion control will be needed

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Sufficient space required to achieve the target hydraulic residence time

Siting Constraints:

- Place in areas of natural lows or cut sections to minimize damage caused by gophers or other burrowing animals
- Climate and soil conducive to sustainable plant growth

Construction:

None identified

Advantages

- Incorporates well into the environment
- Effective removal efficiencies for total suspended solids and total metals
- Potential for substantial infiltration

Constraints

- Soil may need to be conditioned to allow vegetation to establish
- Climate may preclude vegetation establishment

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Performance Demonstrations Literature Sources

Barrett, M. E. 2008. Comparison of BMP Performance Using the International BMP Database. Journal of Irrigation and Drainage Engineering, 134(5), 556-561.

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Caltrans. 2005. Evaluation of Factors Controlling Herbicide Runoff to Surface Water. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-084-73.04.

Read, J., T. Wevill, T. Fletcher, and A. Deletic. 2008. Variation Among Plant Species in Pollutant Removal from Stormwater in Biofiltration Systems. Water Research, 42, 893-902.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention Basin

Description

A detention basin is an impoundment that collects stormwater via storm drain inlets. The basin captures and detains the design runoff volume (typically for 48 hours). Discharges from the basin typically occur through a perforated riser. The basin removes floatable debris and coarse suspended solids. Pollutant removal is achieved primarily through settling of sediments and particulate forms of pollutants.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	◒	●
Total Nitrogen	○	◒
Total Phosphorus	◒	◒
Pesticides	NA	
Total Metals	◒	●
Dissolved Metals	○	◒
Microbiological	○	○
Litter	●	◒
Biochemical Oxygen Demand (BOD)	NA	
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

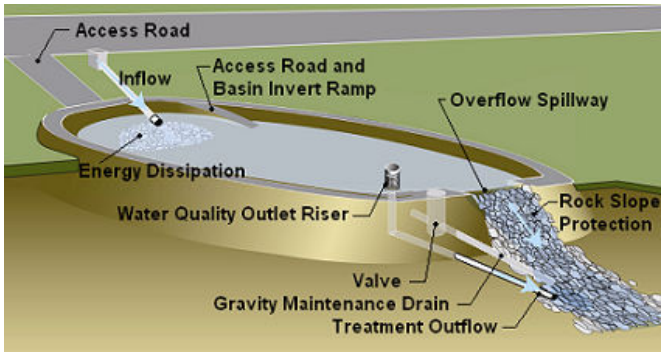
Notes:

Removal efficiency and levels of confidence ratings are based on results from unlined detention basins. The Caltrans Retrofit Pilot Program (2004) constructed five detention basins for study. The litter removal rating is based on best professional judgment.

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Capture volume
- Drain time
- Debris screen to protect orifice
- Maintenance access
- Side slopes
- High flow routing
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Cost assessment is not applicable because cost effectiveness is relative to detention basins. Cost comparisons to other BMPs are based on a 20-year life cycle cost of $673/m³ (1999 dollars) (Caltrans 2004).

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Detention Basin

Maintenance Issues

Requirements:

- Regular inspections for standing water, side slope stability, debris and sediment accumulation, and vegetative cover
- If vegetative cover of the basin invert or side slopes is not established to acceptable thresholds, re-seeding or erosion control measures may need to be implemented
- Sediment removal

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Space requirements are relatively high

Siting Constraints:

- Site where there is sufficient hydraulic head to facilitate complete drainage
- Do not site in areas where groundwater contamination is a concern, unless lined (and anchored to combat floatation)

Construction:

None identified

Advantages

- Relatively easy to operate and maintain
- Potential for substantial infiltration
- Can be sited more easily than Austin filters

Constraints

- Limited pollutant removal for nutrients and dissolved constituents
- Can only be placed in areas with sufficient hydraulic head

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Performance Demonstrations Literature Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Glick, R., G. C. Chang, and M. E. Barrett. 1998. Monitoring and Evaluation of Stormwater Quality Control Basins, in Watershed Management: Moving from Theory to Implementation, Denver, CO, May 3-6, 1998, pp. 369-376.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Dry Weather Flow Diversion

Description

A dry weather flow diversion device can divert dry weather flows from the storm drain system to the sanitary sewer system, and convey it to a publicly-owned treatment works (POTW). During wet weather, this diversion is suspended because stormwater flows can be greater than the flow the POTW is designed to manage.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	●	●
Total Nitrogen	●	●
Total Phosphorus	●	●
Pesticides	●	●
Total Metals	●	●
Dissolved Metals	●	●
Microbiological	●	●
Litter	●	●
Biochemical Oxygen Demand (BOD)	●	●
Total Dissolved Solids (TDS)	●	●

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

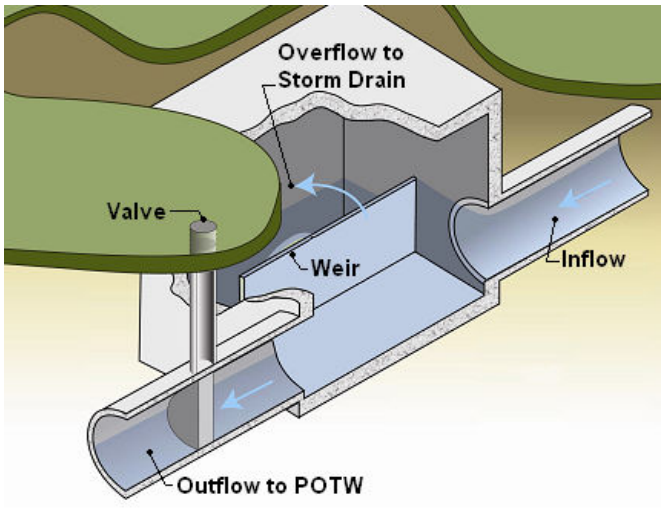
Notes:

Removal efficiency ratings are based on the diversion of dry weather flow events. The device does not treat stormwater flows when closed during wet weather.

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	○

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Dry Weather Flow Diversion

Maintenance Issues

Requirements:
Depends on the complexity of the diversion

Special Training:
May require special training for inspection and maintenance of pumped diversions

Project Development Issues

Right-of-Way Requirements:
Small footprint

Siting Constraints:
Must be able to convey diverted flow to a POTW sewer

Construction:
Coordination required with local POTW

Advantages

Advanced treatment of the diverted flow

Constraints

- Must have agreement with POTW
- Cost is highly variable depending on site conditions

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Performance Demonstrations Literature Sources

None identified

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration

Bed

Austin Sand Filter

Description

The Austin Sand Filter includes a sedimentation basin and a filtration basin. The sedimentation basin captures and detains the design water quality runoff volume (typically for 24 hrs.) prior to discharge to the filtration basin. The sedimentation basin removes floatable debris and coarse suspended solids, and prevents premature clogging of the filter media surface. The sedimentation chamber effluent discharges to the filtration basin typically through a perforated riser. In the filtration basin, the water first passes through a sand layer, then through a geotextile layer, and finally into a gravel underdrain. Pollutant removal is achieved primarily by physical filtration of pollutants through the filtration media, and the settling of solids in the sedimentation basin. An Austin Sand Filter can also be designed so that the sedimentation and filtration sections are combined into one basin. In this design, gabions are used to disperse water and encourage sedimentation prior to the sand bed.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	●	●
Total Nitrogen	○	●
Total Phosphorus	◒	●
Pesticides	NA	
Total Metals	◒	●
Dissolved Metals	◒	◒
Microbiological	◒	○
Litter	●	◒
Biochemical Oxygen Demand (BOD)	◒	◒
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

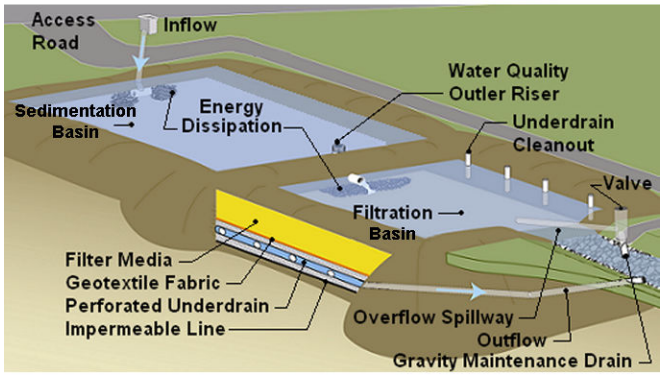
Notes:

Except where noted, removal efficiency and levels of confidence ratings are based on the Caltrans Retrofit Pilot Program Final Report (2004). Five Austin Sand Filters were constructed and monitored. While nitrate concentrations increased by 35%, total nitrogen decreased by 32%. The phosphorus removal efficiency rating is based on the average of results from Caltrans and Glick et al. (1998). BOD ratings are based on metadata compiled by Young et al. (1996). Litter removal ratings are based on best professional judgment.

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Capture volume
- Orifice plate on effluent pipe to enhance sand media contact time
- Media area and depth
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Cost effectiveness determination pending further evaluation.

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration Bed

Austin Sand Filter

Maintenance Issues

Requirements:

- Media scraping
- Sediment removal
- Media replacement

Special Training:

Training required for media removal and replacement

Project Development Issues

Right-of-Way Requirements:

Space requirements are marginally higher than those for a detention basin

Siting Constraints:

- Head requirement of about 4 feet
- Avoid locations with base flow because of clogging due to algae growth

Construction:

If used for construction site runoff, remove and replace sand after drainage area has been completely stabilized

Advantages

- High constituent removal for suspended solids, total metals, and bacteria
- Provides consistent pollutant removal when properly maintained
- Treats runoff from drainage areas up to 20 hectares

Constraints

- Limited pollutant removal for nutrients
- More expensive to construct than a detention basin

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

US EPA. Storm Water Technology Fact Sheet, Sand Filters. EPA 832-F-99-007.

Performance Demonstrations Literature Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Caltrans. 2007. Caltrans Statewide [Austin] Sand Filter Study Final 2006 Stormwater Monitoring Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-06-128.01.1.

Erickson, A. J., J. S. Gulliver, and P. T. Weiss. 2007. Enhanced Sand Filtration for Storm Water Phosphorus Removal. Journal of Environmental Engineering, 10.1061, (ASCE) 0733-9372 133:5(485).

Glick, R., G. C. Chang, and M. E. Barrett. 1998. Monitoring and Evaluation of Stormwater Quality Control Basins, in Watershed Management: Moving from Theory to Implementation, Denver, CO, May 3-6, 1998, pp. 369-376.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration

Bed

Delaware Sand Filter

Description

Delaware Sand Filters are often located at the curbside edge of a paved area or parking lot, and consist of two parallel concrete chambers: a sedimentation chamber and a sand filter chamber. The sedimentation chamber holds a permanent pool of water. The sedimentation chamber removes coarse suspended solids and prevents premature clogging of the filter media surface. The sedimentation effluent discharges over a weir into the sand filter chamber where water is filtered first through a 12- to 18-inch sand filter, then through a geotextile layer, and finally into an under-drain. These on-line devices process all runoff leaving the site up to the point where the overflow limit is reached. The typical shape of the device is narrower (but longer) than some other treatment BMPs, which can be advantageous in some situations.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	●	●
Total Nitrogen	○	◒
Total Phosphorus	◒	●
Pesticides	NA	
Total Metals	●	●
Dissolved Metals	◒	●
Microbiological	◒	◒
Litter	●	◒
Biochemical Oxygen Demand (BOD)	○	○
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

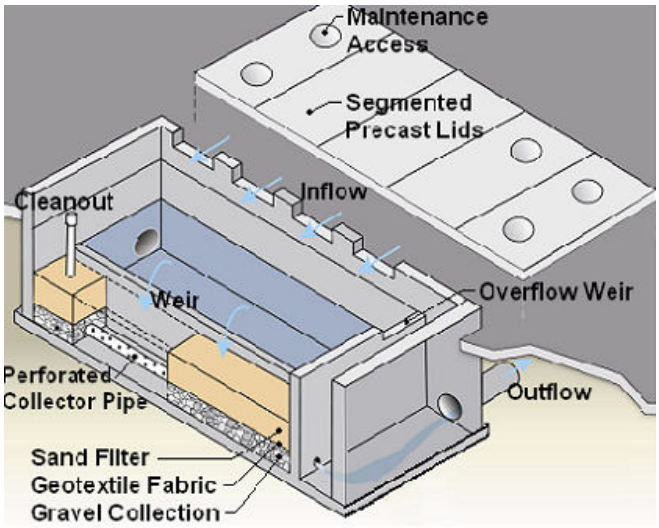
Notes:

This device was sited as part of the Caltrans BMP Retrofit Pilot Program (2004). Although not thought to be effective for removing dissolved constituents, some removal was observed. The litter removal rating is based on best professional judgment. Caltrans (2004) reported that nitrate concentrations increased by 78%, and a high removal efficiency for dissolved zinc. BOD ratings are based on metadata compiled by Young et al. (1996).

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- The Delaware unit that was evaluated was designed and installed according to the guidelines described by Young et al. (1996), which requires the sedimentation volume to equal 5 mm of runoff (0.2 inches). Consequently, if it is desired to treat a larger water quality volume, the unit must act as a flow-through device
- Size the filter based on unit values for the sedimentation chamber volume and filter bed area per acre of tributary area treated
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Filtration Bed

Delaware Sand Filter

Maintenance Issues

Requirements:

- Maintenance for smaller, underground filters is usually best done manually
- Disposal of accumulated trash and replacement of the upper few inches of sand when the filter clogs
- Vector control or abatement

Special Training:

Training required for media removal

Project Development Issues

Right-of-Way Requirements:

Space requirements are relatively high

Siting Constraints:

- Do not site where runoff from bare soil or construction activities will be allowed to enter the filter
- Minimum head requirement of 3 feet
- Avoid locations with base flow

Construction:

None identified

Advantages

- Can be installed underground in urban settings with covers appropriate for the intended above ground land use, such as sidewalk or landscaping
- Similar in performance to the Austin Filter design with the principal advantage being narrower footprint that requires less head
- Waste media from the filters does not appear to be toxic and is likely to be environmentally safe for landfill disposal

Constraints

- The sedimentation basin holds a permanent pool of water and has the potential to provide breeding opportunities for mosquitoes
- Relatively expensive to construct compared to other approved BMPs (Caltrans 2004)
- Limited pollutant removal capability for nutrients

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

US EPA. Storm Water Technology Fact Sheet, Sand Filters. EPA 832-F-99-007.

Performance Demonstrations Literature Sources

Bell, W., L. Stokes, L. J. Gavan,and T. N. Nguyen. 1995. Assessment of the Pollutant Removal Efficiencies of Delaware Sand Filter BMPs. Department of Transportation and Environmental Services. Alexandria, VA. p. 140.

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Horner, R. R., and C. R. Horner. 1995. Design, Construction, and Evaluation of a Sand Filter Stormwater Treatment System. Part III. Performance Monitoring. Report to Alaska Marine Lines, Seattle, WA.

Shaver, E., and R. Baldwin. 1991. Sand Filter Design for Water Quality Treatment. Delaware Department of Natural Resources and Environmental Control. Dover, DE. 14 pp.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Infiltration Basin

Description

Infiltration basins are depressions used to detain stormwater runoff until it percolates into the groundwater table. Pollutant removal occurs through the infiltration of runoff and the adsorption of pollutants into the soil and vegetation. Infiltration basins are designed to infiltrate within 72 hours to prevent vector problems due to standing water. There needs to be sufficient space between the basin invert and the seasonally high groundwater elevation to allow infiltration to occur.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	●	●
Total Nitrogen	●	●
Total Phosphorus	●	●
Pesticides	●	●
Total Metals	●	●
Dissolved Metals	●	●
Microbiological	●	●
Litter	●	●
Biochemical Oxygen Demand (BOD)	●	●
Total Dissolved Solids (TDS)	●	●

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

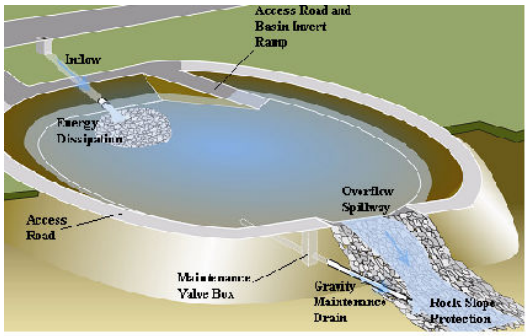
Notes:

The removal rating for infiltration is assumed to be 100% for the design water quality volume because no water is discharged to surface waters. Removal efficiencies reported in the literature are usually based on overflow discharge (Young et al. 1996). Litter is assumed to be captured within the basin.

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Capture volume
- Basin invert area
- Maintenance access
- High flow routing
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Based on Caltrans data (2004)

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Infiltration Basin

Maintenance Issues

Requirements:

- Conduct regular inspections for standing water, debris and sediment accumulation, and slope stability
- Avoid rubber tired vehicles in basin to reduce compaction
- Tracked equipment recommended for major maintenance

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Space requirements are relatively high for infiltration basins

Siting Constraints:

- Infiltration basins can only be placed in areas where soil is hydrologic soil group type A, B, or C soils and that meet permeability requirements
- Soil cannot have more than 30% clay or more than 40% clay and silt combined
- Minimum infiltration rate of 0.5 in/hr is preferred
- Distance between the groundwater elevation and the basin invert should be at least 4 feet, but 10 feet is preferable

Construction:

- Stabilize area draining into the facility. If possible, place a diversion berm to prevent sediment from entering the facility
- Build the basin without driving heavy equipment over the infiltration surface. Any equipment should have "low pressure" treads or tires
- After final grading, deeply till the infiltration surface
- Use appropriate erosion control seed mix

Advantages

Due to the infiltration of the entire water quality volume, the constituent removal is considered to be 100%

Constraints

- Site only in areas with the appropriate soil type/content and distance from the groundwater elevation to facilitate infiltration
- Restrict use if the runoff does not meet the requirement of a RWQCB-issued Basin Plan, or if the potential site is above a known pollutant plume

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Performance Demonstrations Literature Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Gaus, J. 1993. Soils of Infiltration Basins in the Puget Sound Region: Trace Metals and Concentrations. Masters Thesis. Univ. of Washington.

Hilding, K. 1993. A Study of Infiltration Basins in the Puget Sound Region. Masters Thesis. Dept. of Biological and Agricultural Engineering. Univ. of California, Davis.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Infiltration

Trench

Description

An infiltration trench is typically a long and narrow excavation that is lined with filter fabric and backfilled with stone aggregate or gravel to form an underground basin. Runoff is diverted to the trench and infiltrates into the soil. Pollutants are filtered out of the runoff as it infiltrates the surrounding soils. Infiltration trenches must be sited in areas where soils meet the minimum infiltration rate. Regulators may caution against installation of this device in highly industrial areas or areas where highly soluble constituents may be discharged to the trench.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	●	●
Total Nitrogen	●	●
Total Phosphorus	●	●
Pesticides	●	●
Total Metals	●	●
Dissolved Metals	●	●
Microbiological	●	●
Litter	●	●
Biochemical Oxygen Demand (BOD)	●	●
Total Dissolved Solids (TDS)	●	●

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

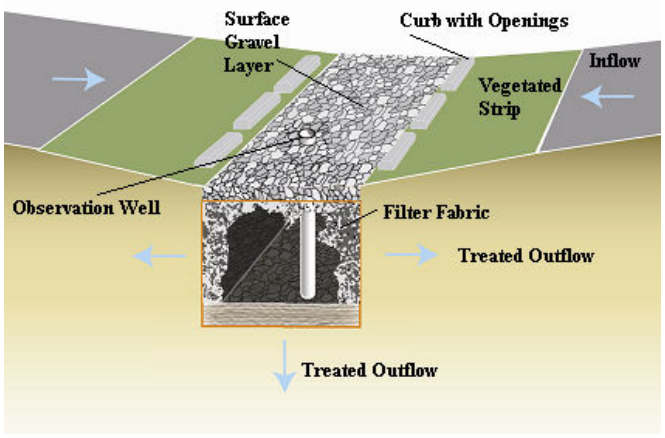
Notes:

Two infiltration trenches were evaluated as part of the Caltrans BMP Retrofit Pilot Program (2004). The removal rating for infiltration is assumed to be 100% for the design water quality volume because no water is discharged to surface waters. Removal efficiencies reported in the literature are usually based on overflow discharge (Young et al. 1996). Litter is assumed to be captured within the basin.

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Trench depth and invert area
- Capture volume
- Backfill material
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Infiltration

Trench

Maintenance Issues

Requirements:

- Remove trash and debris from the site on a regular basis
- Sediment accumulation should be inspected and, if visible on top of the trench, the top layer of trench, silt, filter fabric, and stone should be removed
- Replace fabric; stone can be reinstalled after it is washed

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Space requirements are relatively high, but it can fit in a narrow right-of-way

Siting Constraints:

- Do not site within about 100 feet of building or bridge foundations. Infiltration trenches sited within about 100 feet would require detailed site structural and geotechnical investigation. Infiltration trenches are suitable for drainage areas up to 4 hectares. Trenches work best at sites with an up-gradient drainage area slope of less then 5%
- Trenches should be sited where infiltration rates are at least one-half in/hr and there is at least about 10 feet separation between trench invert and the groundwater
- Trenches are not recommended in industrial land use areas or in locations were soluble constituents may impact ground water quality

Construction:

- During excavation for trench construction, light equipment should be used to avoid compaction of the soil
- Stabilize the entire area draining to the facility before construction begins. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction

Advantages

- Due to the infiltration of the entire water quality volume, the constituent removal is considered to be 100%
- Infiltration trenches can be narrow and are not highly visible

Constraints

- Infiltration trenches must have soils with adequate permeability and suitable groundwater separation
- Major maintenance (removal and replacement of the rock matrix) is relatively costly
- Pretreatment is recommended to reduce the amount of influent sediment
- Construction costs per capture volume are higher than infiltration basins
- Can clog prematurely if not properly maintained

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

US EPA. Storm Water Technology Fact Sheet, Infiltration Trench. EPA 832-F-99-019.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Performance Demonstrations Literature Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Litter and Debris Removal

GSRD–Inclined Screen

Description

The Gross Solids Removal Device (GSRD) Inclined Screen (IS) is a non-proprietary device whose primary function is to remove gross solids (litter and vegetative material) from stormwater runoff. Currently, there is one IS configuration approved as a full capture treatment device. This GSRD IS has a parabolic wedge-wire screen with spacing up to 5 mm (Caltrans 2007). The device is configured with an influent trough to allow some solids to settle (see schematic).

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	NA	
Total Nitrogen	NA	
Total Phosphorus	NA	
Pesticides	NA	
Total Metals	NA	
Dissolved Metals	NA	
Microbiological	NA	
Litter	●	●
Biochemical Oxygen Demand (BOD)	NA	
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

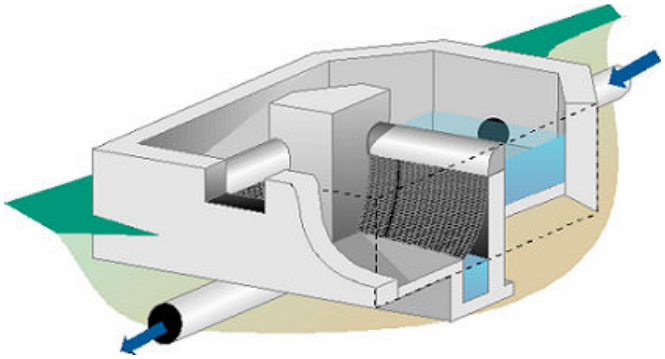
Notes:

Litter ratings are based on field studies (Caltrans 2003). Litter removal is the target constituent for the device. No long-term water quality monitoring studies have been conducted to evaluate treatment effectiveness of the GSRD IS on other water quality constituents.

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Size the GSRD-IS to hold gross solids to be deposited during a 1-year period and pass the design flow (e.g., 25-year flow)
- Regulations may have a lower design storm than is associated with the drainage of the highway, and if upstream diversion is used the design event given in the regulation could be used
- Hydraulic head
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Litter and Debris Removal

GSRD–Inclined Screen

Maintenance Issues

Requirements:

- Periodic inspections required to ensure that the device is functional
- Sediment/debris removal

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Small footprint

Siting Constraints:

Must provide sufficient hydraulic head to operate by gravity (about 3 feet)

Construction:

None identified

Advantages

- Small footprint
- Based on pilot studies, the devices remove nearly all the gross solids from stormwater runoff with minimal maintenance requirements

Constraints

Hydraulic head requirement

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Performance Demonstrations Literature Sources

Caltrans. 2003a. Phase I Gross Solids Removal Devices Pilot Study: 2000-2002. Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-072.31.22.

Caltrans. 2003b. Phase II Gross Solids Removal Devices Pilot Study: 2001-2003. Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-097.31.22.

Caltrans. 2003c. Phase III Gross Solids Removal Devices Pilot Study: 2002-2003. Interim Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-099.31.24.

Certifications, Verifications, or Designations

LA RWQCB: Full Capture certification for trash

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Litter and Debris Removal

GSRD–Linear Radial

Description

The Gross Removal Device (GSRD) Linear Radial (LR) is a non-proprietary device whose primary function is to remove gross solids (litter and vegetative material) from stormwater runoff. Currently, there is one GSRD LR configuration approved as a full capture treatment device. This GSRD LR utilizes a modular well casing with 5 mm x 64 mm louvers to serve as the screen. The GSRD LR is placed on a 2-percent slope.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	NA	
Total Nitrogen	NA	
Total Phosphorus	NA	
Pesticides	NA	
Total Metals	NA	
Dissolved Metals	NA	
Microbiological	NA	
Litter	●	●
Biochemical Oxygen Demand (BOD)	NA	
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

Notes:

Litter ratings are based on field studies (Caltrans 2003). Litter is the target constituent for the device. No long-term water quality monitoring studies have been conducted to evaluate treatment effectiveness of the GSRDs LR on other water quality constituents.

Caltrans Evaluation Status

Approved

Schematic

Source: Caltrans

Key Design Elements

- Annual estimated gross solids loading rate size to hold gross solids to be deposited during a 1-year period and pass the design flow (e.g., 25-year flow)
- Regulations may have a lower design storm than is associated with the drainage of the highway, and if upstream diversion is used the design event given in the regulation could be used
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Litter and Debris Removal

GSRD–Linear Radial

Maintenance Issues

Requirements:

- Periodic inspections required to ensure that the device is functional
- Sediment/debris removal

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Small footprint

Siting Constraints:

- Must provide sufficient area to accommodate the length of linear radial GSRD required
- Low head requirement

Construction:

None identified

Advantages

- Small footprint
- Based on pilot studies, the device removes nearly all the gross solids from stormwater runoff with minimal maintenance requirements

Constraints

Length requirement

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Performance Demonstrations Literature Sources

Caltrans. 2003. Phase I Gross Solids Removal Devices Pilot Study: 2000-2002. Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-072.31.22.

Certifications, Verifications, or Designations

LA RWQCB: Full Capture certification for trash

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Multi-Chambered Treatment

Description

Multi-chambered treatment trains (MCTTs) use three treatment mechanisms. The first chamber is a catch basin used to remove large, grit-sized material. The second chamber is a settling chamber that removes settleable solids with tube separators, and oil and grease with sorbent pads. The third chamber is a sand/peat filter. The filtration chamber consists of a 450-mm filter media layer with a 50/50 mixture of sand and peat moss. This layer is separated from a gravel-packed underdrain by a layer of filter fabric. The filter area is determined from the recommended solids loading rate of a peat/sand mixture (5000 g TSS/m2/year). Gravity draining can be used to return the filtered runoff to the drainage system. These devices were originally designed to reduce toxicity in the runoff from critical stormwater source areas and to be implemented where toxicity in runoff is an identified problem.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	●	●
Total Nitrogen	○	○
Total Phosphorus	○	○
Pesticides	NA	
Total Metals	◒	●
Dissolved Metals	○	◒
Microbiological	○	○
Litter	●	◒
Biochemical Oxygen Demand (BOD)	NA	
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

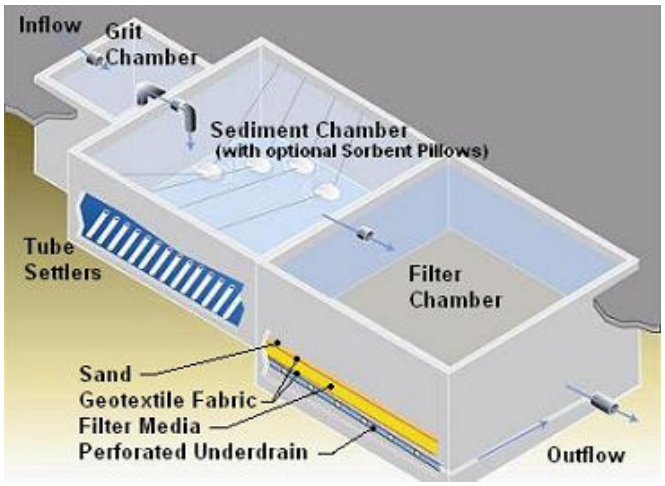
Notes:

Two MCTTs were sited, constructed, and monitored as part of the Caltrans BMP Retrofit Pilot Program (2004). The high TSS removal efficiency rating is based on Pitt et al. (1996). Caltrans data showed 75% TSS removal, but average influent was only 41 mg/L, nitrate concentrations increased by 62%, and dissolved zinc removal efficiency rating was high (Caltrans 2004). The litter removal efficiency rating is based on best professional judgment. Level of confidence based on the Caltrans study.

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Capture volume
- Mosquito proofing
- Settling chamber area
- Filter area
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Multi-Chambered Treatment

Maintenance Issues

Requirements:

- Periodic cleaning and replacement of media
- Inspection of mosquito proofing
- Vector control or abatement

Special Training:

Training required for media replacement

Project Development Issues

Right-of-Way Requirements:

Space requirements are relatively high

Siting Constraints:

- Site where there is a small, impervious contributing watershed
- Do not site MCTTs where runoff from bare soil or construction activities will be allowed to enter the filter
- MCTTs should be sited where enough vertical clearance (head) is provided, about 6.5 feet

Construction:

- Material availability for the filter, excavation for the device/unknown field conditions, and interface with existing activities at the site are the primary issues to be addressed in the construction of MCTTs
- The tube settler system is a special-order item with a significant lead-time

Advantages

- Constituent removal for suspended solids, metals, and bacteria similar to that for an Austin Sand Filter
- The MCTTs can provide consistent pollutant removal when properly maintained
- The target area for use of MCTTs are vehicle service facilities, parking areas, paved storage areas, and fueling stations with drainage areas up to 1 hectare

Constraints

- More expensive to construct than gravity-drained Austin Sand Filters, which provide comparable performance
- The presence of tube settlers in the sedimentation basin impedes maintenance activities
- A permanent pool of water is maintained in the MCTT, which increases vector concerns

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Performance Demonstrations Literature Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Pitt, R., B. Robertson, P. Barron, A. Ayyoubi, and S. Clark. 1999. Stormwater Treatment at Critical Areas Vol. 1: The Multi-Chambered Treatment Train. Birmingham: University of Alabama at Birmingham, Department of Civil and Environmental Engineering.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Traction Sand Trap

Double Barrel

Description

Double Barrel Traction Sand Traps are inverted pipe sections that capture traction sand that was previously applied to snowy or icy roads.

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	○	●
Total Nitrogen	○	○
Total Phosphorus	○	○
Pesticides	NA	
Total Metals	○	●
Dissolved Metals	○	○
Microbiological	NA	
Litter	NA	
Biochemical Oxygen Demand (BOD)	NA	
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

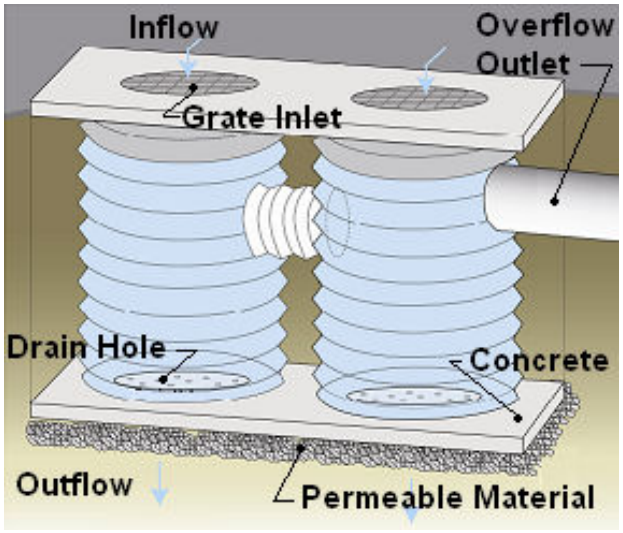
Notes:

Removal ratings and levels of confidence are based on the evaluations of two sand traps that were part of the Tahoe Sand Trap Effectiveness Study (2003).

Caltrans Evaluation Status

Approved

Schematic



Source: Caltrans

Key Design Elements

- Sand storage capacity
- Invert 3 to 6 ft above groundwater if drainage is allowed through base (CMP riser type)
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Traction Sand Trap

Double Barrel

Maintenance Issues

Requirements:

- Annual vactoring out of the traction sand traps
- Vector control or abatement

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Small footprint

Siting Constraints:

Low head requirement

Construction:

None identified

Advantages

- Sand traps require very little land space
- Requires very little or no hydraulic head to operate

Constraints

Treatment for most constituents is marginal

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

Performance Demonstrations Literature Sources

Caltrans. 2003. Caltrans Tahoe Highway Runoff Characterization and Sand Trap Effectiveness Studies. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-03-054.36.02.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Wet Basin/Pond

Description

A Wet Basin holds a permanent pool of water designed to detain and treat a runoff water quality volume. The basin supports plant species that provide constituent removal by biological processes. In addition, the vegetation may help reduce erosion of the side slopes and trap sediments. Sedimentation processes also occur in the basin. Wet basins are usually deep enough to prevent resuspension of particles, and should be sited where a permanent pool of water can be maintained from a dry weather flow source. In some references, this BMP is referred to as a "wet pond."

Constituent Removal

Constituent Group	Removal Efficiency	Level of Confidence
Total Suspended Solids (TSS)	●	●
Total Nitrogen	◒	◒
Total Phosphorus	○	○
Pesticides	NA	
Total Metals	●	●
Dissolved Metals	◒	●
Microbiological	●	○
Litter	●	◒
Biochemical Oxygen Demand (BOD)	NA	
Total Dissolved Solids (TDS)	NA	

Rating Key for Constituent Removel Efficiency and Level of Confidence

● High ◒ Medium ○ Low

Notes:

Removal ratings and levels of confidence were based on an evaluation of a wet basin as part of the Caltrans BMP Retrofit Pilot Program Study (2004). Average nitrate concentration from discharges after storm events was 132% greater than stormwater influent, however dry weather flow reductions caused a net annual removal of total nitrogen. The litter removal efficiency rating is based on best professional judgment.

Caltrans Evaluation Status

Approved

Schematic

Source: Caltrans

Key Design Elements

- Drawdown time
- Length width ratio
- Depth (deeper reduces maintenance of emerged vegetation)
- Permanent pool to capture volume ratio
- Basin side slopes
- Sedimentation forebay
- Vegetation selection
- Liner requirements
- Caltrans designers should follow the Project Planning and Design Guide (Caltrans 2007)

Cost Effectiveness Relative to Detention Basins

Cost Effectiveness	Level of Confidence
◪	●

Rating Key for Cost Effectiveness Relative to Detention Basins

Benefit ↑ Cost ↓	Benefit ↑ Cost ↑
Benefit ↓ Cost ↓	Benefit ↓ Cost ↑

Rating Key for Cost Effectiveness Level of Confidence

● High ◒ Medium ○ Low

Notes:

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Wet Basin/Pond

Maintenance Issues

Requirements:

- Sensitive species inspections
- Vegetation removal to maintain efficacy of mosquito fish
- Sediment removal (hand removal with machetes was found to be more cost-effective than mechanical removal)
- Vector control or abatement

Special Training:

None identified

Project Development Issues

Right-of-Way Requirements:

Space requirements are high for wet basins

Siting Constraints:

- A wet basin usually has an area of 1 to 3 percent of the contributing drainage area
- Soil should have a low infiltration rate or be lined with a clay or geotextile liner so that water level is maintained in the basin
- Wet basins should be sited where a permanent pool of water can be maintained from a dry weather flow source

Construction:

- Excavated soil surface should be suitable to support plant life
- If a pond liner is used, it must be carefully constructed to avoid punctures

Advantages

- High removal efficiencies for many constituents
- Recreational and aesthetic benefits

Constraints

- There are potential problems associated with mosquitoes and the device may become a regulated wetland if not consistently maintained per an established schedule
- A permanent pool of water must be maintained and therefore may have limitations on siting
- Wet basins are larger than extended detention basins

Design, Construction, Maintenance, and Cost Sources

Caltrans. 2007. Stormwater Quality Handbook: Project Planning and Design Guide. Sacramento: Caltrans, Office of Storm Water Management, Division of Design. CTSW-RT-07-172.19.1.

King County. 2005. Surface Water Design Manual, King County Surface Water Management Division, Washington. Retrieved January 17, 2009, from Dnr.metrokc.gov/wlr/dss/2005SWDM/2005Manualwith Errata.pdf

US EPA. Storm Water Technology Fact Sheet, Wet Detention Ponds. EPA 832-F-99-048.

Performance Demonstrations Literature Sources

Caltrans. 2004. BMP Retrofit Pilot Program Final Report. Sacramento: Caltrans, Division of Environmental Analysis. CTSW-RT-01-050.

Schueler, T. R. 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. Department of Environmental Programs, Metropolitan Washington Council of Governments, Washington, DC.

Urbonas, B. R., J. T. Doerfer, J. Sorenson, J. T. Wulliman, and T. Fairley. 1992. Urban Storm Drainage Criteria Manual, Volume 3 - Best Management Practices, Stormwater Quality, Urban Drainage and Flood Control District, Denver, CO.

Weber, S. L. 2007. Evaluation of Two Washington State Department of Transportation Stormwater Facilities Along State Route 18 Highway. Report prepared for MBA requirement from University of New Mexico.

Young, G. K., S. Stein, P. Cole, T. Kammer, F. Graziano, and F. Bank. 1996. Evaluation and Management of Highway Runoff Water Quality. U.S. Department of Transportation.

Certifications, Verifications, or Designations

None identified

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Table 3-1 BENEFICIAL USES - Continued

LAKES AND RESERVOIRS	BENEFICIAL USE																		Hydrologic Unit	
	MUN	AGR	IND	PROC	GWR	NAV	POW	REC1	REC2	COMM	WARM	LWRM	COLD	BIOL	WILD	RARE*	SPWN	EST	Primary	Secondary
SAN JACINTO RIVER BASIN																				
Canyon Lake (Railroad Canyon Reservoir)	X	X			X			X	X		X				X				802.11	802.12
Elsinore, Lake	+							X	X		X				X				802.31	
Fulmor, Lake	X	X						X	X		X		X		X				802.21	
Hemet, Lake	X	X			X		X	X	X		X		X		X		X		802.22	
Perris, Lake	X	X	X	X	X			X	X	X	X		X		X				802.11	

X Present or Potential Beneficial Use
I Intermittent Beneficial Use
\+ Excepted from MUN (see text)

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

CITY OF MORENO VALLEY
ZONING ATLAS
05/16/2012

COMMERCIAL	
CC	COMMUNITY COMMERCIAL
NC	NEIGHBORHOOD COMMERCIAL
O	OFFICE
OC	OFFICE COMMERCIAL
VC	VILLAGE COMMERCIAL

INDUSTRIAL	
BP	BUSINESS PARK
BPX	BUSINESS PARK MIXED USE
I	INDUSTRIAL

OPEN SPACE	
OS	OPEN SPACE

RESIDENTIAL	
HR	HILLSIDE RESIDENTIAL (DU/AC* Based on Slope Analysis)
R1	RESIDENTIAL - UP TO 1 DU/AC
RA2	RESIDENTIAL AGRICULTURE - UP TO 2 DU/AC
R2	RESIDENTIAL - UP TO 2 DU/AC
R3	RESIDENTIAL - UP TO 3 DU/AC
R5	RESIDENTIAL - UP TO 5 DU/AC
RS10	RESIDENTIAL UP TO 10 SINGLE FAM DU/AC
R10	RESIDENTIAL UP TO 10 DU/AC
R15	RESIDENTIAL UP TO 15 DU/AC
R20	RESIDENTIAL UP TO 20 DU/AC
R30	RESIDENTIAL UP TO 30DU/AC

SPECIAL DISTRICTS	
AICUZ	AIR INSTALLATION COMPATIBILITY USE OVERLAY
MUO	MEDICAL USE OVERLAY
P	PUBLIC
PAKO	PRIMARY ANIMAL KEEPING OVERLAY
MUD1	MIXED USE DISTRICT 1
MUD2	MIXED USE DISTRICT 2

SPECIFIC PLANS

SP 168 SUNNYMEAD RANCH	
CPS	SCENIC HIGHWAY CORRIDOR
P	PARK
R1	RESIDENTIAL- SINGLE FAMILY DWELLING
R1-10000	RESIDENTIAL -1DU ON MIN 10K SQFT LOT
R1-12000	RESIDENTIAL -1DU ON MIN 12K SQFT LOT
R4	PLANNED RESIDENTIAL UNITS
R5	OPEN AREA COMBINED WITH RESIDENTIAL DEVELOPMENTS

SP 193 MORENO VALLEY RANCH	
C	COMMERCIAL
CF	COMMUNITY FACILITY
CR	COMMUNITY RECREATIONAL
C or H	COMMERCIAL OR HIGH DENSITY RESIDENTIA
C or M	COMMERICAL OR MEDIUM DENSITY RESIDEN
EQ/R	EQUESTRIAN/RECREATIONAL
GC	GOLF COURSE
H	HIGH DENSITY RESIDENTIAL
L	LOW DENSITY RESIDENTIAL
L or P	SUBURBAN RESIDENTIAL or PARK
M	MEDIUM DENSITY RESIDENTIAL
MH	MEDIUM HIGH DENSITY RESIDENTIAL
ML	MEDIUM LOW DENSITY RESIDENTIAL
NOS-A	NATURAL OPEN SPACE - A
NOS-B	NATURAL OPEN SPACE - B
P	PARK

SP 195 HIDDEN SPRINGS	
EST	VERY LOW DENSITY RESIDENTIAL
NOS	UNDISTURBED NATURAL OPEN SPACE
OS	NATURAL GREENBELT PASEOS
P	PARK
PRD	MEDIUM LOW DENSITY RESIDENTIAL
S	SCHOOL
SFD	LOW DENSITY RESIDENTIAL

SP 200 TOWNGATE	
C	COMMUNITY COMMERCIAL
H	HIGH DENSITY RESIDENTIAL
HC	HIGHWAY COMMERCIAL
L	LOW DENSITY RESIDENTIAL
M	SUBURBAN RESIDENTIAL
MH	MEDIUM HIGH RESIDENTIAL
MUC	MIXED USE COMMERCIAL
O	OFFICE
OC	OFFICE COMMERCIAL
P	PUBLIC/QUASI-PUBLIC
R4500	MEDIUM DENSITY RESIDENTIAL
R4500A	MEDIUM DENSITY RESIDENTIAL
RDB	PUBLIC FACILITIES
Regional/ MUC	REGIONAL/MIXED-USE COMMERCIAL
S	SCHOOL

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

CITY OF MORENO VALLEY
ZONING ATLAS
05/16/2012

SP 204 THE VILLAGE	
CC	COMMUNITY COMMERCIAL
P	PUBLIC
VCR	VILLAGE COMMERCIAL/RESIDENTIAL
VOR	VILLAGE OFFICE RESIDENTIAL
VR	VILLAGE RESIDENTIAL

SP 205 THE FESTIVAL	
C/OP	OFFICE PARK
OS	OPEN SPACE
R1	RESIDENTIAL
RC	RETAIL COMMERCIAL

SP 208 MORENO VALLEY INDUSTRIAL AREA	
CZ	CLEAR ZONE
I	INDUSTRIAL
ISA	INDUSTRIAL SUPPORT AREA
P	MORENO VALLEY REGIONAL WASTEWATER RECLAMATION FACILITY

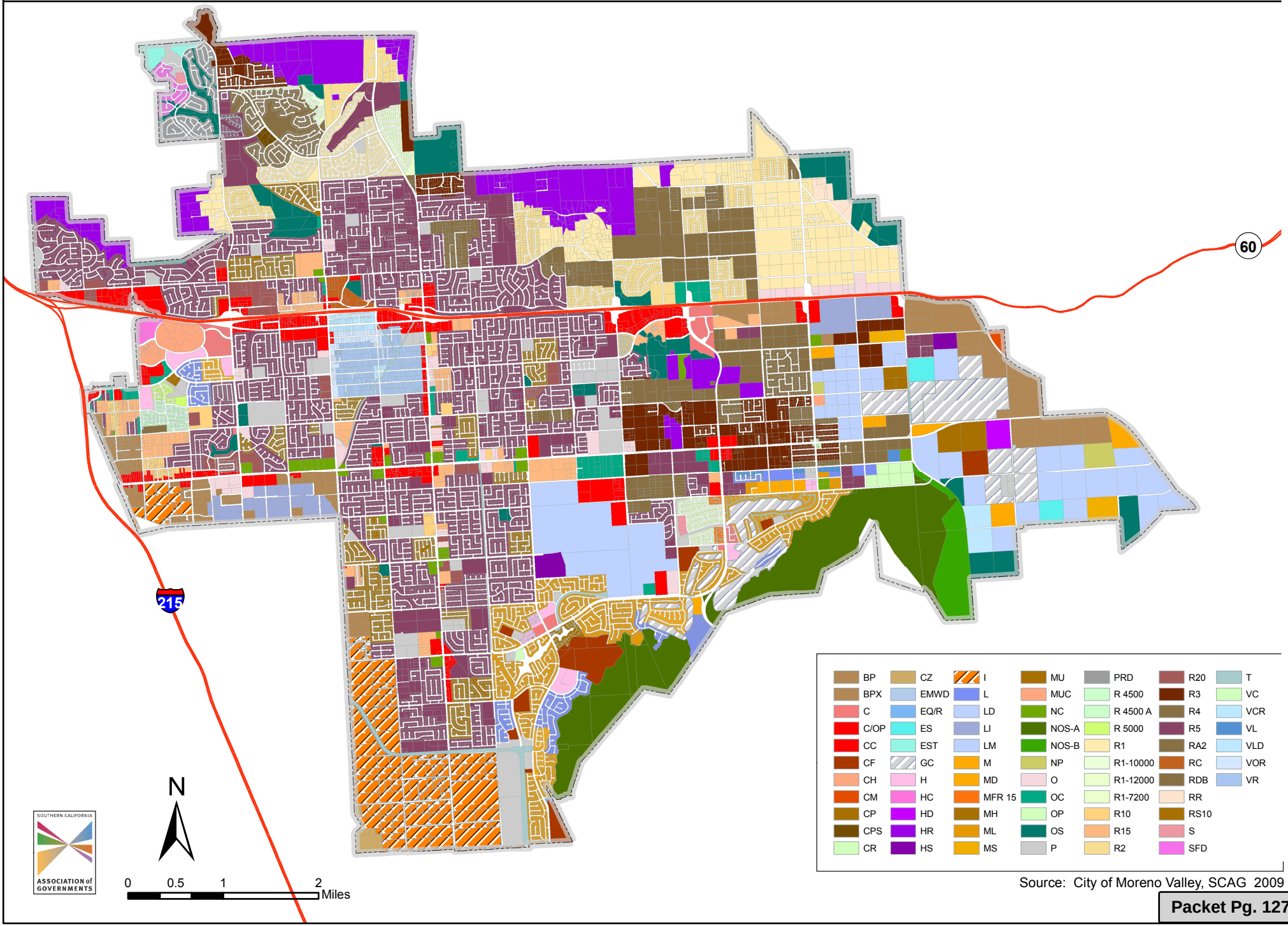
SP 209 AUTO MALL	
C	COMMERCIAL
OS	OPEN SPACE
PH3 CC	COMMERCIAL
PH3 OS	OPEN SPACE
PH3 R15	RESIDENTIAL UP TO 15 DU/AC THRESHOLD 12 DU/AC

SP 212-1 MORENO HIGHLANDS	
BP	BUSINESS PARK
CC	COMMUNITY COMMERCIAL
CF	COMMUNITY FACILITY
CH	CHURCH
CM	CEMETERY
ES	ELEMENTARY SCHOOL
F	FIRE STATION
GC	GOLF COURSE
GM	GROUNDS MAINTENANCE FACILITY
HD	HIGH DENSITY RESIDENTIAL
HS	HIGH SCHOOL
LD	LOW DENSITY RESIDENTIAL
MD	MEDIUM DENSITY RESIDENTIAL
MS	MIDDLE SCHOOL
MU	MIXED USE
NC	NEIGHBORHOOD COMMERCIAL
NP	NEIGHBORHOOD PARK
OS	ENHANCED OPEN SPACE/NATURAL BUFFER
VLD	VERY LOW DENSITY RESIDENTIAL

SP 218 AQUABELLA (FORMERLY MORENO VALLEY FIELD STATION)	
C	COMMERCIAL
H	HIGH DENSITY RESIDENTIAL
HS	HIGH SCHOOL
L/M	LOW/MEDIUM DENSITY RESIDENTIAL

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-

Zoning Map for City of Moreno Valley



Source: City of Moreno Valley, SCAG 2009

Attachment: Water Quality Management Plan (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot

TRAFFIC IMPACT STUDY

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Prepared by:

DAVID EVANS AND ASSOCIATES INC.

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February 3, 2017

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

February 3, 2017 Job No. CACT0000-0001

Mr. Ino Cruz
JNT Management
139 Radio Road
Corona, Ca 92879

RE: Traffic Impact Study – Moreno Valley Cactus -Moreno Valley, California

Dear Mr. Cruz;

David Evans and Associates, Inc. is pleased to submit this Traffic Impact Study (TIS) Report for the Proposed Project consisting of a Gasoline Station with Convenience Market and Car Wash, Fast Food Restaurants and an Office/Warehouse, located in the City of Moreno Valley, California. The proposed project is northeast corner of Commerce Center Drive and Cactus Avenue in the City of Moreno Valley, California.

The report examines the traffic impacts specifically for the project and presents recommended traffic improvements. The report also addresses the impacts of overall growth within the area to assure that cumulative traffic mitigations can be addressed.

We are pleased to have been of assistance to you in processing and obtaining approval for the project. If you have any questions or comments, please feel free to contact me at 760-524-9115.

Respectfully submitted,

Division of David Evans and Associates, Inc.

REGISTERED PROFESSIONAL ENGINEER
ROBERT KILPATRICK
No. 1573
TRAFFIC
STATE OF CALIFORNIA

Robert A. Kilpatrick, P.E., T.E.
Senior Project Manager / Senior Associate

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

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Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

1 INTRODUCTION

This report identifies the traffic impacts and presents recommendations for access and traffic mitigation for the Moreno Valley Cactus Project. The proposed project consists of a Gasoline Station with Convenience Market and Car Wash, Fast Food Restaurants and an Office/Warehouse, at the northeast corner of Commerce Center Drive and Cactus Avenue in the City of Moreno Valley, California. *Figure 1* illustrates the vicinity map and project location and *Figure 2* illustrates the proposed project site plan. The proposed project is bounded to the north by Goldencrest Drive, to the south Cactus Avenue and March Air Reserve Base, to the west Commerce Center Drive, and to the east a Business Park.

The proposed project consists of two (2) different site access alternatives. The site access alternatives include Alternative 1 which consists of a continued southbound left turn movement restriction at Commerce Center Drive and Cactus Avenue and Alternative 2 which consists of the inclusion of a southbound left turn movement provided at Commerce Center Drive and Cactus Avenue. Any modification of the intersection of Commerce Center Drive and Cactus Avenue would require the approval of the California Department of Transportation (Caltrans).

The intent of this Traffic Impact Study (TIS) is to address the impacts and mitigations required for the proposed development. This report identifies seven (7) study scenarios. The scenarios include an Existing Conditions, Background Condition, Background plus Project Condition, Cumulative Condition, Cumulative plus Project Condition, Buildout Year 2035, and Buildout Year 2035 plus Project.

The Background Condition (Existing plus Ambient Growth) addresses impacts due to ambient growth up to the project opening year 2020 within the study area. The ambient growth is estimated as an annual 2% growth rate.

The Background plus Project Condition (Existing plus Ambient plus Project) addresses impacts due to the project traffic and the 2% annual ambient growth up to the project opening year 2020 within the study area.

The Cumulative Condition (Existing plus Ambient plus Cumulative) addresses impacts due to cumulative project traffic and the 2% annual ambient growth up to the project opening year 2020 within the study area.

The Cumulative plus Project Condition (Existing plus Ambient plus Project plus Cumulative) addresses impacts due to cumulative project traffic, the proposed project traffic, and the 2% annual ambient growth up to the project opening year 2020 within the study area. The Cumulative plus Project Condition considers a trip distribution utilizing existing intersections included in the study area.

The Buildout Year 2035 addresses impacts due to ambient growth up to the buildout year within the study area. The ambient growth up to the buildout year was developed from the Moreno Valley Traffic Model (MVTM).

The Buildout Year 2035 plus Project addresses impacts due to the proposed project and ambient growth up to the buildout year within the study area. The ambient growth up to the buildout year was developed from the Moreno Valley Traffic Model (MVTM).

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

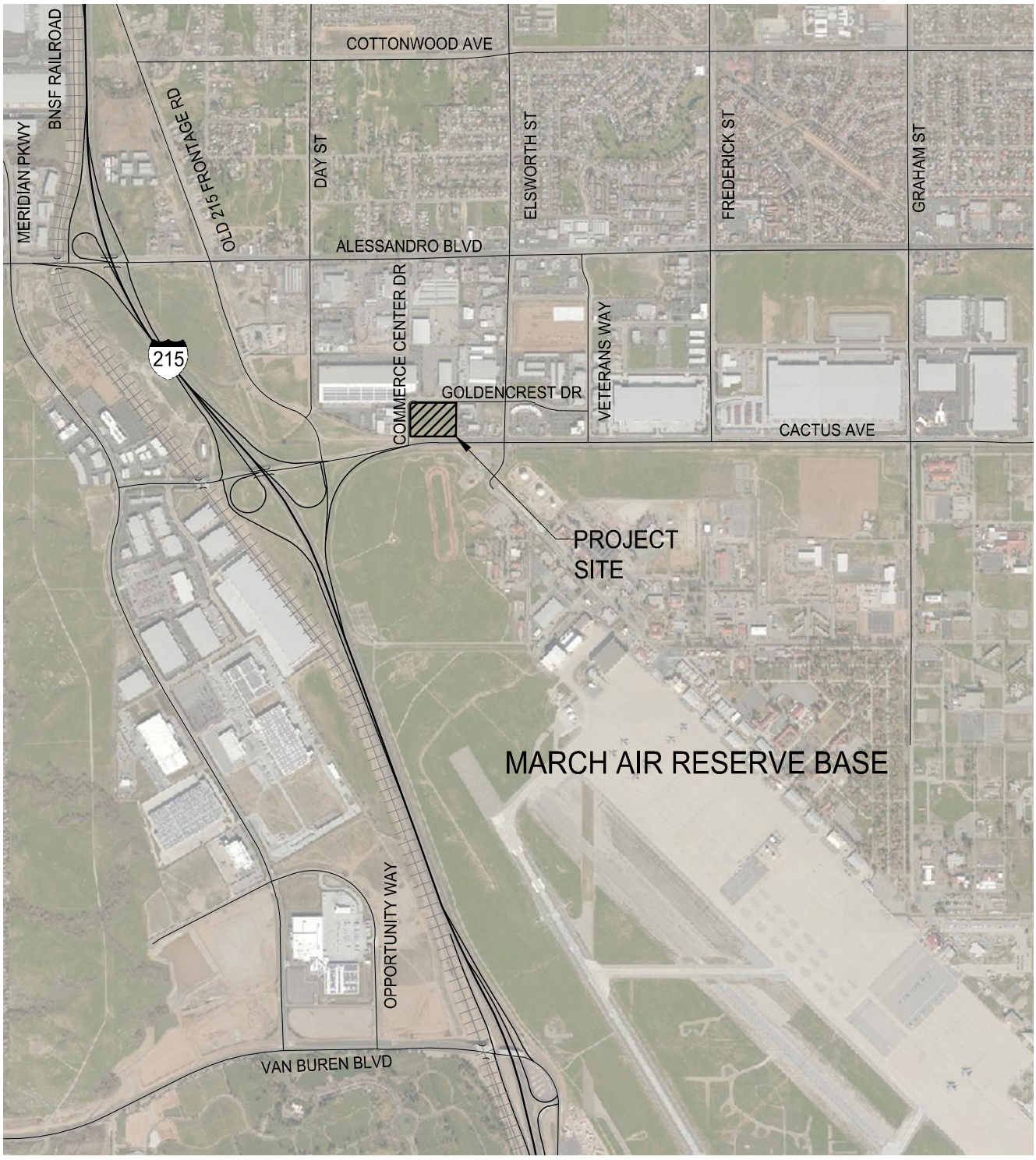

FIGURE 1: VICINITY MAP

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MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

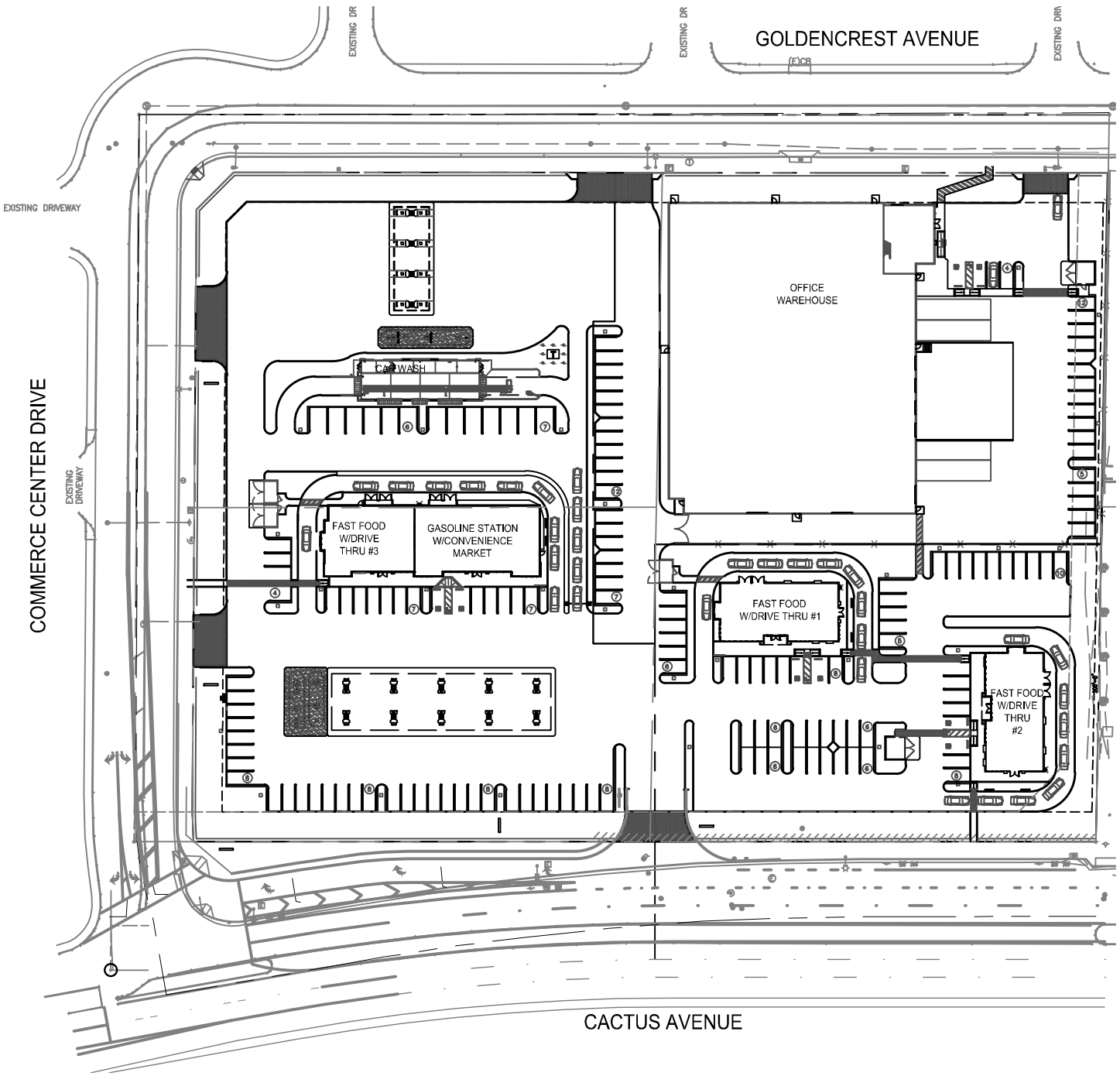

FIGURE 2: SITE PLAN

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MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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2 EXISTING CONDITION

Existing Street System

The following roadways provide access to and within the study area;

Cactus Avenue is an east-west local roadway. It is four lane divided roadway, two in each direction with a raised median and left turn pockets. Cactus Avenue provides regional and local access with the Cactus Avenue and I-215 freeway interchange. It is identified as a modified divided major arterial on the Moreno Valley Circulation Plan.

Commerce Center Drive is a north-south local roadway. It is a three lane roadway, one in each direction and a Two-Way-Left-Turn-Lane (TWLTL).

Elsworth Street is a north-south local roadway. It is a five lane roadway, two in each direction with a Two-Way-Left-Turn-Lane (TWLTL). It is identifies as a minor arterial on the Moreno Valley Circulation Plan.

Goldencrest Drive is an east-west local roadway. It is a three lane roadway, one in each direction and a Two-Way-Left-Turn-Lane (TWLTL).

The access to the proposed project will be obtained from Cactus Avenue, Commerce Center Drive, and Goldencrest Drive.

The proposed project is located at the northeast corner of Commerce Center Drive and Cactus Avenue in the City of Moreno Valley, California. Based on potential traffic impacts to the area roadways, five (5) existing intersections and five (5) future intersections in the study area have been identified for analysis;

1. Cactus Avenue and I-215 Freeway SB Ramps
2. Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road
3. Cactus Avenue and Commerce Center Drive
4. Cactus Avenue and Elsworth Street/ March ARB
5. Goldencrest Drive and Elsworth Street
6. Project Driveway #1 on Cactus Avenue (Future Intersection)
7. Project Driveway #2 on Commerce Center Drive (Future Intersection)
8. Project Driveway #3 on Commerce Center Drive (Future Intersection)
9. Project Driveway #4 on Goldencrest Drive (Future Intersection)
10. Project Driveway #5 on Goldencrest Drive (Future Intersection)

The criteria for the study intersections are intersections which the proposed project will add 50 or more trips during any peak hour.

The intersections of Cactus Avenue and I-215 Freeway SB Ramps, Cactus Avenue and I-215 Freeway NB Off-Ramps, Cactus Avenue and Commerce Center Drive, Cactus Avenue and Elsworth Street signalized intersections.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

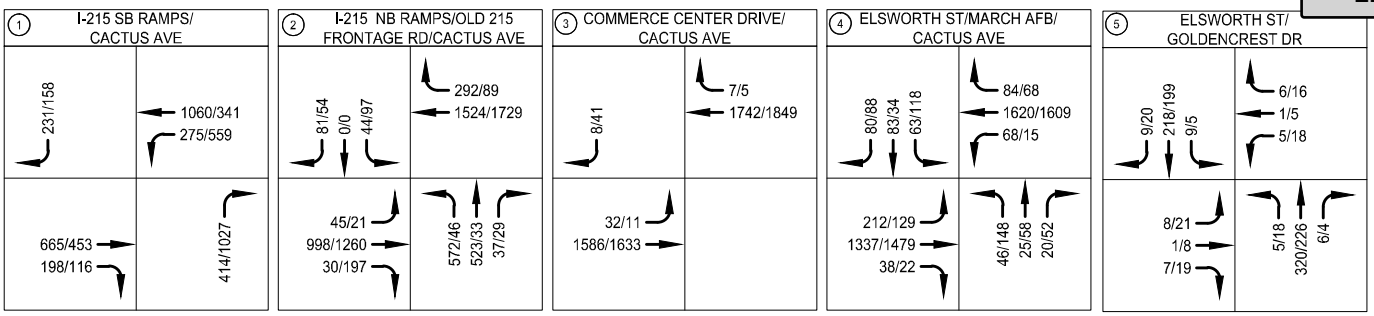
Based on traffic impacts to the area roadways, six (6) existing roadway segments in the study area have been identified for analysis;

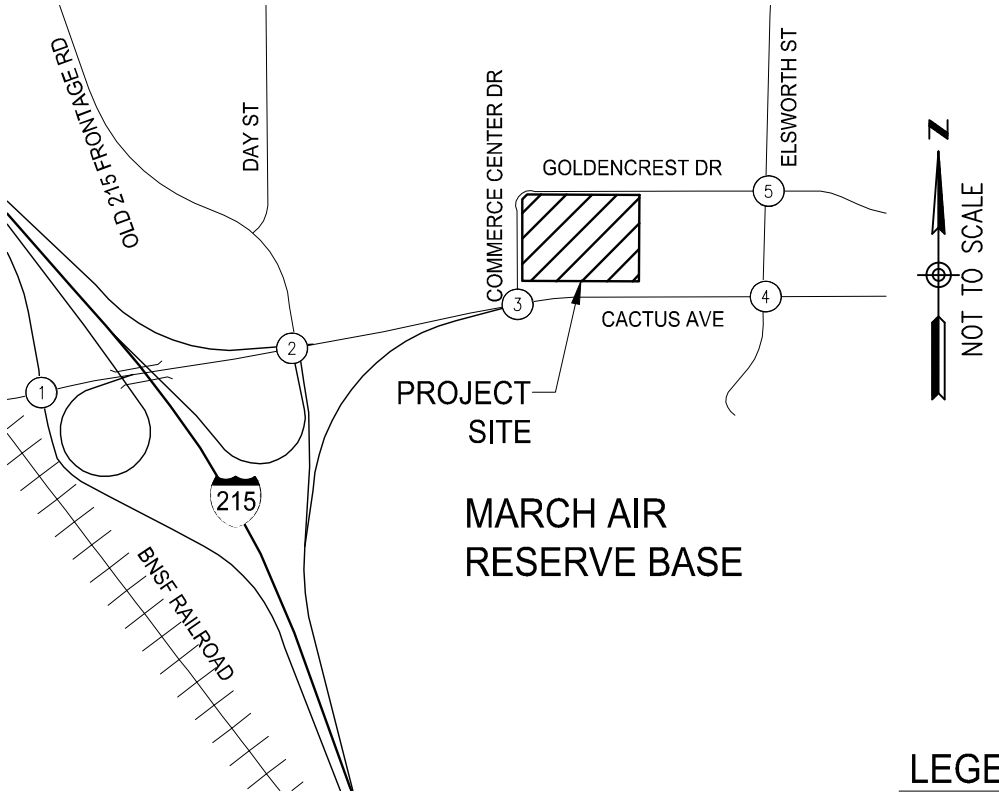
1. Commerce Center Drive
2. Goldencrest Drive
3. Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)
4. Cactus Avenue (Commerce Center Drive to Elsworth Street)
5. Cactus Avenue (Elsworth Street to Frederick Street)
6. Elsworth Street (Cactus Avenue to Alessandro Boulevard)

Existing Traffic Volumes

Figure 3 illustrates the existing peak hour traffic volumes in the study area. Turn movement counts were obtained from Newport Traffic Studies, an independent traffic data collection company. Turn movement counts were collected during the AM and PM peak hour at the above-mentioned existing intersections identified for detailed analysis. These counts were conducted in September 2015. The resulting turning movement volumes are presented in the *Appendix D* of this report.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

FIGURE 3: EXISTING TRAFFIC VOLUME

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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Capacity Analysis Methodologies

In order to verify the intersection capacity analysis impacts, present Level-of-Service (LOS) were conducted for the study intersections. The intersection capacity analyses are based on the existing intersection geometrics and traffic volumes during the AM and PM peak hours. The intersection capacity analyses were conducted for the signalized and un-signalized intersections using the Synchro Software. Synchro is released by Trafficware Ltd, version 8. Synchro implements the methods of the HCM 2010, chapter 15, 16 and 17.

Signalized Intersections

The analysis determines a LOS which quantitatively describes the operating characteristics of signalized intersections and the maximum delay. *Table 2-1* provides the HCM 2010 LOS thresholds for signalized intersections.

Table 2-1: HCM 2010 - LOS Criteria for Signalized Intersections

LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10 and ≤20
C	> 20 and ≤35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

Source: **HCM 2010**

Un-Signalized Intersections

The TWSC intersection analysis LOS is computed for each movement and the most critical LOS is the one that describes the effectiveness of that intersection, which is typically the stop controlled left turn movement from the minor street. The AWSC intersection analysis LOS is defined by the control delay of the whole intersection. *Table 2-2* provides the HCM 2010 LOS thresholds for TWSC and AWSC intersections.

Table 2-2: HCM 2010 - LOS Criteria for TWSC and AWSC

LOS	Control Delay per Vehicle (s/veh)
A	≤ 10
B	> 10 and ≤15
C	> 15 and ≤25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Source: **HCM 2010**

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

Roadway Segments Analysis Methodologies

The Roadway Segment Analysis complies with the City of Moreno Valley General Plan. The guideline compares Average Daily Traffic (ADT) on a link to the roadway capacity. The ADT volumes for each of the seven (7) conditions were factored from PM peak hour counts, obtained from the existing condition turn movement count. The following formula was used for each intersection leg in determining the ADT volumes.

$$PM\ Peak\ Hour\ (Approach + Exit\ Volume) \times 11.5 = Daily\ Leg\ Volume$$

Table 2-3 provides the LOS thresholds by type of roadway per City of Moreno Valley General Plan

Table 2-3: Roadway Segment Analysis Methodologies

Type of Roadway	Level of Service*				
	A	B	C	D	E
Six Lane Divided Arterial	33,900	39,400	45,000	50,600	56,300
Four Lane Divided Arterial	22,500	26,300	30,000	33,800	37,500
Four Lane Undivided Arterial	15,000	17,500	20,000	22,500	25,000
Two Lane Industrial Collector	7,500	8,800	10,000	11,300	12,500
Two Lane Undivided Residential	N/A	N/A	N/A	N/A	2,000

* Maximum Average Daily Traffic (ADT)

Source: **City of Moreno Valley General Plan**

The City of Moreno Valley Traffic Impact Analysis Preparation Guide, dated August 2007 outlines the City's Level of Service standards. Per the City of Moreno Valley General Plan, Figure 5.2-7 LOS Standards, the peak hour intersection Level of Service standard is LOS C for most intersections and roadways. Intersections and roadways that are adjacent to freeway on/off ramps, and/or adjacent to employment generating land uses, and Boundary intersections the Level of Service standard is LOS D. The LOS D applies to the intersections and roadway segments of Cactus Avenue and Elsworth Street.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

2.1 Existing Traffic Analysis

Intersection capacity analysis were conducted for the study intersection to determine an existing intersection level-of-service (LOS), based on the existing intersection geometrics and the AM and PM peak hour traffic volumes. The results of the analysis are shown in *Table 2-4* and provided in *Appendix D. Figure 4* illustrates the existing and proposed intersection geometrics utilized in the capacity analysis.

Table 2-4: Intersection Capacity Analysis - Existing Condition
Traffic Study – Moreno Valley Cactus

	Intersection	AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	Cactus Avenue and I-215 Freeway SB Ramps	16.3	B	27.2	C
2	Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road	59.9	E	9.2	A
	Mitigated: Widen westbound Cactus Avenue	35.9	D	8.0	A
3	Cactus Avenue and Commerce Center Drive	5.0	A	1.5	A
	Mitigated: Widen westbound Cactus Avenue	4.7	A	0.9	A
4	Cactus Avenue and Elsworth Street/ March ARB	28.4	C	31.9	C
5	Goldencrest Drive and Elsworth Street (3)	13.9	B	13.3	B

(1) Delay –In Seconds
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection

Source: **David Evans and Associates, Inc.**

As provided in *Table 2-4* under Existing Condition, most of the study intersections are operating at an acceptable LOS with the exception of the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road. The intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road is currently operating at LOS E during the AM peak period, which is below the City of Moreno Valley's peak hour intersection Level of Service standard.

The existing condition mitigation is to widen westbound Cactus Avenue to provide three through lanes along the segment of Northbound I-215 On-ramp to Elsworth Street. This improvement will provide a westbound through lane to the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road is a mitigation identified to return the intersection to an LOS that complies with the City of Moreno Valley's peak hour intersection Level of Service standard.

Traffic signal warrant analysis was completed with the existing condition volume for the un-signalized intersection of Goldencrest Drive and Elsworth Street, resulting in the intersection not complying with any of the warrants.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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Roadway Segment capacity analysis for the Existing Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 2-5* and provided in *Appendix F.*

Table 2-5: Roadway Segment Capacity Analysis - Existing Condition
Traffic Study – Moreno Valley Cactus

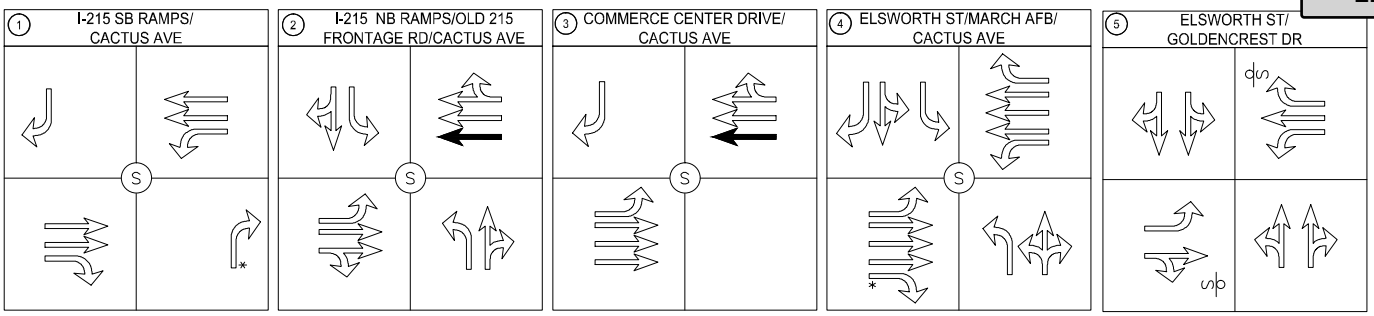
	Roadway Segment	Type of roadway	ADT	LOS
1	Commerce Center Drive	Two Lane Industrial Collector	4,700	A
2	Goldencrest Drive	Two Lane Industrial Collector	3,100	A
3	Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)	Four Lane Divided Arterial	44,300	F
4	Cactus Avenue (Commerce Center Drive to Elsworth Street)	Six Lane Divided Arterial	43,900	C
5	Cactus Avenue (Elsworth Street to Frederick Street)	Six Lane Divided Arterial	44,000	C
6	Elsworth Street (Cactus Avenue to Alessandro Boulevard)	Four Lane Divided Arterial	6,600	A

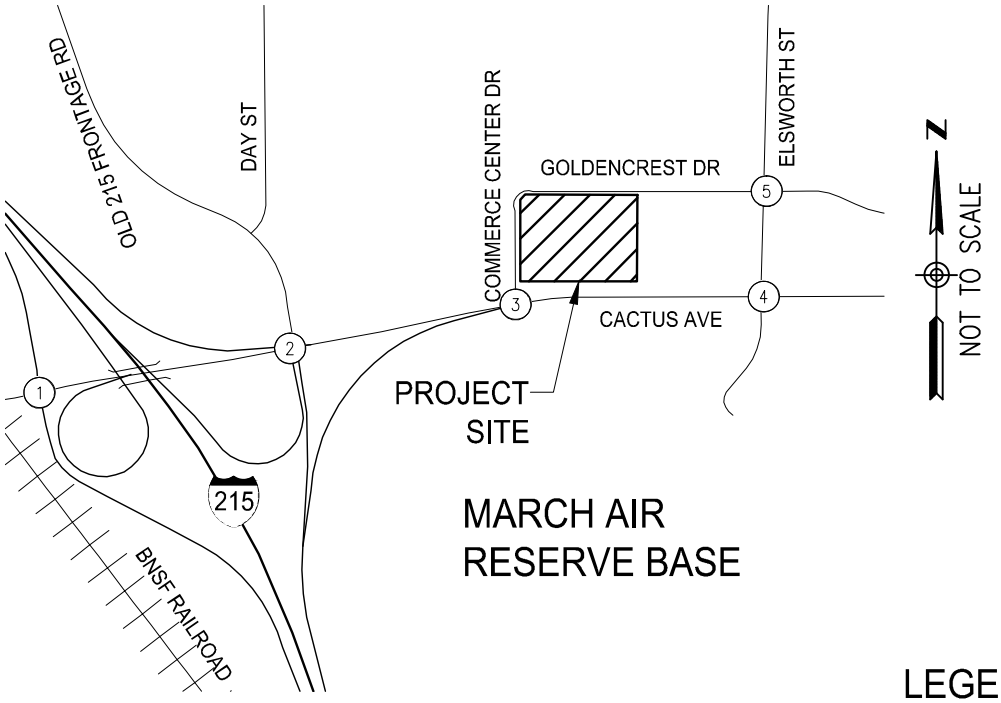
ADT – Average Daily Traffic
LOS – Level of Service
Source: **David Evans and Associates, Inc.**

As provided in *Table 2-5* under Existing Condition, most of the roadway segments are operating at an acceptable LOS C or better with the exception of the roadway segment of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive.

The roadway segment of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive is anticipated to continue to operate at LOS F, which is below the City of Moreno Valley's peak hour roadway segment Level of Service standard.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

- ps - UNSIGNALIZED INTERSECTION
- * - FREE RIGHT TURN
- (#) - STUDY INTERSECTIONS
- (S) - SIGNALIZED INTERSECTION
- ⇦ - EXISTING GEOMETRICS
- ⇦ - PROPOSED GEOMETRICS

FIGURE 4: EXISTING CONDITION INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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3 BACKGROUND CONDITION

The project is anticipated to open in the Year 2020. To analyze the project impacts, the inclusion of traffic generated by regional ambient growth within the study area is necessary. Typically, ambient growth is expected over the years at rates ranging from 1% to 2% annually, a 2% annual increase was utilized. The Background Condition addresses impacts due to ambient growth up to the project opening year 2020. *Figure 5* illustrates Background Traffic Volumes. *Figure 6* illustrates the intersection geometrics utilized in the capacity analysis.

3.1 Background Traffic Analysis

Intersection capacity analysis for the Background Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 3-1* and provided in *Appendix D.*

Table 3-1: Intersection Capacity Analysis - Background Condition
Traffic Study - Moreno Valley Cactus

Intersection		AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	Cactus Avenue and I-215 Freeway SB Ramps	16.9	B	28.3	C
2	Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road	86.4	F	10.7	B
	Mitigated: Widen westbound Cactus Avenue	47.8	D	8.9	A
3	Cactus Avenue and Commerce Center Drive	5.1	A	1.8	A
	Mitigated: Widen westbound Cactus Avenue	4.5	A	1.0	A
4	Cactus Avenue and Elsworth Street/ March ARB	25.3	C	33.0	C
5	Goldencrest Drive and Elsworth Street (3)	14.7	B	14.1	B

(1) Delay –In Seconds
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As provided in *Table 3-1* under Background Condition, most of the study intersections are anticipated to operate at an acceptable LOS. with the exception of the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road.

The intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road is anticipated to continue to operate at LOS F during the AM peak period, which continues to exceed the City of Moreno Valley's peak hour intersection Level of Service standard.

The existing condition mitigation proposed widening of westbound Cactus Avenue will provide a westbound through lane to the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road.

Traffic signal warrant analysis was completed with the background condition volume for the un-signalized intersection of Goldencrest Drive and Elsworth Street, resulting in the intersection not complying with any of the warrants.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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Roadway Segment capacity analysis for the Background Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 3-2* and provided in *Appendix F.*

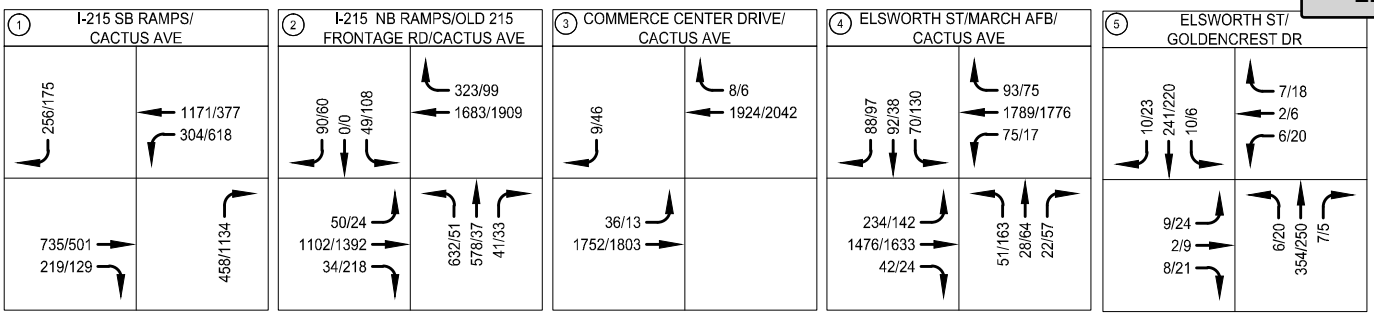
Table 3-2: Roadway Segment Capacity Analysis - Background Condition
Traffic Study – Moreno Valley Cactus

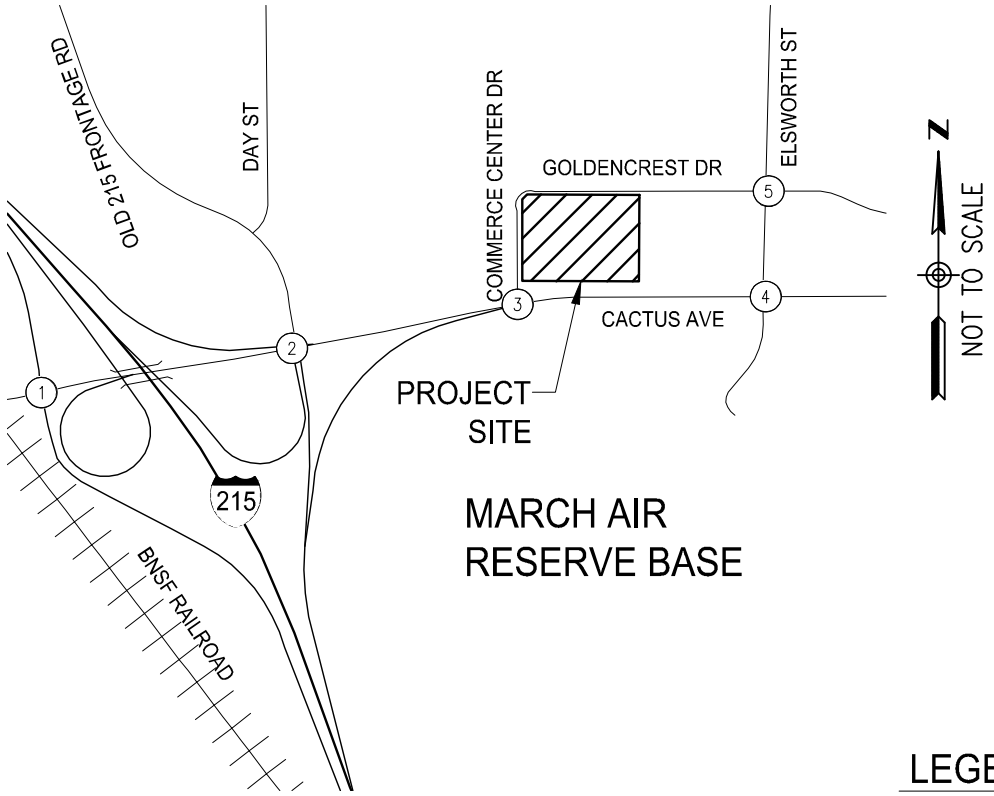
	Roadway Segment	Type of roadway	ADT	LOS
1	Commerce Center Drive	Two Lane Industrial Collector	700	A
2	Goldencrest Drive	Two Lane Industrial Collector	1,200	A
3	Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)	Four Lane Divided Arterial	40,500	F
4	Cactus Avenue (Commerce Center Drive to Elsworth Street)	Six Lane Divided Arterial	44,100	C
5	Cactus Avenue (Elsworth Street to Frederick Street)	Six Lane Divided Arterial	42,300	C
6	Elsworth Street (Cactus Avenue to Alessandro Boulevard)	Four Lane Divided Arterial	6,200	A

ADT – Average Daily Traffic
LOS – Level of Service
Source: **David Evans and Associates, Inc.**

As provided in *Table 3-2* under Background Condition, most of the roadway segments are anticipated to continue operating at an acceptable LOS C or better with the exception of the roadway segment of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive. The roadway segment of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive is currently operating at LOS F, which is below the City of Moreno Valley's peak hour roadway segment Level of Service standard.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

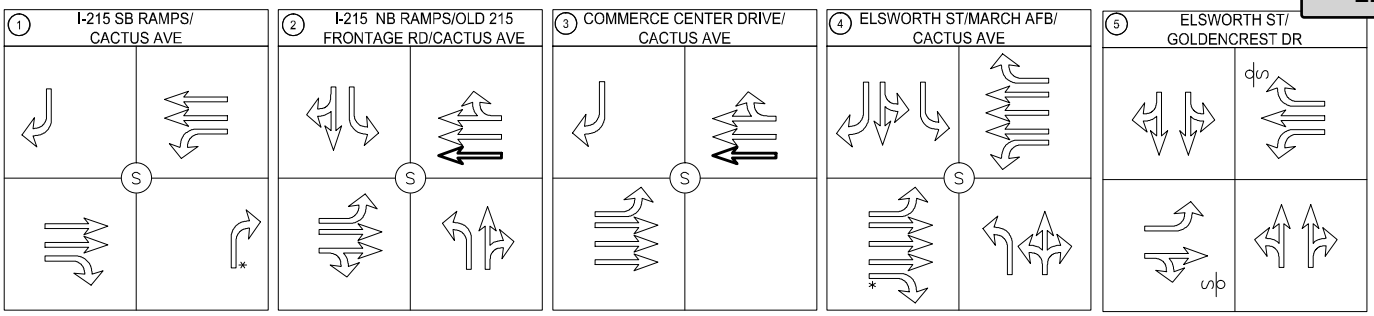
DAVID EVANS AND ASSOCIATES INC.

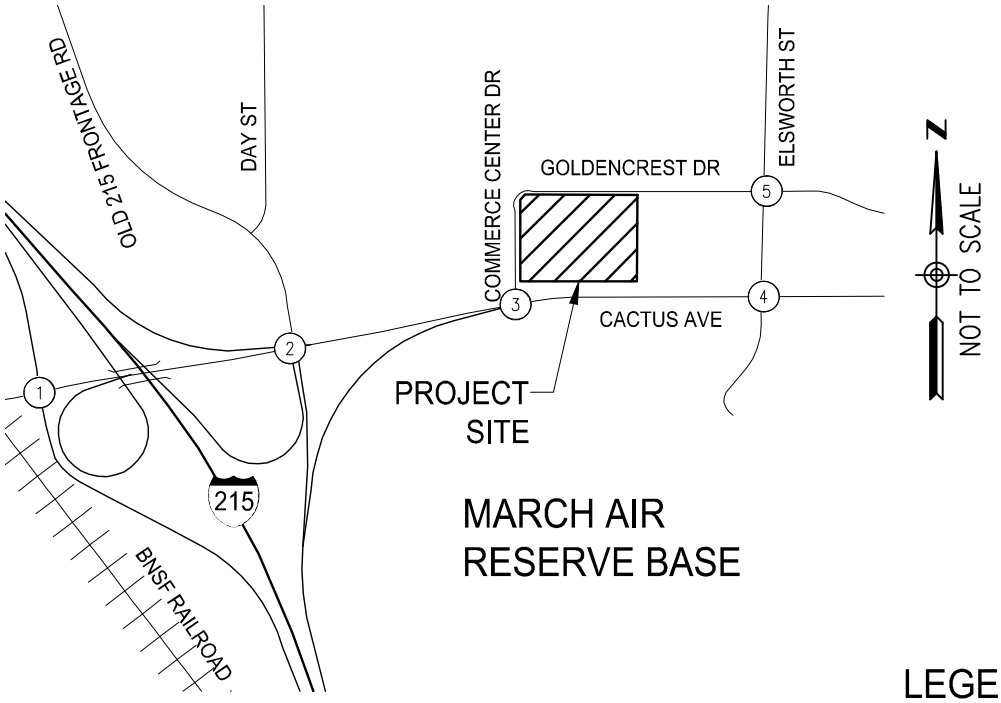
FIGURE 5: BACKGROUND CONDITION TRAFFIC VOLUMES

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

- ps - UNSIGNALIZED INTERSECTION
- * - FREE RIGHT TURN
- (#) - STUDY INTERSECTIONS
- (S) - SIGNALIZED INTERSECTION
- EXISTING GEOMETRICS
- PROPOSED EXISTING GEOMETR

FIGURE 6:BACKGROUND CONDITION INTERSECTION GEOMETRICS

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

4 BACKGROUND PLUS PROJECT CONDITION

The proposed project consists of a Gasoline Station with Convenience Market and Car Wash, Fast Food Restaurants and an Office/Warehouse. The Background plus Project Conditions address impacts due to project traffic.

Project Trip Generation

To identify potential traffic impacts, trip generation factors were applied to the land use to generate project trip estimates. The trip generation factors for the 24 Hour Convenience Store with Pumps, Fast Food Restaurant with Drive-Through Window, and the Office/Warehouse were obtained from the 9th Edition of the Institute of Transportation Engineers trip generation report.

The anticipated truck mix for the Office/Warehouse is 80% passenger vehicles and 20% trucks as outlined in the Fontana Truck Trip Generation Study. The anticipated truck mix for the 24 Hour Convenience Store with Pumps was developed based on the fueling pumps. The Passenger Car Equivalent (PCE) Trips are calculated with a PCE factor of 3.0.

Table 4-1 summarizes the estimated trip generation for the project site during the AM (7-9 AM) peak and PM (4-6 PM) peak periods. The diverted link trip and pass-by trip reduction percentages for the Fast-Food Restaurant with Drive-Through Window and Gasoline/Service Station with Convenience Market were calculated from the ITE Trip Generation Manual, 9th Edition Chapter 5. A 5% internal trip reduction was applied to the trip generation.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

Table 4-1: Project Trip Generation
Traffic Scope –Moreno Valley Cactus

	Use		AM Peak Hour			PM Peak Hour		
		Daily	In	Out	Total	In	Out	Total
1	**Gasoline/Service Station with Convenience Market and Car Wash**							
	(ITE 946) Vehicle Fueling Positions	152.84	6.04	5.80	11.84	7.07	6.79	13.86
	20 Gasoline Fueling Positions	3,057	121	116	237	141	136	277
	8 Diesel Fueling Positions	1,223	49	46	95	57	54	111
	Truck PCE Trips	3,669	147	138	285	171	162	333
	Sub-Total PCE Trips	6,726	268	254	522	312	298	610
	Internal PCE Trips (5%/5%)	-	13	13	26	16	15	31
	Adjusted Total PCE Trips	6,726	255	241	496	296	283	579
	Primary Trips (17%/13%)	-	43	41	84	38	37	75
	Diverted Link Trips (21%/31%)	-	54	51	104	92	88	180
	Pass-By Trips (62%/56%)	-	158	149	308	166	158	324
2	**Fast-Food Restaurant with Drive-Through Window**							
	(ITE 934) Per 1,000 Sq. Feet Gross Floor Area	496.12	23.16	22.26	45.42	16.98	15.67	32.65
	9,200 Sq. Feet Gross Floor Area	4,564	213	205	418	156	144	300
	Internal PCE Trips (5%/5%)	228	11	10	21	8	7	15
	Adjusted Total PCE Trips	4,336	202	195	397	148	137	285
	Primary Trips (18%/22%)	-	46	45	91	40	37	77
	Diverted Link Trips (28%/23%)	-	57	54	111	34	31	65
	Pass-By Trips (49%/50%)	-	99	96	195	74	69	143
3	**Office/Warehouse**							
	(ITE 150) Per 1,000 Sq. Feet Gross Floor Area	3.56	0.24	0.06	0.30	0.08	0.24	0.32
	48,258 Sq. Feet Gross Floor Area	172	11	3	14	4	12	15
	Auto Trips (80% Auto Trips)	138	9	2	11	3	10	12
	Truck Trips (20% Truck Trips)	34	2	1	3	1	2	3
	Truck PCE Trips	102	6	3	9	3	6	9
	Sub-Total PCE Trips	240	15	5	20	6	16	22
	Internal PCE Trips (5%/5%)	12	1	0	1	0	1	1
	Adjusted Total PCE Trips	228	14	5	19	6	15	21
	Total Auto Trips	7,759	343	323	666	300	290	589
	Total Truck Trips	1,257	51	47	98	58	56	114
	Total Truck PCE Trips	3,771	153	141	294	174	168	342
	Sub-Total Project Trips	11,530	496	464	960	474	458	932
	Internal Trip Reduction (5%/5%)	240	25	23	48	24	23	47
	Adjusted Total PCE Trips	**11,290**	471	441	**912**	450	435	**885**
	Primary Total PCE Trips	-	103	91	194	84	89	173
	Diverted Link Total PCE Trips	-	111	105	215	126	119	245
	Pass-By Total PCE Trips	-	257	245	503	240	227	467

Source: "Trip Generation Manual, Institute of Transportation Engineers", 9th Edition

As presented in *Table 4-1,* it is estimated that the project will generate 11,290 daily PCE trips, 912 AM PCE trips and 885 PM PCE trips.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

Project Trip Distribution

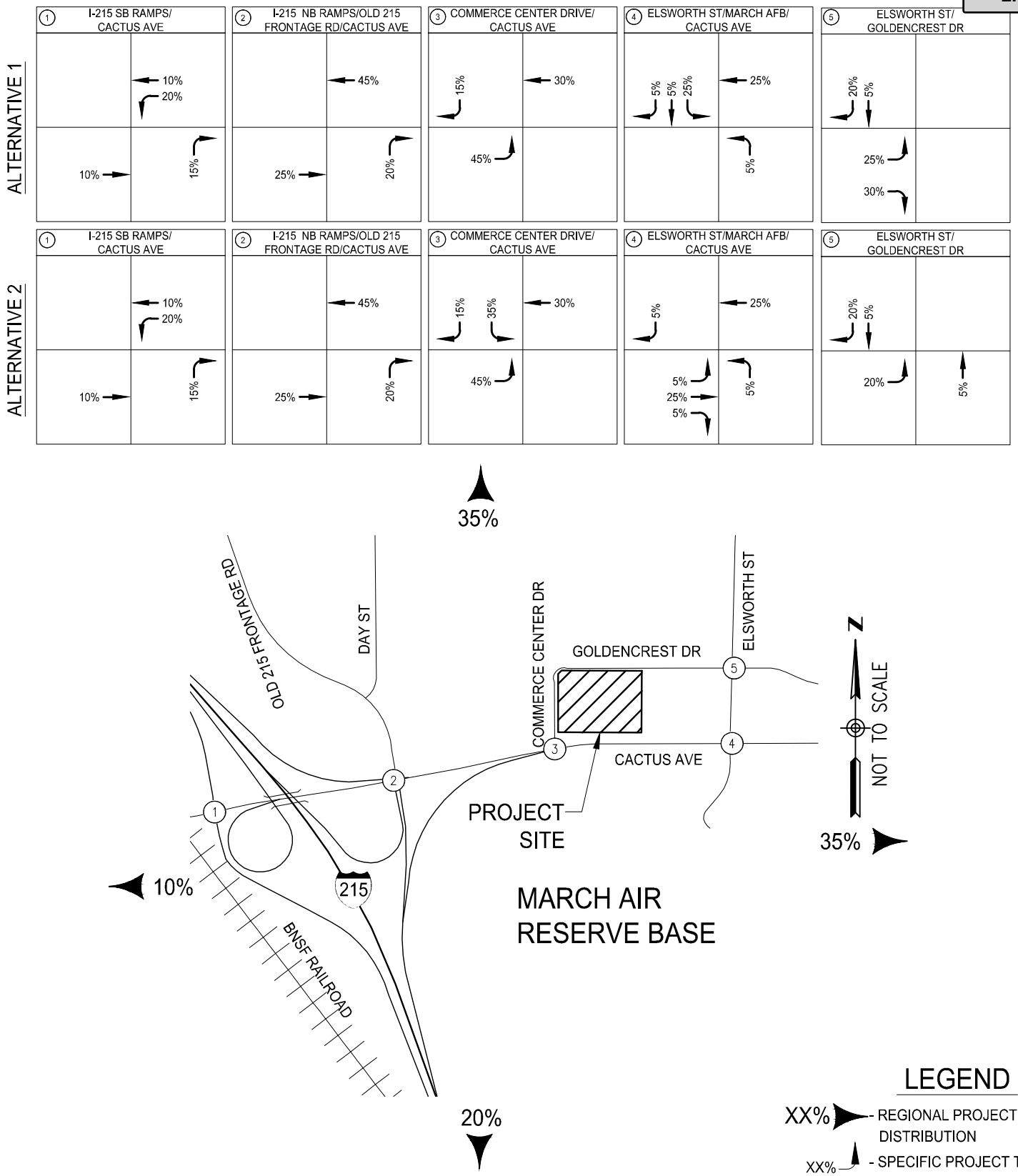
The proposed project consists of two (2) different site access alternatives. Any modification of the intersection of Commerce Center Drive and Cactus Avenue would require the approval of the California Department of Transportation (Caltrans).

The site access alternatives include Alternative 1 which consists of a continued southbound left turn movement restriction at Commerce Center Drive and Cactus Avenue and Alternative 2 which consists of the inclusion of a southbound left turn movement provided at Commerce Center Drive and Cactus Avenue. The addition of the southbound left turn lane in Alternative 2 provides a redistribution of traffic exiting the site.

To address the impacts of the estimated project traffic, the trips were distributed and assigned to the surrounding streets and study intersection based on each site access alternative. The project traffic was distributed based on the anticipated project utilization and on each site access alternative. Once the distribution pattern was established, project trips were assigned to the area streets that serve the project.

The Project Primary Trip Distribution is illustrated *Figure 7* for both Alternative 1 and Alternative 2. The Project Diverted Link Trip Distribution is illustrated in *Figure 8* for both Alternative 1 and Alternative 2. The Project Primary Trips is illustrated in *Figure 9* for both Alternative 1 and Alternative 2. The Project Diverted Link Trips is illustrated in *Figure 10* for both Alternative 1 and Alternative 2. The Project Pass-By Trips is illustrated in *Figure 11* for both Alternative 1 and Alternative 2. The Total Project Trips is illustrated in *Figure 12* for both Alternative 1 and Alternative 2.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

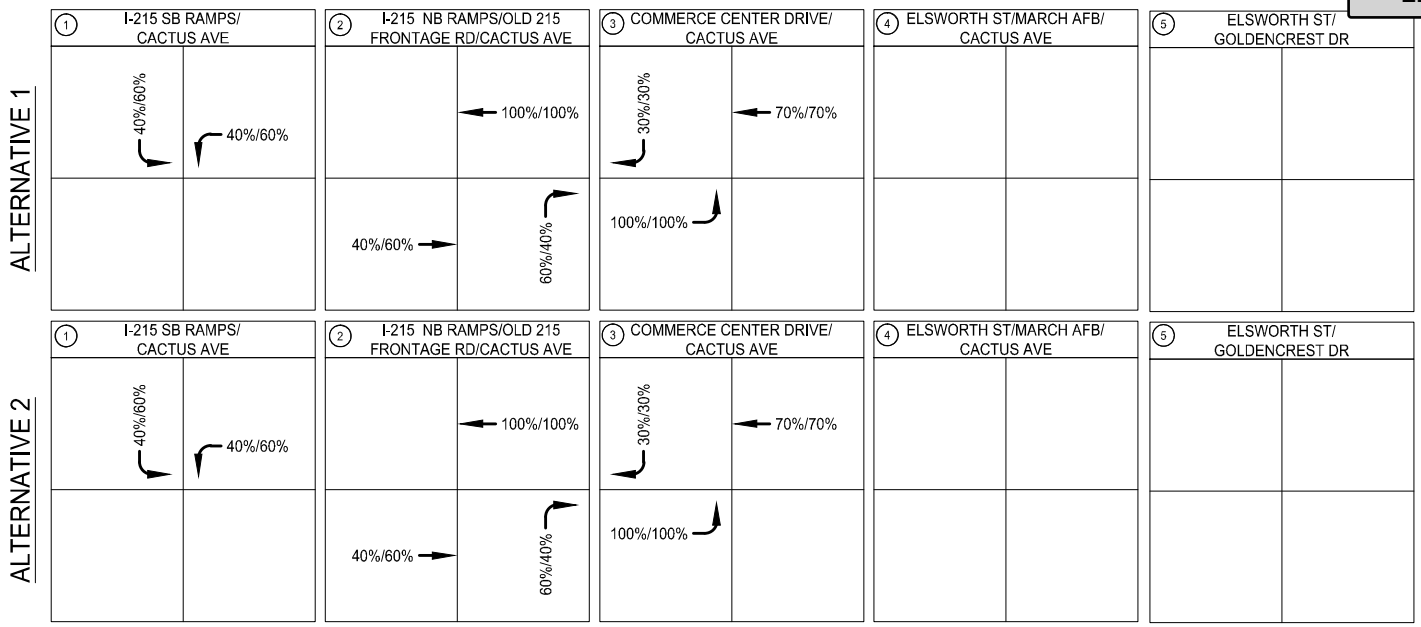


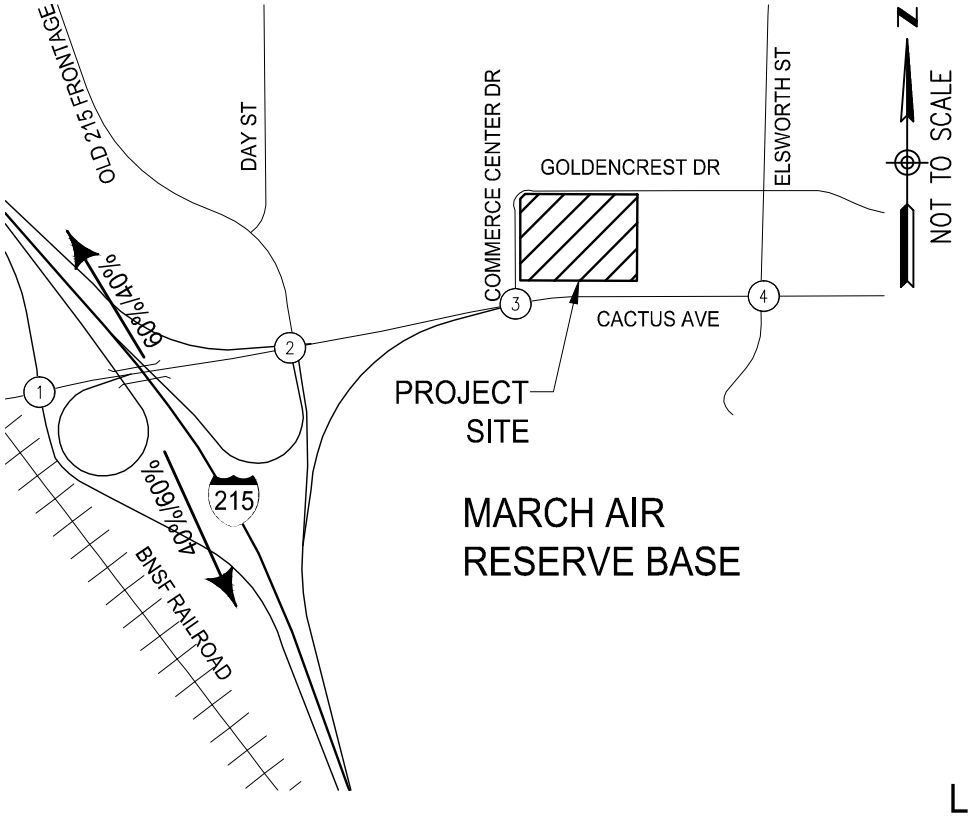
DAVID EVANS AND ASSOCIATES INC.

FIGURE 7: PROJECT PRIMARY TRIP DISTRIBUTIOI

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX%/XX% - REGIONAL DIVERTED AM/PM PROJECT TRIP DISTRIBUTIOI

XX%/XX% - SPECIFIC DIVERTED AM/PM PROJECT TRIP DISTRIBUTIOI

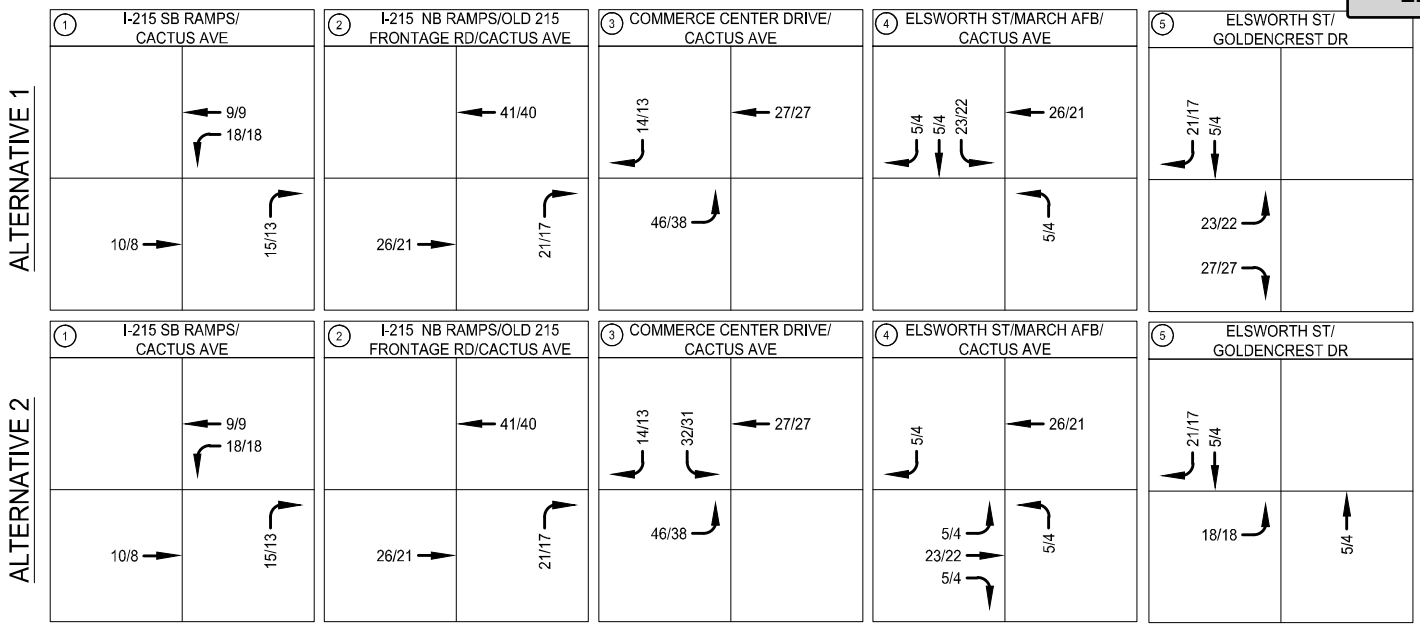
(#) - STUDY INTERSECTIONS

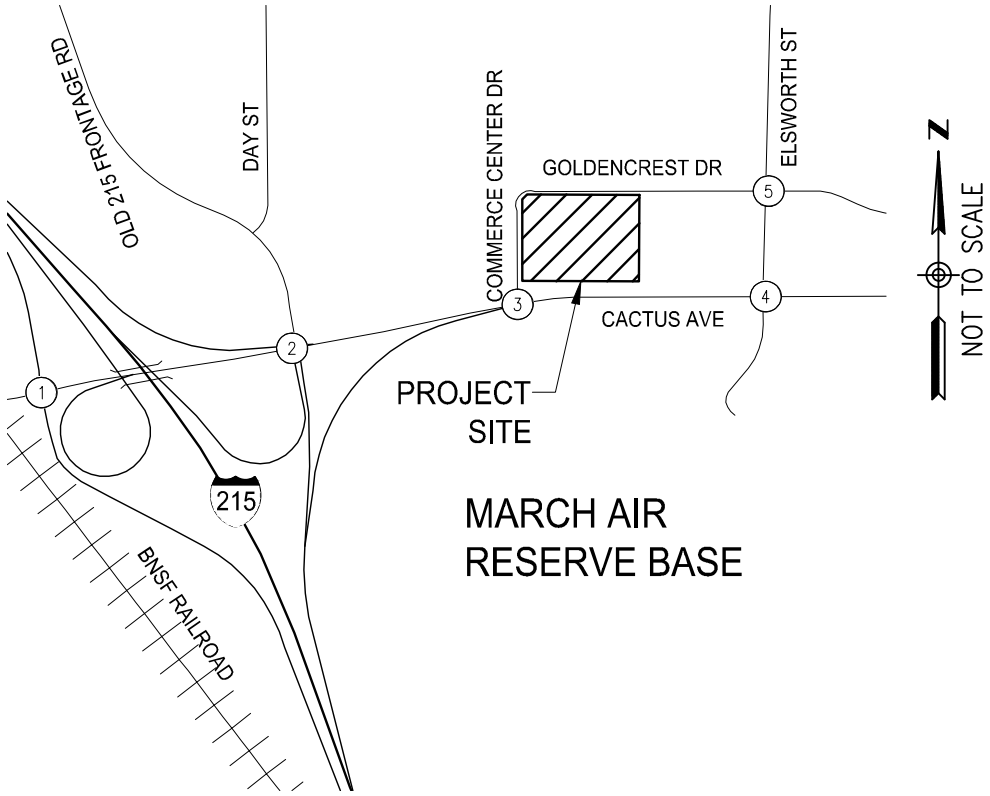
FIGURE 8: PROJECT DIVERTED LINK TRIP DISTRIBUTION

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





PRIMARY TRIPS

AM PEAK PERIOD - 103 IN / 91 OUT
PM PEAK PERIOD - 84 IN / 89 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP
(#) - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

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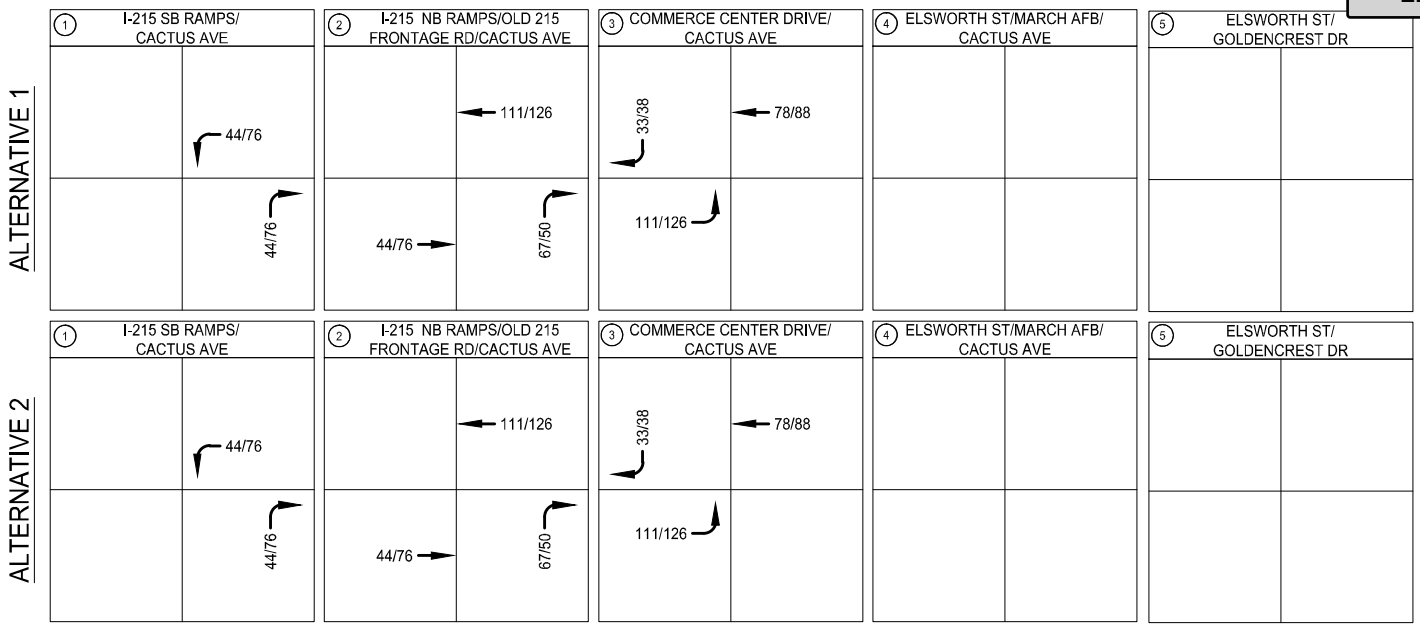
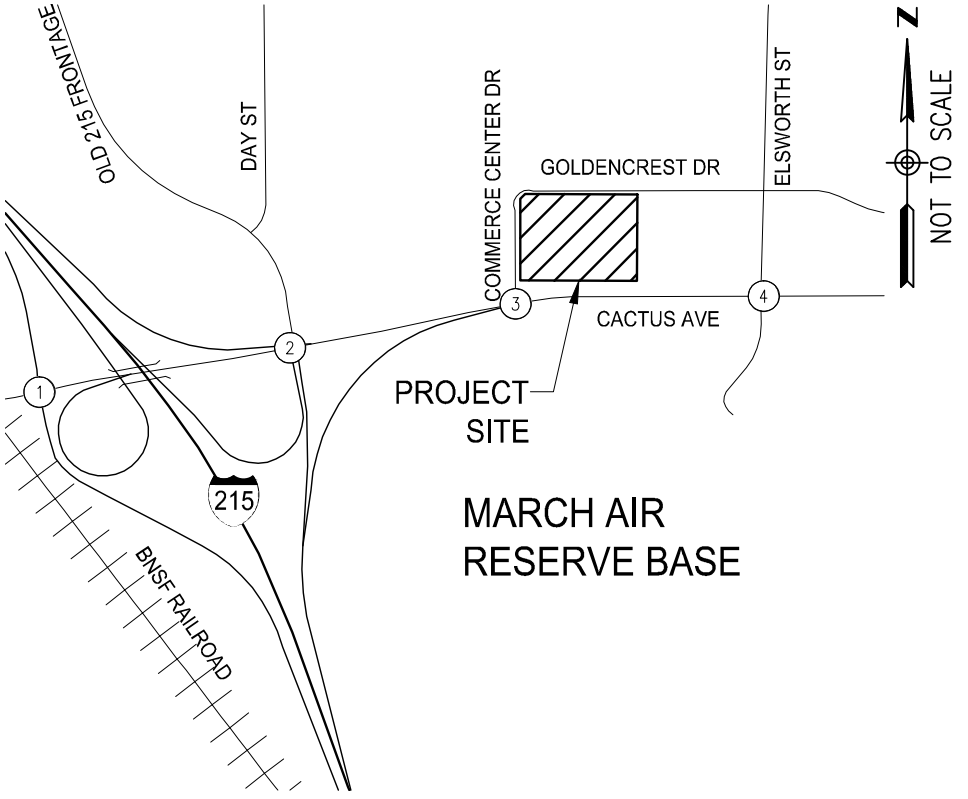
FIGURE 9: PROJECT PRIMARY TRIPS
MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





DIVERTED-LINK TRIPS

AM PEAK PERIOD	-	111 IN / 105 OUT
PM PEAK PERIOD	-	126 IN / 119 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

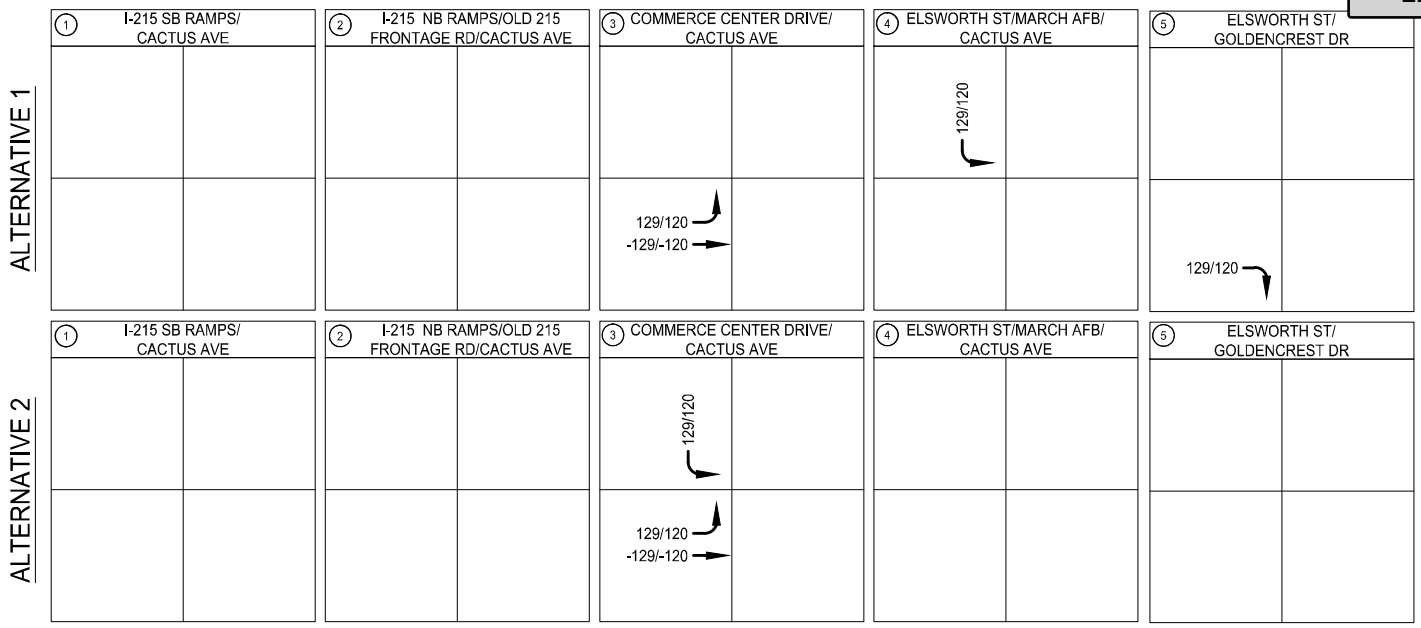
DAVID EVANS AND ASSOCIATES INC.

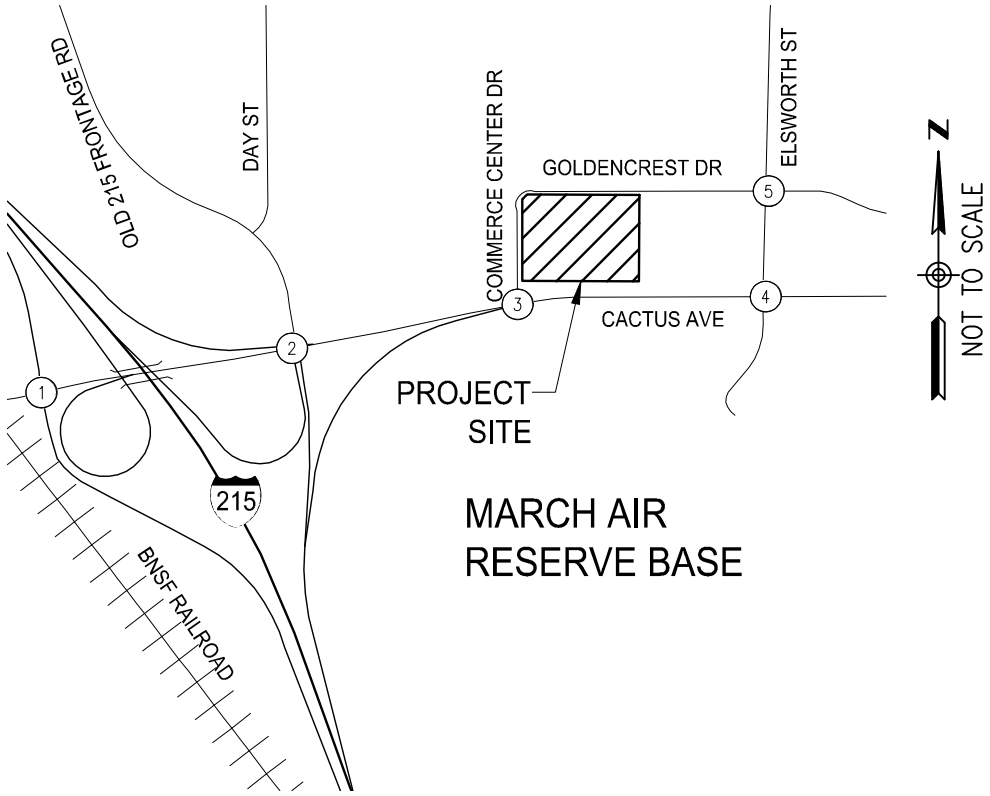
FIGURE 10: PROJECT DIVERTED-LINK TRIPS

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





PASS-BY TRIPS

AM PEAK PERIOD	-	257 IN / 245 OUT
PM PEAK PERIOD	-	240 IN / 227 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

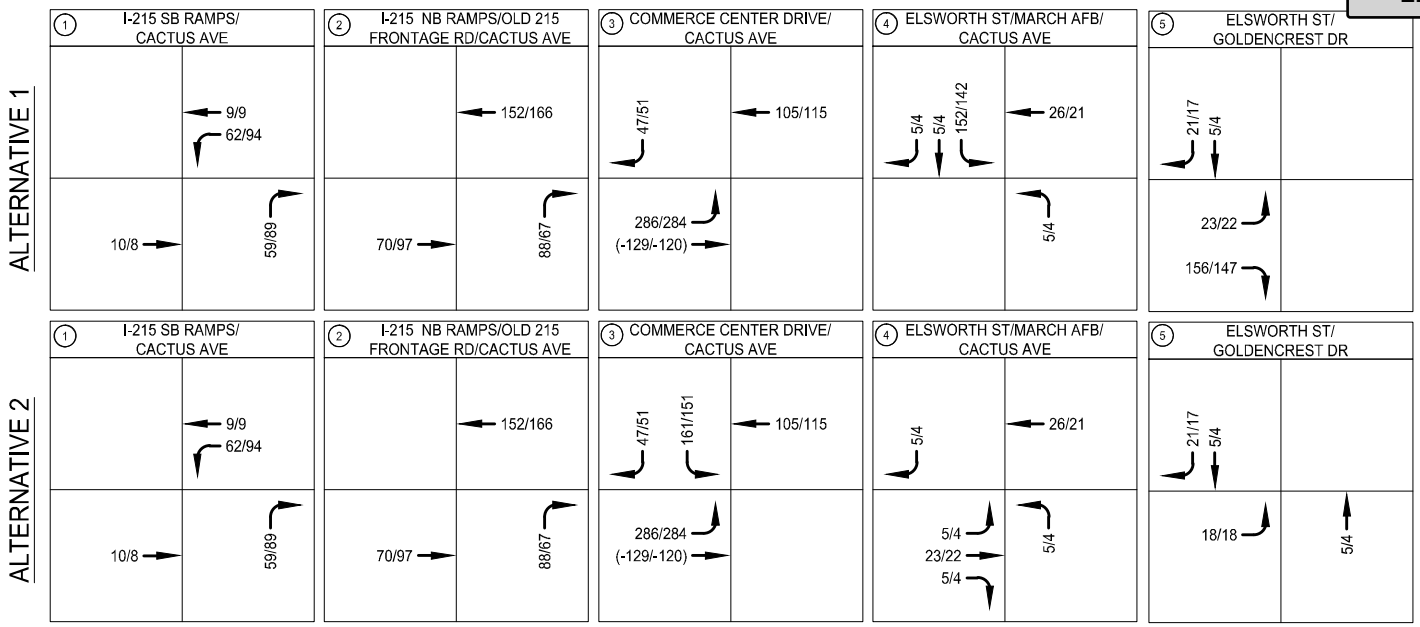
DAVID EVANS AND ASSOCIATES INC.

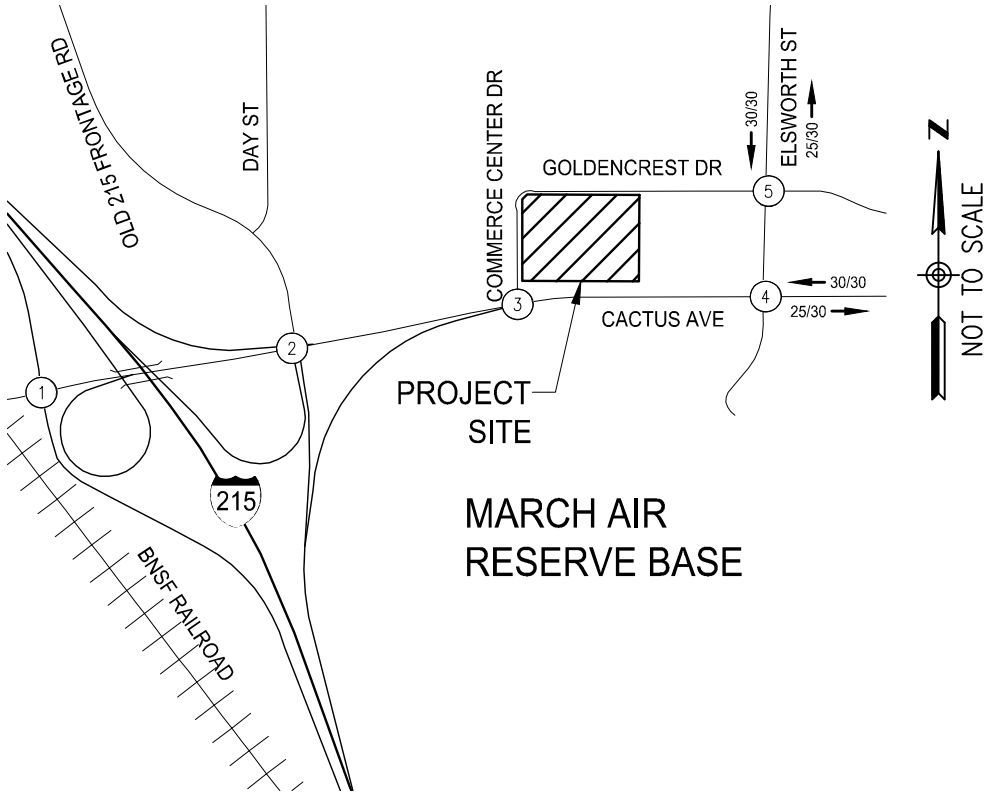
FIGURE 11: PROJECT PASS-BY TRIPS

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





TOTAL PROJECT TRIPS

AM PEAK PERIOD - 471 IN / 441 OUT

PM PEAK PERIOD - 450 IN / 435 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

FIGURE 12: TOTAL PROJECT TRIPS

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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4.1 Background plus Project Traffic Analysis

Based on the proposed project trip generation, traffic distribution and assignment patterns intersection capacity analyses were conducted to assess the estimated project impacts.

The project trips were added to the Existing Traffic Volumes to develop the Existing plus Project Traffic Volumes for Alternative 1 and Alternative 2 respectively, illustrated in *Figure 13* and *Figure 14.* Intersection capacity analysis for the Background plus Project Condition was performed using the methodology presented in *Chapter 2.* The results of the analysis are shown in *Table 4-2* and provided in *Appendix D.*

Table 4-2: Intersection Capacity Analysis - Background plus Project Condition
Traffic Study – Moreno Valley Cactus

Intersection		AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	Cactus Avenue and I-215 Freeway SB Ramps	17.5	B	22.9	C
2	Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road	99.99*	F	15.3	B
	Mitigated: Widen westbound Cactus Avenue	53.0	D	11.6	B
3	Cactus Avenue and Commerce Center Drive	20.2	C	19.6	B
	Mitigated: Widen westbound Cactus Avenue	14.6	B	14.0	B
	Mitigated: Alternative 1 Addition of Right Turn Lane	14.1	B	13.1	B
	Mitigated: Alternative 2 Southbound left lane	21.9	C	20.5	C
4	Cactus Avenue and Elsworth Street/ March ARB	29.3	C	30.8	C
	Alternative 2 Redistribution and intersection improvement	22.2	C	22.9	C
5	Goldencrest Drive and Elsworth Street (3)	15.8	C	15.5	C
	Alternative 2 Redistribution	15.1	C	14.5	B
6	Cactus Avenue at Driveway #1 (3)	60.1	F	73.6	F
	Mitigated: Widen westbound Cactus Avenue	87.4	F	99.99*	F
	Alternative 2 Redistribution	87.4	F	99.99*	F
7	Commerce Center at Driveway #2 (3)	10.2	B	10.0	B
	Alternative 2 Redistribution	11.5	B	11.4	B
8	Commerce Center at Driveway #3 (3)	9.4	A	9.3	A
	Alternative 2 Redistribution	9.6	A	9.6	A
9	Goldencrest Drive at Driveway #4 (3)	9.3	A	9.6	A
	Alternative 2 Redistribution	8.6	A	8.8	A
10	Goldencrest Drive at Driveway #5 (3)	9.7	A	10.0	B
	Alternative 2 Redistribution	8.8	A	9.0	A

99.99* - Level of Service exceeds the LOS F threshold
(1) Delay –In Seconds
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection

Source: **David Evans and Associates, Inc.**

As provided in *Table 4-2* under Background plus Project Condition, most of the study intersections are anticipated to operate at an acceptable LOS with the exception of the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road and the Project Driveway #1 and Cactus Avenue.

The intersection of Project Driveway on Cactus Avenue is shown to operate at a LOS F with the maximum delay of 110 seconds; several unique characteristics contribute to the operation of the intersection. The driveway is right-in/right-out; the southbound right turn lane delay is calculated considering three (3) westbound travel lanes.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

The project driveway is evaluated as a two-way stop controlled intersection within a coordinated network. The adjacent intersection to the west is a signalized intersection operating with a 120 second cycle length. Do to the proximity to the signalized intersection adequate gaps are anticipated to accommodate the 75 foot maximum queue, which translated to three (3) vehicles.

The intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road is anticipated to continue to operate at LOS F during the AM peak period, which continues to exceed the City of Moreno Valley's peak hour intersection Level of Service standard.

The existing condition mitigation proposed widening of westbound Cactus Avenue will provide a westbound through lane to the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road.

In addition to the existing condition mitigation the Alternative 1 provides a westbound right turn lane at the intersection of Commerce Center Drive and Cactus Avenue. The Alternative 1 Intersection Geometrics are illustrated in *Figure 15.*

The addition to the Alternative 1 improvements, Alternative 2 provides a redistribution of traffic exiting the site. The redistribution of traffic exiting the site will not negatively impact the intersection of Cactus Avenue and Commerce Center Drive but rather provide an improvement to the LOS of intersections Cactus Avenue and Elsworth Street/ March ARB and Goldencrest Drive and Elsworth Street. This is directly related to the reduction of exiting traffic utilizing the minor approaches of Elsworth Street for intersection Cactus Avenue and Elsworth Street/ March ARB and Goldencrest Drive for intersection Goldencrest Drive and Elsworth Street. The redistribution of the traffic to the major movement allows more green time to be allocated to the east/west major road approaches. The Alternative 2 Intersection Geometrics are illustrated in *Figure 16.*

Mitigations proposed at the intersection of Cactus Avenue and Elsworth Street/ March ARB are to accommodate the anticipated eastbound left turn queue and the vehicles previously entering the commercial center turning left. The eastbound left turn queue is anticipated to extend beyond the existing 150 ft storage pocket. This mitigation would include the closure of the existing left turn pocket into the adjacent commercial center in order to extend the eastbound left turn pocket to 300 feet, removing the southbound right turn overlap, and allowing eastbound u-turns. The intersection of Cactus Ave and Elsworth St will operate at the same overall LOS with the removal of the southbound right turn overlap and the additional traffic incurred by the closure of the adjacent commercial center left turn pocket during the am and pm peak periods.

Traffic signal warrant analysis was completed with the background plus project condition volume for the un-signalized intersection of Goldencrest Drive and Elsworth Street, resulting in the intersection not complying with any of the warrants.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Roadway Segment capacity analysis for the Background plus Project Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 4-3* and provided in *Appendix F.*

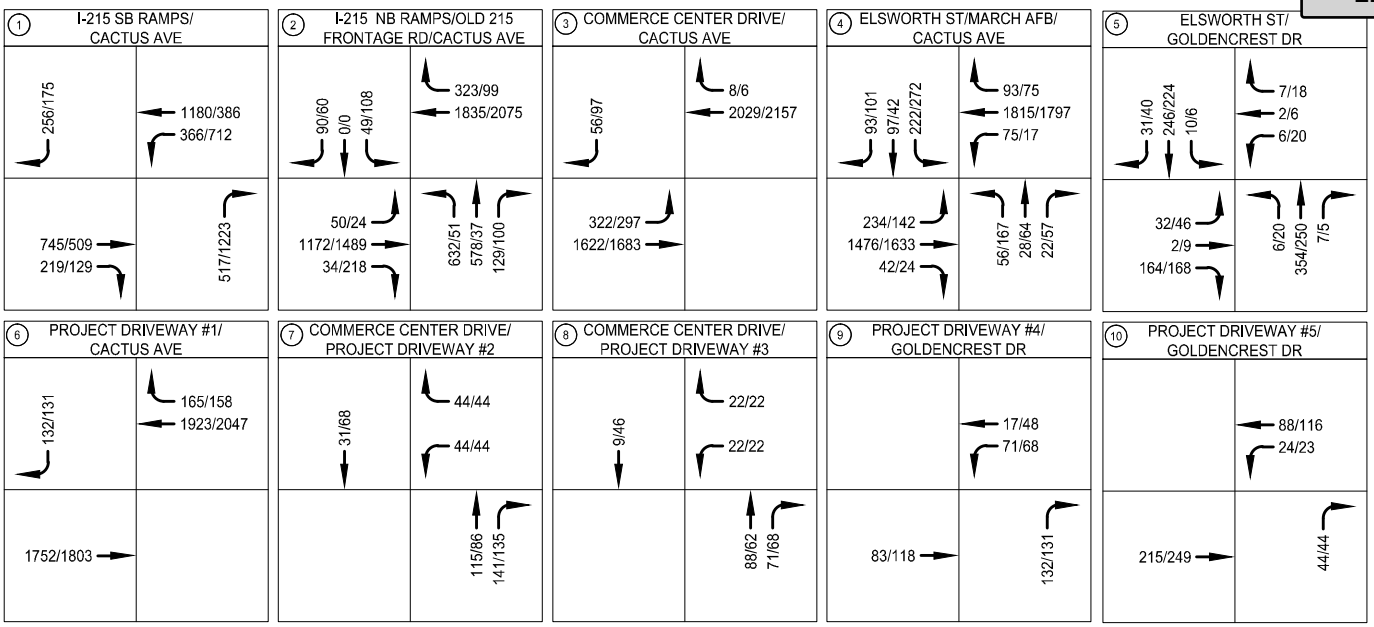
Table 4-3: Roadway Segment Capacity Analysis - Background plus Project Condition
Traffic Study – Moreno Valley Cactus

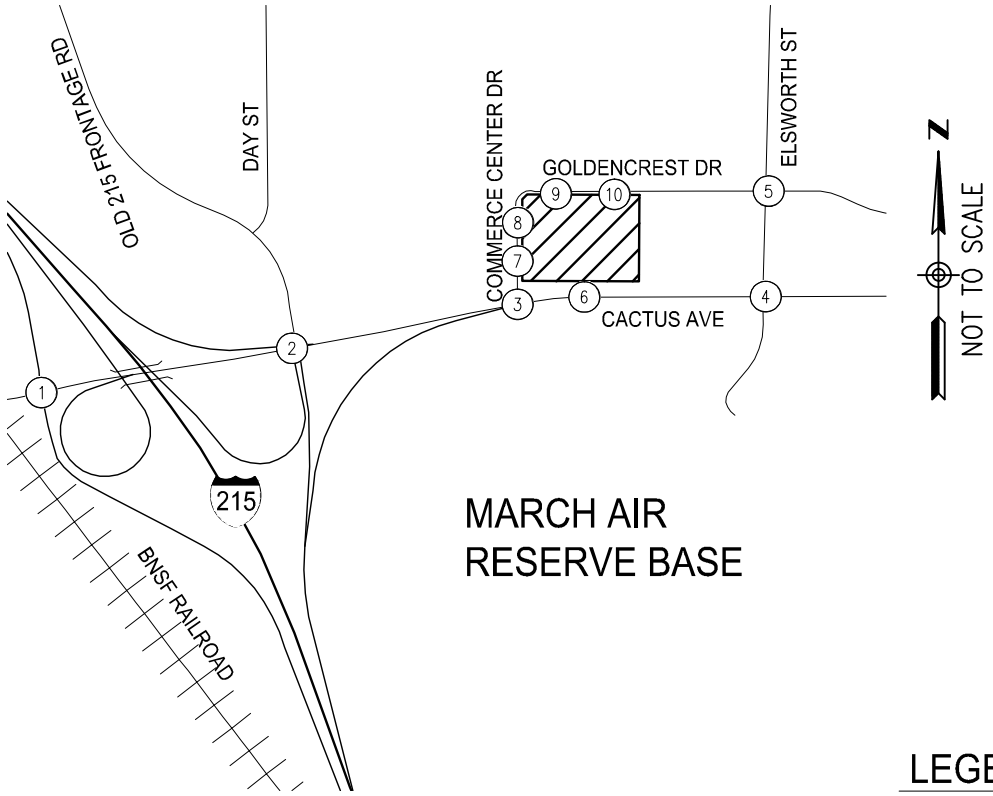
	Roadway Segment	Type of roadway	ADT	LOS
1	Commerce Center Drive	Two Lane Industrial Collector	4,700	A
2	Goldencrest Drive	Two Lane Industrial Collector	3,100	A
3	Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)	Four Lane Divided Arterial	44,300	F
4	Cactus Avenue (Commerce Center Drive to Elsworth Street)	Six Lane Divided Arterial	43,900	C
5	Cactus Avenue (Elsworth Street to Frederick Street)	Six Lane Divided Arterial	44,000	C
6	Elsworth Street (Cactus Avenue to Alessandro Boulevard)	Four Lane Divided Arterial	6,600	A

ADT – Average Daily Traffic
LOS – Level of Service
Source: **David Evans and Associates, Inc.**

As provided in *Table 4-3* under Background plus Project Condition, most of the roadway segments are anticipated to continue operating at an acceptable LOS C or better with the exception of the roadway segment of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive. The roadway segment of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive is anticipated to continue to operate at LOS F, which exceeds the City of Moreno Valley's peak hour roadway segment Level of Service standard.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

FIGURE 13: BACKGROUND + PROJECT CONDITION TRAFFIC VOLUMES

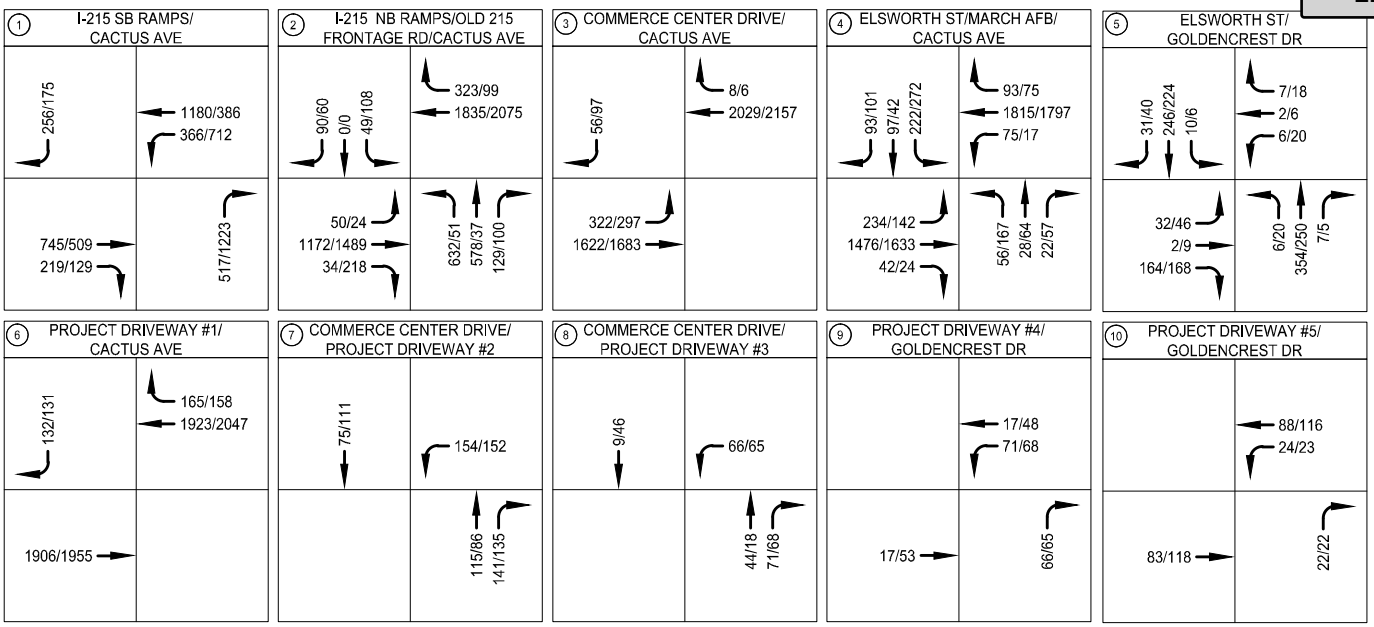
ALTERNATIVE 1

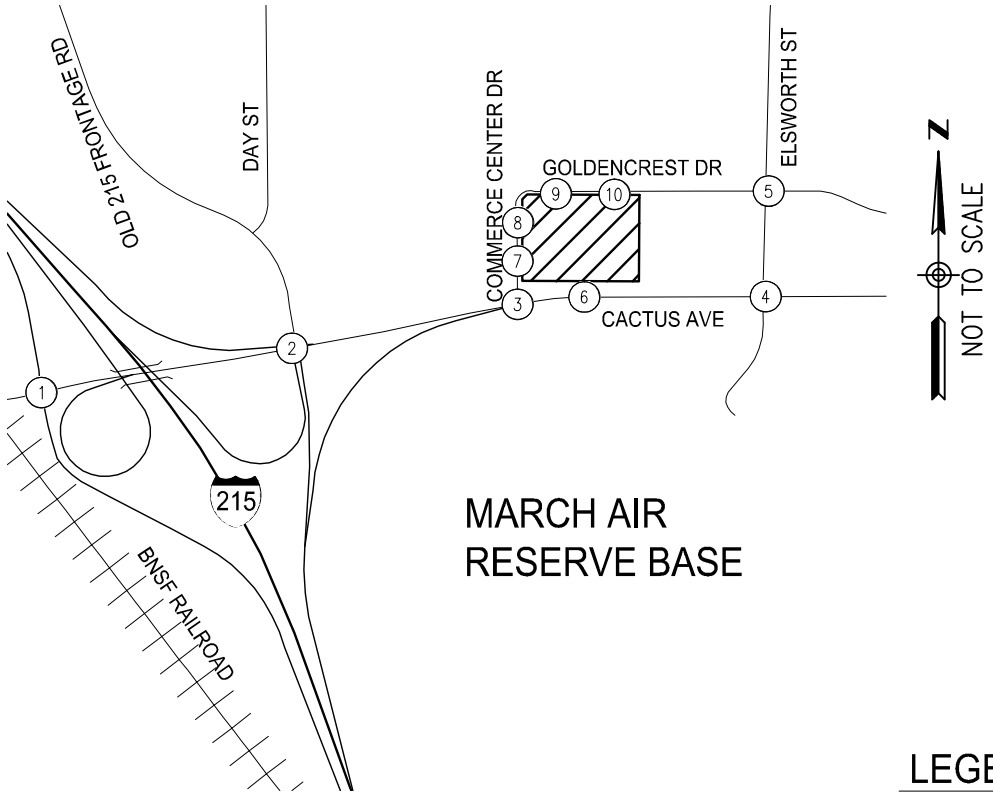
MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

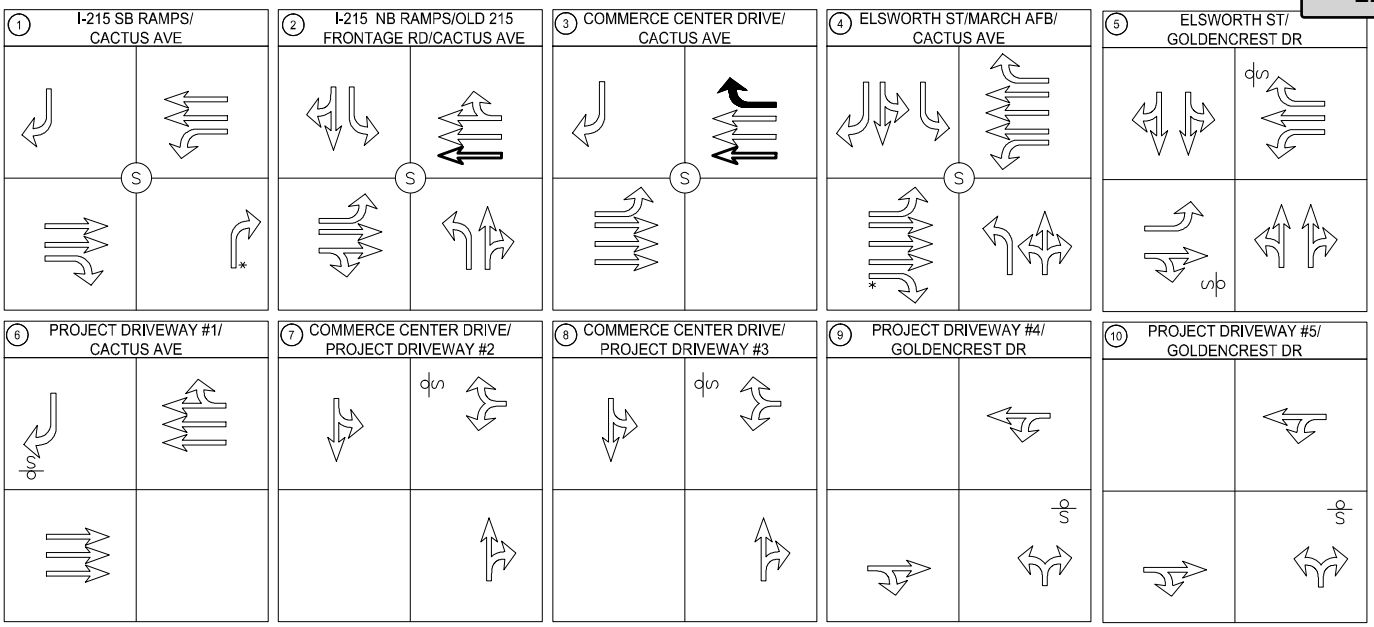
FIGURE 14: BACKGROUND + PROJECT CONDITION TRAFFIC VOLUMES ALTERNATIVE 2

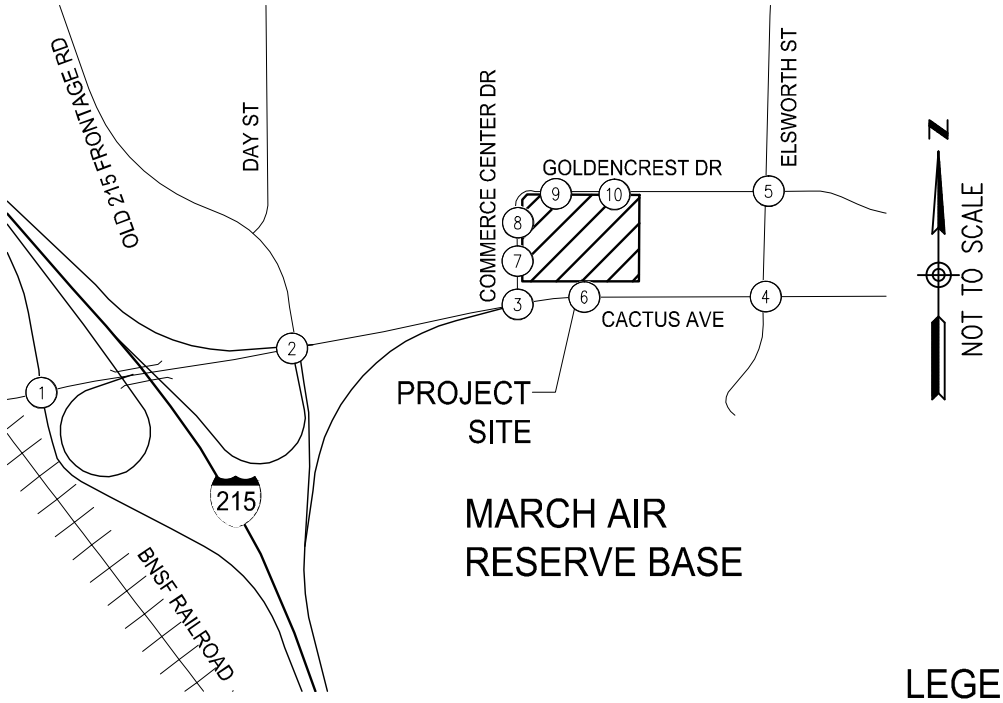
MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

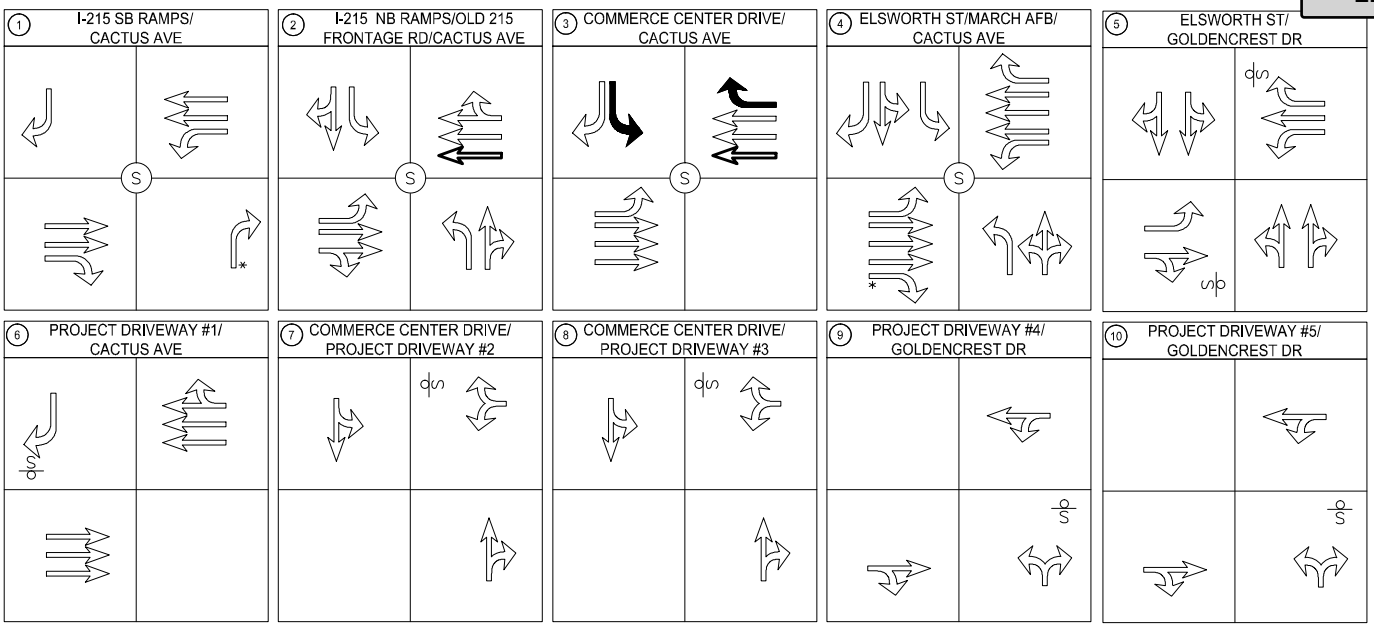
- UNSIGNALIZED INTERSECTION
- FREE RIGHT TURN
- STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- EXISTING GEOMETRICS
- PROPOSED EXISTING GEOMETR
- PROPOSED PROJECT GEOMETR

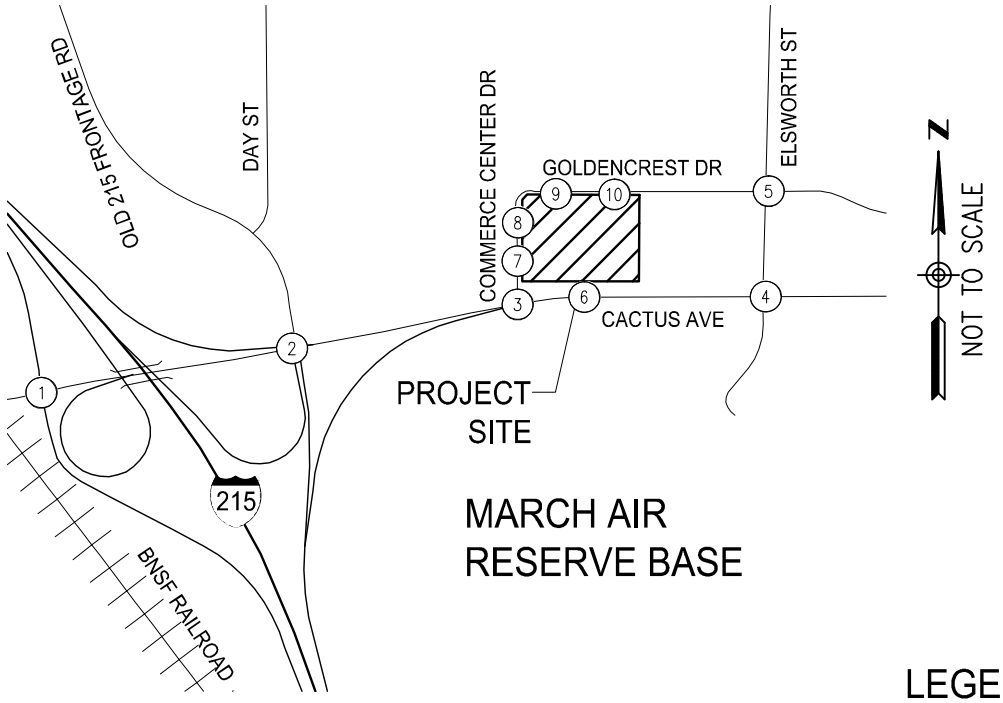
FIGURE 15:BACKGROUND + PROJECT CONDITION ALTERNATIVE 1 INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

- UNSIGNALIZED INTERSECTION
- FREE RIGHT TURN
- STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- EXISTING GEOMETRICS
- PROPOSED EXISTING GEOMETR
- PROPOSED PROJECT GEOMETR

FIGURE 16:BACKGROUND + PROJECT CONDITION ALTERNATIVE 2 INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

4.2 Onsite Circulation and Driveway Analysis

The driveways locations are illustrated on *Figure 17.* The turn restriction for the project driveways are as follows:

1. The Driveway #1 at Cactus Ave is restricted to a right in and right out only.
2. The Driveway #2 at Commerce Center Dr will be provided as full access.
3. The Driveway #3 at Commerce Center Dr will be provided as full access.
4. The Driveway #4 at Goldencrest Dr will be provided as full access.
5. The Driveway #5 at Goldencrest Dr will be provided as full access.

The driveway spacing distances between intersections, adjacent driveways on the same side of the street, and adjacent driveways on the opposite side of the street are identified on *Table 4-4.*

Table 4-4: Driveway Spacing
Traffic Study – Moreno Valley Cactus

Driveway Location	Intersection		Adjacent Driveway Same side		Adjacent Driveway Opposite side	
	Standard	Distance	Standard	Distance	Standard	Distance
Cactus Avenue at Driveway #1	Limited Access	344 ft	Limited Access	-	Limited Access	-
Commerce Center at Driveway #2	350 ft	**213 ft**	150 ft	214 ft	150 ft	**105 ft**
Commerce Center at Driveway #3	350 ft	**141 ft**	150 ft	214 ft	150 ft	**109 ft**
Goldencrest Drive at Driveway #4	350 ft	**320 ft**	150 ft	290 ft	150 ft	179 ft / **45 ft**
Goldencrest Drive at Driveway #5	350 ft	-	150 ft	290 ft	150 ft	245 ft / 7 **ft**

Denoted in **Bold** are the vaiance to City Standards Table 9.11.080-14
Source: **David Evans and Associates, Inc.**

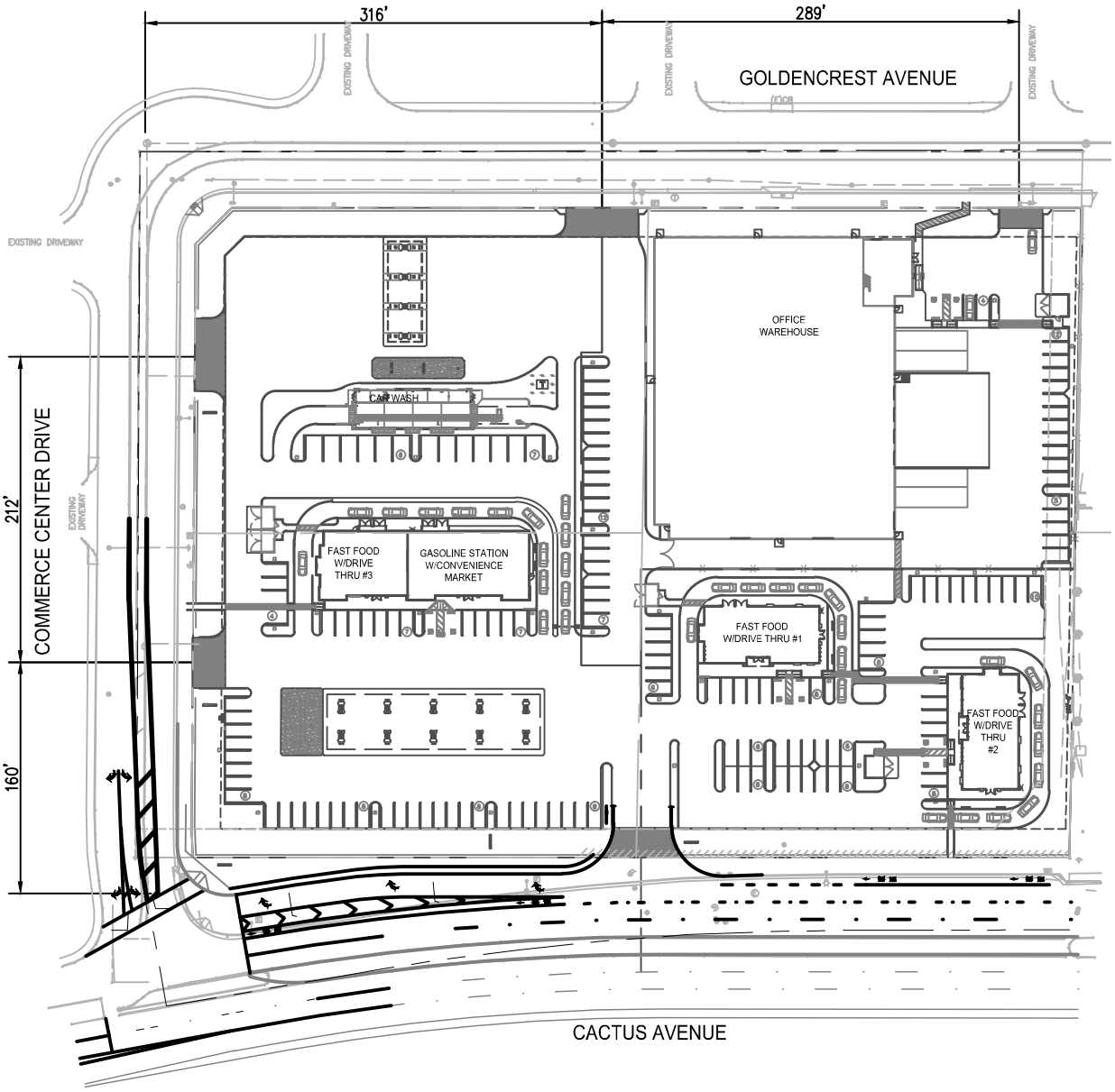
As presented in *Table 4-4* the driveway spacing for most driveways are in compliance with the City of Moreno Valley Municipal Code – Design Guidelines Table 9.11.080-14. A variance is requested for the driveway spacing distance denoted in bold.

The Table 9.11.080-14 identify that a street classified as divided major/modified major would have limited access. A footnote included that for the distance from a driveway to an intersection access may be limited to the minimum movements necessary to safely expedite traffic and access may be restricted by medians. These City standards affect the Driveway #1 since this driveway is proposed along a segment of Cactus Avenue identified as a divided major/modified major. As previously discussed the proposed driveway #1 location is restricted to a right in and right out only.

The driveways #2 - #5 are proposed along industrial collector streets. The City standard for the distance from a driveway to an intersection is listed as 350 ft, distance from an adjacent driveway same side and distance from an adjacent driveway opposite side is listed as 150 feet. A variance is requested for the distance from a driveway to an intersection and distance from an adjacent driveway opposite side for the proposed location of driveway #2 - driveway #5. The proposed locations of driveway #2 - driveway #5 are in compliance with the City of Moreno Valley Municipal Code – Design Guidelines for the intersection and adjacent driveway same side standard.

The truck turning templates from Alternative 1 and Alternative 2 are provided in *Figure 18* and *Figure 19.*

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

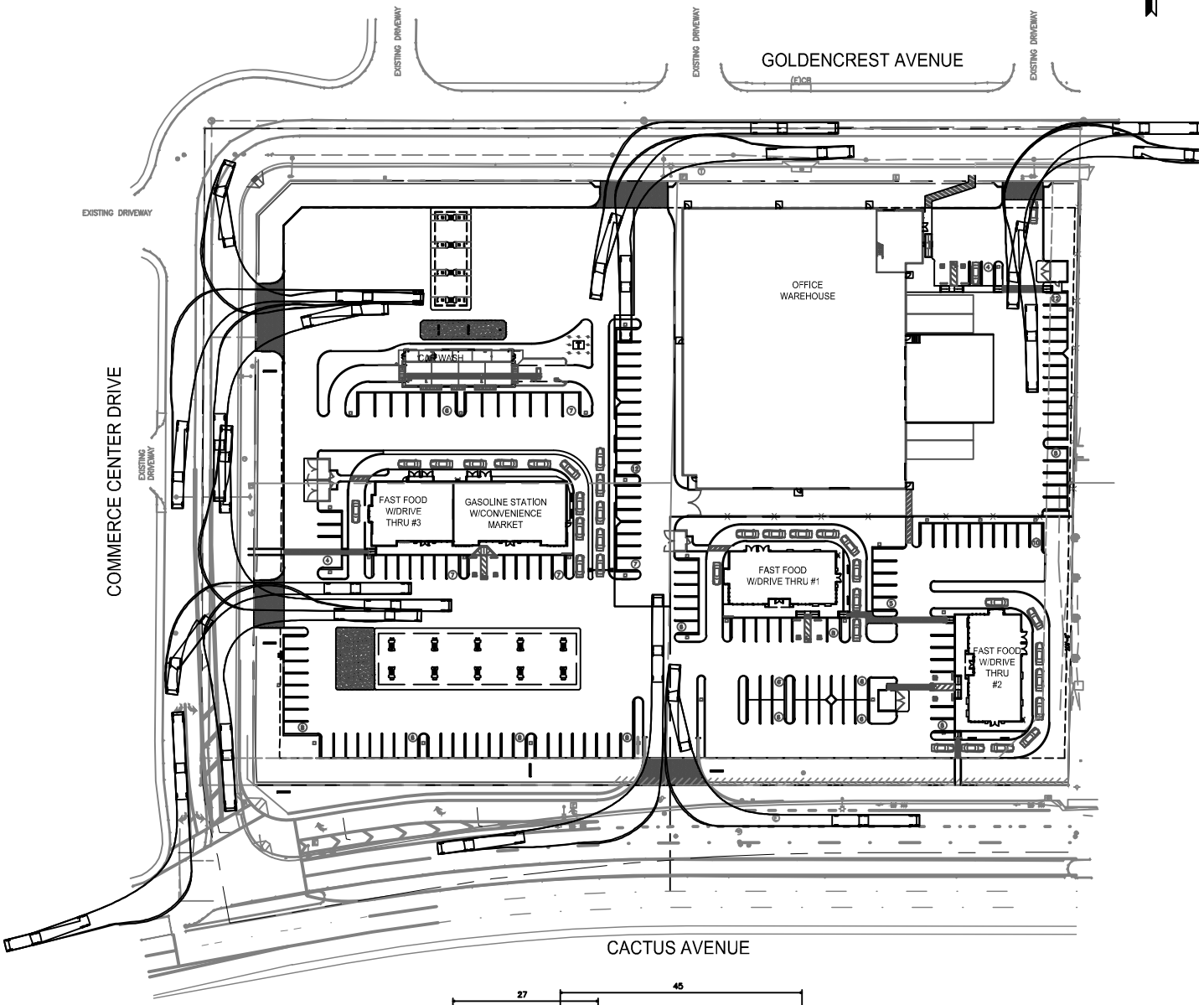


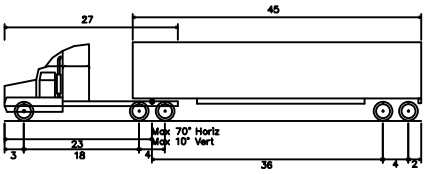
NOT TO SCALE

DAVID EVANS AND ASSOCIATES INC.

FIGURE 17: DRIVEWAY LOCATIONS
MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





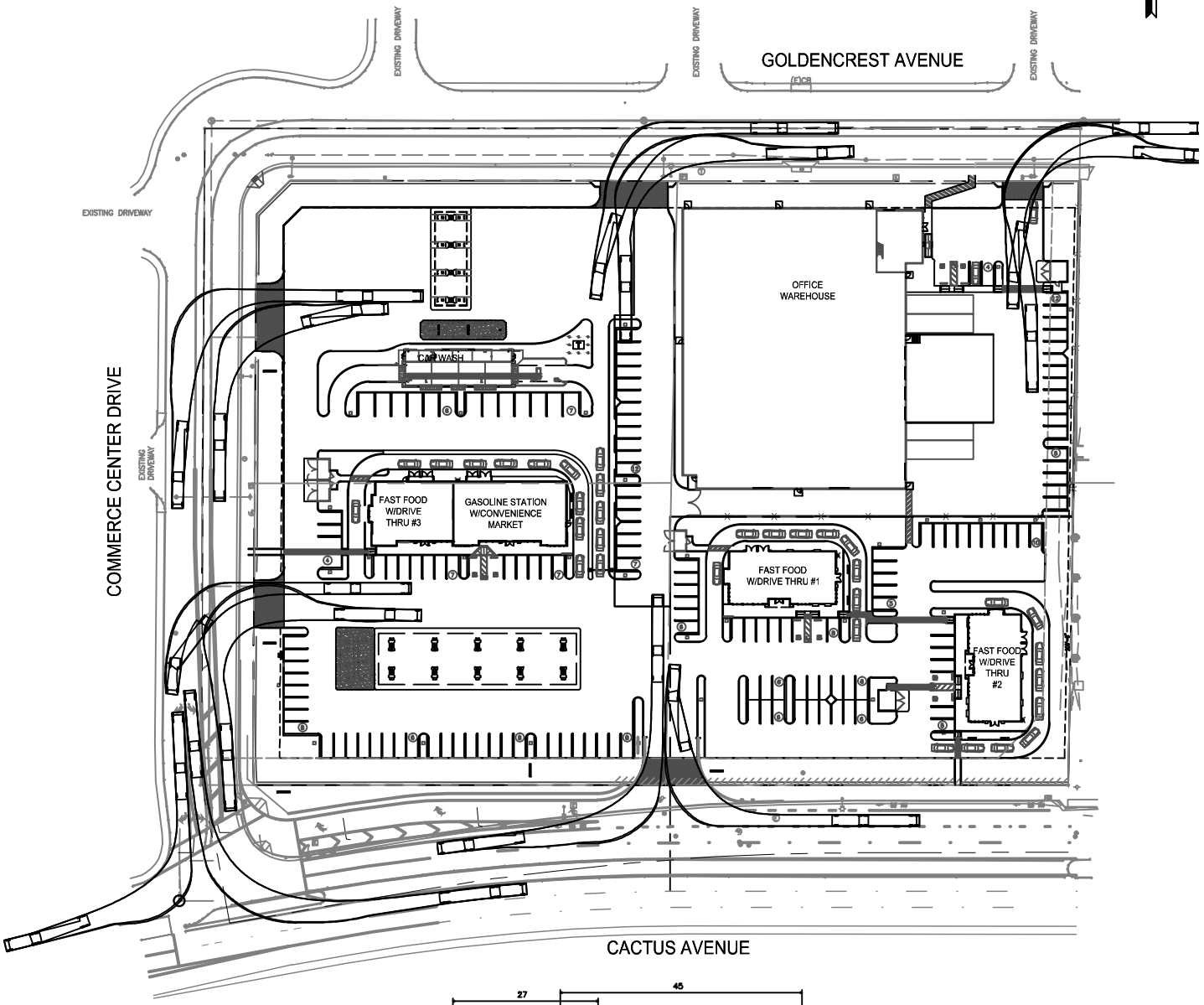
California Legal Design Vehicle	
Overall Length	65.000ft
Overall Width	8.500ft
Overall Body Height	12.227ft
Min Body Ground Clearance	1.422ft
Track Width	8.500ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	26.30°

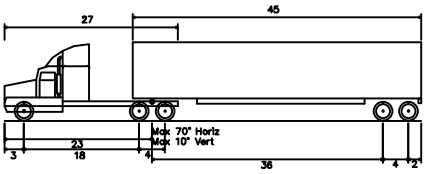
FIGURE 18: ALTERNATIVE 1
TRUCK TURNING TEMPLATE

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





California Legal Design Vehicle	
Overall Length	65.000ft
Overall Width	8.500ft
Overall Body Height	12.227ft
Min Body Ground Clearance	1.422ft
Track Width	8.500ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	26.30°

DAVID EVANS AND ASSOCIATES INC.

FIGURE 19: ALTERNATIVE 2
TRUCK TURNING TEMPLATE

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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The estimated queue length, available storage length, and proposed storage lengths for the turn pockets are provided in *Table 4-5* each driveway and intersection.

Table 4-5-1: Queue Length Comparison of Background Conditions
Traffic Study – Moreno Valley Cactus

				Plus Project Condition		Plus Project Condition with Mitigation		Plus Project Condition with Alternative 1		Plus Project Condition with Alternative 2	
				AM	PM	AM	PM	AM	PM	AM	PM
Intersection/Movement			Storage Distance	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue
1	Cactus Ave at I-215 SB Ramps	EBT		500	475	475	475	400	**450**	**500**	475
		EBT		525	525	500	500	325	425	**500**	450
		EBR	275	425	75	325	150	200	350	325	75
		WBL	1,250	175	200	225	225	**225**	200	**225**	200
		WBT		125	50	125	50	100	50	125	25
		WBT		100	25	100	25	75	25	100	25
		SBR	1,100	275	650	275	725	275	**750**	275	**750**
2	Cactus Ave at I-215 NB Ramps/ Old 215 Frontage Rd	EBL	150	175	100	200	100	200	100	200	75
		EBT		250	200	250	150	**250**	175	250	125
		EBTR		275	225	250	175	225	200	**250**	175
		WBT		625	450	550	25	475	25	450	75
		WBT		-	-	600	350	**625**	25	**675**	475
		WBTR		525	550	525	575	525	375	625	600
		NBL	125	225	100	225	100	275	100	225	100
		NBTR	850	825	150	825	150	**825**	125	**825**	175
		SBL	100	75	150	100	150	100	**150**	100	**125**
		SBTR		100	125	100	150	100	100	125	125

(-) No queue length was reported
95th %– 95th Percentile Queue provided in feet rounded up to the nearest 25', Length of vehicle
Source: **David Evans and Associates, Inc.**

As presented in *Table 4-5* the anticipated maximum queue lengths are provided in bold by intersection for each condition. The current storage distances at the intersections of Cactus Ave at I-215 SB Ramps and Cactus Ave at I-215 NB Ramps/ Old 215 Frontage Rd are adequate to support the anticipated maximum queue length.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

Table 4-5: Queue Length Comparison of Background Conditions– Continued –
Traffic Study – Moreno Valley Cactus

				Plus Project Condition		Plus Project Condition with Mitigation		Plus Project Condition with Alternative 1		Plus Project Condition with Alternative 2	
				AM	PM	AM	PM	AM	PM	AM	PM
Intersection/Movement			Storage Distance	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue
3	Cactus Ave at Commerce Center Dr	EBL	225**(325)**	325	325	250	225	250	**275**	**300**	250
		EBT		200	225	250	100	75	150	200	125
		EBT		175	100	50	75	50	75	150	125
		EBT		100	75	50	75	50	75	100	125
		WBT		300	275	350	300	**350**	250	**350**	300
		WBT		-	-	325	300	300	300	325	300
		WBT		-	-	-	-	300	300	300	275
		WBTR		300	300	300	300	**-**	-	-	-
		WBR	**(250)**	-	-	-	-	25	25	25	25
		SBL	**(200)**	-	-	-	-	-	-	150	**175**
		SBR	**(200)**	125	200	100	175	75	**150**	100	150
4	Cactus Ave at Elsworth St/ March ARB	EBL	150**(300)**	175	150	175	175	225	175	**250**	200
		EBT		150	200	200	200	**250**	225	175	175
		EBT		150	200	200	200	**250**	225	200	175
		EBT		175	150	200	175	**250**	200	200	225
		EBR	350	-	-	-	-	-	-	-	-
		WBL	140	300	125	300	100	250	125	225	50
		WBT		625	575	675	400	**675**	375	**700**	325
		WBT		600	575	650	450	**675**	450	**675**	400
		WBT		650	600	625	525	650	525	650	525
		WBR	200	425	425	425	275	400	375	400	275
		NBL		75	150	75	150	50	175	75	125
		NBLTR		125	200	125	200	125	**200**	150	**200**
		SBL	100	175	150	175	175	200	175	200	125
		SBLT		200	150	225	200	**225**	200	**250**	150
		SBR	100	75	25	150	100	75	75	100	100

- : No queue length was reported
(XXX) : Storage lengths provide in bold represent proposed mitigations
95^{th} %: 95^{th} Percentile Queue provided in feet rounded up to the nearest 25', Length of vehicle
Source: **David Evans and Associates, Inc.**

As presented in *Table 4-5* the anticipated maximum queue lengths are provided in bold by intersection for each condition. Most of the current storage distances are adequate to support the anticipated maximum queue length.

The Alternative 2 mitigations proposed for the intersection of Cactus Ave at Elsworth St/ March ARB are to extend the eastbound left turn pocket to 300 feet. This mitigation would include the closure of the existing left turn pocket into the adjacent commercial center.

The Alternative 2 mitigations proposed for the intersection of Cactus Ave at Commerce Center Dr are to extend the eastbound left turn pocket to 325 feet, providing a 250 foot westbound right turn lane, and a 200 foot southbound left turn lane.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

Table 4-5: Queue Length Comparison of Background Conditions – Continued – Traffic Study – Moreno Valley Cactus

				Plus Project Condition		Plus Project Condition with Mitigation		Plus Project Condition with Alternative 1		Plus Project Condition with Alternative 2	
				AM	PM	AM	PM	AM	PM	AM	PM
Intersection/Movement			Storage Distance	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue
5	Goldencrest Dr at Elsworth St	EBL	75	50	50	50	75	50	50	50	**75**
		EBTR		75	75	75	75	75	**75**	50	50
		WBL	90	25	25	25	50	50	50	25	**50**
		WBT		25	25	25	25	50	25	25	**50**
		WBR	90	25	25	50	50	50	**50**	25	**50**
		NBLT		-	25	25	50	**50**	25	**50**	**50**
		NBTR		-	-	-	-	-	-	-	-
		SBLT		50	25	-	50	**50**	25	**25**	**25**
		SBTR		-	-	-	-	-	-	-	-
6	Cactus Ave at Driveway #1	WBT	**N/A**	-	-	-	-	-	-	-	-
		WBT	**N/A**	-	-	-	-	-	-	-	-
		WBTR		-	-	-	-	-	-	-	-
		SBR	*	100	100	75	100	75	**75**	75	75
7	Commerce Center Dr at Driveway #2	WBLR	*	75	150	75	75	75	**75**	75	**100**
		NBTR	**N/A**	-	-	-	-	-	-	-	-
		SBLT	**TWLTL**	-	125	-	75	-	-	-	-

- : No queue length was reported
***** : Denotes a project driveway.
N/A : Denotes a movement that is not impacted by the project traffic
(XXX) : Denotes storage lengths included in proposed mitigations
TWLTL : Two way left turn lane
95^{th} %: 95^{th} Percentile Queue provided in feet rounded up to the nearest 25', Length of vehicle
Source: **David Evans and Associates, Inc.**

As presented in *Table 4-5* the anticipated maximum queue lengths are provided in bold by intersection for each condition. The current storage distances at the intersection of Goldencrest Dr and Elsworth St are adequate to support the anticipated maximum queue length.

The Cactus Avenue at Driveway #1 estimated maximum queue lengths for Alternative 1 and Alternative 2 at the driveway are 75 feet. Do to the proximity to the signalized intersection adequate gaps are anticipated to accommodate the 75 foot maximum queue, which translates to three (3) vehicles. The site as presented will accommodate the anticipated maximum queue. A throat is provided to allow for stacking at the Driveway #1.

The Commerce Center Dr at Driveway #2 estimated maximum queue lengths for Alternative 1 and Alternative 2 at the driveway are 75 and 100 feet this is well within the available storage space provided. The two way left turn lane will accommodate the entering trips, as illustrated no queue is estimated for the entering trips.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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Table 4-5: Queue Length Comparison of Background Conditions – Continued –
Traffic Study – Moreno Valley Cactus

				Plus Project Condition		Plus Project Condition with Mitigation		Plus Project Condition with Alternative 1		Plus Project Condition with Alternative 2	
				AM	PM	AM	PM	AM	PM	AM	PM
Intersection/Movement			Storage Distance	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue	95th% Queue
8	Commerce Center Dr at Driveway #3	WBLR	*	50	50	75	50	50	**75**	75	**75**
		NBTR	**N/A**	-	-	-	-	-	-	-	-
		SBLT	**TWLTL**	-	-	-	-	-	-	-	-
9	Goldencrest Dr at Driveway #4	EBTR	**N/A**	-	-	-	-	-	-	-	-
		WBLT	**TWLTL**	25	25	25	50	25	**50**	25	**25**
		NBLR	*	75	75	75	75	75	75	50	75
10	Goldencrest Dr at Driveway #5	EBTR	**N/A**	-	-	-	-	-	-	-	-
		WBLT	**TWLTL**	50	25	25	50	25	**25**	25	**50**
		NBLR	*	50	50	75	50	50	**50**	50	**50**

- : No queue length was reported
***** : Denotes a project driveway.
N/A : Denotes a movement that is not impacted by the project traffic
(XXX) : Denotes storage lengths included in proposed mitigations
TWLTL : Two way left turn lane
95^{th} %: 95^{th} Percentile Queue provided in feet rounded up to the nearest 25', Length of vehicle
Source: **David Evans and Associates, Inc.**

As presented in *Table 4-5* the anticipated maximum queue lengths are provided in bold by intersection for each condition.

The Commerce Center Dr at Driveway #3 estimated maximum queue lengths for Alternative 1 and Alternative 2 at the driveway are 75 feet this is well within the available storage space provided. The two way left turn lane will accommodate the entering trips, as shown no queue is estimated for the entering trips.

The Goldencrest Dr at Driveway #4 estimated maximum queue lengths for Alternative 1 and Alternative 2 at the driveway are 50 and 25 feet this is well within the available storage space provided. The two way left turn lane will accommodate the entering trips, as shown the estimated maximum queue length for the entering trips are 75 feet.

The Goldencrest Dr at Driveway #5 estimated maximum queue lengths for Alternative 1 and Alternative 2 at the driveway are 25 and 50 feet this is well within the available storage space provided. The two way left turn lane will accommodate the entering trips, as shown the estimated maximum queue length for the entering trips are 50 feet.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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4.3 Non-Motorized Site Access

The City of Moreno Valley released the Bicycle Master Plan by KTU+A Planning + Landscape Architecture, dated November 2014. The document provided information on Existing Facilities and Programs, Transit Connections, and Recommended Facilities. The Bicycle Master Plan reference figures are provided in the *Appendix C.*

Currently a Class 2 Bike Lane existing on Alessandro Blvd from Old 215 Frontage Road to Elsworth as identified on the City of Moreno Valley Bicycle Master Plan. A Class 3 Bike Route exists on Cactus Avenue from Heacock Street to Lasselle Street and a Class 2 Bike Lane from Lasselle Street to Nason Street.

The recommendations included in the Bicycle Master Plan included recommendations for Class 1 Multi-Use Paths ("Bicycle Paths"), Class 2 Bike Lanes, Class 3 Bicycle Routes, and Bicycle Boulevards. It was recommended to provide a Class 2 Bike Lane on Cactus Avenue from Old 215 Frontage Road to Lasselle Street, which will connect to the existing Class 2 Bike Lane that extends to Nason Street. The recommendations included a Class 2 Bike Lane on Elsworth Street from Cactus Avenue to Eucalyptus Avenue.

The Riverside Transit Agency offers 36 local fixed-routes services within a 2,500 square mile area of western Riverside County. Among these 36 local fixed-routes services there are nine (9) routes that have stops in Moreno Valley. Of these nine (9) routes two (2) routes have a stop within a mile of the project site. The route RTA 11 offers stops near the intersection of Frederick St and Brodiea Ave and a stop/transfer point at the intersection of Alessandro Blvd and Frederick St. The route RTA 20 offers stops at the intersection of Alessandro Blvd and Elsworth Street and a stop/transfer point at the intersection of Alessandro Blvd and Frederick St.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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5 CUMULATIVE CONDITION

The Cumulative Condition addresses impacts due to cumulative project traffic and the 2% annual ambient growth within the study area.

Area Growth

To analyze the cumulative impacts, the inclusion of traffic generated by other projects within the study area is necessary. The Other Area projects include approved projects that were recently constructed or will be constructed by Project Completion.

The approved recently constructed or to be constructed Other Area projects are provided in *Table 5-1.* The project list was provided by the City of Moreno Valley.

Table 5-1: Other Area Project Land Uses
Traffic Study - Moreno Valley Cactus

	Use	Land Use	Quantity	Units
1	**Meridian Business Park North**	Industrial Park	5,985.000	TSF
2	**Amstar/Kaliber Development, PP22925**	General Light Industrial	42.222	TSF
		Heavy Industrial	409.312	TSF
		Commercial Retail	10.000	TSF
		General Office	258.102	TSF
3	**Alessandro Metrolink Station (Light Rail Transit Station)**	Light Rail Transit Station	300	SP
4	**Airport Master Plan (Airport)**	Airport Use	559.000	TSF
5	**PA 08-0047-0052 (Komar Cactus Plaza)**	Hotel	110	RMS
		Fat Food w/Drive Thru	8.000	TSF
		Commercial	42.400	TSF
6	**373K Industrial Facility**	High-Cube Warehouse	373.030	TSF
7	**PA 08-0072 (Overton Moore Properties)**	High-Cube Warehouse	520.000	TSF
8	**Harbor Freight Expansion**	High-Cube Warehouse	1,279.910	TSF
9	**Centerpointe Business Park**	General Light Industrial	356.000	TSF
10	**PA 04-0063 (Centerpointe Buildings 8-9)**	General Light Industrial	361.384	TSF
11	**PA 08-0093 (Centerpointe Business Park II)**	General Light Industrial	99.988	TSF
12	**March Lifecare Campus Specific Plan**	Medical Offices	190.000	TSF
		Commercial Retail	210.000	TSF
		Research & Education	200.000	TSF
		Hospital	50	Beds
		Institutional Residential	660	Beds
13	**TM 34748**	Single Family Detached Residential	135	DU
14	**PA 07-0035; PA 07-0039 (Moreno Valley Industrial Park)**	General Light Industrial	204.657	TSF
		High-Cube Warehouse	409.920	TSF

Source: (1) - **City of Moreno Valley**

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

Table 5-1: Other Area Project Land Uses–Continued–
Traffic Study - Moreno Valley Cactus

	Use	Land Use	Quantity	Units
15	**March Business Center**	General Light Industrial	16.732	TSF
		Warehousing	87.429	TSF
		High-Cube Warehouse	1,380.246	TSF
16	**PA 07-0079 (Indian Business Park)**	High-Cube Warehouse	1,560.046	TSF
17	**TR 22180/ Young Homes**	Residential	87	DU
18	**TM 33810**	Single Family Detached Residential	16	DU
19	**TM 34151**	Single Family Detached Residential	37	DU
20	**TM 33417**	Condo/Townhomes	10	DU
21	**TM 33607**	Condo/Townhomes	54	DU
22	**TM 34151**	Condo/Townhomes	251	DU
23	**TM 32917**	Condo/Townhomes	227	DU
24	**TR 32142**	Residential	81	DU
25	**a. Moreno Medical Campus**	Medical Offices	80.000	TSF
	b. Aqua Bella Specific Plan	Single Family Detached Residential	2922	DU
	c. TR 34329 (Granite Capitol)	Single Family Detached Residential	90	DU
	d. Cresta Bella	General Office	30.000	TSF
26	**TM 34681**	Condo/Townhomes	49	DU
27	**a. Convenience Store/Fueling Station**	Gas Station with Market	30.750	TSF
	b. Senior Assisted Living	Assisted Living Units	139	DU
	c. TR 31590 (Winchester Associates)	Single Family Detached Residential	96	DU
	d. TR 32548 (Gabel, Cook & Associates)	Single Family Detached Residential	107	DU
	e. 26th Corp. & Granite Capitol	Single Family Detached Residential	32	DU
	f. TR 32218 (Whitney)	Single Family Detached Residential	63	DU
	g. Moreno Marketplace	Commercial Retail	93.788	TSF
	h. Medical Plaza	Medical Offices	311.633	TSF
28	**Commercial Medical Plaza**	Medical Offices	311.633	TSF

Source: (1) - **City of Moreno Valley**

The trip generation rates for the other area projects during the AM (7-9 AM) peak and PM (4-6 PM) peak periods were obtained from the ITE Trip Generation Manual, 9th Edition. The resulting daily, am in and out, and pm in and out trips are provided in *Table 5-2.*

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

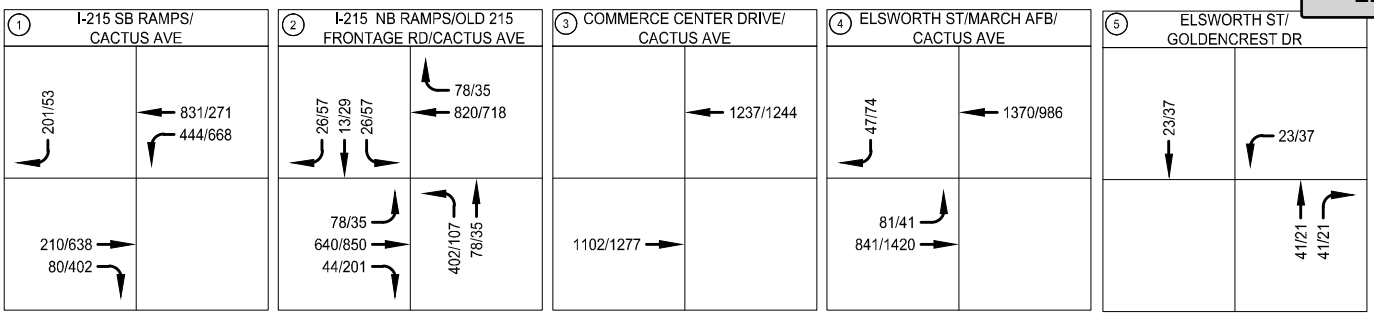
Table 5-2: Other Area Projects Trip Generation
Traffic Study - Moreno Valley Cactus

	Use		AM Peak Hour			PM Peak Hour		
		Daily	In	Out	Total	In	Out	Total
1	**Meridian Business Park North**	40,878	4,024	883	4,908	1,068	4,019	5,087
2	**Amstar/Kaliber Development, PP22925**	4,198	525	193	719	137	416	554
3	**Alessandro Metrolink Station (Light Rail Transit Station)**	753	257	64	321	216	156	372
4	**Airport Master Plan (Airport)**	-	-	-	-	-	-	-
5	**PA 08-0047-0052 (Komar Cactus Plaza)**	6,857	359	353	712	289	251	540
6	**373K Industrial Facility**	627	28	13	41	14	31	45
7	**PA 08-0072 (overton Moore Properties)**	874	39	18	57	19	43	62
8	**Harbor Freight Expansion**	2,150	97	44	141	48	106	154
9	**Centerpointe Business Park**	2,481	288	39	328	41	304	345
10	**PA 04-0063 (Centerpointe Buildings 8-9)**	2,519	293	40	332	42	308	351
11	**PA 08-0093 (Centerpointe Business Park II)**	697	81	11	92	12	85	97
12	**March Lifecare Campus Specific Plan**	20,249	1,354	958	2,313	884	1,279	2,163
13	**TM 34748**	1,285	25	76	101	85	50	135
14	**PA 07-0035; PA 07-0039 (Moreno Valley Industrial Park)**	2,115	197	37	233	39	209	248
15	**Mix Use: General Light Industrial, Warehousing, and High-Cube Warehouse**	2,747	139	54	193	60	150	210
16	**PA 07-0079 (Indian Business Park)**	2,621	118	53	172	58	129	187
17	**TR 22180/ Young Homes**	828	25	76	101	85	50	135
18	**TM 33810**	152	3	9	12	10	6	16
19	**TM 34151**	352	7	21	28	23	14	37
20	**TM 33417**	58	1	4	4	3	2	5
21	**TM 33607**	314	4	20	24	19	9	28
22	**TM 34151**	1,458	19	92	110	87	43	131
23	**TM 32917**	1,319	17	83	100	79	39	118
24	**TR 32142**	771	15	46	61	51	30	81
25	**Mix Use: Moreno Medical Campus (Medical Office), Aqua Bella Specific Plan, TR 34329 (Granite Capitol), and Cresta Bella (General Office)**	34,412	1,070	1,783	2,853	2,043	1,639	3,682
26	**TM 34681**	285	4	18	22	17	8	25
27	**Mix Use: Convenience Store/Fueling Station, Senior Assisted Living, TR 31590 (Winchester Associates), TR 32548 (Gabel, Cook & Associates),26th Corp. & Granite Capitol, TR 32218 (Whitney), Moreno Marketplace, and Medical Plaza**	18,623	952	658	1,610	763	1,118	1,881
28	**Commercial Medical Plaza**	11,259	588	156	745	312	801	1,113

(-) Trip Generation Ratios were not available
Source: "Trip Generation Manual, Institute of Transportation Engineers", 9th Edition

The other area projects trips were grouped together geographically. Then distributed and assigned to the surrounding streets and study intersection based on land use and location. The sum of the other area project trips are illustrated in *Figure 20 a*nd provided in the *Appendix D.*

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)



LEGEND

XX/XX - AM/PM PEAK HOUR VOLUM
(#) - STUDY INTERSECTIONS
△# - OTHER AREA PROJECT SIT

FIGURE 20: CUMULATIVE OTHER AREA PROJECT TRIPS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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5.1 Cumulative Condition Traffic Analysis

The results of the Cumulative Condition forecasted calculations are illustrated in *Figure 21.*

Intersection capacity analysis for the Cumulative Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in Table 5-3 and provided in *Appendix D.*

Table 5-3: Intersection Capacity Analysis - Cumulative Condition
Traffic Study - Moreno Valley Cactus

Intersection		AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	Cactus Avenue and I-215 Freeway SB Ramps	33.3	C	139.9	F
2	Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road	99.99*	F	62.5	E
	Mitigated: Widen westbound Cactus Avenue	99.99*	F	37.7	D
3	Cactus Avenue and Commerce Center Drive	22.3	C	64.6	E
	Mitigated: Widen westbound Cactus Avenue	2.8	A	7.3	A
4	Cactus Avenue and Elsworth Street/ March ARB	99.99*	F	76.9	E
5	Goldencrest Drive and Elsworth Street (3)	16.3	C	15.0	C

99.99* - Level of Service exceeds the LOS F threshold
(1) Delay –In Seconds
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As provided in *Table 5-3* under Cumulative Condition, some of the study intersections are anticipated to operate at an acceptable LOS.

With the addition of the cumulative traffic it is anticipated that the intersections of Cactus Avenue and I-215 Freeway SB Ramps, Cactus Avenue and Commerce Center Drive, and Cactus Avenue and Elsworth Street/ March ARB will operate at a LOS that is below the City of Moreno Valley's peak hour intersection Level of Service standard.

The intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road is anticipated to continue to operate at LOS F during the AM peak period, which continues to exceed the City of Moreno Valley's peak hour intersection Level of Service standard. In the Cumulative Condition it is anticipated that intersection of Cactus Avenue and I-215 Freeway SB Ramps will operate at an LOS F during the PM peak, Cactus Avenue and Commerce Center Drive will operate at an LOS E during the PM peak, and Cactus Avenue and Elsworth Street/ March ARB will operate at LOS F during the AM peak and LOS E during the PM peak.

The cumulative condition impacts to the study intersections are outside the scope of this project and mitigations would be based on future development.

The mitigations evaluated under cumulative condition are the proposed existing condition mitigation of widening westbound Cactus Avenue to provide three through lanes along the segment of Northbound I-215 On-ramp to Elsworth Street. This improvement will provide a westbound through lane to the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road. The intersection geometrics are illustrated in *Figure 22.*

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Traffic signal warrant analysis was completed with the cumulative condition volume for the un-signalized intersection of Goldencrest Drive and Elsworth Street, resulting in the intersection not complying with any of the warrants.

Roadway Segment capacity analysis for the Cumulative Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 5-4* and provided in *Appendix F.*

Table 5-4: Roadway Segment Capacity Analysis - Cumulative Condition
Traffic Study – Moreno Valley Cactus

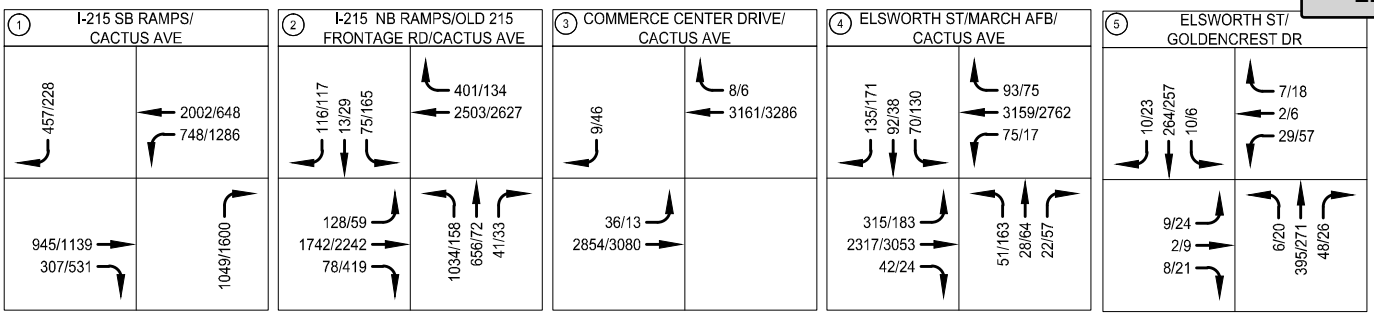
	Roadway Segment	Type of roadway	ADT	LOS
1	Commerce Center Drive	Two Lane Industrial Collector	700	A
2	Goldencrest Drive	Two Lane Industrial Collector	1,200	A
3	Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)	Four Lane Divided Arterial	59,600	F
4	Cactus Avenue (Commerce Center Drive to Elsworth Street)	Six Lane Divided Arterial	73,100	F
5	Cactus Avenue (Elsworth Street to Frederick Street)	Six Lane Divided Arterial	69,900	F
6	Elsworth Street (Cactus Avenue to Alessandro Boulevard)	Four Lane Divided Arterial	6,800	A

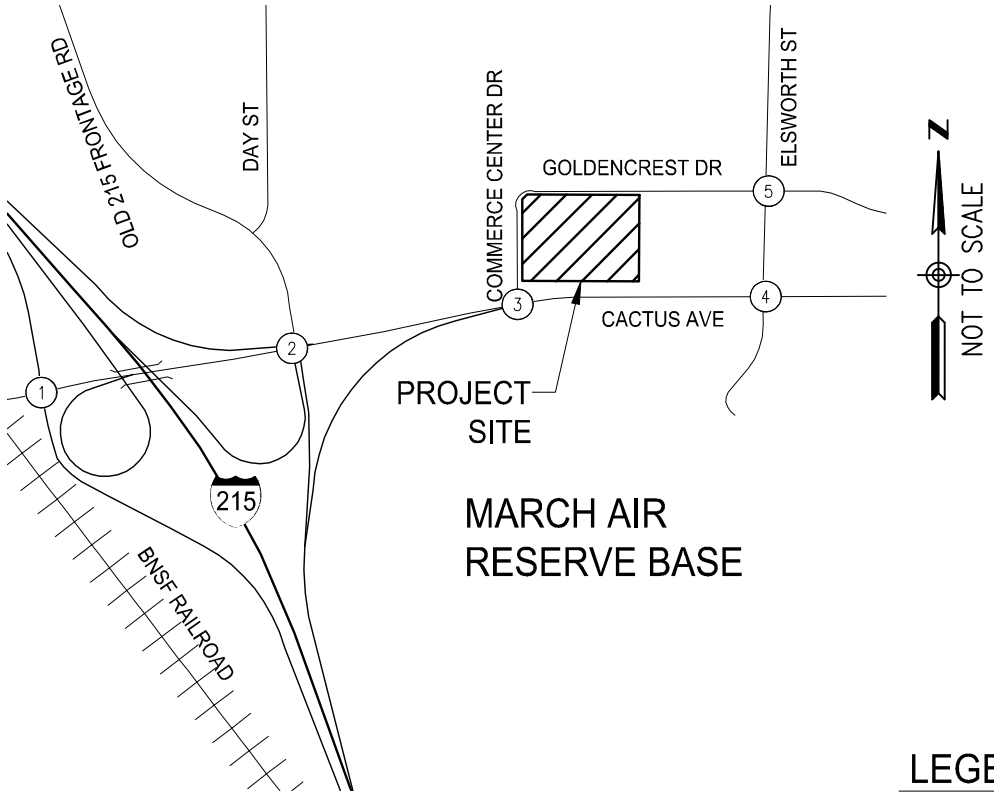
ADT – Average Daily Traffic
LOS – Level of Service
Source: **David Evans and Associates, Inc.**

As provided in *Table 5-4* under Cumulative Condition, some of the roadway segments are anticipated to continue operating at an acceptable LOS C or better with the exception of the roadway segments of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard.

With the inclusion of the other area project trips, the Cactus Avenue roadway segments from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard are anticipated to operate at LOS F, which is below the City of Moreno Valley's peak hour roadway segment Level of Service standard.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

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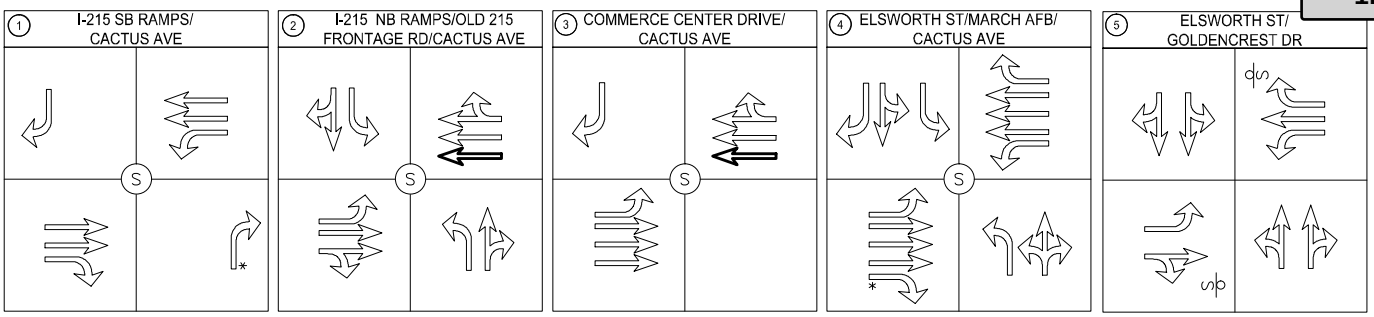
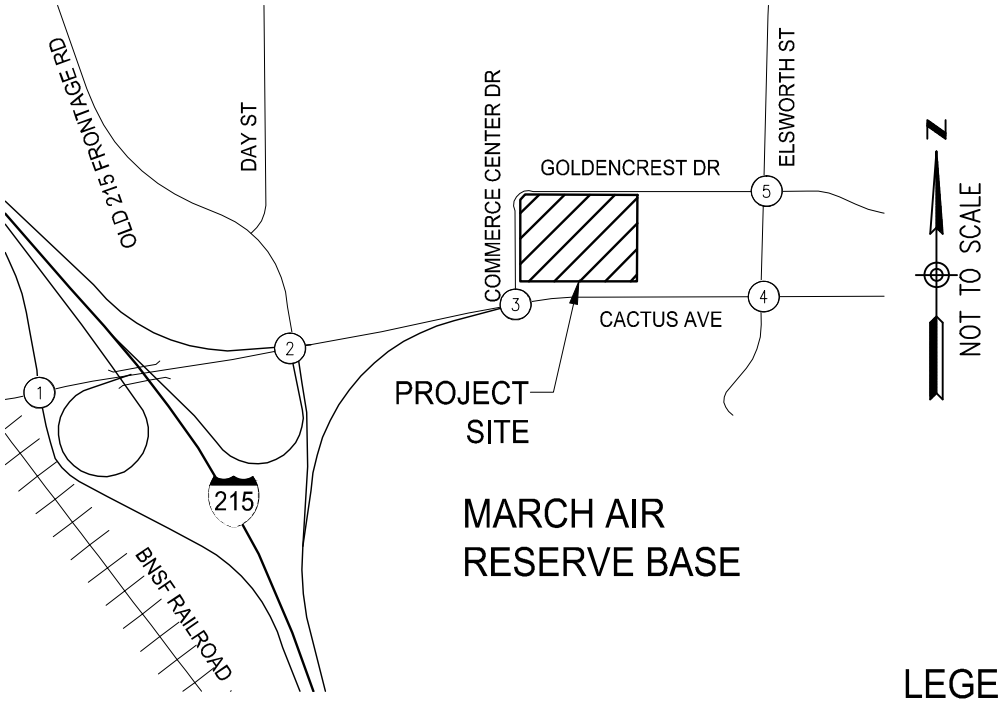
FIGURE 21: CUMULATIVE CONDITION TRAFFIC VOLUMES

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

- sb/S - UNSIGNALIZED INTERSECTION
- * - FREE RIGHT TURN
- (#) - STUDY INTERSECTIONS
- (S) - SIGNALIZED INTERSECTION
- ⇦ - EXISTING GEOMETRICS
- ⇦ - PROPOSED GEOMETRICS

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FIGURE 22: CUMULATIVE CONDITION INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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6 CUMULATIVE PLUS PROJECT CONDITION

The Cumulative plus Project Condition addresses impacts due to cumulative project traffic, the proposed project traffic, and the 2% annual ambient growth within the study area.

6.1 Cumulative plus Project Condition Traffic Analysis

The results of the Cumulative plus Project Condition forecasted calculations for Alternative 1 and Alternative 2 respectively are illustrated in *Figure 23* and *Figure 24.*

Intersection capacity analysis for the Cumulative plus Project Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 6-1* and provided in *Appendix D.*

Table 6-1: Intersection Capacity Analysis - Cumulative plus Project Condition
Traffic Study - Moreno Valley Cactus

Intersection		AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	Cactus Avenue and I-215 Freeway SB Ramps	34.7	C	99.99*	F
2	Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road	99.99*	F	85.9	F
	Mitigated: Widen westbound Cactus Avenue	99.99*	F	48.2	D
3	Cactus Avenue and Commerce Center Drive	99.99*	F	99.99*	F
	Mitigated: Widen westbound Cactus Avenue	29.7	C	26.3	C
	Mitigated: Alternative 1 Addition of Right Turn Lanes	27.0	C	29.0	C
	Mitigated: Alternative 2 Southbound left lane	55.6	E	57.2	E
4	Cactus Avenue and Elsworth Street/ March ARB	90.0	F	79.8	E
	Mitigated: Intersection modification & Alternative 2 redistribution	85.5	F	81.6	F
5	Goldencrest Drive and Elsworth Street (3)	19.3	C	18.0	C
	Alternative 2 Redistribution	16.9	C	15.3	C
6	Cactus Avenue at Driveway #1 (3)	99.99*	F	99.99*	F
	Mitigated: Widen westbound Cactus Avenue	99.99*	F	99.99*	F
	Alternative 2 Redistribution	99.99*	F	99.99*	F
7	Commerce Center at Driveway #2 (3)	10.2	B	10.0	B
	Alternative 2 Redistribution	11.5	B	11.4	B
8	Commerce Center at Driveway #3 (3)	9.4	A	9.3	A
	Alternative 2 Redistribution	9.6	A	9.6	A
9	Goldencrest Drive at Driveway #4 (3)	9.3	A	9.6	A
	Alternative 2 Redistribution	8.6	A	8.8	A
10	Goldencrest Drive at Driveway #5 (3)	9.7	A	10.0	A
	Cactus Avenue at Driveway #1 (3)	8.8	A	9.0	A

99.99* - Level of Service exceeds the LOS F threshold
(1) Delay –In Seconds
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection

Source: **David Evans and Associates, Inc.**

As provided in *Table 6-1* under Cumulative plus Project Condition, some of the study intersections are anticipated to operate at an acceptable LOS.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

The intersections of Cactus Avenue and I-215 Freeway SB Ramps, Cactus Avenue and Commerce Center Drive, and Cactus Avenue and Elsworth Street/ March ARB are anticipated to continue to operate at an LOS that exceeds the City of Moreno Valley's peak hour intersection Level of Service standard.

It is anticipated that intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road will operate at LOS F during the AM and PM peak periods, Cactus Avenue and I-215 Freeway SB Ramps will operate at an LOS F during the AM and PM peak periods, Cactus Avenue and Commerce Center Drive will operate at an LOS F during the AM and PM peak periods, Cactus Avenue and Elsworth Street/ March ARB will operate at LOS F during the AM peak and LOS E during the PM peak, and Project Driveway #1 and Cactus Avenue is anticipated to operate at LOS F during the AM and PM peak periods.

The cumulative condition impacts to the study intersections are outside the scope of this project and mitigations would be based on future development.

The mitigations evaluated under cumulative plus project condition are the proposed existing condition mitigation of widening westbound Cactus Avenue to provide three through lanes along the segment of Northbound I-215 On-ramp to Elsworth Street. This improvement will provide a westbound through lane to the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road.

The Alternative 1 Mitigations evaluated under cumulative plus project condition expand the existing condition mitigation and provides a westbound right turn lane at the intersection of Cactus Avenue and Commerce Center Drive. The intersection geometrics are illustrated in *Figure 25*.

The Alternative 2 Mitigations evaluated under cumulative plus project condition expand the Alternative 1 mitigation and provides southbound left lane at the intersections of Cactus Avenue and Commerce Center Drive. Additionally the project traffic is redistributed to include the use of the left turn lane provided at the intersection of Cactus Avenue and Commerce Center Drive. The intersection geometrics are illustrated in *Figure 26*.

Traffic signal warrant analysis was completed with the cumulative plus project condition volume for the un-signalized intersection of Goldencrest Drive and Elsworth Street, resulting in the intersection not complying with any of the warrants.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Roadway Segment capacity analysis for the Cumulative plus Project Condition was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 6-2* and provided in *Appendix F.*

Table 6-2: Roadway Segment Capacity Analysis - Cumulative plus Project Condition
Traffic Study – Moreno Valley Cactus

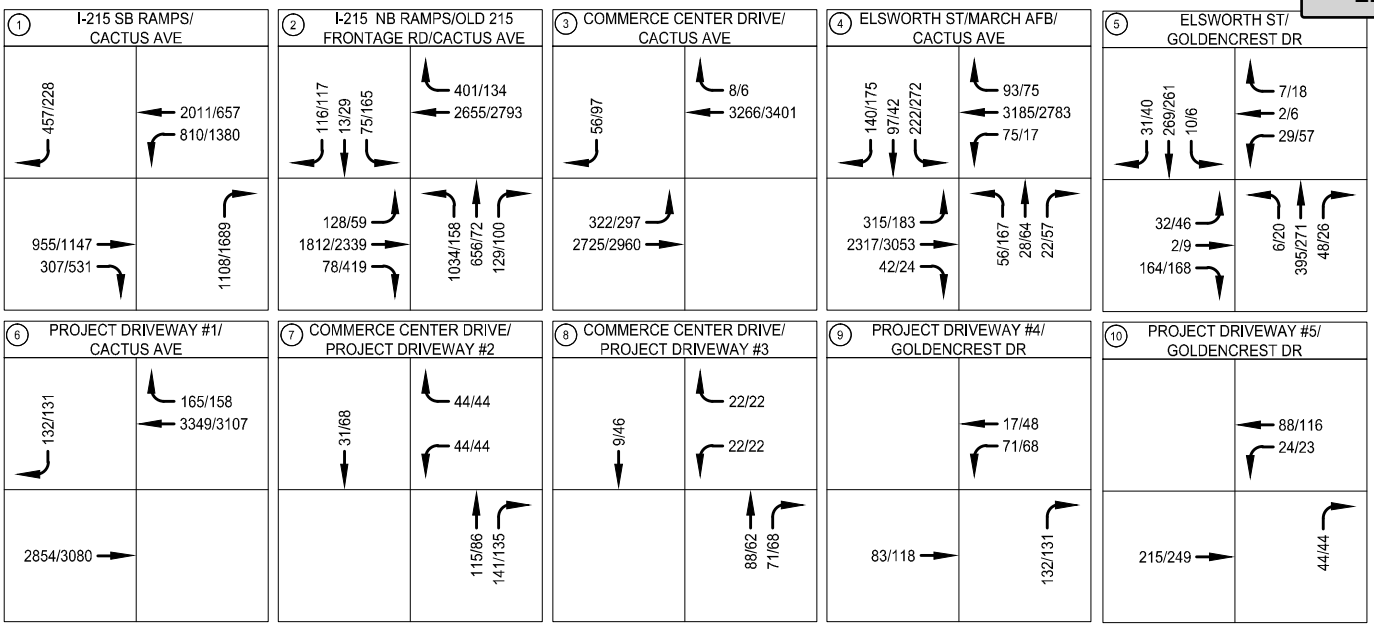
	Roadway Segment	Type of roadway	ADT	LOS
1	Commerce Center Drive	Two Lane Industrial Collector	4,700	A
2	Goldencrest Drive	Two Lane Industrial Collector	3,100	A
3	Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)	Four Lane Divided Arterial	63,400	F
4	Cactus Avenue (Commerce Center Drive to Elsworth Street)	Six Lane Divided Arterial	72,900	F
5	Cactus Avenue (Elsworth Street to Frederick Street)	Six Lane Divided Arterial	71,700	F
6	Elsworth Street (Cactus Avenue to Alessandro Boulevard)	Four Lane Divided Arterial	7,000	A

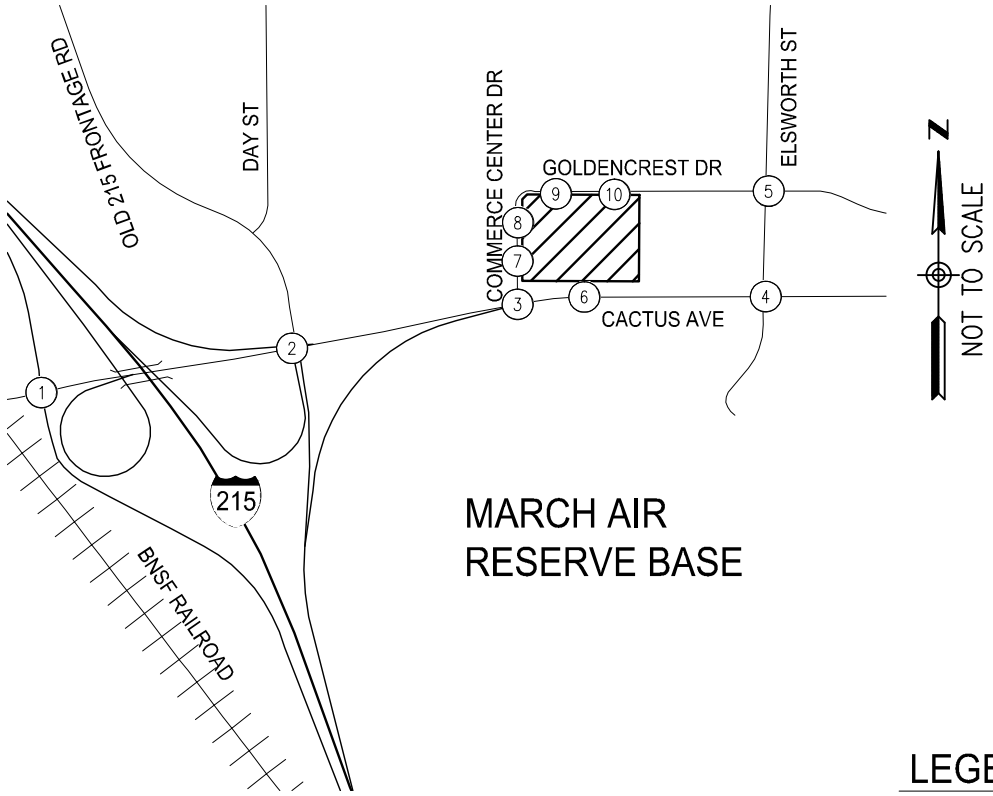
ADT – Average Daily Traffic
LOS – Level of Service
Source: **David Evans and Associates, Inc.**

As provided in *Table 6-2* under Cumulative plus Project Condition, some of the roadway segments are anticipated to continue operating at an acceptable LOS C or better with the exception of the roadway segments of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard.

The Cactus Avenue roadway segments from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard are anticipated to continue to operate at LOS F, which exceeds the City of Moreno Valley's peak hour roadway segment Level of Service standard.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

FIGURE 23: CUMULATIVE + PROJECT CONDITION TRAFFIC VOLUMES

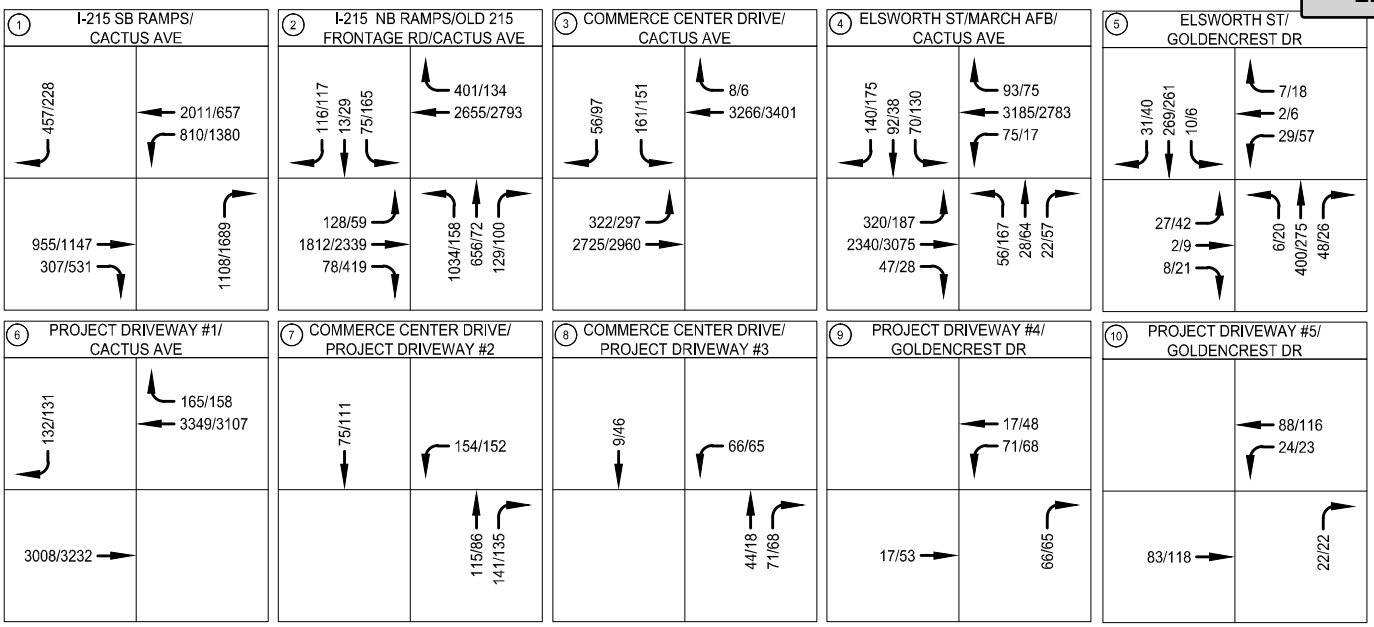
ALTERNATIVE 1

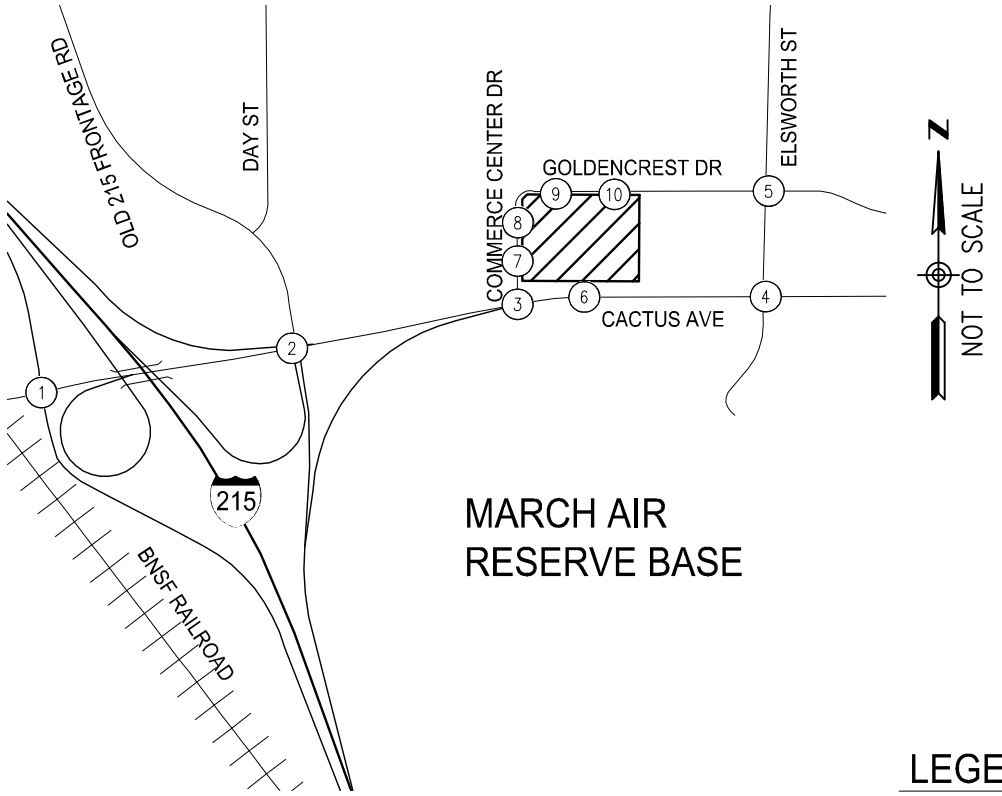
MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

FIGURE 24: CUMULATIVE + PROJECT CONDITION TRAFFIC VOLUMES

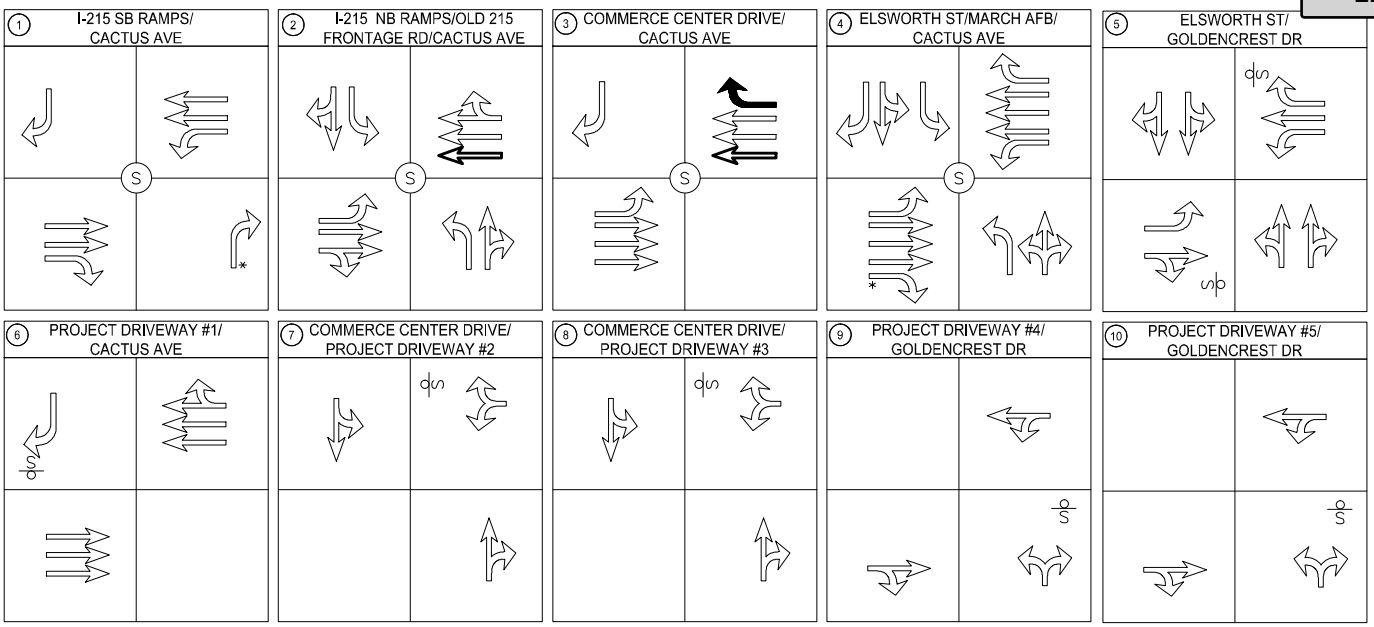
ALTERNATIVE 2

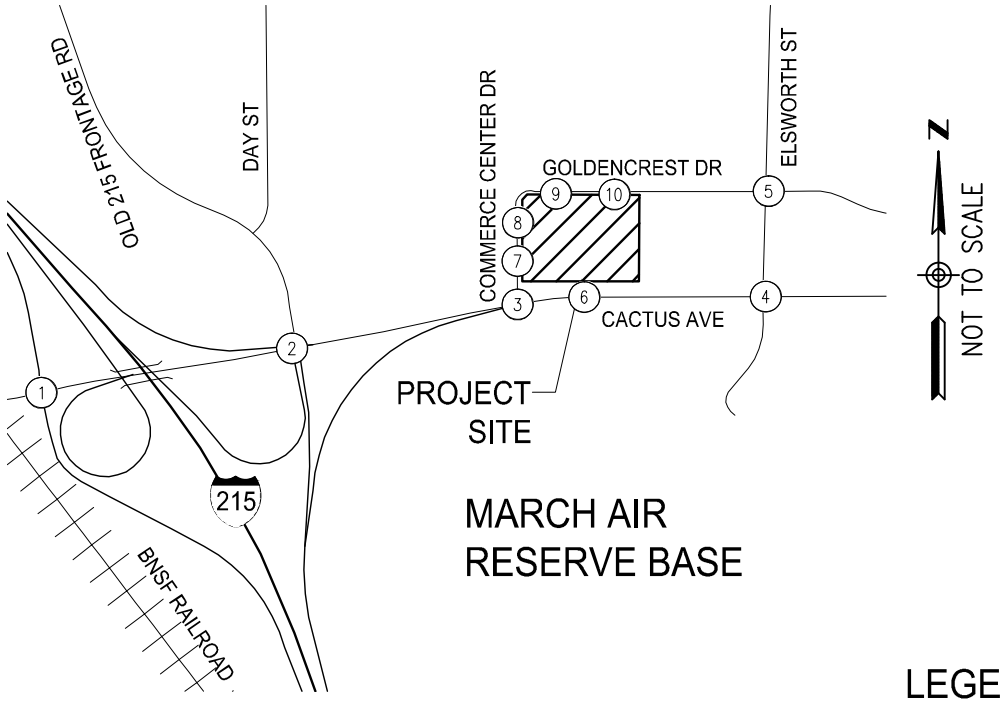
MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

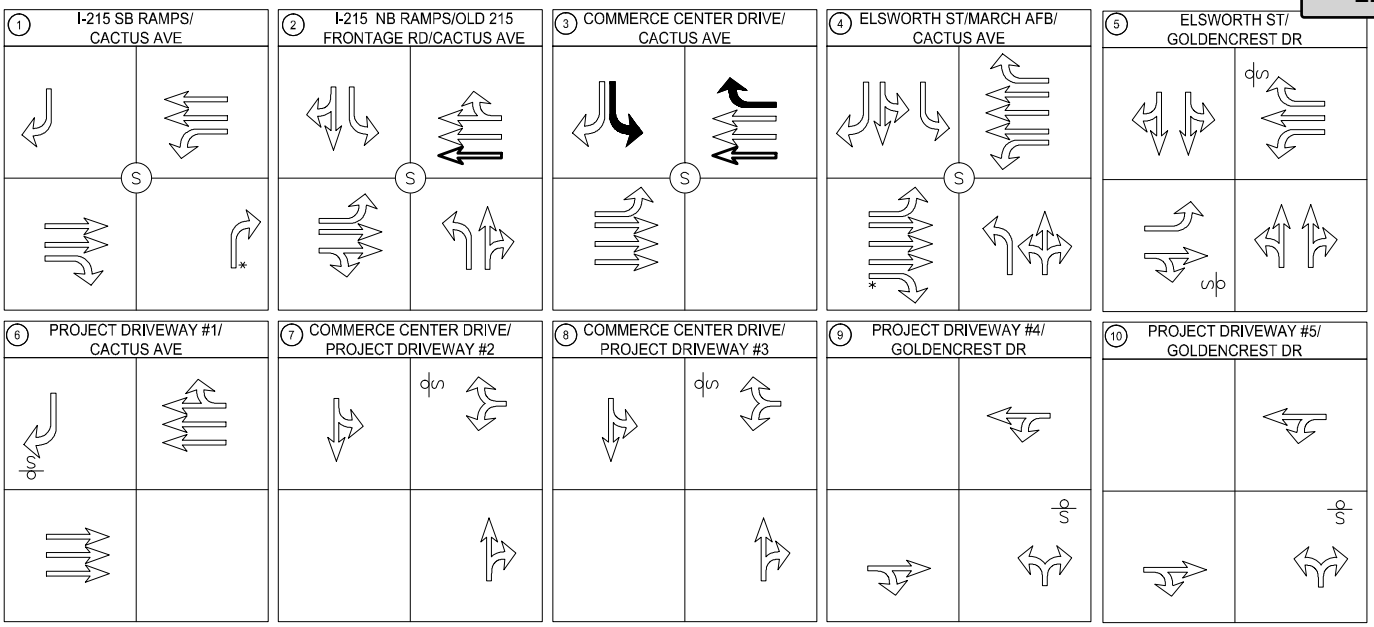
- UNSIGNALIZED INTERSECTION
- FREE RIGHT TURN
- STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- EXISTING GEOMETRICS
- PROPOSED EXISTING GEOMETR
- PROPOSED PROJECT GEOMETR

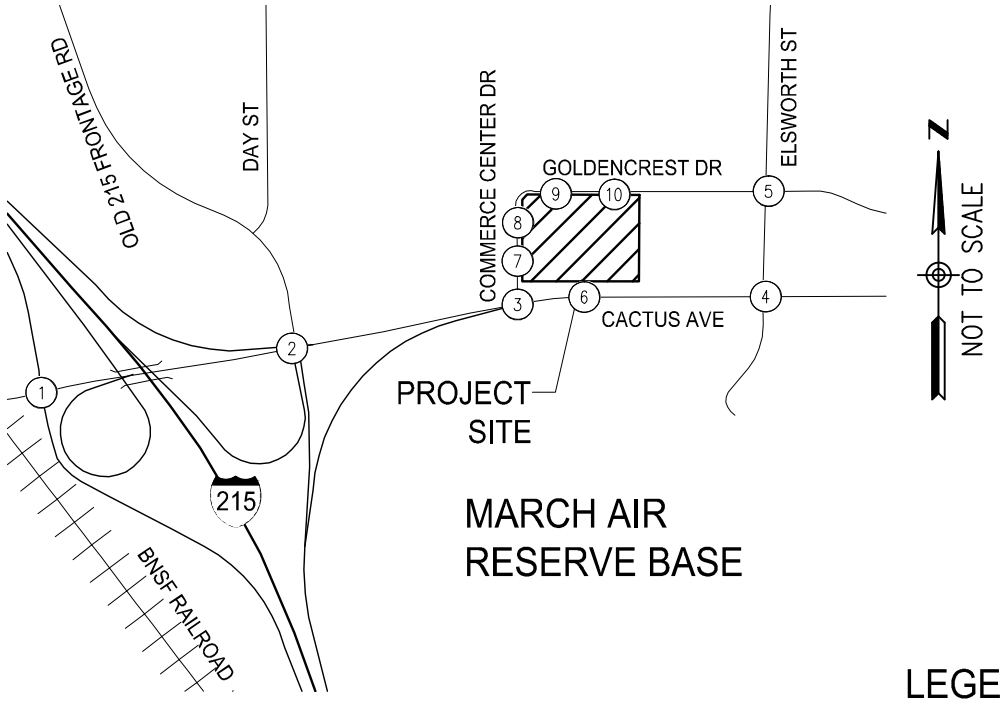
FIGURE 25: CUMULATIVE + PROJECT CONDITION ALTERNATIVE 1 INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

- UNSIGNALIZED INTERSECTION
- FREE RIGHT TURN
- STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- EXISTING GEOMETRICS
- PROPOSED EXISTING GEOMETR
- PROPOSED PROJECT GEOMETR

FIGURE 26: CUMULATIVE + PROJECT CONDITION ALTERNATIVE 2 INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

7 BUILDOUT YEAR 2035

The Buildout Year 2035 addresses impacts due to ambient growth up to the buildout year within the study area. The ambient growth up to the buildout year was developed from the Moreno Valley Traffic Model (MVTM).

7.1 Buildout Year 2035 Traffic Analysis

The results of the Buildout Year 2035 forecasted calculations are illustrated in *Figure 27,* and presented in the Turn Movement summary worksheets provided in *Appendix D* of this report.

Intersection capacity analysis for Buildout Year 2035 Condition was performed using the methodology presented in *Chapter 2.* The results of the analysis are shown in *Table 7-1* and provided in *Appendix D.*

Table 7-1: Intersection Capacity Analysis - Buildout Year 2035
Traffic Study – Moreno Valley Cactus

Intersection		AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	Cactus Avenue and I-215 Freeway SB Ramps	48.1	D	99.99*	F
2	Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road	99.99*	F	99.99*	F
	Mitigated: Widen westbound Cactus Avenue	99.99*	F	71.0	E
3	Cactus Avenue and Commerce Center Drive	14.7	B	57.5	E
	Mitigated: Widen westbound Cactus Avenue	4.1	A	8.5	A
4	Cactus Avenue and Elsworth Street/ March ARB	30.0	C	78.7	E
5	Goldencrest Drive and Elsworth Street (3)	25.2	D	33.5	D

99.99* - Level of Service exceeds the LOS F threshold
(1) Delay –In Seconds
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection

Source: **David Evans and Associates, Inc.**

As presented in *Table 7-1* under Buildout Year 2035, some of the study intersections are anticipated to operate at an acceptable LOS.

With the addition of the future traffic it is anticipated that the intersections of Cactus Avenue and I-215 Freeway SB Ramps, Cactus Avenue and Commerce Center Drive, and Cactus Avenue and Elsworth Street/ March ARB will operate at an LOS that is below the City of Moreno Valley's peak hour intersection Level of Service standard.

The intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road is anticipated to continue to operate at LOS F during the AM and PM peak periods, which continues to exceed the City of Moreno Valley's peak hour intersection Level of Service standard. In the Buildout Year 2035 it is anticipated that intersection of Cactus Avenue and I-215 Freeway SB Ramps will operate at an LOS F during the PM peak, Cactus Avenue and Commerce Center Drive will operate at an LOS E during the PM peak, and Cactus Avenue and Elsworth Street/ March ARB will operate at LOS E during the PM peak.

The buildout condition impacts to the study intersections are outside the scope of this project and mitigations would be based on future development.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

The mitigations evaluated under future condition are the proposed existing condition mitigation of widening westbound Cactus Avenue to provide three through lanes along the segment of Northbound I-215 On-ramp to Elsworth Street. This improvement will provide a westbound through lane to the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road. The intersection geometrics are illustrated in *Figure 28.*

Traffic signal warrant analysis was completed with the buildout condition volume for the un-signalized intersection of Goldencrest Drive and Elsworth Street, resulting in the intersection not complying with any of the warrants.

Roadway Segment capacity analysis for the Buildout Year 2035 was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 7-2* and provided in *Appendix F.*

Table 7-2: Roadway Segment Capacity Analysis - Buildout Year 2035
Traffic Study – Moreno Valley Cactus

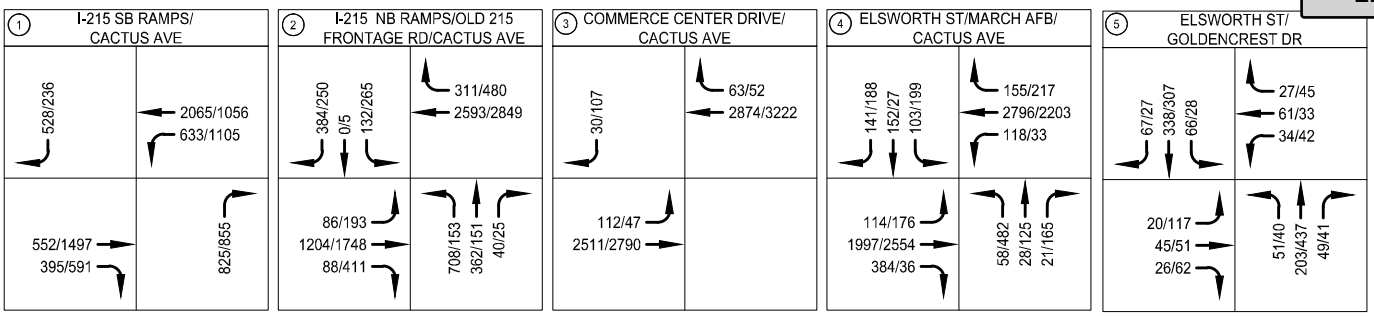
	Roadway Segment	Type of roadway	ADT	LOS
1	Commerce Center Drive	Two Lane Industrial Collector	2,400	A
2	Goldencrest Drive	Two Lane Industrial Collector	3,800	A
3	Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)	Four Lane Divided Arterial	61,700	F
4	Cactus Avenue (Commerce Center Drive to Elsworth Street)	Six Lane Divided Arterial	69,700	F
5	Cactus Avenue (Elsworth Street to Frederick Street)	Six Lane Divided Arterial	61,800	F
6	Elsworth Street (Cactus Avenue to Alessandro Boulevard)	Four Lane Divided Arterial	10,200	A

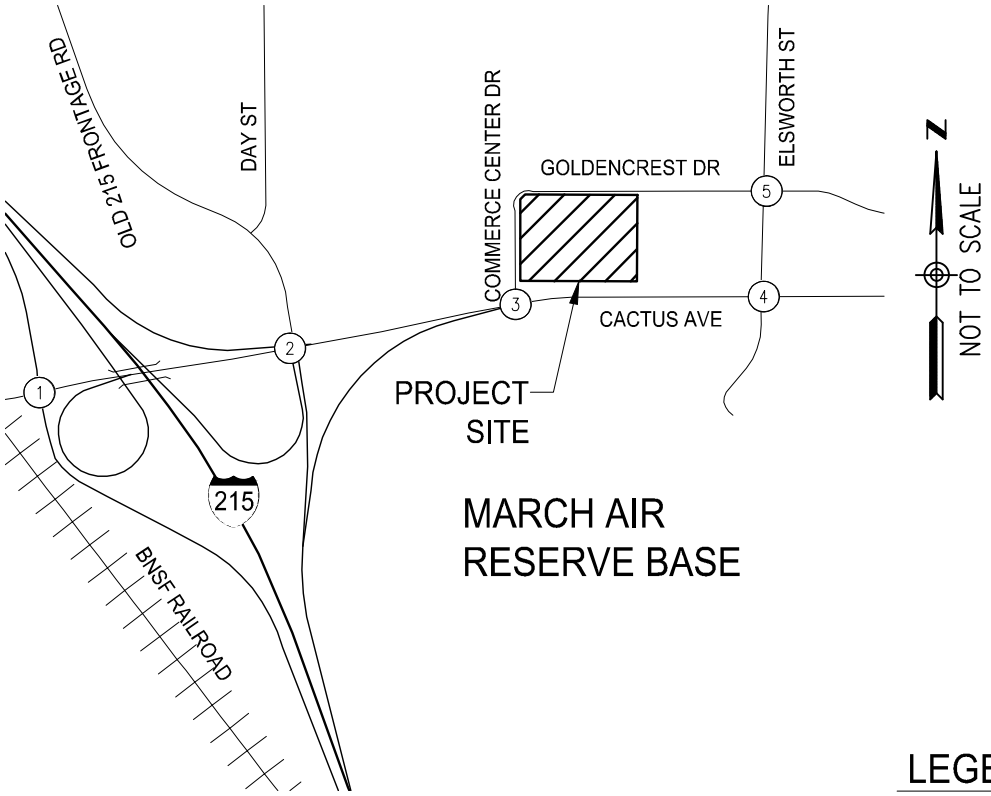
ADT – Average Daily Traffic
LOS – Level of Service
Source: **David Evans and Associates, Inc.**

As provided in *Table 7-2* under Buildout Year 2035, some of the roadway segments are anticipated to continue operating at an acceptable LOS C or better with the exception of the roadway segments of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard.

The Cactus Avenue roadway segments from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard are anticipated to continue to operate at LOS F, which exceeds the City of Moreno Valley's peak hour roadway segment Level of Service standard.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

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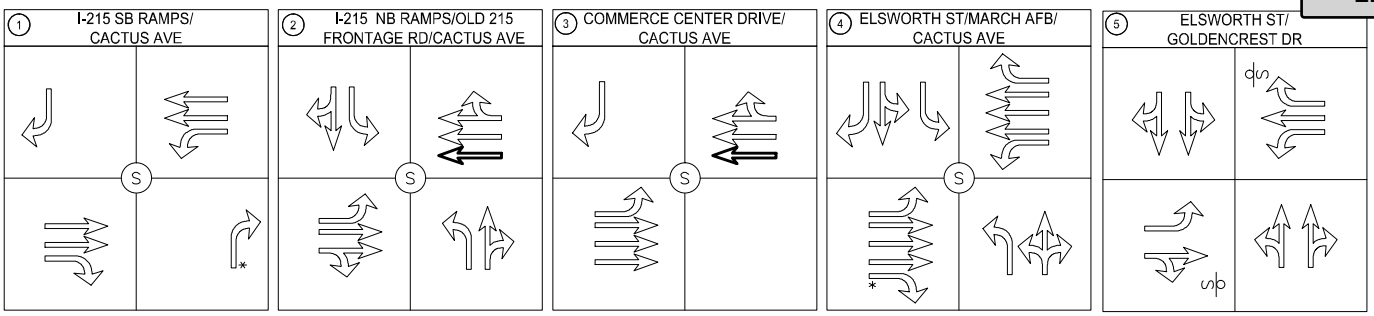
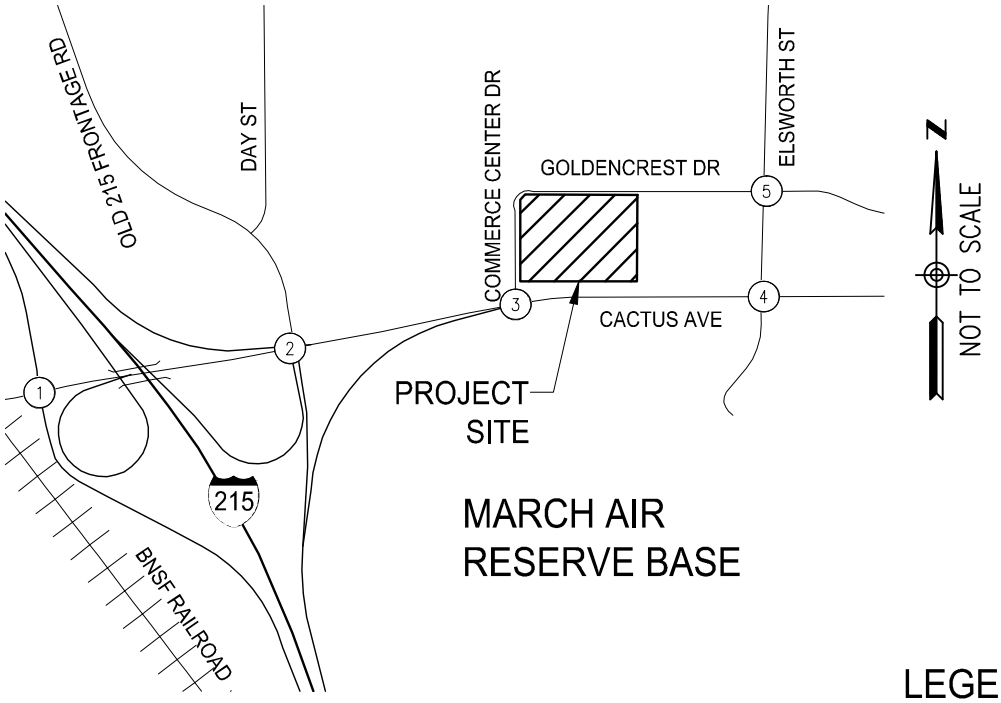
FIGURE 27: BUILDOUT YEAR 2035 TRAFFIC VOLUMES

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

- ps - UNSIGNALIZED INTERSECTION
- * - FREE RIGHT TURN
- (#) - STUDY INTERSECTIONS
- (S) - SIGNALIZED INTERSECTION
- ⇦ - EXISTING GEOMETRICS
- ⇦ - PROPOSED EXISTING GEOMETR

FIGURE 28: BUILDOUT YEAR 2035 INTERSECTION GEOMETRICS

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

8 BUILDOUT YEAR 2035 PLUS PROJECT

The Buildout Year 2035 plus Project addresses impacts due to the proposed project and ambient growth up to the buildout year within the study area.

8.1 Buildout Year 2035 Traffic Analysis

The results of the Buildout Year 2035 plus Project forecasted volumes for Alternative 1 and Alternative 2 respectively are illustrated in *Figure 29* and *Figure 30.*

Intersection capacity analysis for Buildout Year 2035 plus Project Condition was performed using the methodology presented in *Chapter 2.* The results of the analysis are shown in *Table 8-1* and provided in *Appendix D.*

Table 8-1: Intersection Capacity Analysis - Buildout Year 2035 plus Project
Traffic Study – Moreno Valley Cactus

Intersection		AM		PM	
		Delay (1)	LOS(2)	Delay (1)	LOS(2)
1	Cactus Avenue and I-215 Freeway SB Ramps	57.3	E	115.7	F
2	Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road	99.99*	F	99.99*	F
	Mitigated: Widen westbound Cactus Avenue	99.99*	F	82.6	F
3	Cactus Avenue and Commerce Center Drive	50.4	D	86.8	F
	Mitigated: Widen westbound Cactus Avenue	13.5	B	20.0	C
	Mitigated: Alternative 1 Addition of Right Turn Lane	12.0	B	16.8	B
	Mitigated: Alternative 2 Southbound left lane	19.4	B	35.2	D
4	Cactus Avenue and Elsworth Street/ March ARB	42.2	D	76.5	E
	Alternative 2 Redistribution	39.8	D	73.5	E
5	Goldencrest Drive and Elsworth Street (3)	24.7	A	30.5	D
	Alternative 2 Redistribution	22.4	C	29.0	D
6	Cactus Avenue at Driveway #1 (3)	99.99*	F	52.1	F
	Mitigated: Widen westbound Cactus Avenue	99.99*	F	62.5	F
	Alternative 2 Redistribution	99.99*	F	62.5	F
7	Commerce Center at Driveway #2 (3)	10.0	B	9.8	B
	Alternative 2 Redistribution	10.9	B	10.4	B
8	Commerce Center at Driveway #3 (3)	9.9	A	9.4	A
	Alternative 2 Redistribution	10.1	B	9.8	A
9	Goldencrest Drive at Driveway #4 (3)	9.6	A	9.7	A
	Alternative 2 Redistribution	9.0	A	9.6	A
10	Goldencrest Drive at Driveway #5 (3)	9.9	A	9.8	A
	Cactus Avenue at Driveway #1 (3)	9.1	A	9.6	A

99.99* - Level of Service exceeds the LOS F threshold
(1) Delay –In Seconds
(2) LOS – HCM Level of Service
(3) Un-Signalized Intersection
Source: **David Evans and Associates, Inc.**

As presented in *Table 8-1* under Buildout Year 2035 plus Project, some of the study intersections are anticipated to operate at an acceptable LOS.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

The intersections of Cactus Avenue and I-215 Freeway SB Ramps, Cactus Avenue and Commerce Center Drive, and Cactus Avenue and Elsworth Street/ March ARB are anticipated to continue to operate at an LOS that is below the City of Moreno Valley's peak hour intersection Level of Service standard.

It is anticipated that intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road will operate at LOS F during the AM and PM peak periods, Cactus Avenue and I-215 Freeway SB Ramps will operate at an LOS F during the AM and PM peak periods, Cactus Avenue and Commerce Center Drive will operate at an LOS F during the AM and PM peak periods, Cactus Avenue and Elsworth Street/ March ARB will operate at LOS F during the AM peak and LOS E during the PM peak, and Project Driveway #1 and Cactus Avenue is anticipated to operate at LOS F during the AM and PM peak periods.

The cumulative condition impacts to the study intersections are outside the scope of this project and mitigations would be based on future development.

The mitigations evaluated under cumulative plus project condition are the proposed existing condition mitigation of widening westbound Cactus Avenue to provide three through lanes along the segment of Northbound I-215 On-ramp to Elsworth Street. This improvement will provide a westbound through lane to the intersection of Cactus Avenue and I-215 Freeway NB Ramps/Old 215 Frontage Road.

The Alternative 1 Mitigations evaluated under cumulative plus project condition expand the existing condition mitigation and provides a westbound right turn lane at the intersection of Cactus Avenue and Commerce Center Drive. The intersection geometrics are illustrated in *Figure 31*.

The Alternative 2 Mitigations evaluated under cumulative plus project condition expand the alternative 1 mitigation and provides southbound left lane at the intersections of Cactus Avenue and Commerce Center Drive. Additionally the project traffic is redistributed to include the use of the left turn lane provided at the intersection of Cactus Avenue and Commerce Center Drive. The intersection geometrics are illustrated in *Figure 32*.

Traffic signal warrant analysis was completed with the buildout plus project condition volume for the un-signalized intersection of Goldencrest Drive and Elsworth Street, resulting in the intersection not complying with any of the warrants.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

Roadway Segment capacity analysis for the Buildout Year 2035 plus Project was performed using the methodology presented in *Chapter 2*. The results of the analysis are shown in *Table 8-2* and provided in *Appendix F.*

Table 8-2: Roadway Segment Capacity Analysis - Buildout Year 2035 plus Project
Traffic Study – Moreno Valley Cactus

	Roadway Segment	Type of roadway	ADT	LOS
1	Commerce Center Drive	Two Lane Industrial Collector	5,000	A
2	Goldencrest Drive	Two Lane Industrial Collector	3,200	A
3	Cactus Avenue (Old 215 Frontage Road to Commerce Center Drive)	Four Lane Divided Arterial	64,100	F
4	Cactus Avenue (Commerce Center Drive to Elsworth Street)	Six Lane Divided Arterial	68,300	F
5	Cactus Avenue (Elsworth Street to Frederick Street)	Six Lane Divided Arterial	61,900	F
6	Elsworth Street (Cactus Avenue to Alessandro Boulevard)	Four Lane Divided Arterial	9,300	A

ADT – Average Daily Traffic
LOS – Level of Service
Source: **David Evans and Associates, Inc.**

As provided in *Table 8-2* under Buildout Year 2035 plus Project, some of the roadway segments are anticipated to continue operating at an acceptable LOS C or better with the exception of the roadway segments of Cactus Avenue from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard.

The Cactus Avenue roadway segments from Old 215 Frontage Road to Commerce Center Drive, from Commerce Center Drive to Elsworth Street, and from Elsworth Street to Alessandro Boulevard are anticipated to continue to operate at LOS F, which is below the City of Moreno Valley's peak hour roadway segment Level of Service standard.

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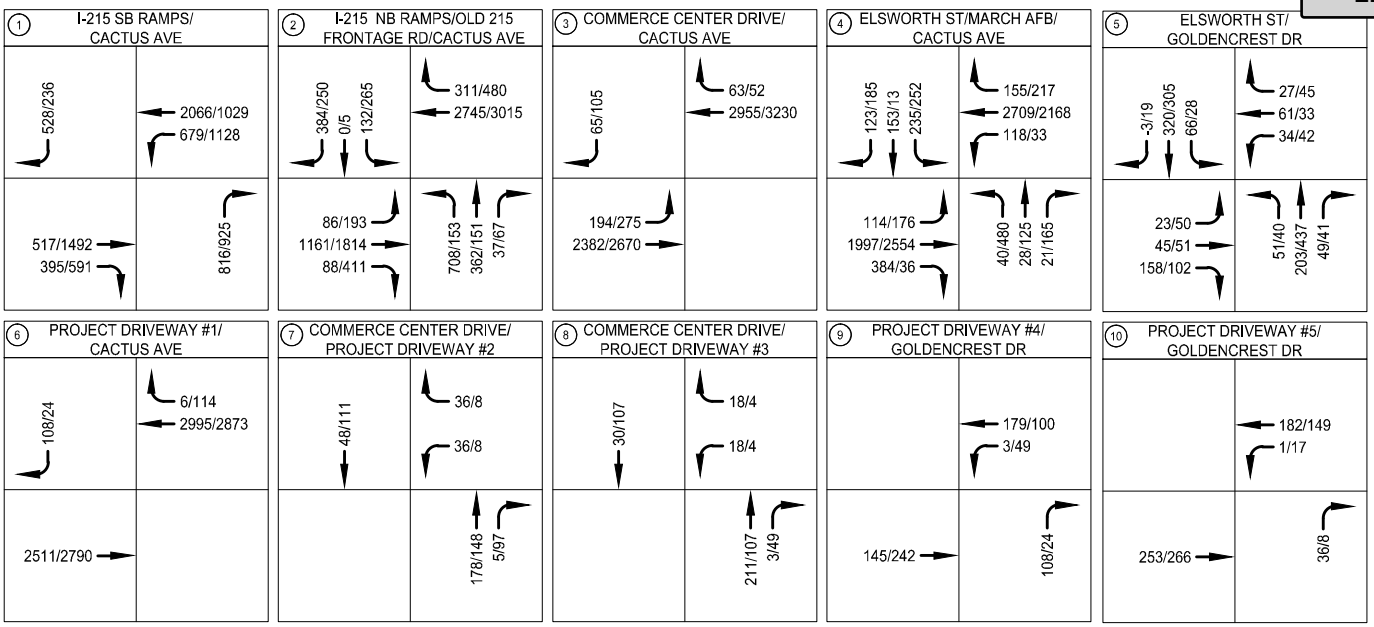
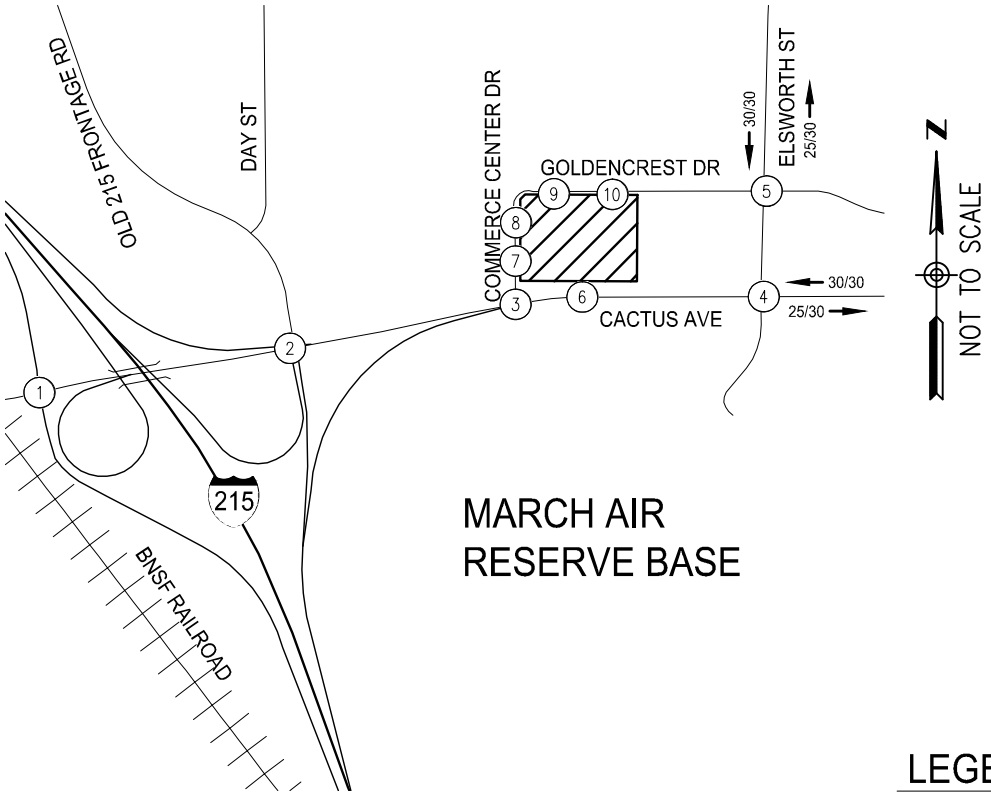




LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

(#) - STUDY INTERSECTIONS

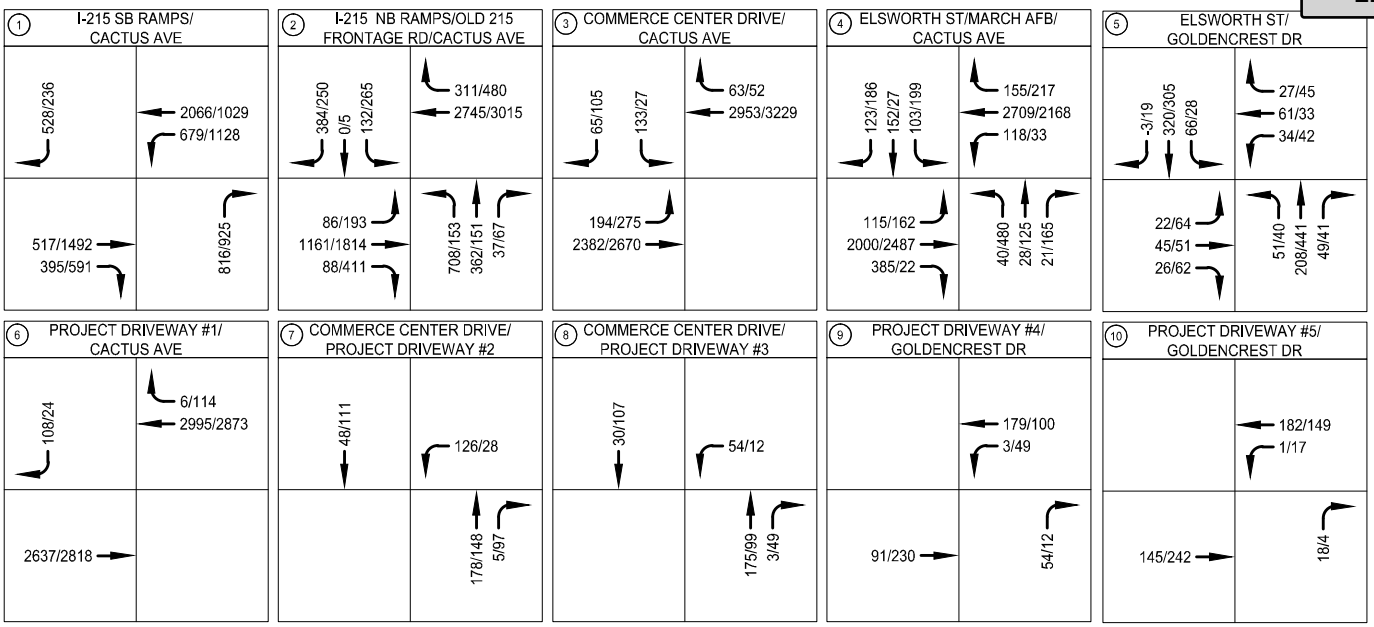
FIGURE 29: BUILDOUT YEAR 2035 + PROJECT TRAFFIC VOLUMES ALTERNATIVE 1

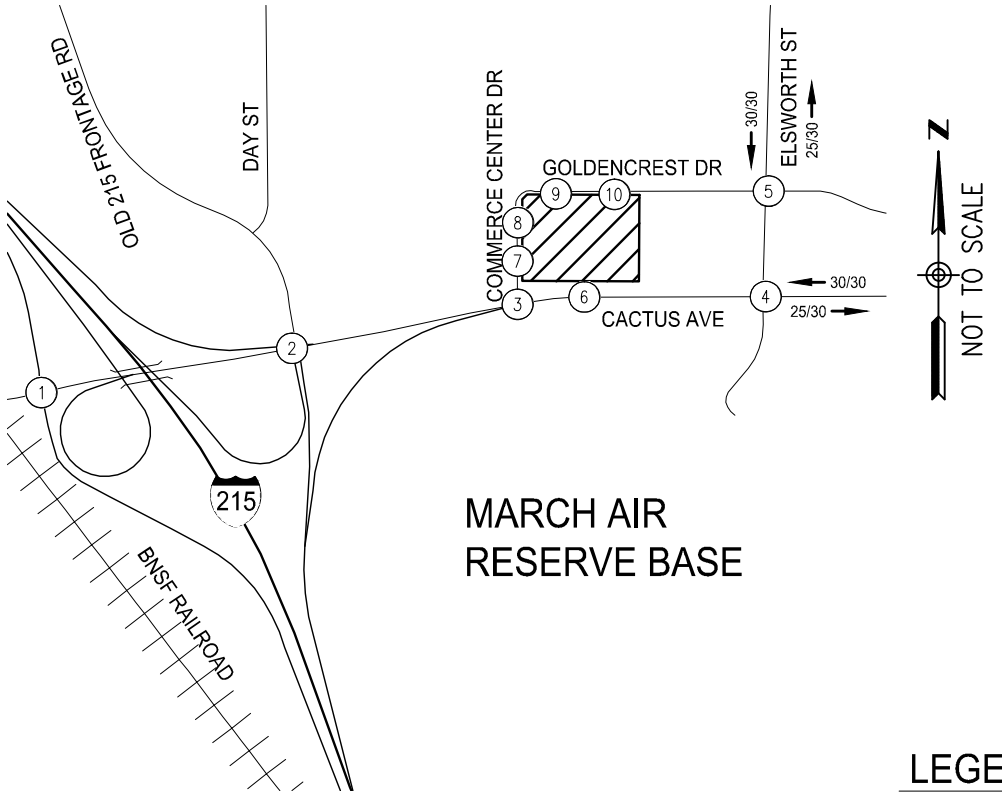
MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

XX/XX - AM/PM PEAK HOUR VOLUMES

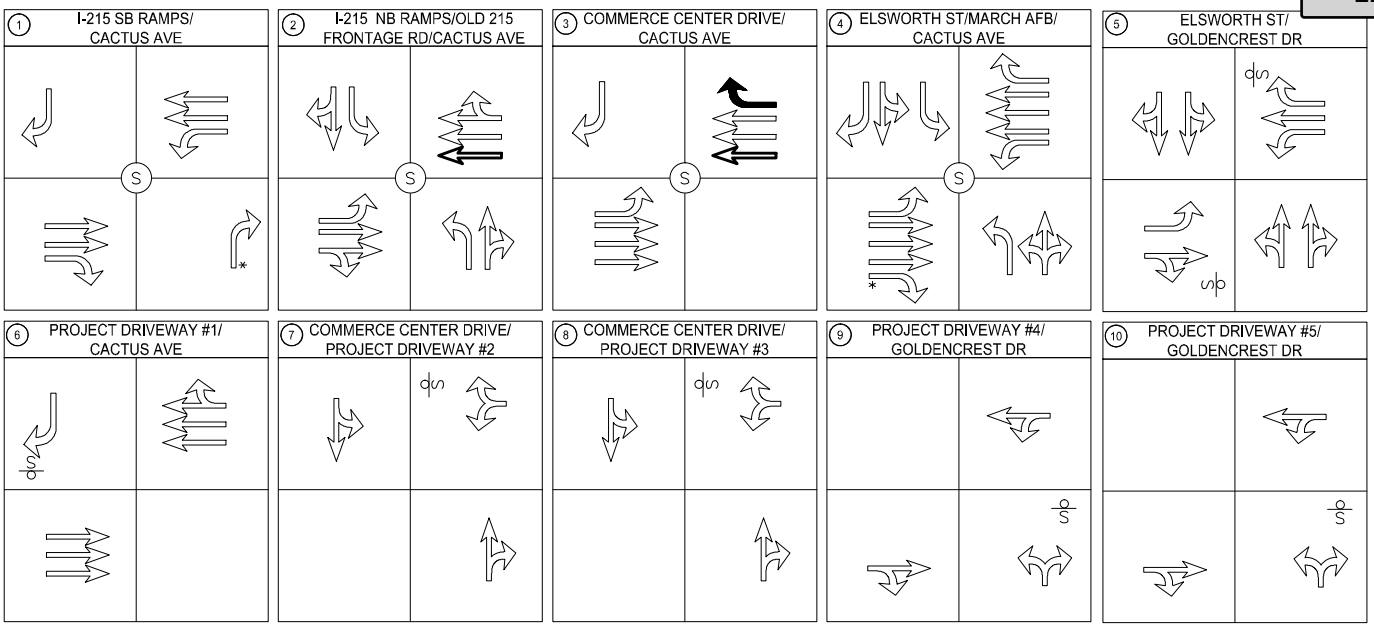
(#) - STUDY INTERSECTIONS

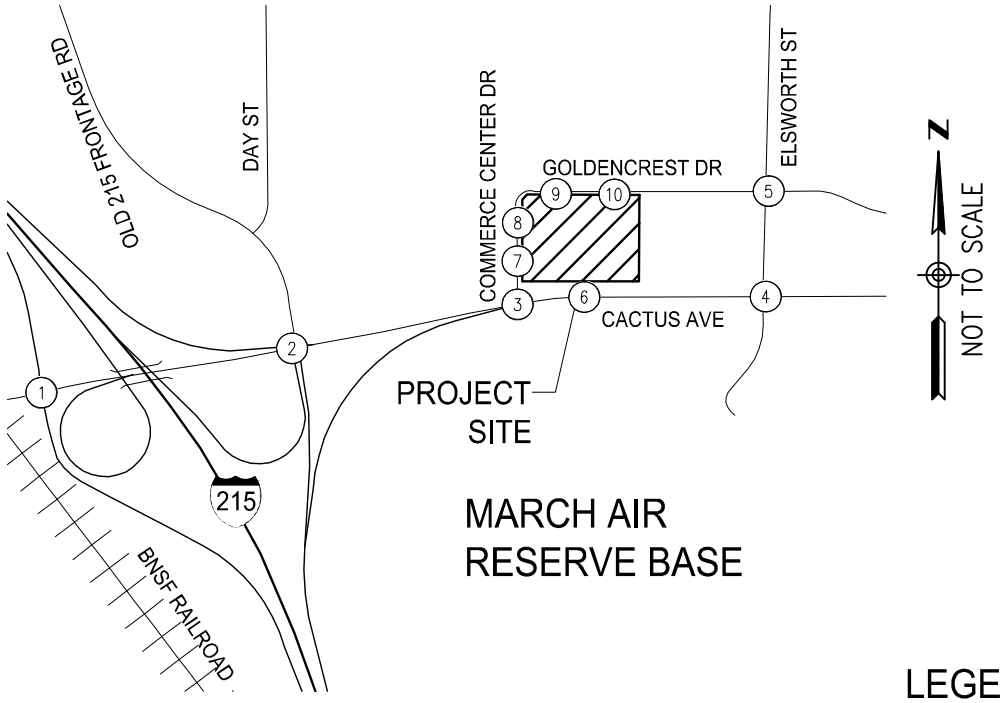
FIGURE 30: BUILDOUT YEAR 2035 + PROJECT TRAFFIC VOLUMES
ALTERNATIVE 2

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

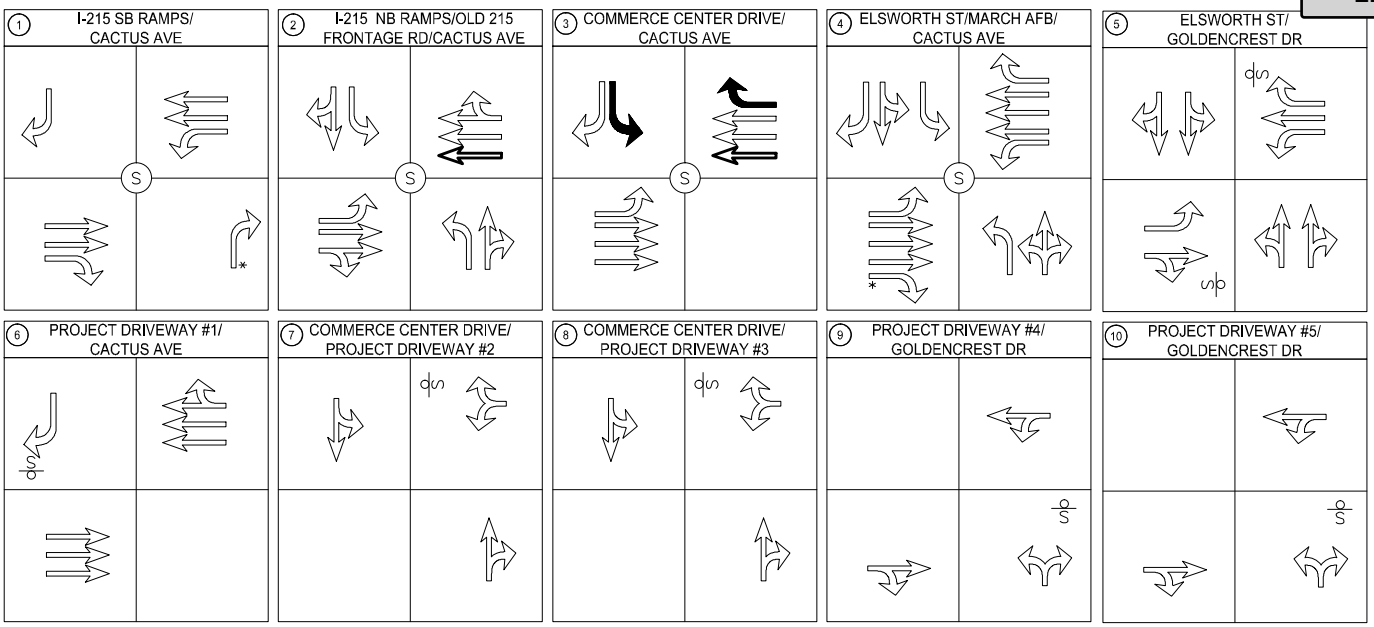
- UNSIGNALIZED INTERSECTION
- FREE RIGHT TURN
- STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- EXISTING GEOMETRICS
- PROPOSED EXISTING GEOMETR
- PROPOSED PROJECT GEOMETR

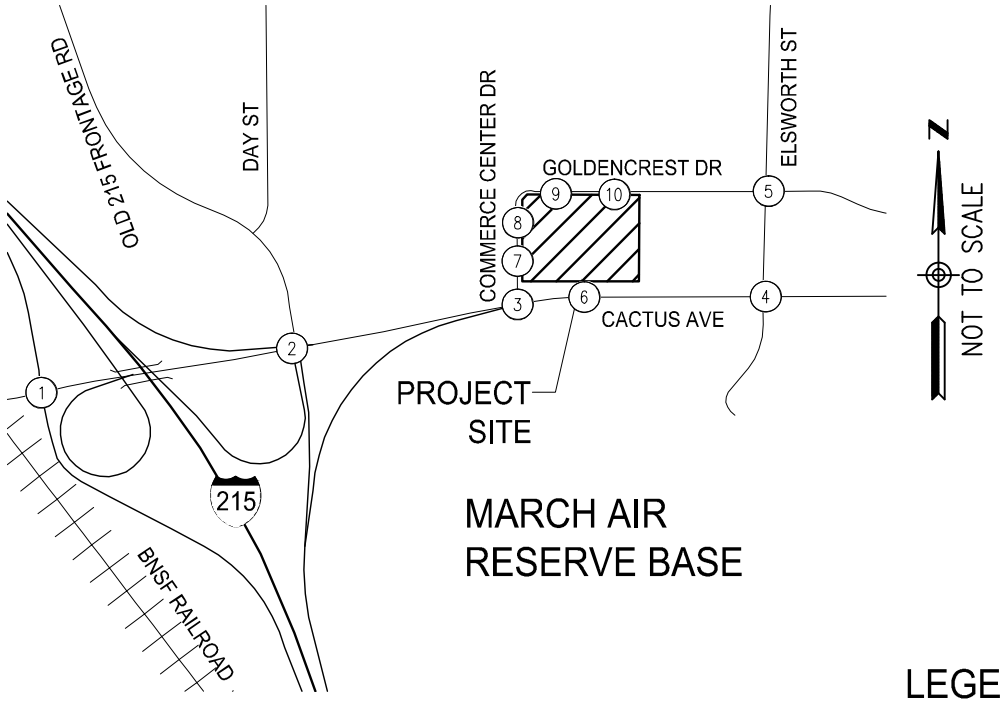
FIGURE 31: BUILDOUT YEAR 2035 + PROJECT CONDITION ALTERNATIVE 1 INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)





LEGEND

- UNSIGNALIZED INTERSECTION
- FREE RIGHT TURN
- STUDY INTERSECTIONS
- SIGNALIZED INTERSECTION
- EXISTING GEOMETRICS
- PROPOSED EXISTING GEOMETR
- PROPOSED PROJECT GEOMETR

FIGURE 32: BUILDOUT YEAR 2035 + PROJECT CONDITION ALTERNATIVE 2 INTERSECTION GEOMETRICS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

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9 PROJECT MITIGATION AND SUMMARY

The proposed project consists of two (2) different site access alternatives. Any modification of the intersection of Commerce Center Drive and Cactus Avenue would require the approval of the California Department of Transportation (Caltrans).

The site access alternatives include Alternative 1 which consists of a continued southbound left turn movement restriction at Commerce Center Drive and Cactus Avenue and Alternative 2 which consists of the inclusion of a southbound left turn movement provided at Commerce Center Drive and Cactus Avenue. The addition of the southbound left turn lane in Alternative 2 provides a redistribution of traffic exiting the site.

In summary, the project as presented will not cause significant impacts to the intersections. The proposed mitigations by condition are as follows.

9.1 Project Specific Mitigations

To accommodate project traffic, specific traffic mitigations have been identified. The project specific mitigation consists of the proposed Alternative 2 improvements to the intersection of Commerce Center Drive and Cactus Avenue. The project specific mitigations are illustrated in *Figure 33.* The recommended project mitigations include;

1. Construct the project driveways on Cactus Avenue, Commerce Center Drive, and Goldencrest Drive.

2. Construct a raised median along Cactus Avenue project frontage.

3. Commerce Center Drive and Cactus Avenue: Provide the southbound left turn as proposed in Alternative 2*;* convert the shared through-right lane to an exclusive right turn lane. Restripe the westbound approach to provide an exclusive westbound right turn trap lane. Restripe the eastbound left turn pocket to 325 feet.

4. Cactus Ave at Elsworth St/ March ARB: Extend the eastbound left turn pocket to provide the 300 feet of storage and the southbound right turn overlap be removed to accommodate the additional eastbound left and eastbound u-turning traffic. This mitigation would include the closure of the existing left turn pocket into the adjacent commercial center.

5. Proposed Northbound I-215 Off-ramp guide signage as illustrated in *Figure 34.*

9.2 Existing Condition Mitigations

To accommodate existing traffic, specific traffic mitigations have been identified. The recommended existing mitigations include;

1. Widening the westbound Cactus Avenue to provide three through lanes along the segment of Northbound I-215 On-ramp to Elsworth Street

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

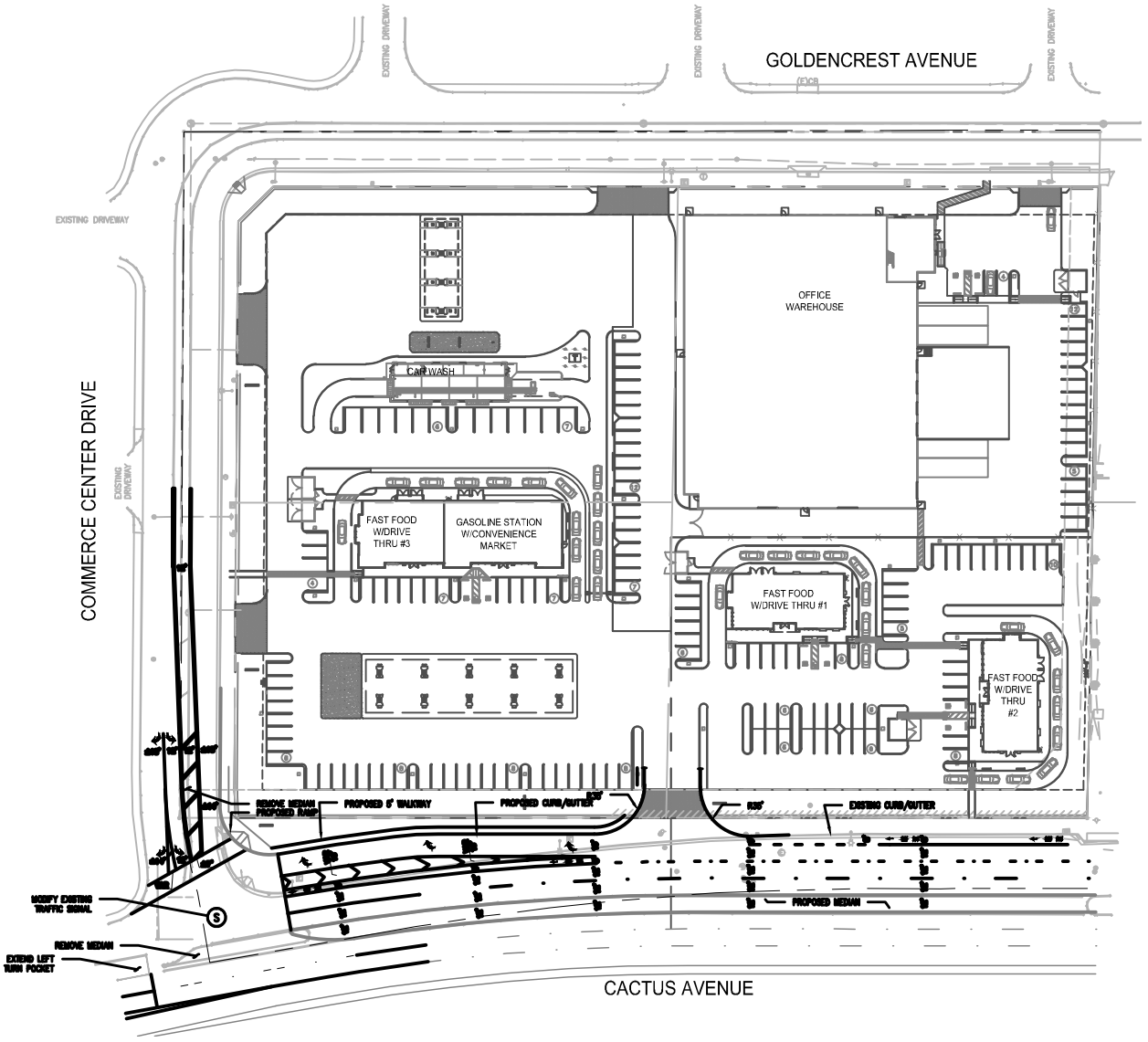


FIGURE 33: PROJECT SPECIFIC MITIGATIONS

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

DAVID EVANS AND ASSOCIATES INC.

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

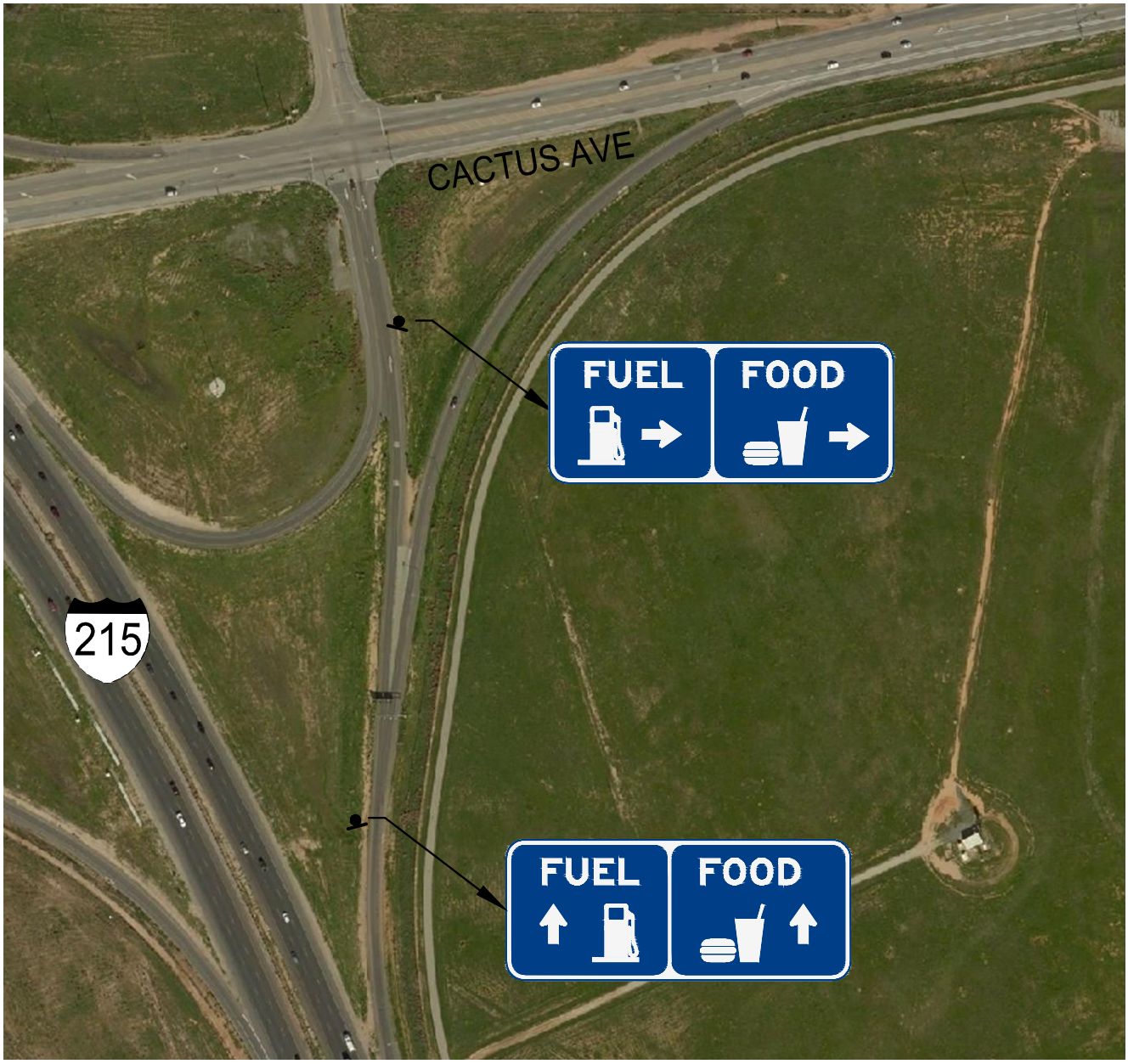


FIGURE 34: PROJECT SPECIFIC MITIGATIONS OFF-RAMP RECOMMENDATIONS

DAVID EVANS AND ASSOCIATES INC.

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

10 APPENDICES

A. Scope Memo/Memorandum of Understanding
B. Model Plots
C. City of Moreno Valley Bicycle Master Plan Figures
D. Other Area Projects
E. Intersection Capacity Analysis Calculations
F. Roadway Segment Capacity Analysis Calculations
G. Goldencrest Drive and Elsworth Street Traffic Signal Warrant Worksheet
H. Queuing Analysis

Attachment: Traffic Study (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot Plan)

DAVID EVANS AND ASSOCIATES INC.

APPENDIX A: SCOPE MEMO/MEMORANDUM OF UNDERSTANDING

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

MORENO VALLEY

SCOPING AGREEMENT FOR TRAFFIC ANALYSIS STUDY

Date: September 30, 2015

This letter acknowledges the City of Moreno Valley Transportation Engineering Division requirements for the traffic impact analysis of the following project.

Case No.	PA15-0032
Project Name:	Moreno Valley Cactus
Project Address:	TBD (northeast corner of Cactus Avenue and Commercial Center Drive)
Project Description:	The Proposed Project consisting of a Gasoline Station with Convenience Market and Car Wash, Fast Food Restaurants and an Office/Warehouse.
Related Cases:	Not Available

	Consultant	Developer
Name:	Rob Kilpatrick, David Evans and Associates, Inc.	Ino Cruz, JNT Management
Address:	14297 Cajon Avenue, Suite 101 Victorville, CA 92392	139 Radio Road Corona, CA 92879
Telephone:	(760) 524-9115	

I. Background

The project is proposed on a currently vacant parcel located at the northeast corner of Commerce Center Drive and Cactus Avenue in the City of Moreno Valley, California. The proposed project site is currently zoned as a Business Park/Light Industrial Land Use.

The proposed project site is bounded by business park to the west and north of the project site, commercial to the east of the project site, and March Air Reserve Base to the south.

II. Trip Geographic Distribution and Assignment

N: 35% **S:** 20% **E:** 35% **W:** 10%

III. Site Trip Generation Forecast

A. ITE Trip Generation Manual (latest edition)
B. AM Peak: 7:00-9:00 AM (based upon existing 24-hour traffic counts)
C. PM Peak: 4:00-6:00 PM (based upon existing 24-hour traffic counts)
D. Intersection and link acceptable Level of Service "D" for some intersections and links and Level of Service "C" for others based upon the current City policy. (Use Highway Capacity Manual - latest edition - operations procedures; parameters per County of Riverside Traffic Impact Analysis Guidelines.)

Proposed Use Rates*

Land Use (per unit): Daily: AM: PM:

1. **Gasoline/Service Station with Convenience Market and Car Wash (Auto)**
   Daily: 152.84 AM: 11.84 PM: 13.86
2. **Fast Food Restaurant with Drive-Through Window**
   Daily: 496.12 AM: 45.42 PM: 32.65
3. **Office/Warehouse:**
   Daily: 3.56 AM: 0.30 PM: 0.32

Existing Use Rates*

Land Use (per unit): Daily: AM: PM:

Internal Trip Allowance: Yes X No _____ Percentage 5%

Pass-by Trip Allowance: Yes X No _____ Percentage Varies

Use	Size/Unit	AM Peak Hour		AM Total	PM Peak Hour		PM Total	Daily Trips
		In	Out		In	Out		
Proposed								
Gasoline/Service Station with Convenience Market and Car Wash	20 Gasoline Fueling Positions	121	116	237	141	136	277	3,057
Gasoline/Service Station with Convenience Market and Car Wash	8 Diesel Fueling Positions	147	138	285	171	162	333	3,669
Fast Food Restaurant with Drive-Through Window	9,200 SF	213	205	418	156	144	300	4,564
Office/Warehouse	48,258 SF	15	5	20	6	16	22	240

*** Source**: "Trip Generation Manual, Institute of Transportation Engineers", 9th Edition

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

IV. Specific Project Issues to be Analyzed

A. The focus of this traffic study will be on addressing the adequacy of site access and identifying specific near-term and future circulation improvements required in the study area to maintain acceptable peak hour and daily levels of service (LOS).
B. The traffic study shall address the project traffic impacts at all study intersections listed in Section VI and provide appropriate mitigation measures if applicable, including but not limited to traffic signal, raised medians, left-turn lane modifications.
C. The traffic study shall include a section that discusses the difference in trip generation between the previous proposed or existing use and the proposed project.
D. Different site Access alternatives will be analyzed.
   Alt 1: Southbound left turn movement will not be provided at Commerce Center Drive and Cactus Avenue
   Alt 2: Southbound left turn movement will be provided at Commerce Center Drive and Cactus Avenue
E. Queuing Analysis at all project driveways to determine storage lengths for turning vehicles
F. Assess non-motorized (peds/bikes) access, document available transit/bus routes
G. Include a copy of truck turning exhibit/on-site circulation to show how trucks enter/exit the project site.

V. Study of Horizon Years

A. Existing
B. Existing + Ambient Growth (existing to opening year***, assume growth rate of 2% per year)
C. Existing + Ambient + Project
D. Existing + Ambient + Cumulative
E. Existing + Ambient + Cumulative + Project
F. General Plan Build-out (with and without the project) – Build-out data will be obtained from City's traffic forecast model. If proposed project increases intensity or land use, intersection data from the forecast model will need to be refined for analysis. If unavailable a growth factor will be utilized.

***** Opening year should have five (5) year minimum horizon**

VI. Facilities to be Studied

A. Intersections
   1. Cactus Avenue and I-215 Freeway SB Ramps
   2. Cactus Avenue and I-215 Freeway NB On-Off Ramps/ Old 215 Frontage Road
   3. Cactus Avenue and Commerce Center Drive
   4. Cactus Avenue and Elsworth Street/ March ARB
   5. Goldencrest Drive and Elsworth Street
   6. Project Driveway on Cactus Avenue
   7. Project Driveways on Commerce Center Drive
   8. Project Driveways on Goldencrest Drive

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

B. Roadway Segments
   1. Commerce Center Drive
   2. Goldencrest Drive
   3. Cactus Avenue (Old 215 Frontage Road to Frederick Street)
   4. Elsworth Street (Cactus Avenue to Alessandro Boulevard)

VII. Deliverables

A. Draft traffic impact study (2 copies)
B. Final traffic impact study (4 copies)

All draft and final traffic impact studies shall be delivered with the appropriate review fee to the Permit Technician, Land Development Division, Moreno Valley City Hall, 14177 Frederick Street, Moreno Valley, CA 92552. Please contact the Land Development Division at 951-413-3110 prior to the delivery of the traffic study.

If you have any questions regarding this *Scoping Agreement*, please contact Eric Lewis at (951) 413-3140.

Recommended By:

Rob Kilpatrick
David Evans and Associates, Inc.

Approved By:

Eric Lewis, P.E., T.E.
City Traffic Engineer

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

September 29, 2014 Job No. CACT0000-0001

MEMORANDUM

To: Mr. Ino Cruz
JNT Management
139 Radio Road
Corona, Ca 92879

From: Robert Kilpatrick, PE/TE
Senior Project Manager / Senior Associate

RE: Traffic Scope Outline – Moreno Valley Cactus - Moreno Valley, California

This memorandum presents the scope of the traffic study for the Proposed Project consisting of a Gasoline Station with Convenience Market and Car Wash. Also to be provided in the Proposed Project is Fast Food Restaurants and an Office/Warehouse. The proposed project is located at the northeast corner of Commerce Center Drive and Cactus Avenue in the City of Moreno Valley, California. JNT Management is looking to obtain approval of the proposed project. The purpose of the scope is to assess the requirements of a detailed Traffic Study for the project by the City of Moreno Valley Engineering Department.

A. Project Description

The proposed project is located at the northeast corner of Commerce Center Drive and Cactus Avenue in the City of Moreno Valley, California, as illustrated in *Exhibit A.* It is bounded to the north by Goldencrest Drive, March Air Reserve Base to the south, Commerce Center Drive to the west, and a Restaurant to the east.

As presented, the proposed project is comprised of a Gasoline Station with Convenience Market and Car Wash, Fast Food Restaurant, and a Carwash, Fast Food Restaurants, and an Office/Warehouse. *Exhibit B* illustrates the proposed Site Plan. As illustrated, the access to the site will be obtained from Cactus Avenue, Commerce Center Drive, and Goldencrest Drive.

B. Project Trip Generation

The anticipated truck mix for the Office/Warehouse is 80% passenger vehicles and 20% trucks as outlined in the Fontana Truck Trip Generation Study. The Passenger Car Equivalent (PCE) Trips are calculated with a PCE factor of 3.0. *Table A* summarizes the estimated trip generation for the project site during the AM (7-9 AM) peak and PM (4-6 PM) peak periods. The generation factors for the Gasoline/Service Station with Convenience Market and Car Wash, Fast Food Restaurant with Drive-Through Window, and the Office/Warehouse were obtained from the ITE Trip Generation Manual, 9th Edition. The diverted link trip and pass-by trip reduction percentages for the Fast-Food Restaurant with Drive-Through Window and Gasoline/Service Station with Convenience Market were calculated from the ITE Trip Generation Manual, 9th Edition Chapter 5. A 5% internal trip reduction was applied to the trip generation.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

Table A: Project Trip Generation

Traffic Scope –Moreno Valley Cactus

	Use		AM Peak Hour			PM Peak Hour		
		Daily	In	Out	Total	In	Out	Total
1	**Gasoline/Service Station with Convenience Market and Car Wash**							
	(ITE 946) Vehicle Fueling Positions	152.84	6.04	5.80	11.84	7.07	6.79	13.86
	20 Gasoline Fueling Positions	3,057	121	116	237	141	136	277
	8 Diesel Fueling Positions	1,223	49	46	95	57	54	111
	Truck PCE Trips	3,669	147	138	285	171	162	333
	Sub-Total PCE Trips	6,726	268	254	522	312	298	610
	Primary Trips (12%/18%)	-	32	30	63	25	24	49
	Diverted Link Trips (21%/31%)	-	56	53	110	97	92	189
	Pass-By Trips (62%/56%)	-	166	157	324	175	167	342
	Internal PCE Trips (5%/5%)	-	13	13	26	16	15	31
2	**Fast-Food Restaurant with Drive-Through Window**							
	(ITE 934) Per 1,000 Sq. Feet Gross Floor Area	496.12	23.16	22.26	45.42	16.98	15.67	32.65
	9,200 Sq. Feet Gross Floor Area	4,564	213	205	418	156	144	300
	Primary Trips (18%/22%)	-	38	37	75	34	32	66
	Diverted Link Trips (28%/23%)	-	60	57	117	36	33	69
	Pass-By Trips (49%/50%)	-	105	100	205	78	72	150
	Internal PCE Trips (5%/5%)	-	11	10	21	8	7	15
3	**Office/Warehouse**							
	(ITE 150) Per 1,000 Sq. Feet Gross Floor Area	3.56	0.24	0.06	0.30	0.08	0.24	0.32
	48,258 Sq. Feet Gross Floor Area	172	11	3	14	4	12	15
	Auto Trips (80% Auto Trips)	138	9	2	11	3	10	12
	Truck Trips (20% Truck Trips)	34	2	1	3	1	2	3
	Truck PCE Trips	102	6	3	9	3	6	9
	Sub-Total PCE Trips	240	15	5	20	6	16	22
	Primary PCE Trips (95%/95%)	228	14	5	19	6	15	21
	Internal PCE Trips (5%/5%)	12	1	0	1	0	1	1
	Total Auto Trips	7,759	343	323	666	300	290	589
	Total Truck Trips	1,257	51	47	98	58	56	114
	Total Truck PCE Trips	3,771	153	141	294	174	168	342
	Total Project Trips	9,016	394	370	764	358	346	703
	Total PCE Trips	**11,530**	496	464	**960**	474	458	**931**
	Primary Total PCE Trips	-	**84**	**72**	157	**65**	**71**	136
	Diverted Link Total PCE Trips	-	**116**	110	227	**133**	125	258
	Pass-By Total PCE Trips	-	**271**	**257**	529	**253**	**239**	492
	Internal Total PCE Trips	-	25	23	48	24	23	47

Source: "Trip Generation Manual, Institute of Transportation Engineers", 9th Edition

It is estimated that the project will generate 11,530 daily PCE trips, 960 AM PCE trips and 931 PM PCE trips.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

C. Project Trip Distribution and Assignment

Different site access alternatives are to be analyzed. The site access alternatives include Alternative 1 which consists of a continued southbound left turn movement restriction at Commerce Center Drive and Cactus Avenue and Alternative 2 which consists of the inclusion of a southbound left turn movement provided at Commerce Center Drive and Cactus Avenue.

The project trips are distributed based on the local area network streets. The Project Primary Trip Distribution is illustrated in *Exhibit C1* for both Alternative 1 and Alternative 2. The Project Diverted Link Trip Distribution is illustrated in *Exhibit C2* for both Alternative 1 and Alternative 2. The Project Primary Trips are illustrated in *Exhibit D1* for both Alternative 1 and Alternative 2. The Project Diverted Link Trips are illustrated in *Exhibit D2* for both Alternative 1 and Alternative 2. The Project Pass-By Trips are illustrated in *Exhibit D3* for both Alternative 1 and Alternative 2. The Total Project Trips are illustrated in *Exhibit D4A* for both Alternative 1 and Alternative 2. The Supplemental Intersections Total Project Trips are illustrated in *Exhibit D4B* for both Alternative 1 and Alternative 2. The trip distribution is based on the existing street system.

D. Study Intersections

The proposed project is located at the northeast corner of Commerce Center Drive and Cactus Avenue in the City of Moreno Valley, California. We examined the trips distributed to seven (7) intersections in the study area;

1. Cactus Avenue and I-215 Freeway SB Ramps
2. Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road
3. Cactus Avenue and Commerce Center Drive
4. Cactus Avenue and Elsworth Street/ March ARB
5. Goldencrest Drive and Elsworth Street
6. Elsworth Street and Alessandro Boulevard
7. Cactus Avenue and Frederick Street

The intersections of Cactus Avenue and I-215 Freeway SB Ramps, Cactus Avenue and I-215 Freeway NB Off-Ramps, Cactus Avenue and Commerce Center Drive, Cactus Avenue and Elsworth Street signalized intersections

The criteria for the study intersections are intersections which the proposed project will add 50 or more trips during any peak hour. Based on our review of the proposed trip generation and distribution of the project trips, we are recommending five (5) existing intersections and five (5) future intersection in the study area have been identified for analysis;

1. Cactus Avenue and I-215 Freeway SB Ramps
2. Cactus Avenue and I-215 Freeway NB Ramps/ Old 215 Frontage Road
3. Cactus Avenue and Commerce Center Drive
4. Cactus Avenue and Elsworth Street/ March ARB
5. Goldencrest Drive and Elsworth Street
6. Project Driveway on Cactus Avenue (Future Intersection)
7. Project Driveways on Commerce Center Drive (Two Future Intersections)
8. Project Driveways on Goldencrest Drive (Two Future Intersections)

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

E. Traffic Study Scenarios

The following is an outline of the Traffic Study analysis scenarios;

1. Existing Conditions (AM (7-9 AM) peak and PM (4-6 PM) peak periods)

2. Existing + Ambient Growth
    a. Existing
    b. Growth (assume growth rate of 2% per year)

3. Existing + Ambient + Project
    a. Existing
    b. Growth (assume growth rate of 2% per year)
    c. Project Traffic
        i. Proposed Cactus Avenue Driveway Analysis (Weaving Analysis)

4. Existing + Ambient + Cumulative
    a. Existing
    b. Growth (assume growth rate of 2% per year)
    c. Related Projects in the vicinity

5. Existing + Ambient + Cumulative + Project
    a. Existing
    b. Growth (assume growth rate of 2% per year)
    c. Related Projects in the vicinity
    d. Project Traffic
        ii. Proposed Cactus Avenue Driveway Analysis (Weaving Analysis)

6. General Plan Build-out Year 2035
    a. City's traffic forecast model (to be provided by the City)

7. General Plan Build-out Year 2035 With Project
    b. City's traffic forecast model (to be provided by the City)
    c. Project Traffic

If you have any questions or comments, please feel free to contact us.

Attachments

1. Exhibit A - Vicinity Map
2. Exhibit B - Site Plan
3. Exhibit C1 - Project Primary Trip Distribution
4. Exhibit C2 - Project Diverted Link Trip Distribution
5. Exhibit D1 - Project Primary Trips
6. Exhibit D2 - Project Diverted Link Trips
7. Exhibit D3 – Project Pass-By Trips
8. Exhibit D4A – Total Project Trips
9. Exhibit D4B – Supplemental Intersections Total Project Trips

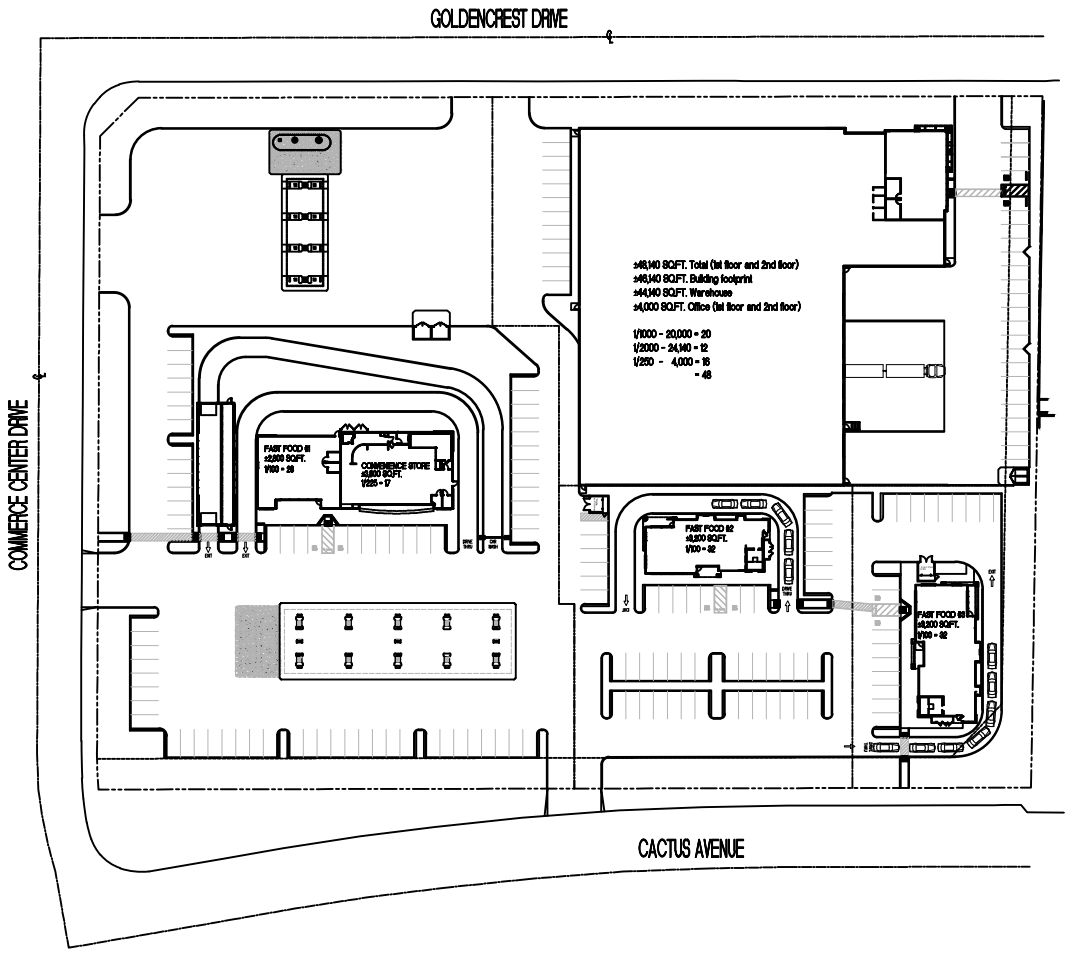
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

EXHIBIT A: VICINITY MAP

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot



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NOT TO SCALE

DAVID EVANS AND ASSOCIATES INC.

EXHIBIT B: SITE PLAN

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

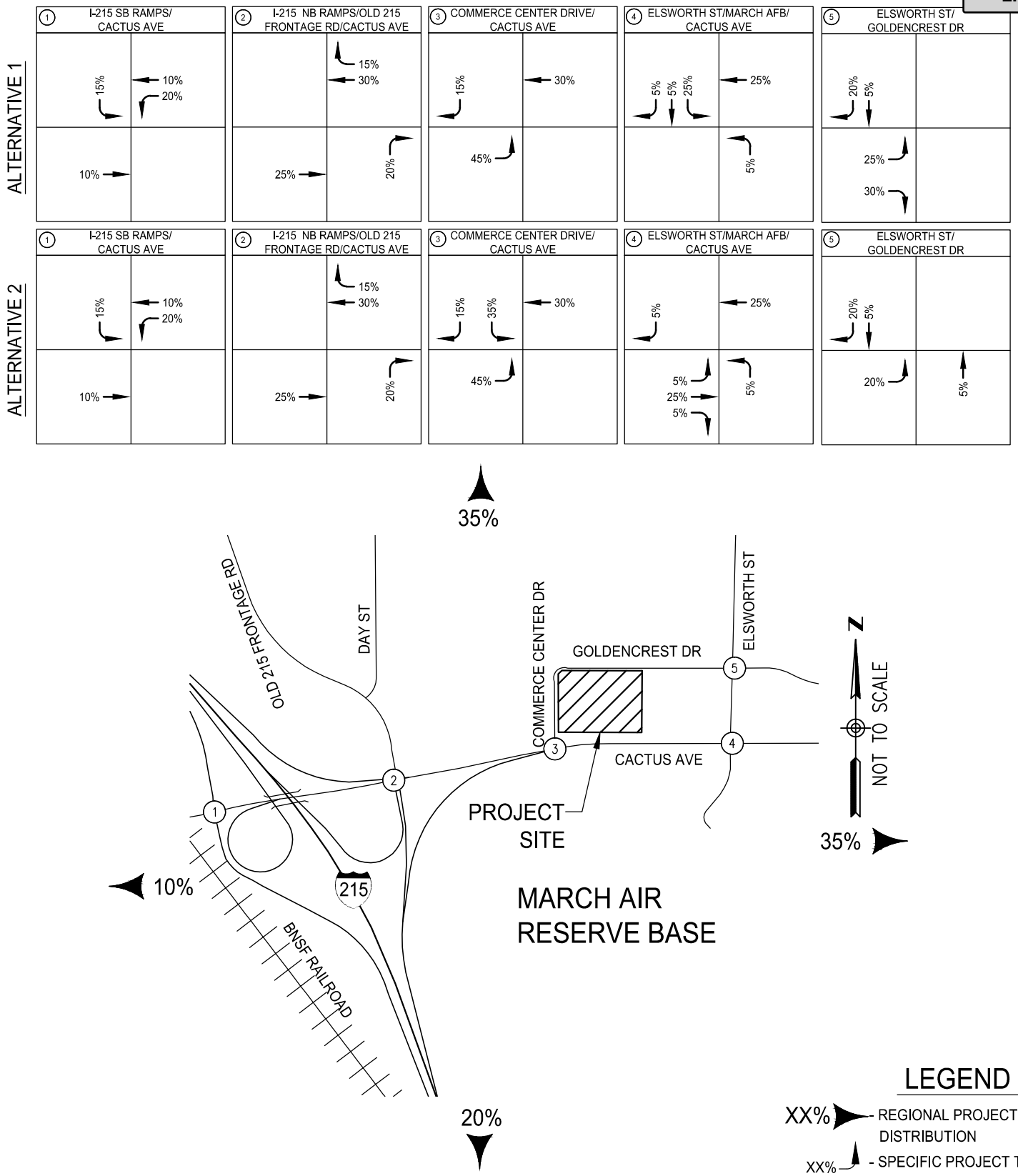

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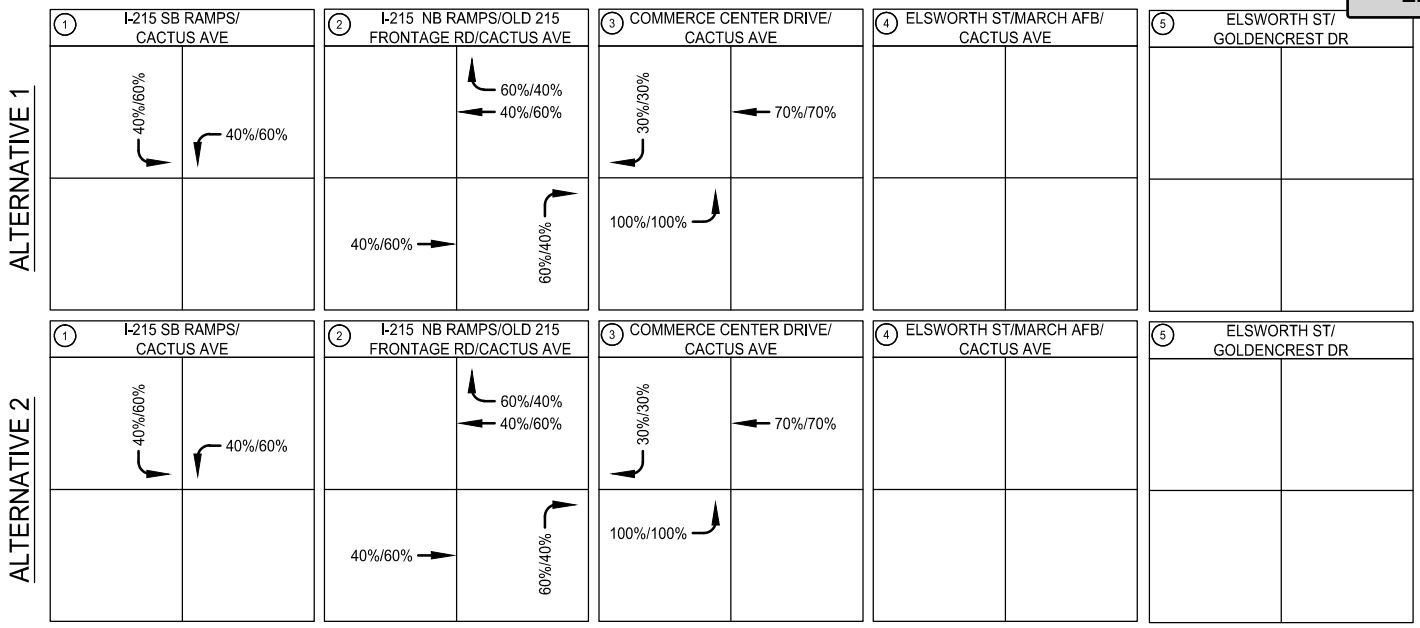
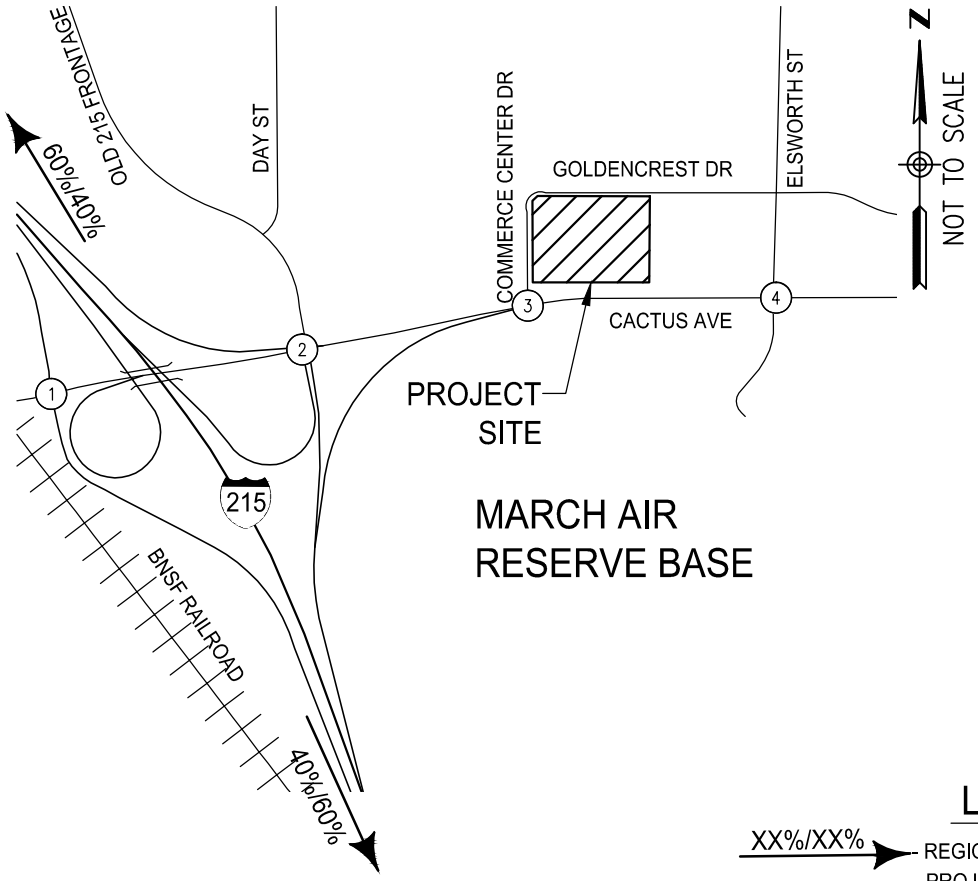
EXHIBIT C1: PROJECT PRIMARY TRIP DISTRIBUTION

MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot





LEGEND

XX%/XX% - REGIONAL DIVERTED AM/PM PROJECT TRIP DISTRIBUTIOI

XX%/XX% - SPECIFIC DIVERTED AM/PM PROJECT TRIP DISTRIBUTIOI

(#) - STUDY INTERSECTIONS

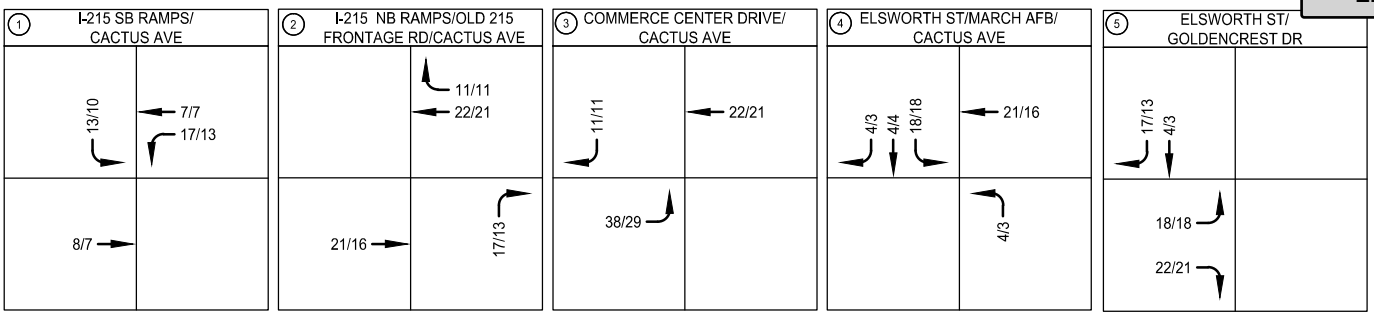
DAVID EVANS AND ASSOCIATES INC.

EXHIBIT C2: PROJECT DIVERTED LINI TRIP DISTRIBUTION

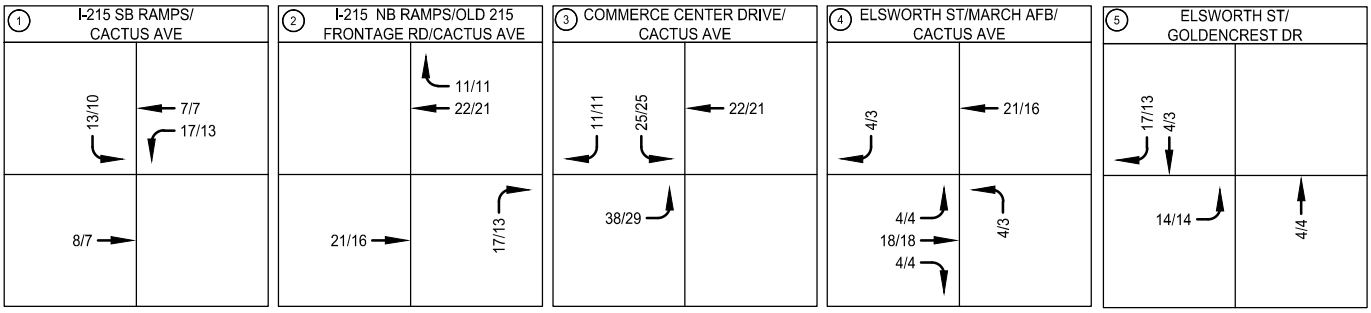
MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

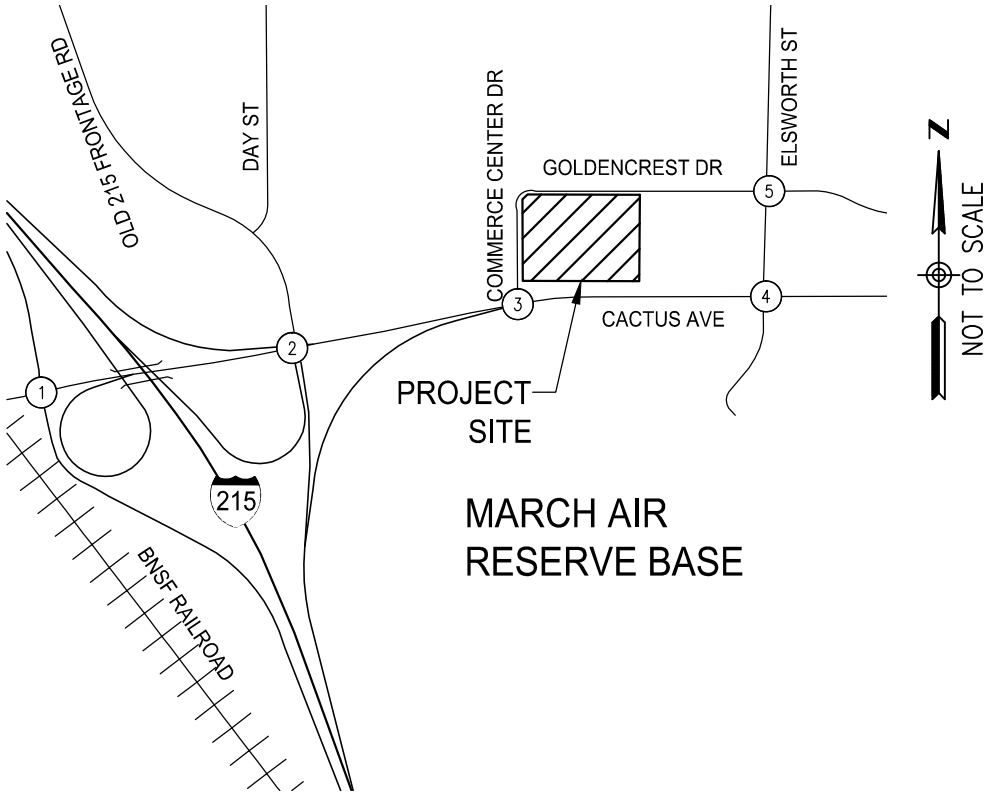
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

ALTERNATIVE 1



ALTERNATIVE 2





PRIMARY TRIPS

AM PEAK PERIOD - 84 IN / 72 OUT
PM PEAK PERIOD - 65 IN / 71 OUT

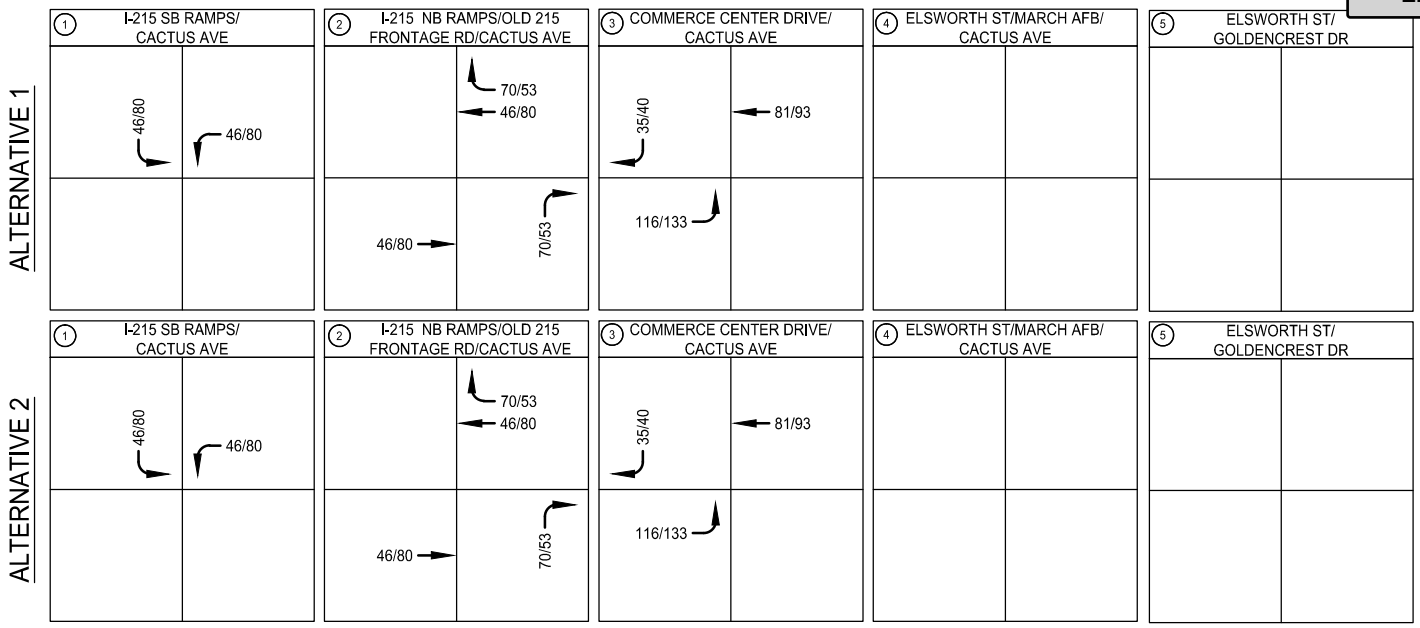
LEGEND

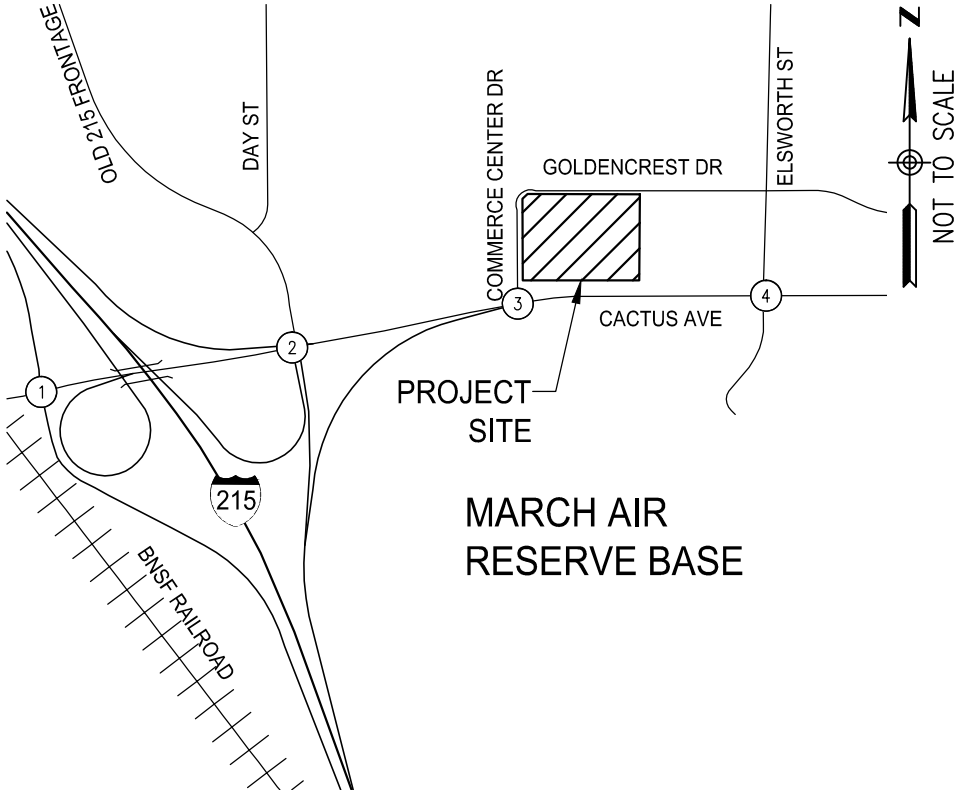
XX/XX - AM/PM PROJECT TRIP
- STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

EXHIBIT D1: PROJECT PRIMARY TRIPS
MORENO VALLEY CACTUS
MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot





DIVERTED-LINK TRIPS

AM PEAK PERIOD	-	116 IN / 110 OUT
PM PEAK PERIOD	-	133 IN / 125 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

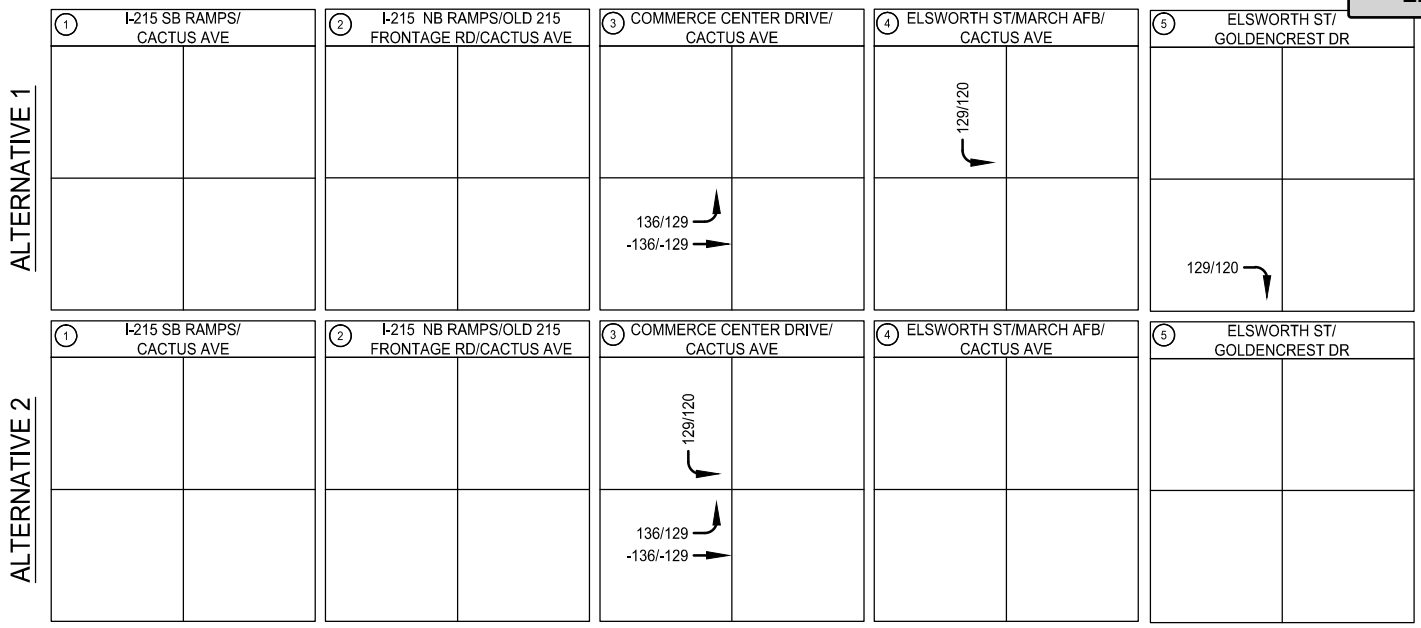
DAVID EVANS AND ASSOCIATES INC.

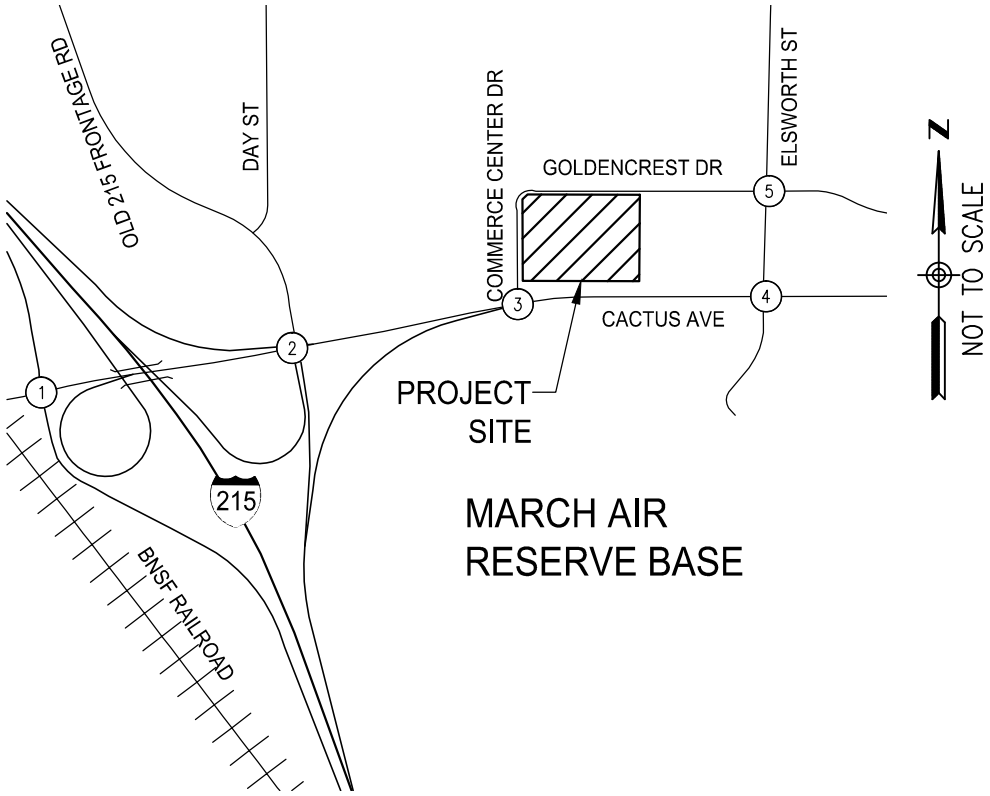
EXHIBIT D2: PROJECT DIVERTED-LINK TRIPS

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot





PASS-BY TRIPS

AM PEAK PERIOD - 271 IN / 257 OUT

PM PEAK PERIOD - 253 IN / 239 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

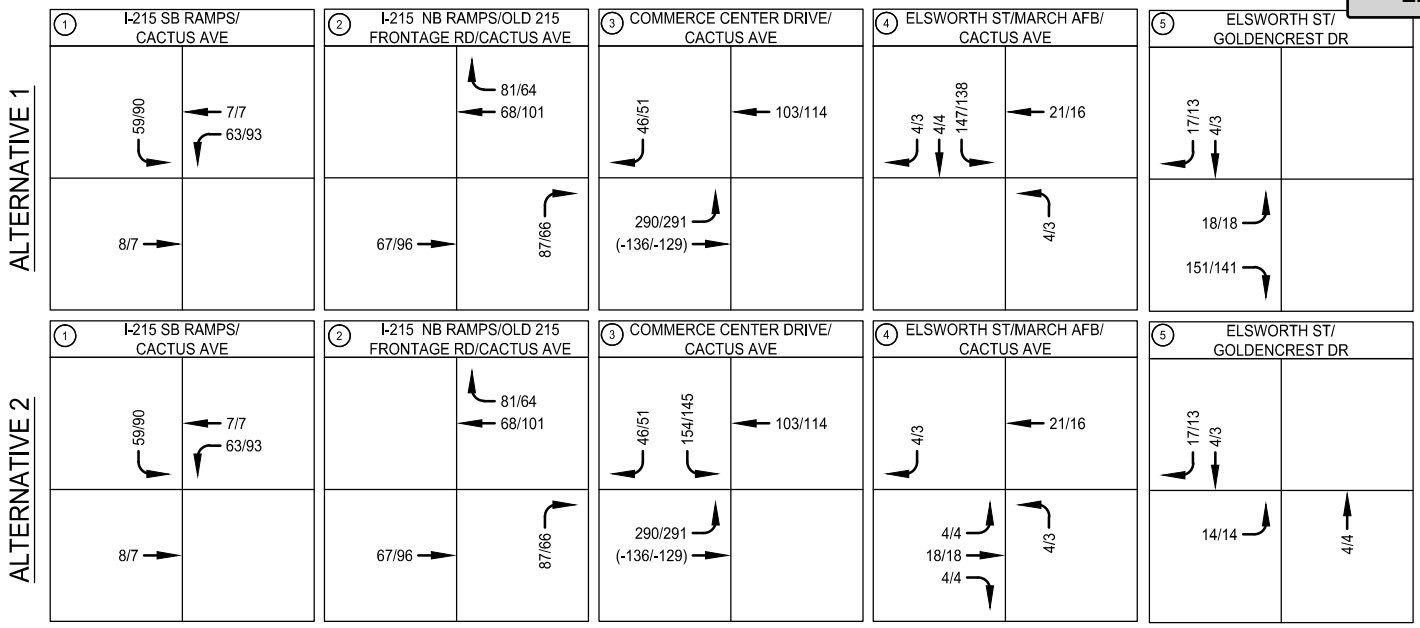
DAVID EVANS AND ASSOCIATES INC.

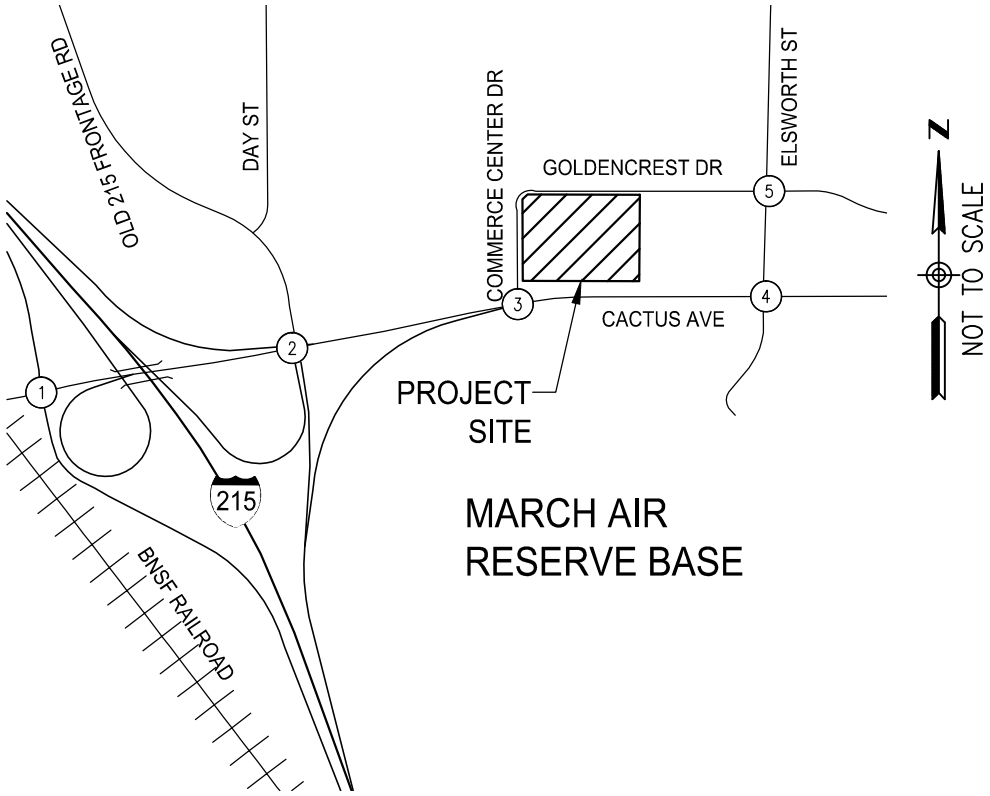
EXHIBIT D3: PROJECT PASS-BY TRIPS

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot





TOTAL PROJECT TRIPS

AM PEAK PERIOD	-	496 IN / 464 OUT
PM PEAK PERIOD	-	474 IN / 458 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

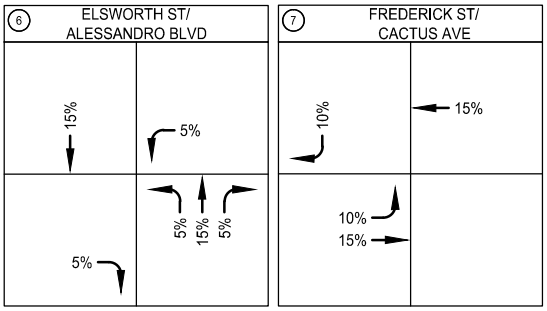
EXHIBIT D4A: TOTAL PROJECT TRIPS

MORENO VALLEY CACTUS

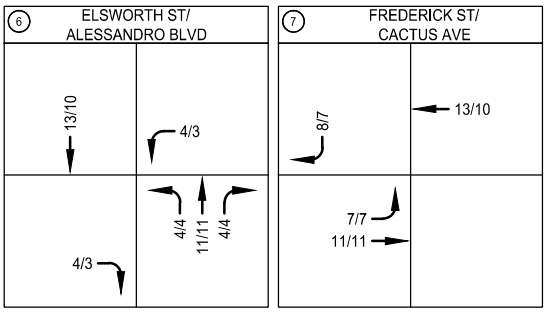
MORENO VALLEY, CALIFORNIA

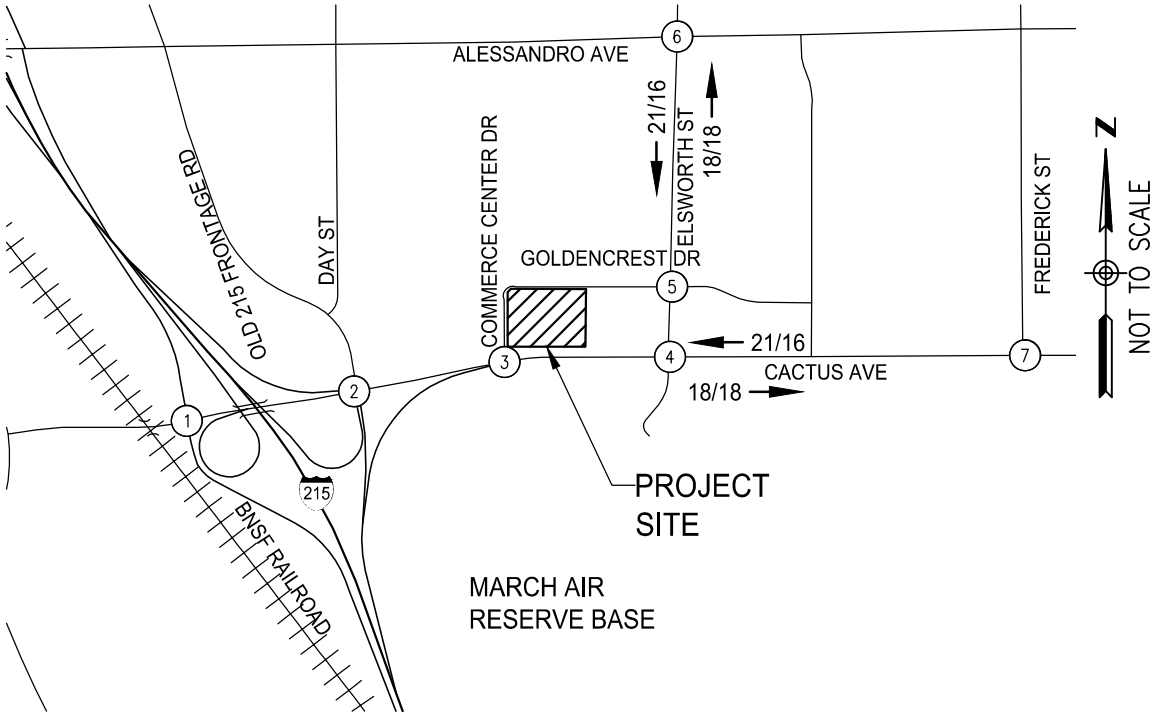
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

PRIMARY TRIP DISTRIBUTION



PROJECT TRIPS





TOTAL PROJECT TRIPS

AM PEAK PERIOD	-	496 IN / 464 OUT
PM PEAK PERIOD	-	474 IN / 458 OUT

LEGEND

XX/XX - AM/PM PROJECT TRIP

(#) - STUDY INTERSECTIONS

DAVID EVANS AND ASSOCIATES INC.

EXHIBIT D4B: SUPPLEMENTAL INTERSECTIONS TOTAL PROJECT TRIPS

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 5.1 Land Uses and Time Periods with Pass-By Data

Land Use Code and Description	Time Period	Table	Figure
813 Free-Standing Discount Superstore	Weekday, p.m. Peak Period	5.2	—
815 Free-Standing Discount Store	Weekday, p.m. Peak Period	5.3	5.3
	Saturday, Midday Peak Period	5.4	5.4
816 Hardware/Paint Store	Weekday, p.m. Peak Period	5.5	—
820 Shopping Center	Weekday, p.m. Peak Period	5.6	5.5/5.6
	Saturday, Midday Peak Period	5.7	5.7
843 Automobile Parts Sales	Weekday, p.m. Peak Period	5.8	—
848 Tire Store	Weekday, p.m. Peak Period	5.9	—
850 Supermarket	Weekday, p.m. Peak Period	5.10	5.8
851 Convenience Market (Open 24 Hours)	Weekday, p.m. Peak Period	5.11	5.9
853 Convenience Market with Gasoline Pumps	Weekday, a.m. Peak Period	5.12	5.10
	Weekday, p.m. Peak Period	5.13	5.11
854 Discount Supermarket	Weekday, p.m. Peak Period	5.14	5.12
862 Home Improvement Superstore	Weekday, p.m. Peak Period	5.15	—
863 Electronics Superstore	Weekday, p.m. Peak Period	5.16	—
880 Pharmacy/Drugstore without Drive-Through Window	Weekday, p.m. Peak Period	5.17	—
881 Pharmacy/Drugstore with Drive-Through Window	Weekday, p.m. Peak Period	5.18	—
890 Furniture Store	Weekday, p.m. Peak Period	5.19	—
912 Drive-In Bank	Weekday, p.m. Peak Period	5.20	—
931 Quality Restaurant	Weekday, p.m. Peak Period	5.21	—
932 High-Turnover (Sit-Down) Restaurant	Weekday, p.m. Peak Period	5.22	5.13
934 Fast-Food Restaurant with Drive-Through Window	Weekday, a.m. Peak Period	5.23	—
	Weekday, p.m. Peak Period	5.24	5.14
935 Fast-Food Restaurant without Drive-Through Window and No Indoor Seating (*Specialized Land Use: Coffee/ Espresso Stand*)	Weekday	5.25/5.26	—
944 Gasoline/Service Station	Weekday, a.m. Peak Period	5.27	—
	Weekday, p.m. Peak Period	5.28	—
945 Gasoline/Service Station with Convenience Market	Weekday, a.m. Peak Period	5.29	5.15
	Weekday, p.m. Peak Period	5.30	5.16

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 5.23
Pass-By Trips and Diverted Linked Trips
Weekday, a.m. Peak Period

Land Use 934—Fast-Food Restaurant with Drive-Through Window

SEATS	SIZE (1,000 SQ. FT. GFA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PRIMARY TRIP (%)	NON-PASS-BY TRIP (%)	DIVERTED LINKED TRIP (%)	PASS-BY TRIP (%)	ADJ. STREET PEAK HOUR VOLUME	SOURCE
n/a	<5	Chicago suburbs, IL	1987	84	7:00–9:00 a.m.	—	56	—	44	n/a	Kenig, O'Hara, Humes, Flock
88	1.4	Louisville area, KY	1993	n/a	7:00–9:00 a.m.	22	—	16	62	1,407	Barton-Aschman Assoc.
100	3.6	Louisville, KY	1993	n/a	7:00–9:00 a.m.	47	—	21	32	437	Barton-Aschman Assoc.
87	4.2	New Albany, IN	1993	n/a	7:00–9:00 a.m.	23	—	31	46	1,049	Barton-Aschman Assoc.
150	3.0	Louisville area, KY	1993	n/a	7:00–9:00 a.m.	14	—	43	43	2,903	Barton-Aschman Assoc.
n/a	3.3	varies	1996	n/a	6:00–9:00 a.m.	—	32	—	68	n/a	Oracle Engineering

Average Pass-By Trip Percentage: 49

Average Diverted-Link Trip (%)

$$\frac{(16+21+31+43)}{4} = 28\%$$

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1371

Table 5.24
Pass-By Trips and Diverted Linked Trips
Weekday, p.m. Peak Period

Land Use 934—Fast-Food Restaurant with Drive-Through Window

SEATS	SIZE (1,000 SQ. FT. GFA)	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PRIMARY TRIP (%)	NON-PASS-BY TRIP (%)	DIVERTED LINKED TRIP (%)	PASS-BY TRIP (%)	ADJ. STREET PEAK HOUR VOLUME	SOURCE
n/a	~2.6	Minn-St. Paul, MN	1987	50	3:00–7:00 p.m.	27	—	48	25	n/a	n/a
n/a	<5.0	Chicago suburbs, IL	1987	80	3:00–6:00 p.m.	—	62	—	38	n/a	Kenig, O'Hara, Humes, Flock
n/a	<5.0	Chicago suburbs, IL	1987	100	3:00–6:00 p.m.	—	45	—	55	n/a	Kenig, O'Hara, Humes, Flock
n/a	<5.0	Chicago suburbs, IL	1987	159	3:00–6:00 p.m.	—	44	—	56	n/a	Kenig, O'Hara, Humes, Flock
n/a	<5.0	Chicago suburbs, IL	1987	225	3:00–6:00 p.m.	—	52	—	48	n/a	Kenig, O'Hara, Humes, Flock
n/a	<5.0	Chicago suburbs, IL	1987	88	3:00–6:00 p.m.	—	65	—	35	n/a	Kenig, O'Hara, Humes, Flock
n/a	<5.0	Chicago suburbs, IL	1987	84	3:00–6:00 p.m.	—	56	—	44	n/a	Kenig, O'Hara, Humes, Flock
88	1.3	Louisville area, KY	1993	n/a	4:00–6:00 p.m.	22	—	10	68	2,055	Barton-Aschman Assoc.
120	1.9	Louisville area, KY	1993	33	4:00–6:00 p.m.	24	—	9	67	2,447	Barton-Aschman Assoc.
87	4.2	New Albany, IN	1993	n/a	4:00–6:00 p.m.	25	—	19	56	1,632	Barton-Aschman Assoc.
150	3.0	Louisville area, KY	1993	n/a	4:00–6:00 p.m.	31	—	38	31	4,250	Barton-Aschman Assoc.
n/a	3.1	Kissimmee, FL	1995	28	2:00–6:00 p.m.	—	29	n/a	71	n/a	TPD Inc.
n/a	3.1	Apopka, FL	1996	29	2:00–6:00 p.m.	—	62	n/a	38	n/a	TPD Inc.
n/a	2.8	Winter Springs, FL	1995	47	2:00–6:00 p.m.	—	34	—	66	n/a	TPD Inc.
n/a	4.3	Longwood, FL	1994	304	2:00–6:00 p.m.	—	38	—	62	n/a	TPD Inc.
n/a	3.2	Altamonte Springs, FL	1996	202	2:00–6:00 p.m.	39	—	21	40	n/a	TPD Inc.
n/a	2.9	Winter Park, FL	1996	271	2:00–6:00 p.m.	41	—	18	41	n/a	TPD Inc.
n/a	3.3*	several	1996	varies	4:00–6:00 p.m.	—	38	—	62	n/a	Oracle Engineering

* Average of several combined studies.

Average Pass-By Trip Percentage: 50

Average Diverted-Link Trip (%)

$$\frac{(48+10+9+19+38+21+18)}{7} = 23\%$$

Table 5.29
Pass-By Trips and Diverted Linked Trips
Weekday, a.m. Peak Period

Land Use 945—Gasoline/Service Station with Convenience Market

SIZE (1,000 SQ. FT. GFA)	VEHICLE FUELING POSITIONS	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PRIMARY TRIP (%)	NON-PASS-BY TRIP (%)	DIVERTED LINKED TRIP (%)	PASS-BY TRIP (%)	ADJ. STREET PEAK HOUR VOLUME	SOURCE
0.8	8	Louisville area, KY	1993	61	7:00–9:00 a.m.	15	—	25	60	4,000	Barton-Aschman Assoc.
0.6	8	Louisville, KY	1993	48	7:00–9:00 a.m.	13	—	19	68	1,307	Barton-Aschman Assoc.
0.7	10	Louisville, KY	1993	47	7:00–9:00 a.m.	11	—	22	67	1,105	Barton-Aschman Assoc.
0.7	8	Louisville area, KY	1993	n/a	7:00–9:00 a.m.	22	—	22	56	1,211	Barton-Aschman Assoc.
0.7	10	Louisville area, KY	1993	n/a	7:00–9:00 a.m.	31	—	12	46	1,211	Barton-Aschman Assoc.
0.3	n/a	Louisville area, KY	1993	75	7:00–9:00 a.m.	15	—	13	72	n/a	Barton-Aschman Assoc.
0.8	8	Silver Spring, MD	1992	36	7:00–9:00 a.m.	14	—	39	47	3,095	RBA
0.4	8	Derwood, MD	1992	46	7:00–9:00 a.m.	0	—	25	75	3,770	RBA
2.2	8	Kensington, MD	1992	31	7:00–9:00 a.m.	34	—	19	47	1,785	RBA
1	8	Silver Spring, MD	1992	35	7:00–9:00 a.m.	9	—	13	78	7,080	RBA

Average Pass-By Trip Percentage: 62

$$\text{Average Diverted-Link Trip (\%)} = \frac{(25+19+22+22+12+13+39+25+19+13)}{10} = 21\%$$

Table 5.30
Pass-By Trips and Diverted Linked Trips
Weekday, p.m. Peak Period

Land Use 945—Gasoline/Service Station with Convenience Market

SIZE (1,000 SQ. FT. GFA)	VEHICLE FUELING POSITIONS	LOCATION	WEEKDAY SURVEY DATE	NO. OF INTERVIEWS	TIME PERIOD	PRIMARY TRIP (%)	NON-PASS-BY TRIP (%)	DIVERTED LINKED TRIP (%)	PASS-BY TRIP (%)	ADJ. STREET PEAK HOUR VOLUME	SOURCE
0.8	8	Louisville area, KY	1993	83	4:00–6:00 p.m.	8	—	40	52	4,965	Barton-Aschman Assoc.
0.6	8	Louisville, KY	1993	60	4:00–6:00 p.m.	20	—	27	53	1,491	Barton-Aschman Assoc.
0.7	10	Louisville, KY	1993	n/a	4:00–6:00 p.m.	19	—	24	57	1,812	Barton-Aschman Assoc.
0.7	8	Louisville area, KY	1993	n/a	4:00–6:00 p.m.	7	—	21	72	2,657	Barton-Aschman Assoc.
0.7	10	Louisville area, KY	1993	n/a	4:00–6:00 p.m.	16	—	29	55	2,657	Barton-Aschman Assoc.
0.8	8	Silver Spring, MD	1992	36	4:00–6:00 p.m.	14	—	19	67	3,095	RBA
0.4	8	Derwood, MD	1992	46	4:00–6:00 p.m.	11	—	43	46	3,770	RBA
2.1	8	Kensington, MD	1992	31	4:00–6:00 p.m.	13	—	35	52	1,785	RBA
1	8	Silver Spring, MD	1992	35	4:00–6:00 p.m.	3	—	43	54	7,080	RBA

Average Pass-By Trip Percentage: 56

Average Diverted-Link Trip (%)

$$\frac{(40+27+24+21+29+19+43+35+43)}{9} = 23\%$$

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

APPENDIX B: MODEL PLOTS

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

URBAN CROSSROADS

41 Corporate Park | Suite 300 | Irvine, CA 92606 | (949) 660-1994
www.urbanXroads.com

November 9, 2015

Ms. Trisha Muñoz
Hall & Foreman
14297 Cajon Avenue, Suite 101
Victorville, CA 92392

SUBJECT: MORENO VALLEY CACTUS PROJECT MODELING SUPPORT

Dear Ms. Trisha Muñoz:

Urban Crossroads, Inc. is pleased to submit this memorandum documenting the Modeling Support for the Moreno Valley Cactus Project ("Project") located in the City of Moreno Valley. The proposed project includes a mix of uses which include gasoline/service station/convenience market/car wash, fast food, and office/warehouse uses. The purpose of the Modeling Support is to provide study area without project forecast volumes (Year 2040, representing General Plan buildout) for use your Traffic Impact Analysis.

TRAFFIC VOLUME FORECASTING PROCESS

Traffic projections for General Plan Buildout Without Project conditions were derived from a version of RivTAM modified to represent General Plan Buildout conditions for the City of Moreno Valley using accepted procedures for model forecast refinement and smoothing. The traffic forecasts reflect the area-wide growth anticipated between Existing (2015) conditions and General Plan Buildout conditions.

In many instances, the traffic model zone structure is not designed to provide accurate turning movements along arterial roadways unless refinement and reasonableness checking is performed. As such, General Plan Buildout turning volumes were compared to existing count volumes in order to ensure minimum growth as a part of the refinement process, where applicable. The initial estimate of the future General Plan Buildout Without Project peak hour turning movements was then reviewed by Urban Crossroads for reasonableness at intersections where model results showed unreasonable turning movements. The initial raw model estimates were adjusted to achieve flow conservation (where applicable), reasonable growth, and reasonable diversion between parallel routes.

GENERAL PLAN BUILDOUT TRAFFIC VOLUMES

Traffic volume forecasts have been prepared for five study area intersections and related isolated freeway ramps. Intersection forecast locations include:

- I-215 Southbound Ramps (NS) at Cactus Avenue (EW)

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

- I-215 Northbound Ramps (NS) at Cactus Avenue (EW)
- Commerce Center Drive (NS) at Cactus Avenue (EW)
- Elsworth Street (NS) at Cactus Avenue (EW)
- Elsworth Street (NS) at Goldencrest Drive (EW)

AM and PM peak hour General Plan buildout without project traffic volume forecasts are shown on Exhibits A and B, respectively,

Daily roadway segment volumes have been developed for seven roadway segments:

- Cactus Avenue west of Commerce Center Drive
- Cactus Avenue between Commerce Center Drive and Elsworth Street
- Cactus Avenue east of Elsworth Street
- Commerce Center Drive north of Cactus Avenue
- Elsworth Street north of Goldencrest Drive
- Elsworth Street between of Goldencrest Drive and Cactus Avenue
- Goldencrest Drive between Commerce Center Drive and Elsworth Street

Exhibit C shows the General Plan buildout without project Average Daily Traffic (ADT) volumes.

CONCLUSION

Urban Crossroads, Inc. is pleased to provide this memorandum documenting the Modeling Support for the Moreno Valley Cactus Project. Traffic volume forecasts have been prepared for five study area intersections and related isolated freeway ramps.

Respectfully submitted,

URBAN CROSSROADS, INC.

John Kain, AICP
Principal

Marlie Whiteman, P.E.
Senior Associate

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

EXHIBIT 1: GENERAL PLAN BUILDOUT (2040) WITHOUT PROJECT
AM PEAK HOUR INTERSECTION VOLUMES

1 I-215 SB Ramps & Cactus Av.	2 I-215 NB Ramps & Cactus Av.	3 Commerce Center Dr. & Cactus Av.	4 Elsworth St. & Cactus Av.	5 Elsworth St. & Goldencrest Dr.
528 → 2065 ← 633	384 → 0 → 132 → 311 ← 2593	30 → 63 ← 2874	141 → 152 → 103 → 155 ← 2796 ← 118	67 → 338 → 66 → 27 ← 61 ← 34
552 → 395 → 825 ←	86 → 1204 → 88 → 708 ← 362 ← 40 ←	112 → 2511 →	114 → 1997 → 384 → 58 ← 28 ← 21 ←	20 → 45 → 26 → 51 ← 203 ← 49 ←

N

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

EXHIBIT 2: GENERAL PLAN BUILDOUT (2040) WITHOUT PROJECT
PM PEAK HOUR INTERSECTION VOLUMES

1 I-215 SB Ramps & Cactus Av.	2 I-215 NB Ramps & Cactus Av.	3 Commerce Center Dr. & Cactus Av.	4 Elsworth St. & Cactus Av.	5 Elsworth St. & Goldencrest Dr.
236 → 1056 ← 1105	250 → 5 → 265 ← 480 ← 2849	107 → 52 ← 3222	188 → 27 → 199 ← 217 ← 2203 ← 33	27 → 307 → 28 ← 45 ← 33 ← 42
1497 → 591 → 855 ←	193 → 1748 → 411 → 153 ← 151 ← 25 ←	47 → 2790 →	176 → 2554 → 36 → 482 ← 125 ← 165 ←	117 → 51 → 62 → 40 ← 437 ← 41 ←

N

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

EXHIBIT 3: GENERAL PLAN BUILDOUT (2040) WITHOUT PROJECT AVERAGE DAILY TRAFFIC (ADT)

LEGEND:

10.0 = VEHICLES PER DAY (1000'S)

N

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

APPENDIX C: CITY OF MORENO VALLEY BICYCLE MASTER PLAN FIGURES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Bicycle Master Plan

City of Moreno Valley

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 2: Existing Bicycle Facilities

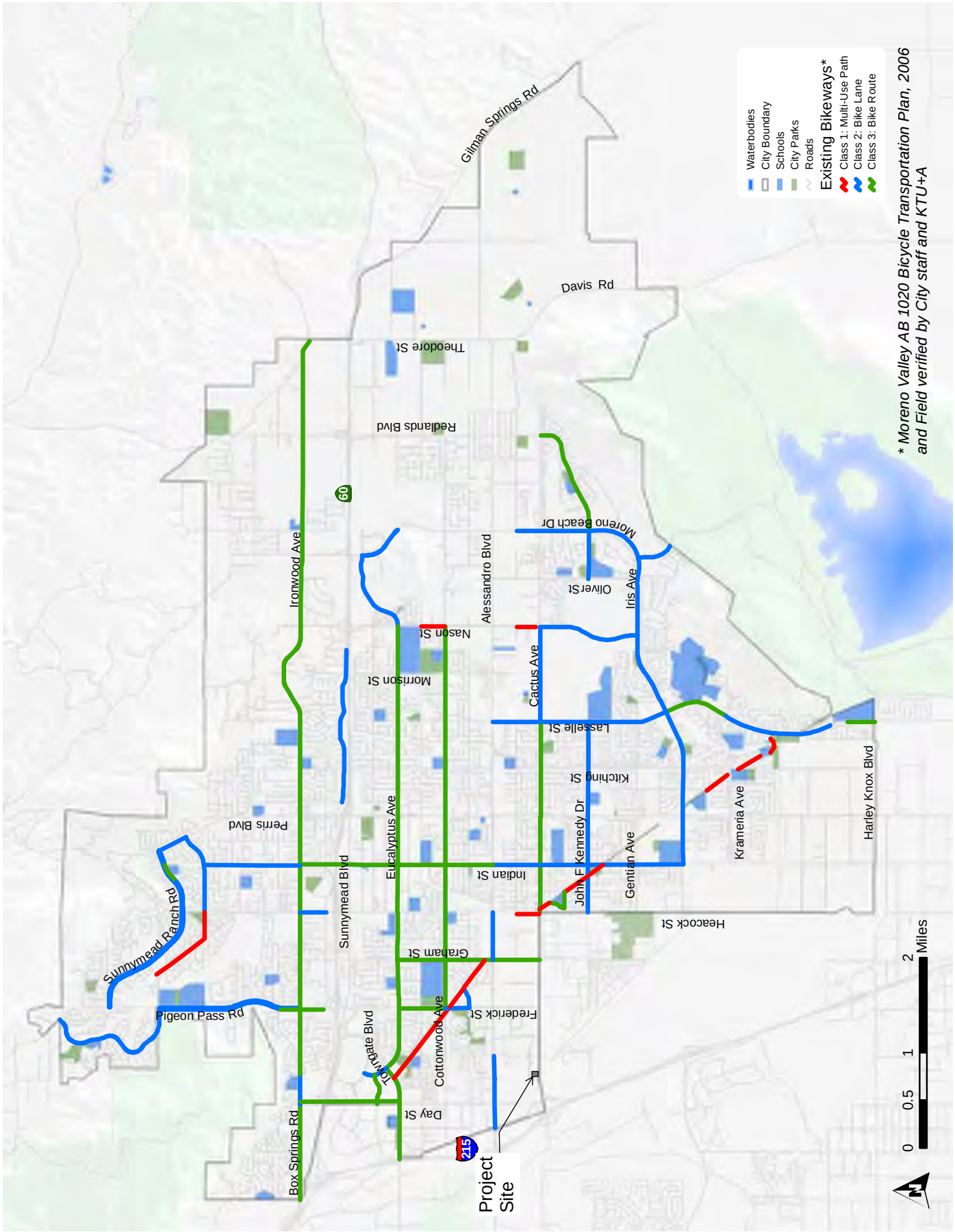
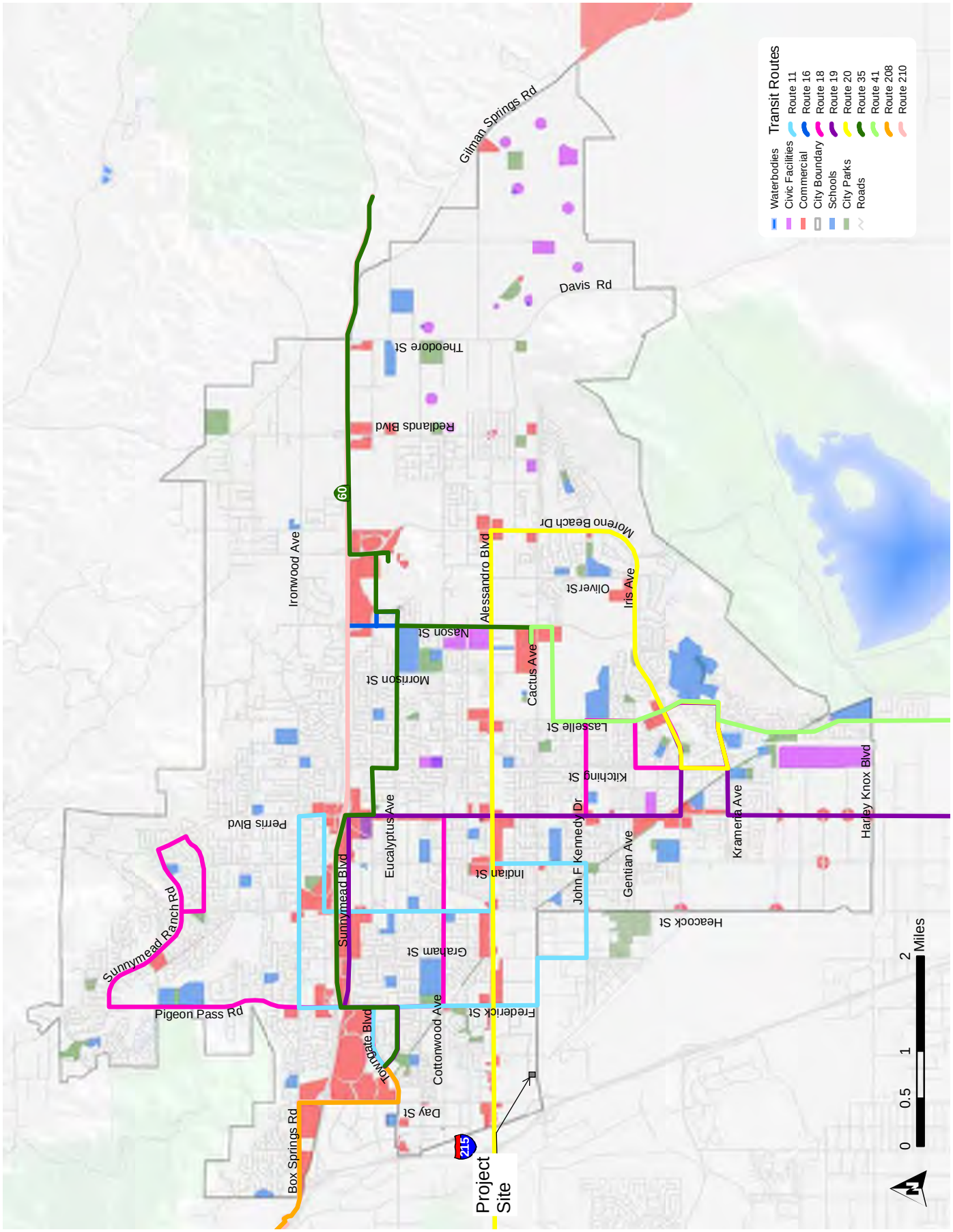
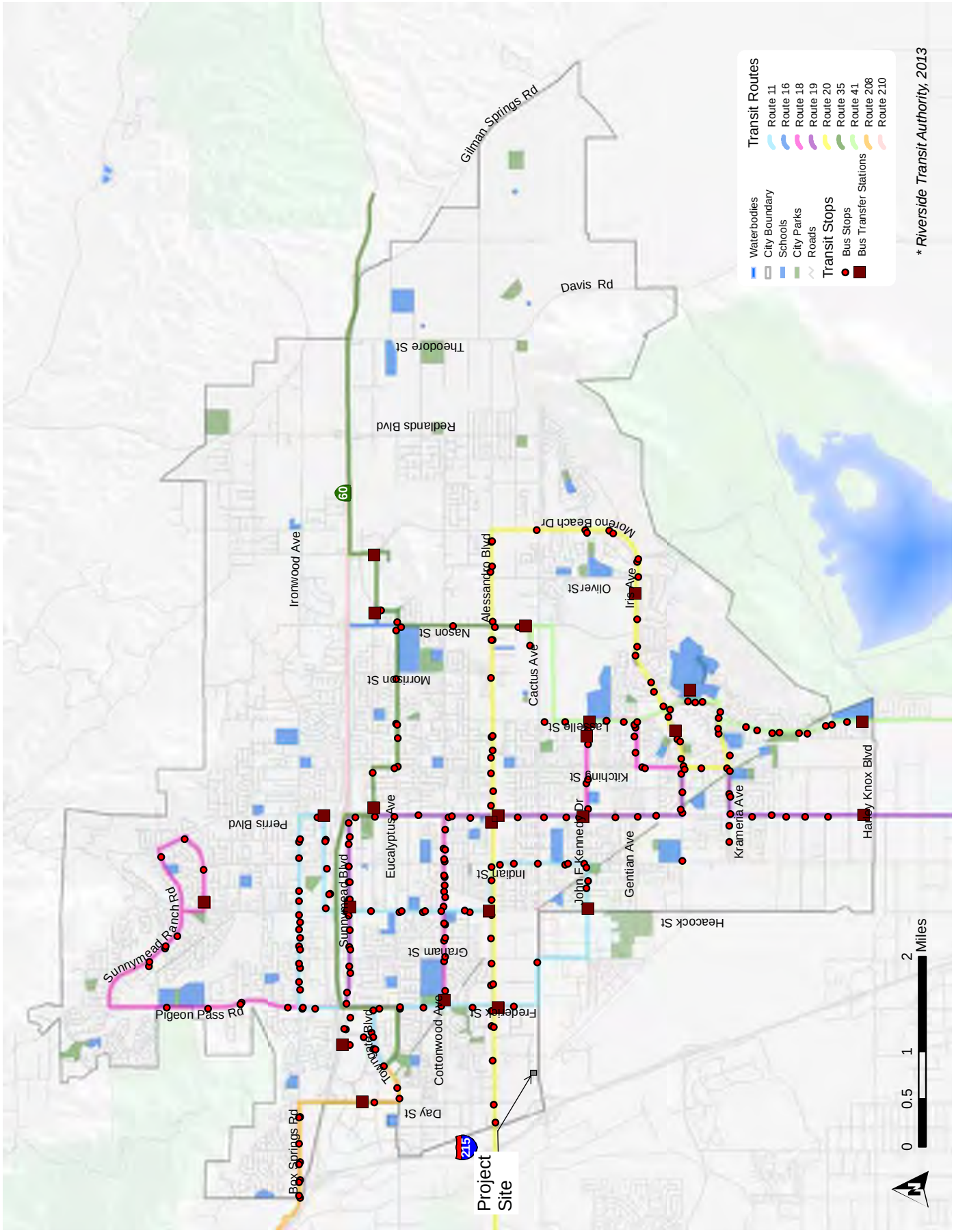


Figure 7a: RTA Bus Routes in Moreno Valley



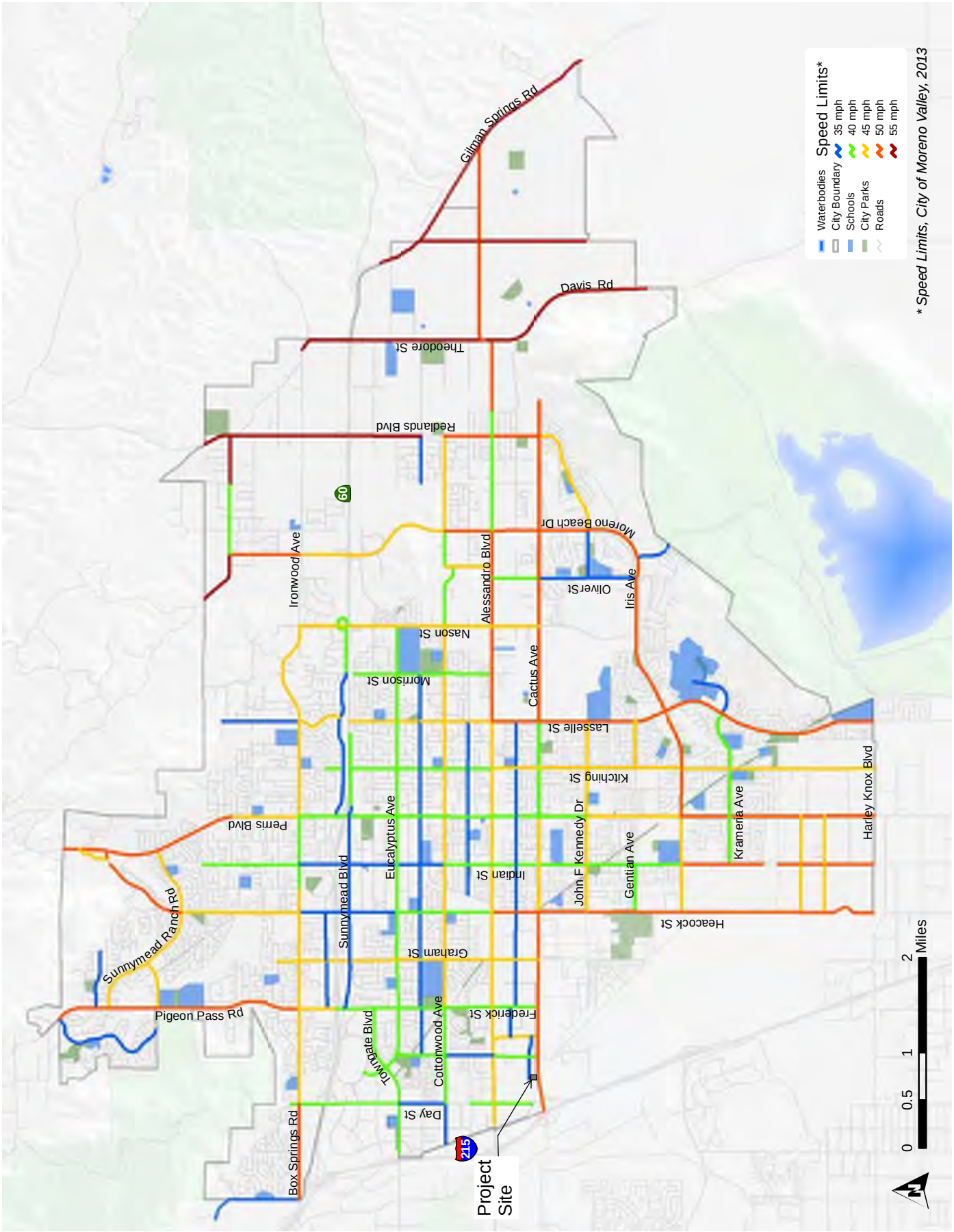
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 7b: Bus Stops



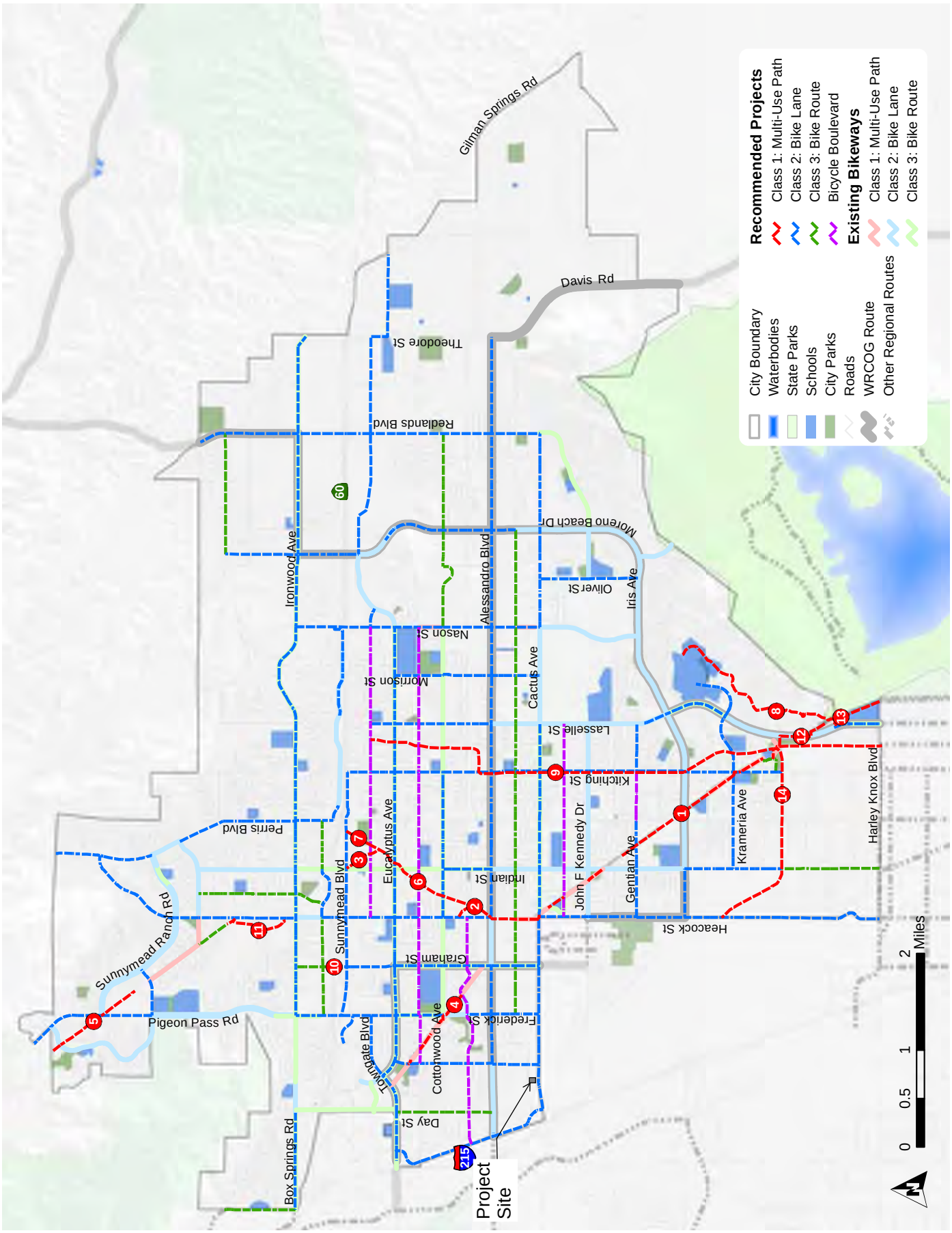
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 11: Speed Limits



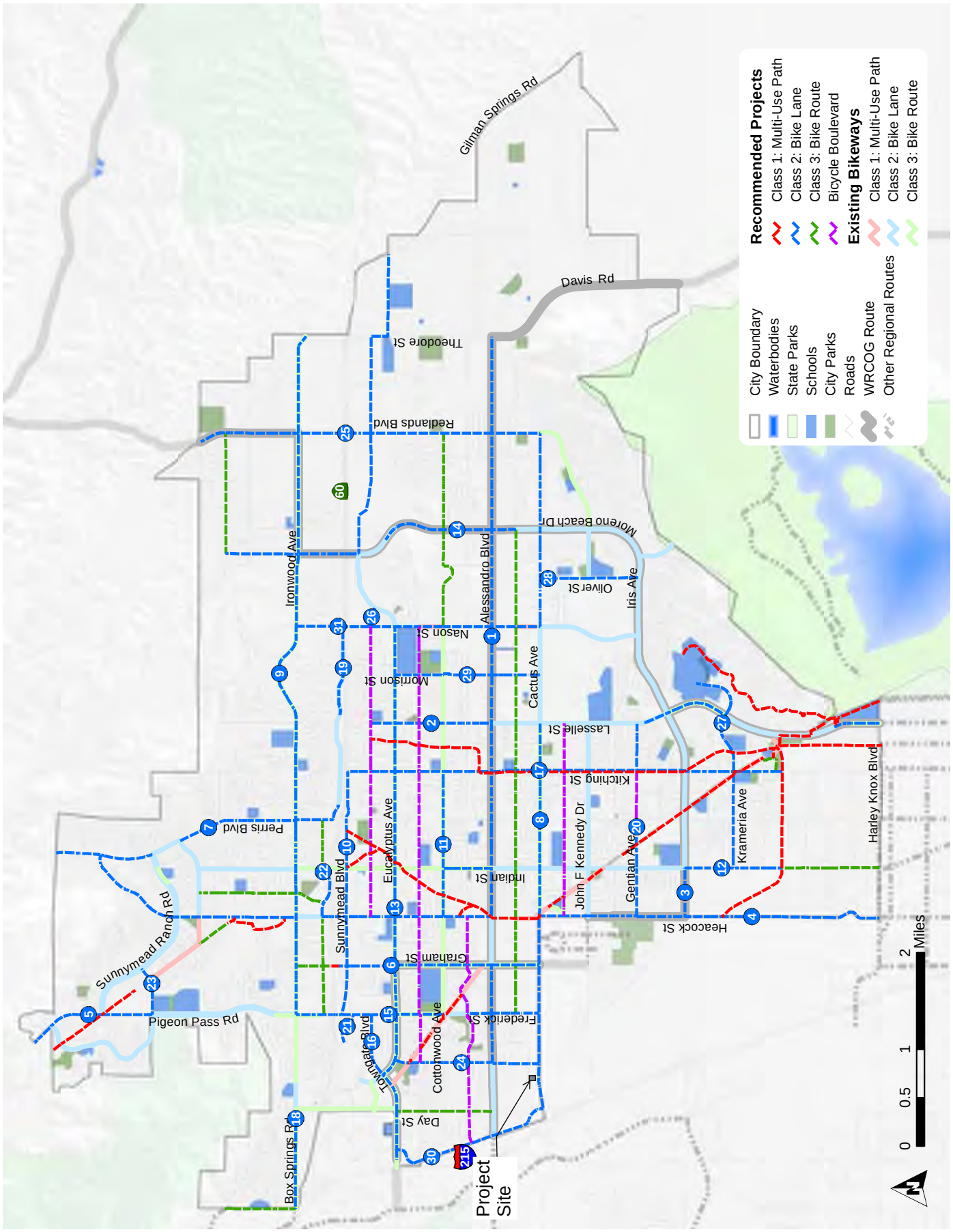
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 14: Recommended Class 1 Multi-Use Paths ("Bicycle Paths")



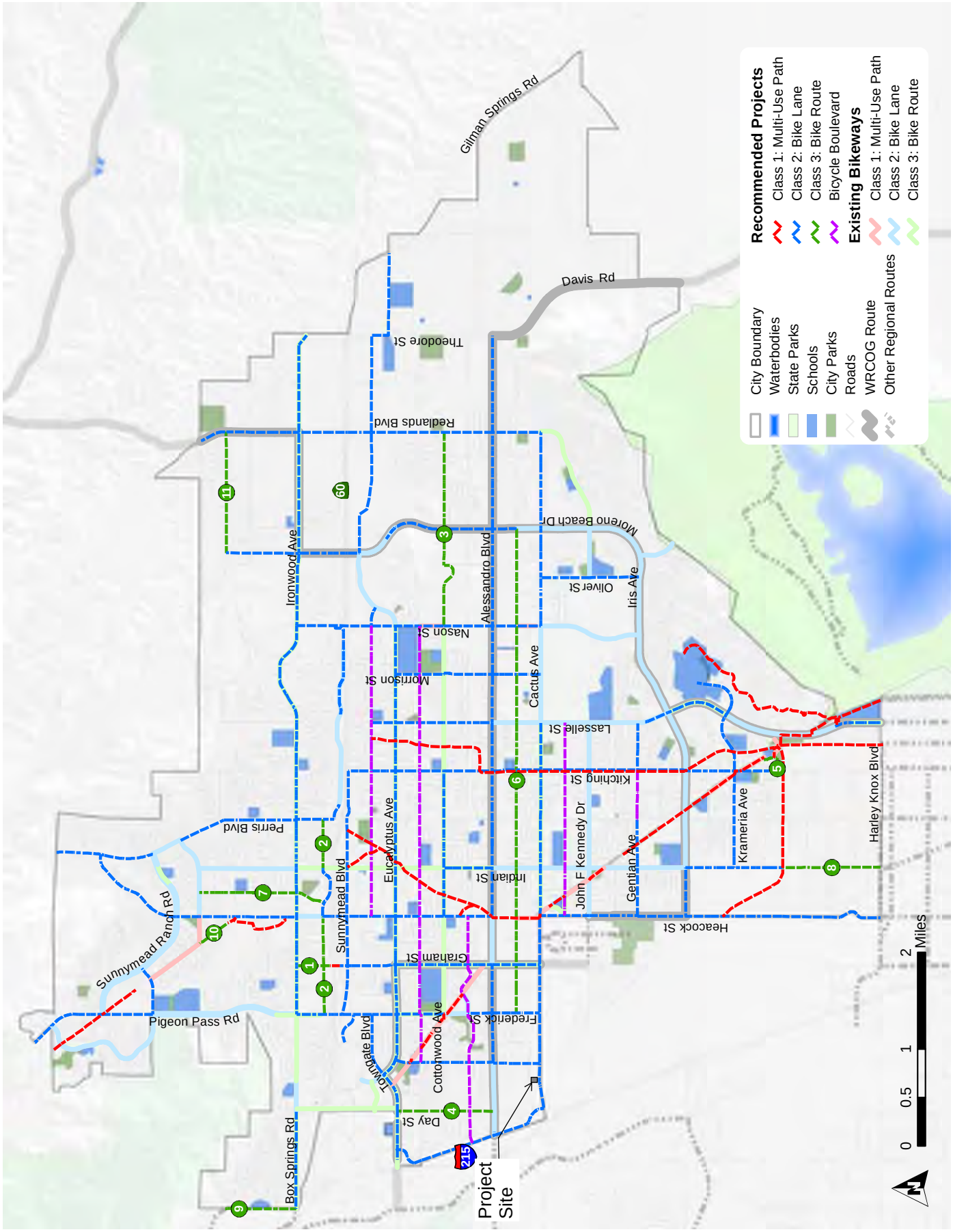
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 15: Recommended Class 2 Bicycle Lanes



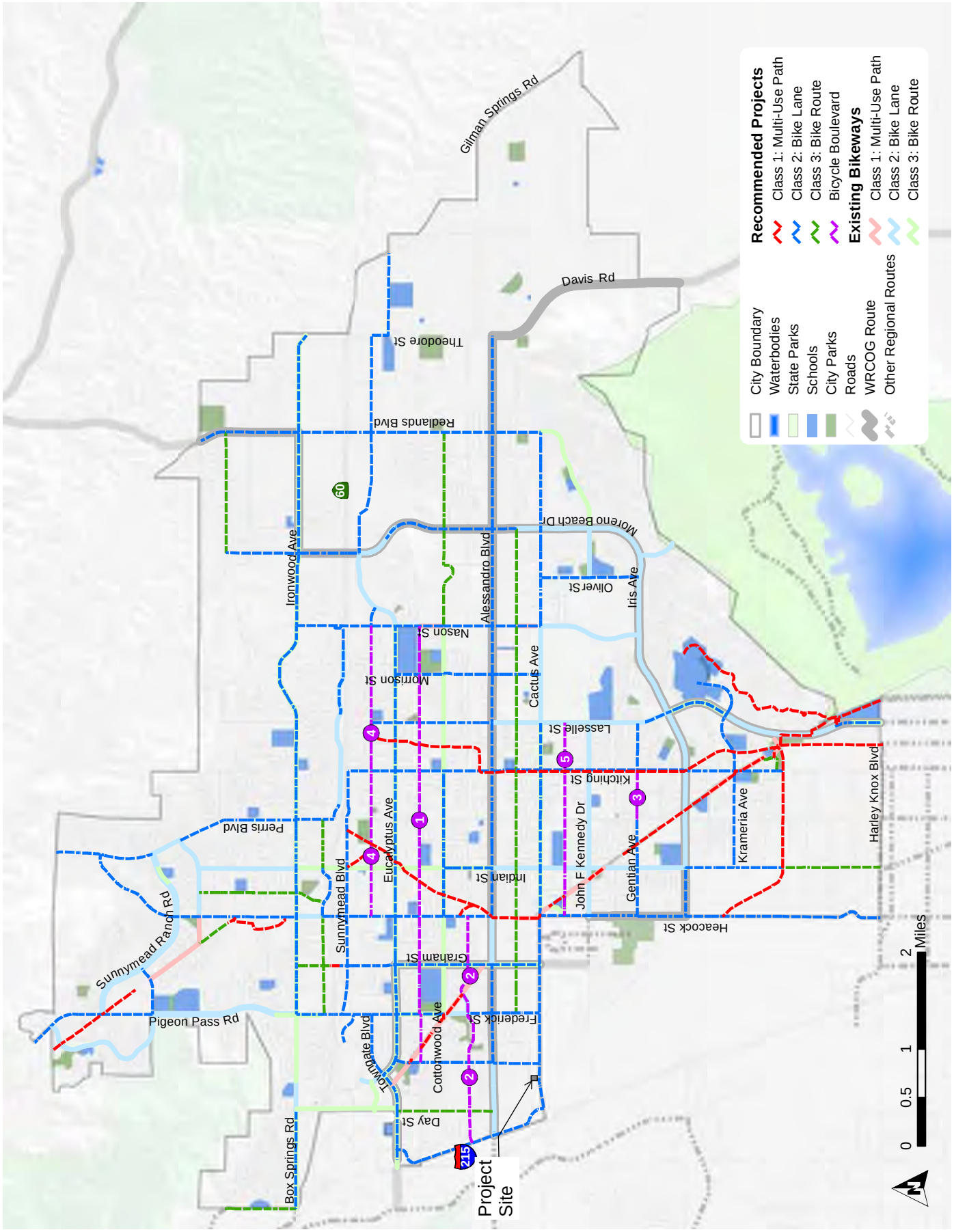
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 16: Recommended Class 3 Bicycle Routes



Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 17: Recommended Bicycle Boulevards



Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

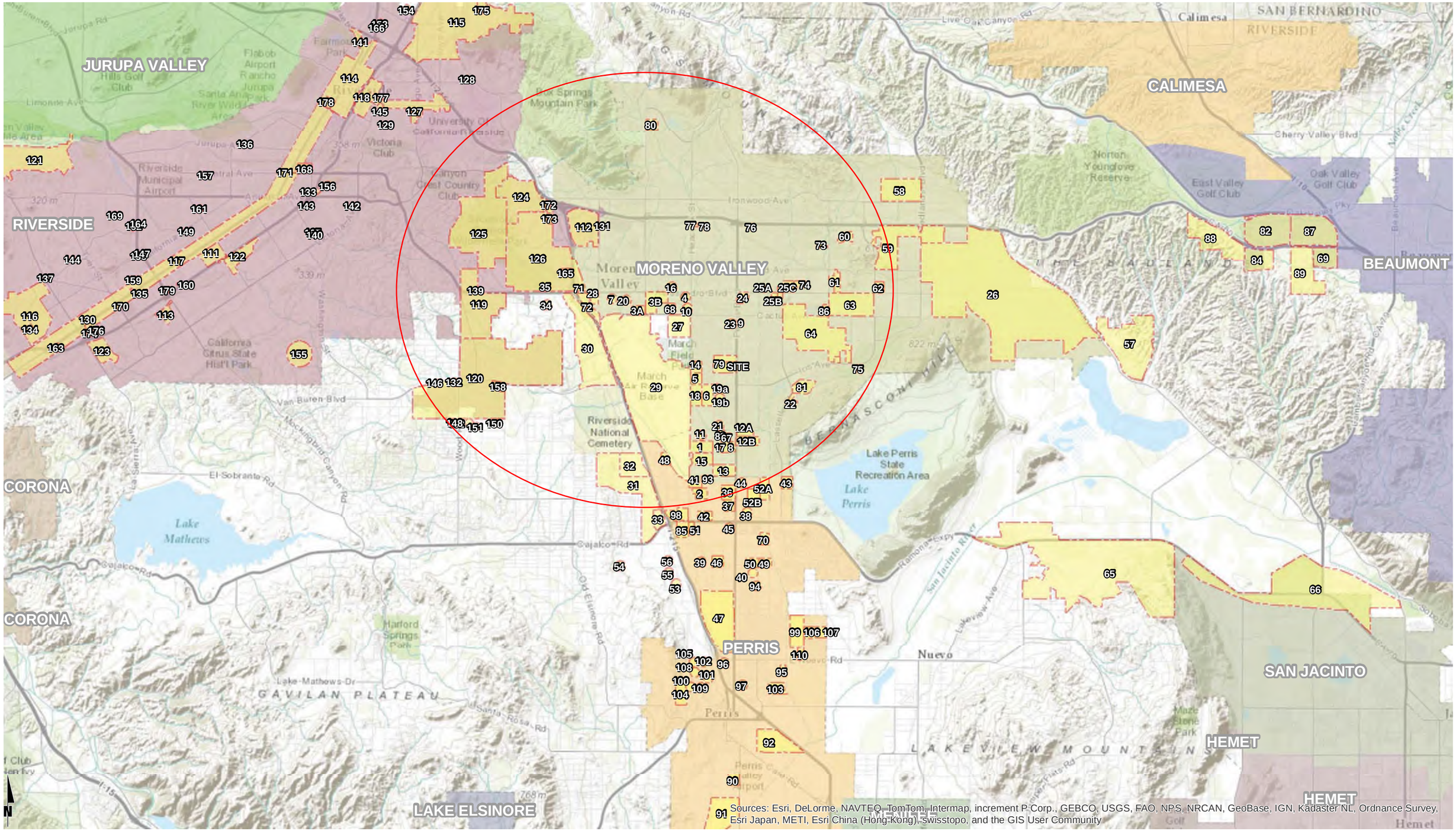
DAVID EVANS AND ASSOCIATES INC.

APPENDIX D: OTHER AREA PROJECTS

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

EXHIBIT 4-7

CUMULATIVE DEVELOPMENT PROJECTS LOCATION MAP



Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
1	PA 06-0152 & PA 06-0153 (First Park Nandina I & II)	High-Cube Warehouse	1,182.918	TSF
2	Integra Pacific Industrial Facility	High-Cube Warehouse	880.000	TSF
3A	PA 08-0072 (Overton Moore Properties)	High-Cube Warehouse	520.000	TSF
3B	Harbor Freight Expansion	High-Cube Warehouse	1,279.910	TSF
4	PA 04-0063 (Centerpointe Buildings 8 and 9)	General Light Industrial	361.384	TSF
5	PA 07-0035; PA 07-0039 (Moreno Valley Industrial Park)	General Light Industrial	204.657	TSF
		High-Cube Warehouse	409.920	TSF
6	PA 07-0079 (Indian Business Park)	High-Cube Warehouse	1,560.046	TSF
7	PA 08-0047-0052 (Komar Cactus Plaza)[3]	Hotel	110	RMS
		Fast Food w/Drive Thru	8.000	TSF
		Commercial	42.400	TSF
8	First Inland Logistics Center	High-Cube Warehouse	400.130	TSF
9	TM 33607	Condo/Townhomes	54	DU
10	PA 08-0093 (Centerpointe Business Park II)	General Light Industrial	99.988	TSF
11	PA 06-0021; PA 06-0022; PA 06-0048; PA 06-0049 (Komar Investments)	Warehousing	2,057.400	TSF
12A	PA 06-0017 (Ivan Devries)	Industrial Park	569.200	TSF
12B	Modular Logistics (Dorado Property)	High-Cube Warehouse	1,109.378	TSF
13	PA 09-0004 (Vogel)	High-Cube Warehouse	1,616.133	TSF
14	TM 34748	SFDR	135	DU
15	First Nandina Logistics Center	High-Cube Warehouse	1,450.000	TSF
16	PA 09-0031	Gas Station	12	VFP
17	First Park Nandina III	High-Cube Warehouse	691.960	TSF
	Moreno Valley Commerce Park	High-Cube Warehouse	354.321	TSF
18	March Business Center	General Light Industrial	16.732	TSF
		Warehousing	87.429	TSF
		High-Cube Warehouse	1,380.246	TSF
19A	TM 33810	SFDR	16	DU
19B	TM 34151	SFDR	37	DU
20	373K Industrial Facility	High-Cube Warehouse	373.030	TSF
21	TM 32716	SFDR	57	DU
22	TM 32917	Condo/Townhomes	227	DU
23	TM 33417	Condo/Townhomes	10	DU
24	TM 34988	Condo/Townhomes	251	DU
25A	TM 34216	Condo/Townhomes	40	DU
25B	TM 34681	Condo/Townhomes	49	DU
25C	PA 08-0079-0081 (Winco Foods)	Discount Supermarket	95.440	TSF
		Specialty Retail	14.800	TSF

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
26	Moreno Beach Marketplace (Lowe's)	Commercial Retail	175.000	TSF
	Auto Mall Specific Plan (Planning Area C)	Commercial Retail	304.500	TSF
	Westridge	High-Cube Warehouse	937.260	TSF
	ProLogis	High-Cube Warehouse	1,916.190	TSF
		Warehousing	328.448	TSF
	World Logistics Center	High-Cube Warehouse	41,400.000	TSF
		Warehousing	200.000	TSF
		Gas Station w/ Market	12	VFP
		Existing SFDR	7	DU
27	March Lifecare Campus Specific Plan[4]	Medical Offices	190.000	TSF
		Commercial Retail	210.000	TSF
		Research & Education	200.000	TSF
		Hospital	50	Beds
		Institutional Residential	660	Beds
28	Alessandro Metrolink Station	Light Rail Transit Station	300	SP
29	Airport Master Plan	Airport Use	559.000	TSF
30	Meridian Business Park North	Industrial Park	5,985.000	TSF
31	SP 341; PP 21552 (Majestic Freeway Business Center)	High-Cube Warehouse	6,200.000	TSF
32	PP 20699 (Oleander Business Park)	Warehousing	1,206.710	TSF
33	Ramona Metrolink Station	Light Rail Transit Station	300	SP
34	PP 22925 (Amstar/Kaliber Development)	Office (258.102 TSF)	258.102	TSF
		Warehousing	409.312	TSF
		General Light Industrial	42.222	TSF
		Retail	10.000	TSF
35	P07-1028 (Alessandro Business Park)	General Light Industrial	662.018	TSF
36	P 05-0113 (IDI)	High-Cube Warehouse	1,750.000	TSF
37	P 05-0192 (Oakmont I)	High-Cube Warehouse	697.600	TSF
38	P 05-0477	High-Cube Warehouse	462.692	TSF
39	Rados Distribution Center	High-Cube Warehouse	1,200.000	TSF
40	Investment Development Services (IDS) II	High-Cube Warehouse	350.000	TSF
41	P 07-09-0018	Warehousing	170.000	TSF
42	P 07-07-0029 (Oakmont II)	High-Cube Warehouse	1,600.000	TSF
43	TR 32707	SFDR	137	DU
44	TR 34716	SFDR	318	DU
45	P 05-0493 (Ridge I)	High-Cube Warehouse	700.000	TSF
46	Ridge II	High-Cube Warehouse	2,000.000	TSF

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
47	Harvest Landing Specific Plan	SFDR	717	DU
		Condo/Townhomes	1,139	DU
		Sports Park	16.700	AC
		Business Park	1,233.401	TSF
		Shopping Center	73.181	TSF
	Perris Marketplace	Shopping Center	450.000	TSF
48	P 06-0411 (Concrete Batch Plant)	Manufacturing	2.000	TSF
49	Jordan Distribution	High-Cube Warehouse	378.000	TSF
50	Aiere	High-Cube Warehouse	642.000	TSF
51	P 08-11-0005; P 08-11-0006 (Starcrest)	High-Cube Warehouse	454.088	TSF
52A	Stratford Ranch Specific Plan	High-Cube Warehouse	1,725.411	TSF
52B	Stratford Ranch Specific Plan	High-Cube Warehouse	480.000	TSF
		General Light Industrial	120.000	TSF
53	PP 18908	General Light Industrial	133.000	TSF
54	Tract 33869	SFDR	39.000	DU
55	PP 16976	General Light Industrial	85.000	TSF
56	PP 21144	Industrial Park	190.802	TSF
57	Quail Ranch Specific Plan	Private School (K-12)	300	STU
		Golf Course	18	Holes
		Hotel	500	ROOMS
		Specialty Retail	66.667	TSF
		General office	66.667	TSF
		Assisted Living	500	Beds
		Senior Living (Detached)	200	DU
		SFDR	600	DU
58	a TR 32460 (Sussex Capital)	SFDR	58	DU
	b TR 32459 (Sussex Capital)	SFDR	11	DU
	c TR 30411 (Pacific Communities)	SFDR	24	DU
	d TR 33962 (Pacific Scene Homes)	SFDR	31	DU
	e TR 30998 (Pacific Communities)	SFDR	47	DU
59	a Westridge Commerce Center	High-Cube Warehouse	937.260	TSF
	b P06-158 (Gascon)	Commercial Retail	116.360	TSF
	c Auto Mall Specific Plan (PAC)	Commercial Retail	304.500	TSF
	d ProLogis	Warehousing	367.000	TSF
		High-Cube Warehouse	1,901.000	TSF
	e TR 35823 (Stowe Passco)	SFDR	262	DU
		Apartments	216	DU
60	TR 36340	SFDR	275	DU

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
61	a TR 31771 (Sanchez)	SFDR	25	DU
	b TR 34397 (Winchester Associates)	SFDR	52	DU
	c TR 32645 (Winchester Associates)	SFDR	54	DU
62	Lowe's (Moreno Beach Marketplace)	Home Improvement Store	175.000	TSF
63	a Convenience Store/ Fueling Station	Gas Station w/ Market	30.750	TSF
	b Senior Assisted Living	Assisted Living Units	139	DU
	c TR 31590 (Winchester Associates)	SFDR	96	DU
	d TR 32548 (Gabel, Cook & Associates)	SFDR	107	DU
	e 26th Corp. & Granite Capitol	SFDR	32	DU
	f TR 32218 (Whitney)	SFDR	63	DU
	g Moreno Marketplace	Commercial Retail	93.788	TSF
	h Medical Plaza	Medical Offices	311.633	TSF
64	a Moreno Medical Campus	Medical Offices	80.000	TSF
	b Aqua Bella Specific Plan	SFDR	2,922	DU
	c TR 34329 (Granite Capitol)	SFDR	90	DU
	d Cresta Bella	General Office	30.000	TSF
65	a Villages of Lakeview	SFDR	860	DU
		Condo/Townhomes	1,920	DU
		Elementary School	1,200	STU
		Commercial Retail	100.000	TSF
		Soccer Complex	12	Fields
		City Park	8.900	AC
		County Park	8.100	AC
		Regional Park	107.100	AC
	b Motte Lakeview Ranch	SFDR	847	DU
		Condo/Townhomes	686	DU
		Apartments	467	DU
		Elementary School	650	STU
		Middle School	300	STU
		Commercial Retail	120.000	TSF
		Regional Park	177.000	AC
66	Gateway Area Specific Plan	Commercial Retail	255.000	AC
		General Office	510.000	AC
		Business Park	595.000	AC
		Residential	340.000	AC
67	Moreno Valley Industrial Center (Industrial Area SP)	General Light Industrial	354.810	TSF
68	Centerpointe Business Park	General Light Industrial	356.000	TSF
69	ProLogis/Rolling Hills Ranch Industrial	Heavy Industrial	2,565.684	TSF
70	P05-0493	Logistics	597.370	TSF

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
71	P07-1028, -0102; and P09-0416, -0418, -0419	General Light Industrial	652.018	TSF
72	Amstar/Kaliber Development, PP22925	General Light Industrial	42.222	TSF
		Heavy Industrial	409.312	TSF
		Commercial Retail	10.000	TSF
		General Office	258.102	TSF
73	TR 31305 / Richmond American	Residential	87	DU
74	TR 32505 / DR Horton	Residential	71	DU
75	TR 34329 / Granite Capitol	Residential	90	DU
76	TR 31814 / Moreno Valley Investors	Residential	60	DU
77	TR 33771 / Creative Design Associates	Residential	12	DU
78	TR 35663 / Kha	Residential	12	DU
79	TR 22180 / Young Homes	Residential	87	DU
80	TR 32515	Residential	161	DU
81	TR 32142	Residential	81	DU
82	Heartland	Residential	922	DU
83	San Michele Industrial Center (Industrial Area SP)	General Light Industrial	865.960	TSF
84	Hidden Canyon	General Light Industrial	2,890.000	TSF
85	Starcrest, P011-0005; 08-11-0006	General Light Industrial	454.088	TSF
86	Commercial Medical Plaza	Medical Offices	311.633	TSF
87	Mountain Bridge Regional Commercial Community	Commercial	1,853.251	TSF
88	Jack Rabbit Trail	Residential	2,000	DU
89	The Preserve / Legacy Highlands SP	Commercial	595.901	TSF
		Residential	3,412	DU
90	South Perris Industrial Phase 1	Logistics	787.700	TSF
91	South Perris Industrial Phase 2	Logistics	3,448.734	TSF
92	South Perris Industrial Phase 3	Logistics	3,166.857	TSF
93	P 04-0343	Warehousing	41.650	TSF
94	P 06-0228	General Light Industrial	149.738	TSF
95	P 06-0378	Senior Housing	429	DU
96	P 11-09-0011	Retail	80.000	TSF
97	P 12-05-0013	Apartments	75	DU
98	P 12-10-0005	High-Cube Warehouse	1,463.887	TSF
99	TR 30850	Residential	496	DU
100	TR 30973	Residential	35	DU
101	TR 31225	Residential	57	DU
102	TR 31226	Residential	82	DU
103	TR 31240	Residential	114	DU
104	TR 31407	Residential	243	DU
105	TR 31650	SFDR	61	DU
106	TR 31659	SFDR	161	DU

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Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
107	TR 32041	Residential	122	DU
108	TR 32406	SFDR	15	DU
109	TR 33193	Townhomes	94	DU
110	TR 33338	Residential	75	DU
111	California Baptist University Specific Plan	University	157	AC
112	Canyon Springs Specific Plan	Commercial, Office, Entertainment, Recreational	318	AC
113	Citrus Business Park Specific Plan	Industrial Business Park	49	AC
114	Downtown Specific Plan	Residential	5,000	DU
115	Hunter Business Park	Industrial	1,300	AC
116	La Sierra University Specific Plan	Mixed-Use		
117	Magnolia Avenue Specific Plan	Mixed-Use/Very High Residential	1,473	AC
118	Marketplace Specific Plan	Commercial Retail/Office	200	AC
119	Mission Grove Specific Plan	Business/Office Park	56.79	AC
		Commercial Retail	68.12	AC
		High Density Residential	53.77	AC
		Low Density Residential	78.38	AC
		Medium Density Residential	155.31	AC
120	Orangecrest Specific Plan	Rural Residential	2.13	AC
		Business/Office Park	2.70	AC
		Commercial Retail	138.96	AC
		High Density Residential	13.70	AC
		Low Density Residential	540.76	AC
		Medium Density Residential	1,217.80	AC
		Public Facilities/Institutions	121.59	AC
		Public Park	59.51	AC
121	Rancho La Sierra Specific Plan	SFDR	598	DU
122	Riverside Auto Center Specific Plan	Auto Center		
123	Riverwalk Vista Specific Plan	Residential	402	DU
124	Sycamore Canyon Specific Plan	Hillside Residential	41.83	AC
		Low Density Residential	97.28	AC
		Medium Density Residential	14.84	AC
		Very Low Density Residential	884.22	AC
		Public Park	27.85	AC
125	Sycamore Canyon Business Park Specific Plan	Business/Office Park	847.15	AC
		Commercial Retail	10.32	AC

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Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
126	Sycamore-Highlands Specific Plan	Commercial Retail	14.63	AC
		High Density Residential	52.18	AC
		Medium Density Residential	99.11	AC
		Public Facilities	1.56	AC
		Public Park	144.17	AC
		Very Low Density Residential	49.09	AC
127	University Avenue Specific Plan	Mixed-Use	Varies	
128	807 Blaine Street (P09-0717; P09-0718)	Apartments	55	DU
129	2340 Fourteenth Street (P09-0808; P08-0809)	Senior Housing	134	BEDS
130	10938 Magnolia Avenue (P10-0083)	Pharmacy	14.064	TSF
131	6287 Day Street (P10-0090; P10-0091)	Gas Station	2	VFP
132	N. of Van Buren Boulevard; W. of Wood Street (P10-0808; P10-0708)	Fast Food w/Drive Thru	2.361	TSF
133	3439 Arlington Avenue (P12-0234)	Fitness Club	9.600	TSF
134	NWC of Riverwalk Parkway and Flat Rock Drive (P12-0019; P12-0156; P12-0158)	Convenience Store	2.400	TSF
		Coffee Shop	3.946	TSF
135	3875 Dawes Street (P10-0438; Magnolia Garden Condominiums)	Condo/Townhomes	62	DU
136	5938-5944 Grand Avenue (P12-0266; P12-0267; P12-0268)	Senior Housing	37	DU
137	4901 La Sierra Avenue (P11-0627; P11-0628; P11-0777; P11-0778)	Gas Station	4.100	TSF
138	4250 Van Buren Boulevard (P12-0605; P12-0606)	Gas Station	1.776	TSF
139	360 Alessandro Boulevard (P12-0419; P12-0557; P12-0558; P12-0559)	Bank	3.858	TSF
140	2831 Mary Street (P12-0761; P12-0442 P12-0443; P12-0444)	Pharmacy	56.101	TSF
141	2450 Market Street (P13-0087; P13-0262)	Apartments	77	DU
142	6091 Victoria Avenue (P13-0432)	Day Care	1.831	TSF
143	6692 Indiana Avenue (P13-0159; P13-0160)	Gas Station	2.958	TSF
144	4824 Jones Avenue (P13-0181; P13-0182)	Church	23.124	TSF
145	2586 University avenue (P13-0650; P13-0651)	Bed and Breakfast	3.618	TSF
146	18580 Van Buren Boulevard (P08-0402; P13-0822)	Auto Repair Shop	8.142	TSF
147	4247 Van Buren Boulevard (P13-0785; P13-0787)	Church Expansion	12.166	TSF
148	SWC of Lurin Avenue and Wood Road (P06-0900; P08-0269; P08-0270; TTM 32301)	SFDR	20	DU
149	8616 California Avenue (P08-0084; PM 35852)	Condo/Townhomes	21	DU
150	19811 Lurin Avenue (P06-1355; TM 33480)	SFDR	32	DU
151	APN:266140029, 030 (P06-1396; Mariposa Avenue; TM 33481)	SFDR	25	DU
152	APN:266140002, 021, 022 (P06-1404; Lurin Avenue; TM 33482)	SFDR	29	DU
153	3719 Strong Street (P05-0269; P08-0416; TM 33550)	SFDR	9	DU
154	1006 & 1008 Clark Street (P06-0782; TM 34908)	SFDR	15	DU
155	E. of Gratton St., W. of Corsica Av., N. of Van Buren Bl. (P05-1528; P09-0087; TM 34509)	SFDR	50	DU
156	NWC of Dominion Avenue and Division Street (P08-0396; P08-0397; P08-0398; P08-0399; TM 35620)	Condo/Townhomes	36	DU
157	6639 Hillside Avenue (P08-0727; PM 35901)	Industrial	5	LOTS
158	19985 Van Buren Boulevard (P10-0118; Gless Ranch)	Commercial Retail	425.447	TSF

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Table 4-3

Cumulative Development Land Use Summary

TAZ	Project Name	Land Use[1]	Quantity	Units[2]
159	3990 Reynolds Road (P12-0021; P12-0022; P12-0074; PM 36442)	Condo/Townhomes	102	DU
160	NEC of Martha Way & Everest Avenue (P13-0389; TM 36579)	SFDR	5	DU
161	4325, 4335, 4345, 4355, 4375 Adams Street (P13-0723; P13-0724; P13-0725; TM 36654)	SFDR	62	DU
162	5200 Van Buren Boulevard (P09-0600; P09-0601; Walmart Expansion)	Free Standing Discount Store	22.272	TSF
163	11500 Magnolia Avenue (P10-0406; P10-0407; P10-0408)	Apartments	168	DU
164	9241 & 9265 Audrey Avenue (P12-0184; P12-0185; P12-0187; Azar Plaza)	Commercial Retail	6.150	TSF
165	2325 Cottonwood Avenue (P12-0507; P12-0508; P12-0509; P12-0510)	High-Cube Warehouse	235.741	TSF
166	1710 Main Street (P12-0717)	Family Dollar Store	8.039	TSF
167	2861 Mary Street (P12-0442; P12-0443; P12-0444)	Shopping Center	56.101	TSF
168	3545 Central Avenue (P12-0741; P12-0743)	Riverside Plaza Renovations	35	AC
169	5731, 5741, 5761 & 5797 Pickler Street (P13-0198; P13-0199; P13-0200; P13-0201)	Apartments	30	DU
170	3705 Tyler Street (P13-0501; P13-0502)	Restaurant	6.000	TSF
171	6570 Magnolia Avenue; 3739 & 3747 Central Avenue (P13-0196; P13-0197)	Fast Food w/Drive Thru	3.795	TSF
172	5940-5980 Sycamore Canyon Boulevard (P13-0553; P13-0554; P13-0583; P14-0065)	Apartments	275	DU
173	SEC Sycamore Canyon Boulevard & Box Springs Road (P13-0607 P13-06008; P0609; P13-0854)	Industrial Building	171.616	TSF
174	3742 Park Sierra Avenue (P13-0912; P13-0913)	Fitness Club	45.000	TSF
175	474 Palmyrita Avenue (P13-0956; P13-0959; P13-0960; P13-0963; P13-0964; P13-0965; P13-0966)	High-Cube Warehouse	1,461.449	TSF
176	Park Sierra Avenue (P14-0026; P14-0027)	Fast Food w/Drive Thru	3.500	TSF
177	E. of Commerce St., between Mission Inn Av. and Ninth St. (P14-0045; P14-0046; P14-0047; P14-0048; P14-0049)	Apartments	208	DU
178	4445 Magnolia Avenue (P13-0207; P13-0208; P13-0209; P13-0210; P13-0211)	Hospital Expansion	Varies	
179	SR-91/Van Buren Commercial	Commercial Retail	23.565	TSF

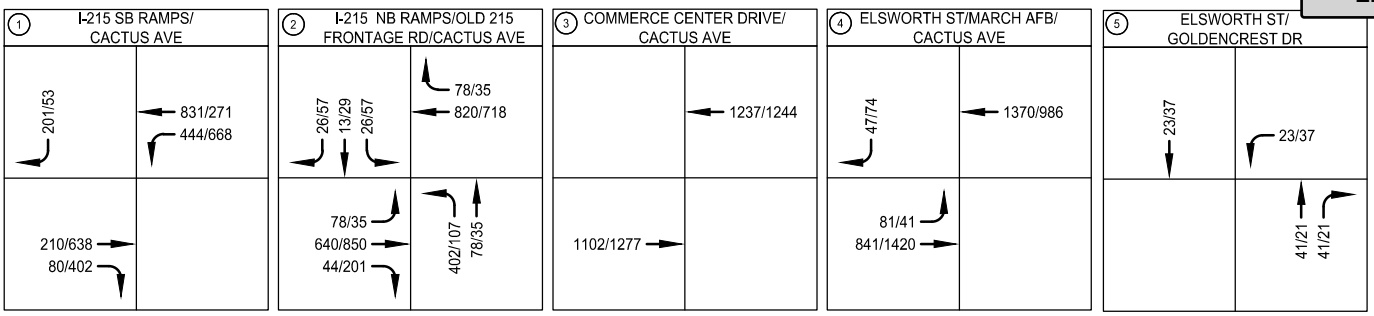
[1] SFDR = Single Family Detached Residential

[2] DU = Dwelling Units; TSF = Thousand Square Feet; SP = Spaces; VFP = Vehicle Fueling Positions

[3] Source: Cactus Avenue and Commerce Center Drive Commercial Center TIA, Urban Crossroads, Inc., December 9, 2008 (Revised).

[4] Source: March Lifecare Campus Specific Plan Traffic Impact Analysis, Mountain Pacific, Inc., May 2009 (Revised).

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot



LEGEND

XX/XX - AM/PM PEAK HOUR VOLUM

- STUDY INTERSECTIONS

- OTHER AREA PROJECT SIT

DAVID EVANS AND ASSOCIATES INC.

FIGURE 15: CUMULATIVE OTHER AREA PROJECT TRIPS

MORENO VALLEY CACTUS

MORENO VALLEY, CALIFORNIA

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

APPENDIX E: INTERSECTION CAPACITY ANALYSIS CALCULATIONS

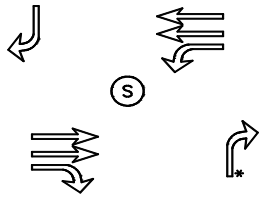
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

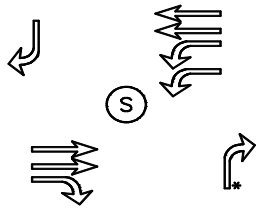
E/W STREET : CACTUS AVE
N/S STREET : I-215 SB RAMPS
CONDITION : AM PEAK HOUR

INTERSECTION : 1
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS



EXISTING GEOMETRICS



CUMULATIVE GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	665	70	735	10	745	210	945	955	552	-35	517
EB Right	198	21	219	0	219	88	307	307	395	0	395
WB Left	275	29	304	62	366	444	748	810	633	46	679
WB Thru	1060	111	1171	9	1180	831	2002	2011	2065	1	2066
WB Right	0	0	0	0	0	0	0	0	0	0	0
I-215 SB RAMPS											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	414	44	458	59	517	591	1049	1108	825	-9	816
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	231	25	256	0	256	201	457	457	528	0	528
TOTALS	**2843**	**300**	**3143**	**140**	**3283**	**2365**	**5508**	**5648**	**4998**	**3**	**5001**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	2	OF 2

E/W STREET : CACTUS AVE
CONDITION : AM PEAK HOUR
N/S STREET : I-215 SB RAMPS
PHF : 0.88

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	0	0	1	0	0	2	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
3	0	0	1	0	0	1	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
3	0	0	0	0	0	7	0	0
3	0	0	1	0	0	12	0	0
2	0	0	0	0	0	6	0	0
2	0	0	1	0	0	4	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	3	0	0	2	0	0	2	0
0	4	0	0	0	0	0	3	0
0	0	0	0	0	0	0	8	0
0	1	0	0	1	0	0	3	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	2	0	0	0	0	1	3	0
1	1	0	0	0	0	0	2	0
0	0	0	0	0	0	0	2	0
0	0	0	1	0	0	2	4	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
18	0	0	63	0	0	0	266	92	14	150	0
57	0	0	97	0	0	0	310	36	59	165	0
73	0	0	72	0	0	0	211	86	53	183	0
56	0	0	59	0	0	0	192	61	57	125	0

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	0	0	**0**	**0**
EB THRU	14	623	**637**	**665**
EB RIGHT	5	183	**188**	**198**
WB LEFT	0	275	**275**	**275**
WB THRU	27	979	**1006**	**1060**
WB RIGHT	0	0	**0**	**0**
I-215 SB RAMPS				
NB LEFT	0	0	**0**	**0**
NB THRU	0	0	**0**	**0**
NB RIGHT	41	291	**332**	**414**
SB LEFT	0	0	**0**	**0**
SB THRU	0	0	**0**	**0**
SB RIGHT	9	204	**213**	**231**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: I-215 SB
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 07:00AM

NORTH LEG

TOTAL: 213

Rt	Thru	Lt	
213			Total
22			1st
57			2nd
73			3rd
61			4th

EAST LEG TOTAL: 2,028

	1st	2nd	3rd	4th	Total
Rt	163	191	205	188	747
Thru	273	317	219	197	1006
Lt	92	36	86	61	275

WEST LEG TOTAL: 825

Total	1st	2nd	3rd	4th	
					Lt
637	155	168	185	129	Thru
188	15	60	53	60	Rt

PEAK HOUR FACTORS

NORTH LEG = 0.73
SOUTH LEG = 0.73
EAST LEG = 0.93
WEST LEG = 0.87

ALL LEGS = 0.90

SOUTH LEG

TOTAL: 332

Lt	Thru	Rt	
		73	1st
		113	2nd
		80	3rd
		66	4th
		332	Total

HOUR TOTAL: 3,398

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : I-215 SB
EAST-WEST STREET : CACTUS AVE
BEGINNING TIME : 07:00AM

MORENO VALLEY
09-30-15

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
NORTH LEG												
18	0	0	1	0	0	1	0	0	2	0	0	22
57	0	0	0	0	0	0	0	0	0	0	0	57
73	0	0	0	0	0	0	0	0	0	0	0	73
56	0	0	3	0	0	1	0	0	1	0	0	61
40	0	0	0	0	0	0	0	0	1	0	0	41
35	0	0	0	0	0	0	0	0	1	0	0	36
38	0	0	1	0	0	2	0	0	1	0	0	42
25	0	0	0	0	0	0	0	0	0	0	0	25
342	0	0	5	0	0	4	0	0	6	0	0	357
SOUTH LEG												
63	0	0	3	0	0	0	0	0	7	0	0	73
97	0	0	3	0	0	1	0	0	12	0	0	113
72	0	0	2	0	0	0	0	0	6	0	0	80
59	0	0	2	0	0	1	0	0	4	0	0	66
30	0	0	4	0	0	0	0	0	9	0	0	43
50	0	0	2	0	0	0	0	0	4	0	0	56
36	0	0	4	0	0	1	0	0	10	0	0	51
61	0	0	6	0	0	0	0	0	9	0	0	76
468	0	0	26	0	0	3	0	0	61	0	0	558
EAST LEG												
149	266	92	3	3	0	4	2	0	7	2	0	528
184	310	36	2	4	0	0	0	0	5	3	0	544
191	211	86	3	0	0	2	0	0	9	8	0	510
175	192	61	1	1	0	2	1	0	10	3	0	446
140	180	56	7	3	0	1	0	0	9	5	0	401
184	130	48	2	4	0	1	1	0	12	4	0	386
141	161	55	4	3	0	3	1	0	13	5	0	386
179	90	29	3	1	0	0	2	0	15	3	0	322
1343	1540	463	25	19	0	13	7	0	80	33	0	3523
WEST LEG												
14	150	0	0	2	0	0	0	0	1	3	0	170
59	165	0	1	1	0	0	0	0	0	2	0	228
53	183	0	0	0	0	0	0	0	0	2	0	238
57	125	0	0	0	0	1	0	0	2	4	0	189
67	121	0	0	2	0	0	0	0	0	5	0	195
65	78	0	0	0	0	0	0	0	1	0	0	144
43	86	0	2	1	0	0	0	0	0	2	0	134
49	78	0	0	3	0	1	1	0	3	4	0	139
407	986	0	3	9	0	2	1	0	7	22	0	1437

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 SB

EAST-WEST STREET: CACTUS AVE

TIME: 07:00AM-08:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
213			Total
22			1st
57			2nd
73			3rd
61			4th

	1st	2nd	3rd	4th	Total
Rt	163	191	205	188	747
Thru	273	317	219	197	1006
Lt	92	36	86	61	275

Total	1st	2nd	3rd	4th	
					Lt
637	155	168	185	129	Thru
188	15	60	53	60	Rt

	Lt	Thru	Rt
1st			73
2nd			113
3rd			80
4th			66
Total			332

Frepared by NEWFORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 SB

EAST-WEST STREET: CACTUS AVE

TIME: 08:00AM-09:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
144			Total
41			1st
36			2nd
42			3rd
25			4th

	1st	2nd	3rd	4th	Total
Rt	157	199	161	197	714
Thru	188	139	170	96	593
Lt	56	48	55	29	188

Total	1st	2nd	3rd	4th	
					Lt
381	128	78	89	86	Thru
231	67	66	45	53	Rt

	Lt	Thru	Rt
1st			43
2nd			56
3rd			51
4th			76
Total			226

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

7/22/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱	↰	↑↑							↱
Volume (veh/h)	0	665	198	275	1060	0	0	0	0	0	0	231
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	731	218	302	1165	0				0	0	254
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1173	525	1010	3399	0				0	0	0
Arrive On Green	0.00	0.32	0.32	0.56	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	731	218	302	1165	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	20.6	12.6	10.6	3.3	0.0						
Cycle Q Clear(g_c), s	0.0	20.6	12.6	10.6	3.3	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	1173	525	1010	3399	0						
V/C Ratio(X)	0.00	0.62	0.42	0.30	0.34	0.00						
Avail Cap(c_a), veh/h	0	1173	525	1010	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	34.3	31.6	14.0	0.3	0.0						
Incr Delay (d2), s/veh	0.0	2.5	2.4	0.2	0.3	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	10.7	6.0	5.3	1.6	0.0						
LnGrp Delay(d),s/veh	0.0	36.8	34.0	14.2	0.6	0.0						
LnGrp LOS		D	C	B	A							
Approach Vol, veh/h		949			1467							
Approach Delay, s/veh		36.1			3.4							
Approach LOS		D			A							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	74.0	46.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	37.0	42.0				83.0		
Max Q Clear Time (g_c+I1), s	13.6	23.6				6.3		
Green Ext Time (p_c), s	9.2	4.9				11.5		

Intersection Summary	
HCM 2010 Ctrl Delay	16.3
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	735	219	304	1171	0	0	0	0	0	0	256
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	808	241	334	1287	0				0	0	281
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1173	525	1010	3399	0				0	0	0
Arrive On Green	0.00	0.32	0.32	0.56	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	808	241	334	1287	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	23.4	14.2	12.0	3.9	0.0						
Cycle Q Clear(g_c), s	0.0	23.4	14.2	12.0	3.9	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	1173	525	1010	3399	0						
V/C Ratio(X)	0.00	0.69	0.46	0.33	0.38	0.00						
Avail Cap(c_a), veh/h	0	1173	525	1010	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	35.2	32.1	14.4	0.3	0.0						
Incr Delay (d2), s/veh	0.0	3.3	2.9	0.2	0.3	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	12.2	6.8	6.0	1.9	0.0						
LnGrp Delay(d),s/veh	0.0	38.5	35.0	14.5	0.6	0.0						
LnGrp LOS		D	D	B	A							
Approach Vol, veh/h		1049			1621							
Approach Delay, s/veh		37.7			3.5							
Approach LOS		D			A							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	74.0	46.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	36.0	42.0				82.0		
Max Q Clear Time (g_c+I1), s	15.0	26.4				6.9		
Green Ext Time (p_c), s	9.9	5.2				13.8		

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1409

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	745	219	366	1180	0	0	0	0	0	0	256
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	819	241	402	1297	0				0	0	281
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91				0.91	0.91	0.91
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1143	511	1025	3399	0				0	0	0
Arrive On Green	0.00	0.32	0.32	0.57	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	819	241	402	1297	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	24.1	14.4	14.9	3.9	0.0						
Cycle Q Clear(g_c), s	0.0	24.1	14.4	14.9	3.9	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	1143	511	1025	3399	0						
V/C Ratio(X)	0.00	0.72	0.47	0.39	0.38	0.00						
Avail Cap(c_a), veh/h	0	1143	511	1025	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	36.2	32.9	14.5	0.3	0.0						
Incr Delay (d2), s/veh	0.0	3.9	3.1	0.2	0.3	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	12.6	6.9	7.4	2.0	0.0						
LnGrp Delay(d),s/veh	0.0	40.1	36.0	14.7	0.6	0.0						
LnGrp LOS		D	D	B	A							
Approach Vol, veh/h		1060			1699							
Approach Delay, s/veh		39.2			4.0							
Approach LOS		D			A							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	75.0	45.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	40.0	41.0				85.0		
Max Q Clear Time (g_c+I1), s	17.9	27.1				6.9		
Green Ext Time (p_c), s	10.6	5.0				14.6		

Intersection Summary	
HCM 2010 Ctrl Delay	17.5
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	945	307	748	2002	0	0	0	0	0	0	457
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	1027	334	813	2176	0				0	0	497
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	933	417	1131	3399	0				0	0	0
Arrive On Green	0.00	0.26	0.26	0.63	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	1027	334	813	2176	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	31.0	23.2	36.7	10.6	0.0						
Cycle Q Clear(g_c), s	0.0	31.0	23.2	36.7	10.6	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	933	417	1131	3399	0						
V/C Ratio(X)	0.00	1.10	0.80	0.72	0.64	0.00						
Avail Cap(c_a), veh/h	0	933	417	1131	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	44.5	41.6	15.3	0.5	0.0						
Incr Delay (d2), s/veh	0.0	61.2	14.9	2.2	0.9	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	23.3	12.0	18.8	5.3	0.0						
LnGrp Delay(d),s/veh	0.0	105.7	56.5	17.6	1.5	0.0						
LnGrp LOS		F	E	B	A							
Approach Vol, veh/h		1361			2989							
Approach Delay, s/veh		93.6			5.8							
Approach LOS		F			A							

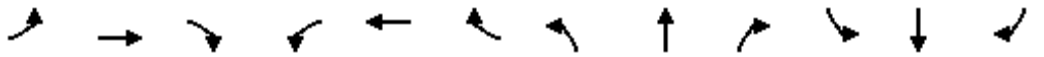
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	82.0	38.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	46.0	34.0				84.0		
Max Q Clear Time (g_c+I1), s	39.7	34.0				13.6		
Green Ext Time (p_c), s	5.9	0.0				45.0		

Intersection Summary	
HCM 2010 Ctrl Delay	33.3
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱	↰	↑↑							↱
Volume (veh/h)	0	955	307	810	2011	0	0	0	0	0	0	457
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	1038	334	880	2186	0				0	0	497
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	933	417	1131	3399	0				0	0	0
Arrive On Green	0.00	0.26	0.26	0.63	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	1038	334	880	2186	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	31.0	23.2	42.6	10.7	0.0						
Cycle Q Clear(g_c), s	0.0	31.0	23.2	42.6	10.7	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	933	417	1131	3399	0						
V/C Ratio(X)	0.00	1.11	0.80	0.78	0.64	0.00						
Avail Cap(c_a), veh/h	0	933	417	1131	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	44.5	41.6	16.4	0.5	0.0						
Incr Delay (d2), s/veh	0.0	65.6	14.9	3.5	0.9	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	23.9	12.0	22.1	5.3	0.0						
LnGrp Delay(d),s/veh	0.0	110.1	56.5	19.9	1.5	0.0						
LnGrp LOS		F	E	B	A							
Approach Vol, veh/h		1372			3066							
Approach Delay, s/veh		97.0			6.8							
Approach LOS		F			A							

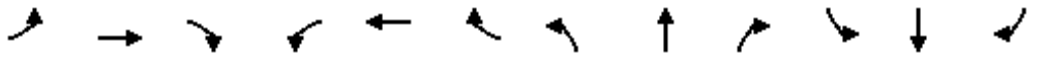
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	82.0	38.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	47.0	34.0				85.0		
Max Q Clear Time (g_c+I1), s	45.6	34.0				13.7		
Green Ext Time (p_c), s	1.4	0.0				46.9		

Intersection Summary	
HCM 2010 Ctrl Delay	34.7
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

7/21/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱	↰	↑↑							↱
Volume (veh/h)	0	552	395	633	2065	0	0	0	0	0	0	528
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	581	416	666	2174	0				0	0	556
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	602	269	1297	3399	0				0	0	0
Arrive On Green	0.00	0.17	0.17	0.72	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	581	416	666	2174	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	19.2	20.0	19.8	10.6	0.0						
Cycle Q Clear(g_c), s	0.0	19.2	20.0	19.8	10.6	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	602	269	1297	3399	0						
V/C Ratio(X)	0.00	0.97	1.55	0.51	0.64	0.00						
Avail Cap(c_a), veh/h	0	602	269	1297	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	49.7	50.0	7.6	0.5	0.0						
Incr Delay (d2), s/veh	0.0	29.1	263.2	0.3	0.9	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	12.0	28.6	9.9	5.3	0.0						
LnGrp Delay(d),s/veh	0.0	78.8	313.2	8.0	1.4	0.0						
LnGrp LOS		E	F	A	A							
Approach Vol, veh/h		997			2840							
Approach Delay, s/veh		176.6			3.0							
Approach LOS		F			A							

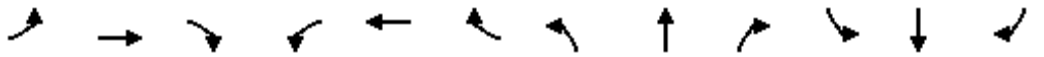
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	93.0	27.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	46.0	23.0				73.0		
Max Q Clear Time (g_c+I1), s	22.8	23.0				13.6		
Green Ext Time (p_c), s	19.1	0.0				38.5		

Intersection Summary	
HCM 2010 Ctrl Delay	48.1
HCM 2010 LOS	D

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	517	395	679	2066	0	0	0	0	0	0	528
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	544	416	715	2175	0				0	0	556
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	542	242	1327	3399	0				0	0	0
Arrive On Green	0.00	0.15	0.15	0.73	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	544	416	715	2175	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	18.0	18.0	20.9	10.6	0.0						
Cycle Q Clear(g_c), s	0.0	18.0	18.0	20.9	10.6	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	542	242	1327	3399	0						
V/C Ratio(X)	0.00	1.00	1.72	0.54	0.64	0.00						
Avail Cap(c_a), veh/h	0	542	242	1327	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	51.0	51.0	7.1	0.5	0.0						
Incr Delay (d2), s/veh	0.0	39.8	339.7	0.4	0.9	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	11.9	30.9	10.5	5.3	0.0						
LnGrp Delay(d),s/veh	0.0	90.8	390.7	7.5	1.4	0.0						
LnGrp LOS		F	F	A	A							
Approach Vol, veh/h		960			2890							
Approach Delay, s/veh		220.8			2.9							
Approach LOS		F			A							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	95.0	25.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	49.0	21.0				74.0		
Max Q Clear Time (g_c+I1), s	23.9	21.0				13.6		
Green Ext Time (p_c), s	20.6	0.0				39.5		

Intersection Summary	
HCM 2010 Ctrl Delay	57.3
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1414

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : I-215 SB RAMPS
CONDITION : PM PEAK HOUR

INTERSECTION : 1
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	453	48	501	8	509	638	1139	1147	1497	-5	1492
EB Right	116	13	129	0	129	402	531	531	591	0	591
WB Left	559	59	618	94	712	668	1286	1380	1105	23	1128
WB Thru	341	36	377	9	386	271	648	657	1056	-27	1029
WB Right	0	0	0	0	0	0	0	0	0	0	0
I-215 SB RAMPS											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	1027	107	1134	89	1223	466	1600	1689	855	70	925
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	158	17	175	0	175	53	228	228	236	0	236
TOTALS	**2654**	**280**	**2934**	**200**	**3134**	**2498**	**5432**	**5632**	**5340**	**61**	**5401**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	2	OF 2

E/W STREET : CACTUS AVE
CONDITION : PM PEAK HOUR

N/S STREET : I-215 SB RAMPS
PHF : 0.97

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	1	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
6	0	0	2	0	0	9	0	0
4	0	0	3	0	0	4	0	0
4	0	0	4	0	0	6	0	0
6	0	0	2	0	0	5	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	1	0	0	1	0	0	0	0
0	0	0	0	0	0	0	1	0
0	2	0	0	1	0	0	3	0
0	1	0	0	0	0	0	0	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	1	0	0	1	0	1	0	0
0	0	0	0	0	0	0	1	0
3	3	0	0	1	0	2	1	0
0	1	0	0	0	0	0	0	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
24	0	0	233	0	0	0	56	147	11	93	0
46	0	0	233	0	0	0	90	169	26	61	0
28	0	0	176	0	0	0	111	136	20	125	0
51	0	0	220	0	0	0	54	107	41	147	0

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	0	0	**0**	**0**
EB THRU	9	426	**435**	**453**
EB RIGHT	6	98	**104**	**116**
WB LEFT	0	559	**559**	**559**
WB THRU	10	311	**321**	**341**
WB RIGHT	0	0	**0**	**0**
I-215 SB RAMPS				
NB LEFT	0	0	**0**	**0**
NB THRU	0	0	**0**	**0**
NB RIGHT	55	862	**917**	**1027**
SB LEFT	0	0	**0**	**0**
SB THRU	0	0	**0**	**0**
SB RIGHT	3	149	**152**	**158**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: I-215 SB
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 04:15PM

NORTH LEG

TOTAL: 152

Rt	Thru	Lt	
152			Total
25			1st
46			2nd
29			3rd
52			4th

EAST LEG TOTAL: 1,721

	1st	2nd	3rd	4th	Total
Rt	222	205	215	199	841
Thru	58	91	117	55	321
Lt	147	169	136	107	559

WEST LEG TOTAL: 539

Total	1st	2nd	3rd	4th	
					Lt
435	95	62	130	148	Thru
104	12	26	25	41	Rt

SOUTH LEG

TOTAL: 917

	Lt	Thru	Rt
1st			250
2nd			244
3rd			190
4th			233
Total			917

PEAK HOUR FACTORS

NORTH LEG = 0.73
SOUTH LEG = 0.92
EAST LEG = 0.92
WEST LEG = 0.71

ALL LEGS = 0.99

HOUR TOTAL: 3,329

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : I-215 SB
EAST-WEST STREET : CACTUS AVE

MORENO VALLEY
09-30-15

BEGINNING TIME : 04:00PM

AUTOS			LARGE 2 AXLE			3 AXLE			4(+) AXLE			TOTALS
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	
NORTH LEG												
8	0	0	0	0	0	1	0	0	2	0	0	11
24	0	0	1	0	0	0	0	0	0	0	0	25
46	0	0	0	0	0	0	0	0	0	0	0	46
28	0	0	0	0	0	1	0	0	0	0	0	29
51	0	0	0	0	0	0	0	0	1	0	0	52
22	0	0	0	0	0	0	0	0	0	0	0	22
50	0	0	0	0	0	0	0	0	1	0	0	51
24	0	0	2	0	0	0	0	0	3	0	0	29
253	0	0	3	0	0	2	0	0	7	0	0	265
SOUTH LEG												
277	0	0	4	0	0	1	0	0	6	0	0	288
233	0	0	6	0	0	2	0	0	9	0	0	250
233	0	0	4	0	0	3	0	0	4	0	0	244
176	0	0	4	0	0	4	0	0	6	0	0	190
220	0	0	6	0	0	2	0	0	5	0	0	233
211	0	0	4	0	0	0	0	0	9	0	0	224
240	0	0	4	0	0	2	0	0	5	0	0	251
207	0	0	2	0	0	0	0	0	8	0	0	217
1797	0	0	34	0	0	14	0	0	52	0	0	1897
EAST LEG												
259	45	89	4	0	0	2	0	0	5	2	0	406
206	56	147	6	1	0	4	1	0	6	0	0	427
197	90	169	2	0	0	2	0	0	4	1	0	465
198	111	136	7	2	0	1	1	0	9	3	0	468
193	54	107	3	1	0	1	0	0	2	0	0	361
222	54	79	3	0	0	3	0	0	3	1	0	365
220	53	98	3	0	0	2	1	0	0	0	0	377
175	76	68	6	1	0	3	0	0	5	2	0	336
1670	539	893	34	5	0	18	3	0	34	9	0	3205
WEST LEG												
8	47	0	1	1	0	2	0	0	3	1	0	63
11	93	0	0	1	0	0	1	0	1	0	0	107
26	61	0	0	0	0	0	0	0	0	1	0	88
20	125	0	3	3	0	0	1	0	2	1	0	155
41	147	0	0	1	0	0	0	0	0	0	0	189
20	105	0	0	1	0	0	0	0	2	3	0	131
30	107	0	1	1	0	0	0	0	0	2	0	141
16	125	0	0	2	0	1	1	0	1	1	0	147
172	810	0	5	10	0	3	3	0	9	9	0	1021

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 SB

EAST-WEST STREET: CACTUS AVE

TIME: 04:00PM-05:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
111			Total
11			1st
25			2nd
46			3rd
29			4th

	1st	2nd	3rd	4th	Total
Rt	270	222	205	215	912
Thru	47	58	91	117	313
Lt	89	147	169	136	541

Total	1st	2nd	3rd	4th	
					Lt
336	49	95	62	130	Thru
77	14	12	26	25	Rt

	Lt	Thru	Rt
1st			288
2nd			250
3rd			244
4th			190
Total			972

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 SB

EAST-WEST STREET: CACTUS AVE

TIME: 05:00PM-06:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
154			Total
52			1st
22			2nd
51			3rd
29			4th

	1st	2nd	3rd	4th	Total
Rt	199	231	225	189	844
Thru	55	55	54	79	243
Lt	107	79	98	68	352

Total	1st	2nd	3rd	4th	
					Lt
496	148	109	110	129	Thru
112	41	22	31	18	Rt

	Lt	Thru	Rt
1st			233
2nd			224
3rd			251
4th			217
Total			925

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

7/22/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	453	116	559	341	0	0	0	0	0	0	158
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	503	129	621	379	0				0	0	176
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1911	855	641	3399	0				0	0	0
Arrive On Green	0.00	0.53	0.53	0.35	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	503	129	621	379	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	9.1	4.9	40.5	0.8	0.0						
Cycle Q Clear(g_c), s	0.0	9.1	4.9	40.5	0.8	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	1911	855	641	3399	0						
V/C Ratio(X)	0.00	0.26	0.15	0.97	0.11	0.00						
Avail Cap(c_a), veh/h	0	1911	855	965	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	15.4	14.4	38.1	0.2	0.0						
Incr Delay (d2), s/veh	0.0	0.3	0.4	17.4	0.1	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	4.6	2.3	23.3	0.4	0.0						
LnGrp Delay(d),s/veh	0.0	15.8	14.8	55.5	0.3	0.0						
LnGrp LOS		B	B	E	A							
Approach Vol, veh/h		632			1000							
Approach Delay, s/veh		15.6			34.6							
Approach LOS		B			C							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	49.5	70.5				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	67.0	32.0				103.0		
Max Q Clear Time (g_c+I1), s	43.5	12.1				3.8		
Green Ext Time (p_c), s	2.0	5.5				6.6		

Intersection Summary	
HCM 2010 Ctrl Delay	27.2
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	501	129	618	377	0	0	0	0	0	0	175
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	557	143	687	419	0				0	0	194
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1778	795	707	3399	0				0	0	0
Arrive On Green	0.00	0.49	0.49	0.39	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	557	143	687	419	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	11.1	5.9	44.7	0.9	0.0						
Cycle Q Clear(g_c), s	0.0	11.1	5.9	44.7	0.9	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	1778	795	707	3399	0						
V/C Ratio(X)	0.00	0.31	0.18	0.97	0.12	0.00						
Avail Cap(c_a), veh/h	0	1778	795	950	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	18.3	17.0	35.9	0.2	0.0						
Incr Delay (d2), s/veh	0.0	0.5	0.5	19.4	0.1	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	5.6	2.7	26.1	0.4	0.0						
LnGrp Delay(d),s/veh	0.0	18.7	17.5	55.3	0.3	0.0						
LnGrp LOS		B	B	E	A							
Approach Vol, veh/h		700			1106							
Approach Delay, s/veh		18.5			34.5							
Approach LOS		B			C							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	53.9	66.1				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	66.0	32.0				102.0		
Max Q Clear Time (g_c+I1), s	47.7	14.1				3.9		
Green Ext Time (p_c), s	2.2	6.0				7.6		

Intersection Summary	
HCM 2010 Ctrl Delay	28.3
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	509	129	712	386	0	0	0	0	0	0	175
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	566	143	791	429	0				0	0	194
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90				0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	812	363	1191	3399	0				0	0	0
Arrive On Green	0.00	0.22	0.22	0.66	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	566	143	791	429	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	17.3	9.0	31.8	0.9	0.0						
Cycle Q Clear(g_c), s	0.0	17.3	9.0	31.8	0.9	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	812	363	1191	3399	0						
V/C Ratio(X)	0.00	0.70	0.39	0.66	0.13	0.00						
Avail Cap(c_a), veh/h	0	812	363	1191	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	42.7	39.5	12.4	0.2	0.0						
Incr Delay (d2), s/veh	0.0	4.9	3.2	1.4	0.1	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	9.2	4.3	16.3	0.5	0.0						
LnGrp Delay(d),s/veh	0.0	47.7	42.7	13.8	0.3	0.0						
LnGrp LOS		D	D	B	A							
Approach Vol, veh/h		709			1220							
Approach Delay, s/veh		46.7			9.1							
Approach LOS		D			A							

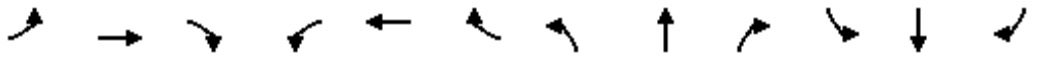
Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	86.0	34.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	70.0	30.0				104.0		
Max Q Clear Time (g_c+I1), s	34.8	20.3				3.9		
Green Ext Time (p_c), s	6.0	2.7				6.1		

Intersection Summary	
HCM 2010 Ctrl Delay	22.9
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1139	531	1286	648	0	0	0	0	0	0	228
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	1238	577	1398	704	0				0	0	248
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	963	431	1116	3399	0				0	0	0
Arrive On Green	0.00	0.27	0.27	0.62	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	1238	577	1398	704	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	32.0	32.0	74.0	1.7	0.0						
Cycle Q Clear(g_c), s	0.0	32.0	32.0	74.0	1.7	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	963	431	1116	3399	0						
V/C Ratio(X)	0.00	1.29	1.34	1.25	0.21	0.00						
Avail Cap(c_a), veh/h	0	963	431	1116	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	44.0	44.0	23.0	0.3	0.0						
Incr Delay (d2), s/veh	0.0	136.6	167.9	121.3	0.1	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	34.2	34.3	74.2	0.8	0.0						
LnGrp Delay(d),s/veh	0.0	180.6	211.9	144.3	0.4	0.0						
LnGrp LOS		F	F	F	A							
Approach Vol, veh/h		1815			2102							
Approach Delay, s/veh		190.6			96.1							
Approach LOS		F			F							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	81.0	39.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	66.0	35.0				105.0		
Max Q Clear Time (g_c+I1), s	77.0	35.0				4.7		
Green Ext Time (p_c), s	0.0	0.0				22.0		

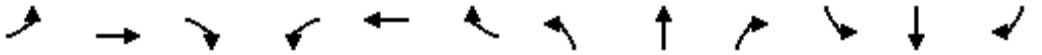
Intersection Summary	
HCM 2010 Ctrl Delay	139.9
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1424

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1147	531	1380	657	0	0	0	0	0	0	228
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	1247	577	1500	714	0				0	0	248
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92				0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	963	431	1116	3399	0				0	0	0
Arrive On Green	0.00	0.27	0.27	0.62	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	1247	577	1500	714	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	32.0	32.0	74.0	1.7	0.0						
Cycle Q Clear(g_c), s	0.0	32.0	32.0	74.0	1.7	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	963	431	1116	3399	0						
V/C Ratio(X)	0.00	1.30	1.34	1.34	0.21	0.00						
Avail Cap(c_a), veh/h	0	963	431	1116	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	44.0	44.0	23.0	0.3	0.0						
Incr Delay (d2), s/veh	0.0	140.7	167.9	161.0	0.1	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	34.7	34.3	86.5	0.9	0.0						
LnGrp Delay(d),s/veh	0.0	184.7	211.9	184.0	0.4	0.0						
LnGrp LOS		F	F	F	A							
Approach Vol, veh/h		1824			2214							
Approach Delay, s/veh		193.3			124.8							
Approach LOS		F			F							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	81.0	39.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	66.0	35.0				105.0		
Max Q Clear Time (g_c+I1), s	77.0	35.0				4.7		
Green Ext Time (p_c), s	0.0	0.0				27.7		

Intersection Summary	
HCM 2010 Ctrl Delay	155.7
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1425

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱	↰	↑↑							↱
Volume (veh/h)	0	1497	591	1105	1056	0	0	0	0	0	0	236
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	1576	622	1163	1112	0				0	0	248
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1264	565	965	3399	0				0	0	0
Arrive On Green	0.00	0.35	0.35	0.53	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	1576	622	1163	1112	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	42.0	42.0	64.0	3.1	0.0						
Cycle Q Clear(g_c), s	0.0	42.0	42.0	64.0	3.1	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	1264	565	965	3399	0						
V/C Ratio(X)	0.00	1.25	1.10	1.21	0.33	0.00						
Avail Cap(c_a), veh/h	0	1264	565	965	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	39.0	39.0	28.0	0.3	0.0						
Incr Delay (d2), s/veh	0.0	118.1	68.3	102.2	0.3	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	41.6	29.4	59.0	1.5	0.0						
LnGrp Delay(d),s/veh	0.0	157.1	107.3	130.2	0.6	0.0						
LnGrp LOS		F	F	F	A							
Approach Vol, veh/h		2198			2275							
Approach Delay, s/veh		143.0			66.8							
Approach LOS		F			E							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	71.0	49.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	56.0	45.0				105.0		
Max Q Clear Time (g_c+I1), s	67.0	45.0				6.1		
Green Ext Time (p_c), s	0.0	0.0				23.4		

Intersection Summary	
HCM 2010 Ctrl Delay	104.2
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	1492	591	1128	1029	0	0	0	0	0	0	236
Number	5	2	12	1	6	16				7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1900	1900	1900	1900	0				0	0	1900
Adj Flow Rate, veh/h	0	1571	622	1187	1083	0				0	0	248
Adj No. of Lanes	0	2	1	1	2	0				0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0				0	0	0
Cap, veh/h	0	1203	538	995	3399	0				0	0	0
Arrive On Green	0.00	0.33	0.33	0.55	0.94	0.00				0.00	0.00	0.00
Sat Flow, veh/h	0	3705	1615	1810	3705	0					0	
Grp Volume(v), veh/h	0	1571	622	1187	1083	0					0.0	
Grp Sat Flow(s),veh/h/ln	0	1805	1615	1810	1805	0						
Q Serve(g_s), s	0.0	40.0	40.0	66.0	3.0	0.0						
Cycle Q Clear(g_c), s	0.0	40.0	40.0	66.0	3.0	0.0						
Prop In Lane	0.00		1.00	1.00		0.00						
Lane Grp Cap(c), veh/h	0	1203	538	995	3399	0						
V/C Ratio(X)	0.00	1.31	1.16	1.19	0.32	0.00						
Avail Cap(c_a), veh/h	0	1203	538	995	3399	0						
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00						
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00						
Uniform Delay (d), s/veh	0.0	40.0	40.0	27.0	0.3	0.0						
Incr Delay (d2), s/veh	0.0	143.6	89.4	96.7	0.2	0.0						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	0.0	43.9	31.2	59.4	1.5	0.0						
LnGrp Delay(d),s/veh	0.0	183.6	129.4	123.7	0.5	0.0						
LnGrp LOS		F	F	F	A							
Approach Vol, veh/h		2193			2270							
Approach Delay, s/veh		168.2			65.0							
Approach LOS		F			E							

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		
Phs Duration (G+Y+Rc), s	73.0	47.0				120.0		
Change Period (Y+Rc), s	4.0	4.0				4.0		
Max Green Setting (Gmax), s	58.0	43.0				105.0		
Max Q Clear Time (g_c+I1), s	69.0	43.0				6.0		
Green Ext Time (p_c), s	0.0	0.0				23.4		

Intersection Summary	
HCM 2010 Ctrl Delay	115.7
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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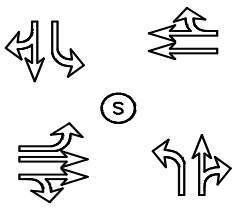
SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

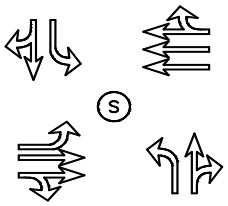
E/W STREET : CACTUS AVE
N/S STREET : I-215 FREEWAY NB RAMPS
CONDITION : AM PEAK HOUR

INTERSECTION : 2
PROJECTED GROWTH PER YEAR : 2%

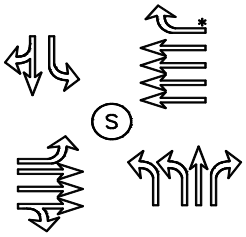
CONDITION DIAGRAMS



EXISTING GEOMETRICS



EXISTING MITIGATED GEOMETRICS



CUMULATIVE GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	45	5	50	0	50	78	128	128	86	0	86
EB Thru	998	104	1102	70	1172	640	1742	1812	1204	-43	1161
EB Right	30	4	34	0	34	44	78	78	88	0	88
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1524	159	1683	152	1835	820	2503	2655	2593	152	2745
WB Right	292	31	323	0	323	78	401	401	311	0	311
I-215 FREEWAY NB RAMPS											
NB Left	572	60	632	0	632	402	1034	1034	708	0	708
NB Thru	523	55	578	0	578	78	656	656	362	0	362
NB Right	37	4	41	88	129	0	41	129	40	-3	37
SB Left	44	5	49	0	49	26	75	75	132	0	132
SB Thru	0	0	0	0	0	13	13	13	0	0	0
SB Right	81	9	90	0	90	26	116	116	384	0	384
TOTALS	**4146**	**436**	**4582**	**310**	**4892**	**2205**	**6787**	**7097**	**5908**	**106**	**6014**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	2	OF 2

E/W STREET : CACTUS AVE
CONDITION : AM PEAK HOUR

N/S STREET : I-215 FREEWAY NB RAMPS
PHF : 0.91

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	1	2	0	0	2	0	3
0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	8	0	1
0	0	0	1	0	0	4	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	1	1	0	1	0	0	0	2
0	4	4	0	0	0	0	2	3
0	0	1	0	4	1	0	2	3
0	0	2	0	1	0	0	5	4

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	5	0	0	4	0	3	5	0
3	2	0	0	0	0	0	4	0
1	2	0	1	1	0	2	6	0
3	0	0	0	2	0	1	6	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	3	1	0	0	0	0	8	1
1	3	0	0	1	0	3	8	4
0	2	0	0	0	0	4	4	0
0	2	0	0	1	0	0	4	3

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
10	0	1	5	73	128	55	369	0	0	215	1
8	0	9	7	127	129	72	393	0	5	255	2
3	0	11	13	142	141	70	344	0	1	238	12
6	0	8	12	121	111	53	307	0	0	182	3

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	9	18	**27**	**45**
EB THRU	36	890	**926**	**998**
EB RIGHT	8	6	**14**	**30**
WB LEFT	0	0	**0**	**0**
WB THRU	37	1413	**1450**	**1524**
WB RIGHT	14	250	**264**	**292**
I-215 FREEWAY NB RAMPS				
NB LEFT	21	509	**530**	**572**
NB THRU	20	463	**483**	**523**
NB RIGHT	0	37	**37**	**37**
SB LEFT	5	29	**34**	**44**
SB THRU	0	0	**0**	**0**
SB RIGHT	18	27	**45**	**81**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: I-215 NB
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 07:00AM

NORTH LEG

TOTAL: 79

Rt	Thru	Lt	
45		34	Total
14		5	1st
9		9	2nd
11		12	3rd
11		8	4th

EAST LEG TOTAL: 1,714

	1st	2nd	3rd	4th	Total
Rt	58	75	74	57	264
Thru	383	399	353	315	1450
Lt					

WEST LEG TOTAL: 967

Total	1st	2nd	3rd	4th	
27	3	6	12	6	Lt
926	226	267	244	189	Thru
14	0	9	5	0	Rt

PEAK HOUR FACTORS

NORTH LEG = 0.86
SOUTH LEG = 0.86
EAST LEG = 0.90
WEST LEG = 0.86

ALL LEGS = 0.91

SOUTH LEG

TOTAL: 1,050

	Lt	Thru	Rt
1st	131	75	5
2nd	136	133	7
3rd	146	148	13
4th	117	127	12
Total	530	483	37

HOUR TOTAL: 3,810

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : I-215 NB
EAST-WEST STREET : CACTUS AVE
BEGINNING TIME : 07:00AM

MORENO VALLEY
09-30-15

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
NORTH LEG												
10	0	1	0	0	1	2	0	0	2	0	3	19
8	0	9	0	0	0	0	0	0	1	0	0	18
3	0	11	0	0	0	0	0	0	8	0	1	23
6	0	8	0	0	0	1	0	0	4	0	0	19
0	0	4	1	0	0	0	0	0	7	0	0	12
4	0	10	0	0	0	0	0	0	10	0	0	24
1	0	7	0	0	0	0	0	1	1	0	1	11
6	0	7	1	0	0	0	0	1	4	0	0	19
38	0	57	2	0	1	3	0	2	37	0	5	145
SOUTH LEG												
5	73	128	0	1	1	0	1	0	0	0	2	211
7	127	129	0	4	4	0	0	0	0	2	3	276
13	142	141	0	0	1	0	4	1	0	2	3	307
12	121	111	0	0	2	0	1	0	0	5	4	256
22	73	89	0	0	1	0	2	0	0	1	1	189
10	73	137	0	1	3	0	2	0	0	3	1	230
15	63	135	0	0	5	0	1	1	0	1	4	225
9	50	89	0	0	0	0	3	1	0	1	3	156
93	722	959	0	6	17	0	14	3	0	15	21	1850
EAST LEG												
55	369	0	0	5	0	0	4	0	3	5	0	441
72	393	0	3	2	0	0	0	0	0	4	0	474
70	344	0	1	2	0	1	1	0	2	6	0	427
53	307	0	3	0	0	0	2	0	1	6	0	372
68	286	0	2	9	0	1	1	0	3	6	0	376
40	220	0	3	3	0	0	2	0	0	5	0	273
23	220	0	2	2	0	3	3	0	2	13	0	268
27	204	0	2	3	0	4	1	0	0	11	0	252
408	2343	0	16	26	0	9	14	0	11	56	0	2883
WEST LEG												
0	215	1	0	3	1	0	0	0	0	8	1	229
5	255	2	1	3	0	0	1	0	3	8	4	282
1	238	12	0	2	0	0	0	0	4	4	0	261
0	182	3	0	2	0	0	1	0	0	4	3	195
3	148	7	0	6	0	0	0	0	1	12	1	178
2	122	3	0	2	0	0	0	0	1	3	0	133
7	112	0	1	4	0	0	1	0	3	6	2	136
3	130	3	1	7	0	0	1	0	3	10	1	159
21	1402	31	3	29	1	0	4	0	15	55	12	1573

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 NB

EAST-WEST STREET: CACTUS AVE

TIME: 07:00AM-08:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
45		34	Total
14		5	1st
9		9	2nd
11		12	3rd
11		8	4th

	1st	2nd	3rd	4th	Total
Rt	58	75	74	57	264
Thru	383	399	353	315	1450
Lt					

Total	1st	2nd	3rd	4th	
27	3	6	12	6	Lt
926	226	267	244	189	Thru
14	0	9	5	0	Rt

	Lt	Thru	Rt
1st	131	75	5
2nd	136	133	7
3rd	146	148	13
4th	117	127	12
Total	530	483	37

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 NB

EAST-WEST STREET: CACTUS AVE

TIME: 08:00AM-09:00AM DATE: 09-30-15

NORTH LEG

35		31	Total
8		4	1st
14		10	2nd
2		9	3rd
11		8	4th
Rt	Thru	Lt	

	1st	2nd	3rd	4th	Total
Rt	74	43	30	33	180
Thru	302	230	238	219	989
Lt					

Total	1st	2nd	3rd	4th	
17	8	3	2	4	Lt
564	166	127	123	148	Thru
25	4	3	11	7	Rt

	Lt	Thru	Rt
1st	91	76	22
2nd	141	79	10
3rd	145	65	15
4th	93	54	9
Total	470	274	56

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: I-215 NB
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 04:15PM

NORTH LEG

TOTAL: 147

Rt	Thru	Lt	
52		95	Total
12		21	1st
17		15	2nd
10		26	3rd
13		33	4th

EAST LEG TOTAL: 1,718

	1st	2nd	3rd	4th	Total
Rt	23	21	19	20	83
Thru	403	446	448	338	1635
Lt					

WEST LEG TOTAL: 1,360

Total	1st	2nd	3rd	4th	
21	9	4	3	5	Lt
1180	303	272	285	320	Thru
159	34	31	32	62	Rt

PEAK HOUR FACTORS

NORTH LEG = 0.80
SOUTH LEG = 0.88
EAST LEG = 0.92
WEST LEG = 0.88

ALL LEGS = 0.98

SOUTH LEG

TOTAL: 88

	Lt	Thru	Rt
1st	8	7	3
2nd	5	9	6
3rd	8	8	9
4th	9	5	11
Total	30	29	29

HOUR TOTAL: 3,313

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/22/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	998	30	0	1524	292	572	523	37	44	0	81
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	48	1073	32	0	1639	314	615	562	40	47	0	87
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1820	54	0	1546	287	582	745	53	188	0	686
Arrive On Green	0.51	0.51	0.51	0.00	0.51	0.51	0.43	0.43	0.43	0.43	0.00	0.43
Sat Flow, veh/h	229	3579	107	0	3136	564	1331	1753	125	830	0	1615
Grp Volume(v), veh/h	48	541	564	0	951	1002	615	0	602	47	0	87
Grp Sat Flow(s),veh/h/ln	229	1805	1881	0	1805	1800	1331	0	1878	830	0	1615
Q Serve(g_s), s	0.0	25.3	25.3	0.0	61.0	61.0	47.1	0.0	32.6	6.1	0.0	3.9
Cycle Q Clear(g_c), s	61.0	25.3	25.3	0.0	61.0	61.0	51.0	0.0	32.6	38.6	0.0	3.9
Prop In Lane	1.00		0.06	0.00		0.31	1.00		0.07	1.00		1.00
Lane Grp Cap(c), veh/h	60	918	956	0	918	915	582	0	798	188	0	686
V/C Ratio(X)	0.80	0.59	0.59	0.00	1.04	1.09	1.06	0.00	0.75	0.25	0.00	0.13
Avail Cap(c_a), veh/h	60	918	956	0	918	915	582	0	798	188	0	686
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	20.7	20.7	0.0	29.5	29.5	38.9	0.0	29.2	45.6	0.0	21.0
Incr Delay (d2), s/veh	68.2	2.8	2.7	0.0	39.7	58.9	53.1	0.0	4.1	0.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	13.2	13.7	0.0	40.2	45.0	27.8	0.0	17.8	1.4	0.0	1.8
LnGrp Delay(d),s/veh	128.2	23.5	23.4	0.0	69.2	88.4	92.0	0.0	33.3	46.2	0.0	21.0
LnGrp LOS	F	C	C		F	F	F		C	D		C
Approach Vol, veh/h		1153			1953			1217			134	
Approach Delay, s/veh		27.8			79.0			63.0			29.9	
Approach LOS		C			E			E			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		65.0		55.0		65.0		55.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		61.0		51.0		61.0		51.0
Max Q Clear Time (g_c+I1), s		63.0		40.6		63.0		53.0
Green Ext Time (p_c), s		0.0		5.4		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	59.9
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/22/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	998	30	0	1524	292	572	523	37	44	0	81
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	48	1073	32	0	1639	314	615	562	40	47	0	87
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	84	1581	47	0	1934	368	676	862	61	269	0	794
Arrive On Green	0.44	0.44	0.44	0.00	0.44	0.44	0.49	0.49	0.49	0.49	0.00	0.49
Sat Flow, veh/h	229	3579	107	0	4549	833	1331	1753	125	830	0	1615
Grp Volume(v), veh/h	48	541	564	0	1292	661	615	0	602	47	0	87
Grp Sat Flow(s),veh/h/ln	229	1805	1881	0	1729	1753	1331	0	1878	830	0	1615
Q Serve(g_s), s	12.5	28.7	28.7	0.0	40.0	40.5	55.4	0.0	28.8	5.4	0.0	3.5
Cycle Q Clear(g_c), s	53.0	28.7	28.7	0.0	40.0	40.5	58.8	0.0	28.8	34.2	0.0	3.5
Prop In Lane	1.00		0.06	0.00		0.48	1.00		0.07	1.00		1.00
Lane Grp Cap(c), veh/h	84	797	831	0	1527	774	676	0	923	269	0	794
V/C Ratio(X)	0.57	0.68	0.68	0.00	0.85	0.85	0.91	0.00	0.65	0.17	0.00	0.11
Avail Cap(c_a), veh/h	84	797	831	0	1527	774	676	0	923	269	0	794
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	56.9	26.7	26.7	0.0	29.9	30.0	32.2	0.0	22.8	35.6	0.0	16.4
Incr Delay (d2), s/veh	25.5	4.6	4.4	0.0	6.0	11.5	16.4	0.0	1.6	0.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	15.3	15.9	0.0	20.3	21.9	23.4	0.0	15.3	1.3	0.0	1.6
LnGrp Delay(d),s/veh	82.4	31.3	31.2	0.0	35.8	41.6	48.6	0.0	24.5	35.9	0.0	16.4
LnGrp LOS	F	C	C		D	D	D		C	D		B
Approach Vol, veh/h		1153			1953			1217			134	
Approach Delay, s/veh		33.4			37.8			36.7			23.3	
Approach LOS		C			D			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		57.0		63.0		57.0		63.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		53.0		59.0		53.0		59.0
Max Q Clear Time (g_c+I1), s		55.0		36.2		42.5		60.8
Green Ext Time (p_c), s		0.0		8.2		9.7		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	35.9
HCM 2010 LOS	D

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	1102	34	0	1683	323	632	578	41	49	0	90
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	54	1185	37	0	1810	347	680	622	44	53	0	97
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1817	57	0	1546	287	572	745	53	145	0	686
Arrive On Green	0.51	0.51	0.51	0.00	0.51	0.51	0.43	0.43	0.43	0.43	0.00	0.43
Sat Flow, veh/h	187	3574	112	0	3136	565	1319	1754	124	782	0	1615
Grp Volume(v), veh/h	54	598	624	0	1051	1106	680	0	666	53	0	97
Grp Sat Flow(s),veh/h/ln	187	1805	1880	0	1805	1800	1319	0	1878	782	0	1615
Q Serve(g_s), s	0.0	29.3	29.3	0.0	61.0	61.0	46.6	0.0	37.9	7.8	0.0	4.4
Cycle Q Clear(g_c), s	61.0	29.3	29.3	0.0	61.0	61.0	51.0	0.0	37.9	45.7	0.0	4.4
Prop In Lane	1.00		0.06	0.00		0.31	1.00		0.07	1.00		1.00
Lane Grp Cap(c), veh/h	60	918	956	0	918	915	572	0	798	145	0	686
V/C Ratio(X)	0.90	0.65	0.65	0.00	1.15	1.21	1.19	0.00	0.83	0.36	0.00	0.14
Avail Cap(c_a), veh/h	60	918	956	0	918	915	572	0	798	145	0	686
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	21.7	21.7	0.0	29.5	29.5	39.1	0.0	30.7	51.1	0.0	21.1
Incr Delay (d2), s/veh	90.0	3.6	3.5	0.0	78.3	104.2	101.4	0.0	7.6	1.5	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	15.4	16.0	0.0	50.0	56.5	35.0	0.0	21.3	1.7	0.0	2.0
LnGrp Delay(d),s/veh	150.0	25.3	25.2	0.0	107.8	133.7	140.6	0.0	38.4	52.6	0.0	21.2
LnGrp LOS	F	C	C		F	F	F		D	D		C
Approach Vol, veh/h		1276			2157			1346			150	
Approach Delay, s/veh		30.5			121.1			90.0			32.3	
Approach LOS		C			F			F			C	

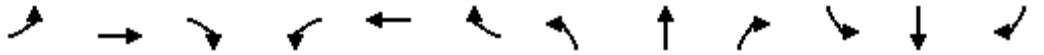
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		65.0		55.0		65.0		55.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		61.0		51.0		61.0		51.0
Max Q Clear Time (g_c+I1), s		63.0		47.7		63.0		53.0
Green Ext Time (p_c), s		0.0		2.4		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	86.4
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/5/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	1102	34	0	1683	323	632	578	41	49	0	90
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	54	1185	37	0	1810	347	680	622	44	53	0	97
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	62	1519	47	0	1863	352	689	892	63	246	0	821
Arrive On Green	0.43	0.43	0.43	0.00	0.43	0.43	0.51	0.51	0.51	0.51	0.00	0.51
Sat Flow, veh/h	187	3574	112	0	4554	829	1319	1754	124	782	0	1615
Grp Volume(v), veh/h	54	598	624	0	1423	734	680	0	666	53	0	97
Grp Sat Flow(s),veh/h/ln	187	1805	1880	0	1729	1754	1319	0	1878	782	0	1615
Q Serve(g_s), s	1.3	34.2	34.2	0.0	48.2	49.7	57.2	0.0	32.4	6.6	0.0	3.8
Cycle Q Clear(g_c), s	51.0	34.2	34.2	0.0	48.2	49.7	61.0	0.0	32.4	39.1	0.0	3.8
Prop In Lane	1.00		0.06	0.00		0.47	1.00		0.07	1.00		1.00
Lane Grp Cap(c), veh/h	62	767	799	0	1470	745	689	0	955	246	0	821
V/C Ratio(X)	0.87	0.78	0.78	0.00	0.97	0.99	0.99	0.00	0.70	0.22	0.00	0.12
Avail Cap(c_a), veh/h	62	767	799	0	1470	745	689	0	955	246	0	821
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	29.7	29.7	0.0	33.7	34.1	33.5	0.0	22.5	37.4	0.0	15.4
Incr Delay (d2), s/veh	81.5	7.7	7.4	0.0	17.0	29.6	30.9	0.0	2.3	0.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	18.6	19.3	0.0	26.4	30.0	28.4	0.0	17.2	1.5	0.0	1.7
LnGrp Delay(d),s/veh	141.4	37.4	37.1	0.0	50.7	63.7	64.4	0.0	24.7	37.8	0.0	15.5
LnGrp LOS	F	D	D		D	E	E		C	D		B
Approach Vol, veh/h		1276			2157			1346			150	
Approach Delay, s/veh		41.7			55.1			44.8			23.4	
Approach LOS		D			E			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		55.0		65.0		55.0		65.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		51.0		61.0		51.0		61.0
Max Q Clear Time (g_c+I1), s		53.0		41.1		51.7		63.0
Green Ext Time (p_c), s		0.0		8.9		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	47.8
HCM 2010 LOS	D

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	1172	34	0	1835	323	632	578	129	49	0	90
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	54	1260	37	0	1973	347	680	622	139	53	0	97
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1850	54	0	1594	272	560	627	140	64	0	673
Arrive On Green	0.52	0.52	0.52	0.00	0.52	0.52	0.42	0.42	0.42	0.42	0.00	0.42
Sat Flow, veh/h	160	3581	105	0	3180	527	1319	1504	336	716	0	1615
Grp Volume(v), veh/h	54	635	662	0	1130	1190	680	0	761	53	0	97
Grp Sat Flow(s),veh/h/ln	160	1805	1881	0	1805	1807	1319	0	1841	716	0	1615
Q Serve(g_s), s	0.0	31.5	31.5	0.0	62.0	62.0	45.5	0.0	49.3	0.7	0.0	4.5
Cycle Q Clear(g_c), s	62.0	31.5	31.5	0.0	62.0	62.0	50.0	0.0	49.3	50.0	0.0	4.5
Prop In Lane	1.00		0.06	0.00		0.29	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	60	933	972	0	933	934	560	0	767	64	0	673
V/C Ratio(X)	0.90	0.68	0.68	0.00	1.21	1.27	1.21	0.00	0.99	0.83	0.00	0.14
Avail Cap(c_a), veh/h	60	933	972	0	933	934	560	0	767	64	0	673
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	21.6	21.6	0.0	29.0	29.0	39.7	0.0	34.8	60.0	0.0	21.7
Incr Delay (d2), s/veh	90.0	4.0	3.9	0.0	105.4	131.8	111.7	0.0	30.5	57.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	16.6	17.2	0.0	57.9	64.8	35.9	0.0	31.4	2.8	0.0	2.0
LnGrp Delay(d),s/veh	150.0	25.6	25.5	0.0	134.4	160.8	151.4	0.0	65.3	117.2	0.0	21.8
LnGrp LOS	F	C	C		F	F	F		E	F		C
Approach Vol, veh/h		1351			2320			1441			150	
Approach Delay, s/veh		30.5			147.9			105.9			55.5	
Approach LOS		C			F			F			E	

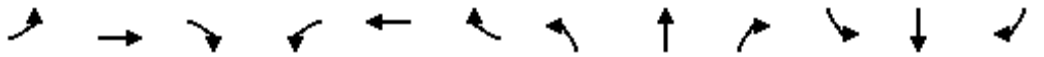
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		66.0		54.0		66.0		54.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		62.0		50.0		62.0		50.0
Max Q Clear Time (g_c+I1), s		64.0		52.0		64.0		52.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	103.7
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/5/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	1172	34	0	1835	323	632	578	129	49	0	90
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	54	1260	37	0	1973	347	680	622	139	53	0	97
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1582	46	0	1967	339	666	740	165	156	0	794
Arrive On Green	0.44	0.44	0.44	0.00	0.44	0.44	0.49	0.49	0.49	0.49	0.00	0.49
Sat Flow, veh/h	160	3581	105	0	4625	768	1319	1504	336	716	0	1615
Grp Volume(v), veh/h	54	635	662	0	1523	797	680	0	761	53	0	97
Grp Sat Flow(s),veh/h/ln	160	1805	1881	0	1729	1764	1319	0	1841	716	0	1615
Q Serve(g_s), s	0.0	36.3	36.4	0.0	52.7	53.0	55.1	0.0	43.0	8.3	0.0	3.9
Cycle Q Clear(g_c), s	53.0	36.3	36.4	0.0	52.7	53.0	59.0	0.0	43.0	51.3	0.0	3.9
Prop In Lane	1.00		0.06	0.00		0.44	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	60	797	831	0	1527	779	666	0	905	156	0	794
V/C Ratio(X)	0.90	0.80	0.80	0.00	1.00	1.02	1.02	0.00	0.84	0.34	0.00	0.12
Avail Cap(c_a), veh/h	60	797	831	0	1527	779	666	0	905	156	0	794
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	28.8	28.9	0.0	33.4	33.5	34.9	0.0	26.4	48.7	0.0	16.5
Incr Delay (d2), s/veh	90.0	8.1	7.8	0.0	22.4	38.1	40.4	0.0	7.2	1.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	19.8	20.6	0.0	29.7	34.0	29.5	0.0	23.6	1.7	0.0	1.7
LnGrp Delay(d),s/veh	150.0	37.0	36.7	0.0	55.8	71.6	75.4	0.0	33.6	50.0	0.0	16.6
LnGrp LOS	F	D	D		E	F	F		C	D		B
Approach Vol, veh/h		1351			2320			1441			150	
Approach Delay, s/veh		41.3			61.2			53.3			28.4	
Approach LOS		D			E			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		57.0		63.0		57.0		63.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		53.0		59.0		53.0		59.0
Max Q Clear Time (g_c+I1), s		55.0		53.3		55.0		61.0
Green Ext Time (p_c), s		0.0		4.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	53.0
HCM 2010 LOS	D

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	128	1742	78	0	2503	401	1034	656	41	75	13	116
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	139	1893	85	0	2721	436	1124	713	45	82	14	126
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1760	78	0	1565	244	543	766	48	96	71	639
Arrive On Green	0.50	0.50	0.50	0.00	0.50	0.50	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	69	3520	157	0	3225	488	1269	1769	112	718	164	1476
Grp Volume(v), veh/h	139	964	1014	0	1538	1619	1124	0	758	82	0	140
Grp Sat Flow(s),veh/h/ln	69	1805	1872	0	1805	1814	1269	0	1880	718	0	1640
Q Serve(g_s), s	0.0	60.0	60.0	0.0	60.0	60.0	45.7	0.0	45.9	6.1	0.0	6.3
Cycle Q Clear(g_c), s	60.0	60.0	60.0	0.0	60.0	60.0	52.0	0.0	45.9	52.0	0.0	6.3
Prop In Lane	1.00		0.08	0.00		0.27	1.00		0.06	1.00		0.90
Lane Grp Cap(c), veh/h	60	903	936	0	903	907	543	0	815	96	0	710
V/C Ratio(X)	2.32	1.07	1.08	0.00	1.70	1.79	2.07	0.00	0.93	0.85	0.00	0.20
Avail Cap(c_a), veh/h	60	903	936	0	903	907	543	0	815	96	0	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	30.0	30.0	0.0	30.0	30.0	39.7	0.0	32.3	58.7	0.0	21.1
Incr Delay (d2), s/veh	641.3	49.7	54.7	0.0	321.6	357.8	488.5	0.0	17.0	47.8	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.7	42.3	45.2	0.0	110.5	120.1	91.6	0.0	27.6	4.0	0.0	2.9
LnGrp Delay(d),s/veh	701.3	79.7	84.7	0.0	351.6	387.8	528.2	0.0	49.3	106.5	0.0	21.2
LnGrp LOS	F	F	F		F	F	F		D	F		C
Approach Vol, veh/h		2117			3157			1882			222	
Approach Delay, s/veh		122.9			370.2			335.3			52.7	
Approach LOS		F			F			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		64.0		56.0		64.0		56.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		60.0		52.0		60.0		52.0
Max Q Clear Time (g_c+I1), s		62.0		54.0		62.0		54.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	280.8
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	128	1742	78	0	2503	401	1034	656	41	75	13	116
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	139	1893	85	0	2721	436	1124	713	45	82	14	126
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1760	78	0	2272	346	543	766	48	96	71	639
Arrive On Green	0.50	0.50	0.50	0.00	0.50	0.50	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	69	3520	157	0	4714	692	1269	1769	112	718	164	1476
Grp Volume(v), veh/h	139	964	1014	0	2037	1120	1124	0	758	82	0	140
Grp Sat Flow(s),veh/h/ln	69	1805	1872	0	1729	1778	1269	0	1880	718	0	1640
Q Serve(g_s), s	0.0	60.0	60.0	0.0	60.0	60.0	45.7	0.0	45.9	6.1	0.0	6.3
Cycle Q Clear(g_c), s	60.0	60.0	60.0	0.0	60.0	60.0	52.0	0.0	45.9	52.0	0.0	6.3
Prop In Lane	1.00		0.08	0.00		0.39	1.00		0.06	1.00		0.90
Lane Grp Cap(c), veh/h	60	903	936	0	1729	889	543	0	815	96	0	710
V/C Ratio(X)	2.32	1.07	1.08	0.00	1.18	1.26	2.07	0.00	0.93	0.85	0.00	0.20
Avail Cap(c_a), veh/h	60	903	936	0	1729	889	543	0	815	96	0	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	30.0	30.0	0.0	30.0	30.0	39.7	0.0	32.3	58.7	0.0	21.1
Incr Delay (d2), s/veh	641.3	49.7	54.7	0.0	86.7	125.9	488.5	0.0	17.0	47.8	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.7	42.3	45.2	0.0	49.1	60.5	91.6	0.0	27.6	4.0	0.0	2.9
LnGrp Delay(d),s/veh	701.3	79.7	84.7	0.0	116.7	155.9	528.2	0.0	49.3	106.5	0.0	21.2
LnGrp LOS	F	F	F		F	F	F		D	F		C
Approach Vol, veh/h		2117			3157			1882			222	
Approach Delay, s/veh		122.9			130.6			335.3			52.7	
Approach LOS		F			F			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		64.0		56.0		64.0		56.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		60.0		52.0		60.0		52.0
Max Q Clear Time (g_c+I1), s		62.0		54.0		62.0		54.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	178.3
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	128	1812	78	0	2655	401	1034	656	129	75	13	116
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	139	1970	85	0	2886	436	1124	713	140	82	14	126
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1764	76	0	1579	233	543	669	131	60	71	639
Arrive On Green	0.50	0.50	0.50	0.00	0.50	0.50	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	58	3527	151	0	3253	465	1269	1543	303	657	164	1476
Grp Volume(v), veh/h	139	1001	1054	0	1618	1704	1124	0	853	82	0	140
Grp Sat Flow(s),veh/h/ln	58	1805	1873	0	1805	1818	1269	0	1847	657	0	1640
Q Serve(g_s), s	0.0	60.0	60.0	0.0	60.0	60.0	45.7	0.0	52.0	0.0	0.0	6.3
Cycle Q Clear(g_c), s	60.0	60.0	60.0	0.0	60.0	60.0	52.0	0.0	52.0	52.0	0.0	6.3
Prop In Lane	1.00		0.08	0.00		0.26	1.00		0.16	1.00		0.90
Lane Grp Cap(c), veh/h	60	903	937	0	903	909	543	0	800	60	0	710
V/C Ratio(X)	2.32	1.11	1.13	0.00	1.79	1.87	2.07	0.00	1.07	1.37	0.00	0.20
Avail Cap(c_a), veh/h	60	903	937	0	903	909	543	0	800	60	0	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	30.0	30.0	0.0	30.0	30.0	39.7	0.0	34.0	60.0	0.0	21.1
Incr Delay (d2), s/veh	641.3	64.6	70.2	0.0	361.4	397.6	488.5	0.0	50.9	241.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	46.0	49.0	0.0	120.4	130.4	91.6	0.0	37.8	6.0	0.0	2.9
LnGrp Delay(d),s/veh	701.3	94.6	100.2	0.0	391.4	427.6	528.2	0.0	84.9	301.4	0.0	21.2
LnGrp LOS	F	F	F		F	F	F		F	F		C
Approach Vol, veh/h		2194			3322			1977			222	
Approach Delay, s/veh		135.7			410.0			337.0			124.7	
Approach LOS		F			F			F			F	

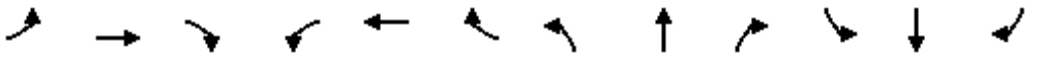
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		64.0		56.0		64.0		56.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		60.0		52.0		60.0		52.0
Max Q Clear Time (g_c+I1), s		62.0		54.0		62.0		54.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	305.1
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	128	1812	78	0	2655	401	1034	656	129	75	13	116
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	139	1970	85	0	2886	436	1124	713	140	82	14	126
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1764	76	0	2291	330	543	669	131	60	71	639
Arrive On Green	0.50	0.50	0.50	0.00	0.50	0.50	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	58	3527	151	0	4752	660	1269	1543	303	657	164	1476
Grp Volume(v), veh/h	139	1001	1054	0	2144	1178	1124	0	853	82	0	140
Grp Sat Flow(s),veh/h/ln	58	1805	1873	0	1729	1784	1269	0	1847	657	0	1640
Q Serve(g_s), s	0.0	60.0	60.0	0.0	60.0	60.0	45.7	0.0	52.0	0.0	0.0	6.3
Cycle Q Clear(g_c), s	60.0	60.0	60.0	0.0	60.0	60.0	52.0	0.0	52.0	52.0	0.0	6.3
Prop In Lane	1.00		0.08	0.00		0.37	1.00		0.16	1.00		0.90
Lane Grp Cap(c), veh/h	60	903	937	0	1729	892	543	0	800	60	0	710
V/C Ratio(X)	2.32	1.11	1.13	0.00	1.24	1.32	2.07	0.00	1.07	1.37	0.00	0.20
Avail Cap(c_a), veh/h	60	903	937	0	1729	892	543	0	800	60	0	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	30.0	30.0	0.0	30.0	30.0	39.7	0.0	34.0	60.0	0.0	21.1
Incr Delay (d2), s/veh	641.3	64.6	70.2	0.0	113.1	152.3	488.5	0.0	50.9	241.4	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.7	46.0	49.0	0.0	55.5	67.0	91.6	0.0	37.8	6.0	0.0	2.9
LnGrp Delay(d),s/veh	701.3	94.6	100.2	0.0	143.1	182.3	528.2	0.0	84.9	301.4	0.0	21.2
LnGrp LOS	F	F	F		F	F	F		F	F		C
Approach Vol, veh/h		2194			3322			1977			222	
Approach Delay, s/veh		135.7			157.0			337.0			124.7	
Approach LOS		F			F			F			F	

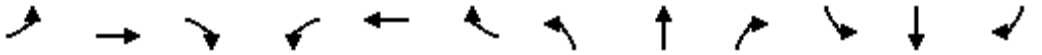
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		64.0		56.0		64.0		56.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		60.0		52.0		60.0		52.0
Max Q Clear Time (g_c+I1), s		62.0		54.0		62.0		54.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	196.1
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	86	1204	88	0	2593	311	708	362	40	132	0	384
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	91	1267	93	0	2729	327	745	381	42	139	0	404
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1535	112	0	1465	172	370	813	90	385	0	781
Arrive On Green	0.45	0.45	0.45	0.00	0.45	0.45	0.48	0.48	0.48	0.48	0.00	0.48
Sat Flow, veh/h	76	3411	250	0	3350	382	997	1682	185	979	0	1615
Grp Volume(v), veh/h	91	669	691	0	1489	1567	745	0	423	139	0	404
Grp Sat Flow(s),veh/h/ln	76	1805	1856	0	1805	1833	997	0	1867	979	0	1615
Q Serve(g_s), s	0.0	38.9	39.1	0.0	54.0	54.0	37.3	0.0	18.2	13.3	0.0	20.7
Cycle Q Clear(g_c), s	54.0	38.9	39.1	0.0	54.0	54.0	58.0	0.0	18.2	31.4	0.0	20.7
Prop In Lane	1.00		0.13	0.00		0.21	1.00		0.10	1.00		1.00
Lane Grp Cap(c), veh/h	60	812	835	0	812	825	370	0	903	385	0	781
V/C Ratio(X)	1.52	0.82	0.83	0.00	1.83	1.90	2.01	0.00	0.47	0.36	0.00	0.52
Avail Cap(c_a), veh/h	60	812	835	0	812	825	370	0	903	385	0	781
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	28.8	28.9	0.0	33.0	33.0	44.4	0.0	20.7	31.2	0.0	21.4
Incr Delay (d2), s/veh	300.6	9.3	9.2	0.0	379.6	409.8	465.7	0.0	0.4	0.6	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.0	21.4	22.1	0.0	112.5	121.1	60.1	0.0	9.4	3.7	0.0	9.3
LnGrp Delay(d),s/veh	360.6	38.1	38.1	0.0	412.6	442.8	510.1	0.0	21.1	31.8	0.0	22.0
LnGrp LOS	F	D	D		F	F	F		C	C		C
Approach Vol, veh/h		1451			3056			1168			543	
Approach Delay, s/veh		58.4			428.1			333.0			24.5	
Approach LOS		E			F			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		58.0		62.0		58.0		62.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		54.0		58.0		54.0		58.0
Max Q Clear Time (g_c+I1), s		56.0		33.4		56.0		60.0
Green Ext Time (p_c), s		0.0		12.8		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	288.7
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	86	1204	88	0	2593	311	708	362	40	132	0	384
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	91	1267	93	0	2729	327	745	381	42	139	0	404
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1336	98	0	1848	213	447	911	100	459	0	875
Arrive On Green	0.39	0.39	0.39	0.00	0.39	0.39	0.54	0.54	0.54	0.54	0.00	0.54
Sat Flow, veh/h	76	3411	250	0	4889	544	997	1682	185	979	0	1615
Grp Volume(v), veh/h	91	669	691	0	1972	1084	745	0	423	139	0	404
Grp Sat Flow(s),veh/h/ln	76	1805	1856	0	1729	1804	997	0	1867	979	0	1615
Q Serve(g_s), s	0.0	43.0	43.3	0.0	47.0	47.0	46.7	0.0	16.1	11.8	0.0	18.3
Cycle Q Clear(g_c), s	47.0	43.0	43.3	0.0	47.0	47.0	65.0	0.0	16.1	27.9	0.0	18.3
Prop In Lane	1.00		0.13	0.00		0.30	1.00		0.10	1.00		1.00
Lane Grp Cap(c), veh/h	60	707	727	0	1354	707	447	0	1011	459	0	875
V/C Ratio(X)	1.52	0.95	0.95	0.00	1.46	1.53	1.66	0.00	0.42	0.30	0.00	0.46
Avail Cap(c_a), veh/h	60	707	727	0	1354	707	447	0	1011	459	0	875
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	35.3	35.4	0.0	36.5	36.5	39.8	0.0	16.3	24.6	0.0	16.8
Incr Delay (d2), s/veh	300.6	23.1	23.2	0.0	209.5	247.3	309.0	0.0	0.3	0.4	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.0	25.9	26.8	0.0	61.8	71.9	53.2	0.0	8.3	3.2	0.0	8.3
LnGrp Delay(d),s/veh	360.6	58.4	58.6	0.0	246.0	283.8	348.8	0.0	16.6	24.9	0.0	17.2
LnGrp LOS	F	E	E		F	F	F		B	C		B
Approach Vol, veh/h		1451			3056			1168			543	
Approach Delay, s/veh		77.4			259.4			228.5			19.2	
Approach LOS		E			F			F			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		51.0		69.0		51.0		69.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		47.0		65.0		47.0		65.0
Max Q Clear Time (g_c+I1), s		49.0		29.9		49.0		67.0
Green Ext Time (p_c), s		0.0		15.2		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	190.1
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	86	1161	88	0	2745	311	708	362	37	132	0	384
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	91	1222	93	0	2889	327	745	381	39	139	0	404
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1559	118	0	1502	167	359	805	82	377	0	767
Arrive On Green	0.46	0.46	0.46	0.00	0.46	0.46	0.47	0.47	0.47	0.47	0.00	0.47
Sat Flow, veh/h	65	3401	258	0	3372	364	997	1696	174	982	0	1615
Grp Volume(v), veh/h	91	648	667	0	1567	1649	745	0	420	139	0	404
Grp Sat Flow(s),veh/h/ln	65	1805	1854	0	1805	1836	997	0	1869	982	0	1615
Q Serve(g_s), s	0.0	36.4	36.5	0.0	55.0	55.0	36.0	0.0	18.3	13.4	0.0	21.0
Cycle Q Clear(g_c), s	55.0	36.4	36.5	0.0	55.0	55.0	57.0	0.0	18.3	31.7	0.0	21.0
Prop In Lane	1.00		0.14	0.00		0.20	1.00		0.09	1.00		1.00
Lane Grp Cap(c), veh/h	60	827	850	0	827	841	359	0	888	377	0	767
V/C Ratio(X)	1.52	0.78	0.79	0.00	1.89	1.96	2.08	0.00	0.47	0.37	0.00	0.53
Avail Cap(c_a), veh/h	60	827	850	0	827	841	359	0	888	377	0	767
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	27.5	27.5	0.0	32.5	32.5	45.0	0.0	21.3	32.0	0.0	22.1
Incr Delay (d2), s/veh	300.6	7.3	7.2	0.0	406.8	436.4	493.7	0.0	0.4	0.6	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.0	19.7	20.2	0.0	120.8	129.8	61.1	0.0	9.4	3.7	0.0	9.5
LnGrp Delay(d),s/veh	360.6	34.8	34.7	0.0	439.3	468.9	538.7	0.0	21.7	32.6	0.0	22.7
LnGrp LOS	F	C	C		F	F	F		C	C		C
Approach Vol, veh/h		1406			3216			1165			543	
Approach Delay, s/veh		55.8			454.5			352.3			25.3	
Approach LOS		E			F			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		59.0		61.0		59.0		61.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		55.0		57.0		55.0		57.0
Max Q Clear Time (g_c+I1), s		57.0		33.7		57.0		59.0
Green Ext Time (p_c), s		0.0		12.4		0.0		0.0

Intersection Summary		
HCM 2010 Ctrl Delay		310.3
HCM 2010 LOS		F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	86	1161	88	0	2745	311	708	362	37	132	0	384
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	91	1222	93	0	2889	327	745	381	39	139	0	404
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	1360	103	0	1899	207	436	904	93	451	0	861
Arrive On Green	0.40	0.40	0.40	0.00	0.40	0.40	0.53	0.53	0.53	0.53	0.00	0.53
Sat Flow, veh/h	65	3401	258	0	4919	519	997	1696	174	982	0	1615
Grp Volume(v), veh/h	91	648	667	0	2076	1140	745	0	420	139	0	404
Grp Sat Flow(s),veh/h/ln	65	1805	1854	0	1729	1808	997	0	1869	982	0	1615
Q Serve(g_s), s	0.0	40.3	40.5	0.0	48.0	48.0	45.3	0.0	16.2	11.9	0.0	18.7
Cycle Q Clear(g_c), s	48.0	40.3	40.5	0.0	48.0	48.0	64.0	0.0	16.2	28.1	0.0	18.7
Prop In Lane	1.00		0.14	0.00		0.29	1.00		0.09	1.00		1.00
Lane Grp Cap(c), veh/h	60	722	742	0	1383	723	436	0	997	451	0	861
V/C Ratio(X)	1.52	0.90	0.90	0.00	1.50	1.58	1.71	0.00	0.42	0.31	0.00	0.47
Avail Cap(c_a), veh/h	60	722	742	0	1383	723	436	0	997	451	0	861
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	33.7	33.7	0.0	36.0	36.0	40.5	0.0	16.9	25.3	0.0	17.4
Incr Delay (d2), s/veh	300.6	16.1	16.1	0.0	229.1	266.1	327.9	0.0	0.3	0.4	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.0	23.2	23.9	0.0	66.9	77.4	54.2	0.0	8.4	3.3	0.0	8.4
LnGrp Delay(d),s/veh	360.6	49.8	49.8	0.0	265.1	302.1	368.4	0.0	17.1	25.7	0.0	17.8
LnGrp LOS	F	D	D		F	F	F		B	C		B
Approach Vol, veh/h		1406			3216			1165			543	
Approach Delay, s/veh		69.9			278.2			241.7			19.8	
Approach LOS		E			F			F			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		52.0		68.0		52.0		68.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		48.0		64.0		48.0		64.0
Max Q Clear Time (g_c+I1), s		50.0		30.1		50.0		66.0
Green Ext Time (p_c), s		0.0		14.9		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	203.1
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : I-215 FREEWAY NB RAMPS
CONDITION : PM PEAK HOUR

INTERSECTION : 2
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	21	3	24	0	24	35	59	59	193	0	193
EB Thru	1260	132	1392	97	1489	850	2242	2339	1748	66	1814
EB Right	197	21	218	0	218	201	419	419	411	0	411
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1729	180	1909	166	2075	718	2627	2793	2849	166	3015
WB Right	89	10	99	0	99	35	134	134	480	0	480
I-215 FREEWAY NB RAMPS											
NB Left	46	5	51	0	51	107	158	158	153	0	153
NB Thru	33	4	37	0	37	35	72	72	151	0	151
NB Right	29	4	33	67	100	0	33	100	25	42	67
SB Left	97	11	108	0	108	57	165	165	265	0	265
SB Thru	0	0	0	0	0	29	29	29	5	0	5
SB Right	54	6	60	0	60	57	117	117	250	0	250
TOTALS	**3555**	**376**	**3931**	**330**	**4261**	**2124**	**6055**	**6385**	**6530**	**274**	**6804**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	2	OF 2

E/W STREET : CACTUS AVE
CONDITION : PM PEAK HOUR

N/S STREET : I-215 FREEWAY NB RAMPS
PHF : 0.98

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	2	0	0	0
0	0	0	0	1	0	0	0	0
0	0	1	0	0	1	0	0	1
0	0	2	0	1	1	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	6	0	0	3	0	0	6	0
1	2	0	0	2	0	0	4	0
0	8	0	0	1	0	1	11	0
0	2	0	0	0	0	1	2	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	6	0	1	2	0	4	3	0
0	4	0	0	3	0	2	3	0
2	5	0	3	1	0	3	3	0
1	6	0	0	1	0	2	3	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
12	0	20	3	7	6	23	388	0	28	292	9
16	0	15	6	8	5	20	438	0	29	262	4
10	0	26	9	8	5	18	428	0	24	276	3
13	0	33	11	4	6	19	334	0	59	310	5

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	0	21	**21**	**21**
EB THRU	40	1140	**1180**	**1260**
EB RIGHT	19	140	**159**	**197**
WB LEFT	0	0	**0**	**0**
WB THRU	47	1588	**1635**	**1729**
WB RIGHT	3	80	**83**	**89**
I-215 FREEWAY NB RAMPS				
NB LEFT	8	22	**30**	**46**
NB THRU	2	27	**29**	**33**
NB RIGHT	0	29	**29**	**29**
SB LEFT	1	94	**95**	**97**
SB THRU	0	0	**0**	**0**
SB RIGHT	1	51	**52**	**54**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : I-215 NB
EAST-WEST STREET : CACTUS AVE
BEGINNING TIME : 04:00PM

MORENO VALLEY
09-30-15

	AUTOS			LARGE 2 AXLE			3 AXLE			4 (+) AXLE			TOTALS
	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	
NORTH LEG													
11	0	19		0	0	0	0	0	0	0	0	0	30
12	0	20		0	0	1	0	0	0	0	0	0	33
16	0	15		0	0	0	0	0	0	1	0	0	32
10	0	26		0	0	0	0	0	0	0	0	0	36
13	0	33		0	0	0	0	0	0	0	0	0	46
23	0	28		0	0	0	0	0	0	1	0	0	52
16	0	21		0	0	0	0	0	0	0	0	0	37
10	0	14		0	0	1	0	0	0	0	0	0	25
111	0	176		0	0	2	0	0	0	2	0	0	291
SOUTH LEG													
3	8	9		0	0	0	0	0	0	0	0	0	20
3	7	6		0	0	0	0	0	2	0	0	0	18
6	8	5		0	0	0	0	1	0	0	0	0	20
9	8	5		0	0	1	0	0	1	0	0	1	25
11	4	6		0	0	2	0	1	1	0	0	0	25
8	16	3		0	1	0	0	0	1	0	0	1	30
8	6	4		0	0	0	0	0	1	0	0	0	19
5	8	1		0	0	0	0	0	1	0	1	0	16
53	65	39		0	1	3	0	2	7	0	1	2	173
EAST LEG													
19	379	0		0	4	0	0	2	0	0	7	0	411
23	388	0		0	6	0	0	3	0	0	6	0	426
20	438	0		1	2	0	0	2	0	0	4	0	467
18	428	0		0	8	0	0	1	0	1	11	0	467
19	334	0		0	2	0	0	0	0	1	2	0	358
11	331	0		0	3	0	0	2	0	0	2	0	349
15	354	0		0	3	0	0	2	0	0	0	0	374
16	308	0		1	5	0	0	2	0	0	7	0	339
141	2960	0		2	33	0	0	14	0	2	39	0	3191
WEST LEG													
28	291	8		1	4	0	0	1	0	2	3	0	338
28	292	9		1	6	0	1	2	0	4	3	0	346
29	262	4		0	4	0	0	3	0	2	3	0	307
24	276	3		2	5	0	3	1	0	3	3	0	320
59	310	5		1	6	0	0	1	0	2	3	0	387
21	294	7		3	1	0	0	0	0	2	10	0	338
13	332	5		0	4	0	1	1	0	6	2	0	364
18	293	10		0	4	0	0	1	0	4	6	0	336
220	2350	51		8	34	0	5	10	0	25	33	0	2736

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 NB

EAST-WEST STREET: CACTUS AVE

TIME: 04:00PM-05:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
50		81	Total
11		19	1st
12		21	2nd
17		15	3rd
10		26	4th

	1st	2nd	3rd	4th	Total
Rt	19	23	21	19	82
Thru	392	403	446	448	1689
Lt					

Total	1st	2nd	3rd	4th	
24	8	9	4	3	Lt
1159	299	303	272	285	Thru
128	31	34	31	32	Rt

	Lt	Thru	Rt
1st	9	8	3
2nd	8	7	3
3rd	5	9	6
4th	8	8	9
Total	30	32	21

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: I-215 NB

EAST-WEST STREET: CACTUS AVE

TIME: 05:00PM-06:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
63		97	Total
13		33	1st
24		28	2nd
16		21	3rd
10		15	4th

	1st	2nd	3rd	4th	Total
Rt	20	11	15	17	63
Thru	338	338	359	322	1357
Lt					

Total	1st	2nd	3rd	4th	
27	5	7	5	10	Lt
1268	320	305	339	304	Thru
130	62	26	20	22	Rt

	Lt	Thru	Rt
1st	9	5	11
2nd	5	17	8
3rd	5	6	8
4th	2	9	5
Total	21	37	32

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/22/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	1260	197	0	1729	89	46	33	29	97	0	54
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	21	1286	201	0	1764	91	47	34	30	99	0	55
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	237	2525	392	0	4071	210	192	119	105	188	0	206
Arrive On Green	0.81	0.81	0.81	0.00	0.81	0.81	0.13	0.13	0.13	0.13	0.00	0.13
Sat Flow, veh/h	252	3133	486	0	5223	260	1370	932	823	1359	0	1615
Grp Volume(v), veh/h	21	737	750	0	1207	648	47	0	64	99	0	55
Grp Sat Flow(s),veh/h/ln	252	1805	1814	0	1729	1854	1370	0	1755	1359	0	1615
Q Serve(g_s), s	3.3	16.1	16.4	0.0	12.5	12.5	3.9	0.0	4.0	8.5	0.0	3.7
Cycle Q Clear(g_c), s	15.8	16.1	16.4	0.0	12.5	12.5	7.5	0.0	4.0	12.5	0.0	3.7
Prop In Lane	1.00		0.27	0.00		0.14	1.00		0.47	1.00		1.00
Lane Grp Cap(c), veh/h	237	1455	1462	0	2787	1494	192	0	224	188	0	206
V/C Ratio(X)	0.09	0.51	0.51	0.00	0.43	0.43	0.24	0.00	0.29	0.53	0.00	0.27
Avail Cap(c_a), veh/h	237	1455	1462	0	2787	1494	303	0	366	298	0	336
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.8	3.8	3.9	0.0	3.5	3.5	50.7	0.0	47.4	53.1	0.0	47.3
Incr Delay (d2), s/veh	0.7	1.3	1.3	0.0	0.5	0.9	0.7	0.0	0.7	2.3	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	8.3	8.6	0.0	6.1	6.7	1.5	0.0	2.0	3.3	0.0	1.7
LnGrp Delay(d),s/veh	6.6	5.1	5.1	0.0	4.0	4.4	51.4	0.0	48.1	55.3	0.0	48.0
LnGrp LOS	A	A	A		A	A	D		D	E		D
Approach Vol, veh/h		1508			1855			111			154	
Approach Delay, s/veh		5.1			4.1			49.5			52.7	
Approach LOS		A			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		100.7		19.3		100.7		19.3
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		87.0		25.0		87.0		25.0
Max Q Clear Time (g_c+I1), s		18.4		14.5		14.5		9.5
Green Ext Time (p_c), s		50.7		0.8		52.8		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	8.0
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	24	1392	218	0	1909	99	51	37	33	108	0	60
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	24	1420	222	0	1948	101	52	38	34	110	0	61
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	171	2494	385	0	2779	143	202	128	114	196	0	223
Arrive On Green	0.80	0.80	0.80	0.00	0.80	0.80	0.14	0.14	0.14	0.14	0.00	0.14
Sat Flow, veh/h	208	3135	484	0	3589	180	1363	926	828	1349	0	1615
Grp Volume(v), veh/h	24	810	832	0	998	1051	52	0	72	110	0	61
Grp Sat Flow(s),veh/h/ln	208	1805	1815	0	1805	1868	1363	0	1754	1349	0	1615
Q Serve(g_s), s	7.3	20.0	20.8	0.0	30.4	31.6	4.3	0.0	4.4	9.6	0.0	4.1
Cycle Q Clear(g_c), s	38.9	20.0	20.8	0.0	30.4	31.6	8.3	0.0	4.4	14.0	0.0	4.1
Prop In Lane	1.00		0.27	0.00		0.10	1.00		0.47	1.00		1.00
Lane Grp Cap(c), veh/h	171	1436	1443	0	1436	1486	202	0	242	196	0	223
V/C Ratio(X)	0.14	0.56	0.58	0.00	0.70	0.71	0.26	0.00	0.30	0.56	0.00	0.27
Avail Cap(c_a), veh/h	171	1436	1443	0	1436	1486	252	0	307	246	0	283
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.8	4.6	4.6	0.0	5.6	5.7	50.1	0.0	46.5	52.8	0.0	46.3
Incr Delay (d2), s/veh	1.7	1.6	1.7	0.0	2.8	2.9	0.7	0.0	0.7	2.5	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	10.3	10.8	0.0	15.8	16.9	1.6	0.0	2.2	3.7	0.0	1.9
LnGrp Delay(d),s/veh	16.5	6.2	6.3	0.0	8.4	8.6	50.7	0.0	47.2	55.3	0.0	47.0
LnGrp LOS	B	A	A		A	A	D		D	E		D
Approach Vol, veh/h		1666			2049			124			171	
Approach Delay, s/veh		6.4			8.5			48.7			52.3	
Approach LOS		A			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		99.4		20.6		99.4		20.6
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		91.0		21.0		91.0		21.0
Max Q Clear Time (g_c+I1), s		40.9		16.0		33.6		10.3
Green Ext Time (p_c), s		44.8		0.6		50.6		0.9

Intersection Summary		
HCM 2010 Ctrl Delay		10.7
HCM 2010 LOS		B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/5/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	24	1392	218	0	1909	99	51	37	33	108	0	60
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	24	1420	222	0	1948	101	52	38	34	110	0	61
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	198	2487	384	0	4007	207	205	130	116	199	0	226
Arrive On Green	0.79	0.79	0.79	0.00	0.79	0.79	0.14	0.14	0.14	0.14	0.00	0.14
Sat Flow, veh/h	208	3135	484	0	5222	261	1363	926	828	1349	0	1615
Grp Volume(v), veh/h	24	810	832	0	1332	717	52	0	72	110	0	61
Grp Sat Flow(s),veh/h/ln	208	1805	1815	0	1729	1854	1363	0	1754	1349	0	1615
Q Serve(g_s), s	5.3	20.2	21.0	0.0	15.5	15.6	4.3	0.0	4.4	9.6	0.0	4.1
Cycle Q Clear(g_c), s	20.9	20.2	21.0	0.0	15.5	15.6	8.3	0.0	4.4	14.0	0.0	4.1
Prop In Lane	1.00		0.27	0.00		0.14	1.00		0.47	1.00		1.00
Lane Grp Cap(c), veh/h	198	1432	1440	0	2743	1471	205	0	246	199	0	226
V/C Ratio(X)	0.12	0.57	0.58	0.00	0.49	0.49	0.25	0.00	0.29	0.55	0.00	0.27
Avail Cap(c_a), veh/h	198	1432	1440	0	2743	1471	298	0	365	291	0	336
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.7	4.6	4.7	0.0	4.2	4.2	49.8	0.0	46.3	52.5	0.0	46.1
Incr Delay (d2), s/veh	1.2	1.6	1.7	0.0	0.6	1.2	0.6	0.0	0.7	2.4	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	10.5	11.1	0.0	7.5	8.2	1.6	0.0	2.2	3.7	0.0	1.9
LnGrp Delay(d),s/veh	8.9	6.3	6.4	0.0	4.8	5.3	50.5	0.0	46.9	54.9	0.0	46.8
LnGrp LOS	A	A	A		A	A	D		D	D		D
Approach Vol, veh/h		1666			2049			124			171	
Approach Delay, s/veh		6.4			5.0			48.4			52.0	
Approach LOS		A			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		99.2		20.8		99.2		20.8
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		87.0		25.0		87.0		25.0
Max Q Clear Time (g_c+I1), s		23.0		16.0		17.6		10.3
Green Ext Time (p_c), s		53.8		0.8		57.6		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	8.9
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	24	1489	218	0	2075	99	51	37	100	108	0	60
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	24	1519	222	0	2117	101	52	38	102	110	0	61
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	124	2380	343	0	2637	125	264	83	223	197	0	294
Arrive On Green	0.75	0.75	0.75	0.00	0.75	0.75	0.18	0.18	0.18	0.18	0.00	0.18
Sat Flow, veh/h	176	3168	456	0	3605	166	1363	457	1227	1269	0	1615
Grp Volume(v), veh/h	24	855	886	0	1081	1137	52	0	140	110	0	61
Grp Sat Flow(s),veh/h/ln	176	1805	1820	0	1805	1871	1363	0	1684	1269	0	1615
Q Serve(g_s), s	12.0	26.9	28.3	0.0	44.5	46.3	4.0	0.0	8.9	10.2	0.0	3.9
Cycle Q Clear(g_c), s	58.3	26.9	28.3	0.0	44.5	46.3	7.9	0.0	8.9	19.1	0.0	3.9
Prop In Lane	1.00		0.25	0.00		0.09	1.00		0.73	1.00		1.00
Lane Grp Cap(c), veh/h	124	1356	1367	0	1356	1405	264	0	307	197	0	294
V/C Ratio(X)	0.19	0.63	0.65	0.00	0.80	0.81	0.20	0.00	0.46	0.56	0.00	0.21
Avail Cap(c_a), veh/h	124	1356	1367	0	1356	1405	312	0	365	241	0	350
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.0	7.1	7.2	0.0	9.2	9.5	45.1	0.0	43.8	52.3	0.0	41.7
Incr Delay (d2), s/veh	3.4	2.2	2.4	0.0	4.9	5.1	0.4	0.0	1.1	2.5	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	13.9	14.9	0.0	23.8	25.4	1.6	0.0	4.3	3.7	0.0	1.8
LnGrp Delay(d),s/veh	31.4	9.3	9.6	0.0	14.2	14.6	45.4	0.0	44.8	54.8	0.0	42.1
LnGrp LOS	C	A	A		B	B	D		D	D		D
Approach Vol, veh/h		1765			2218			192			171	
Approach Delay, s/veh		9.8			14.4			45.0			50.2	
Approach LOS		A			B			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		94.2		25.8		94.2		25.8
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		86.0		26.0		86.0		26.0
Max Q Clear Time (g_c+I1), s		60.3		21.1		48.3		10.9
Green Ext Time (p_c), s		24.8		0.8		35.8		1.5

Intersection Summary		
HCM 2010 Ctrl Delay		15.3
HCM 2010 LOS		B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/5/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	24	1489	218	0	2075	99	51	37	100	108	0	60
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	24	1519	222	0	2117	101	52	38	102	110	0	61
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	162	2386	344	0	3822	182	262	82	221	194	0	291
Arrive On Green	0.75	0.75	0.75	0.00	0.75	0.75	0.18	0.18	0.18	0.18	0.00	0.18
Sat Flow, veh/h	176	3168	456	0	5245	241	1363	457	1227	1269	0	1615
Grp Volume(v), veh/h	24	855	886	0	1440	778	52	0	140	110	0	61
Grp Sat Flow(s),veh/h/ln	176	1805	1820	0	1729	1857	1363	0	1684	1269	0	1615
Q Serve(g_s), s	8.0	26.7	28.1	0.0	21.1	21.4	4.1	0.0	8.9	10.2	0.0	3.9
Cycle Q Clear(g_c), s	29.4	26.7	28.1	0.0	21.1	21.4	7.9	0.0	8.9	19.1	0.0	3.9
Prop In Lane	1.00		0.25	0.00		0.13	1.00		0.73	1.00		1.00
Lane Grp Cap(c), veh/h	162	1360	1370	0	2605	1399	262	0	303	194	0	291
V/C Ratio(X)	0.15	0.63	0.65	0.00	0.55	0.56	0.20	0.00	0.46	0.57	0.00	0.21
Avail Cap(c_a), veh/h	162	1360	1370	0	2605	1399	289	0	337	219	0	323
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.5	6.9	7.1	0.0	6.3	6.3	45.3	0.0	44.0	52.5	0.0	41.9
Incr Delay (d2), s/veh	1.9	2.2	2.4	0.0	0.9	1.6	0.4	0.0	1.1	2.6	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	13.9	14.7	0.0	10.3	11.4	1.6	0.0	4.3	3.7	0.0	1.8
LnGrp Delay(d),s/veh	14.5	9.2	9.5	0.0	7.1	7.9	45.7	0.0	45.1	55.1	0.0	42.3
LnGrp LOS	B	A	A		A	A	D		D	E		D
Approach Vol, veh/h		1765			2218			192			171	
Approach Delay, s/veh		9.4			7.4			45.2			50.5	
Approach LOS		A			A			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		94.4		25.6		94.4		25.6
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		88.0		24.0		88.0		24.0
Max Q Clear Time (g_c+I1), s		31.4		21.1		23.4		10.9
Green Ext Time (p_c), s		51.0		0.5		57.5		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	2242	419	0	2627	134	158	72	33	165	29	117
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	64	2437	455	0	2855	146	172	78	36	179	32	127
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	2316	419	0	2651	134	170	215	99	215	59	233
Arrive On Green	0.76	0.76	0.76	0.00	0.76	0.76	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	81	3054	553	0	3591	177	1247	1231	568	1299	335	1330
Grp Volume(v), veh/h	64	1409	1483	0	1462	1539	172	0	114	179	0	159
Grp Sat Flow(s),veh/h/ln	81	1805	1802	0	1805	1869	1247	0	1800	1299	0	1665
Q Serve(g_s), s	0.0	91.0	91.0	0.0	91.0	91.0	10.5	0.0	6.7	14.3	0.0	10.5
Cycle Q Clear(g_c), s	91.0	91.0	91.0	0.0	91.0	91.0	21.0	0.0	6.7	21.0	0.0	10.5
Prop In Lane	1.00		0.31	0.00		0.09	1.00		0.32	1.00		0.80
Lane Grp Cap(c), veh/h	60	1369	1367	0	1369	1417	170	0	315	215	0	291
V/C Ratio(X)	1.07	1.03	1.09	0.00	1.07	1.09	1.01	0.00	0.36	0.83	0.00	0.55
Avail Cap(c_a), veh/h	60	1369	1367	0	1369	1417	170	0	315	215	0	291
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	14.5	14.5	0.0	14.5	14.5	56.6	0.0	43.6	53.8	0.0	45.1
Incr Delay (d2), s/veh	135.9	32.1	50.9	0.0	44.8	50.9	72.8	0.0	0.7	23.5	0.0	2.1
Initial Q Delay(d3),s/veh	1.9	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	56.3	63.4	0.0	61.1	65.7	9.0	0.0	3.4	7.3	0.0	5.0
LnGrp Delay(d),s/veh	197.8	46.6	65.4	0.0	59.3	65.4	129.5	0.0	44.3	77.3	0.0	47.3
LnGrp LOS	F	F	F		F	F	F		D	E		D
Approach Vol, veh/h		2956			3001			286			338	
Approach Delay, s/veh		59.3			62.4			95.6			63.2	
Approach LOS		E			E			F			E	

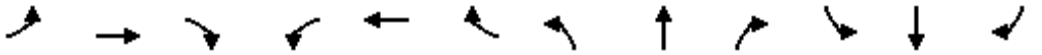
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		95.0		25.0		95.0		25.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		91.0		21.0		91.0		21.0
Max Q Clear Time (g_c+I1), s		93.0		23.0		93.0		23.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	62.5
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	2242	419	0	2627	134	158	72	33	165	29	117
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	64	2437	455	0	2855	146	172	78	36	179	32	127
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	95	2316	419	0	3836	193	170	215	99	215	59	233
Arrive On Green	0.76	0.76	0.76	0.00	0.76	0.76	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	81	3054	553	0	5230	255	1247	1231	568	1299	335	1330
Grp Volume(v), veh/h	64	1409	1483	0	1937	1064	172	0	114	179	0	159
Grp Sat Flow(s),veh/h/ln	81	1805	1802	0	1729	1855	1247	0	1800	1299	0	1665
Q Serve(g_s), s	52.0	91.0	91.0	0.0	36.9	39.0	10.5	0.0	6.7	14.3	0.0	10.5
Cycle Q Clear(g_c), s	91.0	91.0	91.0	0.0	36.9	39.0	21.0	0.0	6.7	21.0	0.0	10.5
Prop In Lane	1.00		0.31	0.00		0.14	1.00		0.32	1.00		0.80
Lane Grp Cap(c), veh/h	95	1369	1367	0	2622	1407	170	0	315	215	0	291
V/C Ratio(X)	0.67	1.03	1.09	0.00	0.74	0.76	1.01	0.00	0.36	0.83	0.00	0.55
Avail Cap(c_a), veh/h	95	1369	1367	0	2622	1407	170	0	315	215	0	291
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.8	14.5	14.5	0.0	8.0	8.2	56.6	0.0	43.6	53.8	0.0	45.1
Incr Delay (d2), s/veh	32.2	32.1	50.9	0.0	1.9	3.8	72.8	0.0	0.7	23.5	0.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	56.3	63.4	0.0	17.9	21.0	9.0	0.0	3.4	7.3	0.0	5.0
LnGrp Delay(d),s/veh	78.1	46.6	65.4	0.0	9.9	12.1	129.5	0.0	44.3	77.3	0.0	47.3
LnGrp LOS	E	F	F		A	B	F		D	E		D
Approach Vol, veh/h		2956			3001			286			338	
Approach Delay, s/veh		56.7			10.6			95.6			63.2	
Approach LOS		E			B			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		95.0		25.0		95.0		25.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		91.0		21.0		91.0		21.0
Max Q Clear Time (g_c+I1), s		93.0		23.0		41.0		23.0
Green Ext Time (p_c), s		0.0		0.0		49.8		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	37.7
HCM 2010 LOS	D

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	2339	419	0	2793	134	158	72	100	165	29	117
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	64	2542	455	0	3036	146	172	78	109	179	32	127
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	2307	401	0	2631	126	181	132	184	162	61	244
Arrive On Green	0.75	0.75	0.75	0.00	0.75	0.75	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	67	3076	535	0	3603	167	1247	719	1004	1215	335	1330
Grp Volume(v), veh/h	64	1460	1537	0	1550	1632	172	0	187	179	0	159
Grp Sat Flow(s),veh/h/ln	67	1805	1806	0	1805	1870	1247	0	1723	1215	0	1665
Q Serve(g_s), s	0.0	90.0	90.0	0.0	90.0	90.0	11.7	0.0	11.9	10.1	0.0	10.3
Cycle Q Clear(g_c), s	90.0	90.0	90.0	0.0	90.0	90.0	22.0	0.0	11.9	22.0	0.0	10.3
Prop In Lane	1.00		0.30	0.00		0.09	1.00		0.58	1.00		0.80
Lane Grp Cap(c), veh/h	60	1354	1354	0	1354	1403	181	0	316	162	0	305
V/C Ratio(X)	1.07	1.08	1.13	0.00	1.15	1.16	0.95	0.00	0.59	1.11	0.00	0.52
Avail Cap(c_a), veh/h	60	1354	1354	0	1354	1403	181	0	316	162	0	305
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	15.0	15.0	0.0	15.0	15.0	55.9	0.0	44.9	56.8	0.0	44.2
Incr Delay (d2), s/veh	135.9	48.6	70.3	0.0	74.5	81.7	52.3	0.0	2.9	101.7	0.0	1.6
Initial Q Delay(d3),s/veh	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	61.9	70.5	0.0	71.6	77.0	8.3	0.0	5.9	9.9	0.0	4.9
LnGrp Delay(d),s/veh	197.8	63.6	85.3	0.0	89.5	96.7	108.2	0.0	47.8	158.5	0.0	45.8
LnGrp LOS	F	F	F		F	F	F		D	F		D
Approach Vol, veh/h		3061			3182			359			338	
Approach Delay, s/veh		77.3			93.2			76.7			105.5	
Approach LOS		E			F			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		94.0		26.0		94.0		26.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		90.0		22.0		90.0		22.0
Max Q Clear Time (g_c+I1), s		92.0		24.0		92.0		24.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	85.9
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1461

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	59	2339	419	0	2793	134	158	72	100	165	29	117
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	64	2542	455	0	3036	146	172	78	109	179	32	127
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	84	2307	401	0	3806	180	181	132	184	162	61	244
Arrive On Green	0.75	0.75	0.75	0.00	0.75	0.75	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	67	3076	535	0	5246	240	1247	719	1004	1215	335	1330
Grp Volume(v), veh/h	64	1460	1537	0	2054	1128	172	0	187	179	0	159
Grp Sat Flow(s),veh/h/ln	67	1805	1806	0	1729	1858	1247	0	1723	1215	0	1665
Q Serve(g_s), s	43.6	90.0	90.0	0.0	43.9	46.4	11.7	0.0	11.9	10.1	0.0	10.3
Cycle Q Clear(g_c), s	90.0	90.0	90.0	0.0	43.9	46.4	22.0	0.0	11.9	22.0	0.0	10.3
Prop In Lane	1.00		0.30	0.00		0.13	1.00		0.58	1.00		0.80
Lane Grp Cap(c), veh/h	84	1354	1354	0	2594	1393	181	0	316	162	0	305
V/C Ratio(X)	0.76	1.08	1.13	0.00	0.79	0.81	0.95	0.00	0.59	1.11	0.00	0.52
Avail Cap(c_a), veh/h	84	1354	1354	0	2594	1393	181	0	316	162	0	305
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.7	15.0	15.0	0.0	9.2	9.6	55.9	0.0	44.9	56.8	0.0	44.2
Incr Delay (d2), s/veh	46.9	48.6	70.3	0.0	2.6	5.2	52.3	0.0	2.9	101.7	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	61.9	70.5	0.0	21.5	25.2	8.3	0.0	5.9	9.9	0.0	4.9
LnGrp Delay(d),s/veh	98.7	63.6	85.3	0.0	11.8	14.7	108.2	0.0	47.8	158.5	0.0	45.8
LnGrp LOS	F	F	F		B	B	F		D	F		D
Approach Vol, veh/h		3061			3182			359			338	
Approach Delay, s/veh		75.3			12.8			76.7			105.5	
Approach LOS		E			B			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		94.0		26.0		94.0		26.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		90.0		22.0		90.0		22.0
Max Q Clear Time (g_c+I1), s		92.0		24.0		48.4		24.0
Green Ext Time (p_c), s		0.0		0.0		41.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	48.2
HCM 2010 LOS	D

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	193	1748	411	0	2849	480	153	151	25	265	5	250
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	203	1840	433	0	2999	505	161	159	26	279	5	263
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	2072	469	0	2200	360	141	359	59	229	7	358
Arrive On Green	0.71	0.71	0.71	0.00	0.71	0.71	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	48	2926	662	0	3201	509	1129	1593	261	1218	30	1589
Grp Volume(v), veh/h	203	1107	1166	0	1707	1797	161	0	185	279	0	268
Grp Sat Flow(s),veh/h/ln	48	1805	1783	0	1805	1810	1129	0	1854	1218	0	1620
Q Serve(g_s), s	0.0	55.6	66.1	0.0	85.0	85.0	8.6	0.0	10.3	16.7	0.0	18.4
Cycle Q Clear(g_c), s	85.0	55.6	66.1	0.0	85.0	85.0	27.0	0.0	10.3	27.0	0.0	18.4
Prop In Lane	1.00		0.37	0.00		0.28	1.00		0.14	1.00		0.98
Lane Grp Cap(c), veh/h	60	1279	1263	0	1279	1282	141	0	417	229	0	364
V/C Ratio(X)	3.38	0.87	0.92	0.00	1.34	1.40	1.15	0.00	0.44	1.22	0.00	0.74
Avail Cap(c_a), veh/h	60	1279	1263	0	1279	1282	141	0	417	229	0	364
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	13.2	14.7	0.0	17.5	17.5	57.5	0.0	40.0	53.8	0.0	43.2
Incr Delay (d2), s/veh	1113.5	8.0	12.5	0.0	156.2	185.4	120.4	0.0	0.7	130.3	0.0	7.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	20.5	29.9	36.5	0.0	97.0	107.7	9.3	0.0	5.4	15.9	0.0	9.0
LnGrp Delay(d),s/veh	1173.5	21.2	27.3	0.0	173.7	202.9	178.0	0.0	40.8	184.2	0.0	50.7
LnGrp LOS	F	C	C		F	F	F		D	F		D
Approach Vol, veh/h		2476			3504			346			547	
Approach Delay, s/veh		118.6			188.7			104.6			118.8	
Approach LOS		F			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		89.0		31.0		89.0		31.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		85.0		27.0		85.0		27.0
Max Q Clear Time (g_c+I1), s		87.0		29.0		87.0		29.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	153.6
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	193	1748	411	0	2849	480	153	151	25	265	5	250
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	203	1840	433	0	2999	505	161	159	26	279	5	263
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	61	2072	469	0	3195	510	141	359	59	229	7	358
Arrive On Green	0.71	0.71	0.71	0.00	0.71	0.71	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	48	2926	662	0	4681	721	1129	1593	261	1218	30	1589
Grp Volume(v), veh/h	203	1107	1166	0	2261	1243	161	0	185	279	0	268
Grp Sat Flow(s),veh/h/ln	48	1805	1783	0	1729	1773	1129	0	1854	1218	0	1620
Q Serve(g_s), s	3.0	55.6	66.1	0.0	66.1	82.0	8.6	0.0	10.3	16.7	0.0	18.4
Cycle Q Clear(g_c), s	85.0	55.6	66.1	0.0	66.1	82.0	27.0	0.0	10.3	27.0	0.0	18.4
Prop In Lane	1.00		0.37	0.00		0.41	1.00		0.14	1.00		0.98
Lane Grp Cap(c), veh/h	61	1279	1263	0	2449	1256	141	0	417	229	0	364
V/C Ratio(X)	3.32	0.87	0.92	0.00	0.92	0.99	1.15	0.00	0.44	1.22	0.00	0.74
Avail Cap(c_a), veh/h	61	1279	1263	0	2449	1256	141	0	417	229	0	364
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	13.2	14.7	0.0	14.8	17.1	57.5	0.0	40.0	53.8	0.0	43.2
Incr Delay (d2), s/veh	1083.2	8.0	12.5	0.0	7.3	23.0	120.4	0.0	0.7	130.3	0.0	7.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	20.4	29.9	36.5	0.0	33.6	47.4	9.3	0.0	5.4	15.9	0.0	9.0
LnGrp Delay(d),s/veh	1143.2	21.2	27.3	0.0	22.0	40.1	178.0	0.0	40.8	184.2	0.0	50.7
LnGrp LOS	F	C	C		C	D	F		D	F		D
Approach Vol, veh/h		2476			3504			346			547	
Approach Delay, s/veh		116.1			28.4			104.6			118.8	
Approach LOS		F			C			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		89.0		31.0		89.0		31.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		85.0		27.0		85.0		27.0
Max Q Clear Time (g_c+I1), s		87.0		29.0		84.0		29.0
Green Ext Time (p_c), s		0.0		0.0		1.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	71.0
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	193	1814	411	0	3015	480	153	151	67	265	5	250
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	203	1909	433	0	3174	505	161	159	71	279	5	263
Adj No. of Lanes	1	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	2014	440	0	2141	332	174	311	139	224	8	397
Arrive On Green	0.68	0.68	0.68	0.00	0.68	0.68	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	40	2947	644	0	3229	486	1129	1246	556	1169	30	1589
Grp Volume(v), veh/h	203	1141	1201	0	1792	1887	161	0	230	279	0	268
Grp Sat Flow(s),veh/h/ln	40	1805	1786	0	1805	1814	1129	0	1802	1169	0	1620
Q Serve(g_s), s	0.0	65.3	78.0	0.0	82.0	82.0	12.2	0.0	13.2	16.8	0.0	17.8
Cycle Q Clear(g_c), s	82.0	65.3	78.0	0.0	82.0	82.0	30.0	0.0	13.2	30.0	0.0	17.8
Prop In Lane	1.00		0.36	0.00		0.27	1.00		0.31	1.00		0.98
Lane Grp Cap(c), veh/h	60	1233	1221	0	1233	1240	174	0	450	224	0	405
V/C Ratio(X)	3.38	0.93	0.98	0.00	1.45	1.52	0.92	0.00	0.51	1.25	0.00	0.66
Avail Cap(c_a), veh/h	60	1233	1221	0	1233	1240	174	0	450	224	0	405
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	16.4	18.4	0.0	19.0	19.0	55.7	0.0	38.7	53.8	0.0	40.4
Incr Delay (d2), s/veh	1113.5	13.0	22.2	0.0	208.5	239.0	46.6	0.0	1.0	142.3	0.0	4.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	20.5	36.5	45.2	0.0	111.5	122.6	7.6	0.0	6.7	16.3	0.0	8.4
LnGrp Delay(d),s/veh	1173.5	29.4	40.5	0.0	227.5	258.0	102.3	0.0	39.7	196.2	0.0	44.4
LnGrp LOS	F	C	D		F	F	F		D	F		D
Approach Vol, veh/h		2545			3679			391			547	
Approach Delay, s/veh		125.9			243.1			65.4			121.8	
Approach LOS		F			F			E			F	

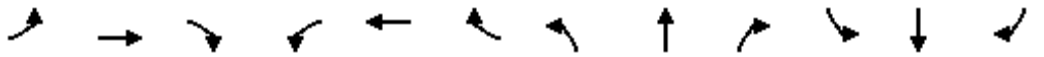
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		86.0		34.0		86.0		34.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		82.0		30.0		82.0		30.0
Max Q Clear Time (g_c+I1), s		84.0		32.0		84.0		32.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	182.5
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

7/21/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	193	1814	411	0	3015	480	153	151	67	265	5	250
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	0	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	203	1909	433	0	3174	505	161	159	71	279	5	263
Adj No. of Lanes	1	2	0	0	3	0	1	1	0	1	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	60	2014	440	0	3108	470	174	311	139	224	8	397
Arrive On Green	0.68	0.68	0.68	0.00	0.68	0.68	0.25	0.25	0.25	0.25	0.25	0.25
Sat Flow, veh/h	40	2947	644	0	4719	688	1129	1246	556	1169	30	1589
Grp Volume(v), veh/h	203	1141	1201	0	2374	1305	161	0	230	279	0	268
Grp Sat Flow(s),veh/h/ln	40	1805	1786	0	1729	1779	1129	0	1802	1169	0	1620
Q Serve(g_s), s	0.0	65.3	78.0	0.0	82.0	82.0	12.2	0.0	13.2	16.8	0.0	17.8
Cycle Q Clear(g_c), s	82.0	65.3	78.0	0.0	82.0	82.0	30.0	0.0	13.2	30.0	0.0	17.8
Prop In Lane	1.00		0.36	0.00		0.39	1.00		0.31	1.00		0.98
Lane Grp Cap(c), veh/h	60	1233	1221	0	2363	1215	174	0	450	224	0	405
V/C Ratio(X)	3.38	0.93	0.98	0.00	1.00	1.07	0.92	0.00	0.51	1.25	0.00	0.66
Avail Cap(c_a), veh/h	60	1233	1221	0	2363	1215	174	0	450	224	0	405
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.0	16.4	18.4	0.0	19.0	19.0	55.7	0.0	38.7	53.8	0.0	40.4
Incr Delay (d2), s/veh	1113.5	13.0	22.2	0.0	19.7	48.0	46.6	0.0	1.0	142.3	0.0	4.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	20.5	36.5	45.2	0.0	44.9	55.7	7.6	0.0	6.7	16.3	0.0	8.4
LnGrp Delay(d),s/veh	1173.5	29.4	40.5	0.0	38.7	67.0	102.3	0.0	39.7	196.2	0.0	44.4
LnGrp LOS	F	C	D		F	F	F		D	F		D
Approach Vol, veh/h		2545			3679			391			547	
Approach Delay, s/veh		125.9			48.7			65.4			121.8	
Approach LOS		F			D			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		86.0		34.0		86.0		34.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		82.0		30.0		82.0		30.0
Max Q Clear Time (g_c+I1), s		84.0		32.0		84.0		32.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	82.6
HCM 2010 LOS	F

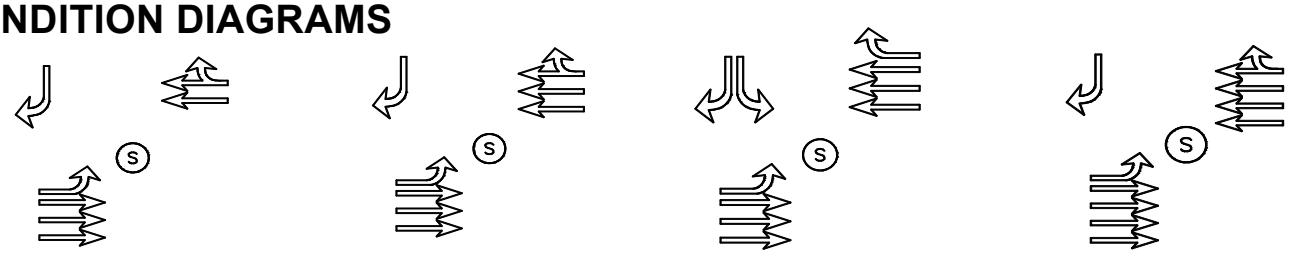
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 3

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



EXISTING GEOMETRICS | **EXISTING MITIGATED GEOMETRICS** | **PROPOSED GEOMETRICS** | **CUMULATIVE GEOMETRICS**

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	32	4	36	286	322	0	36	322	112	82	194
EB Thru	1586	166	1752	-129	1623	1102	2854	2725	2511	-129	2382
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1742	182	1924	105	2029	1237	3161	3266	2874	81	2955
WB Right	7	1	8	0	8	0	8	8	63	0	63
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	8	1	9	47	56	0	9	56	30	35	65
TOTALS	**3375**	**354**	**3729**	**309**	**4038**	**2339**	**6068**	**6377**	**5590**	**69**	**5659**

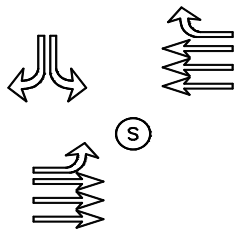
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 3

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	32	4	36	286	322	0	36	322	112	82	194
EB Thru	1586	166	1752	-129	1624	1102	2854	2726	2511	-129	2382
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1742	182	1924	105	2029	1237	3161	3266	2874	81	2955
WB Right	7	1	8	0	8	0	8	8	63	0	63
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	161	161	0	0	161	0	133	133
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	8	1	9	47	56	0	9	56	30	35	65
TOTALS	**3375**	**354**	**3729**	**471**	**4200**	**2339**	**6068**	**6539**	**5590**	**202**	**5792**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	3	OF 3

E/W STREET : CACTUS AVE
CONDITION : AM PEAK HOUR

N/S STREET : COMMERCE CENTER DR
PHF : 0.97

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	5	0	0	0	0	0	4	0
0	3	0	0	2	0	1	6	0
0	3	0	0	2	0	0	7	0
0	10	0	0	2	0	0	7	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	3	0	0	1	0	0	14	0
0	3	0	0	1	0	0	7	0
0	1	1	0	1	0	0	6	0
0	7	0	0	1	0	0	14	2

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	0	0	0	0	0	0	445	0	0	329	5
1	0	0	0	0	0	2	388	0	0	358	2
6	0	0	0	0	0	2	421	0	0	348	10
0	0	0	0	0	0	0	335	0	0	374	6

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	3	23	**26**	**32**
EB THRU	59	1409	**1468**	**1586**
EB RIGHT	0	0	**0**	**0**
WB LEFT	0	0	**0**	**0**
WB THRU	51	1589	**1640**	**1742**
WB RIGHT	1	4	**5**	**7**
COMMERCE CENTER DR				
NB LEFT	0	0	**0**	**0**
NB THRU	0	0	**0**	**0**
NB RIGHT	0	0	**0**	**0**
SB LEFT	0	0	**0**	**0**
SB THRU	0	0	**0**	**0**
SB RIGHT	0	8	**8**	**8**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: COMMERCE CENTER
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 07:15AM

NORTH LEG

TOTAL: 8

Rt	Thru	Lt	
8			Total
1			1st
1			2nd
6			3rd
0			4th

EAST LEG TOTAL: 1,645

	1st	2nd	3rd	4th	Total
Rt	0	3	2	0	5
Thru	454	399	433	354	1640
Lt					

WEST LEG TOTAL: 1,494

Total	1st	2nd	3rd	4th	
26	5	2	11	8	Lt
1468	347	369	356	396	Thru
					Rt

SOUTH LEG

TOTAL: 0

	Lt	Thru	Rt
1st			
2nd			
3rd			
4th			
Total			

PEAK HOUR FACTORS

NORTH LEG = 0.33
SOUTH LEG =
EAST LEG = 0.91
WEST LEG = 0.92

ALL LEGS = 0.97

HOUR TOTAL: 3,147

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : COMMERCE CENTER — MORENO VALLEY
EAST-WEST STREET : CACTUS AVE — 09-30-15
BEGINNING TIME : 07:00AM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
NORTH LEG												
1	0	0	0	0	0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	0	0	0	0	0	1
6	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	2
6	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	17
SOUTH LEG												
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
EAST LEG												
0	411	0	0	5	0	0	4	0	0	8	0	428
0	445	0	0	5	0	0	0	0	0	4	0	454
2	388	0	0	3	0	0	2	0	1	6	0	402
2	421	0	0	3	0	0	2	0	0	7	0	435
0	335	0	0	10	0	0	2	0	0	7	0	354
1	284	0	0	6	0	0	2	0	0	7	0	300
0	237	0	0	5	0	0	5	0	1	14	0	262
0	229	0	0	5	0	0	6	0	0	12	0	252
5	2750	0	0	42	0	0	23	0	2	65	0	2887
WEST LEG												
0	209	1	0	5	0	0	1	0	0	15	1	232
0	329	5	0	3	0	0	1	0	0	14	0	352
0	358	2	0	3	0	0	1	0	0	7	0	371
0	348	10	0	1	1	0	1	0	0	6	0	367
0	374	6	0	7	0	0	1	0	0	14	2	404
0	337	1	0	2	0	0	0	0	0	7	0	347
0	356	3	0	6	0	0	2	0	0	9	0	376
0	259	3	0	7	0	0	2	0	0	14	0	285
0	2570	31	0	34	1	0	9	0	0	86	3	2734

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: COMMERCE CENTER

EAST-WEST STREET: CACTUS AVE

TIME: 07:00AM-08:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
9			Total
1			1st
1			2nd
1			3rd
6			4th

	1st	2nd	3rd	4th	Total
Rt	0	0	3	2	5
Thru	428	454	399	433	1714
Lt					

Total	1st	2nd	3rd	4th	
20	2	5	2	11	Lt
1302	230	347	369	356	Thru
					Rt

	Lt	Thru	Rt
1st			
2nd			
3rd			
4th			
Total			

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: COMMERCE CENTER

EAST-WEST STREET: CACTUS AVE

TIME: 08:00AM-09:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
8			Total
0			1st
2			2nd
6			3rd
0			4th

	1st	2nd	3rd	4th	Total
Rt	0	1	1	0	2
Thru	354	299	261	252	1166
Lt					

Total	1st	2nd	3rd	4th	
15	8	1	3	3	Lt
1397	396	346	373	282	Thru
					Rt

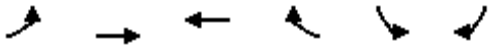
	Lt	Thru	Rt
1st			
2nd			
3rd			
4th			
Total			

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/22/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	32	1586	1742	7	0	8
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	33	1635	1796	7	0	8
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	302	5014	2828	11	0	0
Arrive On Green	0.17	0.97	0.77	0.77	0.00	0.00
Sat Flow, veh/h	1810	5358	3783	14	0	
Grp Volume(v), veh/h	33	1635	879	924	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1897		
Q Serve(g_s), s	1.9	1.8	26.6	26.6		
Cycle Q Clear(g_c), s	1.9	1.8	26.6	26.6		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	302	5014	1384	1455		
V/C Ratio(X)	0.11	0.33	0.63	0.64		
Avail Cap(c_a), veh/h	302	5014	1384	1455		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	42.4	0.1	6.4	6.4		
Incr Delay (d2), s/veh	0.2	0.2	2.2	2.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.9	0.8	13.8	14.5		
LnGrp Delay(d),s/veh	42.6	0.3	8.6	8.5		
LnGrp LOS	D	A	A	A		
Approach Vol, veh/h		1668	1803			
Approach Delay, s/veh		1.1	8.5			
Approach LOS		A	A			

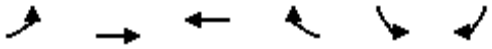
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			24.0	96.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			9.0	92.0		
Max Q Clear Time (g_c+I1), s		3.8			3.9	28.6		
Green Ext Time (p_c), s		17.7			3.9	20.4		

Intersection Summary	
HCM 2010 Ctrl Delay	5.0
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/22/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	32	1586	1742	7	0	8
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	33	1635	1796	7	0	8
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	392	5014	3822	15	0	0
Arrive On Green	0.22	0.97	0.72	0.72	0.00	0.00
Sat Flow, veh/h	1810	5358	5505	21	0	
Grp Volume(v), veh/h	33	1635	1164	639	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1896		
Q Serve(g_s), s	1.7	1.8	17.3	17.3		
Cycle Q Clear(g_c), s	1.7	1.8	17.3	17.3		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	392	5014	2478	1359		
V/C Ratio(X)	0.08	0.33	0.47	0.47		
Avail Cap(c_a), veh/h	392	5014	2478	1359		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	37.5	0.1	7.3	7.3		
Incr Delay (d2), s/veh	0.1	0.2	0.6	1.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.9	0.8	8.3	9.3		
LnGrp Delay(d),s/veh	37.6	0.3	7.9	8.4		
LnGrp LOS	D	A	A	A		
Approach Vol, veh/h		1668	1803			
Approach Delay, s/veh		1.0	8.1			
Approach LOS		A	A			

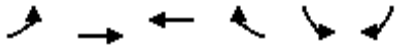
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			30.0	90.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		103.0			13.0	86.0		
Max Q Clear Time (g_c+I1), s		3.8			3.7	19.3		
Green Ext Time (p_c), s		17.7			6.4	18.5		

Intersection Summary	
HCM 2010 Ctrl Delay	4.7
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/29/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	36	1752	1924	8	0	9
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	37	1806	1984	8	0	9
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	271	5014	2889	12	0	0
Arrive On Green	0.15	0.97	0.78	0.78	0.00	0.00
Sat Flow, veh/h	1810	5358	3783	15	0	
Grp Volume(v), veh/h	37	1806	970	1022	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1897		
Q Serve(g_s), s	2.1	2.1	30.2	30.3		
Cycle Q Clear(g_c), s	2.1	2.1	30.2	30.3		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	271	5014	1414	1486		
V/C Ratio(X)	0.14	0.36	0.69	0.69		
Avail Cap(c_a), veh/h	271	5014	1414	1486		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	44.3	0.1	6.1	6.1		
Incr Delay (d2), s/veh	0.2	0.2	2.7	2.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.1	0.9	15.9	16.7		
LnGrp Delay(d),s/veh	44.5	0.3	8.8	8.7		
LnGrp LOS	D	A	A	A		
Approach Vol, veh/h		1843	1992			
Approach Delay, s/veh		1.2	8.8			
Approach LOS		A	A			

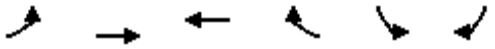
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			22.0	98.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		4.1			4.1	32.3		
Green Ext Time (p_c), s		21.9			2.4	25.8		

Intersection Summary	
HCM 2010 Ctrl Delay	5.1
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	36	1752	1924	8	0	9
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	37	1806	1984	8	0	9
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	362	5014	3911	16	0	0
Arrive On Green	0.20	0.97	0.73	0.73	0.00	0.00
Sat Flow, veh/h	1810	5358	5504	21	0	
Grp Volume(v), veh/h	37	1806	1286	706	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1896		
Q Serve(g_s), s	2.0	2.1	19.0	19.0		
Cycle Q Clear(g_c), s	2.0	2.1	19.0	19.0		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	362	5014	2536	1391		
V/C Ratio(X)	0.10	0.36	0.51	0.51		
Avail Cap(c_a), veh/h	362	5014	2536	1391		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	39.2	0.1	6.8	6.8		
Incr Delay (d2), s/veh	0.1	0.2	0.7	1.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.0	0.9	9.2	10.3		
LnGrp Delay(d),s/veh	39.3	0.3	7.5	8.1		
LnGrp LOS	D	A	A	A		
Approach Vol, veh/h		1843	1992			
Approach Delay, s/veh		1.1	7.7			
Approach LOS		A	A			

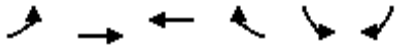
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			28.0	92.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		103.0			11.0	88.0		
Max Q Clear Time (g_c+I1), s		4.1			4.0	21.0		
Green Ext Time (p_c), s		21.9			5.4	22.6		

Intersection Summary	
HCM 2010 Ctrl Delay	4.5
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	1623	2029	8	0	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	332	1673	2092	8	0	58
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	573	5014	2275	9	0	0
Arrive On Green	0.32	0.97	0.62	0.62	0.00	0.00
Sat Flow, veh/h	1810	5358	3783	14	0	
Grp Volume(v), veh/h	332	1673	1023	1077	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1898		
Q Serve(g_s), s	18.4	1.9	60.2	60.4		
Cycle Q Clear(g_c), s	18.4	1.9	60.2	60.4		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	573	5014	1113	1170		
V/C Ratio(X)	0.58	0.33	0.92	0.92		
Avail Cap(c_a), veh/h	573	5014	1113	1170		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	34.3	0.1	20.4	20.4		
Incr Delay (d2), s/veh	1.5	0.2	13.4	13.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	9.5	0.9	33.7	35.6		
LnGrp Delay(d),s/veh	35.8	0.3	33.8	33.4		
LnGrp LOS	D	A	C	C		
Approach Vol, veh/h		2005	2100			
Approach Delay, s/veh		6.2	33.6			
Approach LOS		A	C			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			42.0	78.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			27.0	74.0		
Max Q Clear Time (g_c+I1), s		3.9			20.4	62.4		
Green Ext Time (p_c), s		21.5			5.2	9.4		

Intersection Summary	
HCM 2010 Ctrl Delay	20.2
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	1623	2029	8	0	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	332	1673	2092	8	0	58
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	709	5014	2889	11	0	0
Arrive On Green	0.39	0.97	0.54	0.54	0.00	0.00
Sat Flow, veh/h	1810	5358	5505	20	0	
Grp Volume(v), veh/h	332	1673	1356	744	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1896		
Q Serve(g_s), s	16.4	1.9	35.5	35.5		
Cycle Q Clear(g_c), s	16.4	1.9	35.5	35.5		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	709	5014	1873	1027		
V/C Ratio(X)	0.47	0.33	0.72	0.72		
Avail Cap(c_a), veh/h	709	5014	1873	1027		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	27.2	0.1	20.7	20.7		
Incr Delay (d2), s/veh	0.5	0.2	2.5	4.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.3	0.9	17.4	19.7		
LnGrp Delay(d),s/veh	27.7	0.3	23.2	25.2		
LnGrp LOS	C	A	C	C		
Approach Vol, veh/h		2005	2100			
Approach Delay, s/veh		4.8	23.9			
Approach LOS		A	C			

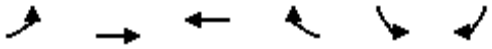
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			51.0	69.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			36.0	65.0		
Max Q Clear Time (g_c+I1), s		3.9			18.4	37.5		
Green Ext Time (p_c), s		21.5			11.2	16.8		

Intersection Summary	
HCM 2010 Ctrl Delay	14.6
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	1623	2029	8	0	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	332	1673	2092	8	0	58
Adj No. of Lanes	1	3	3	1	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	709	5014	2810	875	0	0
Arrive On Green	0.39	0.97	0.54	0.54	0.00	0.00
Sat Flow, veh/h	1810	5358	5358	1615	0	
Grp Volume(v), veh/h	332	1673	2092	8	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615		
Q Serve(g_s), s	16.4	1.9	37.2	0.3		
Cycle Q Clear(g_c), s	16.4	1.9	37.2	0.3		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	709	5014	2810	875		
V/C Ratio(X)	0.47	0.33	0.74	0.01		
Avail Cap(c_a), veh/h	709	5014	2810	875		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	27.2	0.1	21.1	10.9		
Incr Delay (d2), s/veh	0.5	0.2	1.8	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.3	0.9	18.1	0.4		
LnGrp Delay(d),s/veh	27.7	0.3	23.0	10.9		
LnGrp LOS	C	A	C	B		
Approach Vol, veh/h		2005	2100			
Approach Delay, s/veh		4.8	22.9			
Approach LOS		A	C			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			51.0	69.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			36.0	65.0		
Max Q Clear Time (g_c+I1), s		3.9			18.4	39.2		
Green Ext Time (p_c), s		21.5			11.2	16.9		

Intersection Summary	
HCM 2010 Ctrl Delay	14.1
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	1624	2029	8	161	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	332	1674	2092	8	166	58
Adj No. of Lanes	1	3	3	1	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	557	4276	2507	781	197	176
Arrive On Green	0.31	0.82	0.48	0.48	0.11	0.11
Sat Flow, veh/h	1810	5358	5358	1615	1810	1615
Grp Volume(v), veh/h	332	1674	2092	8	166	58
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615	1810	1615
Q Serve(g_s), s	18.7	10.0	41.9	0.2	10.8	4.0
Cycle Q Clear(g_c), s	18.7	10.0	41.9	0.2	10.8	4.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	557	4276	2507	781	197	176
V/C Ratio(X)	0.60	0.39	0.83	0.01	0.84	0.33
Avail Cap(c_a), veh/h	557	4276	2507	781	271	242
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.2	2.7	26.8	7.0	52.4	49.4
Incr Delay (d2), s/veh	1.7	0.3	3.5	0.0	15.5	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.6	4.8	20.8	0.4	6.2	3.7
LnGrp Delay(d),s/veh	37.0	3.0	30.3	7.0	68.0	50.5
LnGrp LOS	D	A	C	A	E	D
Approach Vol, veh/h		2006	2100		224	
Approach Delay, s/veh		8.6	30.2		63.4	
Approach LOS		A	C		E	

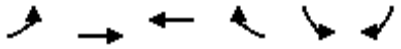
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		102.9		17.1	40.9	62.0		
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		
Max Green Setting (Gmax), s		94.0		18.0	32.0	58.0		
Max Q Clear Time (g_c+I1), s		12.0		12.8	20.7	43.9		
Green Ext Time (p_c), s		21.1		0.3	8.1	10.8		

Intersection Summary	
HCM 2010 Ctrl Delay	21.9
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	36	2854	3161	8	0	9
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	39	3102	3436	9	0	10
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	77	5014	3291	9	0	0
Arrive On Green	0.04	0.97	0.89	0.89	0.00	0.00
Sat Flow, veh/h	1810	5358	3789	10	0	
Grp Volume(v), veh/h	39	3102	1678	1767	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1898		
Q Serve(g_s), s	2.5	6.0	106.9	106.9		
Cycle Q Clear(g_c), s	2.5	6.0	106.9	106.9		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	77	5014	1608	1691		
V/C Ratio(X)	0.51	0.62	1.04	1.04		
Avail Cap(c_a), veh/h	106	5014	1608	1691		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	56.2	0.2	6.5	6.5		
Incr Delay (d2), s/veh	5.1	0.6	34.8	34.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.4	2.6	65.1	68.4		
LnGrp Delay(d),s/veh	61.3	0.7	41.3	41.1		
LnGrp LOS	E	A	F	F		
Approach Vol, veh/h		3141	3445			
Approach Delay, s/veh		1.5	41.2			
Approach LOS		A	D			

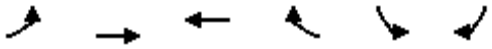
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			9.1	110.9		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		8.0			4.5	108.9		
Green Ext Time (p_c), s		96.2			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	22.3
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	36	2854	3161	8	0	9
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	39	3102	3436	9	0	10
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	77	5014	4759	12	0	0
Arrive On Green	0.04	0.97	0.89	0.89	0.00	0.00
Sat Flow, veh/h	1810	5358	5513	14	0	
Grp Volume(v), veh/h	39	3102	2223	1222	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1898		
Q Serve(g_s), s	2.5	6.0	23.6	23.7		
Cycle Q Clear(g_c), s	2.5	6.0	23.6	23.7		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	77	5014	3081	1691		
V/C Ratio(X)	0.51	0.62	0.72	0.72		
Avail Cap(c_a), veh/h	106	5014	3081	1691		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	56.2	0.2	2.0	2.0		
Incr Delay (d2), s/veh	5.1	0.6	1.5	2.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.4	2.6	11.1	12.8		
LnGrp Delay(d),s/veh	61.3	0.7	3.5	4.7		
LnGrp LOS	E	A	A	A		
Approach Vol, veh/h		3141	3445			
Approach Delay, s/veh		1.5	3.9			
Approach LOS		A	A			

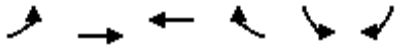
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			9.1	110.9		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		8.0			4.5	25.7		
Green Ext Time (p_c), s		96.2			0.0	67.9		

Intersection Summary	
HCM 2010 Ctrl Delay	2.8
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	2725	3266	8	0	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	350	2962	3550	9	0	61
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	422	5014	2586	7	0	0
Arrive On Green	0.23	0.97	0.70	0.70	0.00	0.00
Sat Flow, veh/h	1810	5358	3789	9	0	
Grp Volume(v), veh/h	350	2962	1734	1825	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1898		
Q Serve(g_s), s	22.1	5.3	84.0	84.0		
Cycle Q Clear(g_c), s	22.1	5.3	84.0	84.0		
Prop In Lane	1.00			0.00		
Lane Grp Cap(c), veh/h	422	5014	1264	1329		
V/C Ratio(X)	0.83	0.59	1.37	1.37		
Avail Cap(c_a), veh/h	422	5014	1264	1329		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	43.7	0.2	18.0	18.0		
Incr Delay (d2), s/veh	12.9	0.5	172.6	172.9		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.5	2.2	101.6	107.0		
LnGrp Delay(d),s/veh	56.7	0.7	190.6	190.9		
LnGrp LOS	E	A	F	F		
Approach Vol, veh/h		3312	3559			
Approach Delay, s/veh		6.6	190.8			
Approach LOS		A	F			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			32.0	88.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			17.0	84.0		
Max Q Clear Time (g_c+I1), s		7.3			24.1	86.0		
Green Ext Time (p_c), s		71.9			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	102.0
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	2725	3266	8	0	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	350	2962	3550	9	0	61
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	528	5014	3428	9	0	0
Arrive On Green	0.29	0.97	0.64	0.64	0.00	0.00
Sat Flow, veh/h	1810	5358	5513	14	0	
Grp Volume(v), veh/h	350	2962	2297	1262	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1898		
Q Serve(g_s), s	20.4	5.3	77.0	77.0		
Cycle Q Clear(g_c), s	20.4	5.3	77.0	77.0		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	528	5014	2219	1218		
V/C Ratio(X)	0.66	0.59	1.04	1.04		
Avail Cap(c_a), veh/h	528	5014	2219	1218		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	37.3	0.2	21.5	21.5		
Incr Delay (d2), s/veh	3.1	0.5	28.9	35.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	10.7	2.2	45.3	52.0		
LnGrp Delay(d),s/veh	40.4	0.7	50.4	57.2		
LnGrp LOS	D	A	F	F		
Approach Vol, veh/h		3312	3559			
Approach Delay, s/veh		4.9	52.8			
Approach LOS		A	D			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			39.0	81.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			24.0	77.0		
Max Q Clear Time (g_c+I1), s		7.3			22.4	79.0		
Green Ext Time (p_c), s		71.9			1.6	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	29.7
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	2725	3266	8	0	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	350	2962	3550	9	0	61
Adj No. of Lanes	1	3	3	1	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	498	5014	3415	1063	0	0
Arrive On Green	0.28	0.97	0.66	0.66	0.00	0.00
Sat Flow, veh/h	1810	5358	5358	1615	0	
Grp Volume(v), veh/h	350	2962	3550	9	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615		
Q Serve(g_s), s	20.9	5.3	79.0	0.2		
Cycle Q Clear(g_c), s	20.9	5.3	79.0	0.2		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	498	5014	3415	1063		
V/C Ratio(X)	0.70	0.59	1.04	0.01		
Avail Cap(c_a), veh/h	498	5014	3415	1063		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	39.1	0.2	20.5	5.7		
Incr Delay (d2), s/veh	4.4	0.5	27.0	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	11.0	2.2	45.8	0.4		
LnGrp Delay(d),s/veh	43.5	0.7	47.5	5.8		
LnGrp LOS	D	A	F	A		
Approach Vol, veh/h		3312	3559			
Approach Delay, s/veh		5.2	47.4			
Approach LOS		A	D			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			37.0	83.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			22.0	79.0		
Max Q Clear Time (g_c+I1), s		7.3			22.9	81.0		
Green Ext Time (p_c), s		71.9			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	27.0
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	322	2725	3266	8	161	56
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	350	2962	3550	9	175	61
Adj No. of Lanes	1	3	3	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	338	4255	3112	969	205	183
Arrive On Green	0.19	0.82	0.60	0.60	0.11	0.11
Sat Flow, veh/h	1810	5358	5358	1615	1810	1615
Grp Volume(v), veh/h	350	2962	3550	9	175	61
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615	1810	1615
Q Serve(g_s), s	22.4	28.7	72.0	0.3	11.4	4.2
Cycle Q Clear(g_c), s	22.4	28.7	72.0	0.3	11.4	4.2
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	338	4255	3112	969	205	183
V/C Ratio(X)	1.03	0.70	1.14	0.01	0.86	0.33
Avail Cap(c_a), veh/h	338	4255	3112	969	241	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.8	4.5	24.0	9.7	52.3	49.0
Incr Delay (d2), s/veh	58.2	1.0	67.7	0.0	22.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.7	13.8	53.5	0.1	6.9	3.9
LnGrp Delay(d),s/veh	107.0	5.5	91.7	9.7	74.3	50.1
LnGrp LOS	F	A	F	A	E	D
Approach Vol, veh/h		3312	3559		236	
Approach Delay, s/veh		16.2	91.5		68.1	
Approach LOS		B	F		E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		102.4		17.6	26.4	76.0		
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		
Max Green Setting (Gmax), s		96.0		16.0	20.0	72.0		
Max Q Clear Time (g_c+I1), s		30.7		13.4	24.4	74.0		
Green Ext Time (p_c), s		52.8		0.2	0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	55.6
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	112	2511	2874	63	0	30
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	118	2643	3025	66	0	32
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	121	5014	3131	68	0	0
Arrive On Green	0.07	0.97	0.87	0.87	0.00	0.00
Sat Flow, veh/h	1810	5358	3708	79	0	
Grp Volume(v), veh/h	118	2643	1506	1585	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1886		
Q Serve(g_s), s	7.8	4.2	80.5	84.3		
Cycle Q Clear(g_c), s	7.8	4.2	80.5	84.3		
Prop In Lane	1.00			0.04		
Lane Grp Cap(c), veh/h	121	5014	1564	1635		
V/C Ratio(X)	0.98	0.53	0.96	0.97		
Avail Cap(c_a), veh/h	121	5014	1564	1635		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	55.9	0.1	6.4	6.7		
Incr Delay (d2), s/veh	74.9	0.4	15.4	16.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.4	1.9	44.8	48.7		
LnGrp Delay(d),s/veh	130.8	0.5	21.9	22.8		
LnGrp LOS	F	A	C	C		
Approach Vol, veh/h		2761	3091			
Approach Delay, s/veh		6.1	22.4			
Approach LOS		A	C			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			12.0	108.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			8.0	93.0		
Max Q Clear Time (g_c+I1), s		6.2			9.8	86.3		
Green Ext Time (p_c), s		98.1			0.0	6.7		

Intersection Summary	
HCM 2010 Ctrl Delay	14.7
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	112	2511	2874	63	0	30
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	118	2643	3025	66	0	32
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	145	5014	4458	97	0	0
Arrive On Green	0.08	0.97	0.85	0.85	0.00	0.00
Sat Flow, veh/h	1810	5358	5396	113	0	
Grp Volume(v), veh/h	118	2643	1995	1096	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1880		
Q Serve(g_s), s	7.7	4.2	24.0	24.6		
Cycle Q Clear(g_c), s	7.7	4.2	24.0	24.6		
Prop In Lane	1.00			0.06		
Lane Grp Cap(c), veh/h	145	5014	2950	1604		
V/C Ratio(X)	0.81	0.53	0.68	0.68		
Avail Cap(c_a), veh/h	226	5014	2950	1604		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	54.3	0.1	3.1	3.1		
Incr Delay (d2), s/veh	11.9	0.4	1.3	2.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	4.3	1.9	11.6	13.5		
LnGrp Delay(d),s/veh	66.2	0.5	4.3	5.5		
LnGrp LOS	E	A	A	A		
Approach Vol, veh/h		2761	3091			
Approach Delay, s/veh		3.3	4.7			
Approach LOS		A	A			

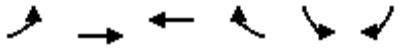
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			13.6	106.4		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			15.0	86.0		
Max Q Clear Time (g_c+I1), s		6.2			9.7	26.6		
Green Ext Time (p_c), s		97.6			0.1	58.9		

Intersection Summary	
HCM 2010 Ctrl Delay	4.1
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	198	2375	2953	63	0	64
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	208	2500	3108	66	0	67
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	332	5014	2711	57	0	0
Arrive On Green	0.18	0.97	0.75	0.75	0.00	0.00
Sat Flow, veh/h	1810	5358	3710	76	0	
Grp Volume(v), veh/h	208	2500	1546	1628	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1887		
Q Serve(g_s), s	12.7	3.7	90.0	90.0		
Cycle Q Clear(g_c), s	12.7	3.7	90.0	90.0		
Prop In Lane	1.00			0.04		
Lane Grp Cap(c), veh/h	332	5014	1354	1415		
V/C Ratio(X)	0.63	0.50	1.14	1.15		
Avail Cap(c_a), veh/h	332	5014	1354	1415		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	45.2	0.1	15.0	15.0		
Incr Delay (d2), s/veh	3.7	0.4	73.3	76.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.7	1.6	71.2	76.0		
LnGrp Delay(d),s/veh	48.9	0.5	88.3	91.3		
LnGrp LOS	D	A	F	F		
Approach Vol, veh/h		2708	3174			
Approach Delay, s/veh		4.2	89.9			
Approach LOS		A	F			

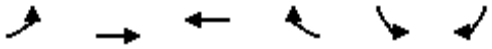
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			26.0	94.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			11.0	90.0		
Max Q Clear Time (g_c+I1), s		5.7			14.7	92.0		
Green Ext Time (p_c), s		50.2			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	50.4
HCM 2010 LOS	D

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	198	2375	2953	63	0	64
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	208	2500	3108	66	0	67
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	467	5014	3529	74	0	0
Arrive On Green	0.26	0.97	0.68	0.68	0.00	0.00
Sat Flow, veh/h	1810	5358	5399	110	0	
Grp Volume(v), veh/h	208	2500	2048	1126	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1881		
Q Serve(g_s), s	11.6	3.7	56.7	58.1		
Cycle Q Clear(g_c), s	11.6	3.7	56.7	58.1		
Prop In Lane	1.00			0.06		
Lane Grp Cap(c), veh/h	467	5014	2334	1269		
V/C Ratio(X)	0.44	0.50	0.88	0.89		
Avail Cap(c_a), veh/h	467	5014	2334	1269		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	37.3	0.1	15.5	15.8		
Incr Delay (d2), s/veh	0.7	0.4	5.1	9.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.9	1.6	28.4	33.0		
LnGrp Delay(d),s/veh	38.0	0.5	20.6	25.2		
LnGrp LOS	D	A	C	C		
Approach Vol, veh/h		2708	3174			
Approach Delay, s/veh		3.4	22.2			
Approach LOS		A	C			

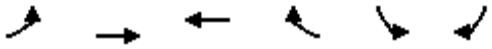
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			35.0	85.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			20.0	81.0		
Max Q Clear Time (g_c+I1), s		5.7			13.6	60.1		
Green Ext Time (p_c), s		50.2			6.0	19.2		

Intersection Summary	
HCM 2010 Ctrl Delay	13.5
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	198	2375	2953	63	0	64
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	208	2500	3108	66	0	67
Adj No. of Lanes	1	3	3	1	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	467	5014	3501	1090	0	0
Arrive On Green	0.26	0.97	0.68	0.68	0.00	0.00
Sat Flow, veh/h	1810	5358	5358	1615	0	
Grp Volume(v), veh/h	208	2500	3108	66	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615		
Q Serve(g_s), s	11.6	3.7	58.3	1.5		
Cycle Q Clear(g_c), s	11.6	3.7	58.3	1.5		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	467	5014	3501	1090		
V/C Ratio(X)	0.44	0.50	0.89	0.06		
Avail Cap(c_a), veh/h	467	5014	3501	1090		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	37.3	0.1	15.8	5.3		
Incr Delay (d2), s/veh	0.7	0.4	3.8	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.9	1.6	28.6	2.9		
LnGrp Delay(d),s/veh	38.0	0.5	19.6	5.4		
LnGrp LOS	D	A	B	A		
Approach Vol, veh/h		2708	3174			
Approach Delay, s/veh		3.4	19.3			
Approach LOS		A	B			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			35.0	85.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			20.0	81.0		
Max Q Clear Time (g_c+I1), s		5.7			13.6	60.3		
Green Ext Time (p_c), s		50.2			6.0	19.3		

Intersection Summary	
HCM 2010 Ctrl Delay	12.0
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	194	2382	2953	63	133	65
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	204	2507	3108	66	140	68
Adj No. of Lanes	1	3	3	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	311	4350	3285	1023	171	153
Arrive On Green	0.17	0.84	0.63	0.63	0.09	0.09
Sat Flow, veh/h	1810	5358	5358	1615	1810	1615
Grp Volume(v), veh/h	204	2507	3108	66	140	68
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615	1810	1615
Q Serve(g_s), s	12.6	18.1	65.8	1.1	9.1	4.8
Cycle Q Clear(g_c), s	12.6	18.1	65.8	1.1	9.1	4.8
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	311	4350	3285	1023	171	153
V/C Ratio(X)	0.66	0.58	0.95	0.06	0.82	0.44
Avail Cap(c_a), veh/h	311	4350	3285	1023	241	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.4	3.0	20.1	2.6	53.3	51.3
Incr Delay (d2), s/veh	4.9	0.6	7.4	0.1	13.8	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	8.6	33.3	2.7	5.2	4.4
LnGrp Delay(d),s/veh	51.3	3.6	27.5	2.8	67.1	53.4
LnGrp LOS	D	A	C	A	E	D
Approach Vol, veh/h		2711	3174		208	
Approach Delay, s/veh		7.2	27.0		62.6	
Approach LOS		A	C		E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		104.6		15.4	24.6	80.0		
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		
Max Green Setting (Gmax), s		96.0		16.0	16.0	76.0		
Max Q Clear Time (g_c+I1), s		20.1		11.1	14.6	67.8		
Green Ext Time (p_c), s		44.2		0.3	1.3	8.0		

Intersection Summary	
HCM 2010 Ctrl Delay	19.4
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 3

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	11	2	13	284	297	0	13	297	47	228	275
EB Thru	1633	170	1803	-120	1683	1277	3080	2960	2790	-120	2670
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1849	193	2042	115	2157	1244	3286	3401	3222	8	3230
WB Right	5	1	6	0	6	0	6	6	52	0	52
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	41	5	46	51	97	0	46	97	107	-2	105
TOTALS	**3539**	**371**	**3910**	**330**	**4240**	**2521**	**6431**	**6761**	**6218**	**114**	**6332**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 3

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	11	2	13	284	297	0	13	297	47	228	275
EB Thru	1633	170	1803	-120	1683	1277	3080	2960	2790	-120	2670
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1849	193	2042	115	2157	1244	3286	3401	3222	8	3230
WB Right	5	1	6	0	6	0	6	6	52	0	52
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	151	151	0	0	151	0	27	27
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	41	5	46	51	97	0	46	97	107	-2	105
TOTALS	**3539**	**371**	**3910**	**481**	**4391**	**2521**	**6431**	**6912**	**6218**	**141**	**6359**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET	OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	3	OF 3

E/W STREET : CACTUS AVE
CONDITION : PM PEAK HOUR

N/S STREET : COMMERCE CENTER DR
PHF : 0.97

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	4	0	0	2	0	0	7	0
0	6	0	0	3	0	0	6	0
0	3	0	0	2	0	0	4	0
0	8	0	0	1	0	1	11	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	4	0	0	1	0	0	4	0
0	6	1	0	2	0	0	3	0
0	4	0	0	3	0	0	3	0
0	5	0	0	2	0	0	5	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
9	0	0	0	0	0	1	386	0	0	378	3
10	0	0	0	0	0	1	418	0	0	390	4
9	0	0	0	0	0	0	442	0	0	358	0
13	0	0	0	0	0	0	432	0	0	381	1

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	1	8	**9**	**11**
EB THRU	42	1507	**1549**	**1633**
EB RIGHT	0	0	**0**	**0**
WB LEFT	0	0	**0**	**0**
WB THRU	57	1678	**1735**	**1849**
WB RIGHT	1	2	**3**	**5**
COMMERCE CENTER DR				
NB LEFT	0	0	**0**	**0**
NB THRU	0	0	**0**	**0**
NB RIGHT	0	0	**0**	**0**
SB LEFT	0	0	**0**	**0**
SB THRU	0	0	**0**	**0**
SB RIGHT	0	41	**41**	**41**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: COMMERCE CENTER
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 04:00PM

NORTH LEG

TOTAL: 41

Rt	Thru	Lt	
41			Total
9			1st
10			2nd
9			3rd
13			4th

EAST LEG TOTAL: 1,738

	1st	2nd	3rd	4th	Total
Rt	1	1	0	1	3
Thru	399	433	451	452	1735
Lt					

WEST LEG TOTAL: 1,558

Total	1st	2nd	3rd	4th	
9	3	5	0	1	Lt
1549	387	401	368	393	Thru
					Rt

SOUTH LEG

TOTAL: 0

	Lt	Thru	Rt
1st			
2nd			
3rd			
4th			
Total			

PEAK HOUR PACTORS

NORTH LEG = 0.79
SOUTH LEG =
EAST LEG = 0.96
WEST LEG = 0.96

ALL LEGS = 0.97

HOUR TOTAL: 3,337

Prepared by NEWPORT TRAPPIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : COMMERCE CENTER — MORENO VALLEY
EAST-WEST STREET : CACTUS AVE — 09-30-15
BEGINNING TIME : 04:00PM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4 (+) AXLE RT	4 (+) AXLE THRU	4 (+) AXLE LT	TOTALS
NORTH LEG												
9	0	0	0	0	0	0	0	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	0	0	10
9	0	0	0	0	0	0	0	0	0	0	0	9
13	0	0	0	0	0	0	0	0	0	0	0	13
9	0	0	0	0	0	0	0	0	0	0	0	9
9	0	0	0	0	0	0	0	0	0	0	0	9
5	0	0	0	0	0	0	0	0	0	0	0	5
6	0	0	0	0	0	0	0	0	0	0	0	6
70	0	0	0	0	0	0	0	0	0	0	0	70
SOUTH LEG												
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
EAST LEG												
1	386	0	0	4	0	0	2	0	0	7	0	400
1	418	0	0	6	0	0	3	0	0	6	0	434
0	442	0	0	3	0	0	2	0	0	4	0	451
0	432	0	0	8	0	0	1	0	1	11	0	453
0	337	0	0	2	0	0	0	0	0	3	0	342
0	334	0	0	3	0	0	2	0	0	1	0	340
1	373	0	0	3	0	0	3	0	0	3	0	383
5	315	0	0	7	0	0	1	0	0	5	0	333
8	3037	0	0	36	0	0	14	0	1	40	0	3136
WEST LEG												
0	378	3	0	4	0	0	1	0	0	4	0	390
0	390	4	0	6	1	0	2	0	0	3	0	406
0	358	0	0	4	0	0	3	0	0	3	0	368
0	381	1	0	5	0	0	2	0	0	5	0	394
0	416	2	0	8	0	0	1	0	0	3	0	430
0	380	4	0	1	0	0	0	0	0	9	1	395
0	419	0	0	3	1	0	1	0	0	3	0	427
0	344	4	0	7	0	0	1	0	0	6	0	362
0	3066	18	0	38	2	0	11	0	0	36	1	3172

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: COMMERCE CENTER

EAST-WEST STREET: CACTUS AVE

TIME: 04:00PM-05:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
41			Total
9			1st
10			2nd
9			3rd
13			4th

	1st	2nd	3rd	4th	Total
Rt	1	1	0	1	3
Thru	399	433	451	452	1735
Lt					

Total	1st	2nd	3rd	4th	
9	3	5	0	1	Lt
1549	387	401	368	393	Thru
					Rt

	Lt	Thru	Rt
1st			
2nd			
3rd			
4th			
Total			

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: COMMERCE CENTER

EAST-WEST STREET: CACTUS AVE

TIME: 05:00PM-06:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
29			Total
9			1st
9			2nd
5			3rd
6			4th

	1st	2nd	3rd	4th	Total
Rt	0	0	1	5	6
Thru	342	340	382	328	1392
Lt					

Total	1st	2nd	3rd	4th	
12	2	5	1	4	Lt
1602	428	390	426	358	Thru
					Rt

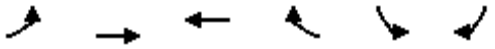
	Lt	Thru	Rt
1st			
2nd			
3rd			
4th			
Total			

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/22/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	11	1633	1849	5	0	41
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	11	1684	1906	5	0	42
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	32	5014	3381	9	0	0
Arrive On Green	0.02	0.97	0.92	0.92	0.00	0.00
Sat Flow, veh/h	1810	5358	3789	10	0	
Grp Volume(v), veh/h	11	1684	931	980	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1898		
Q Serve(g_s), s	0.7	1.9	10.8	10.8		
Cycle Q Clear(g_c), s	0.7	1.9	10.8	10.8		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	32	5014	1652	1738		
V/C Ratio(X)	0.34	0.34	0.56	0.56		
Avail Cap(c_a), veh/h	106	5014	1652	1738		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	58.2	0.1	0.9	0.9		
Incr Delay (d2), s/veh	6.0	0.2	1.4	1.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	0.9	5.8	6.1		
LnGrp Delay(d),s/veh	64.3	0.3	2.3	2.2		
LnGrp LOS	E	A	A	A		
Approach Vol, veh/h		1695	1911			
Approach Delay, s/veh		0.7	2.2			
Approach LOS		A	A			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			6.1	113.9		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		3.9			2.7	12.8		
Green Ext Time (p_c), s		75.6			0.0	64.0		

Intersection Summary	
HCM 2010 Ctrl Delay	1.5
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/22/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	11	1633	1849	5	0	41
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	11	1684	1906	5	0	42
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	32	5014	4890	13	0	0
Arrive On Green	0.02	0.97	0.92	0.92	0.00	0.00
Sat Flow, veh/h	1810	5358	5513	14	0	
Grp Volume(v), veh/h	11	1684	1234	677	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1898		
Q Serve(g_s), s	0.7	1.9	5.6	5.6		
Cycle Q Clear(g_c), s	0.7	1.9	5.6	5.6		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	32	5014	3166	1737		
V/C Ratio(X)	0.34	0.34	0.39	0.39		
Avail Cap(c_a), veh/h	136	5014	3166	1737		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	58.2	0.1	0.7	0.7		
Incr Delay (d2), s/veh	6.0	0.2	0.4	0.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	0.9	2.7	3.1		
LnGrp Delay(d),s/veh	64.3	0.3	1.0	1.3		
LnGrp LOS	E	A	A	A		
Approach Vol, veh/h		1695	1911			
Approach Delay, s/veh		0.7	1.1			
Approach LOS		A	A			

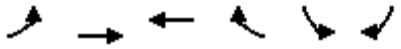
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			6.1	113.9		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		101.0			9.0	88.0		
Max Q Clear Time (g_c+I1), s		3.9			2.7	7.6		
Green Ext Time (p_c), s		70.2			0.0	61.2		

Intersection Summary	
HCM 2010 Ctrl Delay	0.9
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/29/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	13	1803	2042	6	0	46
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	13	1859	2105	6	0	47
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	37	5014	3371	10	0	0
Arrive On Green	0.02	0.97	0.91	0.91	0.00	0.00
Sat Flow, veh/h	1810	5358	3788	11	0	
Grp Volume(v), veh/h	13	1859	1028	1083	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1898		
Q Serve(g_s), s	0.9	2.2	13.9	13.9		
Cycle Q Clear(g_c), s	0.9	2.2	13.9	13.9		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	37	5014	1648	1733		
V/C Ratio(X)	0.35	0.37	0.62	0.62		
Avail Cap(c_a), veh/h	106	5014	1648	1733		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	58.0	0.1	1.1	1.1		
Incr Delay (d2), s/veh	5.5	0.2	1.8	1.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.5	1.0	7.4	7.7		
LnGrp Delay(d),s/veh	63.5	0.3	2.9	2.8		
LnGrp LOS	E	A	A	A		
Approach Vol, veh/h		1872	2111			
Approach Delay, s/veh		0.8	2.8			
Approach LOS		A	A			

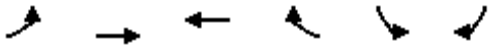
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			6.5	113.5		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		4.2			2.9	15.9		
Green Ext Time (p_c), s		85.6			0.0	68.7		

Intersection Summary	
HCM 2010 Ctrl Delay	1.8
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	13	1803	2042	6	0	46
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	13	1859	2105	6	0	47
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	37	5014	4875	14	0	0
Arrive On Green	0.02	0.97	0.91	0.91	0.00	0.00
Sat Flow, veh/h	1810	5358	5511	15	0	
Grp Volume(v), veh/h	13	1859	1363	748	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1897		
Q Serve(g_s), s	0.9	2.2	6.8	6.8		
Cycle Q Clear(g_c), s	0.9	2.2	6.8	6.8		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	37	5014	3157	1732		
V/C Ratio(X)	0.35	0.37	0.43	0.43		
Avail Cap(c_a), veh/h	136	5014	3157	1732		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	58.0	0.1	0.8	0.8		
Incr Delay (d2), s/veh	5.5	0.2	0.4	0.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.5	1.0	3.2	3.7		
LnGrp Delay(d),s/veh	63.5	0.3	1.2	1.5		
LnGrp LOS	E	A	A	A		
Approach Vol, veh/h		1872	2111			
Approach Delay, s/veh		0.8	1.3			
Approach LOS		A	A			

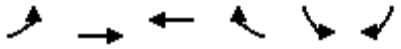
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			6.5	113.5		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		101.0			9.0	88.0		
Max Q Clear Time (g_c+I1), s		4.2			2.9	8.8		
Green Ext Time (p_c), s		79.2			0.0	67.1		

Intersection Summary	
HCM 2010 Ctrl Delay	1.0
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	1683	2157	6	0	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	306	1735	2224	6	0	100
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	513	5014	2401	6	0	0
Arrive On Green	0.28	0.97	0.65	0.65	0.00	0.00
Sat Flow, veh/h	1810	5358	3788	10	0	
Grp Volume(v), veh/h	306	1735	1086	1144	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1898		
Q Serve(g_s), s	17.5	2.0	63.5	63.6		
Cycle Q Clear(g_c), s	17.5	2.0	63.5	63.6		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	513	5014	1173	1234		
V/C Ratio(X)	0.60	0.35	0.93	0.93		
Avail Cap(c_a), veh/h	513	5014	1173	1234		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	37.1	0.1	18.5	18.5		
Incr Delay (d2), s/veh	1.9	0.2	13.6	13.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	9.0	0.9	35.5	37.6		
LnGrp Delay(d),s/veh	39.0	0.3	32.1	31.7		
LnGrp LOS	D	A	C	C		
Approach Vol, veh/h		2041	2230			
Approach Delay, s/veh		6.1	31.9			
Approach LOS		A	C			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			38.0	82.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			23.0	78.0		
Max Q Clear Time (g_c+I1), s		4.0			19.5	65.6		
Green Ext Time (p_c), s		22.9			3.0	10.4		

Intersection Summary	
HCM 2010 Ctrl Delay	19.6
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	1683	2157	6	0	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	306	1735	2224	6	0	100
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	663	5014	3027	8	0	0
Arrive On Green	0.37	0.97	0.57	0.57	0.00	0.00
Sat Flow, veh/h	1810	5358	5512	14	0	
Grp Volume(v), veh/h	306	1735	1440	790	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1897		
Q Serve(g_s), s	15.5	2.0	37.1	37.1		
Cycle Q Clear(g_c), s	15.5	2.0	37.1	37.1		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	663	5014	1960	1075		
V/C Ratio(X)	0.46	0.35	0.73	0.73		
Avail Cap(c_a), veh/h	663	5014	1960	1075		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	29.0	0.1	19.3	19.3		
Incr Delay (d2), s/veh	0.5	0.2	2.5	4.5		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	7.8	0.9	18.3	20.7		
LnGrp Delay(d),s/veh	29.5	0.3	21.8	23.8		
LnGrp LOS	C	A	C	C		
Approach Vol, veh/h		2041	2230			
Approach Delay, s/veh		4.7	22.5			
Approach LOS		A	C			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			48.0	72.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			33.0	68.0		
Max Q Clear Time (g_c+I1), s		4.0			17.5	39.1		
Green Ext Time (p_c), s		22.9			10.5	18.6		

Intersection Summary	
HCM 2010 Ctrl Delay	14.0
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	1683	2157	6	0	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	306	1735	2224	6	0	100
Adj No. of Lanes	1	3	3	1	0	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	648	5014	2983	929	0	0
Arrive On Green	0.36	0.97	0.57	0.57	0.00	0.00
Sat Flow, veh/h	1810	5358	5358	1615	0	
Grp Volume(v), veh/h	306	1735	2224	6	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615		
Q Serve(g_s), s	15.7	2.0	38.3	0.2		
Cycle Q Clear(g_c), s	15.7	2.0	38.3	0.2		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	648	5014	2983	929		
V/C Ratio(X)	0.47	0.35	0.75	0.01		
Avail Cap(c_a), veh/h	648	5014	2983	929		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	29.7	0.1	19.0	9.2		
Incr Delay (d2), s/veh	0.5	0.2	1.7	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	7.9	0.9	18.6	0.3		
LnGrp Delay(d),s/veh	30.3	0.3	20.7	9.3		
LnGrp LOS	C	A	C	A		
Approach Vol, veh/h		2041	2230			
Approach Delay, s/veh		4.8	20.7			
Approach LOS		A	C			

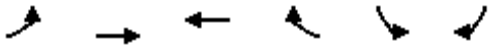
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			47.0	73.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			32.0	69.0		
Max Q Clear Time (g_c+I1), s		4.0			17.7	40.3		
Green Ext Time (p_c), s		22.9			9.9	19.5		

Intersection Summary	
HCM 2010 Ctrl Delay	13.1
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/5/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	1683	2157	6	151	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	306	1735	2224	6	156	100
Adj No. of Lanes	1	3	3	1	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	491	4304	2723	848	187	167
Arrive On Green	0.27	0.83	0.52	0.52	0.10	0.10
Sat Flow, veh/h	1810	5358	5358	1615	1810	1615
Grp Volume(v), veh/h	306	1735	2224	6	156	100
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615	1810	1615
Q Serve(g_s), s	17.8	10.3	42.8	0.1	10.1	7.1
Cycle Q Clear(g_c), s	17.8	10.3	42.8	0.1	10.1	7.1
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	491	4304	2723	848	187	167
V/C Ratio(X)	0.62	0.40	0.82	0.01	0.83	0.60
Avail Cap(c_a), veh/h	491	4304	2723	848	241	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.3	2.6	23.7	5.6	52.8	51.4
Incr Delay (d2), s/veh	2.4	0.3	2.8	0.0	17.4	3.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.3	4.9	21.1	0.3	6.0	6.5
LnGrp Delay(d),s/veh	40.8	2.9	26.5	5.6	70.1	54.8
LnGrp LOS	D	A	C	A	E	D
Approach Vol, veh/h		2041	2230		256	
Approach Delay, s/veh		8.6	26.5		64.1	
Approach LOS		A	C		E	

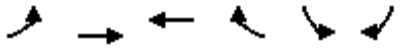
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		103.6		16.4	36.6	67.0		
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		
Max Green Setting (Gmax), s		96.0		16.0	29.0	63.0		
Max Q Clear Time (g_c+I1), s		12.3		12.1	19.8	44.8		
Green Ext Time (p_c), s		22.4		0.3	7.0	13.9		

Intersection Summary	
HCM 2010 Ctrl Delay	20.5
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	13	3080	3286	6	0	46
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	14	3348	3572	7	0	50
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	271	5014	2896	6	0	0
Arrive On Green	0.15	0.97	0.78	0.78	0.00	0.00
Sat Flow, veh/h	1810	5358	3791	7	0	
Grp Volume(v), veh/h	14	3348	1744	1835	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1899		
Q Serve(g_s), s	0.8	7.3	94.0	94.0		
Cycle Q Clear(g_c), s	0.8	7.3	94.0	94.0		
Prop In Lane	1.00			0.00		
Lane Grp Cap(c), veh/h	271	5014	1414	1487		
V/C Ratio(X)	0.05	0.67	1.23	1.23		
Avail Cap(c_a), veh/h	271	5014	1414	1487		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	43.7	0.2	13.0	13.0		
Incr Delay (d2), s/veh	0.1	0.7	111.3	111.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	3.1	89.3	93.9		
LnGrp Delay(d),s/veh	43.8	0.9	124.3	124.3		
LnGrp LOS	D	A	F	F		
Approach Vol, veh/h		3362	3579			
Approach Delay, s/veh		1.1	124.3			
Approach LOS		A	F			

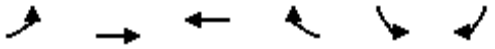
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			22.0	98.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		9.3			2.8	96.0		
Green Ext Time (p_c), s		80.3			4.1	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	64.6
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	13	3080	3286	6	0	46
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	14	3348	3572	7	0	50
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	271	5014	4187	8	0	0
Arrive On Green	0.15	0.97	0.78	0.78	0.00	0.00
Sat Flow, veh/h	1810	5358	5517	10	0	
Grp Volume(v), veh/h	14	3348	2310	1269	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1898		
Q Serve(g_s), s	0.8	7.3	52.3	52.5		
Cycle Q Clear(g_c), s	0.8	7.3	52.3	52.5		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	271	5014	2709	1487		
V/C Ratio(X)	0.05	0.67	0.85	0.85		
Avail Cap(c_a), veh/h	271	5014	2709	1487		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	43.7	0.2	8.5	8.5		
Incr Delay (d2), s/veh	0.1	0.7	3.6	6.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.4	3.1	25.8	29.4		
LnGrp Delay(d),s/veh	43.8	0.9	12.1	14.9		
LnGrp LOS	D	A	B	B		
Approach Vol, veh/h		3362	3579			
Approach Delay, s/veh		1.1	13.1			
Approach LOS		A	B			

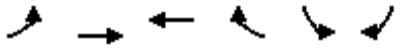
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			22.0	98.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		9.3			2.8	54.5		
Green Ext Time (p_c), s		80.3			4.1	37.0		

Intersection Summary	
HCM 2010 Ctrl Delay	7.3
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	2960	3401	6	0	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	323	3217	3697	7	0	105
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	407	5014	2619	5	0	0
Arrive On Green	0.22	0.97	0.71	0.71	0.00	0.00
Sat Flow, veh/h	1810	5358	3792	7	0	
Grp Volume(v), veh/h	323	3217	1805	1899	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1899		
Q Serve(g_s), s	20.2	6.5	85.0	85.0		
Cycle Q Clear(g_c), s	20.2	6.5	85.0	85.0		
Prop In Lane	1.00			0.00		
Lane Grp Cap(c), veh/h	407	5014	1279	1345		
V/C Ratio(X)	0.79	0.64	1.41	1.41		
Avail Cap(c_a), veh/h	407	5014	1279	1345		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	43.9	0.2	17.5	17.5		
Incr Delay (d2), s/veh	10.3	0.6	189.8	190.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.2	2.7	109.0	114.7		
LnGrp Delay(d),s/veh	54.2	0.8	207.3	207.5		
LnGrp LOS	D	A	F	F		
Approach Vol, veh/h		3540	3704			
Approach Delay, s/veh		5.7	207.4			
Approach LOS		A	F			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			31.0	89.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			16.0	85.0		
Max Q Clear Time (g_c+I1), s		8.5			22.2	87.0		
Green Ext Time (p_c), s		79.6			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	108.8
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1511

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	2960	3401	6	0	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	323	3217	3697	7	0	105
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	467	5014	3609	7	0	0
Arrive On Green	0.26	0.97	0.68	0.68	0.00	0.00
Sat Flow, veh/h	1810	5358	5517	10	0	
Grp Volume(v), veh/h	323	3217	2391	1313	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1898		
Q Serve(g_s), s	19.3	6.5	81.0	81.0		
Cycle Q Clear(g_c), s	19.3	6.5	81.0	81.0		
Prop In Lane	1.00			0.01		
Lane Grp Cap(c), veh/h	467	5014	2334	1281		
V/C Ratio(X)	0.69	0.64	1.02	1.03		
Avail Cap(c_a), veh/h	467	5014	2334	1281		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	40.2	0.2	19.5	19.5		
Incr Delay (d2), s/veh	4.3	0.6	25.1	31.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	10.2	2.7	46.1	52.9		
LnGrp Delay(d),s/veh	44.5	0.8	44.6	51.2		
LnGrp LOS	D	A	F	F		
Approach Vol, veh/h		3540	3704			
Approach Delay, s/veh		4.8	46.9			
Approach LOS		A	D			

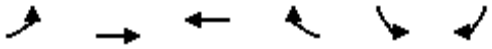
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			35.0	85.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			20.0	81.0		
Max Q Clear Time (g_c+I1), s		8.5			21.3	83.0		
Green Ext Time (p_c), s		79.6			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	26.3
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	2960	3401	6	0	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	323	3217	3697	7	0	105
Adj No. of Lanes	1	3	3	1	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	467	5014	3501	1090	0	0
Arrive On Green	0.26	0.97	0.68	0.68	0.00	0.00
Sat Flow, veh/h	1810	5358	5358	1615	0	
Grp Volume(v), veh/h	323	3217	3697	7	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615		
Q Serve(g_s), s	19.3	6.5	81.0	0.2		
Cycle Q Clear(g_c), s	19.3	6.5	81.0	0.2		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	467	5014	3501	1090		
V/C Ratio(X)	0.69	0.64	1.06	0.01		
Avail Cap(c_a), veh/h	467	5014	3501	1090		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	40.2	0.2	19.5	5.1		
Incr Delay (d2), s/veh	4.3	0.6	32.6	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	10.2	2.7	48.5	0.3		
LnGrp Delay(d),s/veh	44.5	0.8	52.1	5.1		
LnGrp LOS	D	A	F	A		
Approach Vol, veh/h		3540	3704			
Approach Delay, s/veh		4.8	52.1			
Approach LOS		A	D			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			35.0	85.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			20.0	81.0		
Max Q Clear Time (g_c+I1), s		8.5			21.3	83.0		
Green Ext Time (p_c), s		79.6			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	29.0
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	297	2960	3401	6	151	97
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	323	3217	3697	7	164	105
Adj No. of Lanes	1	3	3	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	318	4282	3199	996	195	174
Arrive On Green	0.18	0.83	0.62	0.62	0.11	0.11
Sat Flow, veh/h	1810	5358	5358	1615	1810	1615
Grp Volume(v), veh/h	323	3217	3697	7	164	105
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615	1810	1615
Q Serve(g_s), s	21.1	34.2	74.0	0.2	10.7	7.4
Cycle Q Clear(g_c), s	21.1	34.2	74.0	0.2	10.7	7.4
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	318	4282	3199	996	195	174
V/C Ratio(X)	1.02	0.75	1.16	0.01	0.84	0.60
Avail Cap(c_a), veh/h	318	4282	3199	996	241	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.5	4.8	23.0	8.9	52.5	51.1
Incr Delay (d2), s/veh	54.8	1.3	74.1	0.0	19.2	3.3
Initial Q Delay(d3),s/veh	0.1	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.3	16.3	56.9	0.1	6.4	6.8
LnGrp Delay(d),s/veh	104.3	6.1	97.1	8.9	71.7	54.4
LnGrp LOS	F	A	F	A	E	D
Approach Vol, veh/h		3540	3704		269	
Approach Delay, s/veh		15.0	96.9		65.0	
Approach LOS		B	F		E	

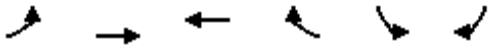
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		103.1		16.9	25.1	78.0		
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		
Max Green Setting (Gmax), s		96.0		16.0	18.0	74.0		
Max Q Clear Time (g_c+I1), s		36.2		12.7	23.1	76.0		
Green Ext Time (p_c), s		52.9		0.3	0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	57.2
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	47	2790	3222	52	0	107
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	49	2937	3392	55	0	113
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	271	5014	2848	46	0	0
Arrive On Green	0.15	0.97	0.78	0.78	0.00	0.00
Sat Flow, veh/h	1810	5358	3731	59	0	
Grp Volume(v), veh/h	49	2937	1679	1768	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1890		
Q Serve(g_s), s	2.8	5.2	94.0	94.0		
Cycle Q Clear(g_c), s	2.8	5.2	94.0	94.0		
Prop In Lane	1.00			0.03		
Lane Grp Cap(c), veh/h	271	5014	1414	1480		
V/C Ratio(X)	0.18	0.59	1.19	1.19		
Avail Cap(c_a), veh/h	271	5014	1414	1480		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	44.6	0.2	13.0	13.0		
Incr Delay (d2), s/veh	0.3	0.5	91.9	94.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.4	2.1	81.6	86.5		
LnGrp Delay(d),s/veh	44.9	0.7	104.9	107.3		
LnGrp LOS	D	A	F	F		
Approach Vol, veh/h		2986	3447			
Approach Delay, s/veh		1.4	106.1			
Approach LOS		A	F			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			22.0	98.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			7.0	94.0		
Max Q Clear Time (g_c+I1), s		7.2			4.8	96.0		
Green Ext Time (p_c), s		66.9			2.1	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	57.5
HCM 2010 LOS	E

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	47	2790	3222	52	0	107
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	49	2937	3392	55	0	113
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	317	5014	3987	64	0	0
Arrive On Green	0.17	0.97	0.76	0.76	0.00	0.00
Sat Flow, veh/h	1810	5358	5429	85	0	
Grp Volume(v), veh/h	49	2937	2225	1222	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1885		
Q Serve(g_s), s	2.8	5.2	52.3	53.5		
Cycle Q Clear(g_c), s	2.8	5.2	52.3	53.5		
Prop In Lane	1.00			0.04		
Lane Grp Cap(c), veh/h	317	5014	2622	1429		
V/C Ratio(X)	0.15	0.59	0.85	0.86		
Avail Cap(c_a), veh/h	317	5014	2622	1429		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	42.0	0.2	9.8	10.0		
Incr Delay (d2), s/veh	0.2	0.5	3.6	6.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.4	2.1	25.7	29.8		
LnGrp Delay(d),s/veh	42.2	0.7	13.5	16.7		
LnGrp LOS	D	A	B	B		
Approach Vol, veh/h		2986	3447			
Approach Delay, s/veh		1.3	14.6			
Approach LOS		A	B			

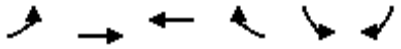
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			25.0	95.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		102.0			7.0	91.0		
Max Q Clear Time (g_c+I1), s		7.2			4.8	55.5		
Green Ext Time (p_c), s		65.5			2.2	32.8		

Intersection Summary	
HCM 2010 Ctrl Delay	8.5
HCM 2010 LOS	A

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

6/30/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	282	2661	3229	52	0	105
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	297	2801	3399	55	0	111
Adj No. of Lanes	1	3	2	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	392	5014	2606	42	0	0
Arrive On Green	0.22	0.97	0.72	0.72	0.00	0.00
Sat Flow, veh/h	1810	5358	3731	59	0	
Grp Volume(v), veh/h	297	2801	1683	1771	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1805	1890		
Q Serve(g_s), s	18.5	4.7	86.0	86.0		
Cycle Q Clear(g_c), s	18.5	4.7	86.0	86.0		
Prop In Lane	1.00			0.03		
Lane Grp Cap(c), veh/h	392	5014	1294	1354		
V/C Ratio(X)	0.76	0.56	1.30	1.31		
Avail Cap(c_a), veh/h	392	5014	1294	1354		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	44.0	0.1	17.0	17.0		
Incr Delay (d2), s/veh	8.3	0.5	141.1	144.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.1	2.0	92.8	98.2		
LnGrp Delay(d),s/veh	52.3	0.6	158.1	161.0		
LnGrp LOS	D	A	F	F		
Approach Vol, veh/h		3098	3454			
Approach Delay, s/veh		5.6	159.6			
Approach LOS		A	F			

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			30.0	90.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			15.0	86.0		
Max Q Clear Time (g_c+I1), s		6.7			20.5	88.0		
Green Ext Time (p_c), s		64.9			0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	86.8
HCM 2010 LOS	F

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/22/2016

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	282	2661	3229	52	0	105
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	297	2801	3399	55	0	111
Adj No. of Lanes	1	3	3	0	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	483	5014	3506	56	0	0
Arrive On Green	0.27	0.97	0.67	0.67	0.00	0.00
Sat Flow, veh/h	1810	5358	5429	85	0	
Grp Volume(v), veh/h	297	2801	2229	1225	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1885		
Q Serve(g_s), s	17.3	4.7	72.6	74.2		
Cycle Q Clear(g_c), s	17.3	4.7	72.6	74.2		
Prop In Lane	1.00			0.04		
Lane Grp Cap(c), veh/h	483	5014	2305	1257		
V/C Ratio(X)	0.62	0.56	0.97	0.97		
Avail Cap(c_a), veh/h	483	5014	2305	1257		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	38.6	0.1	18.8	19.0		
Incr Delay (d2), s/veh	2.3	0.5	12.4	20.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	9.0	2.0	38.0	45.1		
LnGrp Delay(d),s/veh	40.9	0.6	31.2	39.0		
LnGrp LOS	D	A	C	D		
Approach Vol, veh/h		3098	3454			
Approach Delay, s/veh		4.5	34.0			
Approach LOS		A	C			

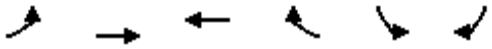
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			36.0	84.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			21.0	80.0		
Max Q Clear Time (g_c+I1), s		6.7			19.3	76.2		
Green Ext Time (p_c), s		64.9			1.7	3.7		

Intersection Summary	
HCM 2010 Ctrl Delay	20.0
HCM 2010 LOS	C

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	282	2661	3229	52	0	105
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	0	1900
Adj Flow Rate, veh/h	297	2801	3399	55	0	111
Adj No. of Lanes	1	3	3	1	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	467	5014	3501	1090	0	0
Arrive On Green	0.26	0.97	0.68	0.68	0.00	0.00
Sat Flow, veh/h	1810	5358	5358	1615	0	
Grp Volume(v), veh/h	297	2801	3399	55	0.0	
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615		
Q Serve(g_s), s	17.5	4.7	74.1	1.2		
Cycle Q Clear(g_c), s	17.5	4.7	74.1	1.2		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	467	5014	3501	1090		
V/C Ratio(X)	0.64	0.56	0.97	0.05		
Avail Cap(c_a), veh/h	467	5014	3501	1090		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	39.5	0.1	18.4	5.3		
Incr Delay (d2), s/veh	2.8	0.5	9.8	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	9.1	2.0	38.1	2.4		
LnGrp Delay(d),s/veh	42.3	0.6	28.2	5.4		
LnGrp LOS	D	A	C	A		
Approach Vol, veh/h		3098	3454			
Approach Delay, s/veh		4.6	27.8			
Approach LOS		A	C			

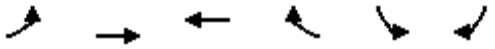
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2			5	6		
Phs Duration (G+Y+Rc), s		120.0			35.0	85.0		
Change Period (Y+Rc), s		4.0			4.0	4.0		
Max Green Setting (Gmax), s		105.0			20.0	81.0		
Max Q Clear Time (g_c+I1), s		6.7			19.5	76.1		
Green Ext Time (p_c), s		64.9			0.5	4.8		

Intersection Summary	
HCM 2010 Ctrl Delay	16.8
HCM 2010 LOS	B

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
3: Cactus Avenue & Commerce Center Drive

7/21/2016



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	275	2670	3229	52	27	105
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	289	2811	3399	55	28	111
Adj No. of Lanes	1	3	3	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0
Cap, veh/h	359	4401	3199	996	153	137
Arrive On Green	0.20	0.85	0.62	0.62	0.08	0.08
Sat Flow, veh/h	1810	5358	5358	1615	1810	1615
Grp Volume(v), veh/h	289	2811	3399	55	28	111
Grp Sat Flow(s),veh/h/ln	1810	1729	1729	1615	1810	1615
Q Serve(g_s), s	18.3	21.5	74.0	1.0	1.7	8.1
Cycle Q Clear(g_c), s	18.3	21.5	74.0	1.0	1.7	8.1
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	359	4401	3199	996	153	137
V/C Ratio(X)	0.80	0.64	1.06	0.06	0.18	0.81
Avail Cap(c_a), veh/h	359	4401	3199	996	241	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.9	3.0	23.0	3.3	51.0	54.0
Incr Delay (d2), s/veh	12.5	0.7	35.7	0.1	0.6	11.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.4	10.2	45.5	2.3	0.9	7.5
LnGrp Delay(d),s/veh	58.4	3.7	58.7	3.4	51.6	65.8
LnGrp LOS	E	A	F	A	D	E
Approach Vol, veh/h		3100	3454		139	
Approach Delay, s/veh		8.8	57.8		63.0	
Approach LOS		A	E		E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		105.8		14.2	27.8	78.0		
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		
Max Green Setting (Gmax), s		96.0		16.0	18.0	74.0		
Max Q Clear Time (g_c+I1), s		23.5		10.1	20.3	76.0		
Green Ext Time (p_c), s		53.0		0.2	0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	35.2
HCM 2010 LOS	D

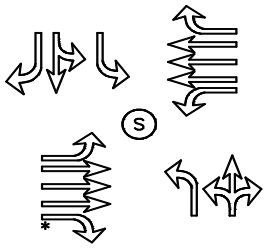
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 3

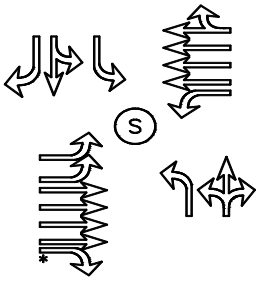
E/W STREET : CACTUS AVE
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



EXISTING GEOMETRICS



CUMULATIVE GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	212	23	234	0	234	81	315	315	114	0	114
EB Thru	1337	140	1476	0	1476	841	2317	2317	1997	0	1997
EB Right	38	4	42	0	42	0	42	42	384	0	384
WB Left	68	8	75	0	75	0	75	75	118	0	118
WB Thru	1620	169	1789	26	1815	1370	3159	3185	2796	-87	2709
WB Right	84	9	93	0	93	0	93	93	155	0	155
ELSWORTH ST											
NB Left	46	5	51	5	56	0	51	56	58	-18	40
NB Thru	25	3	28	0	28	0	28	28	28	0	28
NB Right	20	3	22	0	22	0	22	22	21	0	21
SB Left	63	7	70	152	222	0	70	222	103	132	235
SB Thru	83	9	92	5	97	0	92	97	152	1	153
SB Right	80	9	88	5	93	47	135	140	141	-18	123
TOTALS	**3676**	**389**	**4060**	**193**	**4253**	**2339**	**6399**	**6592**	**6067**	**10**	**6077**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 3

E/W STREET : CACTUS AVE
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	212	23	234	5	239	81	315	320	114	1	115
EB Thru	1337	140	1476	23	1499	841	2317	2340	1997	3	2000
EB Right	38	4	42	5	47	0	42	47	384	1	385
WB Left	68	8	75	0	75	0	75	75	118	0	118
WB Thru	1620	169	1789	26	1815	1370	3159	3185	2796	-87	2709
WB Right	84	9	93	0	93	0	93	93	155	0	155
ELSWORTH ST											
NB Left	46	5	51	5	56	0	51	56	58	-18	40
NB Thru	25	3	28	0	28	0	28	28	28	0	28
NB Right	20	3	22	0	22	0	22	22	21	0	21
SB Left	63	7	70	0	70	0	70	70	103	0	103
SB Thru	83	9	92	0	92	0	92	92	152	0	152
SB Right	80	9	88	5	93	47	135	140	141	-18	123
TOTALS	**3676**	**389**	**4060**	**69**	**4129**	**2339**	**6399**	**6468**	**6067**	**-118**	**5949**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	3 OF 3

E/W STREET : CACTUS AVE
CONDITION : AM PEAK HOUR
N/S STREET : ELSWORTH ST
PHF : 0.98

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	0	0
0	0	0	2	0	0	0	0	0
0	0	0	0	0	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
1	5	0	0	0	0	0	4	0
0	3	0	0	2	0	0	5	0
0	2	0	0	0	0	0	7	0
0	9	0	0	2	0	0	7	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	3	0	0	1	0	0	14	1
0	3	0	0	1	0	0	7	0
0	2	0	0	1	0	0	6	0
0	6	0	0	1	0	0	14	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
18	25	11	8	6	12	14	415	13	11	270	47
19	23	14	1	5	10	19	366	22	10	295	50
13	25	18	2	5	7	21	400	23	7	291	52
21	10	20	6	9	14	27	301	10	10	304	60

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	1	209	**210**	**212**
EB THRU	59	1160	**1219**	**1337**
EB RIGHT	0	38	**38**	**38**
WB LEFT	0	68	**68**	**68**
WB THRU	46	1482	**1528**	**1620**
WB RIGHT	1	81	**82**	**84**
ELSWORTH ST				
NB LEFT	1	43	**44**	**46**
NB THRU	0	25	**25**	**25**
NB RIGHT	1	17	**18**	**20**
SB LEFT	0	63	**63**	**63**
SB THRU	0	83	**83**	**83**
SB RIGHT	3	71	**74**	**80**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: ELSWORTH ST
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 07:15AM

NORTH LEG

TOTAL: 220

Rt	Thru	Lt	
74	83	63	Total
18	25	11	1st
20	23	14	2nd
15	25	18	3rd
21	10	20	4th

EAST LEG TOTAL: 1,678

	1st	2nd	3rd	4th	Total
Rt	15	19	21	27	82
Thru	424	376	409	319	1528
Lt	13	22	23	10	68

WEST LEG TOTAL: 1,467

Total	1st	2nd	3rd	4th	
210	48	50	52	60	Lt
1219	288	306	300	325	Thru
38	11	10	7	10	Rt

PEAK HOUR FACTORS

NORTH LEG = 0.95
SOUTH LEG = 0.75
EAST LEG = 0.93
WEST LEG = 0.93

ALL LEGS = 0.98

SOUTH LEG

TOTAL: 87

	Lt	Thru	Rt
1st	12	6	9
2nd	10	5	1
3rd	8	5	2
4th	14	9	6
Total	44	25	18

HOUR TOTAL: 3,452

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : ELSWORTH ST
EAST-WEST STREET : CACTUS AVE
MORENO VALLEY
09-30-15
BEGINNING TIME : 07:00AM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
NORTH LEG												
12	20	10	0	0	0	2	0	0	0	0	0	44
18	25	11	0	0	0	0	0	0	0	0	0	54
19	23	14	0	0	0	0	0	0	1	0	0	57
13	25	18	0	0	0	2	0	0	0	0	0	58
21	10	20	0	0	0	0	0	0	0	0	0	51
13	10	17	0	0	0	2	0	0	1	0	1	44
15	4	10	0	0	0	3	0	0	1	0	1	34
14	10	11	0	0	0	0	0	0	0	0	0	35
125	127	111	0	0	0	9	0	0	3	0	2	377
SOUTH LEG												
11	7	9	0	0	0	0	0	0	0	0	0	27
8	6	12	0	0	0	0	0	0	1	0	0	27
1	5	10	0	0	0	0	0	0	0	0	0	16
2	5	7	0	0	1	0	0	0	0	0	0	15
6	9	14	0	0	0	0	0	0	0	0	0	29
1	7	9	0	0	1	0	0	0	0	0	0	18
4	4	9	0	0	0	0	0	0	0	0	0	17
3	5	9	0	0	0	0	0	0	0	0	0	17
36	48	79	0	0	2	0	0	0	1	0	0	166
EAST LEG												
14	390	11	0	5	0	0	2	0	0	8	0	430
14	415	13	1	5	0	0	0	0	0	4	0	452
19	366	22	0	3	0	0	2	0	0	5	0	417
21	400	23	0	2	0	0	0	0	0	7	0	453
27	301	10	0	9	0	0	2	0	0	7	0	356
24	263	8	0	6	0	1	0	0	0	6	0	308
23	207	5	0	5	0	0	5	0	0	14	0	259
20	206	5	0	4	0	0	6	0	0	12	0	253
162	2548	97	1	39	0	1	17	0	0	63	0	2928
WEST LEG												
8	162	38	0	6	0	0	0	0	0	15	0	229
11	270	47	0	3	0	0	1	0	0	14	1	347
10	295	50	0	3	0	0	1	0	0	7	0	366
7	291	52	0	2	0	0	1	0	0	6	0	359
10	304	60	0	6	0	0	1	0	0	14	0	395
4	289	44	0	2	0	0	0	1	0	6	0	346
6	305	49	0	6	1	0	3	0	0	9	0	379
5	214	44	0	6	0	0	1	0	0	14	0	284
61	2130	384	0	34	1	0	8	1	0	85	1	2705

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: ELSWORTH ST

EAST-WEST STREET: CACTUS AVE

TIME: 07:00AM-08:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
67	93	53	Total
14	20	10	1st
18	25	11	2nd
20	23	14	3rd
15	25	18	4th

	1st	2nd	3rd	4th	Total
Rt	14	15	19	21	69
Thru	405	424	376	409	1614
Lt	11	13	22	23	69

Total	1st	2nd	3rd	4th	
188	38	48	50	52	Lt
1077	183	288	306	300	Thru
36	8	11	10	7	Rt

	Lt	Thru	Rt
1st	9	7	11
2nd	12	6	9
3rd	10	5	1
4th	8	5	2
Total	39	23	23

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: ELSWORTH ST

EAST-WEST STREET: CACTUS AVE

TIME: 08:00AM-09:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
70	34	60	Total
21	10	20	1st
16	10	18	2nd
19	4	11	3rd
14	10	11	4th

	1st	2nd	3rd	4th	Total
Rt	27	25	23	20	95
Thru	319	275	231	228	1053
Lt	10	8	5	5	28

Total	1st	2nd	3rd	4th	
199	60	45	50	44	Lt
1180	325	297	323	235	Thru
25	10	4	6	5	Rt

	Lt	Thru	Rt
1st	14	9	6
2nd	10	7	1
3rd	9	4	4
4th	9	5	3
Total	42	25	14

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/22/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	212	1337	38	68	1620	84	46	25	20	63	83	80
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	216	1364	0	69	1653	86	46	27	20	64	85	82
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	661	3569	1111	95	1946	606	101	57	42	127	134	114
Arrive On Green	0.37	0.69	0.00	0.05	0.38	0.38	0.06	0.06	0.06	0.07	0.07	0.07
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1015	752	1810	1900	1615
Grp Volume(v), veh/h	216	1364	0	69	1653	86	46	0	47	64	85	82
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1767	1810	1900	1615
Q Serve(g_s), s	10.3	13.4	0.0	4.5	35.1	4.2	3.0	0.0	3.1	4.1	5.2	6.0
Cycle Q Clear(g_c), s	10.3	13.4	0.0	4.5	35.1	4.2	3.0	0.0	3.1	4.1	5.2	6.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	661	3569	1111	95	1946	606	101	0	98	127	134	114
V/C Ratio(X)	0.33	0.38	0.00	0.73	0.85	0.14	0.46	0.00	0.48	0.50	0.64	0.72
Avail Cap(c_a), veh/h	661	3569	1111	151	2118	659	241	0	236	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.4	7.9	0.0	56.0	34.4	24.7	54.9	0.0	55.0	53.7	54.3	54.6
Incr Delay (d2), s/veh	0.3	0.3	0.0	10.1	3.3	0.1	3.2	0.0	3.6	3.0	4.9	8.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	6.4	0.0	2.5	17.3	1.9	1.6	0.0	1.6	2.2	2.9	2.9
LnGrp Delay(d),s/veh	27.7	8.2	0.0	66.1	37.6	24.8	58.1	0.0	58.5	56.8	59.2	62.9
LnGrp LOS	C	A		E	D	C	E		E	E	E	E
Approach Vol, veh/h		1580			1808			93			231	
Approach Delay, s/veh		10.9			38.1			58.3			59.8	
Approach LOS		B			D			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.3	86.6		12.5	47.8	49.0		10.7
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	10.0	62.0		16.0	23.0	49.0		16.0
Max Q Clear Time (g_c+I1), s	6.5	15.4		8.0	12.3	37.1		5.1
Green Ext Time (p_c), s	0.0	12.9		0.5	6.5	8.0		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	28.4
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/5/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	234	1476	42	75	1789	93	51	28	22	70	92	88
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	239	1506	0	77	1826	95	52	30	22	71	94	90
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	269	2637	821	409	3039	946	102	58	42	137	144	122
Arrive On Green	0.15	0.51	0.00	0.23	0.59	0.59	0.06	0.06	0.06	0.08	0.08	0.08
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1020	748	1810	1900	1615
Grp Volume(v), veh/h	239	1506	0	77	1826	95	52	0	52	71	94	90
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1768	1810	1900	1615
Q Serve(g_s), s	15.5	24.1	0.0	4.1	27.0	3.1	3.3	0.0	3.4	4.5	5.8	6.5
Cycle Q Clear(g_c), s	15.5	24.1	0.0	4.1	27.0	3.1	3.3	0.0	3.4	4.5	5.8	6.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.42	1.00		1.00
Lane Grp Cap(c), veh/h	269	2637	821	409	3039	946	102	0	100	137	144	122
V/C Ratio(X)	0.89	0.57	0.00	0.19	0.60	0.10	0.51	0.00	0.52	0.52	0.65	0.74
Avail Cap(c_a), veh/h	347	2637	821	409	3039	946	241	0	236	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.1	20.4	0.0	37.5	15.9	10.9	55.0	0.0	55.0	53.4	53.9	54.3
Incr Delay (d2), s/veh	19.6	0.9	0.0	0.2	0.3	0.0	3.9	0.0	4.1	3.0	5.0	8.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.2	11.7	0.0	2.1	12.9	1.4	1.8	0.0	1.8	2.4	3.2	3.2
LnGrp Delay(d),s/veh	69.7	21.3	0.0	37.7	16.2	11.0	58.9	0.0	59.2	56.4	58.9	62.6
LnGrp LOS	E	C		D	B	B	E		E	E	E	E
Approach Vol, veh/h		1745			1998			104			255	
Approach Delay, s/veh		28.0			16.8			59.0			59.5	
Approach LOS		C			B			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	31.1	65.0		13.1	21.8	74.3		10.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	11.0	61.0		16.0	23.0	49.0		16.0
Max Q Clear Time (g_c+I1), s	6.1	26.1		8.5	17.5	29.0		5.4
Green Ext Time (p_c), s	0.6	12.7		0.5	0.3	12.8		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	25.3
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	234	1476	42	75	1815	93	56	28	22	222	97	93
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	239	1506	0	77	1852	95	54	33	22	163	189	95
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	268	2594	807	345	2816	877	103	60	40	215	226	192
Arrive On Green	0.15	0.50	0.00	0.19	0.54	0.54	0.06	0.06	0.06	0.12	0.12	0.12
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1065	710	1810	1900	1615
Grp Volume(v), veh/h	239	1506	0	77	1852	95	54	0	55	163	189	95
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1775	1810	1900	1615
Q Serve(g_s), s	15.6	24.5	0.0	4.3	30.5	3.4	3.5	0.0	3.6	10.5	11.7	6.6
Cycle Q Clear(g_c), s	15.6	24.5	0.0	4.3	30.5	3.4	3.5	0.0	3.6	10.5	11.7	6.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	268	2594	807	345	2816	877	103	0	101	215	226	192
V/C Ratio(X)	0.89	0.58	0.00	0.22	0.66	0.11	0.53	0.00	0.55	0.76	0.84	0.49
Avail Cap(c_a), veh/h	317	2594	807	345	2816	877	241	0	237	256	269	229
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.2	21.1	0.0	41.0	19.5	13.3	55.0	0.0	55.1	51.2	51.7	49.5
Incr Delay (d2), s/veh	23.2	1.0	0.0	0.3	0.6	0.1	4.1	0.0	4.5	10.2	17.5	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.5	11.9	0.0	2.2	14.6	1.5	1.9	0.0	1.9	5.9	7.2	3.1
LnGrp Delay(d),s/veh	73.4	22.1	0.0	41.4	20.1	13.4	59.1	0.0	59.6	61.4	69.2	51.4
LnGrp LOS	E	C		D	C	B	E		E	E	E	D
Approach Vol, veh/h		1745			2024			109			447	
Approach Delay, s/veh		29.1			20.6			59.4			62.6	
Approach LOS		C			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	26.9	64.0		18.3	21.8	69.1		10.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	11.0	60.0		17.0	21.0	50.0		16.0
Max Q Clear Time (g_c+I1), s	16.3	26.5		13.7	17.6	32.5		5.6
Green Ext Time (p_c), s	2.3	12.5		0.6	0.2	11.8		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	29.3
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1530

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/5/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	239	1499	47	75	1815	93	56	28	22	70	92	93
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	244	1530	0	77	1852	95	54	33	22	71	94	95
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	273	2637	821	403	3010	937	103	60	40	142	149	127
Arrive On Green	0.15	0.51	0.00	0.22	0.58	0.58	0.06	0.06	0.06	0.08	0.08	0.08
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1065	710	1810	1900	1615
Grp Volume(v), veh/h	244	1530	0	77	1852	95	54	0	55	71	94	95
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1775	1810	1900	1615
Q Serve(g_s), s	15.9	24.7	0.0	4.1	28.0	3.1	3.5	0.0	3.6	4.5	5.8	6.9
Cycle Q Clear(g_c), s	15.9	24.7	0.0	4.1	28.0	3.1	3.5	0.0	3.6	4.5	5.8	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.40	1.00		1.00
Lane Grp Cap(c), veh/h	273	2637	821	403	3010	937	103	0	101	142	149	127
V/C Ratio(X)	0.89	0.58	0.00	0.19	0.62	0.10	0.53	0.00	0.55	0.50	0.63	0.75
Avail Cap(c_a), veh/h	332	2637	821	403	3010	937	241	0	237	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.0	20.6	0.0	37.8	16.4	11.2	55.0	0.0	55.1	53.0	53.6	54.1
Incr Delay (d2), s/veh	22.0	0.9	0.0	0.2	0.4	0.0	4.1	0.0	4.5	2.7	4.3	8.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.6	12.0	0.0	2.1	13.3	1.4	1.9	0.0	1.9	2.4	3.2	3.4
LnGrp Delay(d),s/veh	72.0	21.5	0.0	38.1	16.8	11.3	59.1	0.0	59.6	55.7	57.9	62.6
LnGrp LOS	E	C		D	B	B	E		E	E	E	E
Approach Vol, veh/h		1774			2024			109			260	
Approach Delay, s/veh		28.5			17.4			59.4			59.0	
Approach LOS		C			B			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	30.8	65.0		13.4	22.1	73.6		10.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	11.0	61.0		16.0	22.0	50.0		16.0
Max Q Clear Time (g_c+I1), s	6.1	26.7		8.9	17.9	30.0		5.6
Green Ext Time (p_c), s	1.8	12.9		0.5	0.3	13.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	25.8
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	315	2317	42	75	3159	93	51	28	22	70	92	135
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	342	2518	0	82	3434	101	54	31	24	76	100	147
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	424	3337	1039	104	2421	754	103	56	44	197	207	176
Arrive On Green	0.23	0.64	0.00	0.06	0.47	0.47	0.06	0.06	0.06	0.11	0.11	0.11
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	994	770	1810	1900	1615
Grp Volume(v), veh/h	342	2518	0	82	3434	101	54	0	55	76	100	147
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1764	1810	1900	1615
Q Serve(g_s), s	21.4	40.4	0.0	5.4	56.0	4.3	3.5	0.0	3.6	4.7	5.9	10.7
Cycle Q Clear(g_c), s	21.4	40.4	0.0	5.4	56.0	4.3	3.5	0.0	3.6	4.7	5.9	10.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.44	1.00		1.00
Lane Grp Cap(c), veh/h	424	3337	1039	104	2421	754	103	0	100	197	207	176
V/C Ratio(X)	0.81	0.75	0.00	0.79	1.42	0.13	0.53	0.00	0.55	0.39	0.48	0.83
Avail Cap(c_a), veh/h	424	3337	1039	121	2421	754	241	0	235	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.4	14.8	0.0	55.8	32.0	18.2	55.0	0.0	55.1	49.7	50.3	52.4
Incr Delay (d2), s/veh	11.0	1.6	0.0	25.4	190.9	0.1	4.1	0.0	4.6	1.2	1.7	20.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.0	19.6	0.0	3.4	69.5	1.9	1.9	0.0	1.9	2.4	3.2	5.8
LnGrp Delay(d),s/veh	54.4	16.5	0.0	81.2	222.9	18.3	59.1	0.0	59.7	50.9	52.0	72.7
LnGrp LOS	D	B		F	F	B	E		E	D	D	E
Approach Vol, veh/h		2860			3617			109			323	
Approach Delay, s/veh		21.0			214.0			59.4			61.2	
Approach LOS		C			F			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.9	81.2		17.1	32.1	60.0		10.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	8.0	64.0		16.0	16.0	56.0		16.0
Max Q Clear Time (g_c+I1), s	7.4	42.4		12.7	23.4	58.0		5.6
Green Ext Time (p_c), s	0.0	18.3		0.4	0.0	0.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	124.5
HCM 2010 LOS	F

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1532

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	315	2317	42	75	3185	93	56	28	22	222	97	140
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	342	2518	0	82	3462	101	58	35	24	173	200	152
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	241	2766	861	277	2869	893	103	60	41	223	234	199
Arrive On Green	0.13	0.53	0.00	0.15	0.55	0.55	0.06	0.06	0.06	0.12	0.12	0.12
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1052	721	1810	1900	1615
Grp Volume(v), veh/h	342	2518	0	82	3462	101	58	0	59	173	200	152
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1773	1810	1900	1615
Q Serve(g_s), s	16.0	52.8	0.0	4.8	66.4	3.6	3.7	0.0	3.9	11.1	12.4	10.9
Cycle Q Clear(g_c), s	16.0	52.8	0.0	4.8	66.4	3.6	3.7	0.0	3.9	11.1	12.4	10.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	241	2766	861	277	2869	893	103	0	101	223	234	199
V/C Ratio(X)	1.42	0.91	0.00	0.30	1.21	0.11	0.56	0.00	0.58	0.78	0.86	0.76
Avail Cap(c_a), veh/h	241	2766	861	277	2869	893	241	0	236	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.0	25.4	0.0	45.1	26.8	12.8	55.1	0.0	55.2	51.0	51.6	50.9
Incr Delay (d2), s/veh	210.5	5.8	0.0	0.6	96.6	0.1	4.7	0.0	5.2	13.8	22.6	14.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	22.1	26.4	0.0	2.5	57.0	1.6	2.0	0.0	2.1	6.4	8.0	5.6
LnGrp Delay(d),s/veh	262.5	31.2	0.0	45.7	123.4	12.8	59.8	0.0	60.4	64.8	74.2	64.9
LnGrp LOS	F	C		D	F	B	E		E	E	E	E
Approach Vol, veh/h		2860			3645			117			525	
Approach Delay, s/veh		58.8			118.6			60.1			68.4	
Approach LOS		E			F			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	22.4	68.0		18.8	20.0	70.4		10.9
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	18.0	64.0		16.0	16.0	56.0		16.0
Max Q Clear Time (g_c+I1), s	16.8	54.8		14.4	18.0	68.4		5.9
Green Ext Time (p_c), s	1.2	8.2		0.4	0.0	0.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	90.0
HCM 2010 LOS	F

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1533

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	320	2340	47	75	3185	93	56	28	22	70	92	140
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	348	2543	0	82	3462	101	58	35	24	76	100	152
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	241	2766	861	297	2927	911	103	60	41	202	213	181
Arrive On Green	0.13	0.53	0.00	0.16	0.56	0.56	0.06	0.06	0.06	0.11	0.11	0.11
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1052	721	1810	1900	1615
Grp Volume(v), veh/h	348	2543	0	82	3462	101	58	0	59	76	100	152
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1773	1810	1900	1615
Q Serve(g_s), s	16.0	53.9	0.0	4.8	67.7	3.5	3.7	0.0	3.9	4.7	5.9	11.1
Cycle Q Clear(g_c), s	16.0	53.9	0.0	4.8	67.7	3.5	3.7	0.0	3.9	4.7	5.9	11.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	241	2766	861	297	2927	911	103	0	101	202	213	181
V/C Ratio(X)	1.44	0.92	0.00	0.28	1.18	0.11	0.56	0.00	0.58	0.38	0.47	0.84
Avail Cap(c_a), veh/h	241	2766	861	297	2927	911	241	0	236	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.0	25.6	0.0	43.9	26.1	12.2	55.1	0.0	55.2	49.4	50.0	52.2
Incr Delay (d2), s/veh	221.0	6.3	0.0	0.5	86.1	0.1	4.7	0.0	5.2	1.1	1.6	21.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	22.8	27.0	0.0	2.4	55.3	1.6	2.0	0.0	2.1	2.4	3.2	6.0
LnGrp Delay(d),s/veh	273.0	31.9	0.0	44.4	112.2	12.2	59.8	0.0	60.4	50.5	51.6	74.0
LnGrp LOS	F	C		D	F	B	E		E	D	D	E
Approach Vol, veh/h		2891			3645			117			328	
Approach Delay, s/veh		61.0			107.9			60.1			61.7	
Approach LOS		E			F			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	23.7	68.0		17.4	20.0	71.7		10.9
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	8.0	64.0		16.0	16.0	56.0		16.0
Max Q Clear Time (g_c+I1), s	6.8	55.9		13.1	18.0	69.7		5.9
Green Ext Time (p_c), s	1.2	7.4		0.4	0.0	0.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	85.5
HCM 2010 LOS	F

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	114	1997	384	118	2796	155	58	28	21	103	152	141
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	120	2102	0	124	2943	163	56	36	22	108	160	148
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	121	2637	821	345	3279	1021	103	63	39	201	211	179
Arrive On Green	0.07	0.51	0.00	0.19	0.63	0.63	0.06	0.06	0.06	0.11	0.11	0.11
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1105	675	1810	1900	1615
Grp Volume(v), veh/h	120	2102	0	124	2943	163	56	0	58	108	160	148
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1781	1810	1900	1615
Q Serve(g_s), s	8.0	40.2	0.0	7.1	57.9	5.0	3.6	0.0	3.8	6.8	9.8	10.8
Cycle Q Clear(g_c), s	8.0	40.2	0.0	7.1	57.9	5.0	3.6	0.0	3.8	6.8	9.8	10.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.38	1.00		1.00
Lane Grp Cap(c), veh/h	121	2637	821	345	3279	1021	103	0	102	201	211	179
V/C Ratio(X)	0.99	0.80	0.00	0.36	0.90	0.16	0.54	0.00	0.57	0.54	0.76	0.83
Avail Cap(c_a), veh/h	121	2637	821	345	3279	1021	241	0	237	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	56.0	24.4	0.0	42.2	18.8	9.0	55.1	0.0	55.1	50.4	51.8	52.2
Incr Delay (d2), s/veh	80.2	2.6	0.0	0.6	3.7	0.1	4.4	0.0	5.0	2.2	10.4	19.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	19.7	0.0	3.6	28.4	2.2	1.9	0.0	2.0	3.5	5.8	5.8
LnGrp Delay(d),s/veh	136.2	27.0	0.0	42.8	22.5	9.1	59.4	0.0	60.1	52.7	62.2	71.8
LnGrp LOS	F	C		D	C	A	E		E	D	E	E
Approach Vol, veh/h		2222			3230			114			416	
Approach Delay, s/veh		32.9			22.6			59.8			63.1	
Approach LOS		C			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	26.9	65.0		17.3	12.0	79.9		10.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	11.0	61.0		16.0	8.0	64.0		16.0
Max Q Clear Time (g_c+I1), s	9.1	42.2		12.8	10.0	59.9		5.8
Green Ext Time (p_c), s	1.8	13.5		0.5	0.0	4.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	30.0
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	114	1997	384	118	2709	155	40	28	21	235	153	123
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	120	2102	0	124	2852	163	42	29	22	204	221	129
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	264	3093	963	150	2766	861	101	56	42	238	250	213
Arrive On Green	0.15	0.60	0.00	0.08	0.53	0.53	0.06	0.06	0.06	0.13	0.13	0.13
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1004	762	1810	1900	1615
Grp Volume(v), veh/h	120	2102	0	124	2852	163	42	0	51	204	221	129
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1766	1810	1900	1615
Q Serve(g_s), s	7.3	33.0	0.0	8.1	64.0	6.3	2.7	0.0	3.4	13.2	13.7	9.0
Cycle Q Clear(g_c), s	7.3	33.0	0.0	8.1	64.0	6.3	2.7	0.0	3.4	13.2	13.7	9.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	264	3093	963	150	2766	861	101	0	98	238	250	213
V/C Ratio(X)	0.45	0.68	0.00	0.83	1.03	0.19	0.42	0.00	0.52	0.86	0.88	0.61
Avail Cap(c_a), veh/h	264	3093	963	166	2766	861	241	0	235	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	46.9	16.4	0.0	54.2	28.0	14.5	54.8	0.0	55.1	51.0	51.2	49.2
Incr Delay (d2), s/veh	1.2	1.2	0.0	25.8	25.7	0.1	2.7	0.0	4.2	24.7	28.4	4.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	15.9	0.0	5.1	36.8	2.8	1.4	0.0	1.8	8.3	9.2	4.3
LnGrp Delay(d),s/veh	48.1	17.7	0.0	80.0	53.7	14.6	57.5	0.0	59.3	75.7	79.6	53.9
LnGrp LOS	D	B		F	F	B	E		E	E	E	D
Approach Vol, veh/h		2222			3139			93			554	
Approach Delay, s/veh		19.3			52.7			58.5			72.2	
Approach LOS		B			D			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	14.0	75.6		19.8	21.5	68.0		10.7
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	10.0	61.0		16.0	8.0	64.0		16.0
Max Q Clear Time (g_c+I1), s	10.1	35.0		15.7	9.3	66.0		5.4
Green Ext Time (p_c), s	0.0	17.5		0.1	0.0	0.0		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	42.2
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	115	2000	285	118	2709	155	40	28	21	103	152	123
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	121	2105	0	124	2852	163	42	29	22	108	160	129
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	314	3236	1007	150	2766	861	101	56	42	189	198	168
Arrive On Green	0.17	0.62	0.00	0.08	0.53	0.53	0.06	0.06	0.06	0.10	0.10	0.10
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1004	762	1810	1900	1615
Grp Volume(v), veh/h	121	2105	0	124	2852	163	42	0	51	108	160	129
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1766	1810	1900	1615
Q Serve(g_s), s	7.1	30.8	0.0	8.1	64.0	6.3	2.7	0.0	3.4	6.8	9.9	9.3
Cycle Q Clear(g_c), s	7.1	30.8	0.0	8.1	64.0	6.3	2.7	0.0	3.4	6.8	9.9	9.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.43	1.00		1.00
Lane Grp Cap(c), veh/h	314	3236	1007	150	2766	861	101	0	98	189	198	168
V/C Ratio(X)	0.39	0.65	0.00	0.83	1.03	0.19	0.42	0.00	0.52	0.57	0.81	0.77
Avail Cap(c_a), veh/h	314	3236	1007	166	2766	861	241	0	235	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.9	14.3	0.0	54.2	28.0	14.5	54.8	0.0	55.1	51.2	52.6	52.3
Incr Delay (d2), s/veh	0.8	1.0	0.0	25.8	25.7	0.1	2.7	0.0	4.2	2.7	13.9	11.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	14.9	0.0	5.1	36.8	2.8	1.4	0.0	1.8	3.6	6.0	4.7
LnGrp Delay(d),s/veh	44.7	15.3	0.0	80.0	53.7	14.6	57.5	0.0	59.3	53.9	66.5	64.1
LnGrp LOS	D	B		F	F	B	E		E	D	E	E
Approach Vol, veh/h		2226			3139			93			397	
Approach Delay, s/veh		16.9			52.7			58.5			62.3	
Approach LOS		B			D			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	14.0	78.9		16.5	24.8	68.0		10.7
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	11.0	61.0		16.0	8.0	64.0		16.0
Max Q Clear Time (g_c+I1), s	10.1	32.8		11.9	9.1	66.0		5.4
Green Ext Time (p_c), s	0.0	18.5		0.6	0.0	0.0		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	39.8
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 3

E/W STREET : CACTUS AVE
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	129	14	142	0	142	41	183	183	176	0	176
EB Thru	1479	154	1633	0	1633	1420	3053	3053	2554	0	2554
EB Right	22	3	24	0	24	0	24	24	36	0	36
WB Left	15	2	17	0	17	0	17	17	33	0	33
WB Thru	1609	168	1776	21	1797	986	2762	2783	2203	-35	2168
WB Right	68	8	75	0	75	0	75	75	217	0	217
ELSWORTH ST											
NB Left	148	16	163	4	167	0	163	167	482	-2	480
NB Thru	58	7	64	0	64	0	64	64	125	0	125
NB Right	52	6	57	0	57	0	57	57	165	0	165
SB Left	118	13	130	142	272	0	130	272	199	53	252
SB Thru	34	4	38	4	42	0	38	42	27	-14	13
SB Right	88	10	97	4	101	74	171	175	188	-2	186
TOTALS	**3820**	**405**	**4216**	**175**	**4391**	**2521**	**6737**	**6912**	**6405**	**0**	**6405**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 3

E/W STREET : CACTUS AVE
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	129	14	142	4	146	41	183	187	176	-14	162
EB Thru	1479	154	1633	22	1655	1420	3053	3075	2554	-67	2487
EB Right	22	3	24	4	28	0	24	28	36	-14	22
WB Left	15	2	17	0	17	0	17	17	33	0	33
WB Thru	1609	168	1776	21	1797	986	2762	2783	2203	-35	2168
WB Right	68	8	75	0	75	0	75	75	217	0	217
ELSWORTH ST											
NB Left	148	16	163	4	167	0	163	167	482	-2	480
NB Thru	58	7	64	0	64	0	64	64	125	0	125
NB Right	52	6	57	0	57	0	57	57	165	0	165
SB Left	118	13	130	0	130	0	130	130	199	0	199
SB Thru	34	4	38	0	38	0	38	38	27	0	27
SB Right	88	10	97	4	101	74	171	175	188	-2	186
TOTALS	**3820**	**405**	**4216**	**59**	**4275**	**2521**	**6737**	**6796**	**6405**	**-134**	**6271**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	3 OF 3

E/W STREET : CACTUS AVE
CONDITION : PM PEAK HOUR
N/S STREET : ELSWORTH ST
PHF : 0.98

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
0	0	0	1	0	0	1	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	4	0	0	1	0	0	7	0
0	6	0	0	3	0	0	6	0
0	1	0	0	2	0	0	3	0
0	8	0	0	0	0	0	10	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	4	0	0	1	0	0	4	0
0	6	0	0	2	0	0	3	0
0	4	0	0	3	0	0	3	0
0	5	1	0	2	0	0	5	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
15	10	31	14	11	36	16	332	4	6	341	30
23	6	30	13	19	41	19	356	5	6	355	29
20	9	32	16	20	47	16	373	2	5	319	34
15	9	25	9	8	24	17	395	4	5	338	33

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
CACTUS AVE				**3.0**
EB LEFT	1	126	**127**	**129**
EB THRU	42	1353	**1395**	**1479**
EB RIGHT	0	22	**22**	**22**
WB LEFT	0	15	**15**	**15**
WB THRU	51	1456	**1507**	**1609**
WB RIGHT	0	68	**68**	**68**
ELSWORTH ST				
NB LEFT	0	148	**148**	**148**
NB THRU	0	58	**58**	**58**
NB RIGHT	0	52	**52**	**52**
SB LEFT	0	118	**118**	**118**
SB THRU	0	34	**34**	**34**
SB RIGHT	5	73	**78**	**88**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: ELSWORTH ST
EAST-WEST STREET: CACTUS AVE
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 04:00PM

NORTH LEG

TOTAL: 230

Rt	Thru	Lt	
78	34	118	Total
16	10	31	1st
23	6	30	2nd
22	9	32	3rd
17	9	25	4th

EAST LEG TOTAL: 1,590

	1st	2nd	3rd	4th	Total
Rt	16	19	16	17	68
Thru	344	371	379	413	1507
Lt	4	5	2	4	15

WEST LEG TOTAL: 1,544

Total	1st	2nd	3rd	4th	
127	30	29	34	34	Lt
1395	350	366	329	350	Thru
22	6	6	5	5	Rt

PEAK HOUR FACTORS

NORTH LEG = 0.91
SOUTH LEG = 0.78
EAST LEG = 0.92
WEST LEG = 0.96

ALL LEGS = 0.98

SOUTH LEG

TOTAL: 258

	Lt	Thru	Rt
1st	36	11	14
2nd	41	19	13
3rd	47	20	16
4th	24	8	9
Total	148	58	52

HOUR TOTAL: 3,622

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : ELSWORTH ST — MORENO VALLEY
EAST-WEST STREET : CACTUS AVE — 09-30-15
BEGINNING TIME : 04:00PM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
NORTH LEG												
15	10	31	0	0	0	1	0	0	0	0	0	57
23	6	30	0	0	0	0	0	0	0	0	0	59
20	9	32	2	0	0	0	0	0	0	0	0	63
15	9	25	0	0	0	1	0	0	1	0	0	51
13	7	30	0	0	0	1	0	0	0	0	0	51
8	6	25	1	0	0	0	0	0	0	0	0	40
25	4	27	0	0	0	0	0	0	1	1	0	58
18	6	22	0	0	0	0	0	0	0	0	0	46
137	57	222	3	0	0	3	0	0	2	1	0	425
SOUTH LEG												
14	11	36	0	0	0	0	0	0	0	0	0	61
13	19	41	0	0	0	0	0	0	0	0	0	73
16	20	47	0	0	0	0	0	0	0	0	0	83
9	8	24	0	0	0	0	0	0	0	0	0	41
14	5	22	0	0	0	0	0	0	0	0	0	41
11	1	21	0	0	0	1	0	0	0	0	0	34
6	7	21	0	0	0	0	0	0	0	1	0	35
10	10	20	0	0	0	0	0	0	0	0	0	40
93	81	232	0	0	0	1	0	0	0	1	0	408
EAST LEG												
16	332	4	0	4	0	0	1	0	0	7	0	364
19	356	5	0	6	0	0	3	0	0	6	0	395
16	373	2	0	1	0	0	2	0	0	3	0	397
17	395	4	0	8	0	0	0	0	0	10	0	434
15	296	5	0	2	0	0	0	0	0	3	0	321
12	302	5	0	2	0	1	2	0	0	2	0	326
14	324	2	0	3	0	0	3	0	0	2	1	349
9	283	6	0	7	0	0	1	0	0	5	0	311
118	2661	33	0	33	0	1	12	0	0	38	1	2897
WEST LEG												
6	341	30	0	4	0	0	1	0	0	4	0	386
6	355	29	0	6	0	0	2	0	0	3	0	401
5	319	34	0	4	0	0	3	0	0	3	0	368
5	338	33	0	5	1	0	2	0	0	5	0	389
1	380	32	0	7	1	0	1	0	0	3	0	425
2	348	30	0	2	0	0	0	0	0	9	0	391
2	385	31	0	2	0	0	1	0	0	3	0	424
2	317	26	0	8	0	0	1	0	0	6	0	360
29	2783	245	0	38	2	0	11	0	0	36	0	3144

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: ELSWORTH ST

EAST-WEST STREET: CACTUS AVE

TIME: 04:00PM-05:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
78	34	118	Total
16	10	31	1st
23	6	30	2nd
22	9	32	3rd
17	9	25	4th

	1st	2nd	3rd	4th	Total
Rt	16	19	16	17	68
Thru	344	371	379	413	1507
Lt	4	5	2	4	15

Total	1st	2nd	3rd	4th	
127	30	29	34	34	Lt
1395	350	366	329	350	Thru
22	6	6	5	5	Rt

	Lt	Thru	Rt
1st	36	11	14
2nd	41	19	13
3rd	47	20	16
4th	24	8	9
Total	148	58	52

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: ELSWORTH ST

EAST-WEST STREET: CACTUS AVE

TIME: 05:00PM-06:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
67	24	104	Total
14	7	30	1st
9	6	25	2nd
26	5	27	3rd
18	6	22	4th

	1st	2nd	3rd	4th	Total
Rt	15	13	14	9	51
Thru	301	308	332	296	1237
Lt	5	5	3	6	19

Total	1st	2nd	3rd	4th	
120	33	30	31	26	Lt
1473	391	359	391	332	Thru
7	1	2	2	2	Rt

	Lt	Thru	Rt
1st	22	5	14
2nd	21	1	12
3rd	21	8	6
4th	20	10	10
Total	84	24	42

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/22/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	129	1479	22	15	1609	68	148	58	52	118	34	88
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	132	1509	0	15	1642	69	132	86	53	78	94	90
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	549	2766	861	289	2022	630	177	108	66	137	144	122
Arrive On Green	0.30	0.53	0.00	0.16	0.39	0.39	0.10	0.10	0.10	0.08	0.08	0.08
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1101	679	1810	1900	1615
Grp Volume(v), veh/h	132	1509	0	15	1642	69	132	0	139	78	94	90
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1780	1810	1900	1615
Q Serve(g_s), s	6.6	23.0	0.0	0.8	33.9	3.3	8.5	0.0	9.2	5.0	5.8	6.5
Cycle Q Clear(g_c), s	6.6	23.0	0.0	0.8	33.9	3.3	8.5	0.0	9.2	5.0	5.8	6.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.38	1.00		1.00
Lane Grp Cap(c), veh/h	549	2766	861	289	2022	630	177	0	174	137	144	122
V/C Ratio(X)	0.24	0.55	0.00	0.05	0.81	0.11	0.75	0.00	0.80	0.57	0.65	0.74
Avail Cap(c_a), veh/h	549	2766	861	289	2377	740	256	0	252	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.4	18.4	0.0	42.7	32.7	23.3	52.7	0.0	53.0	53.6	53.9	54.3
Incr Delay (d2), s/veh	0.2	0.8	0.0	0.1	1.9	0.1	6.7	0.0	10.8	3.7	4.9	8.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	11.1	0.0	0.4	16.5	1.5	4.6	0.0	5.0	2.6	3.2	3.2
LnGrp Delay(d),s/veh	31.7	19.2	0.0	42.8	34.6	23.4	59.4	0.0	63.8	57.2	58.9	62.6
LnGrp LOS	C	B		D	C	C	E		E	E	E	E
Approach Vol, veh/h		1641			1726			271			262	
Approach Delay, s/veh		20.2			34.2			61.6			59.6	
Approach LOS		C			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	23.2	68.0		13.1	40.4	50.8		15.7
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	64.0		16.0	16.0	55.0		17.0
Max Q Clear Time (g_c+I1), s	2.8	25.0		8.5	8.6	35.9		11.2
Green Ext Time (p_c), s	0.0	13.2		0.5	0.2	10.9		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	31.9
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/29/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	142	1633	24	17	1776	75	163	64	57	130	38	97
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	145	1666	0	17	1812	77	144	95	58	86	105	99
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	487	2723	848	279	2125	661	192	117	72	148	155	132
Arrive On Green	0.27	0.52	0.00	0.15	0.41	0.41	0.11	0.11	0.11	0.08	0.08	0.08
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1106	675	1810	1900	1615
Grp Volume(v), veh/h	145	1666	0	17	1812	77	144	0	153	86	105	99
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1781	1810	1900	1615
Q Serve(g_s), s	7.6	27.0	0.0	1.0	38.0	3.5	9.3	0.0	10.1	5.5	6.4	7.2
Cycle Q Clear(g_c), s	7.6	27.0	0.0	1.0	38.0	3.5	9.3	0.0	10.1	5.5	6.4	7.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.38	1.00		1.00
Lane Grp Cap(c), veh/h	487	2723	848	279	2125	661	192	0	189	148	155	132
V/C Ratio(X)	0.30	0.61	0.00	0.06	0.85	0.12	0.75	0.00	0.81	0.58	0.68	0.75
Avail Cap(c_a), veh/h	487	2723	848	279	2291	713	271	0	267	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.8	19.9	0.0	43.4	32.1	22.0	52.1	0.0	52.4	53.1	53.6	53.9
Incr Delay (d2), s/veh	0.3	1.0	0.0	0.1	3.2	0.1	7.0	0.0	11.7	3.6	5.1	8.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	13.1	0.0	0.5	18.7	1.6	5.0	0.0	5.6	2.9	3.6	3.5
LnGrp Delay(d),s/veh	35.2	21.0	0.0	43.4	35.3	22.0	59.1	0.0	64.2	56.8	58.7	62.3
LnGrp LOS	D	C		D	D	C	E		E	E	E	E
Approach Vol, veh/h		1811			1906			297			290	
Approach Delay, s/veh		22.1			34.8			61.7			59.3	
Approach LOS		C			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	12.5	67.0		13.8	36.3	53.2		16.7
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	63.0		16.0	17.0	53.0		18.0
Max Q Clear Time (g_c+I1), s	13.0	29.0		9.2	9.6	40.0		12.1
Green Ext Time (p_c), s	0.1	14.6		0.6	0.2	9.1		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	33.0
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1546

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	142	1633	24	17	1797	75	167	64	57	272	42	101
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	145	1666	0	17	1834	77	146	98	58	309	0	103
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	2	0	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	436	3257	1014	46	2139	666	194	120	71	385	0	172
Arrive On Green	0.24	0.63	0.00	0.03	0.41	0.41	0.11	0.11	0.11	0.11	0.00	0.11
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1120	663	3619	0	1615
Grp Volume(v), veh/h	145	1666	0	17	1834	77	146	0	156	309	0	103
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1783	1810	0	1615
Q Serve(g_s), s	7.9	21.1	0.0	1.1	38.6	3.5	9.4	0.0	10.3	10.0	0.0	7.3
Cycle Q Clear(g_c), s	7.9	21.1	0.0	1.1	38.6	3.5	9.4	0.0	10.3	10.0	0.0	7.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	436	3257	1014	46	2139	666	194	0	191	385	0	172
V/C Ratio(X)	0.33	0.51	0.00	0.37	0.86	0.12	0.75	0.00	0.82	0.80	0.00	0.60
Avail Cap(c_a), veh/h	436	3257	1014	106	2291	713	256	0	253	543	0	242
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	37.6	12.2	0.0	57.6	32.1	21.8	52.0	0.0	52.4	52.4	0.0	51.2
Incr Delay (d2), s/veh	0.4	0.6	0.0	5.0	3.3	0.1	8.6	0.0	14.4	5.8	0.0	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	10.2	0.0	0.6	19.0	1.6	5.2	0.0	5.8	5.3	0.0	3.4
LnGrp Delay(d),s/veh	38.0	12.8	0.0	62.5	35.4	21.8	60.6	0.0	66.8	58.2	0.0	54.5
LnGrp LOS	D	B		E	D	C	E		E	E		D
Approach Vol, veh/h		1811			1928			302			412	
Approach Delay, s/veh		14.8			35.1			63.8			57.2	
Approach LOS		B			D			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.0	79.4		16.8	32.9	53.5		16.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	62.0		18.0	16.0	53.0		17.0
Max Q Clear Time (g_c+I1), s	3.1	23.1		12.0	9.9	40.6		12.3
Green Ext Time (p_c), s	0.0	16.1		0.8	4.6	8.9		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	30.8
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1547

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

01/04/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	156	1655	28	17	1797	75	167	64	57	130	38	101
Future Volume (veh/h)	156	1655	28	17	1797	75	167	64	57	130	38	101
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	159	1689	0	17	1834	77	146	98	58	86	105	103
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	188	3371	1049	46	2963	922	195	121	71	152	159	135
Arrive On Green	0.10	0.65	0.00	0.03	0.57	0.57	0.11	0.11	0.11	0.08	0.08	0.08
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1120	663	1810	1900	1615
Grp Volume(v), veh/h	159	1689	0	17	1834	77	146	0	156	86	105	103
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1783	1810	1900	1615
Q Serve(g_s), s	10.4	20.3	0.0	1.1	28.1	2.6	9.4	0.0	10.3	5.5	6.4	7.5
Cycle Q Clear(g_c), s	10.4	20.3	0.0	1.1	28.1	2.6	9.4	0.0	10.3	5.5	6.4	7.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	188	3371	1049	46	2963	922	195	0	192	152	159	135
V/C Ratio(X)	0.85	0.50	0.00	0.37	0.62	0.08	0.75	0.00	0.81	0.57	0.66	0.76
Avail Cap(c_a), veh/h	271	3371	1049	106	2963	922	271	0	267	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.8	10.9	0.0	57.6	17.1	11.6	52.0	0.0	52.4	52.9	53.3	53.8
Incr Delay (d2), s/veh	15.1	0.5	0.0	5.0	0.4	0.0	7.1	0.0	12.3	3.3	4.6	8.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	9.7	0.0	0.6	13.5	1.2	5.1	0.0	5.7	2.9	3.6	3.7
LnGrp Delay(d),s/veh	67.9	11.4	0.0	62.5	17.5	11.6	59.1	0.0	64.6	56.2	57.9	62.2
LnGrp LOS	E	B		E	B	B	E		E	E	E	E
Approach Vol, veh/h		1848			1928			302			294	
Approach Delay, s/veh		16.3			17.6			62.0			58.9	
Approach LOS		B			B			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.0	82.0		14.1	16.5	72.5		16.9
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	63.0		16.0	18.0	52.0		18.0
Max Q Clear Time (g_c+I1), s	3.1	22.3		9.5	12.4	30.1		12.3
Green Ext Time (p_c), s	0.0	35.5		0.6	0.2	20.2		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	22.9
HCM 2010 LOS	C

Notes

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	183	3053	24	17	2762	75	163	64	57	130	38	171
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	199	3318	0	18	3002	82	154	101	62	91	111	186
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	213	3111	969	48	2637	821	199	121	75	236	248	211
Arrive On Green	0.12	0.60	0.00	0.03	0.51	0.51	0.11	0.11	0.11	0.13	0.13	0.13
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1103	677	1810	1900	1615
Grp Volume(v), veh/h	199	3318	0	18	3002	82	154	0	163	91	111	186
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1780	1810	1900	1615
Q Serve(g_s), s	13.1	72.0	0.0	1.2	61.0	3.2	9.9	0.0	10.8	5.5	6.5	13.6
Cycle Q Clear(g_c), s	13.1	72.0	0.0	1.2	61.0	3.2	9.9	0.0	10.8	5.5	6.5	13.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.38	1.00		1.00
Lane Grp Cap(c), veh/h	213	3111	969	48	2637	821	199	0	196	236	248	211
V/C Ratio(X)	0.93	1.07	0.00	0.38	1.14	0.10	0.77	0.00	0.83	0.39	0.45	0.88
Avail Cap(c_a), veh/h	213	3111	969	106	2637	821	241	0	237	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.5	24.0	0.0	57.5	29.5	15.3	51.9	0.0	52.3	47.8	48.2	51.3
Incr Delay (d2), s/veh	43.3	37.3	0.0	4.9	67.5	0.1	11.9	0.0	18.6	1.0	1.3	31.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	44.7	0.0	0.7	45.3	1.4	5.6	0.0	6.3	2.8	3.5	7.9
LnGrp Delay(d),s/veh	95.8	61.3	0.0	62.3	97.0	15.3	63.9	0.0	70.9	48.8	49.4	82.9
LnGrp LOS	F	F		E	F	B	E		E	D	D	F
Approach Vol, veh/h		3517			3102			317			388	
Approach Delay, s/veh		63.3			94.7			67.5			65.3	
Approach LOS		E			F			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.2	76.0		19.7	18.1	65.0		17.2
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	65.0		16.0	11.0	61.0		16.0
Max Q Clear Time (g_c+I1), s	13.2	74.0		15.6	15.1	63.0		12.8
Green Ext Time (p_c), s	0.0	0.0		0.1	0.0	0.0		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	76.9
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1550

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	183	3053	24	17	2783	75	167	64	57	272	42	175
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	199	3318	0	18	3025	82	157	105	62	329	0	190
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	2	0	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	206	3090	962	48	2637	821	203	126	74	480	0	214
Arrive On Green	0.11	0.60	0.00	0.03	0.51	0.51	0.11	0.11	0.11	0.13	0.00	0.13
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1121	662	3619	0	1615
Grp Volume(v), veh/h	199	3318	0	18	3025	82	157	0	167	329	0	190
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1783	1810	0	1615
Q Serve(g_s), s	13.1	71.5	0.0	1.2	61.0	3.2	10.1	0.0	11.0	10.4	0.0	13.9
Cycle Q Clear(g_c), s	13.1	71.5	0.0	1.2	61.0	3.2	10.1	0.0	11.0	10.4	0.0	13.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	206	3090	962	48	2637	821	203	0	200	480	0	214
V/C Ratio(X)	0.97	1.07	0.00	0.38	1.15	0.10	0.77	0.00	0.84	0.69	0.00	0.89
Avail Cap(c_a), veh/h	206	3090	962	106	2637	821	241	0	238	483	0	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.9	24.3	0.0	57.5	29.5	15.3	51.8	0.0	52.2	49.7	0.0	51.2
Incr Delay (d2), s/veh	53.0	40.2	0.0	4.9	71.2	0.1	12.3	0.0	19.4	4.0	0.0	32.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.6	45.3	0.0	0.7	46.2	1.4	5.8	0.0	6.5	5.5	0.0	8.1
LnGrp Delay(d),s/veh	105.9	64.4	0.0	62.3	100.7	15.3	64.1	0.0	71.6	53.7	0.0	84.0
LnGrp LOS	F	F		E	F	B	E		E	D		F
Approach Vol, veh/h		3517			3125			324			519	
Approach Delay, s/veh		66.8			98.3			68.0			64.8	
Approach LOS		E			F			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.2	75.5		19.9	17.7	65.0		17.4
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	65.0		16.0	11.0	61.0		16.0
Max Q Clear Time (g_c+I1), s	3.2	73.5		15.9	15.1	63.0		13.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	79.8
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1551

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	187	3075	28	17	2783	75	167	64	57	130	38	175
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	203	3342	0	18	3025	82	157	105	62	91	111	190
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	206	3091	962	48	2637	821	203	126	74	240	252	214
Arrive On Green	0.11	0.60	0.00	0.03	0.51	0.51	0.11	0.11	0.11	0.13	0.13	0.13
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1121	662	1810	1900	1615
Grp Volume(v), veh/h	203	3342	0	18	3025	82	157	0	167	91	111	190
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1783	1810	1900	1615
Q Serve(g_s), s	13.4	71.5	0.0	1.2	61.0	3.2	10.1	0.0	11.0	5.5	6.5	13.9
Cycle Q Clear(g_c), s	13.4	71.5	0.0	1.2	61.0	3.2	10.1	0.0	11.0	5.5	6.5	13.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	206	3091	962	48	2637	821	203	0	200	240	252	214
V/C Ratio(X)	0.99	1.08	0.00	0.38	1.15	0.10	0.77	0.00	0.84	0.38	0.44	0.89
Avail Cap(c_a), veh/h	206	3091	962	106	2637	821	241	0	238	241	253	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.1	24.2	0.0	57.5	29.5	15.3	51.8	0.0	52.2	47.5	48.0	51.2
Incr Delay (d2), s/veh	58.4	43.2	0.0	4.9	71.2	0.1	12.3	0.0	19.4	1.0	1.2	32.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.1	46.1	0.0	0.7	46.2	1.4	5.8	0.0	6.5	2.8	3.5	8.1
LnGrp Delay(d),s/veh	111.4	67.4	0.0	62.3	100.7	15.3	64.1	0.0	71.6	48.5	49.2	84.1
LnGrp LOS	F	F		E	F	B	E		E	D	D	F
Approach Vol, veh/h		3545			3125			324			392	
Approach Delay, s/veh		69.9			98.3			68.0			65.9	
Approach LOS		E			F			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.2	75.5		19.9	17.7	65.0		17.4
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	65.0		16.0	11.0	61.0		16.0
Max Q Clear Time (g_c+I1), s	3.2	73.5		15.9	15.4	63.0		13.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	81.6
HCM 2010 LOS	F

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	176	2554	36	33	2203	217	482	125	165	199	27	188
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	185	2688	0	35	2319	228	406	273	174	229	0	198
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	2	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	181	2515	783	73	2204	686	377	226	144	483	0	215
Arrive On Green	0.10	0.48	0.00	0.04	0.43	0.43	0.21	0.21	0.21	0.13	0.00	0.13
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1086	692	3619	0	1615
Grp Volume(v), veh/h	185	2688	0	35	2319	228	406	0	447	229	0	198
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1778	1810	0	1615
Q Serve(g_s), s	12.0	58.2	0.0	2.3	51.0	11.3	25.0	0.0	25.0	7.0	0.0	14.5
Cycle Q Clear(g_c), s	12.0	58.2	0.0	2.3	51.0	11.3	25.0	0.0	25.0	7.0	0.0	14.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.39	1.00		1.00
Lane Grp Cap(c), veh/h	181	2515	783	73	2204	686	377	0	370	483	0	215
V/C Ratio(X)	1.02	1.07	0.00	0.48	1.05	0.33	1.08	0.00	1.21	0.47	0.00	0.92
Avail Cap(c_a), veh/h	181	2515	783	106	2204	686	377	0	370	483	0	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.0	30.9	0.0	56.4	34.5	23.1	47.5	0.0	47.5	48.1	0.0	51.4
Incr Delay (d2), s/veh	72.9	39.7	0.0	4.9	34.6	0.3	68.4	0.0	115.9	0.7	0.0	39.8
Initial Q Delay(d3),s/veh	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.6	36.9	0.0	1.2	31.3	5.1	19.6	0.0	24.2	3.5	0.0	8.9
LnGrp Delay(d),s/veh	127.1	70.6	0.0	61.2	69.1	23.4	115.9	0.0	163.4	48.8	0.0	91.1
LnGrp LOS	F	F		E	F	C	F		F	D		F
Approach Vol, veh/h		2873			2582			853			427	
Approach Delay, s/veh		74.2			64.9			140.8			68.5	
Approach LOS		E			E			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.8	62.2		20.0	16.0	55.0		29.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	56.0		16.0	12.0	51.0		25.0
Max Q Clear Time (g_c+I1), s	4.3	60.2		16.5	14.0	53.0		27.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	78.7
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

6/30/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	176	2554	36	33	2168	217	480	125	165	252	13	186
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	185	2688	0	35	2282	228	406	271	174	275	0	196
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	2	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	181	2515	783	73	2204	686	377	225	145	483	0	215
Arrive On Green	0.10	0.48	0.00	0.04	0.43	0.43	0.21	0.21	0.21	0.13	0.00	0.13
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1082	695	3619	0	1615
Grp Volume(v), veh/h	185	2688	0	35	2282	228	406	0	445	275	0	196
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1777	1810	0	1615
Q Serve(g_s), s	12.0	58.2	0.0	2.3	51.0	11.3	25.0	0.0	25.0	8.6	0.0	14.4
Cycle Q Clear(g_c), s	12.0	58.2	0.0	2.3	51.0	11.3	25.0	0.0	25.0	8.6	0.0	14.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.39	1.00		1.00
Lane Grp Cap(c), veh/h	181	2515	783	73	2204	686	377	0	370	483	0	215
V/C Ratio(X)	1.02	1.07	0.00	0.48	1.04	0.33	1.08	0.00	1.20	0.57	0.00	0.91
Avail Cap(c_a), veh/h	181	2515	783	106	2204	686	377	0	370	483	0	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.0	30.9	0.0	56.4	34.5	23.1	47.5	0.0	47.5	48.8	0.0	51.3
Incr Delay (d2), s/veh	72.9	39.7	0.0	4.9	29.0	0.3	68.4	0.0	113.9	1.6	0.0	37.7
Initial Q Delay(d3),s/veh	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.6	36.9	0.0	1.2	30.2	5.1	19.6	0.0	24.0	4.4	0.0	8.7
LnGrp Delay(d),s/veh	127.1	70.6	0.0	61.2	63.5	23.4	115.9	0.0	161.4	50.4	0.0	89.0
LnGrp LOS	F	F		E	F	C	F		F	D		F
Approach Vol, veh/h		2873			2545			851			471	
Approach Delay, s/veh		74.2			59.8			139.7			66.4	
Approach LOS		E			E			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.8	62.2		20.0	16.0	55.0		29.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.8	56.0		16.0	12.0	51.0		25.0
Max Q Clear Time (g_c+I1), s	14.3	60.2		16.4	14.0	53.0		27.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	76.5
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1554

HCM 2010 Signalized Intersection Summary
4: March Airforce Base/Elsworth Street & Cactus Avenue

7/21/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	162	2487	22	33	2168	217	480	125	165	199	27	186
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	171	2618	0	35	2282	228	406	271	174	229	0	196
Adj No. of Lanes	1	3	1	1	3	1	1	1	0	2	0	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	166	2472	770	73	2204	686	392	235	151	483	0	215
Arrive On Green	0.09	0.48	0.00	0.04	0.43	0.43	0.22	0.22	0.22	0.13	0.00	0.13
Sat Flow, veh/h	1810	5187	1615	1810	5187	1615	1810	1082	695	3619	0	1615
Grp Volume(v), veh/h	171	2618	0	35	2282	228	406	0	445	229	0	196
Grp Sat Flow(s),veh/h/ln	1810	1729	1615	1810	1729	1615	1810	0	1777	1810	0	1615
Q Serve(g_s), s	11.0	57.2	0.0	2.3	51.0	11.3	26.0	0.0	26.0	7.0	0.0	14.4
Cycle Q Clear(g_c), s	11.0	57.2	0.0	2.3	51.0	11.3	26.0	0.0	26.0	7.0	0.0	14.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.39	1.00		1.00
Lane Grp Cap(c), veh/h	166	2472	770	73	2204	686	392	0	385	483	0	215
V/C Ratio(X)	1.03	1.06	0.00	0.48	1.04	0.33	1.04	0.00	1.16	0.47	0.00	0.91
Avail Cap(c_a), veh/h	166	2472	770	106	2204	686	392	0	385	483	0	215
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.5	31.4	0.0	56.4	34.5	23.1	47.0	0.0	47.0	48.1	0.0	51.3
Incr Delay (d2), s/veh	78.2	36.2	0.0	4.9	29.0	0.3	54.9	0.0	95.5	0.7	0.0	37.7
Initial Q Delay(d3),s/veh	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.1	35.5	0.0	1.2	30.2	5.1	18.9	0.0	22.9	3.5	0.0	8.7
LnGrp Delay(d),s/veh	133.0	67.6	0.0	61.2	63.5	23.4	101.9	0.0	142.5	48.8	0.0	89.0
LnGrp LOS	F	F		E	F	C	F		F	D		F
Approach Vol, veh/h		2789			2545			851			425	
Approach Delay, s/veh		71.7			59.8			123.1			67.3	
Approach LOS		E			E			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.8	61.2		20.0	15.0	55.0		30.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	7.0	55.0		16.0	11.0	51.0		26.0
Max Q Clear Time (g_c+I1), s	4.3	59.2		16.4	13.0	53.0		28.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	73.5
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

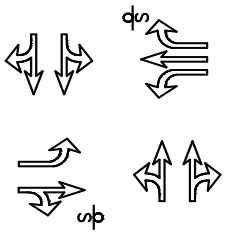
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 3

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



EXISTING GEOMETRICS

PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	8	1	9	23	32	0	9	32	20	3	23
EB Thru	1	1	2	0	2	0	2	2	45	0	45
EB Right	7	1	8	156	164	0	8	164	26	132	158
WB Left	5	1	6	0	6	23	29	29	34	0	34
WB Thru	1	1	2	0	2	0	2	2	61	0	61
WB Right	6	1	7	0	7	0	7	7	27	0	27
ELSWORTH ST											
NB Left	5	1	6	0	6	0	6	6	51	0	51
NB Thru	320	34	354	0	354	41	395	395	203	0	203
NB Right	6	1	7	0	7	41	48	48	49	0	49
SB Left	9	1	10	0	10	0	10	10	66	0	66
SB Thru	218	23	241	5	246	23	264	269	338	-18	320
SB Right	9	1	10	21	31	0	10	31	67	-70	-3
TOTALS	**595**	**67**	**662**	**205**	**867**	**128**	**790**	**995**	**987**	**47**	**1034**

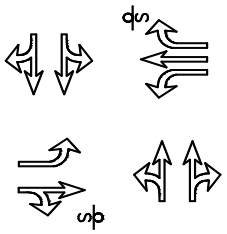
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 3

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS



EXISTING GEOMETRICS

PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	8	1	9	18	27	0	9	27	20	2	22
EB Thru	1	1	2	0	2	0	2	2	45	0	45
EB Right	7	1	8	0	8	0	8	8	26	0	26
WB Left	5	1	6	0	6	23	29	29	34	0	34
WB Thru	1	1	2	0	2	0	2	2	61	0	61
WB Right	6	1	7	0	7	0	7	7	27	0	27
ELSWORTH ST											
NB Left	5	1	6	0	6	0	6	6	51	0	51
NB Thru	320	34	354	5	359	41	395	400	203	5	208
NB Right	6	1	7	0	7	41	48	48	49	0	49
SB Left	9	1	10	0	10	0	10	10	66	0	66
SB Thru	218	23	241	5	246	23	264	269	338	-18	320
SB Right	9	1	10	21	31	0	10	31	67	-70	-3
TOTALS	**595**	**67**	**662**	**49**	**711**	**128**	**790**	**839**	**987**	**-81**	**906**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	3 OF 3

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR
PHF : 0.95

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	2	0	0	0	1
0	0	0	0	0	0	0	0	0
0	0	0	0	2	0	0	1	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	1	1	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
3	57	1	1	71	1	1	0	0	0	0	2
3	53	3	2	77	1	3	0	1	1	0	4
1	50	1	0	95	0	1	0	0	1	0	0
2	43	1	3	74	0	1	1	1	2	0	2

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
GOLDENCREST DR				**3.0**
EB LEFT	0	8	**8**	**8**
EB THRU	0	0	**0**	**1**
EB RIGHT	1	4	**5**	**7**
WB LEFT	1	2	**3**	**5**
WB THRU	0	1	**1**	**1**
WB RIGHT	0	6	**6**	**6**
ELSWORTH ST				
NB LEFT	1	2	**3**	**5**
NB THRU	1	317	**318**	**320**
NB RIGHT	0	6	**6**	**6**
SB LEFT	1	6	**7**	**9**
SB THRU	5	203	**208**	**218**
SB RIGHT	0	9	**9**	**9**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: ELSWORTH ST
EAST-WEST STREET: GOLDENCREST DR
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 07:30AM

NORTH LEG

TOTAL: 224

Rt	Thru	Lt	
9	208	7	Total
3	57	1	1st
3	55	4	2nd
1	50	1	3rd
2	46	1	4th

EAST LEG TOTAL: 10

	1st	2nd	3rd	4th	Total
Rt	1	3	1	1	6
Thru	0	0	0	1	1
Lt	0	1	0	2	3

WEST LEG TOTAL: 13

Total	1st	2nd	3rd	4th	
8	2	4	0	2	Lt
	0	0	0	0	Thru
5	1	1	1	2	Rt

PEAK HOUR FACTORS

NORTH LEG = 0.90
SOUTH LEG = 0.86
EAST LEG = 0.63
WEST LEG = 0.65

ALL LEGS = 0.95

SOUTH LEG

TOTAL: 327

	Lt	Thru	Rt
1st	1	71	1
2nd	1	77	2
3rd	0	95	0
4th	1	75	3
Total	3	318	6

HOUR TOTAL: 574

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : ELSWORTH ST — MORENO VALLEY

EAST-WEST STREET : GOLDENCREST DR

BEGINNING TIME : 07:00AM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4 (+) AXLE RT	4 (+) AXLE THRU	4 (+) AXLE LT	TOTALS
NORTH LEG												
3	42	2	0	0	0	0	2	0	0	0	0	49
3	53	3	0	0	0	0	0	0	1	0	0	60
3	57	1	0	0	0	0	0	0	0	0	0	61
3	53	3	0	0	0	0	2	0	0	0	1	62
1	50	1	0	0	0	0	0	0	0	0	0	52
2	43	1	0	0	0	0	2	0	0	1	0	49
2	26	1	0	0	0	0	3	0	0	1	0	33
2	36	0	0	0	0	0	0	0	0	0	0	38
19	360	12	0	0	0	0	9	0	1	2	1	404
SOUTH LEG												
2	54	2	0	0	0	0	0	0	0	0	0	58
2	64	2	0	1	0	0	0	0	0	1	0	70
1	71	1	0	0	0	0	0	0	0	0	0	73
2	77	1	0	0	0	0	0	0	0	0	0	80
0	95	0	0	0	0	0	0	0	0	0	0	95
3	74	0	0	0	0	0	1	1	0	0	0	79
4	81	1	0	1	0	0	0	0	0	0	0	87
2	66	1	0	0	0	0	0	0	0	0	0	69
16	582	8	0	2	0	0	1	1	0	1	0	611
EAST LEG												
1	0	0	0	0	0	0	0	0	0	0	0	1
1	2	1	0	0	0	0	0	0	0	0	0	4
1	0	0	0	0	0	0	0	0	0	0	0	1
3	0	1	0	0	0	0	0	0	0	0	0	4
1	0	0	0	0	0	0	0	0	0	0	0	1
1	1	1	0	0	0	0	0	0	0	0	1	4
2	0	1	0	0	0	0	0	0	0	0	0	3
1	0	0	0	0	0	0	0	0	0	0	0	1
11	3	4	0	0	0	0	0	0	0	0	1	19
WEST LEG												
1	0	1	0	0	0	0	0	0	0	0	0	2
1	0	0	0	0	0	0	0	0	0	0	0	1
0	0	2	0	0	0	0	0	0	1	0	0	3
1	0	4	0	0	0	0	0	0	0	0	0	5
1	0	0	0	0	0	0	0	0	0	0	0	1
2	0	2	0	0	0	0	0	0	0	0	0	4
3	0	1	0	0	0	0	0	0	1	0	0	5
0	0	1	0	0	0	0	0	0	0	0	0	1
9	0	11	0	0	0	0	0	0	2	0	0	22

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: EL8WORTH ST

EAST-WEST STREET: GOLDENCREST DR

TIME: 07:00AM-08:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
13	209	10	Total
3	44	2	1st
4	53	3	2nd
3	57	1	3rd
3	55	4	4th

	1st	2nd	3rd	4th	Total
Rt	1	1	1	3	6
Thru	0	2	0	0	2
Lt	0	1	0	1	2

Total	1st	2nd	3rd	4th	
7	1	0	2	4	Lt
0	0	0	0	0	Thru
4	1	1	1	1	Rt

	Lt	Thru	Rt
1st	2	54	2
2nd	2	66	2
3rd	1	71	1
4th	1	77	2
Total	6	268	7

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: ELSWORTH ST

EAST-WEST STREET: GOLDENCREST DR

TIME: 08:00AM-09:00AM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
7	162	3	Total
1	50	1	1st
2	46	1	2nd
2	30	1	3rd
2	36	0	4th

	1st	2nd	3rd	4th	Total
Rt	1	1	2	1	5
Thru	0	1	0	0	1
Lt	0	2	1	0	3

Total	1st	2nd	3rd	4th	
4	0	2	1	1	Lt
0	0	0	0	0	Thru
7	1	2	4	0	Rt

	Lt	Thru	Rt
1st	0	95	0
2nd	1	75	3
3rd	1	82	4
4th	1	66	2
Total	3	318	9

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/22/2016

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	8	1	7	5	1	6	5	320	6	9	218	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	8	1	7	5	1	6	5	337	6	9	229	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	432	607	119	485	609	172	239	0	0	343	0	0
Stage 1	253	253	-	351	351	-	-	-	-	-	-	-
Stage 2	179	354	-	134	258	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	512	414	917	470	412	848	1340	-	-	1227	-	-
Stage 1	735	701	-	644	636	-	-	-	-	-	-	-
Stage 2	811	634	-	861	698	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	502	409	917	461	407	848	1340	-	-	1227	-	-
Mov Cap-2 Maneuver	502	409	-	461	407	-	-	-	-	-	-	-
Stage 1	731	695	-	641	633	-	-	-	-	-	-	-
Stage 2	800	631	-	846	692	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	11.2	0.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1340	-	-	502	794	461	407	848	1227	-	-
HCM Lane V/C Ratio	0.004	-	-	0.017	0.011	0.011	0.003	0.007	0.008	-	-
HCM Control Delay (s)	7.7	0	-	12.3	9.6	12.9	13.9	9.3	8	0	-
HCM Lane LOS	A	A	-	B	A	B	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	0	0	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/29/2016

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	9	2	8	6	2	7	6	354	7	10	241	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	9	2	8	6	2	7	6	373	7	11	254	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	480	673	132	538	674	190	264	0	0	380	0	0
Stage 1	280	280	-	389	389	-	-	-	-	-	-	-
Stage 2	200	393	-	149	285	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	474	379	899	431	379	826	1312	-	-	1190	-	-
Stage 1	709	683	-	612	612	-	-	-	-	-	-	-
Stage 2	789	609	-	844	679	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	462	373	899	420	373	826	1312	-	-	1190	-	-
Mov Cap-2 Maneuver	462	373	-	420	373	-	-	-	-	-	-	-
Stage 1	705	675	-	608	608	-	-	-	-	-	-	-
Stage 2	775	605	-	824	672	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	11.8	0.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1312	-	-	462	701	420	373	826	1190	-	-
HCM Lane V/C Ratio	0.005	-	-	0.021	0.015	0.015	0.006	0.009	0.009	-	-
HCM Control Delay (s)	7.8	0	-	13	10.2	13.7	14.7	9.4	8.1	0	-
HCM Lane LOS	A	A	-	B	B	B	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	0	0	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	32	2	164	6	2	7	6	354	7	10	246	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	34	2	173	6	2	7	6	373	7	11	259	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	496	689	146	541	702	190	292	0	0	380	0	0
Stage 1	296	296	-	389	389	-	-	-	-	-	-	-
Stage 2	200	393	-	152	313	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	461	371	881	429	365	826	1281	-	-	1190	-	-
Stage 1	694	672	-	612	612	-	-	-	-	-	-	-
Stage 2	789	609	-	841	661	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	449	365	881	339	359	826	1281	-	-	1190	-	-
Mov Cap-2 Maneuver	449	365	-	339	359	-	-	-	-	-	-	-
Stage 1	690	665	-	608	608	-	-	-	-	-	-	-
Stage 2	775	605	-	667	654	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	12.7	0.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1281	-	-	449	866	339	359	826	1190	-	-
HCM Lane V/C Ratio	0.005	-	-	0.075	0.202	0.019	0.006	0.009	0.009	-	-
HCM Control Delay (s)	7.8	0	-	13.7	10.2	15.8	15.1	9.4	8.1	0	-
HCM Lane LOS	A	A	-	B	B	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.8	0.1	0	0	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/5/2016

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	27	2	8	6	2	7	6	359	7	10	246	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	28	2	8	6	2	7	6	378	7	11	259	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	499	694	146	546	707	193	292	0	0	385	0	0
Stage 1	296	296	-	394	394	-	-	-	-	-	-	-
Stage 2	203	398	-	152	313	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	459	369	881	425	363	822	1281	-	-	1185	-	-
Stage 1	694	672	-	608	609	-	-	-	-	-	-	-
Stage 2	786	606	-	841	661	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	447	363	881	414	357	822	1281	-	-	1185	-	-
Mov Cap-2 Maneuver	447	363	-	414	357	-	-	-	-	-	-	-
Stage 1	690	665	-	604	605	-	-	-	-	-	-	-
Stage 2	772	602	-	821	654	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	11.9	0.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1281	-	-	447	685	414	357	822	1185	-	-
HCM Lane V/C Ratio	0.005	-	-	0.064	0.015	0.015	0.006	0.009	0.009	-	-
HCM Control Delay (s)	7.8	0	-	13.6	10.3	13.8	15.1	9.4	8.1	0	-
HCM Lane LOS	A	A	-	B	B	B	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0	0	0	0	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	9	2	8	29	2	7	6	395	48	10	264	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	10	2	9	32	2	8	7	429	52	11	287	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	543	809	149	634	788	241	298	0	0	482	0	0
Stage 1	314	314	-	468	468	-	-	-	-	-	-	-
Stage 2	229	495	-	166	320	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	427	317	877	368	326	766	1275	-	-	1091	-	-
Stage 1	677	660	-	550	565	-	-	-	-	-	-	-
Stage 2	759	549	-	825	656	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	414	311	877	357	320	766	1275	-	-	1091	-	-
Mov Cap-2 Maneuver	414	311	-	357	320	-	-	-	-	-	-	-
Stage 1	672	652	-	546	560	-	-	-	-	-	-	-
Stage 2	743	545	-	804	648	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	14.9	0.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1275	-	-	414	643	357	320	766	1091	-	-
HCM Lane V/C Ratio	0.005	-	-	0.024	0.017	0.088	0.007	0.01	0.01	-	-
HCM Control Delay (s)	7.8	0	-	13.9	10.7	16.1	16.3	9.7	8.3	0	-
HCM Lane LOS	A	A	-	B	B	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.3	0	0	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	32	2	164	29	2	7	6	395	48	10	269	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	35	2	178	32	2	8	7	429	52	11	292	34

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	560	826	163	637	816	241	326	0	0	482	0	0
Stage 1	331	331	-	468	468	-	-	-	-	-	-	-
Stage 2	229	495	-	169	348	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	415	310	859	366	314	766	1245	-	-	1091	-	-
Stage 1	662	649	-	550	565	-	-	-	-	-	-	-
Stage 2	759	549	-	822	638	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	402	304	859	284	308	766	1245	-	-	1091	-	-
Mov Cap-2 Maneuver	402	304	-	284	308	-	-	-	-	-	-	-
Stage 1	657	641	-	546	560	-	-	-	-	-	-	-
Stage 2	743	545	-	641	630	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	17.4	0.1	0.3
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1245	-	-	402	841	284	308	766	1091	-	-
HCM Lane V/C Ratio	0.005	-	-	0.087	0.215	0.111	0.007	0.01	0.01	-	-
HCM Control Delay (s)	7.9	0	-	14.8	10.4	19.3	16.8	9.7	8.3	0	-
HCM Lane LOS	A	A	-	B	B	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.8	0.4	0	0	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	27	2	8	29	2	7	6	400	48	10	269	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	29	2	9	32	2	8	7	435	52	11	292	34

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	563	831	163	643	822	243	326	0	0	487	0	0
Stage 1	331	331	-	474	474	-	-	-	-	-	-	-
Stage 2	232	500	-	169	348	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	413	307	859	362	311	764	1245	-	-	1086	-	-
Stage 1	662	649	-	545	561	-	-	-	-	-	-	-
Stage 2	756	546	-	822	638	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	400	301	859	351	305	764	1245	-	-	1086	-	-
Mov Cap-2 Maneuver	400	301	-	351	305	-	-	-	-	-	-	-
Stage 1	657	641	-	541	557	-	-	-	-	-	-	-
Stage 2	740	542	-	801	630	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.6	15.1	0.1	0.3
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1245	-	-	400	627	351	305	764	1086	-	-
HCM Lane V/C Ratio	0.005	-	-	0.073	0.017	0.09	0.007	0.01	0.01	-	-
HCM Control Delay (s)	7.9	0	-	14.7	10.8	16.3	16.9	9.8	8.3	0	-
HCM Lane LOS	A	A	-	B	B	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0.3	0	0	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	20	45	26	34	61	27	51	203	49	66	338	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	21	47	27	36	64	28	54	214	52	69	356	71

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	776	903	213	688	912	133	426	0	0	265	0	0
Stage 1	530	530	-	347	347	-	-	-	-	-	-	-
Stage 2	246	373	-	341	565	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	291	279	798	336	276	898	1144	-	-	1311	-	-
Stage 1	506	530	-	648	638	-	-	-	-	-	-	-
Stage 2	742	622	-	653	511	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	204	245	798	251	242	898	1144	-	-	1311	-	-
Mov Cap-2 Maneuver	204	245	-	251	242	-	-	-	-	-	-	-
Stage 1	478	493	-	612	602	-	-	-	-	-	-	-
Stage 2	606	587	-	530	475	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.4	20.7	1.5	1.3
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1144	-	-	204	328	251	242	898	1311	-	-
HCM Lane V/C Ratio	0.047	-	-	0.103	0.228	0.143	0.265	0.032	0.053	-	-
HCM Control Delay (s)	8.3	0.2	-	24.7	19.2	21.7	25.2	9.1	7.9	0.2	-
HCM Lane LOS	A	A	-	C	C	C	D	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.9	0.5	1	0.1	0.2	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	23	45	158	34	61	27	51	203	49	66	320	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	24	47	166	36	64	28	54	214	52	69	337	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	722	849	168	678	823	133	337	0	0	265	0	0
Stage 1	476	476	-	347	347	-	-	-	-	-	-	-
Stage 2	246	373	-	331	476	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	318	300	853	342	311	898	1234	-	-	1311	-	-
Stage 1	544	560	-	648	638	-	-	-	-	-	-	-
Stage 2	742	622	-	662	560	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	232	266	853	218	276	898	1234	-	-	1311	-	-
Mov Cap-2 Maneuver	232	266	-	218	276	-	-	-	-	-	-	-
Stage 1	516	524	-	614	605	-	-	-	-	-	-	-
Stage 2	609	590	-	453	524	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.7	19.9	1.4	1.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1234	-	-	232	573	218	276	898	1311	-	-
HCM Lane V/C Ratio	0.044	-	-	0.104	0.373	0.164	0.233	0.032	0.053	-	-
HCM Control Delay (s)	8.1	0.1	-	22.3	15	24.7	22	9.1	7.9	0.2	-
HCM Lane LOS	A	A	-	C	C	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	1.7	0.6	0.9	0.1	0.2	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	22	45	26	34	61	27	51	208	49	66	320	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	23	47	27	36	64	28	54	219	52	69	337	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	725	854	168	683	828	135	337	0	0	271	0	0
Stage 1	476	476	-	352	352	-	-	-	-	-	-	-
Stage 2	249	378	-	331	476	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	317	298	853	339	309	895	1234	-	-	1304	-	-
Stage 1	544	560	-	643	635	-	-	-	-	-	-	-
Stage 2	739	619	-	662	560	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	230	264	853	259	274	895	1234	-	-	1304	-	-
Mov Cap-2 Maneuver	230	264	-	259	274	-	-	-	-	-	-	-
Stage 1	516	524	-	610	602	-	-	-	-	-	-	-
Stage 2	606	587	-	545	524	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	19	19	1.4	1.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1234	-	-	230	353	259	274	895	1304	-	-
HCM Lane V/C Ratio	0.044	-	-	0.101	0.212	0.138	0.234	0.032	0.053	-	-
HCM Control Delay (s)	8.1	0.1	-	22.4	17.9	21.1	22.1	9.2	7.9	0.2	-
HCM Lane LOS	A	A	-	C	C	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.8	0.5	0.9	0.1	0.2	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 3

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	21	3	24	22	46	0	24	46	117	-67	50
EB Thru	8	1	9	0	9	0	9	9	51	0	51
EB Right	19	2	21	147	168	0	21	168	62	40	102
WB Left	18	2	20	0	20	37	57	57	42	0	42
WB Thru	5	1	6	0	6	0	6	6	33	0	33
WB Right	16	2	18	0	18	0	18	18	45	0	45
ELSWORTH ST											
NB Left	18	2	20	0	20	0	20	20	40	0	40
NB Thru	226	24	250	0	250	21	271	271	437	0	437
NB Right	4	1	5	0	5	21	26	26	41	0	41
SB Left	5	1	6	0	6	0	6	6	28	0	28
SB Thru	199	21	220	4	224	37	257	261	307	-2	305
SB Right	20	3	23	17	40	0	23	40	27	-8	19
TOTALS	**559**	**63**	**622**	**190**	**812**	**116**	**738**	**928**	**1230**	**-37**	**1193**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 3

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	21	3	24	18	42	0	24	42	117	-53	64
EB Thru	8	1	9	0	9	0	9	9	51	0	51
EB Right	19	2	21	0	21	0	21	21	62	0	62
WB Left	18	2	20	0	20	37	57	57	42	0	42
WB Thru	5	1	6	0	6	0	6	6	33	0	33
WB Right	16	2	18	0	18	0	18	18	45	0	45
ELSWORTH ST											
NB Left	18	2	20	0	20	0	20	20	40	0	40
NB Thru	226	24	250	4	254	21	271	275	437	4	441
NB Right	4	1	5	0	5	21	26	26	41	0	41
SB Left	5	1	6	0	6	0	6	6	28	0	28
SB Thru	199	21	220	4	224	37	257	261	307	-2	305
SB Right	20	3	23	17	40	0	23	40	27	-8	19
TOTALS	**559**	**63**	**622**	**43**	**665**	**116**	**738**	**781**	**1230**	**-59**	**1171**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN VOLUME SUMMARY	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR
PHF : 0.90

NORTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	2	0	0	0	0	0	0	0
0	0	0	1	1	0	0	1	0
0	0	0	0	0	0	0	0	0

SOUTH LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0
0	0	1	0	0	0	0	0	0

EAST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

WEST LEG

LARGE 2 AXLE			LARGE 3 AXLE			LARGE 4(+) AXLE		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	1	0

NORTH LEG			SOUTH LEG			EAST LEG			WEST LEG		
RT	THRU	LT	RT	THRU	LT	RT	THRU	LT	RT	THRU	LT
2	55	0	0	65	1	0	1	2	1	1	1
7	53	1	1	61	5	2	3	5	4	0	4
6	39	1	1	54	4	3	1	6	6	1	6
2	40	3	2	43	5	8	0	5	5	0	7

	TRUCK TOTAL	AUTO VOLUMES	TOTALS	PCE VOLUMES
GOLDENCREST DR				**3.0**
EB LEFT	1	18	**19**	**21**
EB THRU	2	2	**4**	**8**
EB RIGHT	1	16	**17**	**19**
WB LEFT	0	18	**18**	**18**
WB THRU	0	5	**5**	**5**
WB RIGHT	1	13	**14**	**16**
ELSWORTH ST				
NB LEFT	1	15	**16**	**18**
NB THRU	1	223	**224**	**226**
NB RIGHT	0	4	**4**	**4**
SB LEFT	0	5	**5**	**5**
SB THRU	4	187	**191**	**199**
SB RIGHT	1	17	**18**	**20**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: ELSWORTH ST
EAST-WEST STREET: GOLDENCREST DR
JURISDICTION: MORENO VALLEY

DATE: 09-30-15

PEAK HOUR: 04:15PM

NORTH LEG

TOTAL: 214

Rt	Thru	Lt	
18	191	5	Total
2	55	0	1st
7	55	1	2nd
7	41	1	3rd
2	40	3	4th

EAST LEG TOTAL: 37

	1st	2nd	3rd	4th	Total
Rt	0	2	4	8	14
Thru	1	3	0	1	5
Lt	2	5	6	5	18

WEST LEG TOTAL: 40

Total	1st	2nd	3rd	4th	
19	1	4	6	8	Lt
4	1	1	1	1	Thru
17	1	4	6	6	Rt

PEAK HOUR FACTORS

NORTH LEG = 0.85
SOUTH LEG = 0.91
EAST LEG = 0.66
WEST LEG = 0.67

ALL LEGS = 0.90

SOUTH LEG

TOTAL: 244

	Lt	Thru	Rt
1st	1	65	0
2nd	5	61	1
3rd	4	55	1
4th	6	43	2
Total	16	224	4

HOUR TOTAL: 535

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : ELSWORTH ST MORENO VALLEY

EAST-WEST STREET : GOLDENCREST DR

BEGINNING TIME : 04:00PM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
NORTH LEG												
1	33	1	0	0	0	0	1	0	0	0	0	36
2	55	0	0	0	0	0	0	0	0	0	0	57
7	53	1	0	2	0	0	0	0	0	0	0	63
6	39	1	0	0	0	1	1	0	0	1	0	49
2	40	3	0	0	0	0	0	0	0	0	0	45
1	34	0	0	1	0	0	0	0	0	0	0	36
1	46	1	0	0	0	0	0	0	0	1	0	49
2	38	0	0	0	0	0	0	0	0	0	0	40
22	338	7	0	3	0	1	2	0	0	2	0	375
SOUTH LEG												
2	52	0	0	0	0	0	0	0	0	0	0	54
0	65	1	0	0	0	0	0	0	0	0	0	66
1	61	5	0	0	0	0	0	0	0	0	0	67
1	54	4	0	1	0	0	0	0	0	0	0	60
2	43	5	0	0	1	0	0	0	0	0	0	51
1	40	1	0	0	0	0	1	0	0	0	0	43
0	48	3	0	0	0	0	0	0	0	0	1	52
4	39	2	0	0	0	0	0	0	0	0	0	45
11	402	21	0	1	1	0	1	0	0	0	1	438
EAST LEG												
0	1	2	0	0	0	0	0	0	0	0	0	3
0	1	2	0	0	0	0	0	0	0	0	0	3
2	3	5	0	0	0	0	0	0	0	0	0	10
3	0	6	1	0	0	0	0	0	0	0	0	10
8	1	5	0	0	0	0	0	0	0	0	0	14
7	0	2	0	0	0	0	0	0	0	0	0	9
8	1	6	0	0	0	0	0	0	0	0	0	15
6	0	3	0	0	0	0	0	0	0	0	0	9
34	7	31	1	0	0	0	0	0	0	0	0	73
WEST LEG												
2	0	1	0	0	0	0	0	0	0	0	0	3
1	1	1	0	0	0	0	0	0	0	0	0	3
4	0	4	0	0	0	0	0	0	0	1	0	9
6	1	6	0	0	0	0	0	0	0	0	0	13
5	0	7	0	0	1	1	0	0	0	1	0	15
2	0	3	0	0	0	0	0	0	0	0	0	5
2	0	5	0	0	0	0	0	0	1	0	0	8
4	0	5	0	0	0	0	0	0	0	0	0	9
26	2	32	0	0	1	1	0	0	1	2	0	65

Prepared by Newport Traffic Studies

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: ELSWORTH ST

EAST-WEST STREET: GOLDENCREST DR

TIME: 04:00PM-05:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
17	185	3	Total
1	34	1	1st
2	55	0	2nd
7	55	1	3rd
7	41	1	4th

	1st	2nd	3rd	4th	Total
Rt	0	0	2	4	6
Thru	1	1	3	0	5
Lt	2	2	5	6	15

Total	1st	2nd	3rd	4th	
12	1	1	4	6	Lt
3	0	1	1	1	Thru
13	2	1	4	6	Rt

	Lt	Thru	Rt
1st	0	52	2
2nd	1	65	0
3rd	5	61	1
4th	4	55	1
Total	10	233	4

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: ELSWORTH ST

EAST-WEST STREET: GOLDENCREST DR

TIME: 05:00PM-06:00PM DATE: 09-30-15

NORTH LEG

Rt	Thru	Lt	
6	160	4	Total
2	40	3	1st
1	35	0	2nd
1	47	1	3rd
2	38	0	4th

	1st	2nd	3rd	4th	Total
Rt	8	7	8	6	29
Thru	1	0	1	0	2
Lt	5	2	6	3	16

Total	1st	2nd	3rd	4th	
21	8	3	5	5	Lt
1	1	0	0	0	Thru
15	6	2	3	4	Rt

	Lt	Thru	Rt
1st	6	43	2
2nd	1	41	1
3rd	4	48	0
4th	2	39	4
Total	13	171	7

Prepared by NEWPORT TRAFFIC STUDIES

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/22/2016

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	21	8	19	18	5	16	18	226	4	5	199	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	23	9	21	20	6	18	20	251	4	6	221	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	411	539	122	419	547	128	243	0	0	256	0	0
Stage 1	243	243	-	293	293	-	-	-	-	-	-	-
Stage 2	168	296	-	126	254	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	530	452	913	523	447	905	1335	-	-	1321	-	-
Stage 1	745	708	-	696	674	-	-	-	-	-	-	-
Stage 2	823	672	-	870	701	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	506	442	913	495	437	905	1335	-	-	1321	-	-
Mov Cap-2 Maneuver	506	442	-	495	437	-	-	-	-	-	-	-
Stage 1	732	704	-	684	663	-	-	-	-	-	-	-
Stage 2	786	661	-	835	697	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.3	11.3	0.7	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1335	-	-	506	694	495	437	905	1321	-	-
HCM Lane V/C Ratio	0.015	-	-	0.046	0.043	0.04	0.013	0.02	0.004	-	-
HCM Control Delay (s)	7.7	0.1	-	12.5	10.4	12.6	13.3	9.1	7.7	0	-
HCM Lane LOS	A	A	-	B	B	B	B	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0.1	0	0.1	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/29/2016

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	23	9	21	20	6	18	20	250	5	6	220	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	26	10	23	22	7	20	22	278	6	7	244	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	458	599	135	466	608	142	270	0	0	283	0	0
Stage 1	271	271	-	325	325	-	-	-	-	-	-	-
Stage 2	187	328	-	141	283	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	491	418	895	484	413	886	1305	-	-	1291	-	-
Stage 1	717	689	-	667	653	-	-	-	-	-	-	-
Stage 2	803	651	-	853	681	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	465	407	895	453	402	886	1305	-	-	1291	-	-
Mov Cap-2 Maneuver	465	407	-	453	402	-	-	-	-	-	-	-
Stage 1	703	685	-	654	640	-	-	-	-	-	-	-
Stage 2	761	638	-	814	677	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.8	11.8	0.7	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1305	-	-	465	658	453	402	886	1291	-	-
HCM Lane V/C Ratio	0.017	-	-	0.055	0.051	0.049	0.017	0.023	0.005	-	-
HCM Control Delay (s)	7.8	0.1	-	13.2	10.8	13.4	14.1	9.2	7.8	0	-
HCM Lane LOS	A	A	-	B	B	B	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.2	0.2	0.1	0.1	0	-	-

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HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	46	9	168	20	6	18	20	250	5	6	224	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	51	10	187	22	7	20	22	278	6	7	249	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	471	612	147	468	632	142	293	0	0	283	0	0
Stage 1	284	284	-	325	325	-	-	-	-	-	-	-
Stage 2	187	328	-	143	307	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	481	411	880	483	400	886	1280	-	-	1291	-	-
Stage 1	705	680	-	667	653	-	-	-	-	-	-	-
Stage 2	803	651	-	851	665	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	455	400	880	366	389	886	1280	-	-	1291	-	-
Mov Cap-2 Maneuver	455	400	-	366	389	-	-	-	-	-	-	-
Stage 1	691	675	-	654	640	-	-	-	-	-	-	-
Stage 2	761	638	-	656	660	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.4	12.8	0.7	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1280	-	-	455	829	366	389	886	1291	-	-
HCM Lane V/C Ratio	0.017	-	-	0.112	0.237	0.061	0.017	0.023	0.005	-	-
HCM Control Delay (s)	7.9	0.1	-	13.9	10.7	15.5	14.4	9.2	7.8	0	-
HCM Lane LOS	A	A	-	B	B	C	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.9	0.2	0.1	0.1	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/5/2016

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	42	9	21	20	6	18	20	254	5	6	224	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	47	10	23	22	7	20	22	282	6	7	249	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	473	616	147	472	636	144	293	0	0	288	0	0
Stage 1	284	284	-	329	329	-	-	-	-	-	-	-
Stage 2	189	332	-	143	307	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	479	409	880	480	398	884	1280	-	-	1286	-	-
Stage 1	705	680	-	664	650	-	-	-	-	-	-	-
Stage 2	800	648	-	851	665	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	453	398	880	449	387	884	1280	-	-	1286	-	-
Mov Cap-2 Maneuver	453	398	-	449	387	-	-	-	-	-	-	-
Stage 1	691	675	-	651	637	-	-	-	-	-	-	-
Stage 2	758	635	-	810	660	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	11.8	0.7	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1280	-	-	453	645	449	387	884	1286	-	-
HCM Lane V/C Ratio	0.017	-	-	0.103	0.052	0.049	0.017	0.023	0.005	-	-
HCM Control Delay (s)	7.9	0.1	-	13.9	10.9	13.4	14.5	9.2	7.8	0	-
HCM Lane LOS	A	A	-	B	B	B	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.2	0.2	0.1	0.1	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	24	9	21	57	6	18	20	271	26	6	257	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	26	10	23	62	7	20	22	295	28	7	279	25

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	499	671	152	510	669	161	304	0	0	323	0	0
Stage 1	305	305	-	352	352	-	-	-	-	-	-	-
Stage 2	194	366	-	158	317	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	459	380	873	451	381	862	1268	-	-	1248	-	-
Stage 1	685	666	-	643	635	-	-	-	-	-	-	-
Stage 2	795	626	-	834	658	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	433	369	873	421	370	862	1268	-	-	1248	-	-
Mov Cap-2 Maneuver	433	369	-	421	370	-	-	-	-	-	-	-
Stage 1	671	661	-	629	622	-	-	-	-	-	-	-
Stage 2	753	613	-	795	653	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.3	13.7	0.6	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1268	-	-	433	619	421	370	862	1248	-	-
HCM Lane V/C Ratio	0.017	-	-	0.06	0.053	0.147	0.018	0.023	0.005	-	-
HCM Control Delay (s)	7.9	0.1	-	13.8	11.1	15	14.9	9.3	7.9	0	-
HCM Lane LOS	A	A	-	B	B	C	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.2	0.5	0.1	0.1	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	46	9	168	57	6	18	20	271	26	6	261	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	50	10	183	62	7	20	22	295	28	7	284	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	512	684	164	512	692	161	327	0	0	323	0	0
Stage 1	318	318	-	352	352	-	-	-	-	-	-	-
Stage 2	194	366	-	160	340	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	449	374	858	449	370	862	1244	-	-	1248	-	-
Stage 1	673	657	-	643	635	-	-	-	-	-	-	-
Stage 2	795	626	-	832	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	423	363	858	339	359	862	1244	-	-	1248	-	-
Mov Cap-2 Maneuver	423	363	-	339	359	-	-	-	-	-	-	-
Stage 1	658	652	-	629	621	-	-	-	-	-	-	-
Stage 2	752	612	-	641	638	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.7	15.9	0.6	0.2
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1244	-	-	423	802	339	359	862	1248	-	-
HCM Lane V/C Ratio	0.017	-	-	0.118	0.24	0.183	0.018	0.023	0.005	-	-
HCM Control Delay (s)	7.9	0.1	-	14.6	10.9	18	15.2	9.3	7.9	0	-
HCM Lane LOS	A	A	-	B	B	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.9	0.7	0.1	0.1	0	-	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	42	9	21	57	6	18	20	275	26	6	261	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	46	10	23	62	7	20	22	299	28	7	284	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	514	689	164	517	697	164	327	0	0	327	0	0
Stage 1	318	318	-	357	357	-	-	-	-	-	-	-
Stage 2	196	371	-	160	340	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	448	371	858	446	367	858	1244	-	-	1244	-	-
Stage 1	673	657	-	639	632	-	-	-	-	-	-	-
Stage 2	793	623	-	832	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	422	360	858	416	356	858	1244	-	-	1244	-	-
Mov Cap-2 Maneuver	422	360	-	416	356	-	-	-	-	-	-	-
Stage 1	658	652	-	625	618	-	-	-	-	-	-	-
Stage 2	750	609	-	792	638	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.2	13.9	0.6	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1244	-	-	422	606	416	356	858	1244	-	-
HCM Lane V/C Ratio	0.017	-	-	0.108	0.054	0.149	0.018	0.023	0.005	-	-
HCM Control Delay (s)	7.9	0.1	-	14.6	11.3	15.2	15.3	9.3	7.9	0	-
HCM Lane LOS	A	A	-	B	B	C	C	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.2	0.5	0.1	0.1	0	-	-

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HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	117	51	62	42	33	45	40	437	41	28	307	27
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	123	54	65	44	35	47	42	460	43	29	323	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	728	983	176	813	977	252	352	0	0	503	0	0
Stage 1	396	396	-	566	566	-	-	-	-	-	-	-
Stage 2	332	587	-	247	411	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	315	251	843	274	253	754	1218	-	-	1072	-	-
Stage 1	606	607	-	481	511	-	-	-	-	-	-	-
Stage 2	661	500	-	741	598	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	246	231	843	195	233	754	1218	-	-	1072	-	-
Mov Cap-2 Maneuver	246	231	-	195	233	-	-	-	-	-	-	-
Stage 1	577	586	-	458	486	-	-	-	-	-	-	-
Stage 2	548	476	-	600	578	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.1	20.2	0.8	0.7
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1218	-	-	246	384	195	233	754	1072	-	-
HCM Lane V/C Ratio	0.035	-	-	0.501	0.31	0.227	0.149	0.063	0.027	-	-
HCM Control Delay (s)	8.1	0.2	-	33.5	18.5	28.8	23.1	10.1	8.5	0.1	-
HCM Lane LOS	A	A	-	D	C	D	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.6	1.3	0.8	0.5	0.2	0.1	-	-

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HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	51	102	42	33	45	40	437	41	28	305	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	53	54	107	44	35	47	42	460	43	29	321	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	722	977	171	812	966	252	341	0	0	503	0	0
Stage 1	390	390	-	566	566	-	-	-	-	-	-	-
Stage 2	332	587	-	246	400	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	318	253	849	274	257	754	1229	-	-	1072	-	-
Stage 1	611	611	-	481	511	-	-	-	-	-	-	-
Stage 2	661	500	-	742	605	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	249	233	849	185	237	754	1229	-	-	1072	-	-
Mov Cap-2 Maneuver	249	233	-	185	237	-	-	-	-	-	-	-
Stage 1	582	591	-	458	486	-	-	-	-	-	-	-
Stage 2	548	476	-	570	585	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.9	20.7	0.8	0.8
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1229	-	-	249	451	185	237	754	1072	-	-
HCM Lane V/C Ratio	0.034	-	-	0.211	0.357	0.239	0.147	0.063	0.027	-	-
HCM Control Delay (s)	8	0.2	-	23.3	17.4	30.5	22.8	10.1	8.5	0.1	-
HCM Lane LOS	A	A	-	C	C	D	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.8	1.6	0.9	0.5	0.2	0.1	-	-

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HCM 2010 TWSC
5: Elsworth Street & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	64	51	62	42	33	45	40	441	41	28	305	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	170	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	67	54	65	44	35	47	42	464	43	29	321	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	724	982	171	816	970	254	341	0	0	507	0	0
Stage 1	390	390	-	570	570	-	-	-	-	-	-	-
Stage 2	334	592	-	246	400	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	317	251	849	272	255	752	1229	-	-	1068	-	-
Stage 1	611	611	-	479	509	-	-	-	-	-	-	-
Stage 2	659	497	-	742	605	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	248	231	849	194	235	752	1229	-	-	1068	-	-
Mov Cap-2 Maneuver	248	231	-	194	235	-	-	-	-	-	-	-
Stage 1	582	590	-	456	485	-	-	-	-	-	-	-
Stage 2	546	473	-	601	584	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.8	20.3	0.8	0.8
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1229	-	-	248	385	194	235	752	1068	-	-
HCM Lane V/C Ratio	0.034	-	-	0.272	0.309	0.228	0.148	0.063	0.028	-	-
HCM Control Delay (s)	8	0.2	-	24.8	18.5	29	23	10.1	8.5	0.1	-
HCM Lane LOS	A	A	-	C	C	D	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	1.3	0.8	0.5	0.2	0.1	-	-

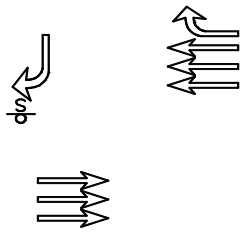
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : PROJECT DRIVEWAY #1
CONDITION : AM PEAK HOUR

INTERSECTION : 6
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	1586	166	1752	0	1752	1102	2854	2854	2511	0	2511
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1749	183	1932	0	1932	1417	3349	3349	2995	0	2995
WB Right	0	0	0	165	165	0	0	165	0	6	6
PROJECT DRIVEWAY #1											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	132	132	0	0	132	0	108	108
TOTALS	**3335**	**349**	**3684**	**297**	**3981**	**2519**	**6203**	**6500**	**5506**	**114**	**5620**

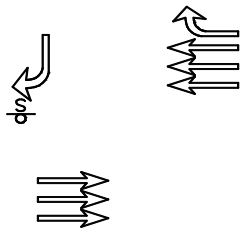
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : CACTUS AVE
N/S STREET : PROJECT DRIVEWAY #1
CONDITION : AM PEAK HOUR

INTERSECTION : 6
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13

CACTUS AVE

EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	1586	166	1752	154	1906	1102	2854	3008	2511	126	2637
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1749	183	1932	0	1932	1417	3349	3349	2995	0	2995
WB Right	0	0	0	165	165	0	0	165	0	6	6

PROJECT DRIVEWAY #1

NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	132	132	0	0	132	0	108	108
TOTALS	**3335**	**349**	**3684**	**451**	**4135**	**2519**	**6203**	**6654**	**5506**	**240**	**5746**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

6/30/2016

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1752	1932	165	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	1904	2100	179	0	143

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2279	0	-	0	2952	1140
Stage 1	-	-	-	-	2190	-
Stage 2	-	-	-	-	762	-
Critical Hdwy	4.1	-	-	-	6.25	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	2.2	-	-	-	3.65	3.3
Pot Cap-1 Maneuver	226	-	-	-	18	198
Stage 1	-	-	-	-	72	-
Stage 2	-	-	-	-	398	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	226	-	-	-	18	198
Mov Cap-2 Maneuver	-	-	-	-	18	-
Stage 1	-	-	-	-	72	-
Stage 2	-	-	-	-	398	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	60.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	226	-	-	-	198
HCM Lane V/C Ratio	-	-	-	-	0.725
HCM Control Delay (s)	0	-	-	-	60.1
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	4.7

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/5/2016

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1752	1932	165	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	1904	2100	179	0	143

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2279	0	-	0	2952	1140
Stage 1	-	-	-	-	2190	-
Stage 2	-	-	-	-	762	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	93	-	-	-	29	170
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	387	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	93	-	-	-	29	170
Mov Cap-2 Maneuver	-	-	-	-	29	-
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	387	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	87.4
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	93	-	-	-	170
HCM Lane V/C Ratio	-	-	-	-	0.844
HCM Control Delay (s)	0	-	-	-	87.4
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	5.9

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/27/2016

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1906	1932	165	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2072	2100	179	0	143

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2279	0	-	0	3019	1140
Stage 1	-	-	-	-	2190	-
Stage 2	-	-	-	-	829	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	93	-	-	-	26	170
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	357	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	93	-	-	-	26	170
Mov Cap-2 Maneuver	-	-	-	-	26	-
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	357	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	87.4
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	93	-	-	-	170
HCM Lane V/C Ratio	-	-	-	-	0.844
HCM Control Delay (s)	0	-	-	-	87.4
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	5.9

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

6/30/2016

Intersection	
Int Delay, s/veh	16.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2854	3349	165	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3102	3640	179	0	143

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3820	0	-	0	4971	1910
Stage 1	-	-	-	-	3730	-
Stage 2	-	-	-	-	1241	-
Critical Hdwy	4.1	-	-	-	6.25	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	2.2	-	-	-	3.65	3.3
Pot Cap-1 Maneuver	55	-	-	-	1	~ 59
Stage 1	-	-	-	-	9	-
Stage 2	-	-	-	-	219	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	55	-	-	-	1	~ 59
Mov Cap-2 Maneuver	-	-	-	-	1	-
Stage 1	-	-	-	-	9	-
Stage 2	-	-	-	-	219	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	$ 801.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	55	-	-	-	59
HCM Lane V/C Ratio	-	-	-	-	2.432
HCM Control Delay (s)	0	-	-	-	$ 801.2
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	14.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/21/2016

Intersection	
Int Delay, s/veh	20.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2854	3349	165	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3102	3640	179	0	143

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3820	0	-	0	4971	1910
Stage 1	-	-	-	-	3730	-
Stage 2	-	-	-	-	1241	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	14	-	-	-	2	~ 51
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	215	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	14	-	-	-	2	~ 51
Mov Cap-2 Maneuver	-	-	-	-	2	-
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	215	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	$ 989.4
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	14	-	-	-	51
HCM Lane V/C Ratio	-	-	-	-	2.813
HCM Control Delay (s)	0	-	-	-	$ 989.4
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	15.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/27/2016

Intersection	
Int Delay, s/veh	19.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	3008	3349	165	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3270	3640	179	0	143

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3820	0	-	0	5038	1910
Stage 1	-	-	-	-	3730	-
Stage 2	-	-	-	-	1308	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	14	-	-	-	2	~ 51
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	198	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	14	-	-	-	2	~ 51
Mov Cap-2 Maneuver	-	-	-	-	2	-
Stage 1	-	-	-	-	4	-
Stage 2	-	-	-	-	198	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	$ 989.4
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	14	-	-	-	51
HCM Lane V/C Ratio	-	-	-	-	2.813
HCM Control Delay (s)	0	-	-	-	$ 989.4
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	15.1

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2511	2995	6	0	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2643	3153	6	0	114

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3159	0	-	0	4213	1579
Stage 1	-	-	-	-	3156	-
Stage 2	-	-	-	-	1057	-
Critical Hdwy	4.1	-	-	-	6.25	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	2.2	-	-	-	3.65	3.3
Pot Cap-1 Maneuver	101	-	-	-	3	~ 100
Stage 1	-	-	-	-	20	-
Stage 2	-	-	-	-	276	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	101	-	-	-	3	~ 100
Mov Cap-2 Maneuver	-	-	-	-	3	-
Stage 1	-	-	-	-	20	-
Stage 2	-	-	-	-	276	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	210.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	101	-	-	-	100
HCM Lane V/C Ratio	-	-	-	-	1.137
HCM Control Delay (s)	0	-	-	-	210.9
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	7.4

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1598

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/21/2016

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2511	2995	6	0	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2643	3153	6	0	114

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3159	0	-	0	4213	1579
Stage 1	-	-	-	-	3156	-
Stage 2	-	-	-	-	1057	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	32	-	-	-	5	~ 86
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	270	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	32	-	-	-	5	~ 86
Mov Cap-2 Maneuver	-	-	-	-	5	-
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	270	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	292.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	32	-	-	-	86
HCM Lane V/C Ratio	-	-	-	-	1.322
HCM Control Delay (s)	0	-	-	-	292.9
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	8.5

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

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HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/27/2016

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2637	2995	6	0	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2776	3153	6	0	114

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3159	0	-	0	4266	1579
Stage 1	-	-	-	-	3156	-
Stage 2	-	-	-	-	1110	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	32	-	-	-	5	~ 86
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	253	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	32	-	-	-	5	~ 86
Mov Cap-2 Maneuver	-	-	-	-	5	-
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	253	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	292.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	32	-	-	-	86
HCM Lane V/C Ratio	-	-	-	-	1.322
HCM Control Delay (s)	0	-	-	-	292.9
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	8.5

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : PROJECT DRIVEWAY #1
CONDITION : PM PEAK HOUR

INTERSECTION : 6
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	1633	170	1803	0	1803	1277	3080	3080	2790	0	2790
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1854	193	2047	0	2047	1060	3107	3107	2873	0	2873
WB Right	0	0	0	158	158	0	0	158	0	114	114
PROJECT DRIVEWAY #1											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	131	131	0	0	131	0	24	24
TOTALS	**3487**	**363**	**3850**	**289**	**4139**	**2337**	**6187**	**6476**	**5663**	**138**	**5801**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : CACTUS AVE
N/S STREET : PROJECT DRIVEWAY #1
CONDITION : PM PEAK HOUR

INTERSECTION : 6
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	1633	170	1803	152	1955	1277	3080	3232	2790	28	2818
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1854	193	2047	0	2047	1060	3107	3107	2873	0	2873
WB Right	0	0	0	158	158	0	0	158	0	114	114
PROJECT DRIVEWAY #1											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	131	131	0	0	131	0	24	24
TOTALS	**3487**	**363**	**3850**	**441**	**4291**	**2337**	**6187**	**6628**	**5663**	**166**	**5829**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

6/30/2016

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1803	2047	158	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	1960	2225	172	0	142

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2397	0	-	0	3095	1198
Stage 1	-	-	-	-	2311	-
Stage 2	-	-	-	-	784	-
Critical Hdwy	4.1	-	-	-	6.25	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	2.2	-	-	-	3.65	3.3
Pot Cap-1 Maneuver	203	-	-	-	15	181
Stage 1	-	-	-	-	62	-
Stage 2	-	-	-	-	387	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	203	-	-	-	15	181
Mov Cap-2 Maneuver	-	-	-	-	15	-
Stage 1	-	-	-	-	62	-
Stage 2	-	-	-	-	387	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	73.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	203	-	-	-	181
HCM Lane V/C Ratio	-	-	-	-	0.787
HCM Control Delay (s)	0	-	-	-	73.6
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	5.3

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/5/2016

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1803	2047	158	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	1960	2225	172	0	142

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2397	0	-	0	3095	1198
Stage 1	-	-	-	-	2311	-
Stage 2	-	-	-	-	784	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	81	-	-	-	24	155
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	377	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	81	-	-	-	24	155
Mov Cap-2 Maneuver	-	-	-	-	24	-
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	377	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	109.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	81	-	-	-	155
HCM Lane V/C Ratio	-	-	-	-	0.919
HCM Control Delay (s)	0	-	-	-	109.6
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	6.6

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/27/2016

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	1955	2047	158	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2125	2225	172	0	142

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2397	0	-	0	3161	1198
Stage 1	-	-	-	-	2311	-
Stage 2	-	-	-	-	850	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	81	-	-	-	22	155
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	348	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	81	-	-	-	22	155
Mov Cap-2 Maneuver	-	-	-	-	22	-
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	348	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	109.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	81	-	-	-	155
HCM Lane V/C Ratio	-	-	-	-	0.919
HCM Control Delay (s)	0	-	-	-	109.6
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	6.6

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	11.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	3080	3107	158	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3348	3377	172	0	142

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3549	0	-	0	4802	1774
Stage 1	-	-	-	-	3463	-
Stage 2	-	-	-	-	1339	-
Critical Hdwy	4.1	-	-	-	6.25	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	2.2	-	-	-	3.65	3.3
Pot Cap-1 Maneuver	70	-	-	-	1	~ 74
Stage 1	-	-	-	-	13	-
Stage 2	-	-	-	-	194	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	70	-	-	-	1	~ 74
Mov Cap-2 Maneuver	-	-	-	-	1	-
Stage 1	-	-	-	-	13	-
Stage 2	-	-	-	-	194	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	$ 553.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	70	-	-	-	74
HCM Lane V/C Ratio	-	-	-	-	1.924
HCM Control Delay (s)	0	-	-	-	$ 553.8
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	12.7

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1606

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/21/2016

Intersection	
Int Delay, s/veh	14.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	3080	3107	158	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3348	3377	172	0	142

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3549	0	-	0	4802	1774
Stage 1	-	-	-	-	3463	-
Stage 2	-	-	-	-	1339	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	20	-	-	-	2	~ 63
Stage 1	-	-	-	-	6	-
Stage 2	-	-	-	-	190	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	20	-	-	-	2	~ 63
Mov Cap-2 Maneuver	-	-	-	-	2	-
Stage 1	-	-	-	-	6	-
Stage 2	-	-	-	-	190	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	$ 717.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	20	-	-	-	63
HCM Lane V/C Ratio	-	-	-	-	2.26
HCM Control Delay (s)	0	-	-	-	$ 717.9
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	13.8

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/27/2016

Intersection	
Int Delay, s/veh	14.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	3232	3107	158	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	3513	3377	172	0	142

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3549	0	-	0	4868	1774
Stage 1	-	-	-	-	3463	-
Stage 2	-	-	-	-	1405	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	20	-	-	-	2	~ 63
Stage 1	-	-	-	-	6	-
Stage 2	-	-	-	-	175	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	20	-	-	-	2	~ 63
Mov Cap-2 Maneuver	-	-	-	-	2	-
Stage 1	-	-	-	-	6	-
Stage 2	-	-	-	-	175	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	$ 717.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	20	-	-	-	63
HCM Lane V/C Ratio	-	-	-	-	2.26
HCM Control Delay (s)	0	-	-	-	$ 717.9
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	13.8

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/21/2016

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2790	2873	114	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2937	3024	120	0	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3144	0	-	0	4259	1572
Stage 1	-	-	-	-	3084	-
Stage 2	-	-	-	-	1175	-
Critical Hdwy	4.1	-	-	-	6.25	6.9
Critical Hdwy Stg 1	-	-	-	-	5.8	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	2.2	-	-	-	3.65	3.3
Pot Cap-1 Maneuver	103	-	-	-	3	101
Stage 1	-	-	-	-	22	-
Stage 2	-	-	-	-	238	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	103	-	-	-	3	101
Mov Cap-2 Maneuver	-	-	-	-	3	-
Stage 1	-	-	-	-	22	-
Stage 2	-	-	-	-	238	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	52.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	103	-	-	-	101
HCM Lane V/C Ratio	-	-	-	-	0.25
HCM Control Delay (s)	0	-	-	-	52.1
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	0.9

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/21/2016

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2790	2873	114	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2937	3024	120	0	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3144	0	-	0	4259	1572
Stage 1	-	-	-	-	3084	-
Stage 2	-	-	-	-	1175	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	33	-	-	-	5	87
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	233	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	33	-	-	-	5	87
Mov Cap-2 Maneuver	-	-	-	-	5	-
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	233	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	62.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	33	-	-	-	87
HCM Lane V/C Ratio	-	-	-	-	0.29
HCM Control Delay (s)	0	-	-	-	62.5
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	1.1

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
6: Cactus Avenue & Driveway 1

7/27/2016

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	2818	2873	114	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	2966	3024	120	0	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	3144	0	-	0	4271	1572
Stage 1	-	-	-	-	3084	-
Stage 2	-	-	-	-	1187	-
Critical Hdwy	5.3	-	-	-	5.7	7.1
Critical Hdwy Stg 1	-	-	-	-	6.6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	3.1	-	-	-	3.8	3.9
Pot Cap-1 Maneuver	33	-	-	-	5	87
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	230	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	33	-	-	-	5	87
Mov Cap-2 Maneuver	-	-	-	-	5	-
Stage 1	-	-	-	-	11	-
Stage 2	-	-	-	-	230	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	62.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	33	-	-	-	87
HCM Lane V/C Ratio	-	-	-	-	0.29
HCM Control Delay (s)	0	-	-	-	62.5
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	1.1

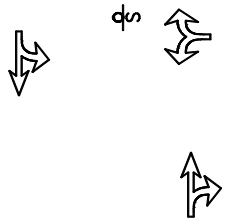
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : DRIVEWAY #2
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 7
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
DRIVEWAY #2											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	44	44	0	0	44	0	36	36
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	44	44	0	0	44	0	36	36
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	39	5	44	71	115	0	44	115	175	3	178
NB Right	0	0	0	141	141	0	0	141	0	5	5
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	8	1	9	22	31	0	9	31	30	18	48
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**47**	**6**	**53**	**322**	**375**	**0**	**53**	**375**	**205**	**98**	**303**

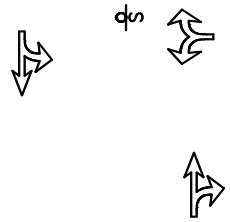
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : DRIVEWAY #2
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 7
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
DRIVEWAY #2											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	154	154	0	0	154	0	126	126
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	0	0	0	0	0	0	0	0
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	39	5	44	71	115	0	44	115	175	3	178
NB Right	0	0	0	141	141	0	0	141	0	5	5
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	8	1	9	66	75	0	9	75	30	54	84
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**47**	**6**	**53**	**432**	**485**	**0**	**53**	**485**	**205**	**188**	**393**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

6/30/2016

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	44	44	115	141	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	48	48	125	153	0	34

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	236	202	0	0	278	0
Stage 1	202	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	757	844	-	-	1296	-
Stage 1	837	-	-	-	-	-
Stage 2	994	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	757	844	-	-	1296	-
Mov Cap-2 Maneuver	746	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	994	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	792	1296	-
HCM Lane V/C Ratio	-	-	0.121	-	-
HCM Control Delay (s)	-	-	10.2	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

7/5/2016

Intersection	
Int Delay, s/veh	3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	154	0	115	141	0	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	167	0	125	153	0	82

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	284	202	0	0	278	0
Stage 1	202	-	-	-	-	-
Stage 2	82	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	710	844	-	-	1296	-
Stage 1	837	-	-	-	-	-
Stage 2	946	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	710	844	-	-	1296	-
Mov Cap-2 Maneuver	723	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	946	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	723	1296	-
HCM Lane V/C Ratio	-	-	0.232	-	-
HCM Control Delay (s)	-	-	11.5	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

6/30/2016

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	44	44	115	141	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	48	48	125	153	0	34

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	236	202	0	0	278	0
Stage 1	202	-	-	-	-	-
Stage 2	34	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	757	844	-	-	1296	-
Stage 1	837	-	-	-	-	-
Stage 2	994	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	757	844	-	-	1296	-
Mov Cap-2 Maneuver	746	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	994	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	792	1296	-
HCM Lane V/C Ratio	-	-	0.121	-	-
HCM Control Delay (s)	-	-	10.2	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

7/21/2016

Intersection	
Int Delay, s/veh	3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	154	0	115	141	0	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	167	0	125	153	0	82

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	284	202	0	0	278	0
Stage 1	202	-	-	-	-	-
Stage 2	82	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	710	844	-	-	1296	-
Stage 1	837	-	-	-	-	-
Stage 2	946	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	710	844	-	-	1296	-
Mov Cap-2 Maneuver	723	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	946	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	723	1296	-
HCM Lane V/C Ratio	-	-	0.232	-	-
HCM Control Delay (s)	-	-	11.5	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	2.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	36	36	178	5	0	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	38	38	187	5	0	51

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	241	190	0	0	193	0
Stage 1	190	-	-	-	-	-
Stage 2	51	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	752	857	-	-	1392	-
Stage 1	847	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	752	857	-	-	1392	-
Mov Cap-2 Maneuver	747	-	-	-	-	-
Stage 1	847	-	-	-	-	-
Stage 2	977	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	798	1392	-
HCM Lane V/C Ratio	-	-	0.095	-	-
HCM Control Delay (s)	-	-	10	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1618

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

7/21/2016

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	126	0	178	5	0	48
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	133	0	187	5	0	51

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	241	190	0	0	193	0
Stage 1	190	-	-	-	-	-
Stage 2	51	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	752	857	-	-	1392	-
Stage 1	847	-	-	-	-	-
Stage 2	977	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	752	857	-	-	1392	-
Mov Cap-2 Maneuver	747	-	-	-	-	-
Stage 1	847	-	-	-	-	-
Stage 2	977	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	747	1392	-
HCM Lane V/C Ratio	-	-	0.178	-	-
HCM Control Delay (s)	-	-	10.9	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.6	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : DRIVEWAY #2
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 7
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
DRIVEWAY #2											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	44	44	0	0	44	0	8	8
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	44	44	0	0	44	0	8	8
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	16	2	18	68	86	0	18	86	99	49	148
NB Right	0	0	0	135	135	0	0	135	0	97	97
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	41	5	46	22	68	0	46	68	107	4	111
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**57**	**7**	**64**	**313**	**377**	**0**	**64**	**377**	**206**	**166**	**372**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : DRIVEWAY #2
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 7
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
DRIVEWAY #2											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	152	152	0	0	152	0	28	28
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	0	0	0	0	0	0	0	0
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	16	2	18	68	86	0	18	86	99	49	148
NB Right	0	0	0	135	135	0	0	135	0	97	97
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	41	5	46	65	111	0	46	111	107	12	119
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**57**	**7**	**64**	**420**	**484**	**0**	**64**	**484**	**206**	**186**	**392**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

6/30/2016

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	44	44	86	135	0	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	48	48	93	147	0	74

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	241	167	0	0	240	0
Stage 1	167	-	-	-	-	-
Stage 2	74	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	752	882	-	-	1339	-
Stage 1	867	-	-	-	-	-
Stage 2	954	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	752	882	-	-	1339	-
Mov Cap-2 Maneuver	753	-	-	-	-	-
Stage 1	867	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	812	1339	-
HCM Lane V/C Ratio	-	-	0.118	-	-
HCM Control Delay (s)	-	-	10	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

7/5/2016

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	152	0	86	135	0	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	165	0	93	147	0	121

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	288	167	0	0	240	0
Stage 1	167	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	707	882	-	-	1339	-
Stage 1	867	-	-	-	-	-
Stage 2	909	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	707	882	-	-	1339	-
Mov Cap-2 Maneuver	727	-	-	-	-	-
Stage 1	867	-	-	-	-	-
Stage 2	909	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	727	1339	-
HCM Lane V/C Ratio	-	-	0.227	-	-
HCM Control Delay (s)	-	-	11.4	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

6/30/2016

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	44	44	86	135	0	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	48	48	93	147	0	74

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	241	167	0	0	240	0
Stage 1	167	-	-	-	-	-
Stage 2	74	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	752	882	-	-	1339	-
Stage 1	867	-	-	-	-	-
Stage 2	954	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	752	882	-	-	1339	-
Mov Cap-2 Maneuver	753	-	-	-	-	-
Stage 1	867	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	812	1339	-
HCM Lane V/C Ratio	-	-	0.118	-	-
HCM Control Delay (s)	-	-	10	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

7/21/2016

Intersection	
Int Delay, s/veh	3.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	152	0	86	135	0	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	165	0	93	147	0	121

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	288	167	0	0	240	0
Stage 1	167	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	707	882	-	-	1339	-
Stage 1	867	-	-	-	-	-
Stage 2	909	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	707	882	-	-	1339	-
Mov Cap-2 Maneuver	727	-	-	-	-	-
Stage 1	867	-	-	-	-	-
Stage 2	909	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	727	1339	-
HCM Lane V/C Ratio	-	-	0.227	-	-
HCM Control Delay (s)	-	-	11.4	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	8	8	148	97	0	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	8	8	156	102	0	117

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	324	207	0	0	258	0
Stage 1	207	-	-	-	-	-
Stage 2	117	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	674	839	-	-	1318	-
Stage 1	832	-	-	-	-	-
Stage 2	913	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	674	839	-	-	1318	-
Mov Cap-2 Maneuver	702	-	-	-	-	-
Stage 1	832	-	-	-	-	-
Stage 2	913	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	764	1318	-
HCM Lane V/C Ratio	-	-	0.022	-	-
HCM Control Delay (s)	-	-	9.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1626

HCM 2010 TWSC
7: Commerce Center Drive & Driveway 2

7/21/2016

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	28	0	148	97	0	111
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	29	0	156	102	0	117

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	324	207	0	0	258	0
Stage 1	207	-	-	-	-	-
Stage 2	117	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	674	839	-	-	1318	-
Stage 1	832	-	-	-	-	-
Stage 2	913	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	674	839	-	-	1318	-
Mov Cap-2 Maneuver	702	-	-	-	-	-
Stage 1	832	-	-	-	-	-
Stage 2	913	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.4	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	702	1318	-
HCM Lane V/C Ratio	-	-	0.042	-	-
HCM Control Delay (s)	-	-	10.4	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

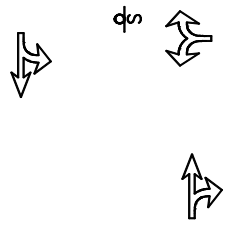
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : DRIVEWAY #3
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 8
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
DRIVEWAY #3											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	22	22	0	0	22	0	18	18
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	22	22	0	0	22	0	18	18
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	39	5	44	44	88	0	44	88	175	36	211
NB Right	0	0	0	71	71	0	0	71	0	3	3
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	8	1	9	0	9	0	9	9	30	0	30
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**47**	**6**	**53**	**159**	**212**	**0**	**53**	**212**	**205**	**75**	**280**

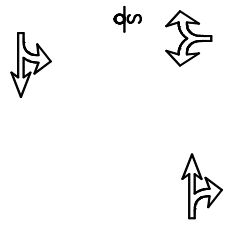
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : DRIVEWAY #3
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 8
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
DRIVEWAY #3											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	66	66	0	0	66	0	54	54
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	0	0	0	0	0	0	0	0
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	39	5	44	0	44	0	44	44	175	0	175
NB Right	0	0	0	71	71	0	0	71	0	3	3
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	8	1	9	0	9	0	9	9	30	0	30
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**47**	**6**	**53**	**137**	**190**	**0**	**53**	**190**	**205**	**57**	**262**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

6/30/2016

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	22	22	88	71	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	24	96	77	0	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	144	134	0	0	173	0
Stage 1	134	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	853	920	-	-	1416	-
Stage 1	897	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	853	920	-	-	1416	-
Mov Cap-2 Maneuver	810	-	-	-	-	-
Stage 1	897	-	-	-	-	-
Stage 2	1018	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	862	1416	-
HCM Lane V/C Ratio	-	-	0.055	-	-
HCM Control Delay (s)	-	-	9.4	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

7/5/2016

Intersection	
Int Delay, s/veh	3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	66	0	44	71	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	72	0	48	77	0	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	96	86	0	0	125	0
Stage 1	86	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	908	978	-	-	1474	-
Stage 1	942	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	908	978	-	-	1474	-
Mov Cap-2 Maneuver	853	-	-	-	-	-
Stage 1	942	-	-	-	-	-
Stage 2	1018	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	853	1474	-
HCM Lane V/C Ratio	-	-	0.084	-	-
HCM Control Delay (s)	-	-	9.6	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	22	22	88	71	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	24	96	77	0	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	144	134	0	0	173	0
Stage 1	134	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	853	920	-	-	1416	-
Stage 1	897	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	853	920	-	-	1416	-
Mov Cap-2 Maneuver	810	-	-	-	-	-
Stage 1	897	-	-	-	-	-
Stage 2	1018	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	862	1416	-
HCM Lane V/C Ratio	-	-	0.055	-	-
HCM Control Delay (s)	-	-	9.4	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1632

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

7/21/2016

Intersection	
Int Delay, s/veh	3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	66	0	44	71	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	72	0	48	77	0	10

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	96	86	0	0	125	0
Stage 1	86	-	-	-	-	-
Stage 2	10	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	908	978	-	-	1474	-
Stage 1	942	-	-	-	-	-
Stage 2	1018	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	908	978	-	-	1474	-
Mov Cap-2 Maneuver	853	-	-	-	-	-
Stage 1	942	-	-	-	-	-
Stage 2	1018	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	853	1474	-
HCM Lane V/C Ratio	-	-	0.084	-	-
HCM Control Delay (s)	-	-	9.6	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	18	18	211	3	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	19	19	222	3	0	32

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	256	224	0	0	225	0
Stage 1	224	-	-	-	-	-
Stage 2	32	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	737	820	-	-	1356	-
Stage 1	818	-	-	-	-	-
Stage 2	996	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	737	820	-	-	1356	-
Mov Cap-2 Maneuver	729	-	-	-	-	-
Stage 1	818	-	-	-	-	-
Stage 2	996	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.9	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	772	1356	-
HCM Lane V/C Ratio	-	-	0.049	-	-
HCM Control Delay (s)	-	-	9.9	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1634

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

7/21/2016

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	54	0	175	3	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	57	0	184	3	0	32

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	218	186	0	0	187	0
Stage 1	186	-	-	-	-	-
Stage 2	32	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	775	861	-	-	1399	-
Stage 1	851	-	-	-	-	-
Stage 2	996	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	775	861	-	-	1399	-
Mov Cap-2 Maneuver	759	-	-	-	-	-
Stage 1	851	-	-	-	-	-
Stage 2	996	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	759	1399	-
HCM Lane V/C Ratio	-	-	0.075	-	-
HCM Control Delay (s)	-	-	10.1	0	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : DRIVEWAY #3
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 8
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
DRIVEWAY #3											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	22	22	0	0	22	0	4	4
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	22	22	0	0	22	0	4	4
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	16	2	18	44	62	0	18	62	99	8	107
NB Right	0	0	0	68	68	0	0	68	0	49	49
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	41	5	46	0	46	0	46	46	107	0	107
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**57**	**7**	**64**	**156**	**220**	**0**	**64**	**220**	**206**	**65**	**271**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : DRIVEWAY #3
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 8
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
DRIVEWAY #3											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	0	0	0	0	0	0	0	0	0	0	0
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	65	65	0	0	65	0	12	12
WB Thru	0	0	0	0	0	0	0	0	0	0	0
WB Right	0	0	0	0	0	0	0	0	0	0	0
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	16	2	18	0	18	0	18	18	99	0	99
NB Right	0	0	0	68	68	0	0	68	0	49	49
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	41	5	46	0	46	0	46	46	107	0	107
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**57**	**7**	**64**	**133**	**197**	**0**	**64**	**197**	**206**	**61**	**267**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	22	22	62	68	0	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	24	67	74	0	50

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	154	104	0	0	141	0
Stage 1	104	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	842	956	-	-	1455	-
Stage 1	925	-	-	-	-	-
Stage 2	978	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	842	956	-	-	1455	-
Mov Cap-2 Maneuver	816	-	-	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	978	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	880	1455	-
HCM Lane V/C Ratio	-	-	0.054	-	-
HCM Control Delay (s)	-	-	9.3	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1638

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

7/5/2016

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	65	0	18	68	0	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	71	0	20	74	0	50

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	107	57	0	0	93	0
Stage 1	57	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	895	1015	-	-	1514	-
Stage 1	971	-	-	-	-	-
Stage 2	978	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	895	1015	-	-	1514	-
Mov Cap-2 Maneuver	853	-	-	-	-	-
Stage 1	971	-	-	-	-	-
Stage 2	978	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	853	1514	-
HCM Lane V/C Ratio	-	-	0.083	-	-
HCM Control Delay (s)	-	-	9.6	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

6/30/2016

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	22	22	62	68	0	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	24	24	67	74	0	50

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	154	104	0	0	141	0
Stage 1	104	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	842	956	-	-	1455	-
Stage 1	925	-	-	-	-	-
Stage 2	978	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	842	956	-	-	1455	-
Mov Cap-2 Maneuver	816	-	-	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	978	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	880	1455	-
HCM Lane V/C Ratio	-	-	0.054	-	-
HCM Control Delay (s)	-	-	9.3	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

7/21/2016

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	65	0	18	68	0	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	71	0	20	74	0	50

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	107	57	0	0	93	0
Stage 1	57	-	-	-	-	-
Stage 2	50	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	895	1015	-	-	1514	-
Stage 1	971	-	-	-	-	-
Stage 2	978	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	895	1015	-	-	1514	-
Mov Cap-2 Maneuver	853	-	-	-	-	-
Stage 1	971	-	-	-	-	-
Stage 2	978	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	853	1514	-
HCM Lane V/C Ratio	-	-	0.083	-	-
HCM Control Delay (s)	-	-	9.6	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	4	4	107	49	0	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	4	4	113	52	0	113

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	251	138	0	0	164	0
Stage 1	138	-	-	-	-	-
Stage 2	113	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	742	916	-	-	1427	-
Stage 1	894	-	-	-	-	-
Stage 2	917	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	742	916	-	-	1427	-
Mov Cap-2 Maneuver	752	-	-	-	-	-
Stage 1	894	-	-	-	-	-
Stage 2	917	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	826	1427	-
HCM Lane V/C Ratio	-	-	0.01	-	-
HCM Control Delay (s)	-	-	9.4	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1642

HCM 2010 TWSC
8: Commerce Center Drive & Driveway 3

7/21/2016

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	12	0	99	49	0	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	13	0	104	52	0	113

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	243	130	0	0	156	0
Stage 1	130	-	-	-	-	-
Stage 2	113	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	750	925	-	-	1436	-
Stage 1	901	-	-	-	-	-
Stage 2	917	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	750	925	-	-	1436	-
Mov Cap-2 Maneuver	757	-	-	-	-	-
Stage 1	901	-	-	-	-	-
Stage 2	917	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	757	1436	-
HCM Lane V/C Ratio	-	-	0.017	-	-
HCM Control Delay (s)	-	-	9.8	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

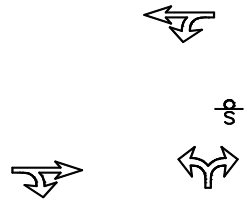
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #4
CONDITION : AM PEAK HOUR

INTERSECTION : 9
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	15	2	17	66	83	0	17	83	91	54	145
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	71	71	0	0	71	0	3	3
WB Thru	15	2	17	0	17	0	17	17	179	0	179
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #4											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	132	132	0	0	132	0	108	108
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**30**	**4**	**34**	**269**	**303**	**0**	**34**	**303**	**270**	**165**	**435**

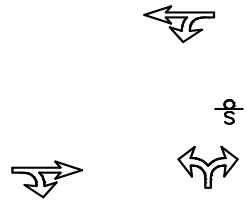
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #4
CONDITION : AM PEAK HOUR

INTERSECTION : 9
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	15	2	17	0	17	0	17	17	91	0	91
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	71	71	0	0	71	0	3	3
WB Thru	15	2	17	0	17	0	17	17	179	0	179
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #4											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	66	66	0	0	66	0	54	54
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**30**	**4**	**34**	**137**	**171**	**0**	**34**	**171**	**270**	**57**	**327**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	5.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	83	0	71	17	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	90	0	77	18	0	143

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	90	0	263	90
Stage 1	-	-	-	-	90	-
Stage 2	-	-	-	-	173	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1518	-	730	973
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1518	-	693	973
Mov Cap-2 Maneuver	-	-	-	-	708	-
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	818	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	973	-	-	1518	-
HCM Lane V/C Ratio	0.147	-	-	0.051	-
HCM Control Delay (s)	9.3	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.2	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

7/5/2016

Intersection	
Int Delay, s/veh	6.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	17	0	71	17	0	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	18	0	77	18	0	72

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	18	0	191	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	173	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1612	-	803	1066
Stage 1	-	-	-	-	1010	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1612	-	764	1066
Mov Cap-2 Maneuver	-	-	-	-	740	-
Stage 1	-	-	-	-	1010	-
Stage 2	-	-	-	-	821	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.9	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1066	-	-	1612	-
HCM Lane V/C Ratio	0.067	-	-	0.048	-
HCM Control Delay (s)	8.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.2	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	5.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	83	0	71	17	0	132
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	90	0	77	18	0	143

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	90	0	263	90
Stage 1	-	-	-	-	90	-
Stage 2	-	-	-	-	173	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1518	-	730	973
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1518	-	693	973
Mov Cap-2 Maneuver	-	-	-	-	708	-
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	818	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	973	-	-	1518	-
HCM Lane V/C Ratio	0.147	-	-	0.051	-
HCM Control Delay (s)	9.3	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.2	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	6.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	17	0	71	17	0	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	18	0	77	18	0	72

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	18	0	191	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	173	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1612	-	803	1066
Stage 1	-	-	-	-	1010	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1612	-	764	1066
Mov Cap-2 Maneuver	-	-	-	-	740	-
Stage 1	-	-	-	-	1010	-
Stage 2	-	-	-	-	821	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.9	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1066	-	-	1612	-
HCM Lane V/C Ratio	0.067	-	-	0.048	-
HCM Control Delay (s)	8.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.2	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	154	0	3	179	0	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	162	0	3	188	0	114

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	162	0	357	162
Stage 1	-	-	-	-	162	-
Stage 2	-	-	-	-	195	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1429	-	645	888
Stage 1	-	-	-	-	872	-
Stage 2	-	-	-	-	843	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1429	-	644	888
Mov Cap-2 Maneuver	-	-	-	-	684	-
Stage 1	-	-	-	-	872	-
Stage 2	-	-	-	-	841	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	888	-	-	1429	-
HCM Lane V/C Ratio	0.128	-	-	0.002	-
HCM Control Delay (s)	9.6	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	91	0	3	179	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	96	0	3	188	0	57

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	96	0	291	96
Stage 1	-	-	-	-	96	-
Stage 2	-	-	-	-	195	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1510	-	704	966
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	843	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1510	-	703	966
Mov Cap-2 Maneuver	-	-	-	-	720	-
Stage 1	-	-	-	-	933	-
Stage 2	-	-	-	-	841	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	966	-	-	1510	-
HCM Lane V/C Ratio	0.059	-	-	0.002	-
HCM Control Delay (s)	9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #4
CONDITION : PM PEAK HOUR

INTERSECTION : 9
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	48	5	53	65	118	0	53	118	230	12	242
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	68	68	0	0	68	0	49	49
WB Thru	43	5	48	0	48	0	48	48	100	0	100
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #4											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	131	131	0	0	131	0	24	24
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**91**	**10**	**101**	**264**	**365**	**0**	**101**	**365**	**330**	**85**	**415**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #4
CONDITION : PM PEAK HOUR

INTERSECTION : 9
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	48	5	53	0	53	0	53	53	230	0	230
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	68	68	0	0	68	0	49	49
WB Thru	43	5	48	0	48	0	48	48	100	0	100
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #4											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	65	65	0	0	65	0	12	12
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**91**	**10**	**101**	**133**	**234**	**0**	**101**	**234**	**330**	**61**	**391**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	118	0	68	48	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	128	0	74	52	0	142

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	128	0	328	128
Stage 1	-	-	-	-	128	-
Stage 2	-	-	-	-	200	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1470	-	671	927
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	838	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1470	-	636	927
Mov Cap-2 Maneuver	-	-	-	-	671	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	794	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	927	-	-	1470	-
HCM Lane V/C Ratio	0.154	-	-	0.05	-
HCM Control Delay (s)	9.6	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.2	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

7/5/2016

Intersection	
Int Delay, s/veh	4.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	53	0	68	48	0	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	58	0	74	52	0	71

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	58	0	258	58
Stage 1	-	-	-	-	58	-
Stage 2	-	-	-	-	200	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1559	-	735	1014
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	838	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1559	-	699	1014
Mov Cap-2 Maneuver	-	-	-	-	704	-
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	797	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1014	-	-	1559	-
HCM Lane V/C Ratio	0.07	-	-	0.047	-
HCM Control Delay (s)	8.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	118	0	68	48	0	131
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	128	0	74	52	0	142

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	128	0	328	128
Stage 1	-	-	-	-	128	-
Stage 2	-	-	-	-	200	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1470	-	671	927
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	838	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1470	-	636	927
Mov Cap-2 Maneuver	-	-	-	-	671	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	794	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	927	-	-	1470	-
HCM Lane V/C Ratio	0.154	-	-	0.05	-
HCM Control Delay (s)	9.6	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.2	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	4.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	53	0	68	48	0	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	58	0	74	52	0	71

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	58	0	258	58
Stage 1	-	-	-	-	58	-
Stage 2	-	-	-	-	200	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1559	-	735	1014
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	838	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1559	-	699	1014
Mov Cap-2 Maneuver	-	-	-	-	704	-
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	797	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1014	-	-	1559	-
HCM Lane V/C Ratio	0.07	-	-	0.047	-
HCM Control Delay (s)	8.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	242	0	49	100	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	255	0	52	105	0	25

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	255	0	463	255
Stage 1	-	-	-	-	255	-
Stage 2	-	-	-	-	208	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1322	-	561	789
Stage 1	-	-	-	-	792	-
Stage 2	-	-	-	-	832	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1322	-	537	789
Mov Cap-2 Maneuver	-	-	-	-	608	-
Stage 1	-	-	-	-	792	-
Stage 2	-	-	-	-	797	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	789	-	-	1322	-
HCM Lane V/C Ratio	0.032	-	-	0.039	-
HCM Control Delay (s)	9.7	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1658

HCM 2010 TWSC
9: Driveway 4 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	230	0	49	100	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	242	0	52	105	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	242	0	450	242
Stage 1	-	-	-	-	242	-
Stage 2	-	-	-	-	208	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1336	-	571	802
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	832	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1336	-	548	802
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	798	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	802	-	-	1336	-
HCM Lane V/C Ratio	0.016	-	-	0.039	-
HCM Control Delay (s)	9.6	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	-

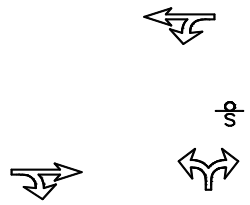
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #5
CONDITION : AM PEAK HOUR

INTERSECTION : 10
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	15	2	17	198	215	0	17	215	91	162	253
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	24	24	0	0	24	0	1	1
WB Thru	15	2	17	71	88	0	17	88	179	3	182
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #5											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	44	44	0	0	44	0	36	36
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**30**	**4**	**34**	**337**	**371**	**0**	**34**	**371**	**270**	**202**	**472**

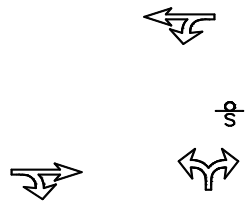
Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #5
CONDITION : AM PEAK HOUR

INTERSECTION : 10
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS



PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	15	2	17	66	83	0	17	83	91	54	145
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	24	24	0	0	24	0	1	1
WB Thru	15	2	17	71	88	0	17	88	179	3	182
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #5											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	22	22	0	0	22	0	18	18
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**30**	**4**	**34**	**183**	**217**	**0**	**34**	**217**	**270**	**76**	**346**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	215	0	24	88	0	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	234	0	26	96	0	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	234	0	382	234
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1345	-	624	810
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1345	-	612	810
Mov Cap-2 Maneuver	-	-	-	-	660	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	866	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	810	-	-	1345	-
HCM Lane V/C Ratio	0.059	-	-	0.019	-
HCM Control Delay (s)	9.7	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1662

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

7/5/2016

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	83	0	24	88	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	90	0	26	96	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	90	0	238	90
Stage 1	-	-	-	-	90	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1518	-	755	973
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1518	-	741	973
Mov Cap-2 Maneuver	-	-	-	-	747	-
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	868	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	973	-	-	1518	-
HCM Lane V/C Ratio	0.025	-	-	0.017	-
HCM Control Delay (s)	8.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	215	0	24	88	0	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	234	0	26	96	0	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	234	0	382	234
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1345	-	624	810
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1345	-	612	810
Mov Cap-2 Maneuver	-	-	-	-	660	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	866	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	810	-	-	1345	-
HCM Lane V/C Ratio	0.059	-	-	0.019	-
HCM Control Delay (s)	9.7	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	83	0	24	88	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	90	0	26	96	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	90	0	238	90
Stage 1	-	-	-	-	90	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1518	-	755	973
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1518	-	741	973
Mov Cap-2 Maneuver	-	-	-	-	747	-
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	868	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	973	-	-	1518	-
HCM Lane V/C Ratio	0.025	-	-	0.017	-
HCM Control Delay (s)	8.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	253	0	1	182	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	266	0	1	192	0	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	266	0	460	266
Stage 1	-	-	-	-	266	-
Stage 2	-	-	-	-	194	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1310	-	563	778
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	844	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1310	-	562	778
Mov Cap-2 Maneuver	-	-	-	-	626	-
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	843	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	778	-	-	1310	-
HCM Lane V/C Ratio	0.049	-	-	0.001	-
HCM Control Delay (s)	9.9	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	145	0	1	182	0	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	153	0	1	192	0	19

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	153	0	347	153
Stage 1	-	-	-	-	153	-
Stage 2	-	-	-	-	194	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1440	-	654	898
Stage 1	-	-	-	-	880	-
Stage 2	-	-	-	-	844	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1440	-	653	898
Mov Cap-2 Maneuver	-	-	-	-	690	-
Stage 1	-	-	-	-	880	-
Stage 2	-	-	-	-	843	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	898	-	-	1440	-
HCM Lane V/C Ratio	0.021	-	-	0.001	-
HCM Control Delay (s)	9.1	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #5
CONDITION : PM PEAK HOUR

INTERSECTION : 10
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 1

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	48	5	53	196	249	0	53	249	230	36	266
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	23	23	0	0	23	0	17	17
WB Thru	43	5	48	68	116	0	48	116	100	49	149
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #5											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	44	44	0	0	44	0	8	8
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**91**	**10**	**101**	**331**	**432**	**0**	**101**	**432**	**330**	**110**	**440**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	22-Jul-16	CACT0000-0001	2 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : DRIVEWAY #5
CONDITION : PM PEAK HOUR

INTERSECTION : 10
PROJECTED GROWTH PER YEAR : 2%
ALTERNATIVE : 2

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	0	0	0	0	0	0	0	0	0	0	0
EB Thru	48	5	53	65	118	0	53	118	230	12	242
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	23	23	0	0	23	0	17	17
WB Thru	43	5	48	68	116	0	48	116	100	49	149
WB Right	0	0	0	0	0	0	0	0	0	0	0
DRIVEWAY #5											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	22	22	0	0	22	0	4	4
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	0	0	0	0	0	0	0	0	0	0	0
TOTALS	**91**	**10**	**101**	**178**	**279**	**0**	**101**	**279**	**330**	**82**	**412**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	249	0	23	116	0	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	271	0	25	126	0	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	271	0	447	271
Stage 1	-	-	-	-	271	-
Stage 2	-	-	-	-	176	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1304	-	573	773
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1304	-	561	773
Mov Cap-2 Maneuver	-	-	-	-	624	-
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	841	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	773	-	-	1304	-
HCM Lane V/C Ratio	0.062	-	-	0.019	-
HCM Control Delay (s)	10	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	215	0	24	88	0	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	234	0	26	96	0	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	234	0	382	234
Stage 1	-	-	-	-	234	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1345	-	624	810
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1345	-	612	810
Mov Cap-2 Maneuver	-	-	-	-	660	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	866	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	810	-	-	1345	-
HCM Lane V/C Ratio	0.059	-	-	0.019	-
HCM Control Delay (s)	9.7	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

6/30/2016

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	249	0	23	116	0	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	271	0	25	126	0	48

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	271	0	447	271
Stage 1	-	-	-	-	271	-
Stage 2	-	-	-	-	176	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1304	-	573	773
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1304	-	561	773
Mov Cap-2 Maneuver	-	-	-	-	624	-
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	841	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	10
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	773	-	-	1304	-
HCM Lane V/C Ratio	0.062	-	-	0.019	-
HCM Control Delay (s)	10	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	118	0	23	116	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	128	0	25	126	0	24

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	128	0	304	128
Stage 1	-	-	-	-	128	-
Stage 2	-	-	-	-	176	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1470	-	692	927
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	859	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1470	-	680	927
Mov Cap-2 Maneuver	-	-	-	-	707	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	844	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	927	-	-	1470	-
HCM Lane V/C Ratio	0.026	-	-	0.017	-
HCM Control Delay (s)	9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	266	0	17	149	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	280	0	18	157	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	280	0	473	280
Stage 1	-	-	-	-	280	-
Stage 2	-	-	-	-	193	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1294	-	553	764
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	845	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1294	-	545	764
Mov Cap-2 Maneuver	-	-	-	-	613	-
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	832	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	764	-	-	1294	-
HCM Lane V/C Ratio	0.011	-	-	0.014	-
HCM Control Delay (s)	9.8	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1674

HCM 2010 TWSC
10: Driveway 5 & Goldencrest Drive

7/21/2016

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	242	0	17	149	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	255	0	18	157	0	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	255	0	448	255
Stage 1	-	-	-	-	255	-
Stage 2	-	-	-	-	193	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1322	-	572	789
Stage 1	-	-	-	-	792	-
Stage 2	-	-	-	-	845	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1322	-	563	789
Mov Cap-2 Maneuver	-	-	-	-	627	-
Stage 1	-	-	-	-	792	-
Stage 2	-	-	-	-	832	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	789	-	-	1322	-
HCM Lane V/C Ratio	0.005	-	-	0.014	-
HCM Control Delay (s)	9.6	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

APPENDIX F: ROADWAY SEGMENT CAPACITY ANALYSIS CALCULATIONS

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
ROADWAY VOLUMES	TM	16-Nov-15	CACT0000-0001	1 OF 1

ROADWAY : COMMERCE CENTER DR

SEGMENT : 1

SEGMENT BOUNDARIES : CITY LIMIT

: GOLDENCREST DR

CONDITION	GRADE	EXISTING CONDITION PCE TRAFFIC	BACKGROUND CONDITION PCE TRAFFIC	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
SCENERIO #								
NORTHBOUND								
AM	**0**	39	43	333	43	333	175	261
PM	**0**	16	18	309	18	309	99	334
SOUTHBOUND								
AM	**0**	8	9	55	9	55	30	64
PM	**0**	41	45	96	45	96	107	105
TOTAL AVERAGE DAILY TRAFFIC								
ADT	**0**	700	700	4,700	700	4,700	2,400	5,000

CONDITION	TYPE OF ROADWAY	ADT	LOS
EXISTING CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**700**	**A**
BACKGROUND CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**700**	**A**
BACKGROUND + PROJECT CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**4,700**	**A**
CUMULATIVE CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**700**	**A**
CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**4,700**	**A**
BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**2,400**	**A**
BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**5,000**	**A**

TYPE OF ROADWAY	LEVEL OF SERVICE*				
	A	B	C	D	E
SIX LANE DIVIDED ARTERIAL	33,900	39,400	45,000	50,600	56,300
FOUR LANE DIVIDED ARTERIAL	22,500	26,300	30,000	33,800	37,500
FOUR LANE UNDIVIDED ARTERIAL	15,000	17,500	20,000	22,500	25,000
TWO LANE INDUSTRIAL COLLECTOR	7,500	8,800	10,000	11,300	12,500
TWO LANE UNDIVIDED RESIDENTIAL	N/A	N/A	N/A	N/A	2,000

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS **PROPOSED GEOMETRICS**

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	32	3	35	290	325	0	35	325	112	86	198
EB Thru	1586	159	1745	-136	1609	1102	2847	2711	2511	-136	2375
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1742	174	1916	103	2019	1237	3153	3256	2874	79	2953
WB Right	7	1	8	0	8	0	8	8	63	0	63
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	8	1	9	46	55	0	9	55	30	34	64
TOTALS	**3375**	**338**	**3713**	**303**	**4016**	**2339**	**6052**	**6355**	**5590**	**63**	**5653**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	11	1	12	291	303	0	12	303	47	235	282
EB Thru	1633	163	1796	-129	1667	1277	3073	2944	2790	-129	2661
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1849	185	2034	114	2148	1244	3278	3392	3222	7	3229
WB Right	5	1	6	0	6	0	6	6	52	0	52
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	41	4	45	51	96	0	45	96	107	-2	105
TOTALS	**3539**	**354**	**3893**	**327**	**4220**	**2521**	**6414**	**6741**	**6218**	**111**	**6329**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
ROADWAY VOLUMES	TM	16-Nov-15	CACT0000-0001	1 OF 1

ROADWAY SEGMENT BOUNDARIES : GOLDENCREST DR : COMMERCE CENTER DR to ELSWORTH ST

SEGMENT : 2

CONDITION	GRADE	EXISTING CONDITION PCE TRAFFIC	BACKGROUND CONDITION PCE TRAFFIC	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
SCENERIO #								
EASTBOUND								
AM	**0**	16	19	188	19	188	91	216
PM	**0**	48	53	212	53	212	230	193
WESTBOUND								
AM	**0**	43	18	35	18	35	179	105
PM	**0**	43	48	61	48	61	100	88
TOTAL AVERAGE DAILY TRAFFIC								
ADT	**0**	1,000	1,200	3,100	1,200	3,100	3,800	3,200

CONDITION	TYPE OF ROADWAY	ADT	LOS
EXISTING CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**1,000**	**A**
BACKGROUND CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**1,200**	**A**
BACKGROUND + PROJECT CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**3,100**	**A**
CUMULATIVE CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**1,200**	**A**
CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**3,100**	**A**
BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**3,800**	**A**
BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC	TWO LANE INDUSTRIAL COLLECTOR	**3,200**	**A**

TYPE OF ROADWAY	LEVEL OF SERVICE*				
	A	B	C	D	E
SIX LANE DIVIDED ARTERIAL	33,900	39,400	45,000	50,600	56,300
FOUR LANE DIVIDED ARTERIAL	22,500	26,300	30,000	33,800	37,500
FOUR LANE UNDIVIDED ARTERIAL	15,000	17,500	20,000	22,500	25,000
TWO LANE INDUSTRIAL COLLECTOR	7,500	8,800	10,000	11,300	12,500
TWO LANE UNDIVIDED RESIDENTIAL	N/A	N/A	N/A	N/A	2,000

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Hall & Foreman, Inc.

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS **PROPOSED GEOMETRICS**

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	8	1	9	18	27	0	9	27	20	-2	18
EB Thru	1	1	2	0	2	0	2	2	45	0	45
EB Right	7	1	8	151	159	0	8	159	26	127	153
WB Left	5	1	6	0	6	23	29	29	34	0	34
WB Thru	1	1	2	0	2	0	2	2	61	0	61
WB Right	6	1	7	0	7	0	7	7	27	0	27
ELSWORTH ST											
NB Left	5	1	6	0	6	0	6	6	51	0	51
NB Thru	320	32	352	0	352	41	393	393	203	0	203
NB Right	6	1	7	0	7	41	48	48	49	0	49
SB Left	9	1	10	0	10	0	10	10	66	0	66
SB Thru	218	22	240	4	244	23	263	267	338	-19	319
SB Right	9	1	10	17	27	0	10	27	67	-74	-7
TOTALS	**595**	**64**	**659**	**190**	**849**	**128**	**787**	**977**	**987**	**32**	**1019**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Hall & Foreman, Inc.

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	21	2	23	18	41	0	23	41	117	-71	46
EB Thru	8	1	9	0	9	0	9	9	51	0	51
EB Right	19	2	21	141	162	0	21	162	62	34	96
WB Left	18	2	20	0	20	37	57	57	42	0	42
WB Thru	5	1	6	0	6	0	6	6	33	0	33
WB Right	16	2	18	0	18	0	18	18	45	0	45
ELSWORTH ST											
NB Left	18	2	20	0	20	0	20	20	40	0	40
NB Thru	226	23	249	0	249	21	270	270	437	0	437
NB Right	4	1	5	0	5	21	26	26	41	0	41
SB Left	5	1	6	0	6	0	6	6	28	0	28
SB Thru	199	20	219	3	222	37	256	259	307	-3	304
SB Right	20	2	22	13	35	0	22	35	27	-12	15
TOTALS	**559**	**59**	**618**	**175**	**793**	**116**	**734**	**909**	**1230**	**-52**	**1178**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
ROADWAY VOLUMES	TM	16-Nov-15	CACT0000-0001	1 OF 1

ROADWAY : CACTUS AVE
SEGMENT BOUNDARIES : OLD 215 FRONTAGE RD
: COMMERCE CENTER DR

SEGMENT : 3

CONDITION	GRADE	EXISTING CONDITION PCE TRAFFIC	BACKGROUND CONDITION PCE TRAFFIC	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
SCENERIO #								
EASTBOUND								
AM	**0**	1079	1187	1341	1853	2007	1376	1326
PM	**0**	1386	1525	1687	2432	2594	2038	2144
WESTBOUND								
AM	**0**	1816	1997	2145	2895	3043	2904	2972
PM	**0**	1818	2000	2165	2753	2918	3329	3430
TOTAL AVERAGE DAILY TRAFFIC								
ADT	**0**	36,800	40,500	44,300	59,600	63,400	61,700	64,100

CONDITION	TYPE OF ROADWAY	**ADT**	**LOS**
EXISTING CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**36,800**	**E**
BACKGROUND CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**40,500**	**F**
BACKGROUND + PROJECT CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**44,300**	**F**
CUMULATIVE CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**59,600**	**F**
CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**63,400**	**F**
BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**61,700**	**F**
BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**64,100**	**F**

TYPE OF ROADWAY	LEVEL OF SERVICE*				
	A	B	C	D	E
SIX LANE DIVIDED ARTERIAL	33,900	39,400	45,000	50,600	56,300
FOUR LANE DIVIDED ARTERIAL	22,500	26,300	30,000	33,800	37,500
FOUR LANE UNDIVIDED ARTERIAL	15,000	17,500	20,000	22,500	25,000
TWO LANE INDUSTRIAL COLLECTOR	7,500	8,800	10,000	11,300	12,500
TWO LANE UNDIVIDED RESIDENTIAL	N/A	N/A	N/A	N/A	2,000

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : I-215 FREEWAY NB RAMPS
CONDITION : AM PEAK HOUR

INTERSECTION : 2
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS

PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	45	5	50	0	50	78	128	128	86	0	86
EB Thru	998	100	1098	67	1165	640	1738	1805	1204	-46	1158
EB Right	30	3	33	0	33	44	77	77	88	0	88
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1524	152	1676	148	1824	820	2496	2644	2593	68	2661
WB Right	292	29	321	0	321	78	399	399	311	0	311
I-215 FREEWAY NB RAMPS											
NB Left	572	57	629	0	629	402	1031	1031	708	0	708
NB Thru	523	52	575	0	575	78	653	653	362	0	362
NB Right	37	4	41	87	128	0	41	128	40	-4	36
SB Left	44	4	48	0	48	26	74	74	132	0	132
SB Thru	0	0	0	0	0	13	13	13	0	0	0
SB Right	81	8	89	0	89	26	115	115	384	0	384
TOTALS	**4146**	**414**	**4560**	**302**	**4862**	**2205**	**6765**	**7067**	**5908**	**18**	**5926**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : I-215 FREEWAY NB RAMPS
CONDITION : PM PEAK HOUR

INTERSECTION : 2
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	21	2	23	0	23	35	58	58	193	0	193
EB Thru	1260	126	1386	96	1482	850	2236	2332	1748	65	1813
EB Right	197	20	217	0	217	201	418	418	411	0	411
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1729	173	1902	165	2067	718	2620	2785	2849	101	2950
WB Right	89	9	98	0	98	35	133	133	480	0	480
I-215 FREEWAY NB RAMPS											
NB Left	46	5	51	0	51	107	158	158	153	0	153
NB Thru	33	3	36	0	36	35	71	71	151	0	151
NB Right	29	3	32	66	98	0	32	98	25	41	66
SB Left	97	10	107	0	107	57	164	164	265	0	265
SB Thru	0	0	0	0	0	29	29	29	5	0	5
SB Right	54	5	59	0	59	57	116	116	250	0	250
TOTALS	**3555**	**356**	**3911**	**327**	**4238**	**2124**	**6035**	**6362**	**6530**	**207**	**6737**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
ROADWAY VOLUMES	TM	16-Nov-15	CACT0000-0001	1 OF 1

ROADWAY : CACTUS AVE
SEGMENT : 3B
SEGMENT BOUNDARIES : COMMERCE CENTER DR
: ELSWORTH ST

CONDITION	GRADE	EXISTING CONDITION PCE TRAFFIC	BACKGROUND CONDITION PCE TRAFFIC	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
SCENERIO #								
EASTBOUND								
AM	**0**	1586	1745	1609	2847	2711	2511	2375
PM	**0**	1633	1796	1667	3073	2944	2790	2661
WESTBOUND								
AM	**0**	1749	1924	2027	3161	3264	2937	3016
PM	**0**	1854	2040	2154	3284	3398	3274	3281
TOTAL AVERAGE DAILY TRAFFIC								
ADT	**0**	40,100	44,100	43,900	73,100	72,900	69,700	68,300

CONDITION	TYPE OF ROADWAY	**ADT**	**LOS**
EXISTING CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**40,100**	**C**
BACKGROUND CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**44,100**	**C**
BACKGROUND + PROJECT CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**43,900**	**C**
CUMULATIVE CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**73,100**	**F**
CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**72,900**	**F**
BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**69,700**	**F**
BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**68,300**	**F**

TYPE OF ROADWAY	LEVEL OF SERVICE*				
	A	B	C	D	E
SIX LANE DIVIDED ARTERIAL	33,900	39,400	45,000	50,600	56,300
FOUR LANE DIVIDED ARTERIAL	22,500	26,300	30,000	33,800	37,500
FOUR LANE UNDIVIDED ARTERIAL	15,000	17,500	20,000	22,500	25,000
TWO LANE INDUSTRIAL COLLECTOR	7,500	8,800	10,000	11,300	12,500
TWO LANE UNDIVIDED RESIDENTIAL	N/A	N/A	N/A	N/A	2,000

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : AM PEAK HOUR

INTERSECTION : 3
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS

PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	32	3	35	290	325	0	35	325	112	86	198
EB Thru	1586	159	1745	-136	1609	1102	2847	2711	2511	-136	2375
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1742	174	1916	103	2019	1237	3153	3256	2874	79	2953
WB Right	7	1	8	0	8	0	8	8	63	0	63
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	8	1	9	46	55	0	9	55	30	34	64
TOTALS	**3375**	**338**	**3713**	**303**	**4016**	**2339**	**6052**	**6355**	**5590**	**63**	**5653**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : COMMERCE CENTER DR
CONDITION : PM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	Existing Condition PCE Traffic	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	11	1	12	291	303	0	12	303	47	235	282
EB Thru	1633	163	1796	-129	1667	1277	3073	2944	2790	-129	2661
EB Right	0	0	0	0	0	0	0	0	0	0	0
WB Left	0	0	0	0	0	0	0	0	0	0	0
WB Thru	1849	185	2034	114	2148	1244	3278	3392	3222	7	3229
WB Right	5	1	6	0	6	0	6	6	52	0	52
COMMERCE CENTER DR											
NB Left	0	0	0	0	0	0	0	0	0	0	0
NB Thru	0	0	0	0	0	0	0	0	0	0	0
NB Right	0	0	0	0	0	0	0	0	0	0	0
SB Left	0	0	0	0	0	0	0	0	0	0	0
SB Thru	0	0	0	0	0	0	0	0	0	0	0
SB Right	41	4	45	51	96	0	45	96	107	-2	105
TOTALS	**3539**	**354**	**3893**	**327**	**4220**	**2521**	**6414**	**6741**	**6218**	**111**	**6329**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
ROADWAY VOLUMES	TM	16-Nov-15	CACT0000-0001	1 OF 1

ROADWAY : CACTUS AVE

SEGMENT BOUNDARIES : ELSWORTH ST - FREDERICK ST

SEGMENT : 5

CONDITION	GRADE	EXISTING CONDITION PCE TRAFFIC	BACKGROUND CONDITION PCE TRAFFIC	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
SCENERIO #								
EASTBOUND								
AM	**0**	1420	1562	1709	2403	2550	2121	2248
PM	**0**	1649	1814	1952	3234	3372	2918	2967
WESTBOUND								
AM	**0**	1772	1949	1970	3319	3340	3069	2977
PM	**0**	1692	1862	1878	2848	2864	2453	2413
TOTAL AVERAGE DAILY TRAFFIC								
ADT	**0**	38,400	42,300	44,000	69,900	71,700	61,800	61,900

CONDITION	TYPE OF ROADWAY	**ADT**	**LOS**
EXISTING CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**38,400**	**B**
BACKGROUND CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**42,300**	**C**
BACKGROUND + PROJECT CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**44,000**	**C**
CUMULATIVE CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**69,900**	**F**
CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**71,700**	**F**
BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**61,800**	**F**
BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC	SIX LANE DIVIDED ARTERIAL	**61,900**	**F**

TYPE OF ROADWAY	LEVEL OF SERVICE*				
	A	B	C	D	E
SIX LANE DIVIDED ARTERIAL	33,900	39,400	45,000	50,600	56,300
FOUR LANE DIVIDED ARTERIAL	22,500	26,300	30,000	33,800	37,500
FOUR LANE UNDIVIDED ARTERIAL	15,000	17,500	20,000	22,500	25,000
TWO LANE INDUSTRIAL COLLECTOR	7,500	8,800	10,000	11,300	12,500
TWO LANE UNDIVIDED RESIDENTIAL	N/A	N/A	N/A	N/A	2,000

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS

PROPOSED GEOMETRICS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	1		3		5		7	9	11		13
CACTUS AVE											
EB Left	212	21	233	0	233	81	314	314	114	0	114
EB Thru	1337	134	1471	0	1471	841	2312	2312	1997	0	1997
EB Right	38	4	42	0	42	0	42	42	384	0	384
WB Left	68	7	75	0	75	0	75	75	118	0	118
WB Thru	1620	162	1782	21	1803	1370	3152	3173	2796	-92	2704
WB Right	84	8	92	0	92	0	92	92	155	0	155
ELSWORTH ST											
NB Left	46	5	51	4	55	0	51	55	58	-19	39
NB Thru	25	3	28	0	28	0	28	28	28	0	28
NB Right	20	2	22	0	22	0	22	22	21	0	21
SB Left	63	6	69	147	216	0	69	216	103	127	230
SB Thru	83	8	91	4	95	0	91	95	152	0	152
SB Right	80	8	88	4	92	47	135	139	141	-19	122
TOTALS	**3676**	**368**	**4044**	**180**	**4224**	**2339**	**6383**	**6563**	**6067**	**-3**	**6064**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : CACTUS AVE
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR

INTERSECTION : 4
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	2		4		6		8	10	12		14
CACTUS AVE											
EB Left	129	13	142	0	142	41	183	183	176	0	176
EB Thru	1479	148	1627	0	1627	1420	3047	3047	2554	0	2554
EB Right	22	2	24	0	24	0	24	24	36	0	36
WB Left	15	2	17	0	17	0	17	17	33	0	33
WB Thru	1609	161	1770	16	1786	986	2756	2772	2203	-40	2163
WB Right	68	7	75	0	75	0	75	75	217	0	217
ELSWORTH ST											
NB Left	148	15	163	3	166	0	163	166	482	-3	479
NB Thru	58	6	64	0	64	0	64	64	125	0	125
NB Right	52	5	57	0	57	0	57	57	165	0	165
SB Left	118	12	130	138	268	0	130	268	199	49	248
SB Thru	34	3	37	4	41	0	37	41	27	-14	13
SB Right	88	9	97	3	100	74	171	174	188	-3	185
TOTALS	**3820**	**383**	**4203**	**164**	**4367**	**2521**	**6724**	**6888**	**6405**	**-11**	**6394**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

SUBJECT	BY	DATE	JOB NO.	SHEET OF
ROADWAY VOLUMES	TM	16-Nov-15	CACT0000-0001	1 OF 1

ROADWAY : ELSWORTH ST
SEGMENT : CACTUS AVE
BOUNDARIES : ALESSANDRO BLVD

SEGMENT : 6

CONDITION	GRADE	EXISTING CONDITION PCE TRAFFIC	BACKGROUND CONDITION PCE TRAFFIC	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
SCENERIO #								
NORTHBOUND								
AM	**0**	334	368	386	409	427	250	248
PM	**0**	263	290	308	311	329	599	528
SOUTHBOUND								
AM	**0**	236	260	281	283	283	283	283
PM	**0**	224	247	263	284	284	284	284
TOTAL AVERAGE DAILY TRAFFIC								
ADT	**0**	5,600	6,200	6,600	6,800	7,000	10,200	9,300

CONDITION	TYPE OF ROADWAY	**ADT**	**LOS**
EXISTING CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**5,600**	**A**
BACKGROUND CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**6,200**	**A**
BACKGROUND + PROJECT CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**6,600**	**A**
CUMULATIVE CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**6,800**	**A**
CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**7,000**	**A**
BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**10,200**	**A**
BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC	FOUR LANE DIVIDED ARTERIAL	**9,300**	**A**

TYPE OF ROADWAY	LEVEL OF SERVICE*				
	A	B	C	D	E
SIX LANE DIVIDED ARTERIAL	33,900	39,400	45,000	50,600	56,300
FOUR LANE DIVIDED ARTERIAL	22,500	26,300	30,000	33,800	37,500
FOUR LANE UNDIVIDED ARTERIAL	15,000	17,500	20,000	22,500	25,000
TWO LANE INDUSTRIAL COLLECTOR	7,500	8,800	10,000	11,300	12,500
TWO LANE UNDIVIDED RESIDENTIAL	N/A	N/A	N/A	N/A	2,000

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Hall & Foreman, Inc.

Engineering • Surveying • Planning • Landscape Architecture

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : AM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

EXISTING GEOMETRICS **PROPOSED GEOMETRICS**

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	1		3		5		7	9	11		13
GOLDENCREST DR											
EB Left	8	1	9	18	27	0	9	27	20	-2	18
EB Thru	1	1	2	0	2	0	2	2	45	0	45
EB Right	7	1	8	151	159	0	8	159	26	127	153
WB Left	5	1	6	0	6	23	29	29	34	0	34
WB Thru	1	1	2	0	2	0	2	2	61	0	61
WB Right	6	1	7	0	7	0	7	7	27	0	27
ELSWORTH ST											
NB Left	5	1	6	0	6	0	6	6	51	0	51
NB Thru	320	32	352	0	352	41	393	393	203	0	203
NB Right	6	1	7	0	7	41	48	48	49	0	49
SB Left	9	1	10	0	10	0	10	10	66	0	66
SB Thru	218	22	240	4	244	23	263	267	338	-19	319
SB Right	9	1	10	17	27	0	10	27	67	-74	-7
TOTALS	**595**	**64**	**659**	**190**	**849**	**128**	**787**	**977**	**987**	**32**	**1019**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Hall & Foreman, Inc.

Engineering • Surveying • Planning • Landscape Architecture

SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENTS	TM	16-Nov-15	CACT0000-0001	1 OF 2

E/W STREET : GOLDENCREST DR
N/S STREET : ELSWORTH ST
CONDITION : PM PEAK HOUR

INTERSECTION : 5
PROJECTED GROWTH PER YEAR : 2%

CONDITION DIAGRAMS

TURN MOVEMENTS

Condition	EXISTING CONDITION PCE TRAFFIC	AMBIENT GROWTH PCE TRIPS	BACKGROUND CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BACKGROUND + PROJECT CONDITION PCE TRAFFIC	CUMULATIVE PROJECT PCE TRIPS	CUMULATIVE CONDITION PCE TRAFFIC	CUMULATIVE + PROJECT CONDITION PCE TRAFFIC	BUILDOUT YEAR 2035 CONDITION PCE TRAFFIC	PROJECT PCE TRIPS	BUILDOUT YEAR 2035 + PROJECT CONDITION PCE TRAFFIC
Scenario #	2		4		6		8	10	12		14
GOLDENCREST DR											
EB Left	21	2	23	18	41	0	23	41	117	-71	46
EB Thru	8	1	9	0	9	0	9	9	51	0	51
EB Right	19	2	21	141	162	0	21	162	62	34	96
WB Left	18	2	20	0	20	37	57	57	42	0	42
WB Thru	5	1	6	0	6	0	6	6	33	0	33
WB Right	16	2	18	0	18	0	18	18	45	0	45
ELSWORTH ST											
NB Left	18	2	20	0	20	0	20	20	40	0	40
NB Thru	226	23	249	0	249	21	270	270	437	0	437
NB Right	4	1	5	0	5	21	26	26	41	0	41
SB Left	5	1	6	0	6	0	6	6	28	0	28
SB Thru	199	20	219	3	222	37	256	259	307	-3	304
SB Right	20	2	22	13	35	0	22	35	27	-12	15
TOTALS	**559**	**59**	**618**	**175**	**793**	**116**	**734**	**909**	**1230**	**-52**	**1178**

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

DAVID EVANS AND ASSOCIATES INC.

APPENDIX G: GOLDENCREST DRIVE AND ELSWORTH STREET TRAFFIC SIGNAL WARRANT WORKSHEET

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 1 of 5)

COUNT DATE 10-1-2015

DIST ____ CO ____ RTE ____ PM ____

CALC TM DATE 10-13-2015

CHK RK DATE 10-13-2015

Major St: ELSWORTH STREET — Critical Approach Speed 40 mph

Minor St: GOLDENCREST DRIVE — Critical Approach Speed 35 mph

Speed limit or critical speed on major street traffic > 40 mph ☐ or
In built up area of isolated community of < 10,000 population ☐ } RURAL (R)

☒ URBAN (U)

WARRANT 1 - Eight Hour Vehicular Volume SATISFIED YES ☐ NO ☒

(Condition A or Condition B or combination of A and B must be satisfied)

Condition A - Minimum Vehicle Volume 100% SATISFIED YES ☐ NO ☒

80% SATISFIED YES ☐ NO ☒

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				11 AM - 12 PM	12 - 1 PM	4 - 5 PM	3 - 4 PM	7 - 8 AM	5 - 6 PM	1 - 2 PM	10 - 11 AM
	U	R	U	R								Hour
APPROACH LANES	1		2 or More									
Both Approaches Major Street	500 (400)	350 (280)	600 (480)	420 (336)	454	341	334	326	303	279	279	279
Highest Approach Minor Street	150 (120)	105 (84)	200 (160)	140 (112)	82	53	48	44	30	43	40	38

Condition B - Interruption of Continuous Traffic 100% SATISFIED YES ☐ NO ☒

80% SATISFIED YES ☐ NO ☒

	MINIMUM REQUIREMENTS (80% SHOWN IN BRACKETS)				11 AM - 12 PM	12 - 1 PM	4 - 5 PM	3 - 4 PM	7 - 8 AM	5 - 6 PM	1 - 2 PM	10 - 11 AM
	U	R	U	R								Hour
APPROACH LANES	1		2 or More									
Both Approaches Major Street	750 (600)	525 (420)	900 (720)	630 (504)	454	341	334	326	303	279	279	279
Highest Approach Minor Street	75 (60)	53 (42)	100 (80)	70 (56)	82	53	48	44	30	43	40	38

Combination of Conditions A & B SATISFIED YES ☐ NO ☒

REQUIREMENT	CONDITION	✓	FULFILLED
TWO CONDITIONS SATISFIED 80%	A. MINIMUM VEHICULAR VOLUME		Yes ☐ No ☒
	AND, B. INTERRUPTION OF CONTINUOUS TRAFFIC		
AND, AN ADEQUATE TRIAL OF OTHER ALTERNATIVES THAT COULD CAUSE LESS DELAY AND INCONVENIENCE TO TRAFFIC HAS FAILED TO SOLVE THE TRAFFIC PROBLEMS			Yes ☐ No ☒

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☒**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	11AM - 12 PM	12 - 1 PM	4-5 PM	3 - 4 PM Hour
Both Approaches - Major Street		X	454	341	334	326
Higher Approach - Minor Street		X	82	53	48	44

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☒
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	11AM - 12 PM Hour
Both Approaches - Major Street		X	454
Higher Approach - Minor Street		X	82

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1697

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 3 of 5)

WARRANT 4 - Pedestrian Volume
(Parts 1 and 2 Must Be Satisfied)

SATISFIED YES ☐ NO ☐ N/A

Part 1 (Parts A or B must be satisfied)

	Hours - - ->				
A.	Vehicles per hour for any 4 hours				
	Pedestrians per hour for any 4 hours				

Figure 4C-5 or Figure 4C-6
SATISFIED YES ☐ NO ☐

	Hours - - ->				
B.	Vehicles per hour for any 1 hour				
	Pedestrians per hour for any 1 hour				

Figure 4C-7 or Figure 4C-8
SATISFIED YES ☐ NO ☐

Part 2 SATISFIED YES ☐ NO ☐

AND, The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐	No ☐
OR, The proposed traffic signal will not restrict progressive traffic flow along the major street.	Yes ☐	No ☐

WARRANT 5 - School Crossing
(Parts A and B Must Be Satisfied)

SATISFIED YES ☐ NO ☐ N/A

Part A
Gap/Minutes and # of Children

SATISFIED YES ☐ NO ☐

		Hour
Gaps vs Minutes	Minutes Children Using Crossing	
	Number of Adequate Gaps	
School Age Pedestrians Crossing Street / hr		

Gaps < Minutes YES ☐ NO ☐
AND Children > 20/hr YES ☐ NO ☐

AND, Consideration has been given to less restrictive remedial measures.	Yes ☐	No ☐

Part B SATISFIED YES ☐ NO ☐

The distance to the nearest traffic signal along the major street is greater than 300 ft	Yes ☐	No ☐
OR, The proposed signal will not restrict the progressive movement of traffic.	Yes ☐	No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1698

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 4 of 5)

WARRANT 6 - Coordinated Signal System **SATISFIED YES ☐ NO ☒**
(All Parts Must Be Satisfied)

MINIMUM REQUIREMENTS	DISTANCE TO NEAREST SIGNAL	
≥ 1000 ft	N 2,000 ft, S 500 ft, E _____ ft, W _____ ft	Yes ☐ No ☒
On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.		Yes ☐ No ☒
OR, On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.		

WARRANT 7 - Crash Experience Warrant **SATISFIED YES ☐ NO ☐** N/A
(All Parts Must Be Satisfied)

Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency.			Yes ☐ No ☐
REQUIREMENTS	Number of crashes reported within a 12 month period susceptible to correction by a traffic signal, and involving injury or damage exceeding the requirements for a reportable crash.		Yes ☐ No ☐
5 OR MORE			
REQUIREMENTS	CONDITIONS	✓	Yes ☐ No ☐
ONE CONDITION SATISFIED 80%	Warrant 1, Condition A - Minimum Vehicular Volume		
	OR, Warrant 1, Condition B - Interruption of Continuous Traffic		
	OR, Warrant 4, Pedestrian Volume Condition Ped Vol ≥ 80% of Figure 4C-5 through Figure 4C-8		

WARRANT 8 - Roadway Network **SATISFIED YES ☒ NO ☐**
(All Parts Must Be Satisfied)

MINIMUM VOLUME REQUIREMENTS	ENTERING VOLUMES - ALL APPROACHES			FULFILLED
1000 Veh/Hr	During Typical Weekday Peak Hour 536 Veh/Hr and has 5-year projected traffic volumes that meet one or more of Warrants 1, 2, and 3 during an average weekday.			Yes ☐ No ☒
	OR During Each of Any 5 Hrs. of a Sat. or Sun _____ Veh/Hr			
CHARACTERISTICS OF MAJOR ROUTES		MAJOR ROUTE A	MAJOR ROUTE B	
Hwy. System Serving as Principal Network for Through Traffic		X		
Rural or Suburban Highway Outside Of, Entering, or Traversing a City				
Appears as Major Route on an Official Plan		X		
Any Major Route Characteristics Met, Both Streets				Yes ☐ No ☒

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 5 of 5)

WARRANT 9 - Intersection Near a Grade Crossing SATISFIED YES ☐ NO ☐ N/A
(Both Parts A and B Must Be Satisfied)

PART A A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach. Track Center Line to Limit Line _____ ft	Yes ☐ No ☐
PART B **There is one minor street approach lane at the track crossing** - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-9. Major Street - Total of both approaches: _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calculate AF) = _____ VPH	Yes ☐ No ☐
OR, There are two or more minor street approach lanes at the track crossing - During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point falls above the applicable curve in Figure 4C-10. Major Street - Total of both approaches : _____ VPH Minor Street - Crosses the track (one direction only, approaching the intersection): _____ VPH X AF (Use Tables 4C-2, 3, & 4 below to calcualte AF) = _____ VPH	

The minor street approach volume may be multiplied by up to three following adjustment factors (AF) as described in Section 4C.10.

1- Number of Rail Traffic per Day_____ Adjustment factor from table 4C-2____

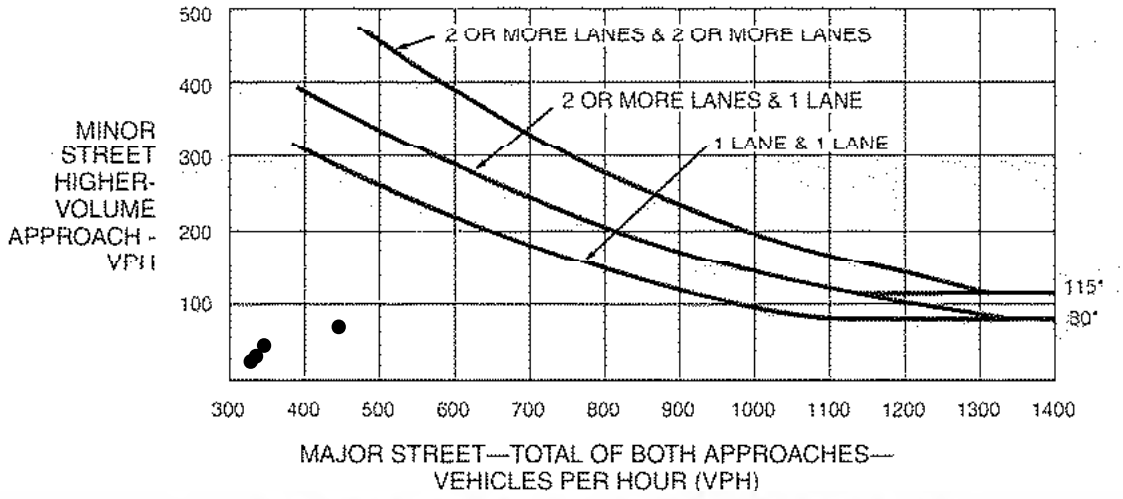
2- Percentage of High-Occupancy Buses on Minor Street Approach_____ Adjustment factor from table 4C-3____

3- Percentage of Tractor-Trailer Trucks on Minor Street Approach_____ Adjustment factor from table 4C-4____

NOTE: If no data is availale or known, then use AF = 1 (no adjustment)

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

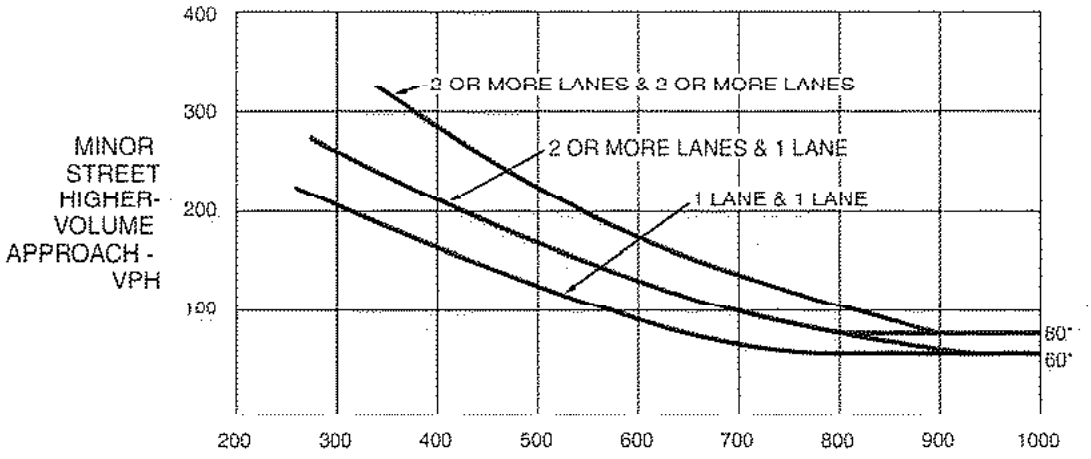
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

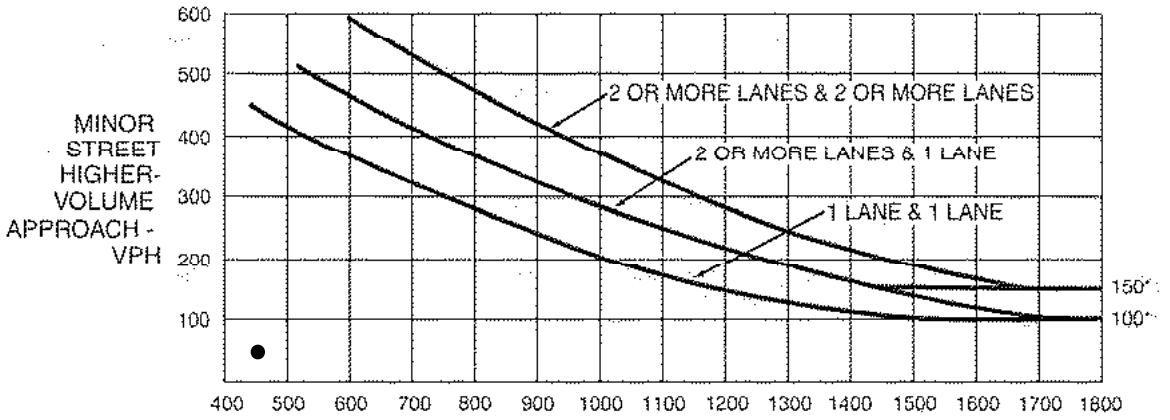
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

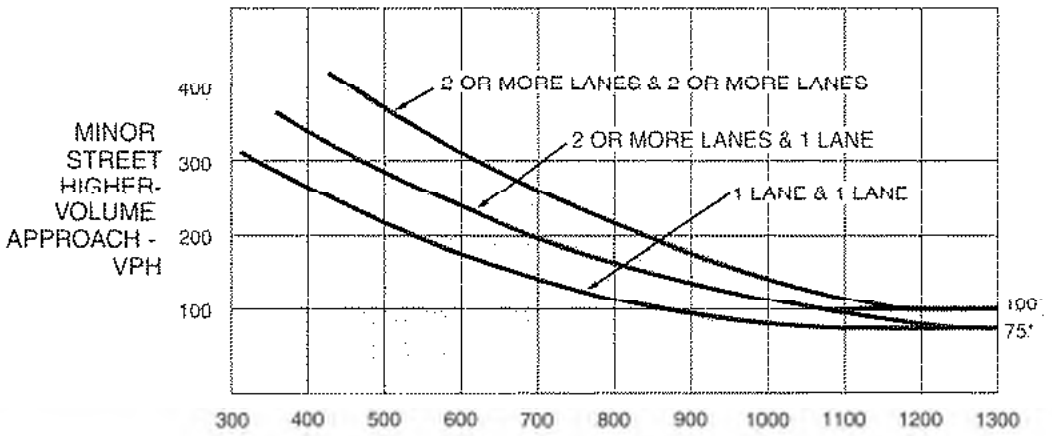
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☒**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	11AM - 12 PM	12 - 1 PM	4-5 PM	3 - 4 PM (Hour)
Both Approaches - Major Street		X	454	341	334	326
Higher Approach - Minor Street		X	82	53	48	44

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐	No ☒
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐	No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐	No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐	No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐	No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	7:30 - 8:30AM (Hour)
Both Approaches - Major Street		X	567
Higher Approach - Minor Street		X	16

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐	No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐	No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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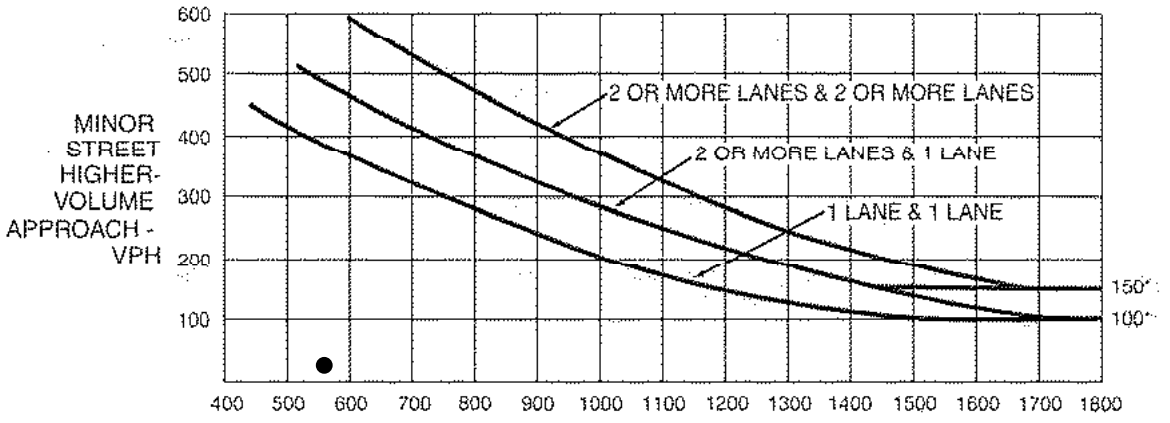
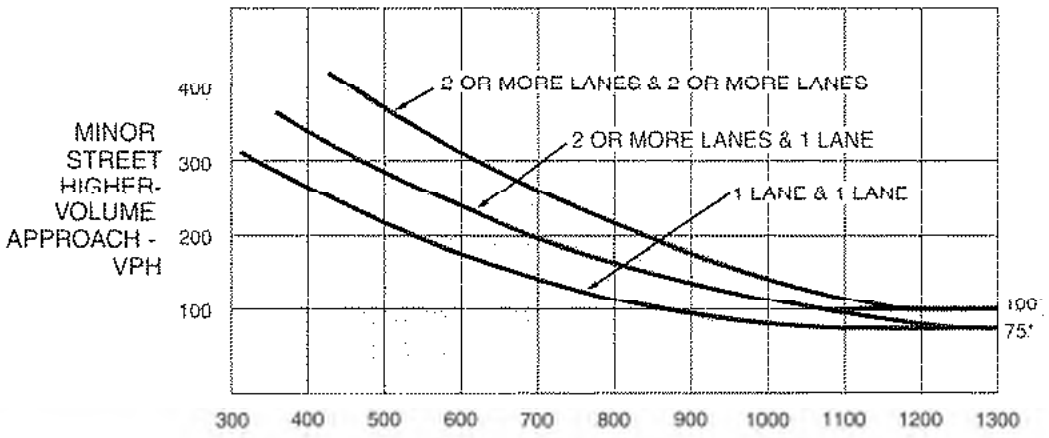
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☒**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More	11AM - 12 PM	12 - 1 PM	4-5 PM	3 - 4 PM (Hour)
Both Approaches - Major Street		X	454	341	334	326
Higher Approach - Minor Street		X	82	53	48	44

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐	No ☒
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐	No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐	No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐	No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐	No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	4:15 - 5:15 PM (Hour)
Both Approaches - Major Street		X	472
Higher Approach - Minor Street		X	48

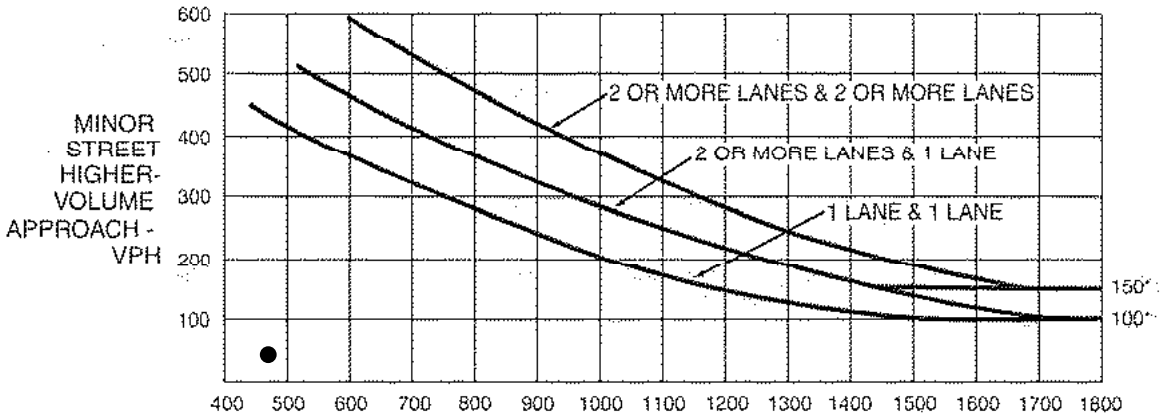
The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐	No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐	No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1705

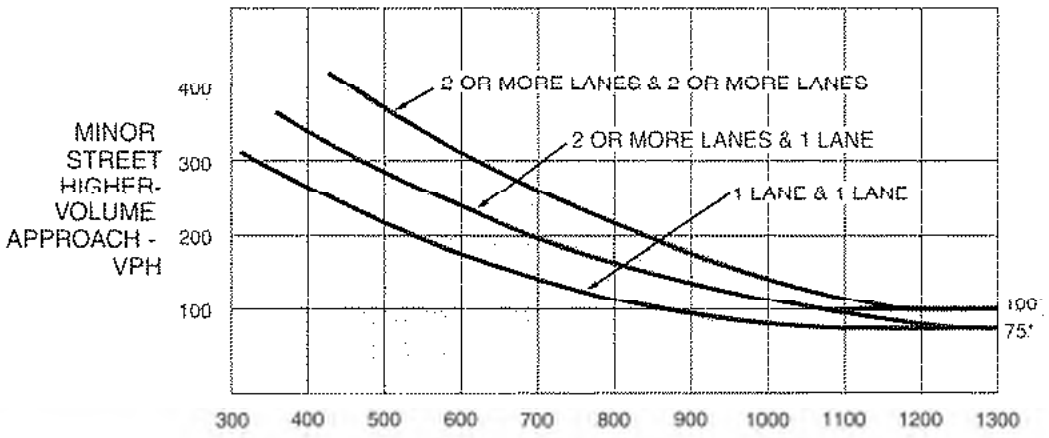
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume SATISFIED* YES ☐ NO ☐ N/A

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour SATISFIED YES ☐ NO ☒
(Part A or Part B must be satisfied)

PART A SATISFIED YES ☐ NO ☒

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B SATISFIED YES ☐ NO ☒

APPROACH LANES	One	2 or More	AM PEAK HOUR Hour
Both Approaches - Major Street		X	628
Higher Approach - Minor Street		X	19

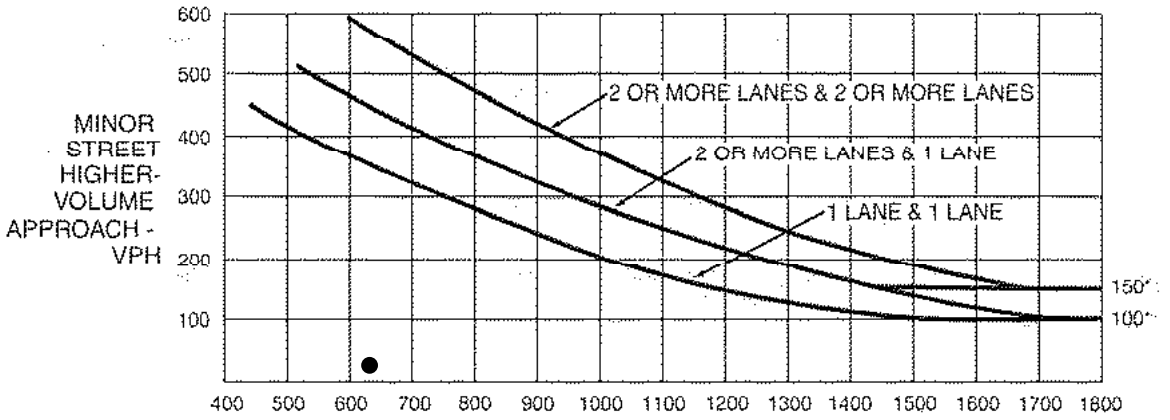
The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1707

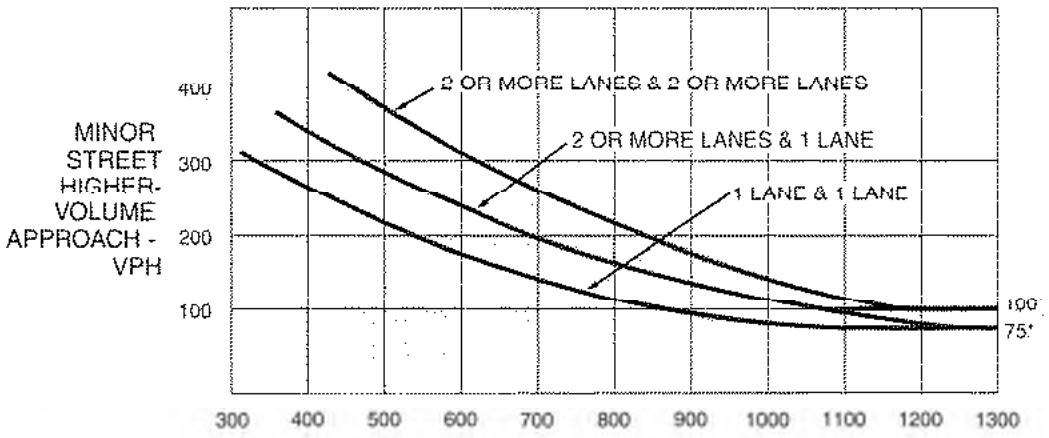
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	PM PEAK HOUR Hour
Both Approaches - Major Street		X	524
Higher Approach - Minor Street		X	54

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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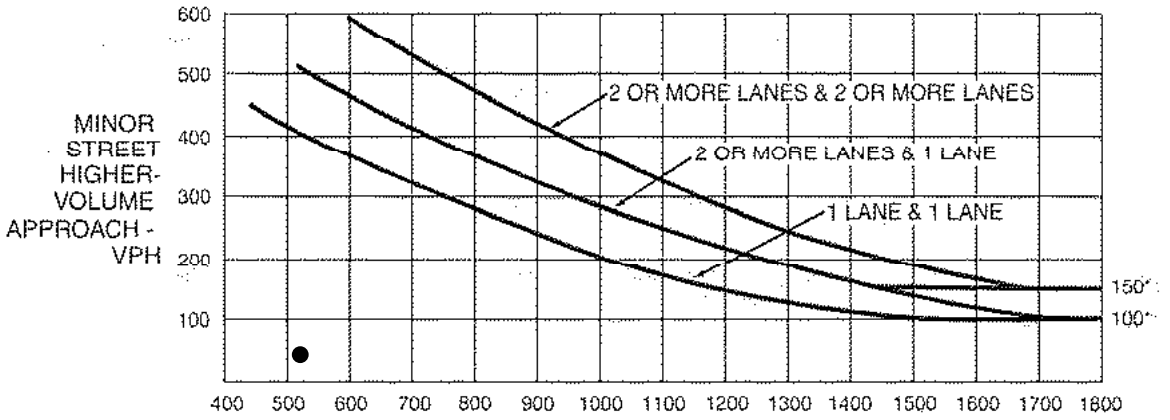
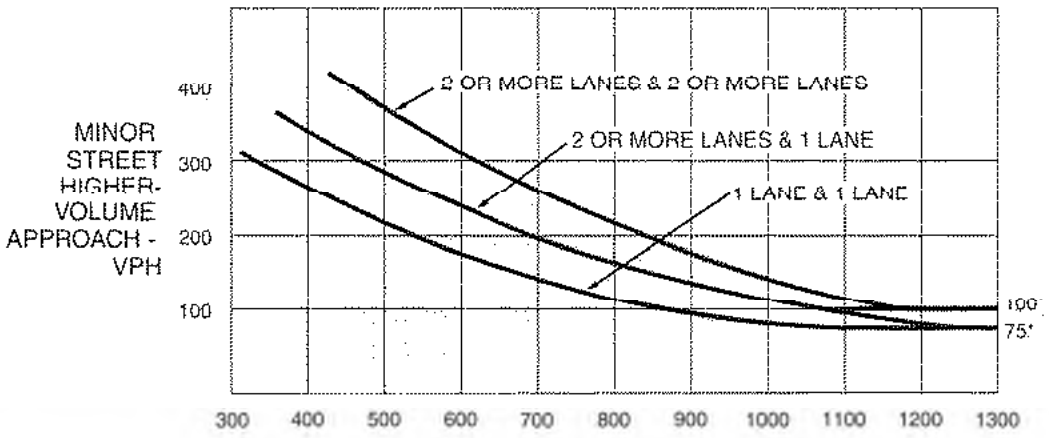
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	AM PEAK HOUR Hour
Both Approaches - Major Street		X	654
Higher Approach - Minor Street		X	198

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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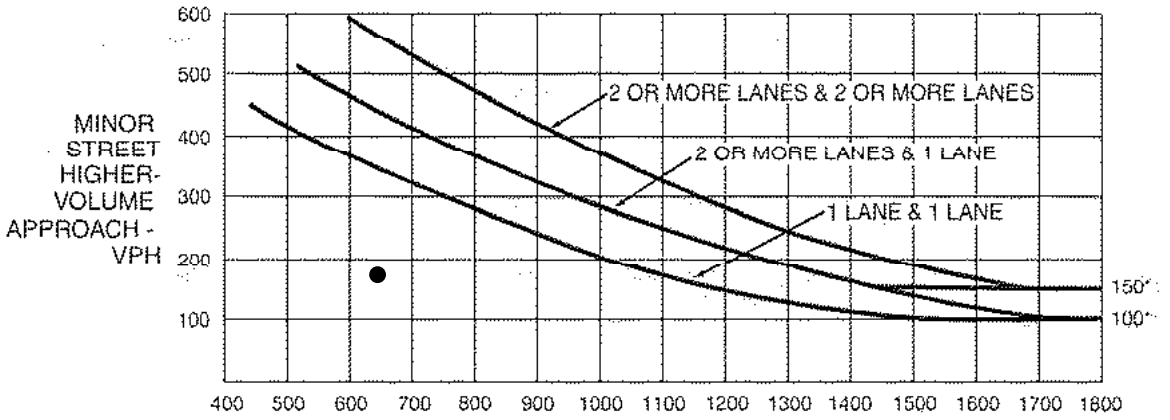
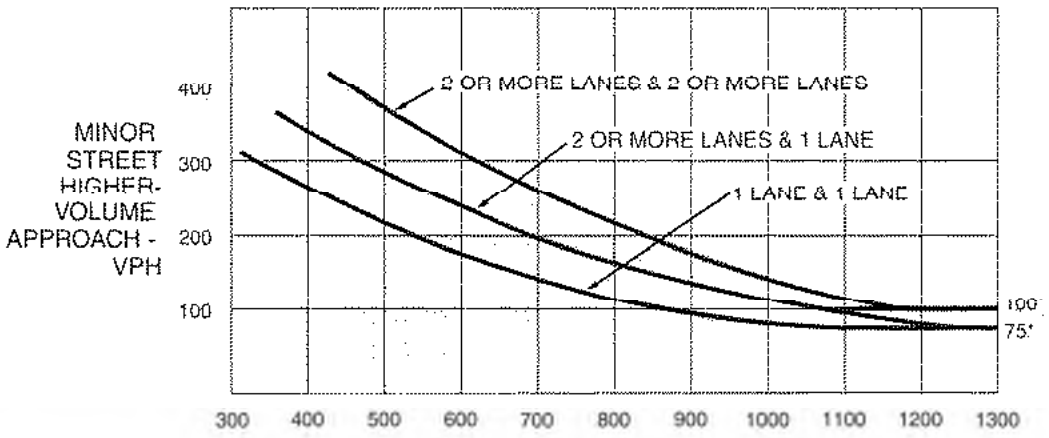
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐	No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐	No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐	No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐	No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐	No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	PM PEAK HOUR Hour
Both Approaches - Major Street		X	545
Higher Approach - Minor Street		X	223

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐	No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐	No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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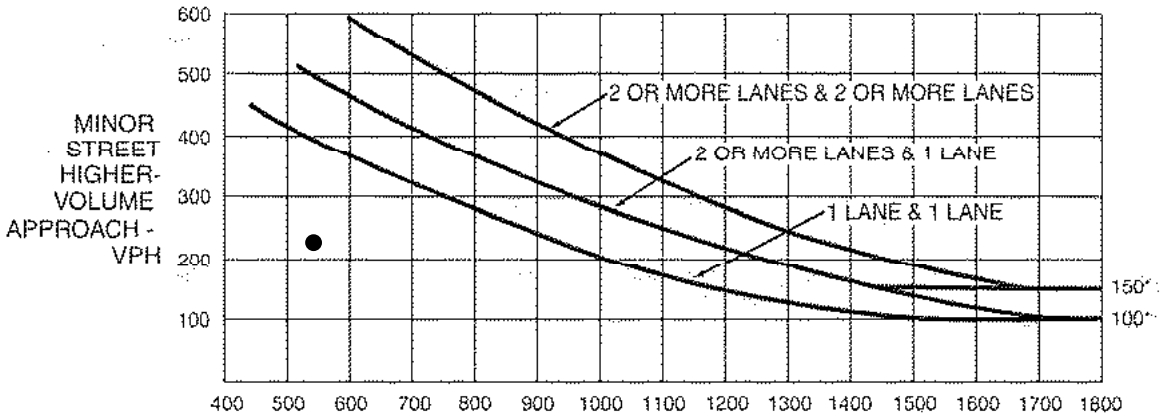
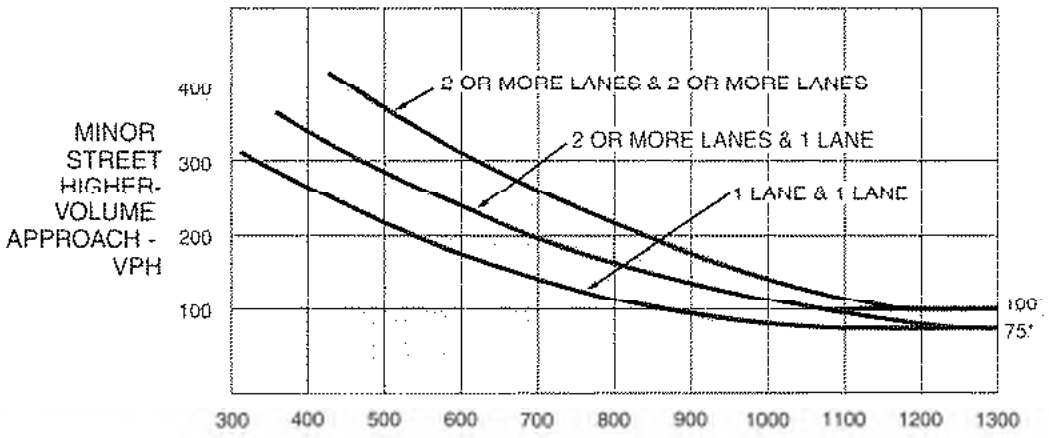
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	AM PEAK HOUR Hour
Both Approaches - Major Street		X	733
Higher Approach - Minor Street		X	38

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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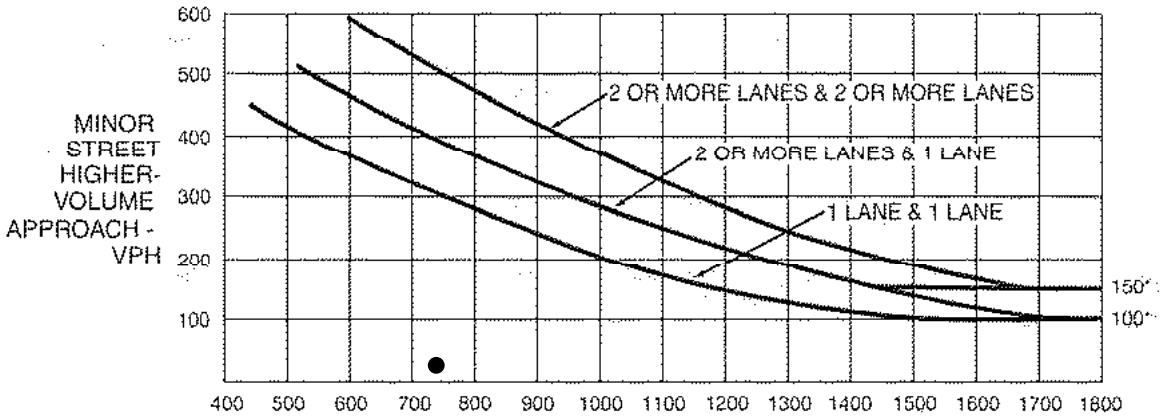
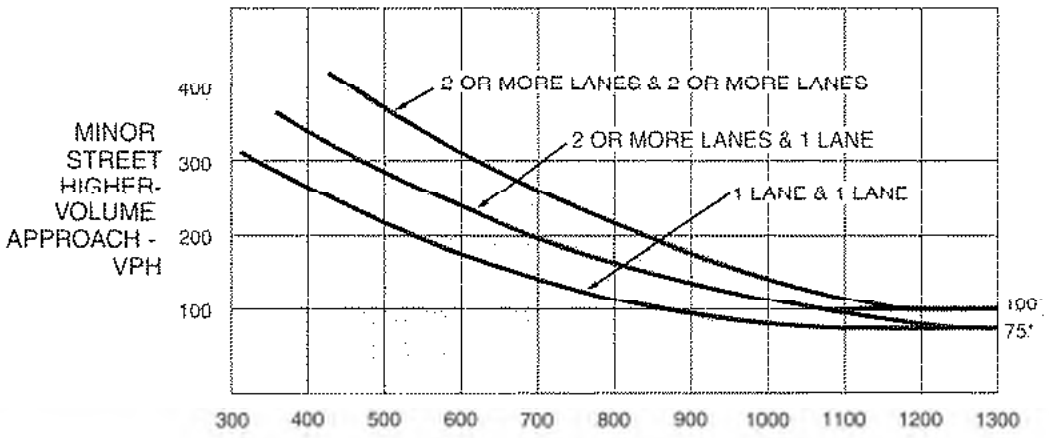
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	PM PEAK HOUR Hour
Both Approaches - Major Street		X	603
Higher Approach - Minor Street		X	81

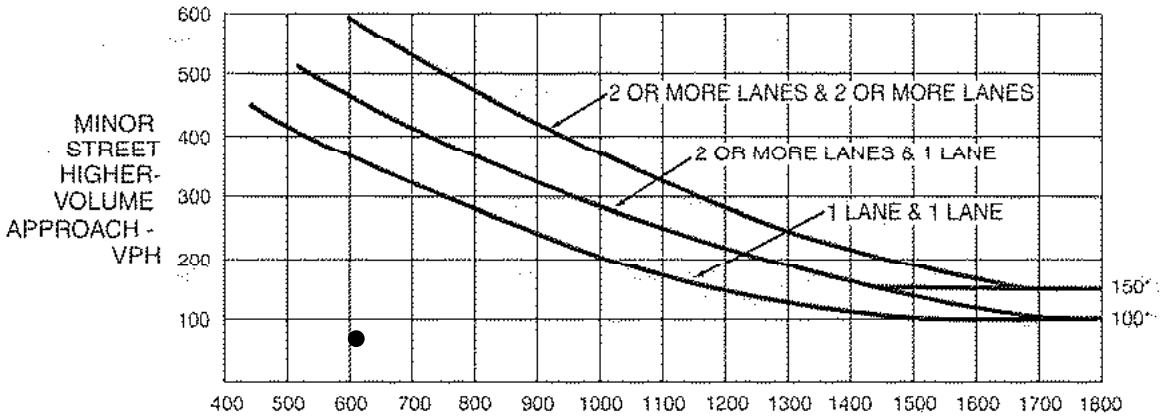
The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1717

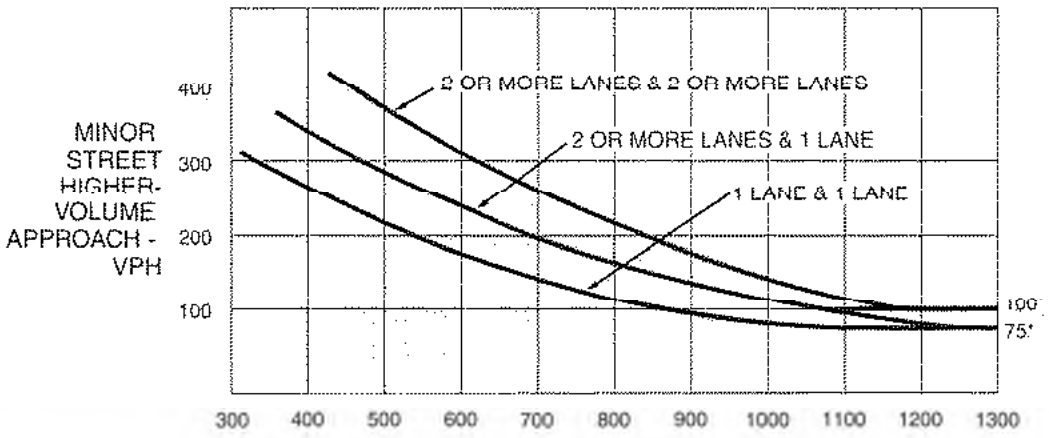
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	AM PEAK HOUR Hour
Both Approaches - Major Street		X	759
Higher Approach - Minor Street		X	198

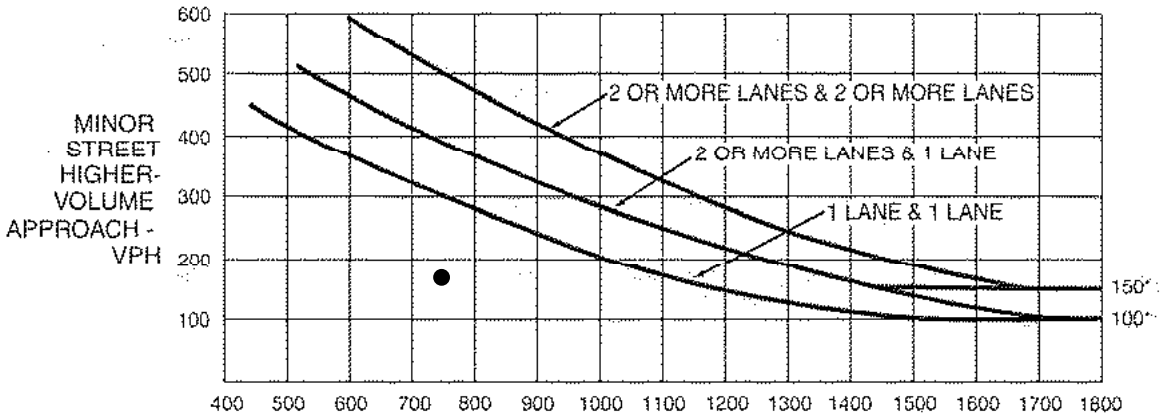
The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1719

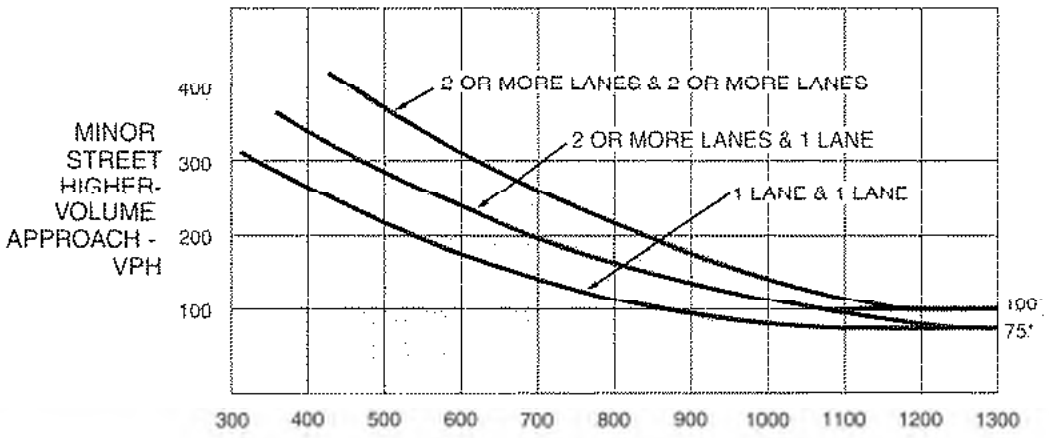
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot
Packet Pg. 1720

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	PM PEAK HOUR Hour
Both Approaches - Major Street		X	624
Higher Approach - Minor Street		X	223

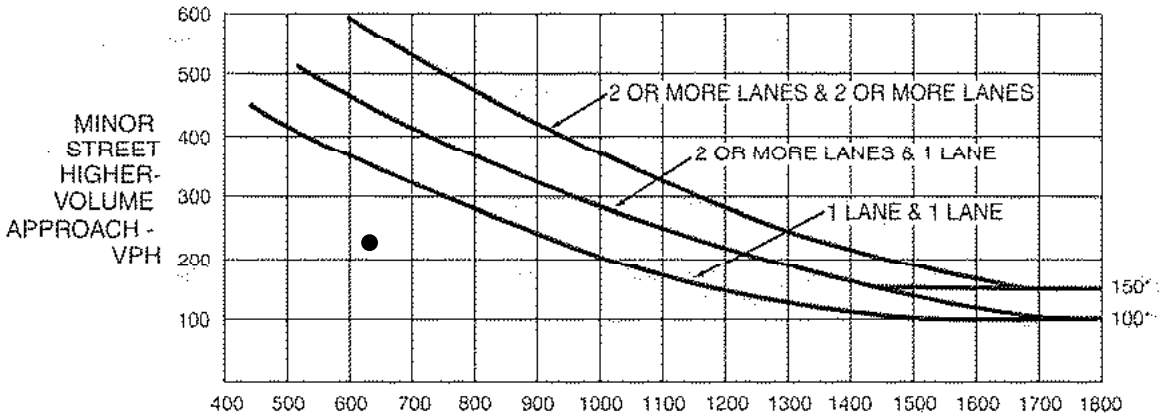
The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1721

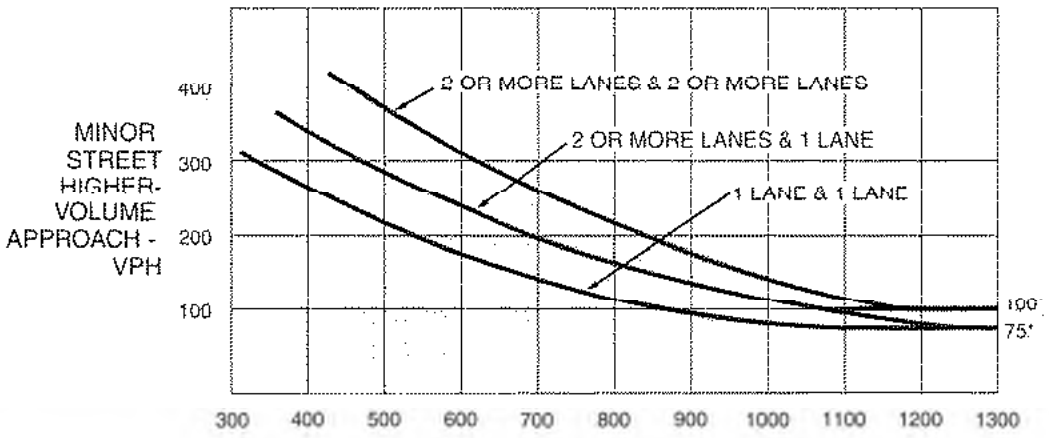
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot
Packet Pg. 1722

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

APPROACH LANES	One	2 or More	AM PEAK HOUR Hour
Both Approaches - Major Street		X	774
Higher Approach - Minor Street		X	122

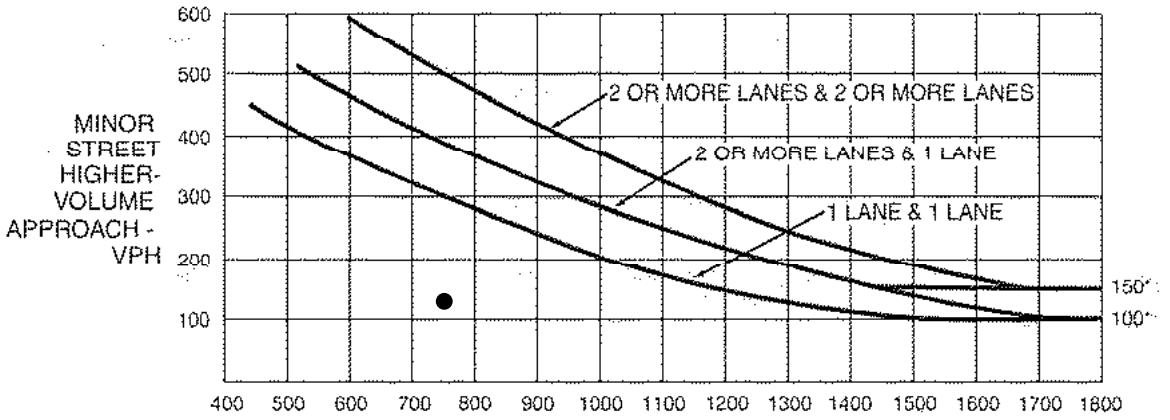
The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Packet Pg. 1723

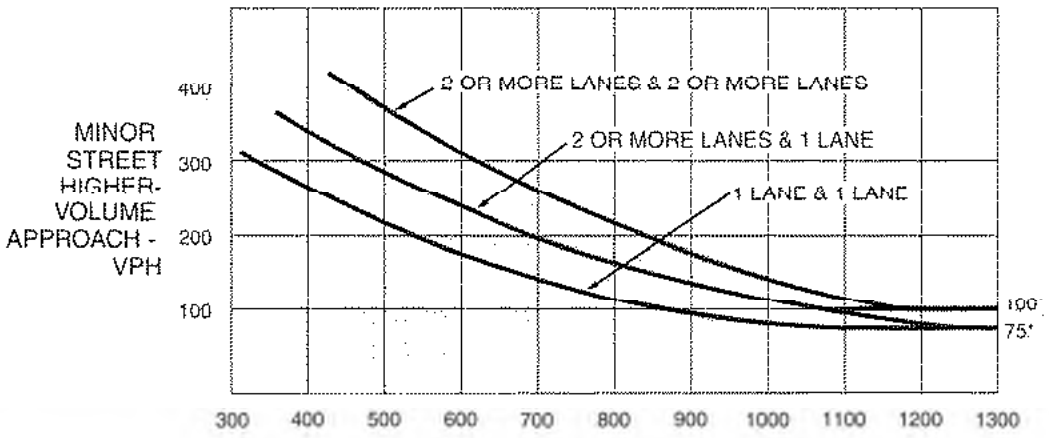
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

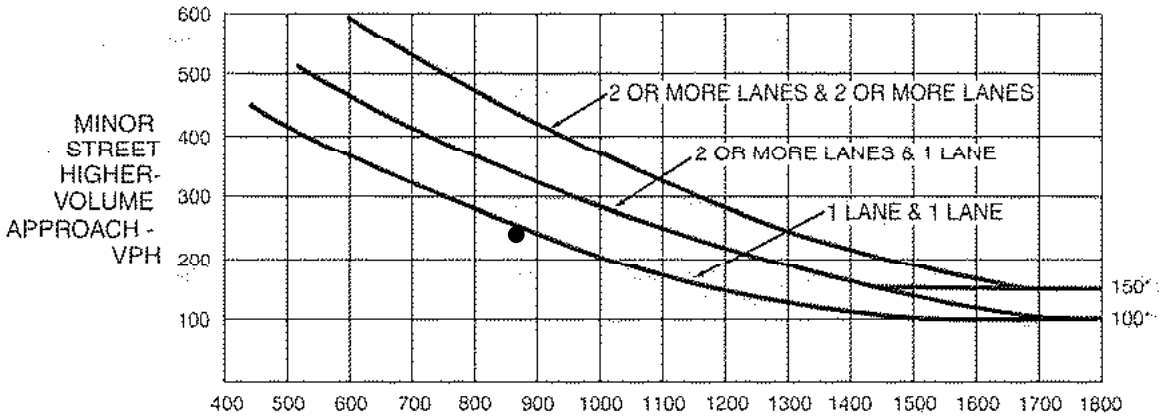
APPROACH LANES	One	2 or More	PM PEAK HOUR Hour
Both Approaches - Major Street		X	880
Higher Approach - Minor Street		X	230

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

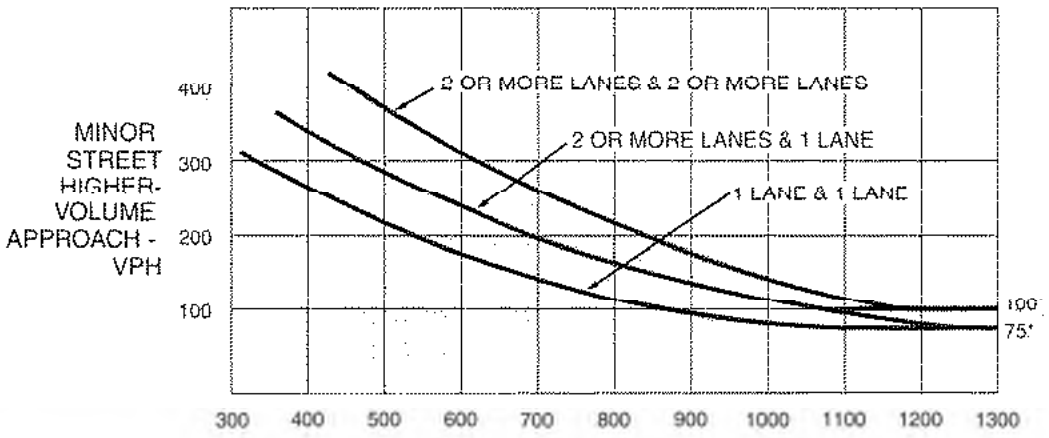
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume **SATISFIED* YES ☐ NO ☐ N/A**

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour **SATISFIED YES ☐ NO ☒**
(Part A or Part B must be satisfied)

PART A **SATISFIED YES ☐ NO ☒**

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B **SATISFIED YES ☐ NO ☒**

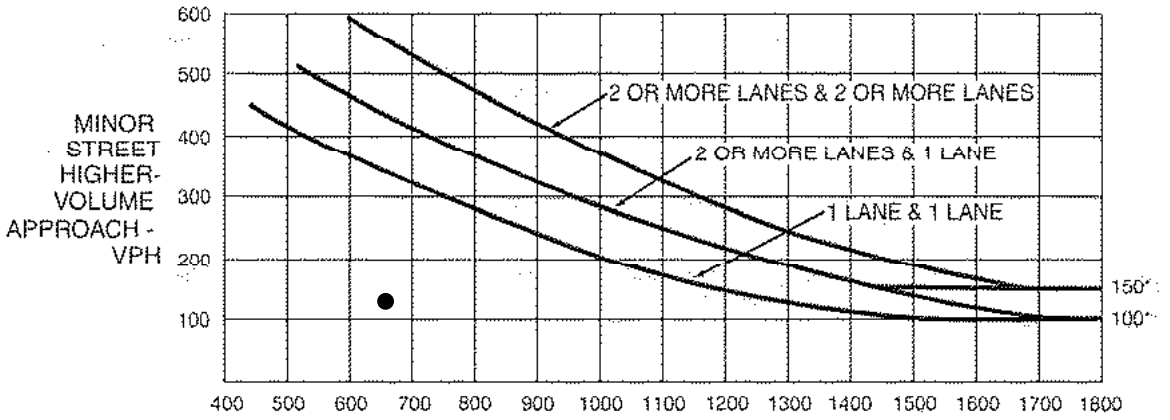
APPROACH LANES	One	2 or More	AM PEAK HOUR Hour
Both Approaches - Major Street		X	686
Higher Approach - Minor Street		X	226

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

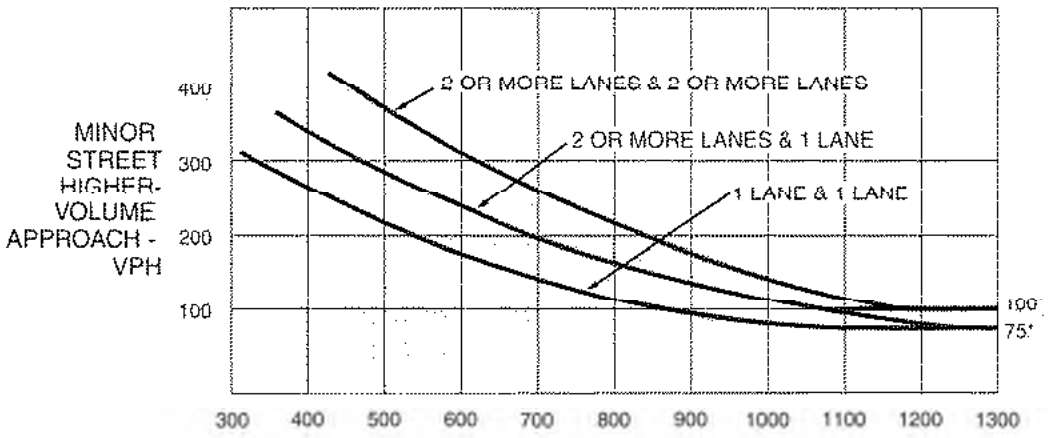
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot
Packet Pg. 1728

Figure 4C-101 (CA). Traffic Signal Warrants Worksheet (Sheet 2 of 5)

WARRANT 2 - Four Hour Vehicular Volume SATISFIED* YES ☐ NO ☐ N/A

Record hourly vehicular volumes for any four hours of an average day.

APPROACH LANES	One	2 or More				Hour
Both Approaches - Major Street						
Higher Approach - Minor Street						

*All plotted points fall above the applicable curve in Figure 4C-1. (URBAN AREAS)	Yes ☐ No ☐
OR, All plotted points fall above the applicable curve in Figure 4C-2. (RURAL AREAS)	Yes ☐ No ☐

WARRANT 3 - Peak Hour SATISFIED YES ☐ NO ☒
(Part A or Part B must be satisfied)

PART A SATISFIED YES ☐ NO ☒

(All parts 1, 2, and 3 below must be satisfied for the same one hour, for any four consecutive 15-minute periods)

1. The total delay experienced by traffic on one minor street approach (one direction only) controlled by a STOP sign equals or exceeds four vehicle-hours for a one-lane approach, or five vehicle-hours for a two-lane approach; AND	Yes ☐ No ☒
2. The volume on the same minor street approach (one direction only) equals or exceeds 100 vph for one moving lane of traffic or 150 vph for two moving lanes; AND	Yes ☐ No ☒
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches or 650 vph for intersections with three approaches.	Yes ☐ No ☒

PART B SATISFIED YES ☐ NO ☒

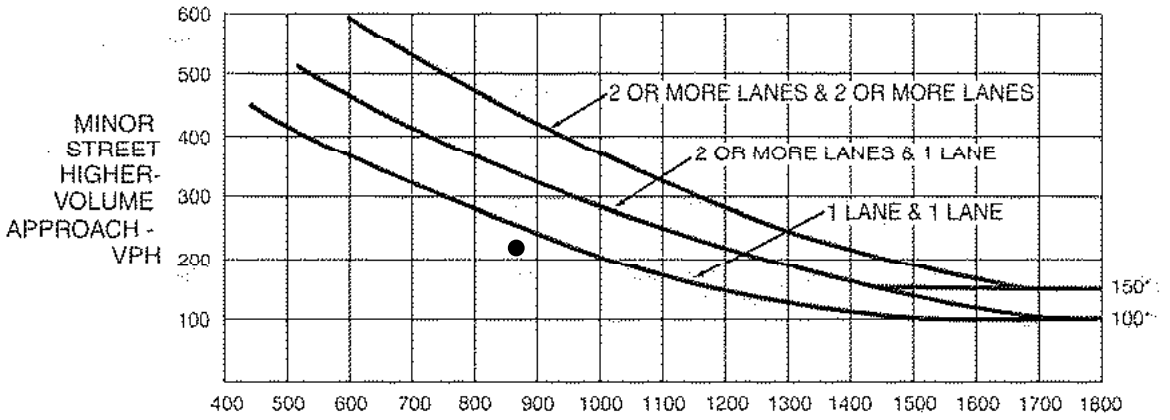
APPROACH LANES	One	2 or More	PM PEAK HOUR Hour
Both Approaches - Major Street		X	870
Higher Approach - Minor Street		X	203

The plotted point falls above the applicable curve in Figure 4C-3. (URBAN AREAS)	Yes ☐ No ☒
OR, The plotted point falls above the applicable curve in Figure 4C-4. (RURAL AREAS)	Yes ☐ No ☐

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

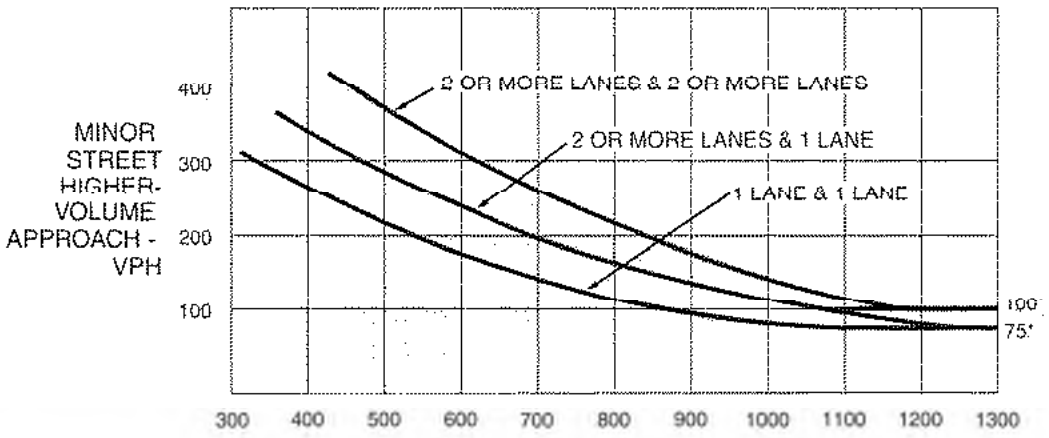
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot
Packet Pg. 1730

DAVID EVANS AND ASSOCIATES INC.

APPENDIX H: Queuing Analysis

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM

12/12/2016

Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	SB
Directions Served	T	T	R	L	T	T	R
Maximum Queue (ft)	264	218	67	199	93	71	248
Average Queue (ft)	218	172	41	113	65	33	208
95th Queue (ft)	276	224	67	212	94	74	260
Link Distance (ft)	392	392		182	182	182	566
Upstream Blk Time (%)				2			
Queuing Penalty (veh)				12			
Storage Bay Dist (ft)			260				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	TR	L	TR	L	TR
Maximum Queue (ft)	136	195	185	512	557	219	802	74	117
Average Queue (ft)	128	183	161	444	499	219	802	33	48
95th Queue (ft)	154	210	216	563	547	221	802	72	105
Link Distance (ft)		181	181	478	478		787		289
Upstream Blk Time (%)		46	11	8	33		55		
Queuing Penalty (veh)		291	70	85	359		0		
Storage Bay Dist (ft)	150					130		100	
Storage Blk Time (%)	73	56				46	40		8
Queuing Penalty (veh)	426	28				327	252		4

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	T	TR	R
Maximum Queue (ft)	328	363	325	31	266	273	67
Average Queue (ft)	244	149	116	17	248	258	38
95th Queue (ft)	403	410	336	41	272	276	66
Link Distance (ft)		411	411	411	247	247	140
Upstream Blk Time (%)					28	45	
Queuing Penalty (veh)					290	462	
Storage Bay Dist (ft)	240						
Storage Blk Time (%)	26	5					
Queuing Penalty (veh)	141	16					

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	136	91	127	158	220	526	526	526	290	52	116	151
Average Queue (ft)	90	65	95	114	63	400	449	337	146	22	58	107
95th Queue (ft)	139	107	142	180	196	585	552	539	338	56	114	168
Link Distance (ft)		338	338	338		510	510	510		151	151	
Upstream Blk Time (%)						18	19	15				
Queuing Penalty (veh)						0	0	0				
Storage Bay Dist (ft)	120				140				200			240
Storage Blk Time (%)	4					48		44				
Queuing Penalty (veh)	20					36		41				

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	185	51
Average Queue (ft)	141	19
95th Queue (ft)	181	52
Link Distance (ft)	392	392
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	SB
Directions Served	L	TR	L	R	LT
Maximum Queue (ft)	53	54	31	26	65
Average Queue (ft)	34	39	6	5	13
95th Queue (ft)	66	57	27	22	56
Link Distance (ft)		254		281	352
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	120		170		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	WB	B25	B25	SB
Directions Served	T	TR	T	T	R
Maximum Queue (ft)	517	517	380	362	72
Average Queue (ft)	324	337	144	140	59
95th Queue (ft)	683	684	435	424	71
Link Distance (ft)	444	444	338	338	64
Upstream Blk Time (%)	35	39	3	4	75
Queuing Penalty (veh)	342	382	34	44	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB
Directions Served	LR
Maximum Queue (ft)	59
Average Queue (ft)	41
95th Queue (ft)	64
Link Distance (ft)	44
Upstream Blk Time (%)	3
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	21
95th Queue (ft)	41
Link Distance (ft)	83
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	31	58
Average Queue (ft)	12	40
95th Queue (ft)	37	63
Link Distance (ft)	235	67
Upstream Blk Time (%)		1
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	51
Average Queue (ft)	34
95th Queue (ft)	48
Link Distance (ft)	71
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	84	54	67	152
Average Queue (ft)	17	11	13	119
95th Queue (ft)	72	47	58	178
Link Distance (ft)	182	182	616	136
Upstream Blk Time (%)				17
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM

12/12/2016

Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	628	626
Average Queue (ft)	211	196
95th Queue (ft)	588	596
Link Distance (ft)	616	616
Upstream Blk Time (%)	1	2
Queuing Penalty (veh)	5	13
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	WB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	137	442	443	182
Average Queue (ft)	53	352	372	99
95th Queue (ft)	125	624	558	200
Link Distance (ft)	478	411	411	554
Upstream Blk Time (%)		18	21	
Queuing Penalty (veh)		185	218	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 4084

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated

12/12/2016

Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	SB
Directions Served	T	T	R	L	T	T	R
Maximum Queue (ft)	320	208	67	182	72	100	200
Average Queue (ft)	236	165	46	132	66	58	183
95th Queue (ft)	315	212	69	180	79	99	197
Link Distance (ft)	392	392		182	182	182	566
Upstream Blk Time (%)				2			
Queuing Penalty (veh)				12			
Storage Bay Dist (ft)			260				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	T	TR	L	TR	L	TR
Maximum Queue (ft)	138	196	193	478	503	504	220	802	30	72
Average Queue (ft)	114	187	177	164	381	460	219	802	21	51
95th Queue (ft)	152	199	195	429	575	554	220	802	41	82
Link Distance (ft)		177	177	478	478	478		787		277
Upstream Blk Time (%)		14	13	0	8	23		42		
Queuing Penalty (veh)		91	81	1	55	164		0		
Storage Bay Dist (ft)	150						130		100	
Storage Blk Time (%)	32	23					43	43		
Queuing Penalty (veh)	186	12					302	273		

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	WB	SB
Directions Served	L	T	T	T	T	T	TR	R
Maximum Queue (ft)	329	537	25	52	208	253	253	89
Average Queue (ft)	180	187	5	17	137	206	229	52
95th Queue (ft)	303	557	21	53	239	287	302	93
Link Distance (ft)		413	413	413	246	246	246	128
Upstream Blk Time (%)		0				16	26	
Queuing Penalty (veh)		3				108	176	
Storage Bay Dist (ft)	240							
Storage Blk Time (%)	11							
Queuing Penalty (veh)	59							

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated

12/12/2016

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	141	136	171	162	45	444	524	526	290	30	96	138
Average Queue (ft)	121	68	90	103	25	239	332	389	82	12	62	87
95th Queue (ft)	143	156	180	174	55	440	568	547	253	35	98	151
Link Distance (ft)		338	338	338		510	510	510		151	151	
Upstream Blk Time (%)							1	3				
Queuing Penalty (veh)							0	0				
Storage Bay Dist (ft)	120				140				200			240
Storage Blk Time (%)	5	1				14		25				
Queuing Penalty (veh)	25	2				10		23				

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	173	60
Average Queue (ft)	124	40
95th Queue (ft)	180	63
Link Distance (ft)	393	393
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB
Directions Served	L	TR	R
Maximum Queue (ft)	30	31	26
Average Queue (ft)	23	29	5
95th Queue (ft)	43	32	22
Link Distance (ft)		254	281
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	120		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	WB	WB	SB
Directions Served	T	T	TR	R
Maximum Queue (ft)	382	437	435	68
Average Queue (ft)	76	119	126	58
95th Queue (ft)	329	400	395	80
Link Distance (ft)	443	443	443	52
Upstream Blk Time (%)		0	0	45
Queuing Penalty (veh)		0	1	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB
Directions Served	LR
Maximum Queue (ft)	56
Average Queue (ft)	34
95th Queue (ft)	52
Link Distance (ft)	44
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	56
Average Queue (ft)	35
95th Queue (ft)	52
Link Distance (ft)	83
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	54
Average Queue (ft)	39
95th Queue (ft)	59
Link Distance (ft)	67
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	28
Average Queue (ft)	11
95th Queue (ft)	34
Link Distance (ft)	71
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	WB	NE
Directions Served	T	R
Maximum Queue (ft)	75	152
Average Queue (ft)	15	107
95th Queue (ft)	65	197
Link Distance (ft)	616	136
Upstream Blk Time (%)		11
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated

12/12/2016

Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	138	141
Average Queue (ft)	78	60
95th Queue (ft)	150	162
Link Distance (ft)	616	616
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	WB	WB	NE
Directions Served	T	T	T	T	T	R
Maximum Queue (ft)	153	136	420	414	445	470
Average Queue (ft)	37	64	161	174	250	338
95th Queue (ft)	135	141	487	488	542	535
Link Distance (ft)	478	478	413	413	413	554
Upstream Blk Time (%)			2	1	11	
Queuing Penalty (veh)			14	5	74	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Network Summary

Network wide Queuing Penalty: 1677

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated ALT 1

12/12/2016

Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	SB
Directions Served	T	T	R	L	T	T	R
Maximum Queue (ft)	282	176	63	196	116	121	264
Average Queue (ft)	194	118	41	148	84	68	174
95th Queue (ft)	281	195	65	215	121	121	252
Link Distance (ft)	392	392		182	182	182	566
Upstream Blk Time (%)				4			
Queuing Penalty (veh)				20			
Storage Bay Dist (ft)			260				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	T	TR	L	TR	L	TR
Maximum Queue (ft)	176	220	197	374	587	497	220	802	30	30
Average Queue (ft)	109	197	185	124	328	482	219	802	12	28
95th Queue (ft)	171	224	195	334	688	510	220	802	36	32
Link Distance (ft)		177	177	478	478	478		787		277
Upstream Blk Time (%)	0	31	17		13	31		45		
Queuing Penalty (veh)	0	197	106		96	221		0		
Storage Bay Dist (ft)	150						130		100	
Storage Blk Time (%)		40					52	31		
Queuing Penalty (veh)		20					371	197		

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	SB
Directions Served	L	T	T	T	T	T	T	R	R
Maximum Queue (ft)	268	74	116	55	286	278	266	31	38
Average Queue (ft)	157	36	45	28	178	239	249	12	26
95th Queue (ft)	254	77	111	67	303	289	273	37	51
Link Distance (ft)		413	413	413	246	246	246	246	113
Upstream Blk Time (%)					7	23	26		
Queuing Penalty (veh)					38	119	137		
Storage Bay Dist (ft)	240								
Storage Blk Time (%)	5								
Queuing Penalty (veh)	28								

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated ALT 1

12/12/2016

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	157	169	154	173	128	187	290	447	52	30	73	180
Average Queue (ft)	113	75	92	108	68	160	219	288	22	21	33	105
95th Queue (ft)	156	154	178	189	137	205	308	438	55	41	67	177
Link Distance (ft)		338	338	338		510	510	510		151	151	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	120				140				200			240
Storage Blk Time (%)	6	2			0	6		15				
Queuing Penalty (veh)	30	5			1	5		14				

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	213	41
Average Queue (ft)	138	25
95th Queue (ft)	210	45
Link Distance (ft)	393	393
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	SB
Directions Served	L	TR	LT
Maximum Queue (ft)	51	31	19
Average Queue (ft)	28	30	4
95th Queue (ft)	54	31	16
Link Distance (ft)		254	352
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	120		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated ALT 1

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	WB	WB	SB
Directions Served	T	T	TR	R
Maximum Queue (ft)	190	363	408	58
Average Queue (ft)	69	175	156	36
95th Queue (ft)	209	425	412	69
Link Distance (ft)	443	443	443	43
Upstream Blk Time (%)				72
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB
Directions Served	LR
Maximum Queue (ft)	56
Average Queue (ft)	34
95th Queue (ft)	52
Link Distance (ft)	44
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	29
95th Queue (ft)	31
Link Distance (ft)	83
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	31	56
Average Queue (ft)	12	35
95th Queue (ft)	38	53
Link Distance (ft)	235	67
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	30	32
Average Queue (ft)	6	18
95th Queue (ft)	26	43
Link Distance (ft)	323	71
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	182	156	30	124
Average Queue (ft)	70	60	12	84
95th Queue (ft)	212	181	36	141
Link Distance (ft)	182	182	616	136
Upstream Blk Time (%)	0			0
Queuing Penalty (veh)	2			0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	EB	EB
Directions Served	T	T
Maximum Queue (ft)	117	116
Average Queue (ft)	58	48
95th Queue (ft)	120	127
Link Distance (ft)	616	616
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	WB	WB	WB	NE
Directions Served	T	T	T	T	R
Maximum Queue (ft)	180	413	463	453	283
Average Queue (ft)	55	243	268	307	169
95th Queue (ft)	162	571	603	597	296
Link Distance (ft)	478	413	413	413	554
Upstream Blk Time (%)		1	8	22	
Queuing Penalty (veh)		6	52	151	
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 1814

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated ALT 2

12/12/2016

Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	SB
Directions Served	T	T	R	L	T	T	R
Maximum Queue (ft)	373	324	69	182	139	129	269
Average Queue (ft)	285	222	42	138	94	72	217
95th Queue (ft)	388	335	77	185	141	127	287
Link Distance (ft)	392	392		182	182	182	566
Upstream Blk Time (%)	0			1			
Queuing Penalty (veh)	0			6			
Storage Bay Dist (ft)			260				
Storage Blk Time (%)		0					
Queuing Penalty (veh)		1					

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	T	TR	L	TR	L	TR
Maximum Queue (ft)	175	196	198	351	529	509	219	802	102	82
Average Queue (ft)	75	148	160	119	255	330	219	802	51	40
95th Queue (ft)	165	202	202	319	603	576	219	802	99	75
Link Distance (ft)		177	177	478	478	478		787		277
Upstream Blk Time (%)	0	6	6		3	10		47		
Queuing Penalty (veh)	0	37	38		18	70		0		
Storage Bay Dist (ft)	150						130		100	
Storage Blk Time (%)	0	11					39	54	0	0
Queuing Penalty (veh)	1	5					277	339	0	0

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	L	R
Maximum Queue (ft)	256	74	94	74	229	242	276	126	59
Average Queue (ft)	168	59	66	45	163	211	229	84	41
95th Queue (ft)	278	75	107	90	275	284	309	146	68
Link Distance (ft)		406	406	406	242	242	242	115	115
Upstream Blk Time (%)					0	2	13	5	
Queuing Penalty (veh)					1	8	65	6	
Storage Bay Dist (ft)	240								
Storage Blk Time (%)	3								
Queuing Penalty (veh)	18								

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background+Project, AM Mitigation 2

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Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	267	257	243	216	230	526	526	526	290	147	164	226
Average Queue (ft)	141	73	86	99	72	424	447	455	163	17	67	72
95th Queue (ft)	240	163	182	181	207	692	664	650	387	63	128	179
Link Distance (ft)		338	338	338		510	510	510		151	151	
Upstream Blk Time (%)						25	52	60		0	3	
Queuing Penalty (veh)						0	0	0		0	0	
Storage Bay Dist (ft)	300				140				200			240
Storage Blk Time (%)						42		64				0
Queuing Penalty (veh)						31		59				0

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	261	129
Average Queue (ft)	141	46
95th Queue (ft)	231	99
Link Distance (ft)	393	393
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)	2	
Queuing Penalty (veh)	1	

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	L	TR	L	T	R	LT	LT
Maximum Queue (ft)	49	30	31	31	29	52	20
Average Queue (ft)	17	9	5	3	3	8	3
95th Queue (ft)	42	30	24	18	17	34	13
Link Distance (ft)		254		281	281	393	352
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	120		170				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Zone Summary

Zone wide Queuing Penalty: 91

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, AM Mitigated ALT 2

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	SB
Directions Served	TR	R
Maximum Queue (ft)	138	58
Average Queue (ft)	57	53
95th Queue (ft)	143	67
Link Distance (ft)	443	43
Upstream Blk Time (%)		70
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB
Directions Served	LR
Maximum Queue (ft)	58
Average Queue (ft)	40
95th Queue (ft)	62
Link Distance (ft)	44
Upstream Blk Time (%)	6
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	54
Average Queue (ft)	29
95th Queue (ft)	57
Link Distance (ft)	83
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	29
95th Queue (ft)	29
Link Distance (ft)	67
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	12
95th Queue (ft)	36
Link Distance (ft)	71
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	151	145	52	152
Average Queue (ft)	30	35	10	115
95th Queue (ft)	130	128	44	177
Link Distance (ft)	182	182	616	136
Upstream Blk Time (%)				8
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	EB	EB	WB
Directions Served	T	T	R
Maximum Queue (ft)	94	70	31
Average Queue (ft)	19	24	6
95th Queue (ft)	81	73	27
Link Distance (ft)	616	616	177
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	WB	WB	NE
Directions Served	T	T	T	T	T	R
Maximum Queue (ft)	52	129	280	378	411	290
Average Queue (ft)	10	49	112	148	165	200
95th Queue (ft)	44	118	338	405	448	323
Link Distance (ft)	478	478	406	406	406	554
Upstream Blk Time (%)					1	
Queuing Penalty (veh)					9	
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Network Summary

Network wide Queuing Penalty: 1036

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background+Project, AM Mitigation 2

02/03/2017

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	267	257	243	216	230	526	526	526	290	147	164	226
Average Queue (ft)	141	73	86	99	72	424	447	455	163	17	67	72
95th Queue (ft)	240	163	182	181	207	692	664	650	387	63	128	179
Link Distance (ft)		338	338	338		510	510	510		151	151	
Upstream Blk Time (%)						25	52	60		0	3	
Queuing Penalty (veh)						0	0	0		0	0	
Storage Bay Dist (ft)	300				140				200			240
Storage Blk Time (%)						42		64				0
Queuing Penalty (veh)						31		59				0

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	261	129
Average Queue (ft)	141	46
95th Queue (ft)	231	99
Link Distance (ft)	393	393
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)	2	
Queuing Penalty (veh)	1	

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	L	TR	L	T	R	LT	LT
Maximum Queue (ft)	49	30	31	31	29	52	20
Average Queue (ft)	17	9	5	3	3	8	3
95th Queue (ft)	42	30	24	18	17	34	13
Link Distance (ft)		254		281	281	393	352
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	120		170				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Zone Summary

Zone wide Queuing Penalty: 91

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM

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Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	SB
Directions Served	T	T	R	L	T	T	R
Maximum Queue (ft)	235	177	66	182	50	21	447
Average Queue (ft)	184	124	40	141	10	4	352
95th Queue (ft)	246	206	82	200	43	18	462
Link Distance (ft)	392	392		182	182	182	566
Upstream Blk Time (%)				9			
Queuing Penalty (veh)				33			
Storage Bay Dist (ft)			260				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	TR	L	TR	L	TR
Maximum Queue (ft)	48	181	186	422	489	51	113	96	103
Average Queue (ft)	15	119	146	149	306	34	73	57	56
95th Queue (ft)	48	190	222	403	472	65	122	110	108
Link Distance (ft)		181	181	478	478		787		289
Upstream Blk Time (%)		0	1		2				
Queuing Penalty (veh)		0	9		21				
Storage Bay Dist (ft)	150					130		100	
Storage Blk Time (%)		0					0	7	1
Queuing Penalty (veh)		0					0	4	1

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	T	TR	R
Maximum Queue (ft)	261	233	171	96	249	276	155
Average Queue (ft)	205	83	67	61	244	259	146
95th Queue (ft)	299	254	155	97	255	279	158
Link Distance (ft)		411	411	411	246	246	140
Upstream Blk Time (%)					5	14	86
Queuing Penalty (veh)					54	155	97
Storage Bay Dist (ft)	240						
Storage Blk Time (%)	12	0					
Queuing Penalty (veh)	68	0					

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	136	246	216	135	230	526	526	526	290	138	166	144
Average Queue (ft)	86	140	149	90	50	497	500	452	174	95	121	110
95th Queue (ft)	142	237	227	148	198	586	585	615	408	170	187	143
Link Distance (ft)	338	338	338	338		511	511	511		151	151	
Upstream Blk Time (%)						47	46	39		0	5	
Queuing Penalty (veh)						0	0	0		0	0	
Storage Bay Dist (ft)					140				200			240
Storage Blk Time (%)						65		87				
Queuing Penalty (veh)						11		65				

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	197	30
Average Queue (ft)	175	7
95th Queue (ft)	218	26
Link Distance (ft)	494	494
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	WB	NB
Directions Served	L	TR	L	T	R	LT
Maximum Queue (ft)	30	71	31	30	29	29
Average Queue (ft)	23	47	12	6	17	6
95th Queue (ft)	43	74	37	26	39	25
Link Distance (ft)		471		281	281	494
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	120		170			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (ft)	202	296	86
Average Queue (ft)	157	230	81
95th Queue (ft)	242	352	90
Link Distance (ft)	446	446	71
Upstream Blk Time (%)			87
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB	SB
Directions Served	LR	T
Maximum Queue (ft)	98	118
Average Queue (ft)	84	72
95th Queue (ft)	111	138
Link Distance (ft)	89	109
Upstream Blk Time (%)	59	3
Queuing Penalty (veh)	0	2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	30
95th Queue (ft)	30
Link Distance (ft)	68
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	53
Average Queue (ft)	34
95th Queue (ft)	50
Link Distance (ft)	50
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	31	31
Average Queue (ft)	6	18
95th Queue (ft)	26	42
Link Distance (ft)	471	55
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	166	182	358	152
Average Queue (ft)	86	165	90	152
95th Queue (ft)	204	204	319	152
Link Distance (ft)	182	182	616	136
Upstream Blk Time (%)	0	21		77
Queuing Penalty (veh)	0	53		0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM

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Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	WB
Directions Served	TR
Maximum Queue (ft)	139
Average Queue (ft)	28
95th Queue (ft)	120
Link Distance (ft)	181
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	WB	NE
Directions Served	T	T	T	T	R
Maximum Queue (ft)	22	53	156	159	140
Average Queue (ft)	4	31	31	38	75
95th Queue (ft)	19	73	134	140	169
Link Distance (ft)	478	478	411	411	554
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Network Summary

Network wide Queuing Penalty: 575

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated

12/12/2016

Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	WB	SB
Directions Served	T	T	R	L	T	R
Maximum Queue (ft)	206	190	46	116	22	243
Average Queue (ft)	180	158	36	88	4	195
95th Queue (ft)	236	216	53	132	19	268
Link Distance (ft)	392	392		182	182	566
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			260			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	TR	L	TR	L	TR
Maximum Queue (ft)	48	123	163	24	531	52	120	178	202
Average Queue (ft)	21	81	138	5	323	32	52	101	98
95th Queue (ft)	51	154	174	21	570	62	129	191	197
Link Distance (ft)		177	177	478	478		787		277
Upstream Blk Time (%)			0		1				
Queuing Penalty (veh)			1		10				
Storage Bay Dist (ft)	150					130		100	
Storage Blk Time (%)							0	36	7
Queuing Penalty (veh)							0	21	7

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	WB	SB
Directions Served	L	T	T	T	T	T	TR	R
Maximum Queue (ft)	281	193	73	70	268	272	272	112
Average Queue (ft)	156	39	30	37	252	257	263	76
95th Queue (ft)	280	166	77	75	265	275	280	127
Link Distance (ft)		413	413	413	246	246	246	128
Upstream Blk Time (%)					14	16	20	0
Queuing Penalty (veh)					104	115	143	0
Storage Bay Dist (ft)	240							
Storage Blk Time (%)	2							
Queuing Penalty (veh)	14							

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated

12/12/2016

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	T	T	T	T	R	L	LTR	L	LT
Maximum Queue (ft)	131	138	169	156	327	403	513	290	149	166	116	234
Average Queue (ft)	70	119	130	86	241	298	337	122	78	147	96	165
95th Queue (ft)	133	154	188	162	335	434	545	349	174	192	137	231
Link Distance (ft)	338	338	338	338	511	511	511		151	151		495
Upstream Blk Time (%)							1		1	16		
Queuing Penalty (veh)							0		0	0		
Storage Bay Dist (ft)								200			240	
Storage Blk Time (%)					28		28					0
Queuing Penalty (veh)					5		21					0

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB
Directions Served	R
Maximum Queue (ft)	61
Average Queue (ft)	32
95th Queue (ft)	66
Link Distance (ft)	495
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	R	LT	LT
Maximum Queue (ft)	72	53	31	28	29	20
Average Queue (ft)	39	35	12	11	6	4
95th Queue (ft)	66	50	38	34	25	17
Link Distance (ft)		471		281	495	352
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	120		170			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	WB	WB	SB
Directions Served	T	T	TR	R
Maximum Queue (ft)	255	382	449	74
Average Queue (ft)	218	279	363	74
95th Queue (ft)	268	385	460	74
Link Distance (ft)	445	445	445	59
Upstream Blk Time (%)			1	85
Queuing Penalty (veh)			5	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	24
95th Queue (ft)	44
Link Distance (ft)	89
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	57
Average Queue (ft)	35
95th Queue (ft)	54
Link Distance (ft)	68
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	58
Average Queue (ft)	45
95th Queue (ft)	66
Link Distance (ft)	50
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	31	31
Average Queue (ft)	12	24
95th Queue (ft)	36	43
Link Distance (ft)	471	55
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	NE
Directions Served	T	T	R
Maximum Queue (ft)	227	185	152
Average Queue (ft)	67	113	152
95th Queue (ft)	215	183	152
Link Distance (ft)	182	182	136
Upstream Blk Time (%)	1	2	72
Queuing Penalty (veh)	3	4	0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated

12/12/2016

Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	WB
Directions Served	TR
Maximum Queue (ft)	38
Average Queue (ft)	20
95th Queue (ft)	47
Link Distance (ft)	177
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	WB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	51	44	286	96
Average Queue (ft)	20	9	137	78
95th Queue (ft)	61	38	334	119
Link Distance (ft)	478	413	413	554
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 454

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated ALT1

12/12/2016

Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	SB
Directions Served	T	T	R	L	R
Maximum Queue (ft)	218	255	134	196	417
Average Queue (ft)	171	177	53	185	227
95th Queue (ft)	230	278	134	194	432
Link Distance (ft)	392	392		182	566
Upstream Blk Time (%)				27	
Queuing Penalty (veh)				97	
Storage Bay Dist (ft)			260		
Storage Blk Time (%)		1			
Queuing Penalty (veh)		1			

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	TR	L	TR	L	TR
Maximum Queue (ft)	25	114	141	136	462	73	52	99	114
Average Queue (ft)	7	90	98	27	205	47	32	59	67
95th Queue (ft)	24	142	157	117	488	74	51	96	117
Link Distance (ft)		177	177	478	478		787		277
Upstream Blk Time (%)					0				
Queuing Penalty (veh)					1				
Storage Bay Dist (ft)	150					130		100	
Storage Blk Time (%)								3	2
Queuing Penalty (veh)								2	2

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	WB	SB
Directions Served	L	T	T	T	T	T	T	R
Maximum Queue (ft)	198	31	75	90	252	252	267	97
Average Queue (ft)	171	12	41	36	226	236	252	58
95th Queue (ft)	208	36	84	85	273	274	277	100
Link Distance (ft)		413	413	413	245	245	245	113
Upstream Blk Time (%)					6	7	11	0
Queuing Penalty (veh)					31	36	61	0
Storage Bay Dist (ft)	240							
Storage Blk Time (%)								
Queuing Penalty (veh)								

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated ALT1

12/12/2016

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	133	209	232	184	23	457	425	418	290	94	166	160
Average Queue (ft)	84	152	155	134	6	282	293	350	127	57	128	111
95th Queue (ft)	151	246	257	215	21	443	453	435	345	92	162	167
Link Distance (ft)	338	338	338	338		511	511	511		151	151	
Upstream Blk Time (%)											7	
Queuing Penalty (veh)											0	
Storage Bay Dist (ft)					140				200			240
Storage Blk Time (%)						29		37				
Queuing Penalty (veh)						5		28				

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	173	126
Average Queue (ft)	146	60
95th Queue (ft)	181	143
Link Distance (ft)	495	495
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	WB	SB
Directions Served	L	TR	L	T	R	LT
Maximum Queue (ft)	31	55	31	28	29	44
Average Queue (ft)	30	44	12	6	6	17
95th Queue (ft)	31	63	38	24	25	45
Link Distance (ft)		471		281	281	352
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	120		170			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated ALT1

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	WB	WB	B24	SB
Directions Served	T	T	TR	T	R
Maximum Queue (ft)	238	352	350	203	63
Average Queue (ft)	148	253	263	41	58
95th Queue (ft)	301	429	482	175	68
Link Distance (ft)	445	445	445	338	48
Upstream Blk Time (%)					58
Queuing Penalty (veh)					0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	30
95th Queue (ft)	30
Link Distance (ft)	89
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	54
Average Queue (ft)	34
95th Queue (ft)	50
Link Distance (ft)	68
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	29
95th Queue (ft)	29
Link Distance (ft)	50
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	23
95th Queue (ft)	43
Link Distance (ft)	55
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	WB	NE
Directions Served	T	T	T	T	R
Maximum Queue (ft)	182	186	628	628	152
Average Queue (ft)	126	126	365	210	152
95th Queue (ft)	242	239	825	647	152
Link Distance (ft)	182	182	616	616	136
Upstream Blk Time (%)	1	4	5	2	59
Queuing Penalty (veh)	1	11	27	12	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

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Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	WB	WB	WB
Directions Served	T	T	TR
Maximum Queue (ft)	180	71	53
Average Queue (ft)	55	14	17
95th Queue (ft)	175	61	53
Link Distance (ft)	177	177	177
Upstream Blk Time (%)	2		
Queuing Penalty (veh)	13		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	WB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	53	116	191	53
Average Queue (ft)	19	23	57	44
95th Queue (ft)	51	100	173	62
Link Distance (ft)	478	413	413	554
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 328

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated ALT2

12/12/2016

Intersection: 1: SB I-215 On-Ramp/SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	SB
Directions Served	T	T	R	L	T	T	R
Maximum Queue (ft)	289	286	153	182	28	49	261
Average Queue (ft)	233	240	63	151	10	18	181
95th Queue (ft)	354	322	142	199	31	48	257
Link Distance (ft)	392	392		182	182	182	566
Upstream Blk Time (%)				4			
Queuing Penalty (veh)				13			
Storage Bay Dist (ft)			260				
Storage Blk Time (%)		4					
Queuing Penalty (veh)		6					

Intersection: 2: NB I-215 Ramps/Old 215 Frontage Rd & Cactus Avenue

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	T	T	TR	L	TR	L	TR
Maximum Queue (ft)	48	140	177	52	147	328	73	96	120	110
Average Queue (ft)	15	95	131	15	61	242	53	65	73	63
95th Queue (ft)	47	146	191	49	151	352	93	93	116	102
Link Distance (ft)		177	177	478	478	478		787		277
Upstream Blk Time (%)			1							
Queuing Penalty (veh)			12							
Storage Bay Dist (ft)	150						130		100	
Storage Blk Time (%)		0							12	0
Queuing Penalty (veh)		0							7	1

Intersection: 3: Cactus Avenue & Commerce Center Drive

Movement	EB	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	L	R
Maximum Queue (ft)	221	185	92	102	255	304	262	130	123
Average Queue (ft)	169	74	67	90	208	261	251	127	64
95th Queue (ft)	243	166	94	106	285	313	262	130	121
Link Distance (ft)		406	406	406	242	242	242	115	115
Upstream Blk Time (%)					8	8	20	73	11
Queuing Penalty (veh)					42	43	109	97	15
Storage Bay Dist (ft)	240								
Storage Blk Time (%)	0								
Queuing Penalty (veh)	0								

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background+Project, PM Mitigation 2

02/03/2017

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	208	210	228	229	47	410	475	526	290	162	166	116
Average Queue (ft)	114	108	110	122	13	220	253	330	80	61	140	43
95th Queue (ft)	190	169	174	205	38	310	390	517	271	122	180	106
Link Distance (ft)		338	338	338		511	511	511		151	151	
Upstream Blk Time (%)								1		0	13	
Queuing Penalty (veh)								0		0	0	
Storage Bay Dist (ft)	300				140				200			240
Storage Blk Time (%)						19		26				
Queuing Penalty (veh)						3		20				

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	152	83
Average Queue (ft)	86	38
95th Queue (ft)	141	79
Link Distance (ft)	495	495
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	L	TR	L	T	R	LT	LT
Maximum Queue (ft)	78	31	51	31	29	31	20
Average Queue (ft)	34	18	15	6	11	10	1
95th Queue (ft)	63	41	43	26	34	32	7
Link Distance (ft)		471		281	281	495	352
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	120		170				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Zone Summary

Zone wide Queuing Penalty: 23

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background Plus Project Condition, PM Mitigated ALT2

12/12/2016

Intersection: 6: Cactus Avenue & Driveway 1

Movement	WB	WB	SB
Directions Served	T	TR	R
Maximum Queue (ft)	244	236	63
Average Queue (ft)	74	110	63
95th Queue (ft)	222	253	63
Link Distance (ft)	445	445	48
Upstream Blk Time (%)			93
Queuing Penalty (veh)			0
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: Commerce Center Drive & Driveway 2

Movement	WB	SB
Directions Served	LR	T
Maximum Queue (ft)	104	117
Average Queue (ft)	104	61
95th Queue (ft)	104	114
Link Distance (ft)	89	109
Upstream Blk Time (%)	75	6
Queuing Penalty (veh)	0	7
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Commerce Center Drive & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	30
95th Queue (ft)	31
Link Distance (ft)	68
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 9: Driveway 4 & Goldencrest Drive

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	29	29
Average Queue (ft)	6	29
95th Queue (ft)	25	29
Link Distance (ft)	392	50
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: Driveway 5 & Goldencrest Drive

Movement	NB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	17
95th Queue (ft)	40
Link Distance (ft)	55
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 14: SB I-215 Off-Ramp & Cactus Avenue

Movement	EB	EB	WB	NE
Directions Served	T	T	T	R
Maximum Queue (ft)	226	191	50	152
Average Queue (ft)	72	165	16	152
95th Queue (ft)	225	215	50	152
Link Distance (ft)	182	182	616	136
Upstream Blk Time (%)	2	6		68
Queuing Penalty (veh)	5	15		0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Intersection: 16: Cactus Avenue & NB I-215 On-Ramp

Movement	EB	WB
Directions Served	T	TR
Maximum Queue (ft)	31	28
Average Queue (ft)	12	6
95th Queue (ft)	38	24
Link Distance (ft)	616	177
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 19: NB I-215 Off-Ramp & Cactus Avenue

Movement	EB	WB	NE
Directions Served	T	T	R
Maximum Queue (ft)	232	28	222
Average Queue (ft)	61	6	99
95th Queue (ft)	205	24	210
Link Distance (ft)	478	406	554
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 402

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

Queuing and Blocking Report
Background+Project, PM Mitigation 2

02/03/2017

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	T	L	T	T	T	R	L	LTR	L
Maximum Queue (ft)	208	210	228	229	47	410	475	526	290	162	166	116
Average Queue (ft)	114	108	110	122	13	220	253	330	80	61	140	43
95th Queue (ft)	190	169	174	205	38	310	390	517	271	122	180	106
Link Distance (ft)		338	338	338		511	511	511		151	151	
Upstream Blk Time (%)								1		0	13	
Queuing Penalty (veh)								0		0	0	
Storage Bay Dist (ft)	300				140				200			240
Storage Blk Time (%)						19		26				
Queuing Penalty (veh)						3		20				

Intersection: 4: March Airforce Base/Elsworth Street & Cactus Avenue

Movement	SB	SB
Directions Served	LT	R
Maximum Queue (ft)	152	83
Average Queue (ft)	86	38
95th Queue (ft)	141	79
Link Distance (ft)	495	495
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Elsworth Street & Goldencrest Drive

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	L	TR	L	T	R	LT	LT
Maximum Queue (ft)	78	31	51	31	29	31	20
Average Queue (ft)	34	18	15	6	11	10	1
95th Queue (ft)	63	41	43	26	34	32	7
Link Distance (ft)		471		281	281	495	352
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	120		170				
Storage Blk Time (%)							
Queuing Penalty (veh)							

Zone Summary

Zone wide Queuing Penalty: 23

Attachment: Traffic Study Appendices (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134 (Plot

SALEM engineering group, inc.

11650 Mission Park Drive, Suite 108
Rancho Cucamonga, California 91730
(909) 980-6455 Office
(909) 980-6435 Fax

December 5, 2016 **Job No. 3-416-0904**

Mr. Ino Cruz
J&T Management, Inc.
139 Radio Road
Corona, CA 92878-1958

Subject: **CULTURAL RESOURCES SURVEY**
Proposed Retail Project – Cactus Center
NEC Cactus Avenue & Commerce Drive
Moreno Valley, California

Dear Mr. Cruz:

At your request and authorization, a Cultural Resources Survey for the above-referenced project (Riverside County Assessor Parcel Numbers [APNs] 297-130-052; -053; and -054) located on the northeast corner of Cactus Avenue & Commerce Drive in Moreno Valley, California (subject property) was conducted. The Cultural Resources Survey was conducted to identify all potential significant cultural resources located within the subject property boundaries. The Cultural Resources Survey was prepared in accordance with California Environmental Quality Act (CEQA) as amended in 2015, which includes criteria for eligibility to the California Register of Historical Resources (CRHR).

During the course of this assessment, no evidence of cultural resources was observed on-site. Additionally, no records of historic sites or historic buildings were encountered during the investigation at University of California Riverside Eastern Information Center as the subject property had not previously been surveyed. No additional work in conjunction with the cultural resources is recommended for the subject property.

We appreciate the opportunity to assist you with this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (909) 980-6455.

Respectfully submitted,

SALEM Engineering Group, Inc.

Maria G. Ruvalcaba, EP
Project Manager

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

PHASE I CULTURAL RESOURCES ASSESSMENT OF THE 6.5-ACRE MORENO VALLEY FAST FOOD/COMMERCIAL-RETAIL SITE LOCATED AT THE NORTHEAST CORNER OF CACTUS AVENUE AND COMMERCE CENTER IN THE CITY OF MORENO VALLEY, SAN BERNARDINO COUNTY

by

Robert S. White

Archaeological Associates
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Sun City, CA, 92586

Tel: (951) 244-1783
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for

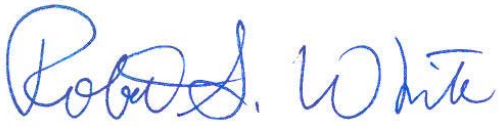
Maria G. Ruvalcaba
Branch Manager, Project Manager
Salem Engineering Group, Inc.
13355 Noel Road, Suite 1100
Dallas, Texas 75240

APN 297-130-052, -053, & -054
Section 14, Township 3 South, Range 4 West, SBBM
Riverside East 7.5' Quadrangle

December, 2016

KEYWORDS: Phase I Survey, City of Moreno Valley, March Air Reserve Base, Riverside Co.

The undersigned certifies that the attached report is a true and accurate description of the results of a CULTURAL RESOURCES ASSESSMENT described herein.



.....
Robert S. White
Principal Investigator

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

NATIONAL ARCHAEOLOGICAL DATA BASE INFORMATION

Author: Robert S. White

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archaeological_associates@hotmail.com

Report Date: December, 2016

Report Title: Phase I Cultural Resources Assessment of the 6.5 Acre Moreno Valley Fast Food/Commercial-Retail Site Located at the Northeast Corner of Cactus Avenue and Commerce Center in the City of Moreno Valley, Riverside County

Prepared for: Maria G. Ruvalcaba
Branch Manager, Project Manager
Salem Engineering Group, Inc.
13355 Noel Road, Suite 1100
Dallas, Texas 75240

USGS Quadrangle: *Riverside East* 7.5', California, 1978/80

Study Area: 6.5 Acres, (APNs 297-130-052, -053, & -054)
Southwest ¼ of the Southeast ¼ of the Northwest ¼ of Section 14, Township 3 South, Range 4 West, SBBM.

Keywords: Phase I Cultural Resources Assessment, City of Moreno Valley, Riverside County, CA
Negative Results

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

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Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

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Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

MANAGEMENT SUMMARY

At the request of Salem Engineering Group, Inc., Archaeological Associates has undertaken a Phase I Cultural Resources Assessment of 6.5 acres of vacant land identified as APNs 297-130-052, -053, & -054. The study area is located at the northeast corner of Cactus Avenue and Commerce Center in the City of Moreno Valley, Riverside County. Presently, it is desired to construct a retail/commercial center on the property.

The purpose of this study was to identify all potentially significant cultural resources situated within the boundaries of the study area. This information is needed since adoption of the proposed development plan could result in adverse effects upon locations of archaeological or historical importance. All field notes, background research and photographs are in the possession of Archaeological Associates.

The results of the records search conducted at the Eastern Information Center at UC Riverside indicated that the property had not been previously surveyed for cultural resources and no prehistoric or historic archaeological sites have been recorded within the boundaries of the study area. The results of the field survey were equally as negative as no prehistoric or historic finds of any kind were made. Consequently, no additional work in conjunction with cultural resources is recommended including monitoring of any future earth-disturbing activities.

In the event that human remains are encountered during the course of any future development, California State Law (*Health and Safety Code Section 7050.5 and Section 5079.98 of the Public Resources Code*) states that no further earth disturbance shall occur at the location of the find until the Riverside County Coroner has been notified. If the remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a Most Likely Descendant (MLD).

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

I. INTRODUCTION

The following report was written for Salem Engineering Group, Inc. by Archaeological Associates. It describes the results of a Phase I Cultural Resources Assessment of a 6.5-acre project site identified as APNs 297-130-052, -053, & -054. The study area is located immediately northeast of the intersection of Cactus Avenue and Commerce Center in the City of Moreno Valley, Riverside County. Presently, a fast food-commercial complex is planned for the property.

The purpose of this assessment was to identify all potentially significant cultural resources situated within the study area. This information is needed since adoption of the proposed development plan could result in adverse effects upon locations of archaeological or historical importance. Our assessment consisted of: (1) a records search conducted to determine whether any previously recorded historic or prehistoric material is present on the property, (2) literature and archival review, and (3) a field reconnaissance intended to identify any previously unrecorded cultural resources within the boundaries of the project area

The archaeological records search for the project was performed by Robert S. White. The intensive survey of the property was conducted by Robert S. White (Principal Investigator, County Approved Archaeologist #164), and Susan Klein (surveyor). The study was conducted in accordance with the California Environmental Quality Act (CEQA), as amended in 2015, which includes criteria for eligibility to the California Register of Historical Resources (CRHR). This report was prepared according to the *Archaeological Resource Management Reports (ARMR): Recommended Contents and Format* contained within the States Preservation Planning Bulletin Number 4(a) (California Department of Parks and Recreation 1989).

II. SETTING

A. Study Area Location

Regionally, the study area lies at the northerly end of the Perris Valley a short distance east of Interstate 215, south of the community of Edgemont, and north of March Air Reserve Base in the City of Moreno Valley, Riverside County (fig.1). The parcel is rectangular in shape with the northern project boundary delineated by Goldcrest Avenue, and the western boundary by Commerce Center. Cactus Avenue delineates the southern boundary while commercial adjoins the project site on the east.

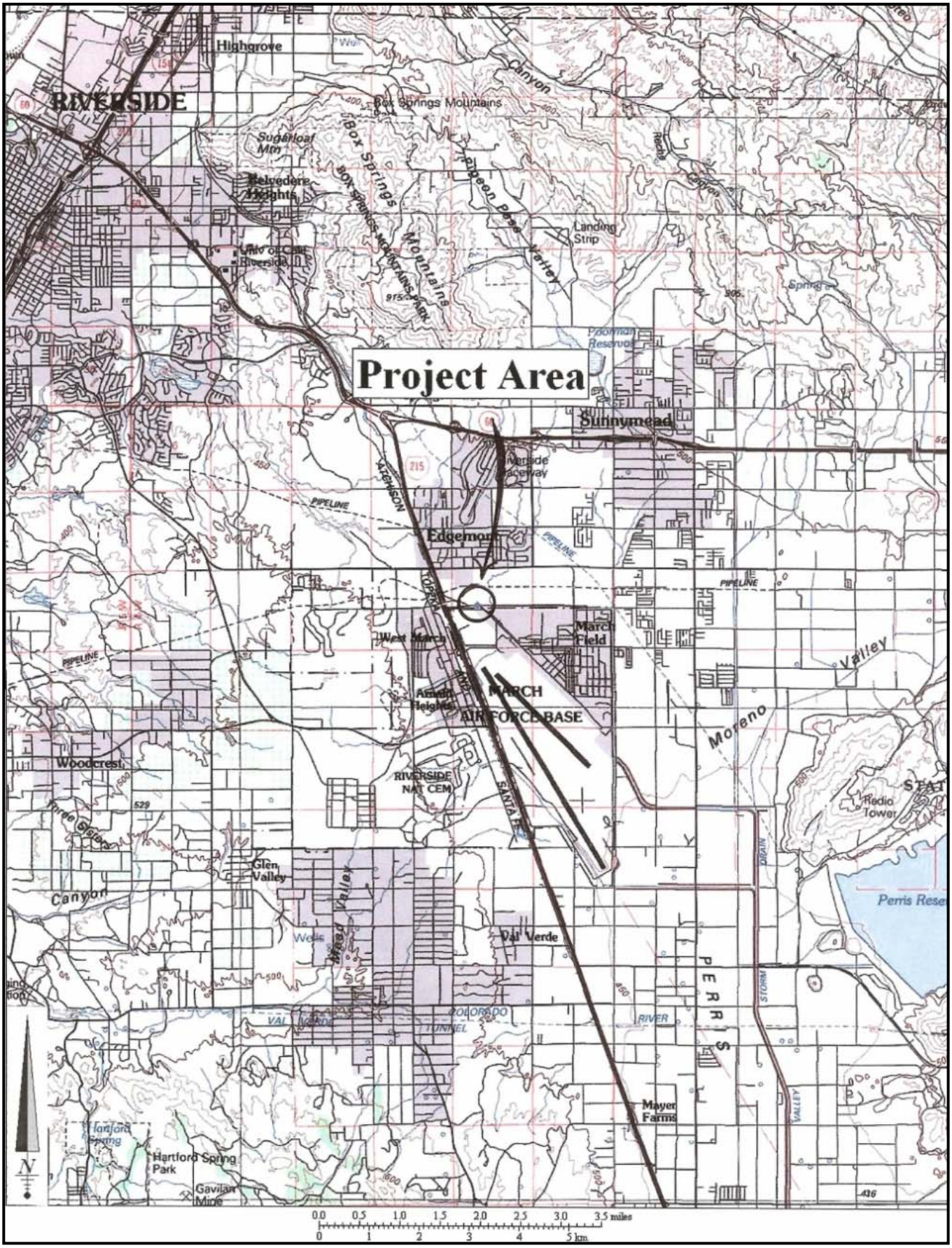

Figure 1. Regional location of the project area as indicated on a portion of the *Santa Ana* USGS 1:100,000 scale topographic map sheet (1983).

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

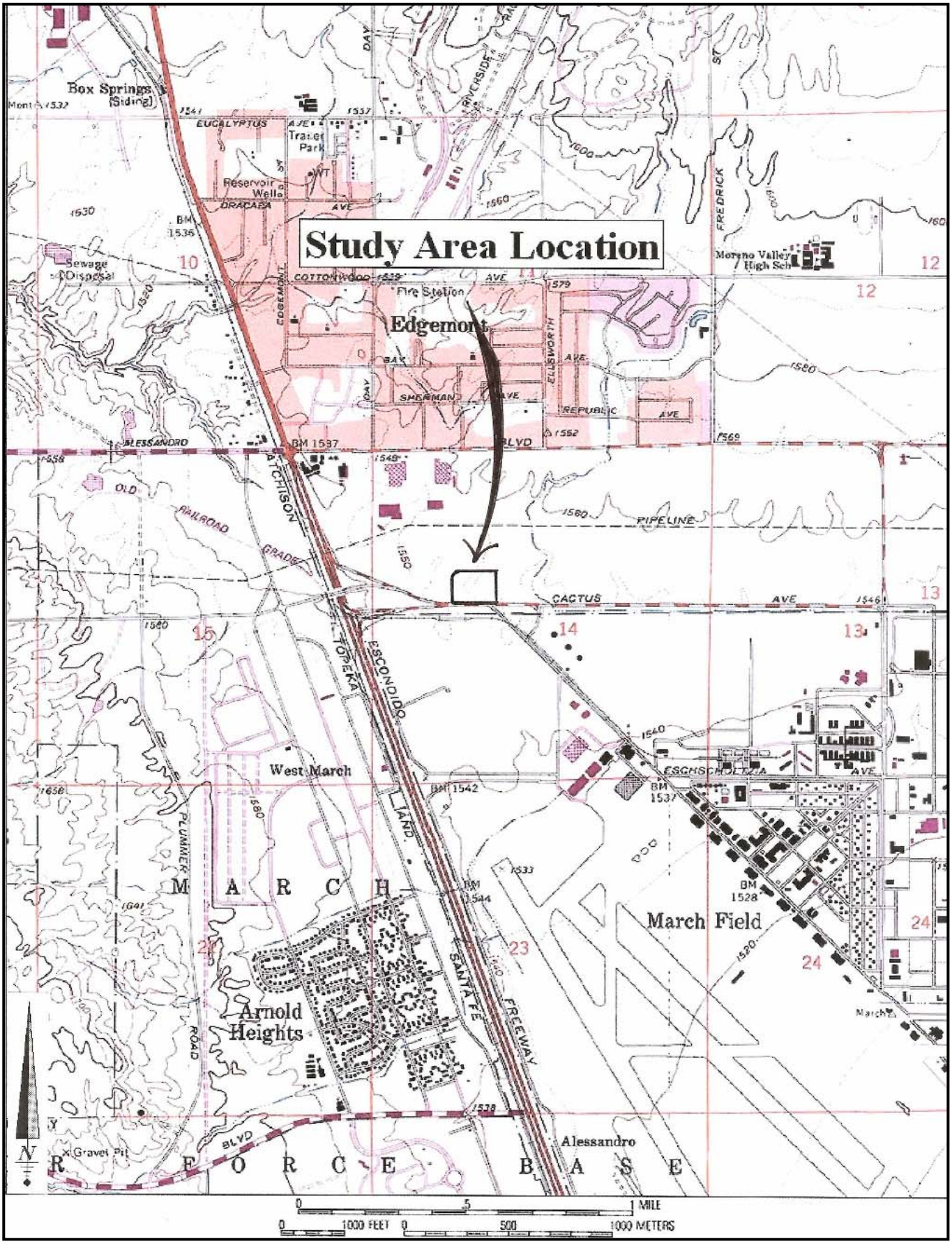

Figure 2. Study area as shown on a portion of the *Riverside East* 7.5' USGS Topographic Quadrangle (1978/7980).

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Legally, the subject property lies within the Southwest ¼ of the Southeast ¼ of the Northwest ¼ of Section 14, Township 3 South, Range 4 West, SBBM as shown on a portion of the *Riverside East* USGS 7.5' Topographic Quadrangle (fig. 2).

B. Natural Setting

The study area is situated in a region of the county where the climate consists of hot and dry summers followed by mild to occasionally wet winters. Topographically, the property is completely flat and devoid of relief. Elevations average 1552 above mean sea level throughout the study area.

On-site vegetation is limited to a seasonal crop of tumbleweeds accompanied by lesser amounts of other exotic weeds and forbes. The parcel appears to be disced on a regular basis for weed abatement. Soils are composed of silty clay that contains small angular stones and is reddish in color. No bedrock exposures or sources of natural surface water were encountered anywhere on the property. Fauna observed were limited to crows and common lizards. Disturbance within the study area is minimal comprising the aforementioned discing. In no way did the nature of the disturbance hinder the efforts of the field study.

C. General Prehistory of southern California

1. Introduction

The Native Americans occupying most of Riverside, Orange, and Los Angeles Counties at the time of the Spanish arrival had not always held these territories. Their earliest well-documented predecessors, who are known only archaeologically, are collectively referred to as the "Millingstone" peoples. Millingstone groups are thought to have been scattered over muchof southern California from as early as ca. 6000 B.C. (cf. Wallace 1955). The Millingstone people were principally seed and root gatherers who rarely seemed to have developed large settlements and who probably never occupied a single area on a year-round basis.

About 1500 B.C. (dates vary with locale and researcher), a change took place. This consisted of the introduction of stone mortars and pestles, implements which greatly facilitated the processing of acorns. The new era has been called the "Intermediate" (ibid.; Elsasser 1978) and is very poorly understood. What is certain is that the Intermediate peoples were replaced by Shoshoneans who moved in from the Great Basin for unknown reasons.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

The exact time at which the Shoshonean "incursion" took place is uncertain but most authorities would place it sometime between A.D. 500 and 1000 (e.g. Kroeber 1925:578). The indigenous Intermediate populations were either absorbed or decimated as the Shoshonean-speakers settled the entire coast from about the latitude of the southern edge of the Santa Monica Mountains south to the area of the San Luis Rey River. Their new territory extended inland across Riverside County.

It is not known whether the Shoshoneans arrived in a great wave over a relatively short period of time or whether they filtered in over hundreds of years. By the time the Spanish arrived, they had become subdivided into three groups: (1) the Gabrieliño who occupied Los Angeles and northern Orange Counties, (2) the Juaneño who resided around what became San Juan Capistrano, and (3) the Luiseño who lived in western Riverside and northern San Diego Counties. It is to be emphasized that the dialectical differences between the groups were minor, all being mutually intelligible. Thus, the differences between say, the Luiseño and Juaneño generally relate to territory and environment. Of course, certain mythological variation also developed over time.

D. A Brief Culture History of the Luiseño

1. Introduction

Our study area falls within the historically known territory of the Luiseño Indians. The Luiseño were the most southwesterly of all Takic speaking peoples and were among the most populous of the Native American groups early in this century (Strong 1929:274). They

survived in much greater numbers than their Shoshonean neighbors to the west (the Gabrieliño and Juaneño) and consequently there is more ethnographic literature relating to the Luiseño.Early investigators included Sparkman (1908), DuBois (1908), Kroeber (1925), Gifford (1918), and Strong (1929). For an excellent source on Luiseño villages and settlement practices, the reader is referred to Oxendine's 1983 Ph.D. dissertation entitled "*The Luiseño Village During the Late Prehistoric Era.*" Here we shall present only a brief overview of what is known about the Luiseño people.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

2. Territory

The Luiseño were so-named after the Mission San Luis Rey de Francia and appear never to have had a formal tribal name for themselves (Kroeber 1925:648). Their territory included only a very short section of the Pacific coast in the area of the mouths of the San Luis Rey and Santa Margarita Rivers (Strong 1929:275, Map 7). From here their territory stretched east as far as present Lake Henshaw and north as far as Perris Reservoir and possibly the San Gorgonio Pass.

3. Society

The Luiseño appear to have had two fundamental social organizations, the clan and the party. The clan comprised a patrilinear family group called a *tunglam* or *kamalmum* (meaning"names" and "sons, children" respectively; Kroeber 1925:686). Kroeber notes that children did not marry into either their father's or mother's clan and he concludes that this indicates that the clans consisted of actual kinsmen. Kroeber goes on to say that:

> On this basis the average "clan" would comprise only 25 or 30 souls, a number well within the limits of traceable blood. The total distinctness of the "clan" names in each district also argues for their being families of local origin (ibid.).Parties were made up of a clan with a hereditary chief to which other chieftainless clans have attached themselves (Gifford 1918:206). Informants claim that originally there were no parties but rather that every clan had its chief (Strong 1929:286).

Execution of religious ceremonies seems to have been a most important function of both the clans and the parties. The chief both ordered and executed ceremonies and a family with a chief constituted "*ipso facto*" religious society (Kroeber 1925:687). However, a clan without a chief had no religious authority and this explains why chieftainless clans became the satellites of clans with chiefs. It seems likely that the chief may also have had great authority in other social areas but specific information regarding this is lacking.

As mentioned earlier, the position of chief was hereditary. Ordinarily, a chief was succeeded by his eldest son though this seems to have been subject to the approval of the clan members. If the members disapprove of the eldest son, a younger son or collateral relative was usually chosen. However, in rare instances a woman could become chief and Strong knew of

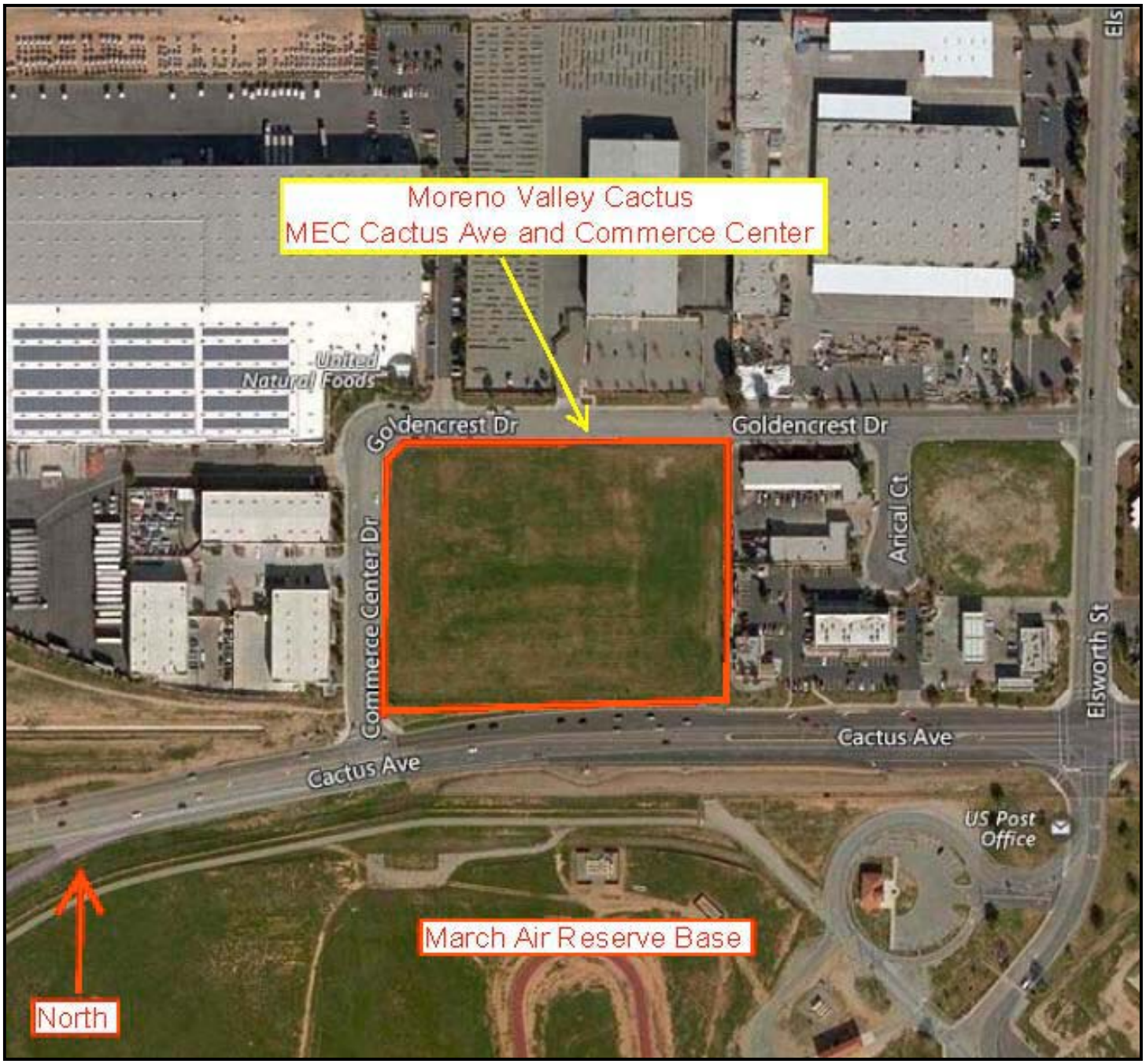

Figure 3. Study area as shown on aerial photograph.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

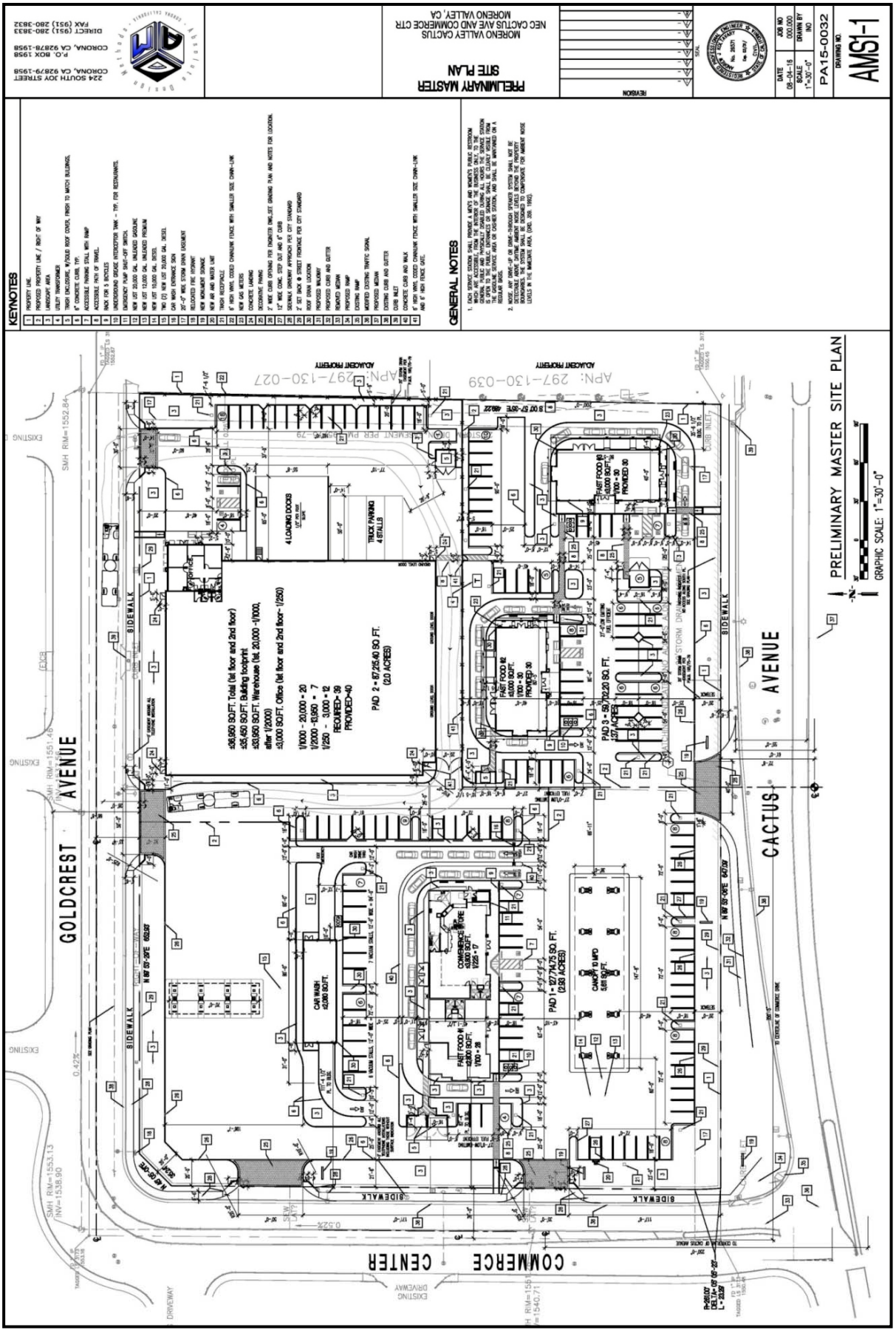

Figure 4. Study area as shown on Preliminary Site Plan.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

several women who claimed this distinction (1929:292). Regarding the qualification of a chief, Strong says that he "...had to be generous and a good provider, know all the myths and rituals relating to clan ceremonies, and have in his possession by inheritance the *maswut* bundle containing the ceremonial impediments of the group" (ibid.).

4. Subsistence

The Luiseño were principally an acorn consuming people (Kroeber 1925:649). The acorns were harvested in the fall and stored through the winter. They were processed by drying the acorn meats, then grinding them in a mortar, and finally leaching the acorns in fresh water to remove the unpalatable tannic acid. The acorns of the live and black oak (*Quercus kelloggii, Quercus agrifolia*) were preferred to the dwarf oak (*Quercus dumosa*) though the latter species could be used when the acorn crop from the other trees failed.

Other native flora exploited by the Luiseño include various kinds of seeds which are followed in importance by foliage and shoots. Fruit and berries were third in importance followed by roots. Kroeber remarks that most of the seeds were gathered from plants of the *Compositae* (sunflower) and *Labiatae* (mint) families as opposed to cereal grasses (ibid.). Plants bearing edible stems and leaves are very numerous but the most important for the Luiseño were species in the clover family. Yucca (*Yucca whipplei*) was also used to provide the well-known baked "mescal".

Kroeber comments that "pulpy fruits" are small and not especially abundant in Luiseño habitat (1925:649). Nonetheless, they were utilized and it is our contention that the fruit from plants of the *Rosaceae* (Rose) family may have been more important than Kroeber indicates. This may have been particularly true of the Hollyleaf Cherry (*Prunus icifolia*; cf. Wilke 1974. Bean 1972; Raven 1966 for description of plant).

Plants were used for a great variety of purposes other than consumption. These include pharmaceuticals, fabrication of houses, implements, clothing, baskets, and dyes. Many types of animals were hunted and it may be more useful to cite the animals not hunted than to list those that were. According to Kroeber, animals not eaten by the Luiseño include the dog, coyote, bear, tree squirrel, pigeon, dove, mud hen, eagle, buzzard, raven, lizards, frogs, and turtles (ibid.:652). Probably the most important game comprised deer, small rodents such as woodrats, and game birds such as quail and ducks. Grasshoppers were also consumed. The Luiseño who lived along

the coast gathered molluscs and fished from canoes or balsas using nets and line made of yucca fiber.

5. Material Culture and Technology

Archaeological data regarding the Luiseño usually relate to the material culture and particularly to those items manufactured from non-perishable materials. Therefore, a brief description of the material culture is especially pertinent to an archeological investigation.

Luiseño houses were made by excavating a shallow hole and then constructing a frame over the hole. The frame was then covered with branches which in turn were covered with earth. "There was a smoke hole in the middle of the roof, but entrance was by a door, which sometimes had a short tunnel built before it" (ibid.). Simple shades were also used in fair weather.

The Luiseño also built sweathouses which were similar in construction to the houses except for being smaller and having the door in one of the long sides. Warmth in the sweathouse was produced by an open fire, never steam. The sweathouse was used by most of the California tribes west of the deserts:

> The California sweathouse is an institution of daily, not occasional service. It serves a habit, not a medical treatment; it enters into ceremony and indirectly rather than as a means of purification. It is the assembly of the men, and often their sleeping quarters. It thus comes to fulfill many of the functions of a club; but is not to be construed as such, since ownership or kinship or friendship, not membership, determines admission (Heizer and Whipple 1951:8).

Luiseño dress was simple: women wore a two piece apron while men went naked when weather permitted. Footgear was worn only when rough ground had to be traversed and consisted of sandals manufactured from agave fiber. Tattoos were common, particularly on the chins of women. These were made by using a cactus thorn to prick charcoal into the skin.

Many other Luiseño fabricated items were related to food collecting or processing. Most frequently encountered are the various forms of bedrock grinding equipment. These were normally made on granite outcroppings near or adjacent to creek beds and oak stands. The grinding features are of three usual types:

A. Mortars. These are natural or pecked concavities in the rock. They are normally circular in plan and vary from 5 to 10 cm. in depth. Bedrock mortars were used in conjunction with stone or wooden pestles for pulverizing food.

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B. Ovals or Bedrock Metates. These are small shallow oval depressions in the bedrock. They usually vary between 15 and 30 cm. in either dimension but are almost always oval in plan. Normally ovals are less than 3 cm. deep. They were probably used in conjunction with manos (hand stones) for grinding food.

C. Slicks. These are amorphous smooth spots on the bedrock. Slicks may measure up to 150 x 150 cm. in their horizontal dimensions but are almost always totally lacking in depth. The smoothness appears to be the result of a mano being rubbed across the natural contour of the stone.

Portable mortars were also manufactured by the Luiseño and they, along with manos, comprise the remainder of the usual groundstone complex (though other utilitarian and decorative groundstone objects occur occasionally).

Most cutting and shaping chores were performed using chipped stone tools manufactured from metavolcanic rocks or cherts. The sharp edges of simple "flakes" struck from amorphous cores are the most common cutting tool. Planes and scraping tools for shaping and removing plant fibre were also manufactured from chipped stone as were projectile points (arrow or dart points). Luiseño projectile points are usually small, triangular specimens many of which bear a notch on either side.

The Luiseño also manufactured pottery using a stone and a wooden paddle (the so-called "paddle and anvil technique"). Usually the ceramics were fabricated from a reddish clay mixed with coarse sand. It was then coiled and finally was shaped by paddling against the surface using the paddle as "backing" on the opposite surface. This family of pottery is characterized by a reddish brown hue and coarse gritty fabric is referred to as "Tizon Brown Ware."

Other Luiseño utilitarian objects were manufactured from basketry. In addition to the usual utilitarian baskets, they also made basketry caps intended to protect the head from the straps on their carrying nets. The caps, which were "somewhat conical", were also worn by women to prevent hair falling into the mortar when they were grinding food. Granaries were also manufactured from basketry.

Evidence for Luiseño ornamental objects is similar to that for their Kumeyaay neighbors to the south. May (1975) describes Kumeyaay ornaments as follows:

> Most of the beads were made by breaking down the sides off an olivella shell and drilling holes in the center. The edges were then ground round. Some shells merely had their spires lopped off.

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> Clay pendants are almost always old potsherds which have been ground oval and drilled at one end. (May 1975:19).

6. Religion

The Luiseño (and presumably their northern and western neighbors) practiced a religion which centered around the god *Chinigchinich* (Strong 1929:338). He was a living god who watched and punished and who ordained the sacred practices except for the mourning ceremonies (Kroeber 1925:656). Luiseño "monotheism" has struck many scholars as remarkable:

> This idea of a present and tremendously powerful god, dictating not only ritual but the conduct of daily life--a truly universal deity and not merely one of a class of spirits or animals--is certainly a remarkable phenomenon to have appeared natively among any American group north of Mexico (ibid.).

It may be that the development of the god is actually a result of the influence of Christianity as spread by the missionaries. In any case, the origin of the *Chinigchinich* religion is traditionally ascribed to Santa Catalina Island. The cult of the god was built around rites entailing Jimsonweed (Toloache) drinking.

Luiseño ceremonies may be divided into two general categories: initiations and mourning rites. The most important of the initiation ceremonies was the Toloache initiation where boys were given the Jimson weed potion and experienced a series of dreams which later became ant sacred to them as individuals. Another ceremony, possibly connected with the Toloache, was the ordeal:

> The boys were lain on ant hills, or put into a hole containing ants. More of the insects were shaken over them from baskets in which they had been gathered. The sting or bite of the large ant smarts intensely, and the ordeal was a sever one, and rather doubtfully ameliorated when at the conclusion the ants were whipped from the body with nettles (Ibid.).

Girls were also initiated when they came of age. Their ceremony, called the *Wekenish* by the Luiseño, was practiced by all of the Shoshonean speaking peoples of southern California. The ceremony entailed placing the girls in a pit which contained a lining of heated rocks covered

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

with grass or matting. The girls remained in the pit for several days. The heat was intended to promote fertility and good health during the girl's adulthood.

The Luiseño practiced cremation of their dead. There are at least half a dozen mourning ceremonies that took place after the cremation. These entailed such rites as washing the clothes of the deceased and burning images of him. Special ceremonies were held for important personages such as chiefs. The ritual killing of an eagle on the anniversary of a chief's death is an example of the latter (Kroeber 1925:676).

III. RESEARCH ORIENTATION

A. Introduction

It is often said that human occupation of southern California may go back as far as 10,000 years ago (Van Horn 1987:22). Evidence for these relatively early people is very sparse and presumption of a very low population density at that time seems entirely reasonable. The "original" people were soon to be supplanted or absorbed by a new population. Archaeologists generally agree that sometime around A.D. 500, coastal southern California, including the Inland Empire region, became home to migrant Shoshonean peoples moving in from the Great Basin.

B. Research Goals

The goals of our research were to identify known locations of potential significance situated within the study area. Our hypotheses were as follows:

(1) Prehistoric sites may be found almost anywhere but are generally located in areas that offered access to water and plant resources. In this particular area, grass lands and the occasional water course lined with oak trees would have been most attractive. Granitic boulders and outcrops were also commonly utilized as milling stations for vegetal foodstuffs and to a lesser extent rock shelters and rock art sites. Typically, prehistoric sites may comprise bedrock milling features, rock art, scatters of potsherds, fire-affected rock, chipped stone implements, and at times, human cremations. Pottery sherds, of Tizon Brown Ware and possibly Lower Colorado Buff Ware may also occur at late period sites in the area.

(2) Historic sites in the region (other than March Field) would most likely be associated with early farming activities. Lacking standing structures, remains of these homesteads and farmsteads typically comprises concrete, river cobble or adobe structure foundations, irrigation

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systems and trash scatters. However, not all debris scatters (e.g. tin can, glass, crockery) can be connected to a particular home or farmstead. In many instances, isolated scatters of dumped historic debris represent nothing more that illicitly discarded rubbish.

IV. ARCHIVAL RESEARCH METHODS

A. Cultural Resources Records Search

An in-person records search of the study area was conducted by Robert S. White at the Eastern Information Center (EIC), University of California at Riverside on September 26, 2016. The search entailed a review of all previously recorded prehistoric and historic archaeological sites situated on or within a one-mile radius of the project area. Additionally, the National Register of Historic Places (NRHP), California Register of Historical Resources (CRHR), California Historical Landmarks (CHL), California Points of Historical Interest (CPHI), and the California Directory of Properties (DOP, aka the Historic Resources Inventory [HRI]) were reviewed for the purpose of identifying historic properties.

1. Previous Surveys

a. Inside Study Area

The results of the search indicated that the study area has not been previously surveyed in conjunction with a cultural resources assessment.

b. Outside Study Area

Outside the study area, a minimum of twelve cultural resource studies have been conducted within a one-mile radius. These investigations cover approximately 40% of the surrounding land within the search radius. They include survey and test reports for both small (less than 20 acres) and large (40 acres or more) scale projects.

The most interesting of the studies in the surrounding region is the Historic Building Inventory and Evaluation study for that portion of March Air Force Base that lies west of Interstate 215 (Wessel 1995). Over two hundred building were evaluated for architectural and historical significance during the study.

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2. Previously Recorded Archaeological Sites Located Within the Study Area

The results of the records search indicated that no prehistoric or historic archaeological sites or isolates have been previously recorded within the boundaries of the study area.

3. Previously Recorded Archaeological Sites Located Within a One-Mile Radius

No archaeological sites (prehistoric or historic) have been documented within a one-mile radius of the study area.

4. Historic Structures and Locations Within a One-Mile Radius

Ten historic structures have been recorded within a one-mile radius of the study area. Each is characterized in Table 1 below. The closest of these buildings (Primary #33-20330) lies approximately ½ to the northwest. Constructed circa 1950, the small house is abandoned and in poor condition (Auck 2008).

5. Isolated Finds

One isolated artifact has been identified within the search radius. It comprises a spent .50 caliber Browning Machine Gun cartridge with a head stamp of 1943. It was discovered on the west side of I-215 northwest of March AFB.

6. Heritage Properties

No California Historical Landmarks (CHL) or California Points of Historical Interest (CPHI) have been recorded within a one-mile radius of the project. However, one listed National Register of Historic Places (NRHP) Historic District has. It comprises the March Filed Historic District located on the west side of Interstate 215. Of the 228 buildings evaluated, 199 were determined to be “Contributing Structures” to the District They date from 1918 to 1943. This portion of the base was listed on December 6, 1994 and assigned # 94001420 (Mikesell and Wee 1992).

Table 1. Historic Structures within a One-mile Radius of the Study Area.

Primary#	Building Description
33-6915	Single family residence characterized as a bungalow. Constructed 1947. (Warner 1983).
33-6916	Single family wood framed residence characterized as vernacular in style. Constructed in 1938 (Warner 1983)
33-6919	Single family wood framed residence characterized as vernacular in style. Constructed in 1920 (Warner 1983)
33-9204	March AFB, Building #420. Industrial Warehouse now Museum. Constructed 1931. Contributing Structure to listed March Field Historic District (Mikesell and Wee 1992).
33-20326	Single family wood framed residence characterized as vernacular in style. Constructed in 1947 (Auck 2008).
33-20327	Single family wood framed residence characterized as vernacular in style. Constructed in 1946 (Auck 2008).
33-20328	Single family wood framed residence characterized as vernacular in style. Constructed in 1943 (Auck 2008).
33-20329	Single family wood framed residence characterized as a bungalow in style. Constructed in 1950 (Auck 2008).
33-20330	Single family wood framed residence characterized as vernacular in style. Constructed circa 1950 (Auck 2008).
33-20331	Single family wood framed residence characterized as ranch in style. Constructed in 1953 (Auck 2008).

B. Historic Map Research

In addition to the records search, numerous historic General Land Office (GLO) and Geological Survey (USGS) maps of the Moreno Valley region were inspected. These maps are on file with one or more of the following entities: Bureau of Land Management, Map Room of the Science Library at UC Riverside, the USGS TopoView Historic Topographic Map Database, and the California Historic Topographic Map Collection housed in Special Collections at the Merriam Library at California State University, Chico. These included:

GLO Map of Township No. III South Range No. IV of West San Bernardino Merid".
Surveyed 1853, Examined and Approved February 28, 1855

Southern California Sheet No.1, 1:250,000, 1901 reprinted 1948
Surveyed 1893-1900.

1901 *Elsinore* 30' USGS Topographic Quadrangle
Surveyed 1897 and 1898

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1901 *Riverside* 15' USGS Topographic Quadrangle
Surveyed 1897

1942 *Riverside* 15' War Dept. Corps of Engineers, U.S. Army Topographic Quadrangle

1953 *Riverside East* 7.5' USGS Topographic Quadrangle

1967 *Riverside East* 7.5' USGS Topographic Quadrangle

1967 *Riverside East* 7.5' USGS Topographic Quadrangle, Photorevised 1980

A review of these maps was performed for the purpose of identifying locations of potential historical resources. No man-made features have been depicted within the parcel boundaries on any of the maps. However, the 1853 GLO Plat Map depicts the "Wagon Road to Temecula" transecting Section 14 from northwest to south approximately ½ to the east of the study area. It appears that the study area has always been vacant land.

C. Land Patents

Archival research also included a review of land patents on file with the Bureau of Land Management (BLM) in Sacramento. The subject parcel lies within the Southwest ¼ of the Southeast ¼ of the Northwest ¼ of Section 14, Township 3 South, Range 4 West, San Bernardino Base Meridian. Office records indicate that a State Volume Patent for 10,500.60 acres including the whole of Section 14 was issued to William B. Bourn on September 20, 1870 by authority of the April 24, 1870, State-Cash Entry (3 Stat. 566). The land patent is recorded as Document Nr: 2196, Accession No. CA0040__.323, and BLM Serial Nr. CACAAA 082784. It does not appear that William Bourn constructed a dwelling within the boundaries of the study area.

V. FIELD SURVEY

An intensive pedestrian survey of the study area was conducted by Archaeological Associates on September 21, 2016. Personnel included Robert S. White (Principal Investigator), and Susan Klein (surveyor). The intent of the survey was to identify all potentially significant cultural resources situated within the boundaries of the property. Historic resources include places and structures relating to significant historic events or having historical or special aesthetic qualities in and of themselves. Prehistoric resources include Native American sites of

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all types. All field notes, photographs, and maps generated or used during the field study are in the possession of Archaeological Associates.

The pedestrian survey began in the northwestern corner of the study area and proceeded in a westerly direction. Surface visibility throughout the parcel was generally good, averaging 80%. The survey of the property was conducted by walking parallel transects spaced at 5-10 meter intervals. Where encountered, backdirt piles resulting from rodent excavations were also examined for any signs of buried, archaeological deposits. By employing these techniques, a thorough examination of the study area was accomplished

VI. REPORT OF FINDINGS

A. Prehistoric Resources

The results of the records search conducted at the Eastern Information Center housed at UC Riverside failed to identify any prehistoric resources within the boundaries of the study area. The results of the field study were also negative. No prehistoric resources of any kind were identified during the course of the investigation.

B. Historic Resources

The results of the records search conducted at the Eastern Information Center at UC Riverside indicated that no historic archaeological sites or historic buildings had been previously recorded within the project area. The results of the historic map research and field survey were also entirely negative. No historic resources of any kind were identified during the course of the investigation.

VII. MANAGEMENT CONSIDERATIONS

A. Prehistoric and Historic Resources

The results of the records search and field study were negative for the presence of prehistoric and historic resources within the project area. Therefore, no further work in conjunction with prehistoric or historic resources is warranted or recommended including monitoring of earth disturbing activities connected with future develop.

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B. Discovery of Human Remains

In the event that human remains are encountered during the course of any future development, California State Law (*Health and Safety Code Section 7050.5 and Section 5079.98 of the Public Resources Code*) states that no further earth disturbance shall occur at the location of the find until the San Bernardino County Coronor has been notified. If the remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a Most Likely Descendant (MLD).

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

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Plate I. Top: Looking southeast across study area from the northwest property corner.
Bottom: Northeasterly view across study area from the southwest property corner.

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Plate II. Top: Looking northwest across study area from the southeast property corner.
Bottom: Southwesterly view across study area from the northeast property corner.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

Plate III. Top: Looking north along the western boundary from the southwest property corner. **Bottom:** Looking west long the southern boundary from the southeast property corner.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

APPENDIX A: Personnel Qualifications

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

RÉSUMÉ OF

ROBERT S. WHITE

Principal, Archaeological Associates

Mr. White has been affiliated with Archaeological Associates since 1983. Starting in 1991 he became the firm's Director and in 2013, Principal. Mr. White has extensive experience in many aspects of cultural resource management, including but not limited to, project administration, field survey, excavation, lab analysis, land survey and cartography, archival research, budgeting, planning, and report writing/production. In those jurisdictions requiring professional certification, Mr. White is certified by the Counties of Riverside, Orange, and Ventura to conduct all phases of archaeological investigation.

Since 1983, Mr. White has conducted well over 500 prehistoric and historic archaeological investigations in Riverside, San Bernardino, Los Angeles, Orange, Kern, San Diego, Imperial, Sonoma, and Inyo Counties. Additionally, in concert with colleague Dr. David Van Horn, they have pioneered innovative techniques that revolutionized data recovery programs on large, low-density archaeological sites.

EDUCATION

B.A., Liberal Studies (emphasis in Anthropology), California State University Long Beach, 1987

A.A., Liberal Arts, Los Angeles Harbor College, 1977

PROFESSIONAL HISTORY

Joined Archaeological Associates in 1983
1991 to 2013, Director of Archaeological Associates
2013 to Present, Principal of Archaeological Associates
Riverside County Approved Archaeologist #164
Orange County Approved Archaeologist

PROFESSIONAL AFFILIATIONS

American Committee for the Preservation of Archaeological Collections (ACPAC)
Pacific Coast Archaeological Society.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

PUBLICATIONS

Van Horn, David, Laura S. White, and Robert S. White

2005 The Prehistory of Gretna Green, a Site in Northern San Diego County, pp. 145-168 IN: Onward and Upward! Papers in honor of Clement W. Meighan (Keith L. Johnson, editor). Stansbury Publishing, Chico.

White, R.S.

1991 Prehistoric Fire-Making Techniques of California and Western Nevada. Pacific Coast Archaeological Society Quarterly, Vol. 27, No. 1, pp. 27-38.

Van Horn, D.M. and R.S. White

1986 Some Techniques for Mechanical Excavation in Salvage Archaeology. Journal of Field Archaeology, 13:239-244.

TRAINING

Tortoise Awareness Training. Joshua Tree, San Bernardino County (September, 2008).

SB 18 Consultation Seminar. Riverside (December, 2005). Offered through the Governor's Office of Planning and research et. al.

* 1987 B.A. in Liberal Studies with emphasis in Anthropology, California State University, Long Beach.

* 1977 A.A. Degree in Liberal Arts, Los Angeles Harbor College.

* Riverside County Certified Archaeologist #164

* Orange County Certified Archaeologist

* Over 30 years of full-time experience conducting cultural resource management projects in southern California.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

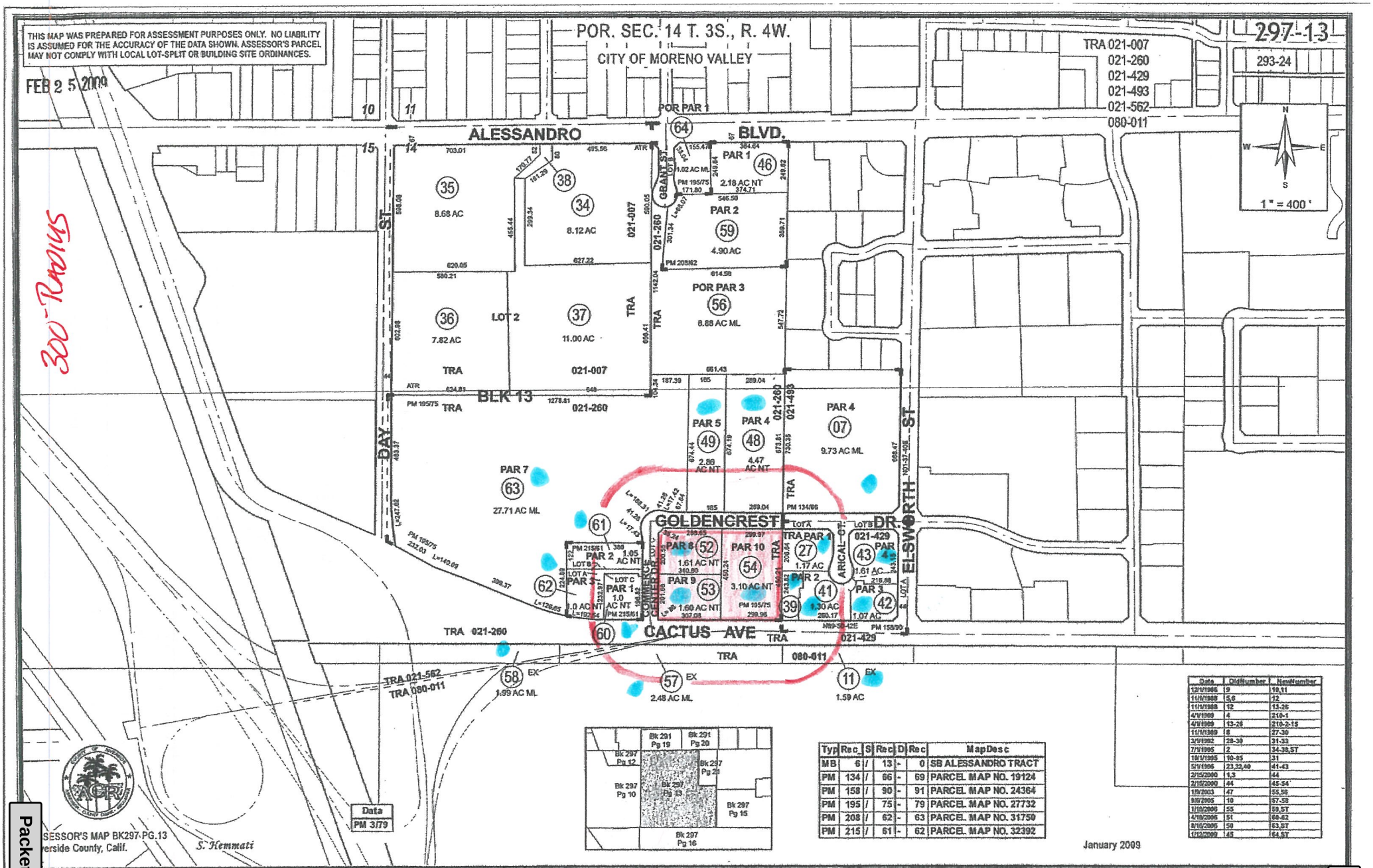
APPENDIX B: Records Search Results

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134

CULTURAL RESOURCES RECORDS SEARCH

On September 26, 2016, an in-person cultural resources records search was conducted by Robert S. White at the Eastern Information Center housed at the University of California at Riverside. Consequently, there is no official letter from the Information Center to attach here. The in-person search included a review of all previously recorded prehistoric and historic archaeological sites situated within a one-mile radius of the study area. Additionally, the National Register of Historic Places (NRHP), California Register of Historical Resources (CRHR), California Historical Landmarks (CHL), California Points of Historical Interest (CPHI), and the California Directory of Properties (DOP, aka the Historic Resources Inventory [HRI]) were reviewed for the purpose of identifying any historic properties. Copies of site record forms were obtained for those resources situated within a one-mile radius of the project. Pertinent archaeological reports were also were reviewed and all relevant information was incorporated into the study.

Attachment: Cultural Resources Survey (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133 (Plot Plan), PEN16-0134


THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY. NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA SHOWN. ASSESSOR'S PARCEL MAY NOT COMPLY WITH LOCAL LOT-SPLIT OR BUILDING SITE ORDINANCES.
FEB 2 5 2009
POR. SEC. 14 T. 3S., R. 4W.
CITY OF MORENO VALLEY
297-13
293-24
TRA 021-007
021-260
021-429
021-493
021-562
080-011
1" = 400'
300' Radius
ALESSANDRO BLVD.
GRANT ST
DAY ST
ELSWORTH ST
BLK 13
LOT 2
POR PAR 1
PAR 1
PAR 2
PAR 3
PAR 4
PAR 5
PAR 7
POR PAR 3
8.68 AC
8.12 AC
7.82 AC
11.00 AC
2.18 AC NT
4.90 AC
8.88 AC ML
9.73 AC ML
2.86 AC NT
4.47 AC NT
27.71 AC ML
GOLDENCREST DR.
ARICAL ST.
COMMERCE CENTER DR.
CACTUS AVE
1.61 AC NT
1.17 AC
1.61 AC
1.60 AC NT
3.10 AC NT
1.30 AC
1.07 AC
1.05 AC NT
1.0 AC NT
1.99 AC ML
2.48 AC ML
1.59 AC
TRA 021-260
TRA 021-562
TRA 080-011
TRA 021-429
021-007
021-260
021-493
080-011
Data
PM 3/79
ASSESSOR'S MAP BK297 PG.13
Riverside County, Calif.
S. Hemmati
January 2009
Typ Rec_ S Rec D Rec MapDesc
MB 6 / 13 - 0 SB ALESSANDRO TRACT
PM 134 / 66 - 69 PARCEL MAP NO. 19124
PM 158 / 90 - 91 PARCEL MAP NO. 24364
PM 195 / 75 - 79 PARCEL MAP NO. 27732
PM 208 / 62 - 63 PARCEL MAP NO. 31750
PM 215 / 61 - 62 PARCEL MAP NO. 32392
Date OldNumber NewNumber
12/1/1906 9 10,11
11/1/1908 5,6 12
11/1/1908 12 13-26
4/1/1909 4 210-1
4/1/1909 13-26 210-2-15
11/1/1909 8 27-30
3/1/1992 28-30 31-33
7/1/1995 2 34-39,ST
10/1/1995 30-35 31
5/1/1996 23,33,40 41-43
2/15/2000 1,3 44
2/15/2000 44 45-54
1/9/2003 47 55,56
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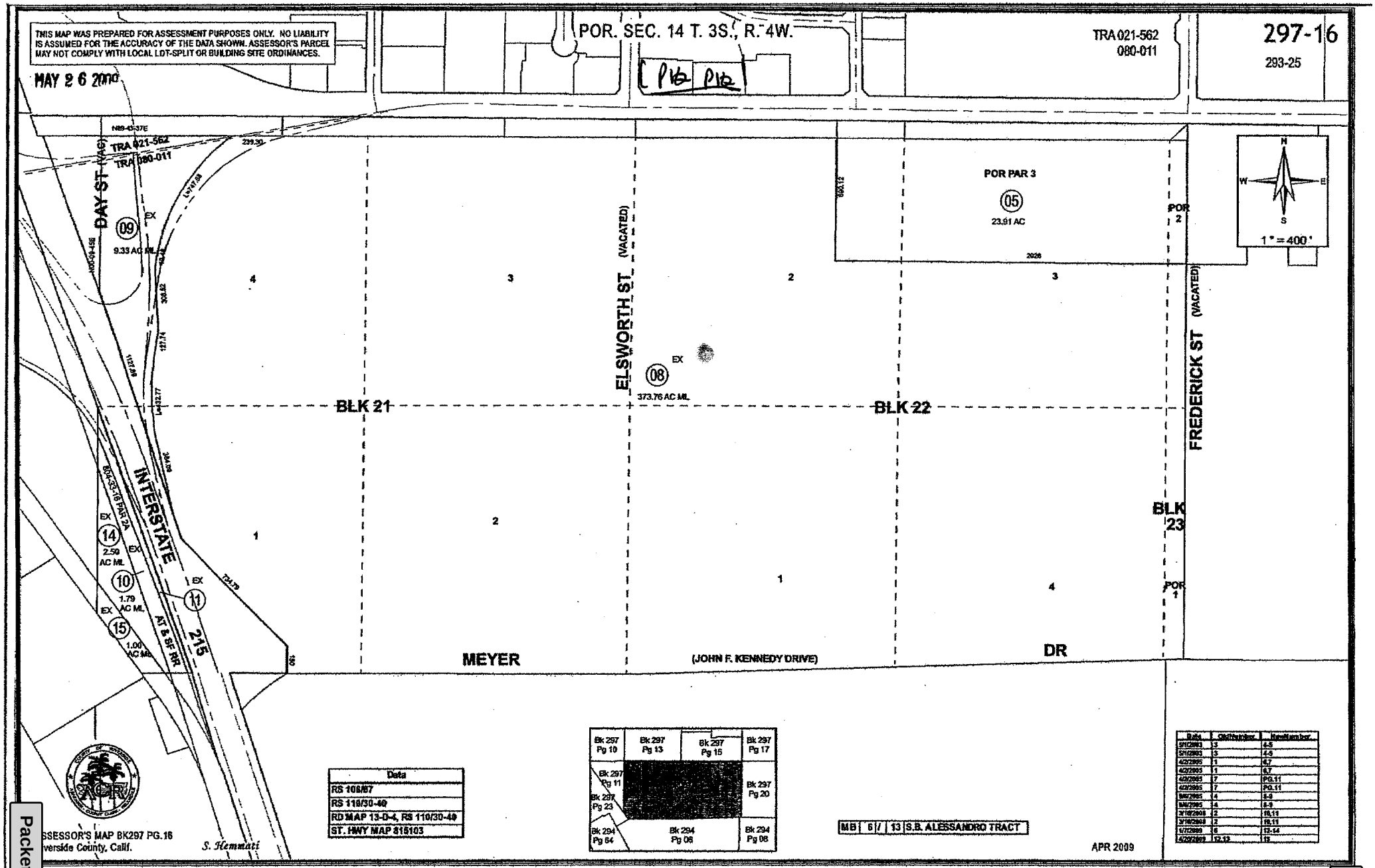
1/12/2009 45 64,ST


THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY. NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA SHOWN. ASSESSOR'S PARCEL MAY NOT COMPLY WITH LOCAL LOT-SPLIT OR BUILDING SITE ORDINANCES.
MAY 2 6 2010
POR. SEC. 14 T. 3S., R. 4W.
TRA 021-562
080-011
297-16
293-25
DAY ST (VAC)
TRA 021-562
TRA 080-011
09
9.33 AC M/L
ELSWORTH ST (VACATED)
08
373.76 AC M/L
POR PAR 3
05
23.91 AC
POR 2
FREDERICK ST (VACATED)
BLK 21
BLK 22
BLK 23
INTERSTATE 215
14
2.50 AC M/L
10
1.79 AC M/L
11
15
1.00 AC M/L
AT & SF RR
MEYER
(JOHN F. KENNEDY DRIVE)
DR
POR 1
1" = 400'
Data
RS 108/67
RS 110/30-40
RD MAP 13-D-4, RS 110/30-40
ST. HWY MAP 815103
MB 61/13 S.B. ALESSANDRO TRACT
APR 2009
ASSESSOR'S MAP BK297 PG.16
Riverside County, Calif.
S. Hemmati

AFFIDAVIT ON PROPERTY OWNERSHIP LIST

THE ATTACHED LIST REPRESENTS NAMES AND ADDRESSES OF ALL PROPERTY OWNERS LOCATED WITHIN 300 FEET OF THE EXTERIOR BOUNDARIES OF PROPERTY LOCATED
AT VACANT LAND OR
APN 297-130-052, 053+054
AS OBTAINED FROM LATEST RIVERSIDE COUNTY TAX ROLE FROM MY DATA SOURCE AND UPDATED MONTHLY TO 1/2017 DEEMED RELIABLE BUT NOT GUARANTEED.

Catherine McDermott
SIGNATURE
2/1/2017

CATHERINE MC DERMOTT
OWNERSHIP LISTING SERVICE
PO BOX 890684 TEMECULA
CA 92589-0684
PHONE AND FAX 951 699 8064
ownershiplistingservice@hotmail.com

Attachment: 300 FT Radius Map for Public Notice Mailing Labels (2518 : PEN16-0131 (Master Plot Plan), PEN16-0132 (Plot Plan), PEN16-0133