

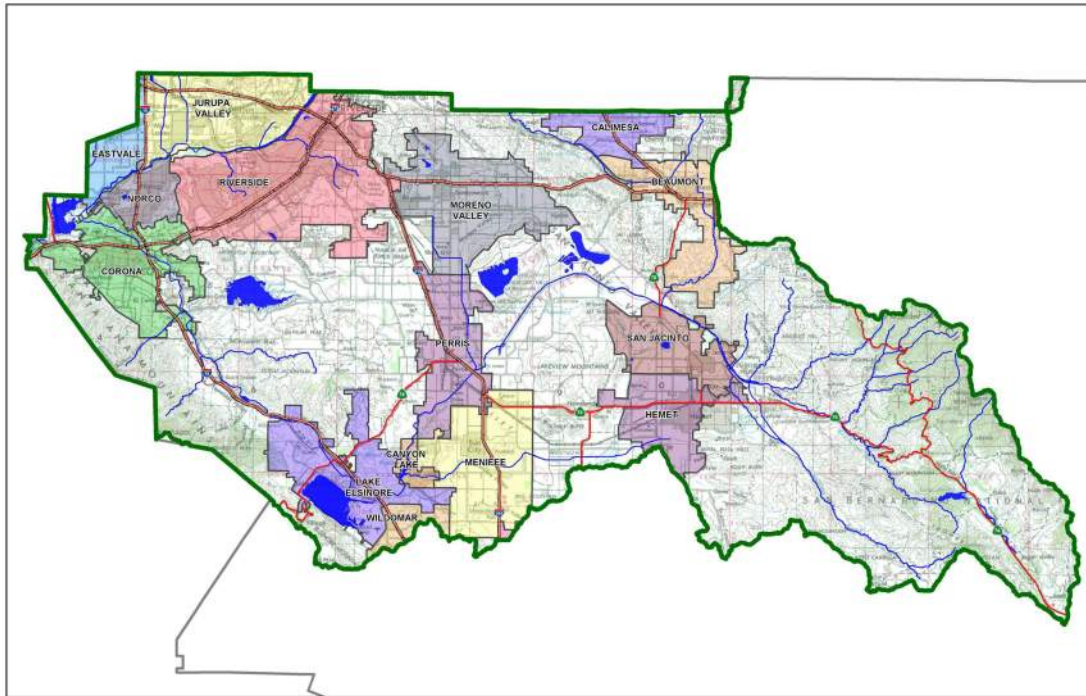
# Project Specific Water Quality Management Plan

A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County

**Project Title:** Beyond Food Mart - Iris Ave & Oliver St

**Development No:** N/A

**Design Review/Case No:** LWQ22-0040



- Preliminary
- Final

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*Prepared for Compliance with  
Regional Board Order No. **R8-2010-0033***

**Template revised June 30, 2016**

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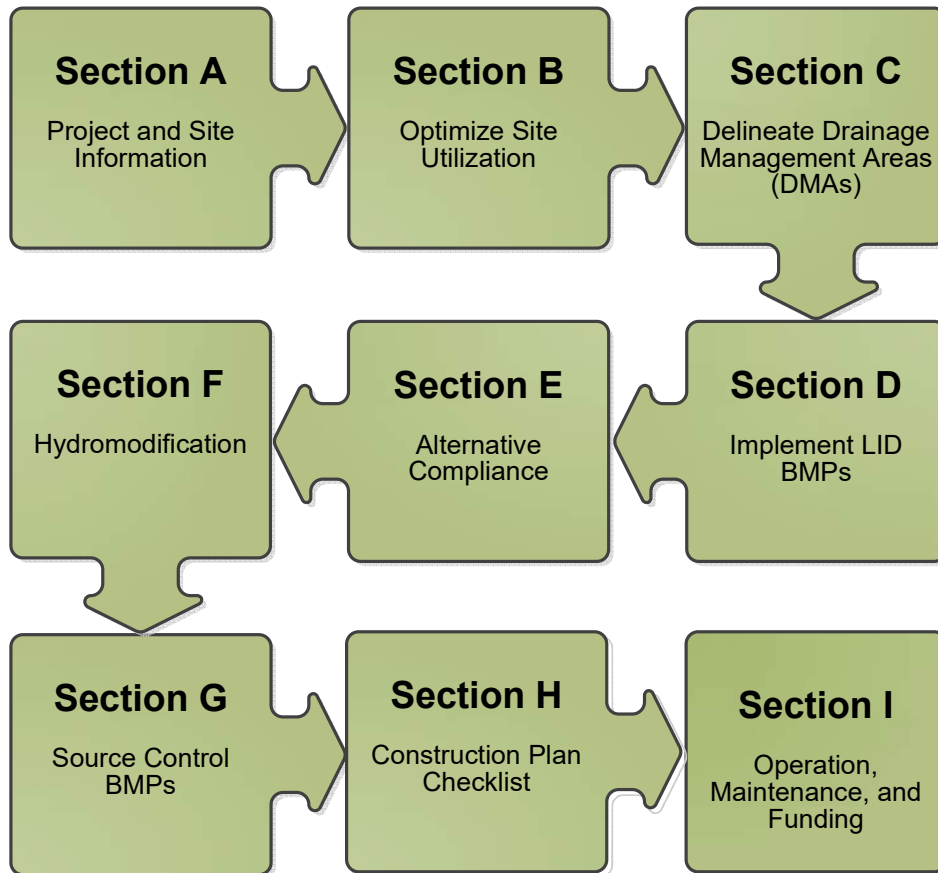
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## A Brief Introduction

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.



## OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Rabih Sater by Blue Engineering and Consulting, Inc. for the Beyond Food Mart - Iris Ave & Oliver St project.

This WQMP is intended to comply with the requirements of City of Moreno Valley for Ordinance 827 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 8.10).

"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."

*Rabih Sater*  
Owner's Signature

01/04/23  
Date

Rabih Sater  
Owner's Printed Name

Owner  
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."

*[Signature]*  
Preparer's Signature

01/04/23  
Date

Angel Cesar, P.E.  
Preparer's Printed Name

President/CEO  
Preparer's Title/Position

Preparer's Licensure:



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## Section A: Project and Site Information

| PROJECT INFORMATION  |  |
|--|--|
| Type of Project:   | Commercial – Fuel Station, Car Wash and Convenience Store        |
| Planning Area:   | Reche Canyon/Badlands  |
| Community Name:  | Moreno Valley, Ca  |
| Development Name:  | Beyond Food Mart – Iris Ave & Oliver St                          |
| PROJECT LOCATION   |  |
| Latitude & Longitude: 33.895850°, -117.183296°   |  |
| Project Watershed and Sub-Watershed: Santa Ana River Watershed, San Jacinto Sub-Watershed  |  |
| APN(s): 486-310-038  |  |
| Map Book and Page No.: MB 239, PG 30-32  |  |
| PROJECT CHARACTERISTICS  |  |
| Proposed or Potential Land Use(s)  | Carwash, Gas Station and Convenience Store                       |
| Proposed or Potential SIC Code(s)  | 7542 and 5541  |
| Area of Impervious Project Footprint (SF)  | 61,046   |
| Total Area of <u>proposed</u> Impervious Surfaces within the Project Limits (SF)/or Replacement  | 61,046   |
| Does the project consist of offsite road improvements?   | <input checked="" type="checkbox"/> Y <input type="checkbox"/> N |
| Does the project propose to construct unpaved roads?   | <input type="checkbox"/> Y <input checked="" type="checkbox"/> N |
| Is the project part of a larger common plan of development (phased project)?   | <input type="checkbox"/> Y <input checked="" type="checkbox"/> N |
| EXISTING SITE CHARACTERISTICS  |  |
| Total area of <u>existing</u> Impervious Surfaces within the project limits (SF)   | 0  |
| Is the project located within any MSHCP Criteria Cell?   | <input type="checkbox"/> Y <input checked="" type="checkbox"/> N |
| If so, identify the Cell number:   |  |
| Are there any natural hydrologic features on the project site?   | <input type="checkbox"/> Y <input checked="" type="checkbox"/> N |
| Is a Geotechnical Report attached?   | <input checked="" type="checkbox"/> Y <input type="checkbox"/> 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?  | 0.66   |
| <p>The project site is located in the City of Moreno Valley approximately 5.18 miles east of I-215 and north of Iris Ave. The proposed 1.58-acre development consists of a Commercial Development and a Infiltration Basin. The site is bound by Iris Ave to the south, by a vacant lot to the west and north, and Oliver St to the east. The existing site is a undeveloped vacant lot. The existing site is sloped moderately with about a 4.4% slope from southeast to northwest. The highest point is along the southern property line closest to the southeast corner. The existing low point is along the northern property line, close to the northwest corner, and drains northwest. Proposed storm drain laterals will collect water from the landscape swale. Proposed storm drain lines will run along the drive aisles and drain northwest toward the proposed underground chambers.</p> |  |

### A.1 Maps and Site Plans

A map of the local vicinity and existing site, including all grading, drainage, and landscaping is located in Appendix 2.

## A.2 Identify Receiving Waters

A map of the receiving waters is included in Appendix 1.

**Table A.1** Identification of Receiving Waters

| Receiving Waters   | EPA Approved 303(d) List Impairments                        | Designated Beneficial Uses            | Proximity to RARE Beneficial Use    |
|--|---|---------------------------------------|-------------------------------------|
| Line F Storm Drain   | None  | None                                  | Not a water body classified as rare |
| Kitching Street Channel Line N                               | None  | None                                  | Not a water body classified as rare |
| Perris Valley Storm Drain (Channel)                          | None  | None                                  | Not a water body classified as rare |
| San Jacinto River (Reach 3) (HU#802.11)                      | None  | AGR, GWR, REC1, REC2, WARM, WILD      | Not a water body classified as rare |
| San Jacinto River (Reach 2), Canyon Lake (HU#802.11, 802.12) | Nutrients   | MUN, AGR, GWR, REC1, REC2, WARM, WILD | Not a water body classified as rare |
| San Jacinto River (Reach 1), (HU#802.31, 802.32)             | None  | AGR, GWR, MUN, REC1, REC2, WARM, WILD | Not a water body classified as rare |
| Lake Elsinore (HU#820.31)                                    | PCBs, Nutrients, Organic Enrichment (Low DO), DDT, Toxicity | REC1, REC2, WARM, WILD                | Not a water body classified as rare |

## 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                     | <input type="checkbox"/> Y            | <input checked="" type="checkbox"/> N |
| State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert. | <input type="checkbox"/> Y            | <input checked="" type="checkbox"/> N |
| US Army Corps of Engineers, CWA Section 404 Permit   | <input type="checkbox"/> Y            | <input checked="" type="checkbox"/> N |
| US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion                  | <input type="checkbox"/> Y            | <input checked="" type="checkbox"/> N |
| Statewide Construction General Permit Coverage   | <input checked="" type="checkbox"/> Y | <input type="checkbox"/> N            |
| Statewide Industrial General Permit Coverage   | <input type="checkbox"/> Y            | <input checked="" type="checkbox"/> N |
| Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)                            | <input type="checkbox"/> Y            | <input checked="" type="checkbox"/> N |
| Other (please list in the space below as required)<br>CITY GRADING PERMIT                  | <input checked="" type="checkbox"/> Y | <input type="checkbox"/> 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.

## Section B: Optimize Site Utilization (LID Principles)

### Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

*The site mimics the existing topography draining from southeast to northwest.*

Did you identify and protect existing vegetation? If so, how? If not, why?

*Site existing vegetation consist of loose dirt. The planting of new vegetation will occur through the site to enhance vegetation.*

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

*The site does not have a particular area with an existing high infiltration capacity, but infiltration is proposed to occur in the landscaped areas that surround the central building and parking lot.*

Did you identify and minimize impervious area? If so, how? If not, why?

*Impervious area has been minimized as much as possible given the other design constraints of the project.*

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

*Yes, runoff will be directed to the proposed BMP location.*

## Section C: Delineate Drainage Management Areas (DMAs)

**Table C.1 DMA Classifications**

| DMA Name or ID | Surface Type(s) <sup>1</sup> | Area (Sq. Ft.) | DMA Type |
|----------------|------------------------------|----------------|----------|
| DMA 1          | Mixed Surface                | 67,425         | D        |
| DMA 2          | Concrete                     | 4,173          | D        |
| DMA 3          | Concrete                     | 1,644          | D        |

<sup>1</sup>Reference Table 2-1 in the WQMP Guidance Document to populate this column

**Table C.2 Type 'A', Self-Treating Areas**

| DMA Name or ID | Area (Sq. Ft.) | Stabilization Type | Irrigation Type (if any) |
|----------------|----------------|--------------------|--------------------------|
| N/A            | N/A            | N/A                | N/A                      |
| N/A            | N/A            | N/A                | N/A                      |
| N/A            | N/A            | N/A                | N/A                      |
| N/A            | N/A            | N/A                | 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                 | N/A                       | N/A                | N/A                  | N/A  | N/A                  | N/A                               |
| N/A                 | N/A                       | N/A                | N/A                  | N/A  | N/A                  | N/A                               |
| N/A                 | N/A                       | N/A                | N/A                  | N/A  | N/A                  | 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 | DMA name /ID                 | Area (square feet) | Ratio |
|              | [A]                |                           | [B]                 |         |                              | [C] = [A] x [B]    |       |
| N/A          | N/A                | N/A                       | N/A                 | N/A     | N/A                          | N/A                | N/A   |
| N/A          | N/A                | N/A                       | N/A                 | N/A     | N/A                          | N/A                | N/A   |
| N/A          | N/A                | N/A                       | N/A                 | N/A     | N/A                          | N/A                | N/A   |
| N/A          | N/A                | N/A                       | N/A                 | N/A     | N/A                          | N/A                | N/A   |

**Table C.5** Type 'D', Areas Draining to BMPs

| DMA Name or ID | BMP Name or ID                    |
|----------------|-----------------------------------|
| DMA 1          | Underground Infiltration Chambers |
| DMA 2          | None                              |
| DMA 3          | Vegetated Swale                   |
|                |                                   |
|                |                                   |

*Note:* More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

*Note for DMA 2:* DMA 2 is a variance from significant threshold of 5% due to public right of way constraints.

## 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; proceed to Section D.3

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 Copermitttee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permitttee, 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: DMA 1   |     |    |
| ...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.

$$2,311 \text{ CF} / 0.046 \text{ CFS} = 56,478 \text{ (sec)} = 14 \text{ (hours)} < 72 \text{ hours}$$

The flow rate of 0.046 CFS is calculated by converting our site infiltration rate of 0.51 in/hr at P-3 (Geotech report) to ft/s, then multiply that by the underground chamber bottom area of 3,900 SF. Although our in-situ infiltration rate is under the recommended rate of 1.6 in/hr, we overcompensate by sizing the chambers accordingly to accommodate the low infiltration rate. The runoff will be able to infiltrate into the ground in less than 72 hours.



## 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: 14,950 SF*

*Type of Landscaping (Conservation Design or Active Turf): Active Turf*

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: 52,475 SF*

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: 0.66*

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: 36,633 SF*

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).

| <b>Minimum required irrigated area (Step 4)</b> | <b>Available Irrigated Landscape (Step 1)</b> |
|---|---|
| 36,633 SF                                       | 14,950 SF                                     |

## 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: 20*

*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: 1.27 acres*

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-2 in Chapter 2 to determine the minimum number of toilet users per tributary impervious acre (TUTIA).

*Enter your TUTIA factor: 143*

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: 200*

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).

| <b>Minimum required Toilet Users (Step 4)</b> | <b>Projected number of toilet users (Step 1)</b> |
|---|--|
| 200   | 20   |

## 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*

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-4 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

*Enter the factor from Table 2-4: N/A*

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 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 projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

| <b>Minimum required non-potable use (Step 4)</b> | <b>Projected average daily use (Step 1)</b> |
|--|---|
| 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 per Section 3.4.2 of the WQMP Guidance Document.

### **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.

## 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                     |                                     |
| DMA 1       | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| DMA 2       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| DMA 3       | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
|             | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
|             | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
|             | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |

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.

Per the percolation test, the design infiltration rate is less than 1.6 in/hr, the rate recommended by the TGD.

For DMA 2, due to the proximity of the proposed driveway on Iris Avenue to the right of way, a BMP treatment is not feasible. A Bioretention facility is proposed on Oliver Street to meet post-construction BMP requirements to the maximum extent possible.

## 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 |   |                                       |
|--------------|----------------------------|---------------------------|--------------------------------------|-------------------|---------------------------|----------------------------------|---|---------------------------------------|
| p            | [A]                        |                           | [B]                                  | [C]               | [A] x [C]                 |                                  |   |                                       |
| <b>DMA 1</b> | 67,425                     | Mixed                     | 0.78                                 | 0.58              | 38,859                    | Design Storm Depth (in)          | Design Capture Volume, $V_{BMP}$ (cubic feet) | Proposed Volume on Plans (cubic feet) |
|              | $A_T = \Sigma[A] = 67,425$ |                           |                                      |                   | $\Sigma = [D] = 38,859$   | $[E] = 0.66$                     | $[F] = \frac{[D] \times [E]}{12} = 2137$      | $[G] = 15,791$                        |

| 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]                 |                                  |   |                                       |
| <b>DMA 2</b> | 4,173                     | Concrete                  | 1.0                                  | 0.89              | 3,722                     | Design Storm Depth (in)          | Design Capture Volume, $V_{BMP}$ (cubic feet) | Proposed Volume on Plans (cubic feet) |
|              | $A_T = \Sigma[A] = 4,173$ |                           |                                      |                   | $\Sigma = [D] = 3,722$    | $[E] = 0.66$                     | $[F] = \frac{[D] \times [E]}{12} = 205$       | $[G] = N/A$                           |

| DMA Type/ID  | DMA Area (square feet)              | Post-Project Surface Type | Effective Impervious Fraction, I <sub>f</sub> | DMA Runoff Factor | DMA Areas x Runoff Factor | Enter BMP Name / Identifier Here |  |                                       |
|--------------|-------------------------------------|---------------------------|---|-------------------|---------------------------|----------------------------------|--|---------------------------------------|
|              | [A]                                 |                           | [B]   | [C]               | [A] x [C]                 |                                  |  |                                       |
| <b>DMA 3</b> | 1,644                               | Mixed Surfaces            | 0.54  | 0.37              | 601                       | Design Storm Depth (in)          | Design Capture Volume, V <sub>BMP</sub> (cubic feet) | Proposed Volume on Plans (cubic feet) |
|              | A <sub>T</sub> =<br>Σ[A] =<br>1,644 |                           |   |                   | Σ = [D] =<br>601          | [E] =<br>0.66                    | [F] = $\frac{[D] \times [E]}{12} = 33$               | [G] = N/A                             |

[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;

## 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.

## 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             |
| <input type="checkbox"/> Detached Residential Development                                | P                            | N                        | P                        | P                        | N                        | P                        | P                        | P                        |
| <input type="checkbox"/> Attached Residential Development                                | P                            | N                        | P                        | P                        | N                        | P                        | P                        | P <sup>(2)</sup>         |
| <input type="checkbox"/> Commercial/Industrial Development                               | P <sup>(3)</sup>             | P                        | P <sup>(1)</sup>         | P <sup>(1)</sup>         | P <sup>(5)</sup>         | P <sup>(1)</sup>         | P                        | P                        |
| <input type="checkbox"/> Automotive Repair Shops   | N                            | P                        | N                        | N                        | P <sup>(4, 5)</sup>      | N                        | P                        | P                        |
| <input type="checkbox"/> Restaurants (>5,000 ft <sup>2</sup> )                           | P                            | N                        | N                        | N                        | N                        | N                        | P                        | P                        |
| <input type="checkbox"/> Hillside Development (>5,000 ft <sup>2</sup> )                  | P                            | N                        | P                        | P                        | N                        | P                        | P                        | P                        |
| <input type="checkbox"/> Parking Lots (>5,000 ft <sup>2</sup> )                          | P <sup>(6)</sup>             | P                        | P <sup>(1)</sup>         | P <sup>(1)</sup>         | P <sup>(4)</sup>         | P <sup>(1)</sup>         | P                        | P                        |
| <input type="checkbox"/> Retail Gasoline Outlets   | N                            | P                        | N                        | N                        | P                        | N                        | P                        | P                        |
| <b>Project Priority Pollutant(s) of Concern</b>  | <input type="checkbox"/>     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

*P = Potential*

*N = Not Potential*

<sup>(1)</sup> A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

<sup>(2)</sup> A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

<sup>(3)</sup> A potential Pollutant is land use involving animal waste

<sup>(4)</sup> Specifically petroleum hydrocarbons

<sup>(5)</sup> Specifically solvents

<sup>(6)</sup> Bacterial indicators are routinely detected in pavement runoff

## E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

| Qualifying Project Categories        | Credit Percentage <sup>2</sup> |
|--------------------------------------|--------------------------------|
| N/A                                  |                                |
| Total Credit Percentage <sup>1</sup> |                                |

<sup>1</sup>Cannot Exceed 50%

<sup>2</sup>Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

## E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

| DMA Type/ID | DMA Area (square feet) | Post-Project Surface Type | Effective Impervious Fraction, I <sub>f</sub> | DMA Runoff Factor | DMA Area x Runoff Factor | Enter BMP Name / Identifier Here |   |                                      |  |
|-------------|------------------------|---------------------------|---|-------------------|--------------------------|----------------------------------|---|--------------------------------------|--|
|             | [A]                    |                           | [B]   | [C]               | [A] x [C]                |                                  |   |                                      |  |
| N/A         | N/A                    | N/A                       | N/A   | N/A               | N/A                      | Design Storm Depth (in)          | Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs) | Total Storm Water Credit % Reduction | Proposed Volume or Flow on Plans (cubic feet or cfs) |
| N/A         | N/A                    | N/A                       | N/A   | N/A               | N/A                      |                                  |   |                                      |  |
| N/A         | N/A                    | N/A                       | N/A   | N/A               | N/A                      |                                  |   |                                      |  |
| N/A         | N/A                    | N/A                       | N/A   | N/A               | N/A                      |                                  |   |                                      |  |
| N/A         | N/A                    | N/A                       | N/A   | N/A               | N/A                      |                                  |   |                                      |  |
| N/A         | N/A                    | N/A                       | N/A   | N/A               | N/A                      |                                  |   |                                      |  |
|             | $A_T = \sum[A]$        |                           |   |                   | $\Sigma = [D]$           | [E]                              | $[F] = \frac{[D] \times [E]}{[G]}$                                    | $[F] \times (1 - [H])$               | [I]  |

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document

[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document

[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12

[H] is from the Total Credit Percentage as Calculated from Table E.2 above

[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6



## 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.4 Treatment Control BMP Selection**

| Selected Treatment Control BMP Name or ID <sup>1</sup> | Priority Pollutant(s) of Concern to Mitigate <sup>2</sup> | Removal Percentage <sup>3</sup> | Efficiency |
|--|---|---------------------------------|------------|
|  |   |                                 |            |
|  |   |                                 |            |
|  |   |                                 |            |

<sup>1</sup> 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.

<sup>2</sup> Cross Reference Table E.1 above to populate this column.

<sup>3</sup> As documented in a Co-Permittee Approved Study and provided in Appendix 6.

# 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 Copermitttee 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<sup>1</sup> 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 |
| <b>Time of Concentration</b> | N/A              | N/A            | N/A          |
| <b>Volume (Cubic Feet)</b>   | N/A              | N/A            | N/A          |

<sup>1</sup> 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.

**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:

Canyon Lake, Lake Elsinore

## 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.

## 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.

**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 storm drain catch basins and grated inlets. Locations are shown on the WQMP Exhibit in Appendix 1. | On-site storm drain signage will utilize language “No Dumping Drains to River”, or equally approved text that is consistent with City of Moreno Valley’s requirements. Landscape area drains surrounded by vegetation will no be signed. 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 repoint or replace inlet markings.<br><br>Provide stormwater pollution prevention information to new site owners, lessees, or operators. |

|                                   |  |   |
|-----------------------------------|--|---|
| Indoor and outdoor - Pest control | Note Building design features that discourage entry of pests.  | Provide integrated pest management information to owners, lessees   |
| Landscape/Outdoor Pesticide Use   | <p>The final landscape shall be designed to accomplish all the following:</p> <p>Design landscape 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.</p> <p>Where Landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.</p> <p>Consider using pest-resistant plants, especially adjacent to hardscape.</p> <p>To ensure successful establishments, select plants appropriate to site, soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.</p> <p>Pesticides should be used at an absolute minimum or not at all in the retention/infiltration basin. If used, it should not be applied close to the rainy season.</p> | <p>Maintain Landscaping using minimum or no pesticide.</p> <p>See applicable operational BMPs in “What you should know for... Landscape and Gardening” at <a href="http://rcflood.org/stormwater">http://rcflood.org/stormwater</a> and Appendix 10.</p> <p>Provide IPM information to new owners, lessees, and operators.</p> <p>Landscape maintenance should include mowing, weeding, trimming, removal of trash and debris, repair of erosion, re-vegetation, and removal of cut and dead vegetation.</p> <p>Irrigation maintenance should include the repair of leaky or broken sprinkler heads the maintaining of timing apparatus accuracy, and the maintaining of shut off valves in good working order.</p> |
| Food Service                      | <p>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.</p> <p>On the drawing, show a note that these drains will be connected to a grease interceptor before.</p>  | See the brochure, “The food Service industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries: in Appendix 10.  |

|                                       |   |   |
|---------------------------------------|---|---|
| <p>Vehicle and Equipment Cleaning</p> | <p>Show on Drawings as appropriate:</p> <ol style="list-style-type: none"> <li>(1) Commercial/Industrial facilities having vehicle/equipment cleaning need 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.</li> <li>(2) 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 waste water reclamation system shall be installed.</li> </ol>   | <p>Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.</p> <p>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 <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a></p> |
| <p>Fuel Dispensing Areas</p>          | <p>Fueling areas 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.</p> <p>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.] The canopy [or cover] shall not drain onto the fueling area</p> |   |

|  |  |   |
|--|--|---|
| Fire Sprinkler Test Water  | Provide a means to drain fire sprinkler test water to the sanitary sewer.  | Provide a means to drain fire sprinkler test water to the sanitary sewer.   |
| <p>Miscellaneous Drain or Wash water or Other sources.</p> <p>Condensate drain lines:</p> <p>Rooftop equipment:</p> <p>Drainage sumps</p> <p>Roofing, gutters, and trim</p> <p>Other sources</p> | <p>Condensate drain lines may discharge to landscaped areas if flow is small enough that runoff will not occur.</p> <p>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.</p> <p>Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.</p> <p>Avoid roofing, gutters and trim made of copper or other unprotected metals that may leach into runoff.</p> <p>Include controls for other sources as specified by local reviewer.</p> |   |
| Plazas, sidewalks, and parking lots  | Spill kits are to be always kept on-site per SC-11   | 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) | BMP Location (Lat/Long)         |
|-----------------------------------|-----------------------------------|-----------------------------|---------------------------------|
| Underground Infiltration Chambers | UNDERGROUND INFILTRATION CHAMBERS |                             | 33°89'61.16"N<br>117°18'34.87"W |
|                                   |                                   |                             |                                 |
|                                   |                                   |                             |                                 |
|                                   |                                   |                             |                                 |
|                                   |                                   |                             |                                 |

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.



## 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. Geolocating 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:** Property owner, Anoop-Meenu Maheshwari, is the responsible party.

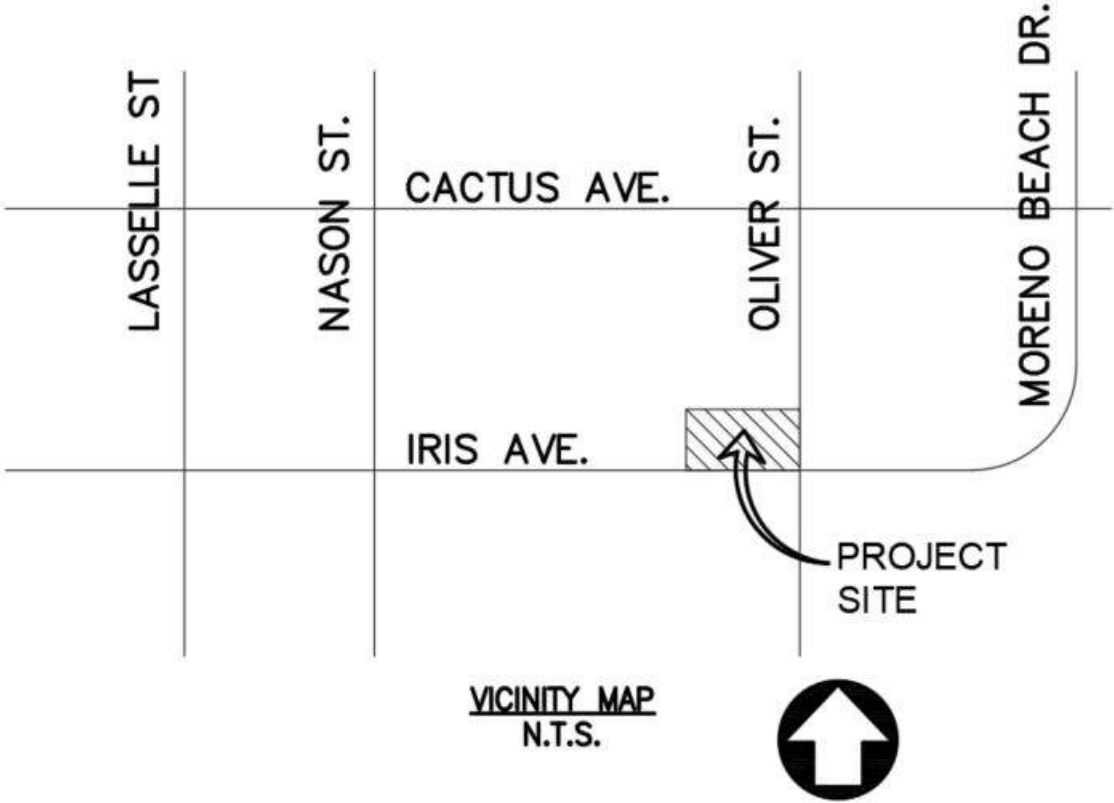
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

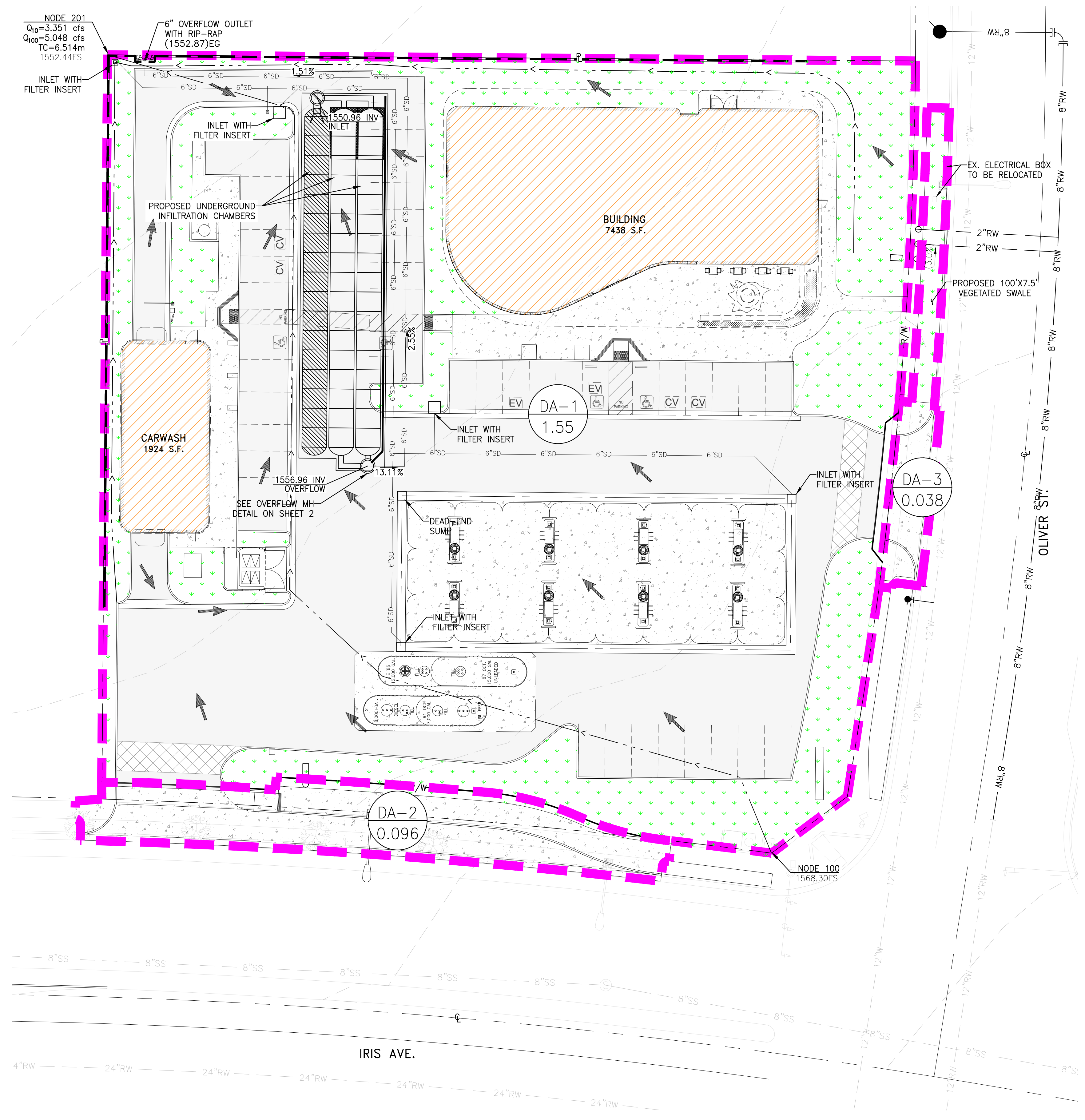
Y       N

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.

# Appendix 1: Maps and Site Plans

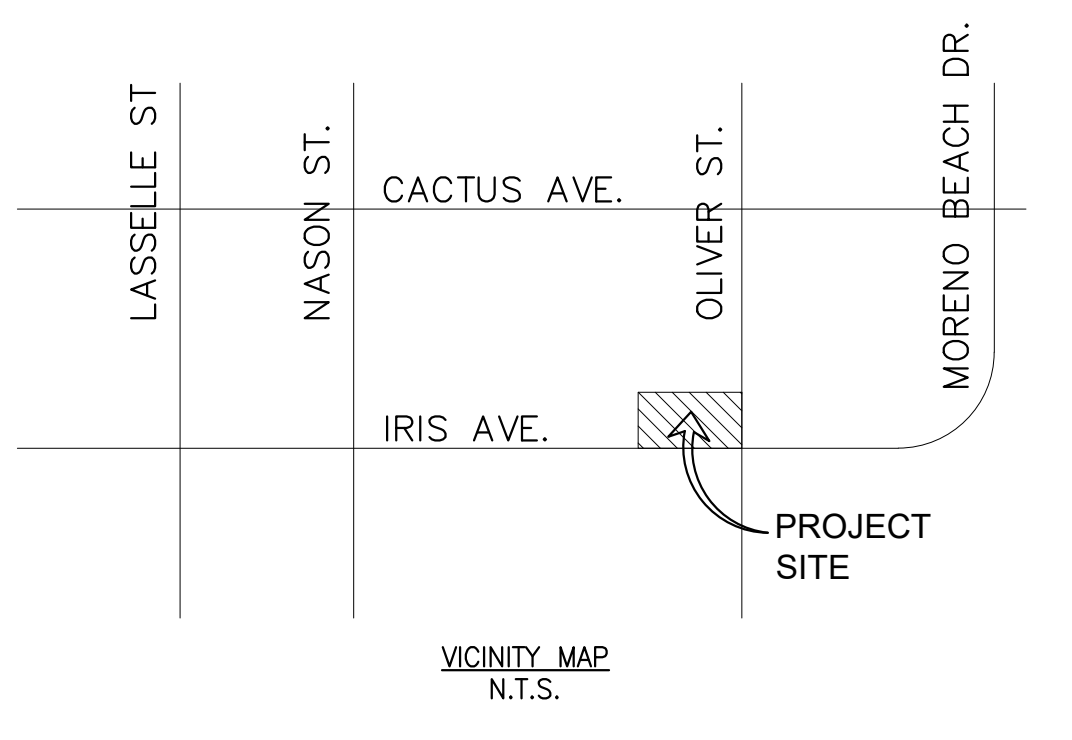
*Location Map, WQMP Site Plan and Receiving Waters Map*





**LEGEND**

- FLOW LINE
- FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- ⊘ # X.XX DRAINAGE AREA DESIGNATION
- ⊘ X.XX DRAINAGE AREA
- ▨ LANDSCAPE AREA
- ▨ ROOF
- ▨ CONCRETE
- ▨ ASPHALT



**PROJECT BMP RATIOS**

| NAME | AREA (SF) | LANDSCAPE AREA (SF) | RATIO (%) | IMPERVIOUS AREA RATIO (%) |
|------|-----------|---------------------|-----------|---------------------------|
| DA-1 | 67,425    | 14,950              | 22        | 52,475                    |
| DA-2 | 4,173     | 0                   | 0         | 4,173                     |
| DA-3 | 1,644     | 762                 | 46        | 882                       |

**PROJECT BMP CONFORMANCE ANALYSIS**

| NAME | AREA (SF) | i    | C    | V <sub>BMP</sub> | BMP                               | A <sub>PROVIDED</sub> | V <sub>PROVIDED</sub> |
|------|-----------|------|------|------------------|-----------------------------------|-----------------------|-----------------------|
| DA 1 | 67,425    | 0.82 | 0.62 | 2,311 CF         | UNDERGROUND INFILTRATION CHAMBERS | 3,900 SF              | 15,791 CF             |
| DA 2 | 4,173     | 1.00 | 0.89 | 205              | N/A                               | N/A                   | N/A                   |
| DA 3 | 1,644     | 0.54 | 0.37 | 33               | VEGETATED SWALE                   | 762 SF                | N/A                   |

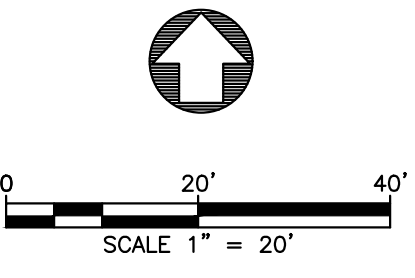
NOTE: DA-2 REQUESTED VARIANCE FROM THE SIGNIFICANT THRESHOLD OF 5% DUE TO PUBLIC RIGHT OF WAY CONSTRAINTS.

NOTE: ALL INLETS HAVE TRASH CAPTURE FILTERS

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

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2 Working Days Before You Dig  
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PEN22-0176

|                      |  |   |      |      |         |             |      |      |      |                                 |  |   |  |                            |
|----------------------|--|---|------|------|---------|-------------|------|------|------|---------------------------------|--|---|--|----------------------------|
| REVIEW BY CITY STAFF | BENCHMARK<br>THE BENCHMARK FOR THIS SURVEY IS CORS STATION "PPBF", ELEV = 1511.70' PER NGS DATA SHEET DH7168 DESIGNATED "PPBF ARD" | BASIS OF BEARING<br>THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF OLIVER STREET SHOWN AS N 00°25'52" E ON THIS MAP. ANS PARCEL MAP NO. 33361, PMB 239/30-32 AS N 00°26'04" E | MARK | DATE | INITIAL | DESCRIPTION | REC. | APPR | DATE | CITY OF MORENO VALLEY APPROVALS | ENGINEER OF RECORD'S SEAL<br>REGISTERED PROFESSIONAL CIVIL ENGINEER<br>ANGEL CESAR<br>No. 87222<br>STATE OF CALIFORNIA | <br>UNDER THE SUPERVISION OF:<br>ANGEL CESAR<br>RCE 87222 | CITY OF MORENO VALLEY<br>APN. 486-310-038<br>IRIS AVE AND OLIVER ST, MORENO VALLEY<br>WQMP EXHIBIT | SHEET 1 OF 3<br>CITY ID No |
|                      |  |   |      |      |         | REVISION    |      |      |      |                                 |  |   |  |                            |



**FGP-0002**

**DETAIL A**  
FILTER FRAME & MOUNTING BRACKET.  
EXPANSION BOLT.  
MOUNTING BRACKET & EXPANSION BOLTS  
SEE NOTE 2  
SCALE: 1X

**SECTION B-B**  
CURBED INLET FILTER ASSEMBLY.  
RUBBER GASKETS.  
CURB OPENING.  
CATCH BASIN.  
SCALE: 1X

**SECTION A-A**  
CURBED INLET FILTER ASSEMBLY.  
SEE DETAIL A  
CURB OPENING.  
FILTER LINER & SUPPORT BASKET.  
OUTLET.  
CATCH BASIN.  
SCALE: 1X

| MODEL NO. | Curb Opening Width -W- | Storage Capacity -Cu-F- | Filtered Flow Rate -Qm-FPS- | Bypass Flow Rate -Qm-FPS- |
|-----------|------------------------|-------------------------|-----------------------------|---------------------------|
| FGP-30C1  | 2.0' (24")             | .85                     | 338 / 7.5                   | 2,513 / 6.6               |
| FGP-30C2  | 2.5' (30")             | 1.20                    | 450 / 10.0                  | 3,008 / 8.7               |
| FGP-36C1  | 3.0' (36")             | 1.50                    | 563 / 12.5                  | 3,547 / 10.1              |
| FGP-36C2  | 3.5' (42")             | 1.80                    | 675 / 15.0                  | 3,951 / 11.0              |
| FGP-48C1  | 4.0' (48")             | 2.10                    | 788 / 17.5                  | 4,445 / 12.9              |
| FGP-48C2  | 5.0' (60")             | 2.40                    | 900 / 20.0                  | 5,208 / 15.6              |
| FGP-60C1  | 6.0' (72")             | 3.05                    | 1,126 / 25.1                | 6,196 / 18.8              |
| FGP-72C1  | 7.0' (84")             | 3.60                    | 1,380 / 30.0                | 7,139 / 20.9              |
| FGP-90C1  | 8.0' (96")             | 4.20                    | 1,576 / 35.1                | 8,062 / 23.8              |
| FGP-108C1 | 10.0' (120")           | 4.85                    | 1,800 / 40.0                | 9,333 / 27.1              |
| FGP-120C1 | 12.0' (144")           | 6.10                    | 2,252 / 50.2                | 11,764 / 33.2             |
| FGP-144C1 | 14.0' (168")           | 7.30                    | 2,700 / 60.2                | 13,515 / 38.1             |
| FGP-168C1 | 16.0' (192")           | 8.50                    | 3,152 / 70.2                | 15,449 / 43.4             |
| FGP-180C1 | 18.0' (216")           | 9.45                    | 3,480 / 77.8                | 17,152 / 48.2             |
| FGP-216C1 | 21.0' (252")           | 10.95                   | 4,050 / 90.2                | 19,891 / 56.3             |
| FGP-288C1 | 28.0' (336")           | 14.60                   | 5,400 / 120.3               | 26,311 / 75.6             |

**NOTES:**

- Filter insert shall have a high flow bypass feature.
- Filter support frame shall be constructed from stainless steel Type 304.
- Filter medium shall be Fossil Rock™, installed and maintained in accordance with manufacturer specifications.
- Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

**FloGard®**  
Catch Basin Insert Filter  
Curb Inlet Style

**Oldcastle®**  
Stormwater Solutions  
7121 Southpark Plaza, Suite 200 | Lithia, CA 91120 | PH: 800.579.8819 | oldcastlestormwater.com  
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DRAWING NO: FGP-0002 | DATE: JPR 5/18/15 | DATE: JPR 1/3/06 | SHEET 1 OF 1

**TOP VIEW**  
IF SIDEWALK IS TO BE CONSTRUCTED BEHIND THE CATCH BASIN, BARS SHALL BE EXTENDED 6" MIN INTO SIDEWALK.  
SIDEWALK IS TO BE POURED MONOLITHIC WITH THE TOP SLAB.  
22" DIA CLEAR OPENING, FRAME & COVER PER STD MVFE-300E  
2" END CLEARANCE  
INSTALL 2 EXTRA No 4 BARS AT 2' OC  
TC AND FL ELEVATIONS TO BE SHOWN ON PLANS  
EXPANSION JOINT  
3/4" Ø ROUND MILD STEEL BAR, BEND HOT & GALVANIZED  
LOCAL DEPRESSION LIMIT OF CATCH BASIN WORK  
EXPANSION JOINT  
PCC SIDEWALK WHERE PROPOSED  
INSTALL 2 EXTRA No 4 BARS AT 2' OC ON EACH SIDE  
NO 4 BARS AT 6" OC IN BOTH DIRECTIONS  
TC AND FL ELEVATIONS TO BE SHOWN ON PLANS  
FACE PLATE ANCHOR  
BACK OF CURB  
CURB LINE  
GUTTER  
EXPANSION JOINT  
STRAIGHT GRADE  
GRADE BREAK  
GRADE BREAK  
STRAIGHT GRADE  
LOCAL DEPRESSION  
LIMIT OF CATCH BASIN WORK  
EXPANSION JOINT  
PCC SIDEWALK WHERE PROPOSED  
BARS SHALL BE EXTENDED 6" MIN INTO SIDEWALK  
SEE STD MVFE-300C FOR OPENING DETAIL  
FOLLOW PAVEMENT CROSS SLOPE  
FOR T=6" FRONT OF BOX TO LINE UP WITH TOP OF CURB (SEE NOTE 2, STD MVFE-300B)  
STEPS (SEE DETAIL)  
7 1/2" MIN  
INVERT ELEV TO BE SHOWN ON PLANS  
1" PER 1' SLOPE  
PLAN VIEW  
FRONT ELEVATION  
SECTION B-B  
STEP DETAIL  
CONST JOINT  
12" MIN  
CB TOP SLAB  
No 4 BAR @ 12" OC  
DOWEL DETAIL  
SHALL BE USED WHEN SLAB IS CONSTRUCTED SEPARATELY  
NOT TO SCALE

**SECTION A-A**  
SCALE: 1X

**CITY OF MORENO VALLEY**  
PUBLIC WORKS DEPARTMENT - CAPITAL PROJECTS DIVISION  
STANDARD PLAN  
MVFE-300A-0  
SHEET 1 OF 6

APPROVED: [Signature] 1-6-17  
DATE: 1/6/17  
CITY ENGINEER

**CURB INLET DETAIL**  
NTS

**FGP-0001**

**DETAIL A**  
EXPLODED VIEW

GRATE  
"ULTIMATE" BYPASS FEATURES  
GASKET  
STAINLESS STEEL SUPPORT BASKET  
Fossil Rock™ ABSORBENT POUCHES  
LINER  
SUPPORT BASKET  
CATCH BASIN (FLAT GRATE STYLE)

**FloGard® FILTER**  
-INSTALLED INTO CATCH BASIN-

U.S. PATENT # 6,00,023 & 6,877,029

**FloGard®**  
Catch Basin Insert Filter  
Grated Inlet Style

**Oldcastle®**  
Stormwater Solutions  
7121 Southpark Plaza, Suite 200 | Lithia, CA 91120 | PH: 800.579.8819 | oldcastlestormwater.com  
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DRAWING NO: FGP-0001 | DATE: JPR 7/13/16 | DATE: JPR 11/3/06 | SHEET 1 OF 2

**NOTES:**

- Filter insert shall have a high flow bypass feature.
- Filter support frame shall be constructed from stainless steel Type 304.
- Filter medium shall be Fossil Rock™, installed and maintained in accordance with manufacturer specifications.
- Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

**INSERT FILTER FOR GRATE INLET DETAIL**  
NTS

**DROP INLET**  
24"x24" I.D.  
(NOMINAL DIMENSIONS)  
WITH FRAME AND GRATE

GALVANIZED GRATE  
GALVANIZED FRAME CAST INTO RISER  
1'-0" TO 5'-0"  
CUSTOM HEIGHTS  
24" x 24" I.D.  
6"  
CUSTOM PIPE OPENINGS AVAILABLE  
1'-6" TO 5'-6"

FOR COMPLETE DESIGN AND PRODUCT INFORMATION CONTACT JENSEN PRECAST.

2/1/08  
D12424\_2424FG\_FF\_A.dwg  
© 2008 Jensen Precast

JENSEN PRECAST

**GRATE INLET DETAIL**  
NTS

**VEGETATED SWALE DETAIL**  
NTS

R/W 6'  
EX. SIDEWALK  
PR. 6" CURB  
(2%)  
PR. 6" WIDE X 4" HIGH CURB OPENING FOR DRAINAGE EVERY 30' O.C.  
2% SLOPE  
PR. 6" WIDE X 4" HIGH CURB OPENING FOR DRAINAGE EVERY 30' O.C.  
PR. SWALE FLOWLINE  
EX. PAVEMENT  
EX. C&G  
VARIES  
VARIES  
CL

**STORM DRAIN CHAMBER OVERFLOW MANHOLE DETAIL**  
NTS

COVER PIPE CONNECTION TO END CAP WITH ADS GEOSYNTHETICS 6011 NON-WOVEN GEOTEXTILE  
OUTLET PIPE  
1559.21 RIM  
1556.96 INV  
MANHOLE  
INLET PIPE  
1550.96 INV  
SUMP DEPTH TBD BY SITE DESIGN ENGINEER (24" [600 mm] MIN RECOMMENDED)  
PERFORATED UNDERDRAIN  
BOTTOM GRAVEL LAYER

**STORM DRAIN CHAMBER OVERFLOW MANHOLE DETAIL**  
NTS

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

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2 Working Days Before You Dig  
WWW.CALL811.COM

|                      |  |   |      |      |         |             |      |      |      |                                 |   |   |  |  |
|----------------------|--|---|------|------|---------|-------------|------|------|------|---------------------------------|---|---|--|--|
| REVIEW BY CITY STAFF | BENCHMARK<br>THE BENCHMARK FOR THIS SURVEY IS CORS STATION "PPBF", ELEV = 1511.70' PER NGS DATA SHEET DH7168 DESIGNATED "PPBF ARD" | BASIS OF BEARING<br>THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF OLIVER STREET SHOWN AS N 00°25'52" E ON THIS MAP. ANS PARCEL MAP NO. 33361, PMB 239/30-32 AS N 00°26'04" E | MARK | DATE | INITIAL | DESCRIPTION | REC. | APPR | DATE | CITY OF MORENO VALLEY APPROVALS | ENGINEER OF RECORD'S SEAL<br>REGISTERED PROFESSIONAL CIVIL ENGINEER<br>No. 87222<br>STATE OF CALIFORNIA | BLUE Engineering & Consulting, Inc<br>UNDER THE SUPERVISION OF:<br>ANGEL CESAR<br>RCE 87222 | CITY OF MORENO VALLEY<br>APN. 486-310-038<br>IRIS AVE AND OLIVER ST, MORENO VALLEY<br>WQMP EXHIBIT DETAILS | PEN22-0176<br>SHEET 2 OF 3<br>CITY ID No |
|----------------------|--|---|------|------|---------|-------------|------|------|------|---------------------------------|---|---|--|--|

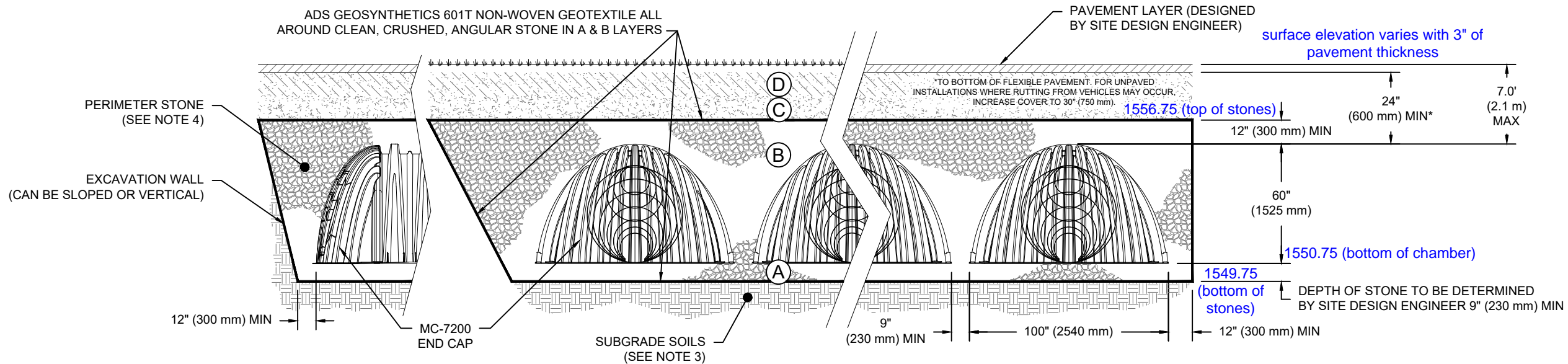


## ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

| MATERIAL LOCATION |  | DESCRIPTION  | AASHTO MATERIAL CLASSIFICATIONS   | COMPACTION / DENSITY REQUIREMENT  |
|-------------------|--|--|---|---|
| D                 | <b>FINAL FILL:</b> FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER  | ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.  | N/A   | PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.   |
| C                 | <b>INITIAL FILL:</b> FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER. | GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE.<br><br>MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER. | AASHTO M145 <sup>1</sup><br>A-1, A-2-4, A-3<br><br>OR<br><br>AASHTO M43 <sup>1</sup><br>3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10 | BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. |
| B                 | <b>EMBEDMENT STONE:</b> FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.  | CLEAN, CRUSHED, ANGULAR STONE  | AASHTO M43 <sup>1</sup><br>3, 4   | NO COMPACTION REQUIRED.   |
| A                 | <b>FOUNDATION STONE:</b> FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.   | CLEAN, CRUSHED, ANGULAR STONE  | AASHTO M43 <sup>1</sup><br>3, 4   | PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. <sup>2,3</sup>   |

**PLEASE NOTE:**

- THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
- STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
- WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
- ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



**NOTES:**

- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
- MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
- PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
  - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
  - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
  - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

178 IRIS

MORENO VALLEY, CA

DRAWN: TT

CHECKED: N/A

DATE:

PROJECT #:

DESCRIPTION

CHK

DRW

DATE

888-892-2694 | WWW.STORMTECH.COM

**StormTech®**  
Chamber System

4640 TRUEMAN BLVD  
HILLIARD, OH 43026  
1-800-733-7473




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# Receiving Map

## Legend

 Iris Ave & Oliver St



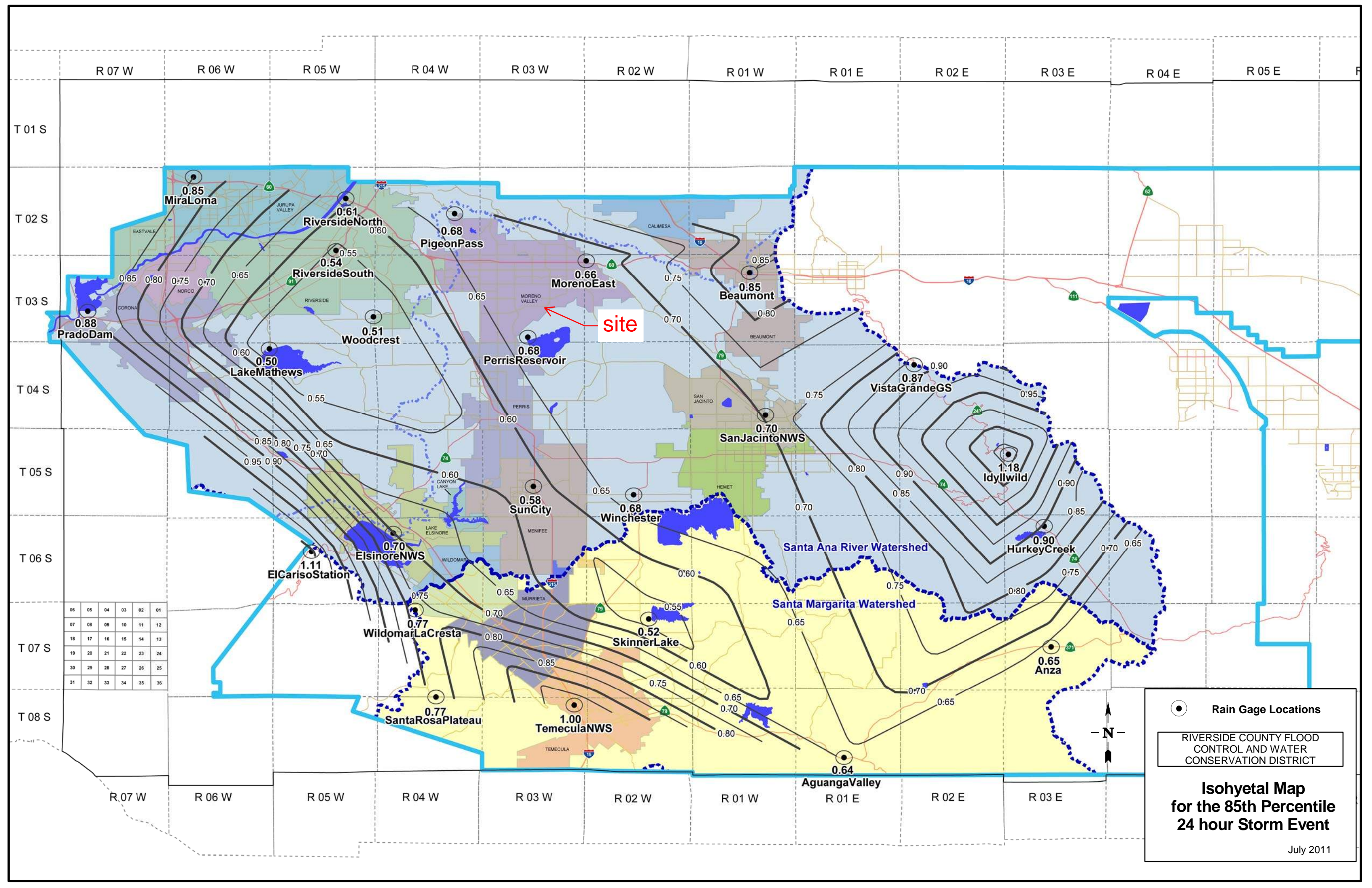
Google Earth

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10 mi





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| 19 | 20 | 21 | 22 | 23 | 24 |
| 30 | 29 | 28 | 27 | 26 | 25 |
| 31 | 32 | 33 | 34 | 35 | 36 |

● Rain Gage Locations  
 RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT  
**Isohyetal Map for the 85th Percentile 24 hour Storm Event**  
 July 2011



# Appendix 2: Construction Plans

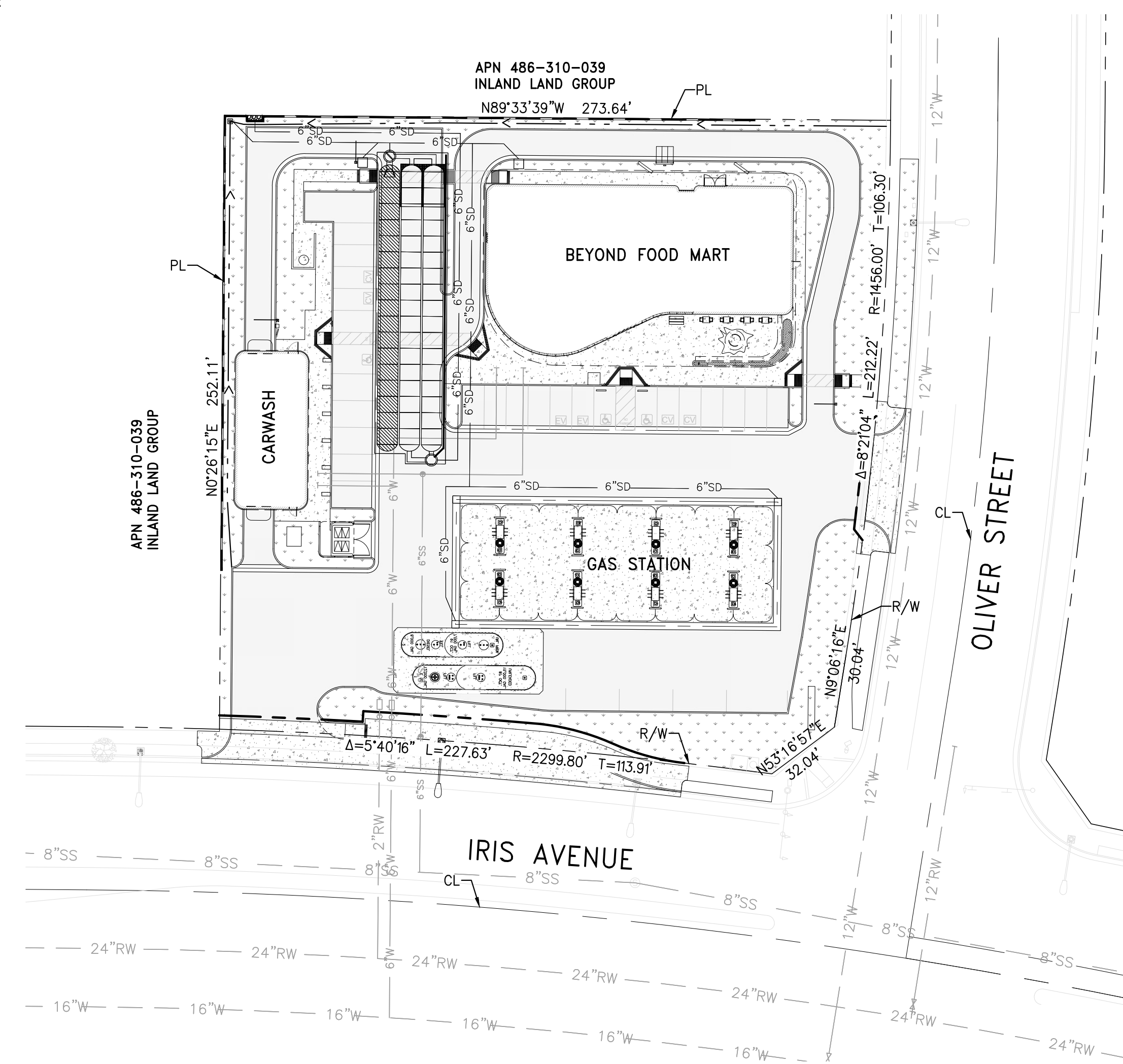
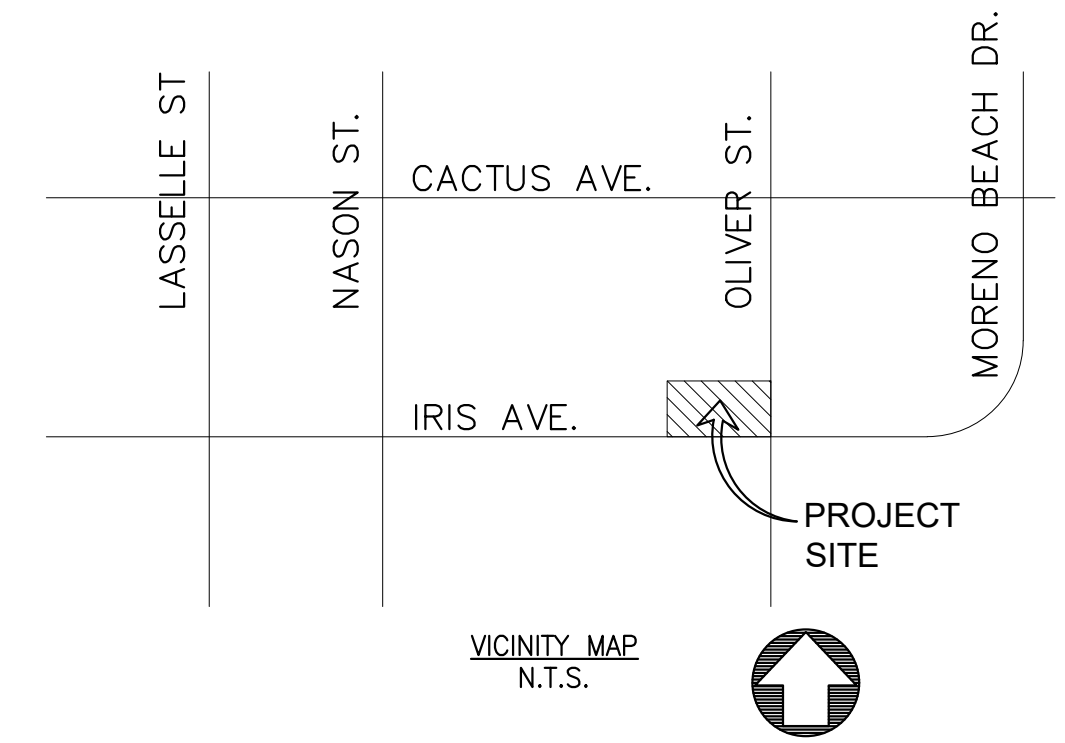
*Grading and Drainage Plans*



**GRADING NOTES**

- ALL GRADING SHALL CONFORM TO THE LATEST CALIFORNIA BUILDING CODE (CBC) CHAPTERS 17, 18, APPENDIX-J AND ALL APPLICABLE SECTIONS.
- A GRADING PERMIT SHALL BE OBTAINED PRIOR TO COMMENCEMENT OF ANY WORK ON THE SITE.
- ISSUANCE OF A GRADING PERMIT DOES NOT ELIMINATE THE NEED FOR PERMITS FROM OTHER REGULATORY AGENCIES WITH REGULATORY RESPONSIBILITIES FOR CONSTRUCTION ACTIVITIES ASSOCIATED WITH THE WORK AUTHORIZED IN THIS PLAN.
- ALL WORK UNDER THIS PERMIT SHALL BE LIMITED TO WORK WITHIN THE PROPERTY LINES. A SEPARATE CONSTRUCTION, EXCAVATION OR ENCROACHMENT PERMIT FROM THE DEPARTMENT OF PUBLIC WORKS MAY BE REQUIRED FOR ANY WORK WITHIN THE COUNTY RIGHT-OF-WAY.
- APPROVAL OF THESE PLANS DOES NOT AUTHORIZE ANY WORK OR GRADING TO BE PERFORMED UNTIL THE EFFECTIVE PROPERTY OWNER'S PERMISSION HAS BEEN OBTAINED AND VALID GRADING PERMIT HAS BEEN ISSUED.
- THIS PLAN IS FOR GRADING PURPOSES ONLY AND IS NOT TO BE USED FOR THE PURPOSE OF CONSTRUCTING ONSITE OR OFFSITE IMPROVEMENTS. ISSUANCE OF A PERMIT BASED ON THIS PLAN DOES NOT CONSTITUTE APPROVAL OF DRIVEWAY LOCATIONS OR SIZES, PARKING LOT STRUCTURAL SECTIONS OR LAYOUT, ADA-RELATED REQUIREMENTS, BUILDING LOCATIONS OR FOUNDATIONS, WALLS, CURBING, OFFSITE DRAINAGE FACILITIES OR OTHER ITEMS NOT RELATED DIRECTLY TO THE BASIC GRADING OPERATION. ONSITE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE TO THE APPROVED BUILDING PERMIT PLANS. OFFSITE IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE TO PLANS APPROVED FOR THIS PURPOSE BY THE PUBLIC WORKS DEPARTMENT.
- MAXIMUM CUT AND FILL SLOPE = 2:1 (HORIZONTAL TO VERTICAL) AND MAXIMUM VERTICAL HEIGHT = 30 FEET, UNLESS AN APPROVED GEOTECHNICAL REPORT CAN JUSTIFY A STEEPER AND TALLER SLOPE.
- NO FILL SHALL BE PLACED ON EXISTING GROUND UNTIL THE GROUND HAS BEEN CLEARED OF WEEDS, DEBRIS, TOPSOIL AND OTHER DELETERIOUS MATERIAL.
- FILL SLOPES SHALL NOT HAVE LESS THAN 90% RELATIVE COMPACTION, OR AS RECOMMENDED ON THE APPROVED GEOTECHNICAL REPORT.
- IT IS THE GRADING CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ADEQUATE COMPACTION HAS BEEN ATTAINED ON THE ENTIRE GRADING SITE, INCLUDING FILL AREAS OUTSIDE THE BUILDING PADS AND ON ALL FILL SLOPES.
- UNLESS OTHERWISE RECOMMENDED IN AN APPROVED GEOTECHNICAL REPORT, OVER-EXCAVATION SHALL BE AT LEAST 24 INCHES MINIMUM BELOW THE BOTTOM OF FOOTINGS OR TO COMPETENT NATIVE SOIL OR BEDROCK MATERIALS, WHICHEVER IS DEEPER, AS APPROVED BY THE PROJECTS GEOTECHNICAL ENGINEER OR GEOLOGIST.
- EARTHWORK VOLUMES:  
CUT 1,008 (CY), FILL 3,662 (CY), TOTAL DISTURBED AREA 4,670 (SF)
- EARTHWORK QUANTITIES ARE SHOWN FOR GRADING PERMIT PURPOSES ONLY, AND SAN BERNARDINO COUNTY IS NOT RESPONSIBLE FOR THEIR ACCURACY.  
385 N. ARROWHEAD AVENUE, FIRST FLOOR, SAN BERNARDINO, CA 92415 | PHONE: 909.387.8311 FAX: 909.387.3223 LAND USE SERVICES DEPARTMENT LAND DEVELOPMENT
- A COPY OF THE GRADING PERMIT AND APPROVED GRADING PLANS MUST BE IN THE POSSESSION OF A RESPONSIBLE PERSON AND AVAILABLE AT THE SITE AT ALL TIMES.
- ANY ONSITE RETAINING WALLS SHOWN ON THE GRADING PLANS THAT ARE OVER 4' IN HEIGHT, MEASURED FROM TOP OF WALL TO BOTTOM OF FOOTING, ARE FOR REFERENCE ONLY. RETAINING WALLS OVER 4' IN HEIGHT ARE NOT CHECKED, PERMITTED, OR INSPECTED PER THE GRADING PERMIT. A SEPARATE RETAINING WALL PERMIT IS REQUIRED FOR ALL RETAINING WALLS OVER 4' IN HEIGHT.
- ANY WALLS, FENCES, STRUCTURES AND/OR APPURTENANCES ADJACENT TO THIS PROJECT ARE TO BE PROTECTED IN PLACE. IF GRADING OPERATIONS DAMAGE OR ADVERSELY AFFECT SAID ITEMS IN ANY WAY, THE CONTRACTOR AND/OR DEVELOPER IS RESPONSIBLE FOR WORKING OUT AN ACCEPTABLE SOLUTION TO THE SATISFACTION OF THE AFFECTED PROPERTY OWNER(S).
- FOR SITES WITH PROTECTED SPECIES OR TREES, THE PROPOSED GRADING MAY BE SUBJECT TO A SEPARATE PERMIT.
- ADEQUATE FIRE ACCESS AROUND BUILDINGS (INCLUDING GARAGES) SHOULD BE PROVIDED AS APPROVED BY COUNTY FIRE.
- EXISTING DRAINAGE COURSES SHALL NOT BE OBSTRUCTED, ALTERED, OR DIVERTED WITHOUT PRIOR APPROVAL FROM THE COUNTY OF SAN BERNARDINO, LAND DEVELOPMENT DIVISION. A STREAMBED ALTERATION AGREEMENT MAY ALSO BE REQUIRED FROM THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE.
- DRAINAGE EASEMENTS SHALL NOT BE OBSTRUCTED, ALTERED OR DIVERTED WITHOUT PRIOR APPROVAL OF THE COUNTY OF SAN BERNARDINO, LAND DEVELOPMENT DIVISION.
- SETBACKS AND BUILDING LOCATIONS SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND MUST BE REVIEWED AND APPROVED UNDER A SEPARATE BUILDING PERMIT.
- UTILITY AND SEPTIC IMPROVEMENTS SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND MUST BE REVIEWED AND APPROVED UNDER A SEPARATE BUILDING PERMIT.
- ON PROJECTS DISTURBING ONE ACRE OR MORE, THE FOLLOWING NOTE MUST BE ADDED: A NOTICE OF INTENT (NOI) HAS BEEN, OR WILL BE FILED WITH THE STATE WATER RESOURCES CONTROL BOARD (SWRCB) AND A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) HAS BEEN OR WILL BE PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF CALIFORNIA GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY (PERMIT NO. CAS000002) FOR ALL OPERATIONS ASSOCIATED WITH THESE PLANS. THE PERMITTEE SHALL KEEP A COPY OF THE SWPPP ON SITE AND AVAILABLE FOR REVIEW BY COUNTY.
- IN CONJUNCTION WITH THE CALIFORNIA GENERAL PERMIT FOR PROPOSED DISTURBANCE OVER ONE ACRE, AN ACTIVE WASTEWATER DISCHARGE ID # (WQID) MUST BE INCLUDED ON THE FINAL GRADING PLAN.
- FOR ENGINEERED GRADING, A FINAL GRADING CERTIFICATION WILL BE COLLECTED BY THE BUILDING INSPECTOR AT THE FINAL BUILDING INSPECTION OR PRIOR A GRADING FINAL STATUS ON THE PERMIT. THE FINAL GRADING CERTIFICATION IS TO BE COMPLETED BY THE ENGINEER OF RECORD ON THE APPROVED GRADING PLANS.
- ALL FLOOD ZONE REQUIREMENTS MUST BE REFLECTED OR ACCOUNTED FOR ON THE GRADING PLANS. ELEVATIONS OR CONSTRUCTION NOTES MUST BE INCLUDED IN THE PLANS TO ENSURE COMPLIANCE WITH ALL APPLICABLE FIRST FLOOR ELEVATION REQUIREMENTS PER FEMA AND SAN BERNARDINO COUNTY DEVELOPMENT CODE GUIDELINES.
- FOR NONRESIDENTIAL PROJECTS, PROVIDE FOLLOWING NOTE ON PLANS:  
CALIFORNIA GREEN BUILDING STANDARDS CODE  
5.408.3 EXCAVATED SOIL AND LAND CLEARING DEBRIS.  
100 PERCENT OF TREES, STUMPS, ROCKS AND ASSOCIATED VEGETATION AND SOILS RESULTING PRIMARILY FROM LAND CLEARING SHALL BE REUSED OR RECYCLED. FOR A PHASED PROJECT, SUCH MATERIAL MAY BE STOCKPILED ON SITE UNTIL THE STORAGE SITE IS DEVELOPED.  
EXCEPTION: REUSE, EITHER ON-OR OFF-SITE, OF VEGETATION OR SOIL CONTAMINATED BY DISEASE OR PEST INFESTATION.

IN THE CITY OF MORENO VALLEY, IN RIVERSIDE COUNTY, STATE OF CALIFORNIA  
**BEYOND FOODS MART IRIS AVE AND OLIVER ST**  
 COMMERCIAL DEVELOPMENT  
 APN: 486-310-038



**INDEX MAP**  
SCALE 1" = 40'

**PROPERTY OWNER:**  
 RABH SATER  
 PARADISE LAKE, LLC  
 4300 EDISON AVE  
 CHINO, CA 91710  
 TEL: (909)465-4101  
 EMAIL: RABH@PEGASUSARC.COM

**CIVIL ENGINEER:**  
 ANGEL CESAR, P.E.  
 BLUE ENGINEERING AND CONSULTING, INC.  
 9320 BASELINE RD., STE. D  
 RANCHO CUCAMONGA, CA 91701  
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 EMAIL: PMAY@PHILMAYDESIGN.COM

**LAND SURVEYOR:**  
 RYAN JOHNSTON, P.L.S.  
 PRECISE SURVEYING & MAPPING  
 8816 FOOTHILL BLVD. #103-179  
 TEL: (626)344-9062  
 EMAIL: RJOHNSTON@PRECISE-SM.COM

**ARCHITECT:**  
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 PEGASUS ARCHITECT  
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 CHINO, CA 91710  
 TEL: (909)465-4101  
 EMAIL: CHAK@PEGASUSARC.COM

**UTILITY AND SERVICE PURVEYORS:**  
 POWER: SOUTHERN CALIFORNIA EDISON  
 GAS: THE GAS COMPANY  
 PHONE: FRONTIER  
 CABLE: FRONTIER  
 WATER: EASTERN MUNICIPAL WATER DISTRICT  
 SEWER: EASTERN MUNICIPAL WATER DISTRICT  
 SCHOOL DISTRICT: MORENO VALLEY UNITED SCHOOL DISTRICT

**SHEET INDEX**

- TITLE SHEET
- DETAILS & SECTIONS
- PRELIMINARY GRADING PLAN
- PRE HYDROLOGY EXHIBIT
- POST HYDROLOGY EXHIBIT

| EARTHWORK QUANTITIES | ABBREVIATIONS     |
|----------------------|-------------------|
| CUT 1,008 CY         | AC. ACRE          |
| FILL 3,662 CY        | CL. CENTER LINE   |
| NET<IMPORT> 2,654 CY | EX. EXISTING      |
|                      | FS FINISH SURFACE |
|                      | P. PROPERTY LINE  |
|                      | PR. PROPOSED      |

**LEGEND**

|  |   |
|--|---|
|  | EXISTING RIGHT OF WAY LINE/ PROPERTY LINE |
|  | PROPOSED RIGHT OF WAY LINE/ PROPERTY LINE |
|  | EXISTING LOT LINE                         |
|  | LIMITS OF GRADING/DAYLIGHT LINE           |
|  | CENTERLINE                                |
|  | EXISTING CONTOUR                          |
|  | PROPOSED CONTOUR                          |

**LEGAL DESCRIPTION:**

THE LAND IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:  
 PARCEL A:  
 PARCEL 1 OF PARCEL MAP NO. 33361, IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 239, PAGE 30 THROUGH 32 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDED & SAID COUNTY.  
 PARCEL B:

A NONEXCLUSIVE, PERMANENT SEWER AND ACCESS EASEMENT ON OVER AND ACROSS THAT CERTAIN PARCEL OF LAND SITUATED IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, BEING A PORTION OF LOT 7 AND LOT 8 IN BLOCK 151, OF BEAR VALLEY AND ALESSANDRO DEVELOPMENT CO. AS SHOWN BY MAP ON FILE IN BOOK 11 OF MAPS, PAGE 10, RECORDS OF SAN BERNARDINO COUNTY, CALIFORNIA, LYING WITHIN SECTION 22, TOWNSHIP 3 SOUTH, RANGE 3 WEST, S.B.M. MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 7, SAID POINT ALSO BEING THE INTERSECTION OF THE CENTERLINE OF FILAREE AVENUE AND THE WEST LINE OF LOT 7 AS SHOWN ON MAP REFERENCED ABOVE AND THE TRUE POINT OF BEGINNING;

THENCE SOUTH 89° 33' 36" EAST, 694.50 FEET ALONG THE SOUTH LINE OF SAID LOT 7, SAID SOUTH LINE ALSO BEING THE CENTERLINE OF SAID FILAREE AVENUE, TO A POINT THAT LIES ON THE SOUTH LINE OF SAID LOT 8, SAID POINT BEING DISTANT 34.00 FEET FROM THE SOUTHWEST CORNER OF SAID LOT 8;

THENCE NORTH 00° 26' 02" EAST, 10.00 FEET TO A POINT THAT LIES ON A LINE THAT IS PARALLEL WITH AND 10.00 FEET NORTH OF SAID SOUTH LINE OF SAID LOT 8;

THENCE NORTH 89°33'36" WEST, 694.50 FEET ALONG SAID PARALLEL LINE TO A POINT ON THE WEST LINE OF SAID LOT 7, SAID PARALLEL LINE IS ALSO PARALLEL WITH THE SOUTH LINE OF SAID LOT 7;

THENCE SOUTH 00° 19' 23" WEST, 10.00 FEET ALONG SAID WEST LINE OF LOT 7 TO TRUE POINT OF BEGINNING, RECORDED SEPTEMBER 30, 2014 AS INSTRUMENT NO. 2014-0371036, OF OFFICIAL RECORDS, IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA.

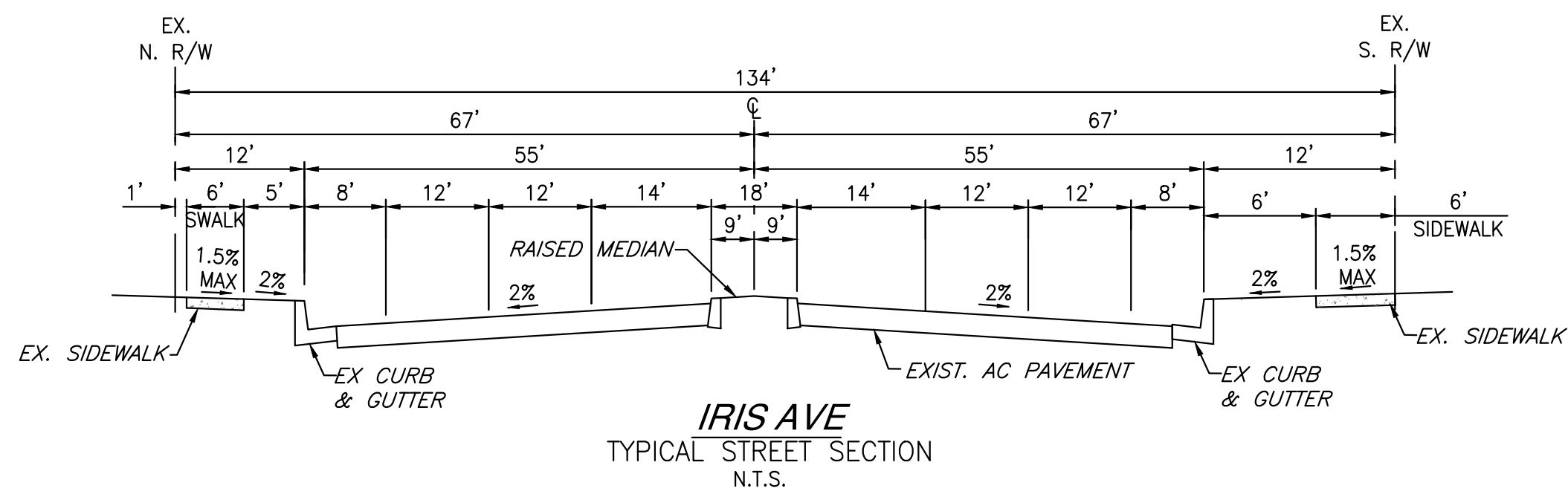
APN: 486-310-038

**EASEMENTS:**

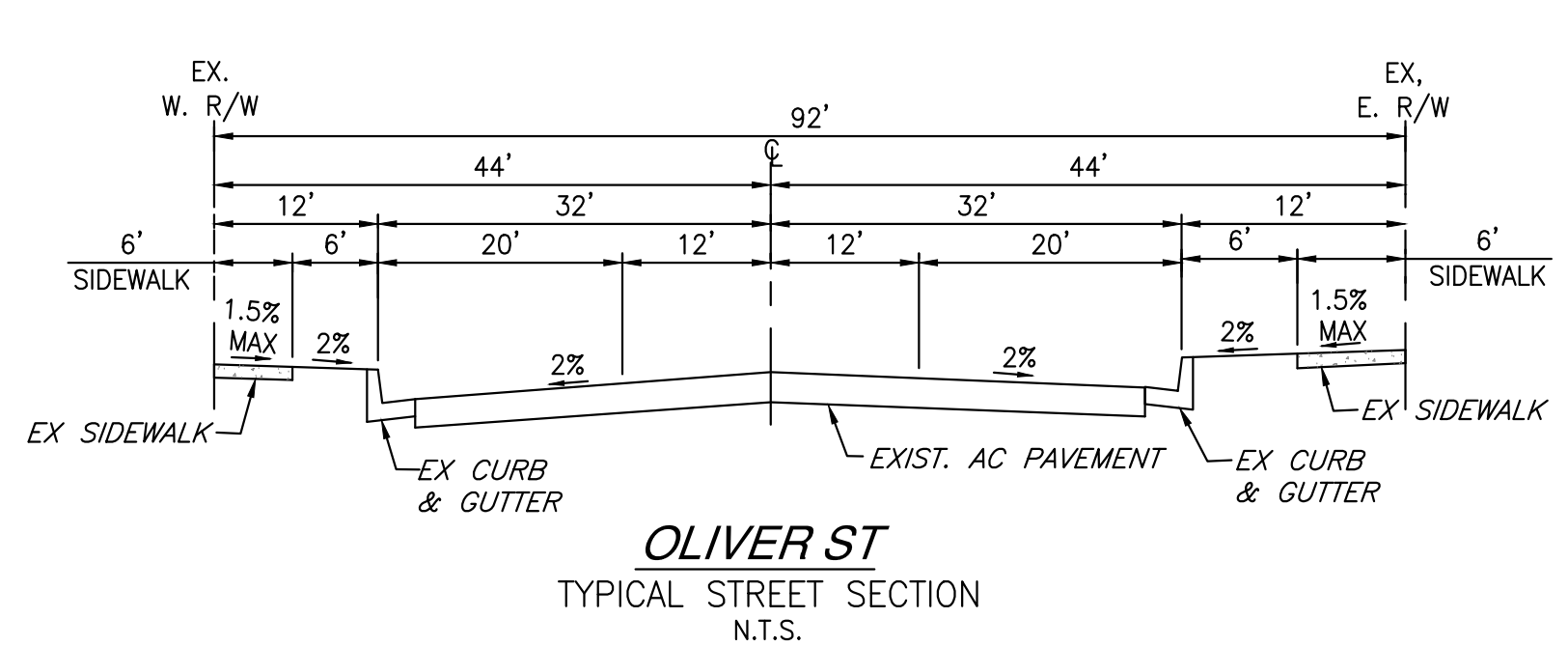
A NONEXCLUSIVE, PERMANENT SEWER AND ACCESS EASEMENT ON OVER AND ACROSS THAT CERTAIN PARCEL OF LAND SITUATED IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, BEING A PORTION OF LOT 7 AND LOT 8 IN BLOCK 151, OF BEAR VALLEY AND ALESSANDRO DEVELOPMENT CO. AS SHOWN BY MAP ON FILE IN BOOK 11 OF MAPS, PAGE 10, RECORDS OF SAN BERNARDINO COUNTY, CALIFORNIA, LYING WITHIN SECTION 22, TOWNSHIP 3 SOUTH, RANGE 3 WEST, S.B.M.

**FLOOD NOTE:**

THE SUBJECT PROPERTY IS LOCATED WITHIN A ZONE "X" DESIGNATION PER FLOOD INSURANCE RATE MAP NO. 06065C0770C MAP EFFECTIVE DATE AUGUST 28, 2008. AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.



**IRIS AVE**  
TYPICAL STREET SECTION  
N.T.S.



**OLIVER ST**  
TYPICAL STREET SECTION  
N.T.S.

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

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CALL 811 or 1-800-422-4133  
 2 Working Days Before You Dig  
 WWW.CALL811.COM

|                      |  |  |                                 |                               |  |   |
|----------------------|--|--|---------------------------------|-------------------------------|--|---|
| REVIEW BY CITY STAFF | BENCHMARK<br>THE BENCHMARK FOR THIS SURVEY IS CORS STATION "PPBF", ELEV = 1511.70' PER NGS DATA SHEET DH7168 DESIGNATED "PPBF ARD" | BASIS OF BEARING<br>THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF OLIVER STREET SHOWN AS N 00°25'12" E ON THIS MAP AND PARCEL MAP NO. 33361, PMB 239/30-32 AS N 00°26'04" E | CITY OF MORENO VALLEY APPROVALS | ENGINEER OF RECORD'S SEAL<br> | <p><b>CITY OF MORENO VALLEY</b></p> <p>TITLE SHEET</p> <p>APN. 486-310-038<br/>                 IRIS AVE AND OLIVER ST, MORENO VALLEY<br/> <b>PRELIMINARY GRADING PLAN</b></p> | <p>SHEET <b>1</b> OF <b>5</b></p> <p>CITY ID No</p> |
| MARK                 | DATE   | INITIAL  | DESCRIPTION                     | REC.                          | APPR   | DATE  |
|                      |  | E.O.R.   | REVISION                        |                               |  |   |

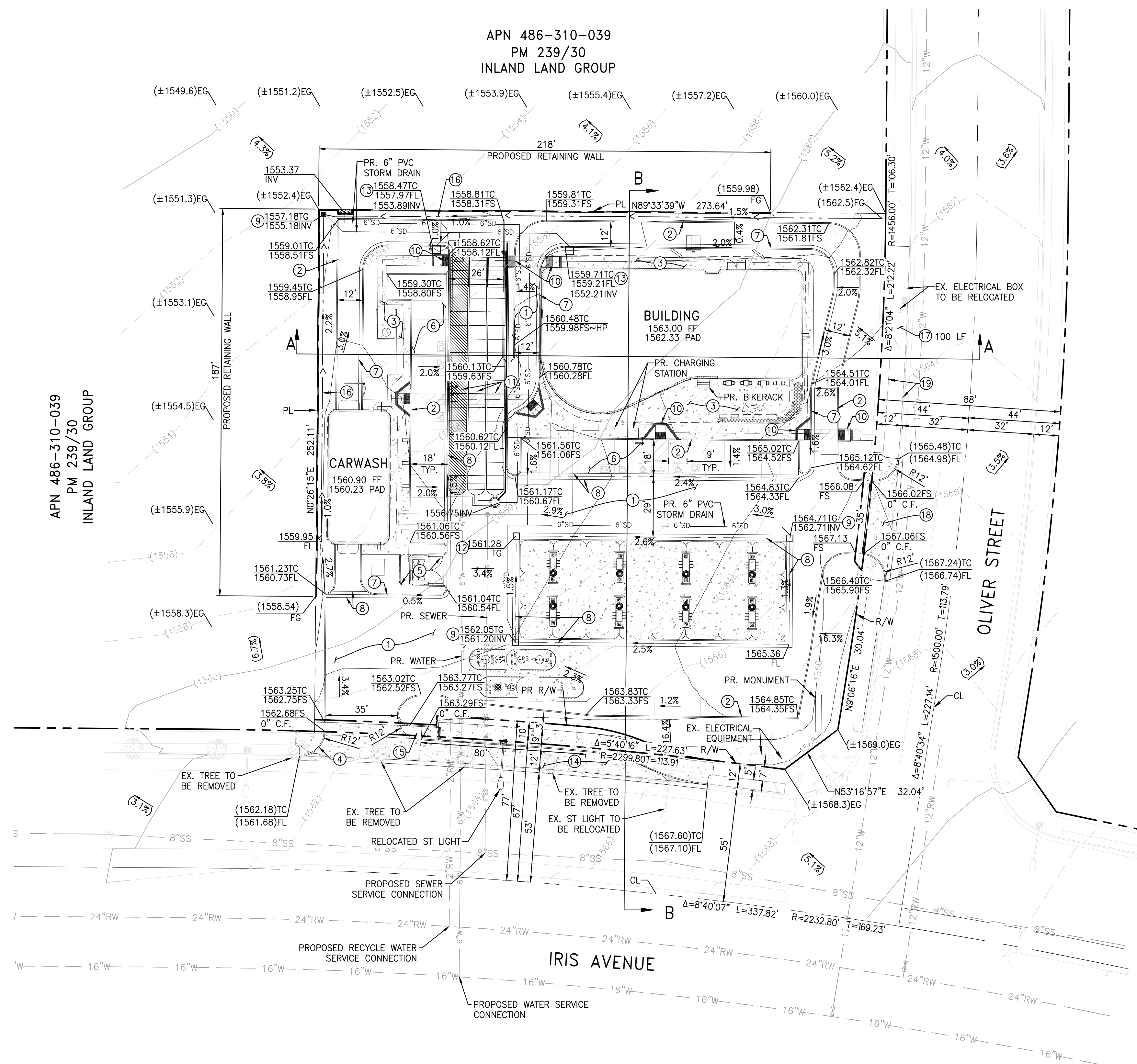
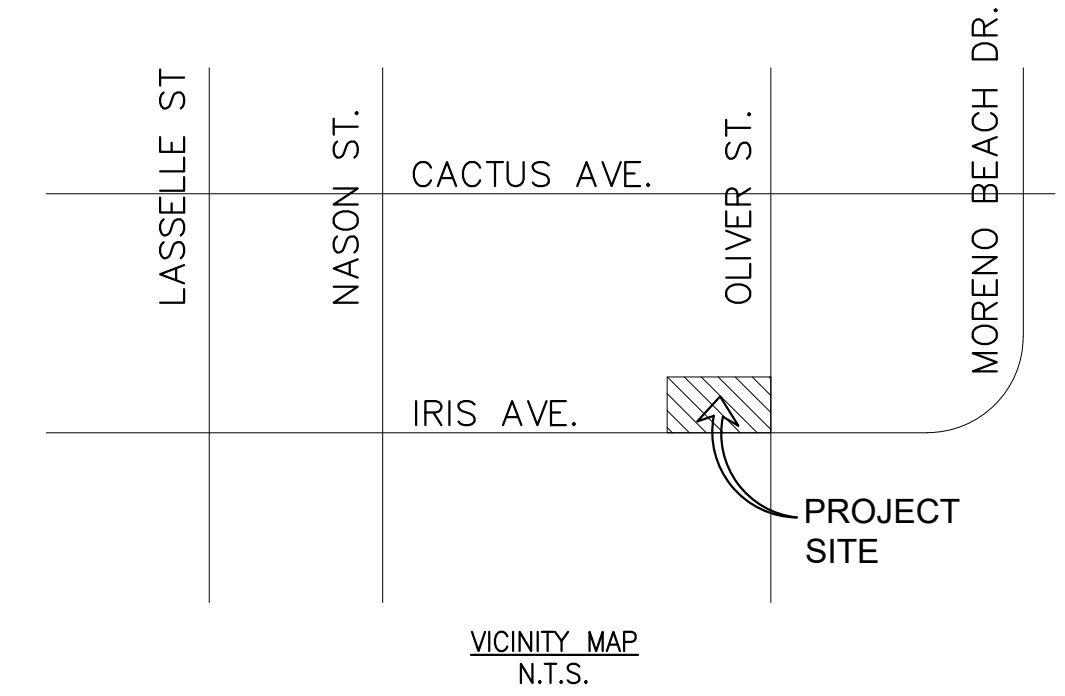
PEN22-0176







APN 486-310-039  
PM 239/30  
INLAND LAND GROUP

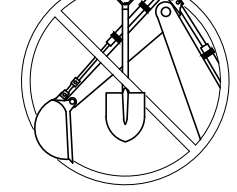


**CONSTRUCTION NOTES**

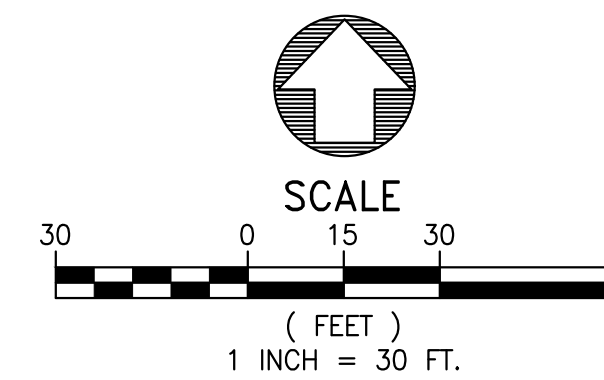
- 1 PROPOSED 3" AC PAVEMENT OVER 6" BASE
- 2 PROPOSED 6" CURB TYPE 6A PER CITY OF MORENO VALLEY STD MVS1-121A-0
- 3 PROPOSED 5' WIDE SIDEWALK
- 4 PROPOSED COMMERCIAL DRIVE APPROACH PER CITY OF MORENO VALLEY STD MVS1-112A-0
- 5 PROPOSED TRASH ENCLOSURE
- 6 PROPOSED 2.5" AC PAVEMENT OVER 5" BASE
- 7 PROPOSED 6" CURB AND GUTTER PER CITY OF MORENO VALLEY STD MVS1-120A-0
- 8 PROPOSED CONCRETE 3' WIDE VALLEY GUTTER
- 9 PROPOSED 24"x24" GRATE INLET CATCH BASIN PER CITY OF MORENO VALLEY STD MVGF-614A-0
- 10 PROPOSED ADA RAMP AND TRUNCATED DOMES PER ADA STANDARDS
- 11 PROPOSED UNDERGROUND CHAMBERS
- 12 PROPOSED DEAD END SUMP
- 13 PROPOSED CURB OPENING CATCH BASIN PER CITY OF MORENO VALLEY STD MVFE-300A-0
- 14 PROPOSED BUS TURNOUT PER CITY OF MORENO VALLEY STD MVS1-161-0
- 15 PROPOSED COMMERCIAL DRIVE APPROACH PER CITY OF MORENO VALLEY STD MVS1-112D-0
- 16 PROPOSED GRADED SWALE
- 17 PROPOSED GRADED SWALE STREET BMP
- 18 PROPOSED COMMERCIAL DRIVE APPROACH PER CITY OF MORENO VALLEY STD MVS1-112C-0
- 19 PROPOSED CURB OPENING 12" WIDE X 4" HIGH FOR DRAINAGE EVERY 30' O.C.

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

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PEN22-0176

REVIEW BY CITY STAFF

BENCHMARK

BASIS OF BEARING

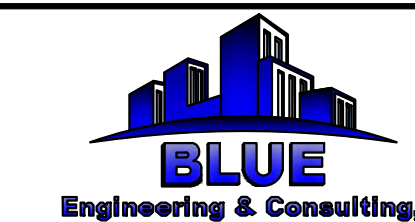
THE BENCHMARK FOR THIS SURVEY IS COR'S STATION "PPBF", ELEV = 1511.70' PER NGS DATA SHEET DH7168 DESIGNATED "PPBF ARD"

THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF OLIVER STREET SHOWN AS N 00°25'52" E ON THIS MAP AND PARCEL MAP NO. 33361, PMB 239/30-32 AS N 00°26'04" E

| MARK | DATE | INITIAL | DESCRIPTION | REC. | APPR | DATE |
|------|------|---------|-------------|------|------|------|
|      |      | E.O.R.  | REVISION    |      |      |      |

CITY OF MORENO VALLEY APPROVALS

ENGINEER OF RECORD'S SEAL



UNDER THE SUPERVISION OF:

ANGEL CESAR  
RCE 87222

DATE

CITY OF MORENO VALLEY

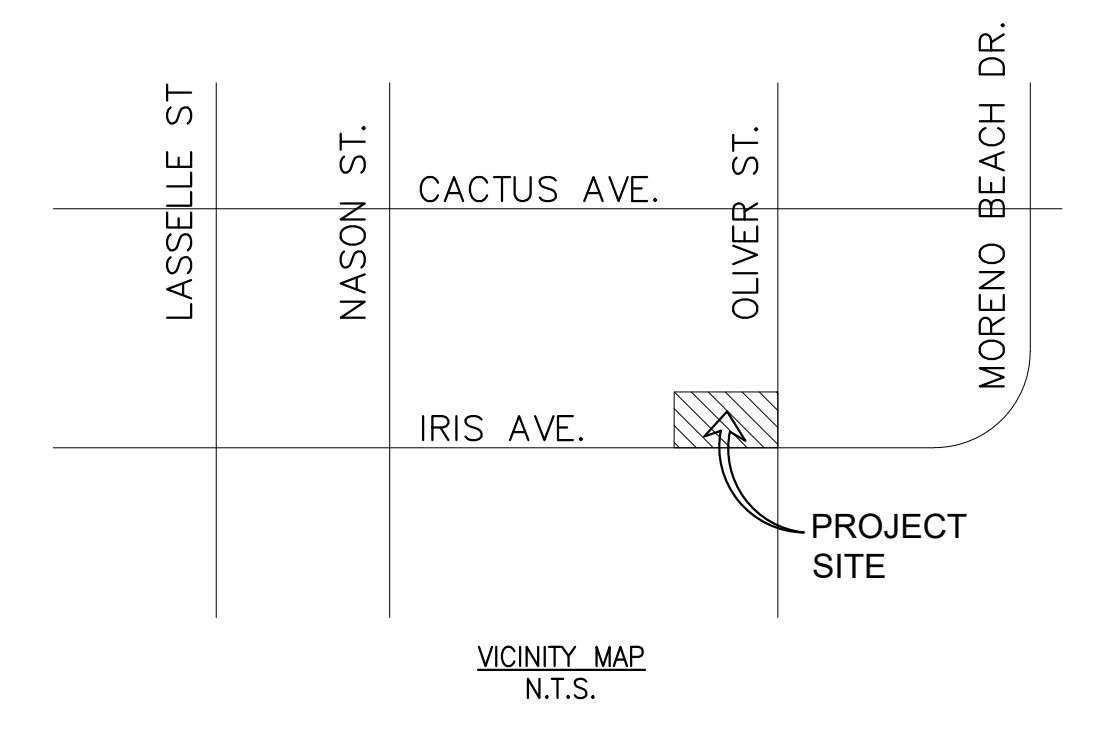
PRELIMINARY GRADING PLAN

APN. 486-310-038  
IRIS AVE AND OLIVER ST, MORENO VALLEY  
PRELIMINARY GRADING PLAN

SHEET 3 OF 5

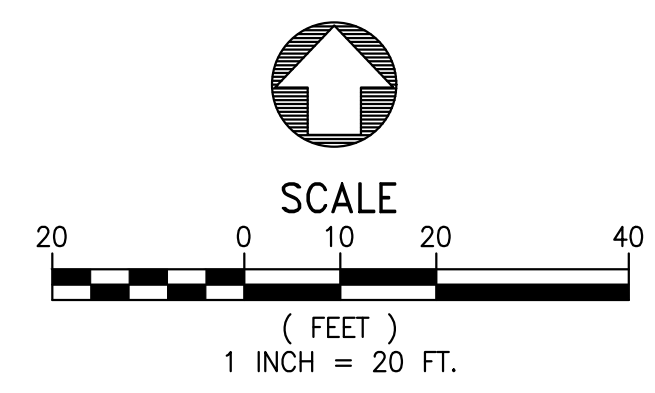
CITY ID No





**LEGEND**

FLOW LINE  
 FLOW DIRECTION  
 DRAINAGE AREA BOUNDARY  
 DRAINAGE AREA DESIGNATION  
 DRAINAGE AREA

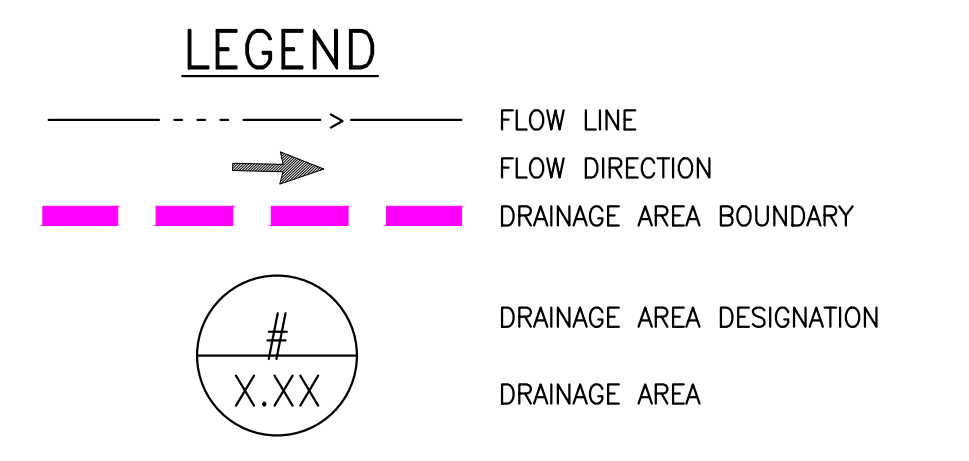
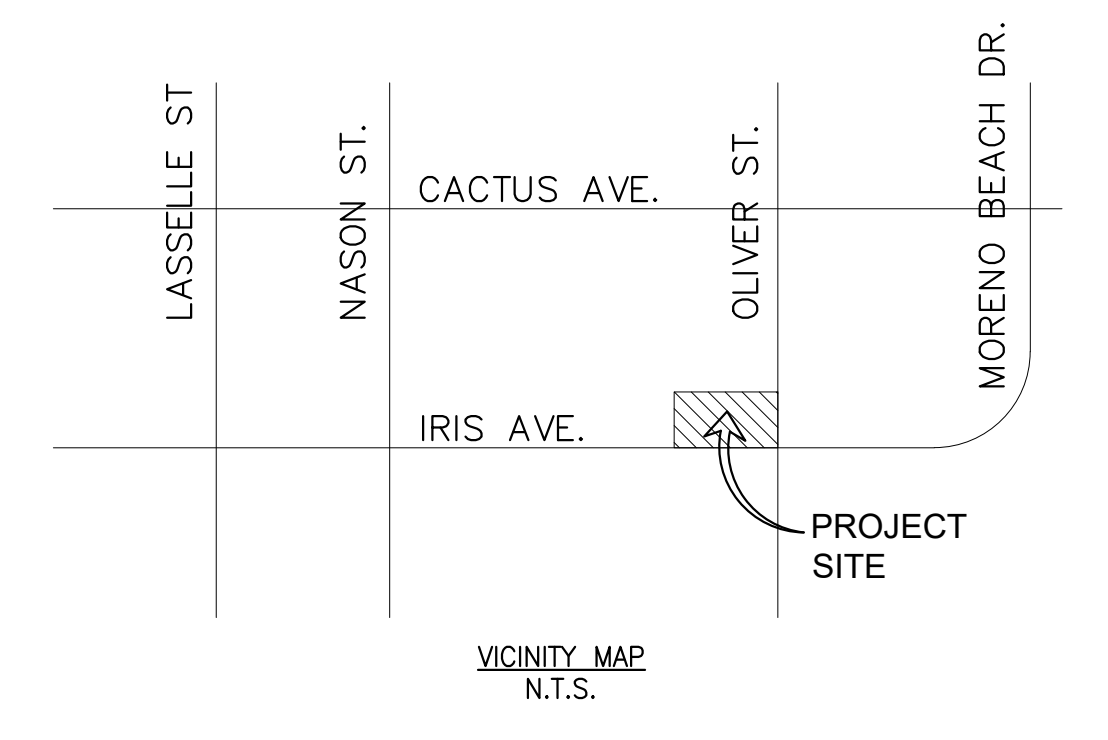
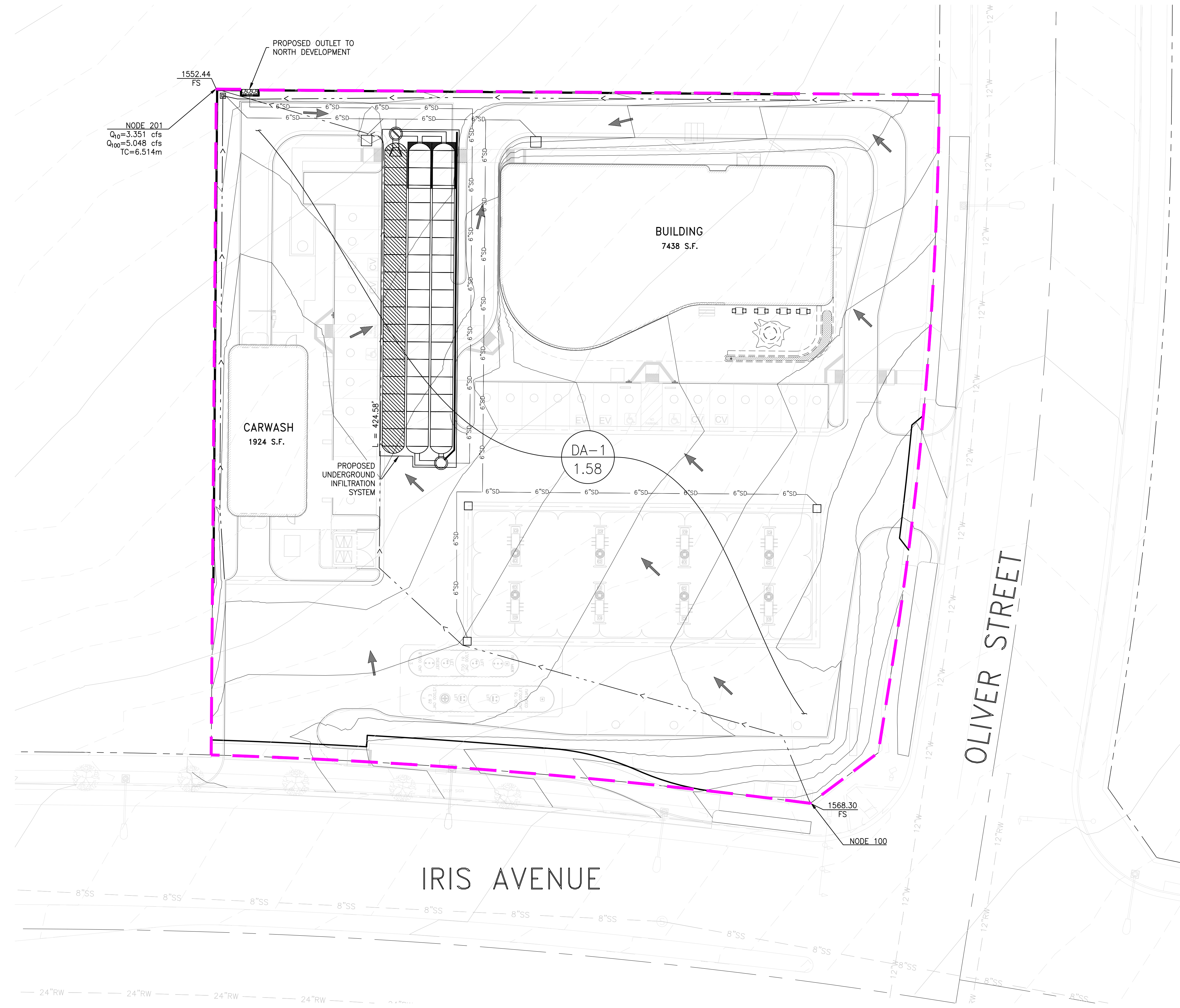


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 WWW.CALL811.COM

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|                      |   |  |                                 |      |         |             |                           |   |                       |  |                       |
|----------------------|---|--|---------------------------------|------|---------|-------------|---------------------------|---|-----------------------|--|-----------------------|
| REVIEW BY CITY STAFF | BENCHMARK   | BASIS OF BEARING   | CITY OF MORENO VALLEY APPROVALS |      |         |             | ENGINEER OF RECORD'S SEAL | <br>UNDER THE SUPERVISION OF:<br>ANGEL CESAR RCE 87222 DATE _____ | CITY OF MORENO VALLEY |  |                       |
|                      | THE BENCHMARK FOR THIS SURVEY IS CORS STATION "PPBF", ELEV = 1511.70' PER NGS DATA SHEET DH7168 DESIGNATED "PPBF ARD" | THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF OLIVER STREET SHOWN AS N 00°25'52" E ON THIS MAP AND PARCEL MAP NO. 33361, PMB 239/30-32 AS N 00°26'04" E | MARK                            | DATE | INITIAL | DESCRIPTION | REC.                      |   | APPR                  | DATE   | PRE HYDROLOGY EXHIBIT |
|                      |   |  |                                 |      |         |             |                           |   |                       | APN. 486-310-038<br>IRIS AVE AND OLIVER ST, MORENO VALLEY<br><b>PRELIMINARY GRADING PLAN</b> | CITY ID No            |

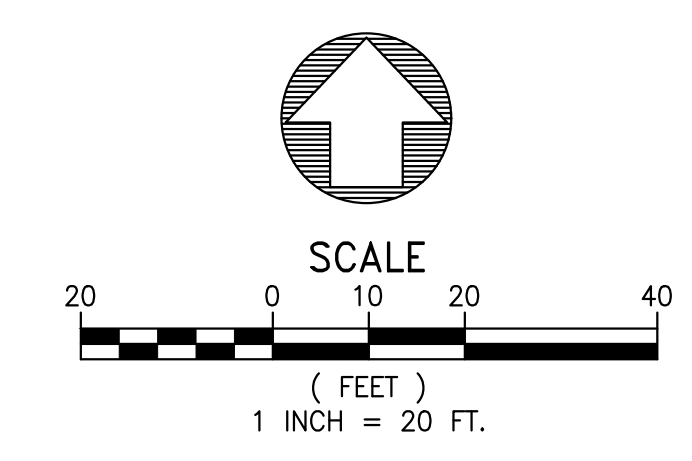




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|                      |  |  |      |      |         |             |      |      |      |                                 |   |  |   |   |
|----------------------|--|--|------|------|---------|-------------|------|------|------|---------------------------------|---|--|---|---|
| REVIEW BY CITY STAFF | BENCHMARK<br>THE BENCHMARK FOR THIS SURVEY IS CORN STATION "PPBF", ELEV = 1511.70' PER NGS DATA SHEET DH7168 DESIGNATED "PPBF ARD" | BASIS OF BEARING<br>THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF OLIVER STREET SHOWN AS N 00°25'52" E ON THIS MAP AND PARCEL MAP NO. 33361, PMB 239/30-32 AS N 00°26'04" E | MARK | DATE | INITIAL | DESCRIPTION | REC. | APPR | DATE | CITY OF MORENO VALLEY APPROVALS | ENGINEER OF RECORD'S SEAL<br>ANGEL CESAR<br>No. 87222<br>CIVIL<br>STATE OF CALIFORNIA | <p>UNDER THE SUPERVISION OF:<br/>ANGEL CESAR<br/>RCE 87222</p> <p>DATE</p> | <p>CITY OF MORENO VALLEY</p> <p>POST HYDROLOGY EXHIBIT</p> <p>APN. 486-310-038<br/>IRIS AVE AND OLIVER ST, MORENO VALLEY</p> <p><b>PRELIMINARY GRADING PLAN</b></p> | <p>SHEET <b>5</b> OF <b>5</b></p> <p>CITY ID No</p> |
|                      |  |  |      |      |         | REVISION    |      |      |      |                                 |   |  |   |   |

# Appendix 3: Soils Information

*Geotechnical Study and Other Infiltration Testing Data*



**SALEM**  
engineering group, inc.

## PRELIMINARY GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED ARCO STATION  
NWC IRIS AVENUE AND OLIVER STREET  
MORENO VALLEY, CALIFORNIA

SALEM PROJECT NO. 3-217-1265  
NOVEMBER 30, 2017

*PREPARED FOR:*

MR. ERIC LEVAUGHN  
SATER OIL INTERNATIONAL, LLC  
683 CLIFFSIDE DRIVE  
SAN DIMAS, CA 91773

*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](http://www.salemeng.com)





11650 Mission Park Dr., #108  
 Rancho Cucamonga, CA 91730  
 Phone (909) 980-6455  
 Fax (909) 980-6435

November 30, 2017

Project No. 3-217-1265

Mr. Eric LeVaughn  
**Sater Oil International, LLC**  
 683 Cliffside Drive  
 San Dimas, CA 91773 85255

**SUBJECT: PRELIMINARY GEOTECHNICAL ENGINEERING INVESTIGATION  
 PROPOSED ARCO STATION  
 NWC IRIS AVENUE AND OLIVER STREET  
 MORENO VALLEY, CALIFORNIA**

Dear Mr. LeVaughn:

At your request and authorization, SALEM Engineering Group, Inc. (SALEM) has prepared this Preliminary Geotechnical Engineering Investigation report for the Proposed ARCO Station 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  
 Geotechnical Division Manager  
 RGE 2477



R. Sammy Salem, MS, PE, GE  
 Principal Engineer  
 RCE 52762 / RGE 2549





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Figure 2, Site Plan

**APPENDIX A – FIELD INVESTIGATION**

Figures A-1 through A-5, Logs of Exploratory Soil Borings B-1 through B-5

Percolation Testing Results, P-1 through P-4

**APPENDIX B – LABORATORY TESTING**

Consolidation Test Results

Direct Shear Test Results

Gradation Curves

Corrosivity Test Results

Maximum Density and Optimum Moisture Proctor Test Results

**APPENDIX C – EARTHWORK AND PAVEMENT SPECIFICATIONS**



11650 Mission Park Drive, Suite 108  
 Rancho Cucamonga, CA 91730  
 Phone (909) 980-6455  
 Fax (909) 980-6435

**PRELIMINARY GEOTECHNICAL ENGINEERING INVESTIGATION  
 PROPSOED ARCO STATION  
 NWC IRIS AVENUE AND OLIVER STREET  
 MORENO VALLEY, CALIFORNIA**

**1. PURPOSE AND SCOPE**

This report presents the results of our Preliminary Geotechnical Engineering Investigation for the site of the Proposed ARCO Station to be located near the intersection of NWC Iris Avenue and Oliver Street 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, percolation testing, laboratory testing, engineering analysis and the preparation of this report. Our field exploration was performed on November 14, 2017 and included the drilling of five (5) small-diameter soil borings to a maximum depth of 50 feet at the site. Additionally, four (4) percolation tests were performed at depths of approximately 8 and 10 feet below existing grade for the determination of the infiltration rate. The locations of the soil borings and percolation tests are depicted on Figure 2, Site Plan. A detailed discussion of our field investigation, percolation tests, and exploratory boring logs 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**

Based on the Site Plan provided to us, we understand that the proposed development will include construction of an ARCO station with an approximately 3,800 square-foot AM/PM convenience store, an 8-MPD's fuel canopy, a 24 feet by 100 feet car wash, and underground storage tanks. 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 kips per linear foot. Maximum column load is expected to be on the order of 70 kips. Floor slab soil bearing pressure is expected to be on the order of 150 psf.

A site grading plan was not available at the time of preparation of this report. As the existing project area is essentially level, we anticipate that cuts and fills during earthwork will be minimal and limited to providing a level pad 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 2.

### 3. SITE LOCATION AND DESCRIPTION

The subject site is located at the northwest corner of the intersection of Iris Avenue and Oliver Street, in the City of Moreno Valley, CA (see Vicinity Map, Figure 1). The subject site is rectangular in shape and encompasses approximately 1.31 acres.

At the time of SALEM's field exploration, the site was a vacant lot with sparse shrubs. The site is bounded by vacant lands to the north and west, Oliver Street to the east, and Iris Avenue to the south. The site area is gently sloping to the north with elevations ranging from approximately 1,566 to 1,555 feet above mean sea level 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-5) were drilled on November 14, 2017 in the area shown on the Site Plan, Figure 2. The test borings were advanced with a 6-inch diameter hollow stem auger and a 4 inch diameter solid flight auger rotated by a truck-mounted CME 45C drill rig. The test borings were extended to a maximum depth of 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 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, in-situ density, shear strength, consolidation potential, 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 4.1 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 33.8958° North; site longitude is 117.1833° West. The ten closest active faults are summarized below in Table 7.1.

**TABLE 7.1  
REGIONAL FAULT SUMMARY**

| <b>Fault Name</b>                                  | <b>Distance to Site (miles)</b> | <b>Max. Earthquake Magnitude, <math>M_w</math></b> |
|--|---------------------------------|--|
| San Jacinto; SBV+SJV+A+CC+B+SM                     | 4.1                             | 7.9  |
| San Jacinto; A+CC+B+SM                             | 4.3                             | 7.6  |
| San Jacinto; SBV                                   | 8.9                             | 7.1  |
| S. San Andreas;<br>PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO | 15.1                            | 8.2  |
| S. San Andreas; PK+CH+CC+BB+NM+SM+NSB              | 17.7                            | 8.0  |
| Elsinore; W+GI+T+J+CM                              | 18.2                            | 7.9  |
| S. San Andreas; BG+CO                              | 22.3                            | 7.4  |
| Chino, alt 2                                       | 22.6                            | 6.8  |
| Elsinore; W  | 23.9                            | 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 0.871g (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.

The soils encountered within the depth of 50 feet on the project site consisted predominately of very loose to dense silty sand with various amounts of clay and gravel, and dense to very dense silty clayey sand. 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 site was evaluated for liquefaction potential. The liquefaction analysis indicated that the soils had a low potential for liquefaction under seismic conditions. Therefore, no mitigation measures are warranted. Detailed geotechnical engineering recommendations are presented in the remaining portions of the text. The recommendations are based on the properties of the materials identified during our investigation.

### **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 very loose to dense silty sand with various amounts of clay and gravel, and dense to very dense silty clayey sand.

Fill soils maybe present on-site between our test boring locations. Verification of the extent of fill should be determined during site grading. Field and laboratory tests suggest that the deeper native soils are moderately strong and slightly compressible.

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 not encountered during this investigation.

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 50 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 <sub>4</sub> ) in Soil, Percentage by Weight | Exposure Severity | Exposure Class | Maximum w/cm Ratio | Minimum Concrete Compressive Strength | Cementitious Materials Type |
|--|-------------------|----------------|--------------------|---------------------------------------|-----------------------------|
| 0.005  | Not Applicable    | S0             | N/A                | 2,500 psi                             | No Restriction              |

The water-soluble chloride concentration detected in saturation extract from the soil samples was 21 mg/kg. This level of chloride concentration is not considered to be severely 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

Four percolation tests (P-1 through P-4) were performed within assumed infiltration areas and were conducted 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.

Four (4) 8-inch diameter boreholes were advanced to the depths shown on the percolation test worksheets. The holes were pre-saturated 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 percolation rates were converted to infiltration rates using the “Porchet Method” according to County Design handbook. The test results are shown on the table below.

### PERCOLATION TEST RESULTS

| Test No. | Depth (feet) | Measured Percolation Rate (min/inch) | Infiltration Rate* (inch/hour) | Soil Type       |
|----------|--------------|--------------------------------------|--------------------------------|-----------------|
| P-1      | 8            | 7.6                                  | <b>1.43</b>                    | Silty SAND (SM) |
| P-2      | 10           | 25.0                                 | <b>0.55</b>                    | Silty SAND (SM) |
| P-3      | 8            | 25.0                                 | <b>0.51</b>                    | Silty SAND (SM) |
| P-4      | 10           | 7.6                                  | <b>1.27</b>                    | Silty SAND (SM) |

\* 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.

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.

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 loose and potentially compressible material at the site. Recommendations to mitigate the effects of these soils are provided in this report.
- 9.1.3 Fill soils may be present on-site between our test boring locations. Undocumented fill materials are not suitable to support any future structures and should be replaced with Engineered Fill. 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 near-surface onsite soils are moisture-sensitive and are moderately to highly 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 (Section 9.5).
- 9.1.6 Based on the subsurface conditions at the site and the anticipated structural loading, we anticipate that the proposed building may be supported using conventional shallow foundations provided that the recommendations presented herein are incorporated in the design and construction of the project.
- 9.1.7 Provided the site is graded in accordance with the recommendations of this report and foundations constructed as described herein, we estimate that total settlement due to static loads utilizing conventional shallow foundations for the proposed building will be within 1 inch and corresponding differential settlement will be less than ½ inch.
- 9.1.8 All references to relative compaction and optimum moisture content in this report are based on ASTM D 1557 (latest edition).
- 9.1.9 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.
- 9.1.10 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.
- 9.1.11 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.
- 9.2 Seismic Design Criteria**
- 9.2.1 For seismic design of the structures, and in accordance with the seismic provisions of the 2016 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  
SEISMIC DESIGN PARAMETERS**

| Seismic Item  | Symbol    | Value                        | 2016 CBC Reference       |
|---|-----------|------------------------------|--------------------------|
| Site Coordinates (Datum = NAD 83)   |           | 33.8958 Lat<br>-117.1833 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  | $F_{PGA}$ | 1.200                        | ASCE 7 Table 11.8-1      |
| Peak Ground Acceleration<br>(adjusted for Site Class effects)                                   | $PGA_M$   | 0.871 g                      | ASCE 7 Equation 11.8-1   |
| Seismic Design Category   | SDC       | D                            | ASCE 7 Table 11.6-1 & 2  |
| Mapped Spectral Acceleration<br>(Short period - 0.2 sec)  | $S_S$     | 1.715 g                      | CBC Figure 1613.3.1(1-6) |
| Mapped Spectral Acceleration<br>(1.0 sec. period)   | $S_1$     | 0.670 g                      | CBC Figure 1613.3.1(1-6) |
| Site Class Modified Site Coefficient  | $F_a$     | 1.200                        | CBC Table 1613.3.3(1)    |
| Site Class Modified Site Coefficient  | $F_v$     | 1.700                        | CBC Table 1613.3.3(2)    |
| MCE Spectral Response Acceleration<br>(Short period - 0.2 sec) $S_{MS} = F_a S_S$               | $S_{MS}$  | 2.058 g                      | CBC Equation 16-37       |
| MCE Spectral Response Acceleration<br>(1.0 sec. period) $S_{M1} = F_v S_1$                      | $S_{M1}$  | 1.139 g                      | CBC Equation 16-38       |
| Design Spectral Response Acceleration<br>$S_{DS} = \frac{2}{3} S_{MS}$ (short period - 0.2 sec) | $S_{DS}$  | 1.372 g                      | CBC Equation 16-39       |
| Design Spectral Response Acceleration<br>$S_{D1} = \frac{2}{3} S_{M1}$ (1.0 sec. period)        | $S_{D1}$  | 0.759 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.

### 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 to laborious effort using conventional heavy-duty or special excavation and earthmoving 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. Temporary excavations are further discussed in a later Section of this report.

- 9.3.3 The upper soils within the project site are identified primarily as silty sands and clayey sands. The sandy 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 removed and replaced with properly moisture conditioned and compacted Engineered Fill. 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 do not contain deleterious matter, organic material, or rock material larger than 3 inches in maximum dimension.
- 9.4.2 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.
- 9.4.3 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 9.4.3.

**TABLE 9.4.3  
IMPORT FILL REQUIREMENTS**

|                                       |    |
|---------------------------------------|----|
| Minimum Percent Passing No. 200 Sieve | 20 |
| Maximum Percent Passing No. 200 Sieve | 50 |
| Minimum Percent Passing No. 4 Sieve   | 80 |
| Maximum Particle Size                 | 3" |
| Maximum Plasticity Index              | 10 |
| Maximum CBC Expansion Index           | 15 |

- 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 Surface vegetation consisting of grasses and other similar 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. In addition, existing concrete and asphalt materials shall be removed from areas of proposed improvements and stockpiled separately from excavated soil material. The stripped vegetation, asphalt and concrete materials will not be suitable for use as Engineered Fill or within 5 feet of building pads or within pavement areas. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas or exported from the site.
- 9.5.5 Structural building pad areas should be considered as areas extending a minimum of 5 feet horizontally beyond the outside dimensions of building, including footings and non-cantilevered overhangs carrying structural loads.
- 9.5.6 To minimize post-construction soil movement and provide uniform support for the proposed building, overexcavation and recompaction within the proposed building areas should be performed to a minimum depth of **five (5) feet** below existing grade or **three (3) feet** 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 footings.
- 9.5.7 Within pavement areas, it is recommended that overexcavation and recompaction be performed to a minimum depth of **1.5 feet** below existing grade or proposed grade, whichever is deeper. Deeper overexcavation may be required in some local areas to removal all unsuitable materials.



The overexcavation and recompaction should also extend laterally to a minimum of 2 feet beyond the outer edges of the proposed pavement.

- 9.5.8 Any fill or disturbed soils 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 8 to 10 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 of the maximum dry density based on ASTM D1557 Test Method latest edition.
- 9.5.10 All Engineered Fill (including scarified ground surfaces and backfill) should be placed in thin lifts which will 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% 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 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.
- 9.5.14 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.
- 9.5.15 We do not anticipate groundwater or seepage to adversely affect construction if conducted during the drier months 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.
- 9.5.16 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 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 structure 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.
- 9.6.3 The bottom of footing excavations should be maintained free of loose and disturbed soil. Footing concrete should be placed into a neat excavation.
- 9.6.4 For design purposes, total settlement due to static loading on the order of 1 inch 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.



- 9.6.5 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                              | 2,000 psf         |
| Dead-Plus-Live Load                         | 2,500 psf         |
| Total Load, Including Wind or Seismic Loads | 3,325 psf         |

- 9.6.6 Resistance to lateral footing displacement can be computed using an allowable coefficient of friction factor of 0.40 acting between the base of foundations and the supporting subgrade.
- 9.6.7 Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 400 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 2015 IBC/2016 CBC that includes wind or earthquake loads.
- 9.6.8 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.
- 9.6.9 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 Concrete Slabs-on-Grade

- 9.7.1 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.
- 9.7.2 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 or its approved equivalent to prevent capillary moisture rise.
- 9.7.3 We recommend reinforcing slabs, at a minimum, with No. 3 reinforcing bars placed 18 inches on center, each way.

- 9.7.4 Slabs subject to structural loading may be designed utilizing a modulus of subgrade reaction K of 180 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).
- 9.7.5 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.
- 9.7.6 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.
- 9.7.7 It is recommended that the utility trenches within the structure 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.
- 9.7.8 Moisture within the structure 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 structure. 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 structure is recommended to reduce the accumulation of interior moisture.
- 9.7.9 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.
- 9.7.10 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.
- 9.7.11 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.

- 9.7.12 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

## 9.8 Caisson Foundations

- 9.8.1 It is recommended that the caisson foundation should have a minimum depth of 12 feet below the lowest adjacent grade.
- 9.8.2 The caissons may be designed using an allowable sidewall friction of 160 psf. This value is for dead-plus-live loads. An allowable end bearing capacity of 3,000 psf may be used 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 of the CBC that includes wind or earthquake loads.
- 9.8.3 Uplift loads can be resisted by caissons using an allowable sidewall friction of 120 psf of the surface area and the weight of the caisson.
- 9.8.4 The total static settlement of the caisson footing is not expected to exceed 1 inches. Differential settlement should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied.
- 9.8.5 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 400 pounds per square foot per foot of depth below the lowest adjacent grade to a maximum of 6,000 psf.
- 9.8.6 The top one-foot of adjacent subgrade should be deleted from the passive pressure computation.
- 9.8.7 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.
- 9.8.8 Sandy soils were encountered at the site. Casing will be required during drilling of the caisson footings.

## 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<br>Level Backfill and Drained Conditions | Equivalent Fluid Pressure, pcf |
|---|--------------------------------|
| Active Pressure   | 35                             |
| At-Rest Pressure  | 55                             |
| Passive Pressure  | 400                            |
| Related Parameters  |                                |
| Allowable Coefficient of Friction                         | 0.40                           |
| In-Place Soil Density (lbs/ft <sup>3</sup> )              | 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.

9.9.3 The top one-foot of adjacent subgrade should be deleted from the passive pressure computation.

9.9.4 A safety factor consistent with the design conditions should be included when using the values in the above table.

9.9.5 For stability against lateral sliding, which is resisted solely by the passive pressure, we recommend a minimum safety factor of 1.5.

9.9.6 For stability against lateral sliding, which is resisted by the combined passive and frictional resistance, a minimum safety factor of 2.0 is recommended.

9.9.7 For lateral stability against seismic loading conditions, we recommend a minimum safety factor of 1.1.

9.9.8 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: $\gamma$ = In-Place Soil Density                    |
| $K_h$ = Horizontal Acceleration = $\frac{2}{3}PGA_M$       |
| H = Wall Height  |

## 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 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% relative compaction at or above optimum moisture content.

- 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 The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than 5 percent for a minimum distance of 10 feet.
- 9.13.3 Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building 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. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed.
- 9.13.4 Roof drains should be installed with appropriate downspout extensions out-falling on splash blocks so as to direct water a minimum of 5 feet away from the structures or be connected to the storm drain system for the development.

### 9.14 Pavement Design

- 9.14.1 Based on site soil conditions, an R-value of 40 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 trucks, and 2 multi-unit trucks. The following table shows the recommended pavement sections for various traffic indices.



**TABLE 9.14.2  
ASPHALT CONCRETE PAVEMENT THICKNESSES**

| Traffic Index                            | Asphaltic Concrete | Class II Aggregate Base* | Compacted Subgrade* |
|--|--------------------|--------------------------|---------------------|
| 5.0<br>(Parking and Vehicle Drive Areas) | 2.5"               | 5.0"                     | 18.0"               |
| 6.0<br>(Heavy Truck Areas)               | 3.0"               | 6.0"                     | 18.0"               |

*\*95% compaction based on ASTM D1557-07 Test Method or Cal 216*

- 9.14.3 The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

**TABLE 9.14.3  
PORTLAND CEMENT CONCRETE PAVEMENT THICKNESSES**

| Traffic Index    | Portland Cement Concrete* | Class II Aggregate Base** | Compacted Subgrade** |
|------------------|---------------------------|---------------------------|----------------------|
| 5.0 (Light Duty) | 5.0"                      | 5.0"                      | 18.0"                |
| 6.0 (Heavy Duty) | 6.0"                      | 5.0"                      | 18.0"                |

*\* Minimum Compressive Strength of 4,000 psi  
\*\* 95% compaction based on ASTM D1557-07 Test Method or Cal 216*

## 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.
- 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 2. 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.

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, PE  
Geotechnical Staff Engineer  
RCE 86724



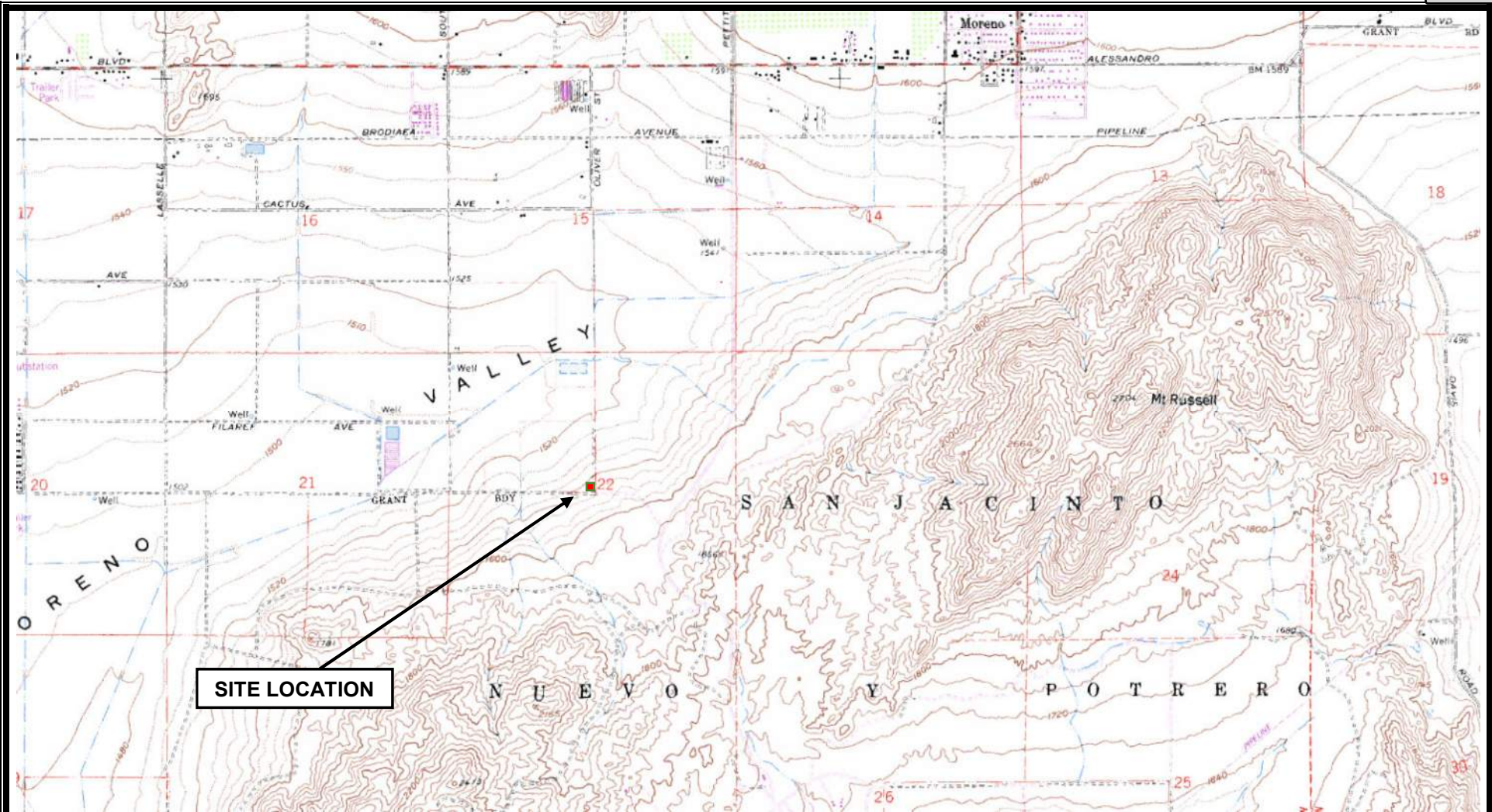
Clarence Jiang, GE  
Senior Geotechnical Engineer  
RGE 2477



R. Sammy Salem, MS, PE, GE  
Principal Engineer  
RCE 52762 / RGE 2549



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)



Source Image: U.S. Geological Survey, Sunnymead, Calif. 7.5' Quadrangle, 1967 (Photo Revised 1980)



**VICINITY MAP**  
**GEOTECHNICAL ENGINEERING INVESTIGATION**  
**Proposed Arco Station**  
**NWC Iris Avenue & Oliver Street**  
**Moreno Valley, California**

SCALE:  
 NOT TO SCALE  
 DRAWN BY:  
 II  
 PROJECT NO.  
 3-217-1265

DATE:  
 11/2017  
 APPROVED BY:  
 CJ  
 FIGURE NO.  
 1

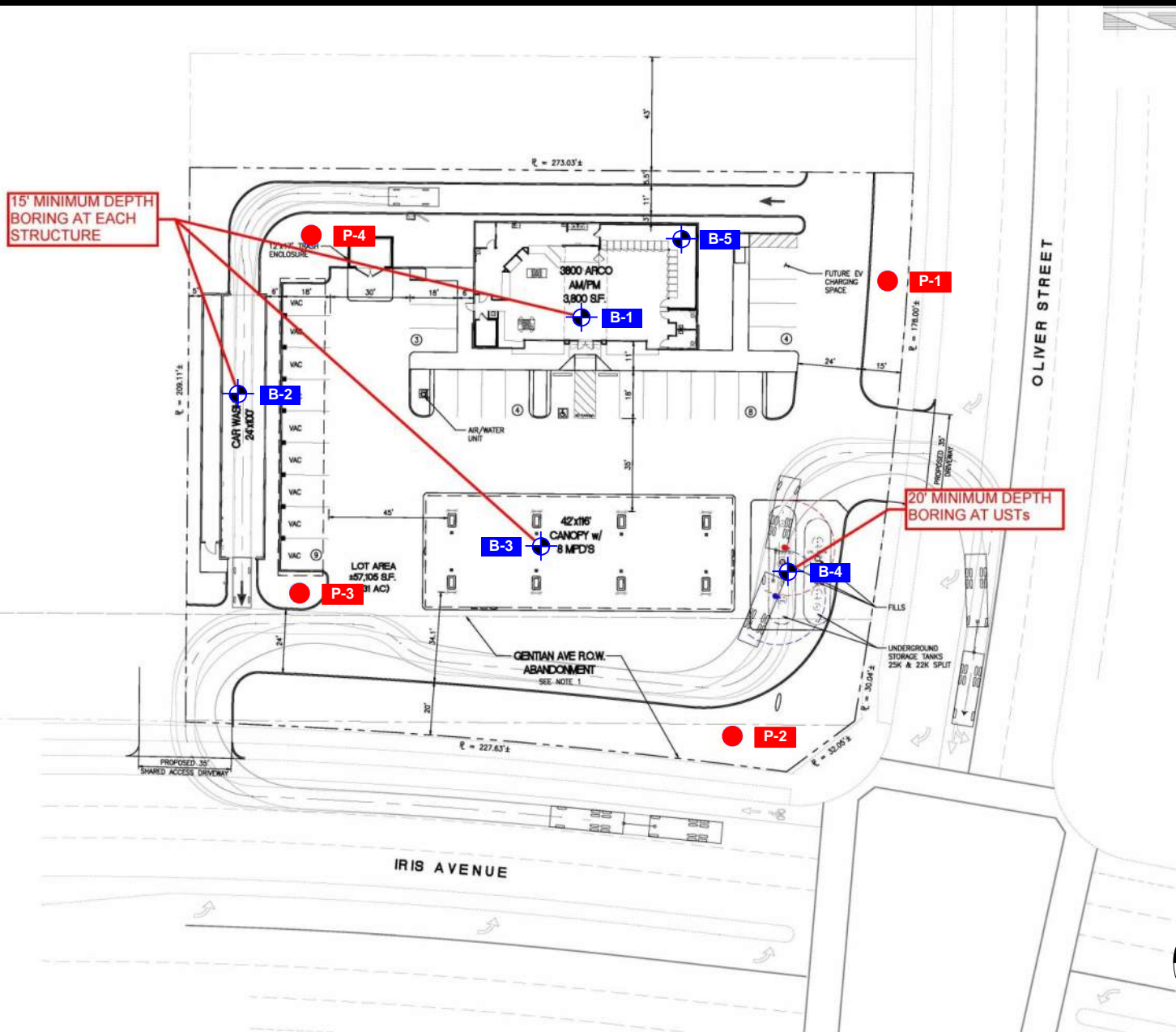


Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A



15' MINIMUM DEPTH BORING AT EACH STRUCTURE

20' MINIMUM DEPTH BORING AT USTs



**SITE PLAN**  
**GEOTECHNICAL ENGINEERING INVESTIGATION**  
 Proposed Arco Station  
 NWC Iris Avenue & Oliver Street  
 Moreno Valley, California

SCALE:  
 NOT TO SCALE  
 DRAWN BY:  
 II  
 PROJECT NO.  
 3-217-1265

DATE:  
 11/2017  
 APPROVED BY:  
 CJ  
 FIGURE NO.  
 2

LEGEND:  
 B-1 Soil Boring Location  
 P-1 Percolation Location  
 All Locations Approximate



APPENDIX

A

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)



## APPENDIX A FIELD EXPLORATION

Fieldwork for our investigation (drilling) was conducted on November 14, 2017 and included a site visit, subsurface exploration, and soil sampling. Percolation tests were performed on November 15, 2017. 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 CME 45C drill rig equipped with an 8-inch and a 6-inch hollow-stem augers and a 4-inch diameter solid flight auger. 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 soil 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   |  |
|--|--|--|--|---|---|--|
| <b>Coarse-grained Soils</b><br>More than ½ retained on the No. 200 Sieve | <b>Gravels</b><br>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.   |  |
|  |  | Gravels  | 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.                          |  |
|  | <b>Sands</b><br>More than ½ passing through the No. 200 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.                                  |  |
|  | <b>Fine-grained Soils</b><br>More than ½ passing through the No. 200 Sieve | <b>Silts and Clays</b><br>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.                         |  |
| <b>Silts and Clays</b><br>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.                                     |   |  |
| <b>Highly Organic Soils</b>  |  |  | PT                                       |   | Peat, muck, and other highly organic soils.                         |  |
| <b>Consistency Classification</b>  |  |  |  |   |   |  |
| <i>Granular Soils</i>  |  |  | <i>Cohesive Soils</i>                    |   |   |  |
| Description - Blows Per Foot (Corrected)                                 |  |  | Description - Blows Per Foot (Corrected) |   |   |  |
| Very loose   | <u>MCS</u><br><5   | <u>SPT</u><br><4                                     | Very soft                                | <u>MCS</u><br><3  | <u>SPT</u><br><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  |   |   |  |

# Boring No. B-1

**Project:** Proposed Arco Station  
**Client:** Sater Oil International, LLC  
**Location:** NWC Iris Avenue & Oliver Street, Moreno Valley, CA  
**Grnd. Surf. Elev. (Ft. MSL)** N/A

**Project No:** 3-217-1265  
**Figure No.:** A-1  
**Logged By:** JH  
**Initial:** None  
**At Completion:** None

Depth to Water >

| SUBSURFACE PROFILE |        |  | SAMPLE            |                      |              |             |            | Penetration Test<br>20 40 60 80 | Water Level |
|--------------------|--------|--|-------------------|----------------------|--------------|-------------|------------|---------------------------------|-------------|
| Depth (ft)         | Symbol | Description  | Dry Density (pcf) | Moisture Content (%) | Sampler Type | Penetration | Blow Count |                                 |             |
| 0                  |        | Ground Surface   |                   |                      |              |             |            |                                 |             |
|                    |        | <b>Silty SAND (SM)</b><br>Loose; brown; moist; fine to medium-grained.                               | 82.4              | 10.5                 | MCS          | █           | 6          |                                 |             |
| 5                  |        | Grades as above.   | 111.2             | 3.1                  | MCS          | █           | 11         |                                 |             |
| 10                 |        | Grades as above; medium dense.   | 109.1             | 4.6                  | MCS          | █           | 22         |                                 |             |
| 15                 |        | <b>Silty Clayey SAND (SC)</b><br>Dense; brown-orange; moist; fine to medium-grained; low plasticity. | --                | 9.6                  | SPT          | █           | 48         |                                 |             |
| 20                 |        | <b>Silty SAND (SM)</b><br>Medium dense; brown; moist; fine to medium-grained.                        | --                | 4.2                  | SPT          | █           | 23         |                                 |             |
| 25                 |        | Grades as above.   | --                | 4.9                  | SPT          | █           | 28         |                                 |             |

**Drill Method:** Hollow Stem Auger  
**Drill Rig:** CME 45C  
**Driller:** Salem Engineering Group, Inc.  
**Sheet:** 1 of 2

**Drill Date:** 11/14/2017  
**Borehole Size:** 6 Inches  
**Hammer Type:** Auto Trip  
**Weight & Drop:** 140 lbs./30 in.



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)



# Boring No. B-1

**Project:** Proposed Arco Station

**Client:** Sater Oil International, LLC

**Location:** NWC Iris Avenue & Oliver Street, Moreno Valley, CA

**Grnd. Surf. Elev. (Ft. MSL)** N/A

**Project No.:** 3-217-1265

**Figure No.:** A-1

**Logged By:** JH

**Initial:** None

**At Completion:** None

Depth to Water >

| SUBSURFACE PROFILE |        |                                      | SAMPLE            |                      |              |             |            | Penetration Test | Water Level |
|--------------------|--------|--------------------------------------|-------------------|----------------------|--------------|-------------|------------|------------------|-------------|
| Depth (ft)         | Symbol | Description                          | Dry Density (pcf) | Moisture Content (%) | Sampler Type | Penetration | Blow Count |                  |             |
| 30                 |        | Grades as above; dense.              | -                 | 5.6                  | SPT          | ■           | 37         | 20 40 60 80      |             |
| 35                 |        | Grades as above; medium dense.       | -                 | 4.9                  | SPT          | ■           | 25         | 20 40 60 80      |             |
| 40                 |        | Grades as above; with trace of clay. | -                 | 5.9                  | SPT          | ■           | 29         | 20 40 60 80      |             |
| 45                 |        | Grades as above.                     | -                 | 5.9                  | SPT          | ■           | 25         | 20 40 60 80      |             |
| 50                 |        | Grades as above.                     |                   |                      |              |             |            | 20 40 60 80      |             |
|                    |        | End of Borehole                      |                   |                      |              |             |            | 20 40 60 80      |             |

**Drill Method:** Hollow Stem Auger  
**Drill Rig:** CME 45C  
**Driller:** Salem Engineering Group, Inc.  
**Sheet:** 2 of 2

**Drill Date:** 11/14/2017  
**Borehole Size:** 6 Inches  
**Hammer Type:** Auto Trip  
**Weight & Drop:** 140 lbs./30 in.











Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

## Boring No. B-2

**Project:** Proposed Arco Station  
**Client:** Sater Oil International, LLC  
**Location:** NWC Iris Avenue & Oliver Street, Moreno Valley, CA  
**Grnd. Surf. Elev. (Ft. MSL)** N/A

**Project No:** 3-217-1265  
**Figure No.:** A-2  
**Logged By:** JH  
**Initial:** None  
**At Completion:** None

Depth to Water >

| SUBSURFACE PROFILE |   |  | SAMPLE            |                      |              |   |            | Penetration Test |    |    |    | Water Level |
|--------------------|---|--|-------------------|----------------------|--------------|---|------------|------------------|----|----|----|-------------|
| Depth (ft)         | Symbol  | Description  | Dry Density (pcf) | Moisture Content (%) | Sampler Type | Penetration   | Blow Count | 20               | 40 | 60 | 80 |             |
| 0                  |   | Ground Surface   |                   |                      |              |   |            |                  |    |    |    |             |
|                    |    | <b>Silty SAND (SM) with trace of Gravel</b><br>Very loose; brown; moist; fine to coarse-grained. | 104.0             | 4.8                  | MCS          |    | 3          |                  |    |    |    |             |
|                    |    | <b>Silty SAND (SM)</b><br>Loose; brown; moist; fine to medium-grained.                           | 108.8             | 5.4                  | MCS          |    | 9          |                  |    |    |    |             |
|                    |  | Grades as above; medium dense.   | 109.8             | 4.1                  | MCS          |  | 32         |                  |    |    |    |             |
|                    |  | <b>Silty Clayey SAND (SC)</b><br>Very dense; brown; moist; fine to medium-grained.               | --                | 8.4                  | SPT          |  | 50         |                  |    |    |    |             |
|                    |   | End of Borehole  |                   |                      |              |   |            |                  |    |    |    |             |
| 20                 |   |  |                   |                      |              |   |            |                  |    |    |    |             |
| 25                 |   |  |                   |                      |              |   |            |                  |    |    |    |             |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

**Drill Method:** Solid Flight Auger  
**Drill Rig:** CME 45C  
**Driller:** Salem Engineering Group, Inc.  
**Sheet:** 1 of 1

**Drill Date:** 11/14/2017  
**Borehole Size:** 4 Inches  
**Hammer Type:** Auto Trip  
**Weight & Drop:** 140 lbs/30 in.



## Boring No. B-3

**Project:** Proposed Arco Station  
**Client:** Sater Oil International, LLC  
**Location:** NWC Iris Avenue & Oliver Street, Moreno Valley, CA  
**Grnd. Surf. Elev. (Ft. MSL)** N/A

**Project No.:** 3-217-1265  
**Figure No.:** A-3  
**Logged By:** JH  
**Initial:** None  
**At Completion:** None

Depth to Water >

| SUBSURFACE PROFILE |        |   | SAMPLE            |                      |              |             |            | Penetration Test |    |    |    | Water Level |
|--------------------|--------|---|-------------------|----------------------|--------------|-------------|------------|------------------|----|----|----|-------------|
| Depth (ft)         | Symbol | Description   | Dry Density (pcf) | Moisture Content (%) | Sampler Type | Penetration | Blow Count | 20               | 40 | 60 | 80 |             |
| 0                  |        | Ground Surface  |                   |                      |              |             |            |                  |    |    |    |             |
|                    |        | <b>Silty SAND (SM)</b><br>Medium dense; brown; moist; fine to medium-grained. | 107.2             | 2.2                  | MCS          |             | 19         |                  |    |    |    |             |
| 5                  |        | Grades as above; loose.   | 104.4             | 2.0                  | MCS          |             | 11         |                  |    |    |    |             |
| 10                 |        | Grades as above; medium dense.  | 108.9             | 4.5                  | MCS          |             | 17         |                  |    |    |    |             |
|                    |        | <b>Silty Clayey SAND (SC)</b><br>Dense; brown; moist; fine to medium-grained. | --                | 8.6                  | SPT          |             | 48         |                  |    |    |    |             |
| 15                 |        | End of Borehole   |                   |                      |              |             |            |                  |    |    |    |             |
| 20                 |        |   |                   |                      |              |             |            |                  |    |    |    |             |
| 25                 |        |   |                   |                      |              |             |            |                  |    |    |    |             |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

**Drill Method:** Solid Flight Auger  
**Drill Rig:** CME 45C  
**Driller:** Salem Engineering Group, Inc.  
**Sheet:** 1 of 1

**Drill Date:** 11/14/2017  
**Borehole Size:** 4 Inches  
**Hammer Type:** Auto Trip  
**Weight & Drop:** 140 lbs/30 in.



# Boring No. B-4

**Project:** Proposed Arco Station  
**Client:** Sater Oil International, LLC  
**Location:** NWC Iris Avenue & Oliver Street, Moreno Valley, CA  
**Grnd. Surf. Elev. (Ft. MSL)** N/A

**Project No:** 3-217-1265  
**Figure No.:** A-4  
**Logged By:** JH  
**Initial:** None  
**At Completion:** None

Depth to Water >

| SUBSURFACE PROFILE |        |   | SAMPLE            |                      |              |             |            | Penetration Test |    |    |    | Water Level |
|--------------------|--------|---|-------------------|----------------------|--------------|-------------|------------|------------------|----|----|----|-------------|
| Depth (ft)         | Symbol | Description   | Dry Density (pcf) | Moisture Content (%) | Sampler Type | Penetration | Blow Count | 20               | 40 | 60 | 80 |             |
| 0                  |        | Ground Surface  |                   |                      |              |             |            |                  |    |    |    |             |
|                    |        | <b>Silty SAND (SM)</b><br>Loose; brown; moist; fine to medium-grained.        | 111.7             | 4.0                  | MCS          |             | 7          |                  |    |    |    |             |
| 5                  |        | Grades as above.  | 106.3             | 5.2                  | MCS          |             | 7          |                  |    |    |    |             |
| 10                 |        | Grades as above; medium dense.  | 112.5             | 2.5                  | MCS          |             | 22         |                  |    |    |    |             |
| 15                 |        | <b>Silty Clayey SAND (SC)</b><br>Dense; brown; moist; fine to medium-grained. | --                | 9.2                  | SPT          |             | 32         |                  |    |    |    |             |
| 20                 |        | <b>Silty SAND (SM)</b><br>Dense; brown; moist; fine to medium-grained.        | --                | 6.4                  | SPT          |             | 36         |                  |    |    |    |             |
| 25                 |        | Grades as above.  | --                | 5.4                  | SPT          |             | 39         |                  |    |    |    |             |
|                    |        | End of Borehole   |                   |                      |              |             |            |                  |    |    |    |             |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

**Drill Method:** Solid Flight Auger  
**Drill Rig:** CME 45C  
**Driller:** Salem Engineering Group, Inc.  
**Sheet:** 1 of 1

**Drill Date:** 11/14/2017  
**Borehole Size:** 4 Inches  
**Hammer Type:** Auto Trip  
**Weight & Drop:** 140 lbs/30 in.



## Boring No. B-5

**Project:** Proposed Arco Station  
**Client:** Sater Oil International, LLC  
**Location:** NWC Iris Avenue & Oliver Street, Moreno Valley, CA  
**Grnd. Surf. Elev. (Ft. MSL)** N/A

**Project No:** 3-217-1265  
**Figure No.:** A-5  
**Logged By:** JH  
**Initial:** None  
**At Completion:** None

Depth to Water >

| SUBSURFACE PROFILE |        |  | SAMPLE            |                      |              |             |            | Penetration Test |    |    |    | Water Level |
|--------------------|--------|--|-------------------|----------------------|--------------|-------------|------------|------------------|----|----|----|-------------|
| Depth (ft)         | Symbol | Description  | Dry Density (pcf) | Moisture Content (%) | Sampler Type | Penetration | Blow Count | 20               | 40 | 60 | 80 |             |
| 0                  |        | Ground Surface   |                   |                      |              |             |            |                  |    |    |    |             |
|                    |        | <b>Silty SAND (SM)</b><br>Loose; brown; moist; fine to medium-grained. | 105.7             | 2.0                  | MCS          |             | 11         |                  |    |    |    |             |
| 5                  |        | Grades as above.   | 105.8             | 2.0                  | MCS          |             | 12         |                  |    |    |    |             |
| 10                 |        | Grades as above; medium dense.   | 114.6             | 4.4                  | MCS          |             | 23         |                  |    |    |    |             |
| 15                 |        | Grades as above; with clay.  | --                | 7.9                  | SPT          |             | 19         |                  |    |    |    |             |
|                    |        | End of Borehole  |                   |                      |              |             |            |                  |    |    |    |             |
| 20                 |        |  |                   |                      |              |             |            |                  |    |    |    |             |
| 25                 |        |  |                   |                      |              |             |            |                  |    |    |    |             |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

**Drill Method:** Solid Flight Auger  
**Drill Rig:** CME 45C  
**Driller:** Salem Engineering Group, Inc.  
**Sheet:** 1 of 1

**Drill Date:** 11/14/2017  
**Borehole Size:** 4 Inches  
**Hammer Type:** Auto Trip  
**Weight & Drop:** 140 lbs/30 in.



### Percolation Test Worksheet

**Project:** Proposed Arco Station  
 NWC Iris Ave & Oliver Street  
 Moreno Valley, CA

**Job No.:** 3-217-1265  
**Date Drilled:** 11/14/2017  
**Soil Classification:** Silty SAND (SM)

Hole Radius: 4 in.  
 Pipe Dia.: 3 in.  
 Total Depth of Hole: 96 in.

**Test Hole No.:** P-1  
**Tested by:** JH  
**Drilled Hole Depth:** 8 ft.

**Presoaking Date:** 11/14/2017  
**Test Date:** 11/15/2017

Stick Up 0 ft

| Time Start                     | Time Finish | Depth of Test Hole (ft) <sup>#</sup> | Refill- Yes or No | Elapsed Time (hrs:min) | Initial Water Level <sup>#</sup> (ft) | Final Water Level <sup>#</sup> (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) | Infiltration Rate, It (in/hr) |
|--------------------------------|-------------|--------------------------------------|-------------------|------------------------|---------------------------------------|-------------------------------------|---------------------|--------|--------------------------|------------------------------|----------------------------|------------------------------|-------------------------------|
| 11:21                          | 11:46       | 8.0                                  | Y                 | 0:25                   | 6.15                                  | 6.75                                | 7.20                | 25     | 3.5                      | 22.2                         | 15.0                       | 18.6                         | 1.68                          |
| 11:47                          | 12:12       | 8.0                                  | Y                 | 0:25                   | 6.22                                  | 6.77                                | 6.60                | 25     | 3.8                      | 21.4                         | 14.8                       | 18.1                         | 1.58                          |
| 12:14                          | 12:24       | 8.0                                  | Y                 | 0:10                   | 6.41                                  | 6.62                                | 2.52                | 10     | 4.0                      | 19.1                         | 16.6                       | 17.8                         | 1.53                          |
| 12:24                          | 12:34       | 8.0                                  | N                 | 0:10                   | 6.62                                  | 6.80                                | 2.16                | 10     | 4.6                      | 16.6                         | 14.4                       | 15.5                         | 1.48                          |
| 12:34                          | 12:44       | 8.0                                  | N                 | 0:10                   | 6.80                                  | 6.96                                | 1.92                | 10     | 5.2                      | 14.4                         | 12.5                       | 13.4                         | 1.49                          |
| 12:44                          | 12:54       | 8.0                                  | N                 | 0:10                   | 6.96                                  | 7.10                                | 1.68                | 10     | 6.0                      | 12.5                         | 10.8                       | 11.6                         | 1.48                          |
| 12:54                          | 13:04       | 8.0                                  | N                 | 0:10                   | 7.10                                  | 7.22                                | 1.44                | 10     | 6.9                      | 10.8                         | 9.4                        | 10.1                         | 1.43                          |
| 13:04                          | 13:14       | 8.0                                  | N                 | 0:10                   | 7.22                                  | 7.33                                | 1.32                | 10     | 7.6                      | 9.4                          | 8.0                        | 8.7                          | 1.48                          |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
| <b>Recommended for Design:</b> |             |                                      |                   |                        |                                       |                                     |                     |        |                          | <b>Infiltration Rate</b>     |                            | <b>1.43</b>                  |                               |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A



## Percolation Test Worksheet

**Project:** Proposed Arco Station  
 NWC Iris Ave & Oliver Street  
 Moreno Valley, CA

**Job No.:** 3-217-1265  
**Date Drilled:** 11/14/2017  
**Soil Classification:** Silty SAND (SM)

Hole Radius: 4 in.

Pipe Dia.: 3 in.

Total Depth of Hole: 120 in.

**Test Hole No.:** P-2

**Presoaking Date:** 11/14/2017

**Tested by:** JH

**Test Date:** 11/15/2017

**Drilled Hole Depth:** 10 ft.

Stick Up 0 ft

| Time Start                     | Time Finish | Depth of Test Hole (ft) <sup>#</sup> | Refill- Yes or No | Elapsed Time (hrs:min) | Initial Water Level <sup>#</sup> (ft) | Final Water Level <sup>#</sup> (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) | Infiltration Rate, It (in/hr) |
|--------------------------------|-------------|--------------------------------------|-------------------|------------------------|---------------------------------------|-------------------------------------|---------------------|--------|--------------------------|------------------------------|----------------------------|------------------------------|-------------------------------|
| 11:13                          | 11:43       | 10.0                                 | Y                 | 0:30                   | 6.25                                  | 6.91                                | 7.92                | 30     | 3.8                      | 45.0                         | 37.1                       | 41.0                         | 0.74                          |
| 11:43                          | 12:13       | 10.0                                 | N                 | 0:30                   | 6.91                                  | 7.41                                | 6.00                | 30     | 5.0                      | 37.1                         | 31.1                       | 34.1                         | 0.67                          |
| 12:13                          | 12:43       | 10.0                                 | N                 | 0:30                   | 7.41                                  | 7.82                                | 4.92                | 30     | 6.1                      | 31.1                         | 26.2                       | 28.6                         | 0.64                          |
| 12:43                          | 13:13       | 10.0                                 | N                 | 0:30                   | 7.82                                  | 8.15                                | 3.96                | 30     | 7.6                      | 26.2                         | 22.2                       | 24.2                         | 0.61                          |
| 13:13                          | 13:43       | 10.0                                 | N                 | 0:30                   | 8.15                                  | 8.42                                | 3.24                | 30     | 9.3                      | 22.2                         | 19.0                       | 20.6                         | 0.57                          |
| 13:43                          | 14:13       | 10.0                                 | N                 | 0:30                   | 8.42                                  | 8.65                                | 2.76                | 30     | 10.9                     | 19.0                         | 16.2                       | 17.6                         | 0.56                          |
| 14:13                          | 14:43       | 10.0                                 | N                 | 0:30                   | 8.65                                  | 8.85                                | 2.40                | 30     | 12.5                     | 16.2                         | 13.8                       | 15.0                         | 0.56                          |
| 14:43                          | 15:13       | 10.0                                 | N                 | 0:30                   | 8.85                                  | 9.02                                | 2.04                | 30     | 14.7                     | 13.8                         | 11.8                       | 12.8                         | 0.55                          |
| 15:13                          | 15:43       | 10.0                                 | N                 | 0:30                   | 9.02                                  | 9.17                                | 1.80                | 30     | 16.7                     | 11.8                         | 10.0                       | 10.9                         | 0.56                          |
| 15:43                          | 16:13       | 10.0                                 | N                 | 0:30                   | 9.17                                  | 9.30                                | 1.56                | 30     | 19.2                     | 10.0                         | 8.4                        | 9.2                          | 0.56                          |
| 16:13                          | 16:43       | 10.0                                 | N                 | 0:30                   | 9.30                                  | 9.42                                | 1.44                | 30     | 20.8                     | 8.4                          | 7.0                        | 7.7                          | 0.60                          |
| 16:43                          | 17:13       | 10.0                                 | N                 | 0:30                   | 9.42                                  | 9.52                                | 1.20                | 30     | 25.0                     | 7.0                          | 5.8                        | 6.4                          | 0.57                          |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
| <b>Recommended for Design:</b> |             |                                      |                   |                        |                                       |                                     |                     |        |                          | <b>Infiltration Rate</b>     |                            | <b>0.55</b>                  |                               |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A



### Percolation Test Worksheet

**Project: Proposed Arco Station**  
**NWC Iris Ave & Oliver Street**  
**Moreno Valley, CA**

**Job No.: 3-217-1265**  
**Date Drilled: 11/14/2017**  
**Soil Classification: Silty SAND (SM)**

Hole Radius: 4 in.

Pipe Dia.: 3 in.

Total Depth of Hole: 96 in.

**Test Hole No.: P-3**

**Presoaking Date: 11/14/2017**

**Tested by: JH**

**Test Date: 11/15/2017**

**Drilled Hole Depth: 8 ft.**

**Stick Up 0 ft**

| Time Start                     | Time Finish | Depth of Test Hole (ft) <sup>#</sup> | Refill- Yes or No | Elapsed Time (hrs:min) | Initial Water Level <sup>#</sup> (ft) | Final Water Level <sup>#</sup> (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) | Infiltration Rate, It (in/hr) |
|--------------------------------|-------------|--------------------------------------|-------------------|------------------------|---------------------------------------|-------------------------------------|---------------------|--------|--------------------------|------------------------------|----------------------------|------------------------------|-------------------------------|
| 11:15                          | 11:45       | 8.0                                  | Y                 | 0:30                   | 4.52                                  | 5.11                                | 7.08                | 30     | 4.2                      | 41.8                         | 34.7                       | 38.2                         | 0.70                          |
| 11:45                          | 12:15       | 8.0                                  | N                 | 0:30                   | 5.11                                  | 5.54                                | 5.16                | 30     | 5.8                      | 34.7                         | 29.5                       | 32.1                         | 0.61                          |
| 12:15                          | 12:45       | 8.0                                  | N                 | 0:30                   | 5.54                                  | 5.88                                | 4.08                | 30     | 7.4                      | 29.5                         | 25.4                       | 27.5                         | 0.55                          |
| 12:45                          | 13:15       | 8.0                                  | N                 | 0:30                   | 5.88                                  | 6.16                                | 3.36                | 30     | 8.9                      | 25.4                         | 22.1                       | 23.8                         | 0.52                          |
| 13:15                          | 13:45       | 8.0                                  | N                 | 0:30                   | 6.16                                  | 6.40                                | 2.88                | 30     | 10.4                     | 22.1                         | 19.2                       | 20.6                         | 0.51                          |
| 13:45                          | 14:15       | 8.0                                  | N                 | 0:30                   | 6.40                                  | 6.61                                | 2.52                | 30     | 11.9                     | 19.2                         | 16.7                       | 17.9                         | 0.51                          |
| 14:15                          | 14:45       | 8.0                                  | N                 | 0:30                   | 6.61                                  | 6.80                                | 2.28                | 30     | 13.2                     | 16.7                         | 14.4                       | 15.5                         | 0.52                          |
| 14:45                          | 15:15       | 8.0                                  | N                 | 0:30                   | 6.80                                  | 6.97                                | 2.04                | 30     | 14.7                     | 14.4                         | 12.4                       | 13.4                         | 0.53                          |
| 15:15                          | 15:45       | 8.0                                  | N                 | 0:30                   | 6.97                                  | 7.12                                | 1.80                | 30     | 16.7                     | 12.4                         | 10.6                       | 11.5                         | 0.53                          |
| 15:45                          | 16:15       | 8.0                                  | N                 | 0:30                   | 7.12                                  | 7.25                                | 1.56                | 30     | 19.2                     | 10.6                         | 9.0                        | 9.8                          | 0.53                          |
| 16:15                          | 16:45       | 8.0                                  | N                 | 0:30                   | 7.25                                  | 7.36                                | 1.32                | 30     | 22.7                     | 9.0                          | 7.7                        | 8.3                          | 0.51                          |
| 16:45                          | 17:15       | 8.0                                  | N                 | 0:30                   | 7.36                                  | 7.46                                | 1.20                | 30     | 25.0                     | 7.7                          | 6.5                        | 7.1                          | 0.53                          |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
| <b>Recommended for Design:</b> |             |                                      |                   |                        |                                       |                                     |                     |        |                          | <b>Infiltration Rate</b>     |                            | <b>0.51</b>                  |                               |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A





### Percolation Test Worksheet

**Project:** Proposed Arco Station  
 NWC Iris Ave & Oliver Street  
 Moreno Valley, CA

**Job No.:** 3-217-1265  
**Date Drilled:** 11/14/2017  
**Soil Classification:** Silty SAND (SM)

Hole Radius: 4 in.

Pipe Dia.: 3 in.

Total Depth of Hole: 120 in.

**Test Hole No.:** P-4

**Presoaking Date:** 11/14/2017

**Tested by:** JH

**Test Date:** 11/15/2017

**Drilled Hole Depth:** 10 ft.

Stick Up 0 ft

| Time Start                     | Time Finish | Depth of Test Hole (ft) <sup>#</sup> | Refill- Yes or No | Elapsed Time (hrs:min) | Initial Water Level <sup>#</sup> (ft) | Final Water Level <sup>#</sup> (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) | Infiltration Rate, It (in/hr) |
|--------------------------------|-------------|--------------------------------------|-------------------|------------------------|---------------------------------------|-------------------------------------|---------------------|--------|--------------------------|------------------------------|----------------------------|------------------------------|-------------------------------|
| 11:23                          | 11:48       | 10.0                                 | Y                 | 0:25                   | 8.00                                  | 8.57                                | 6.84                | 25     | 3.7                      | 24.0                         | 17.2                       | 20.6                         | 1.45                          |
| 11:49                          | 12:14       | 10.0                                 | Y                 | 0:25                   | 8.11                                  | 8.62                                | 6.12                | 25     | 4.1                      | 22.7                         | 16.6                       | 19.6                         | 1.36                          |
| 12:16                          | 12:26       | 10.0                                 | Y                 | 0:10                   | 8.36                                  | 8.55                                | 2.28                | 10     | 4.4                      | 19.7                         | 17.4                       | 18.5                         | 1.33                          |
| 12:26                          | 12:36       | 10.0                                 | N                 | 0:10                   | 8.55                                  | 8.72                                | 2.04                | 10     | 4.9                      | 17.4                         | 15.4                       | 16.4                         | 1.33                          |
| 12:36                          | 12:46       | 10.0                                 | N                 | 0:10                   | 8.72                                  | 8.87                                | 1.80                | 10     | 5.6                      | 15.4                         | 13.6                       | 14.5                         | 1.31                          |
| 12:46                          | 12:56       | 10.0                                 | N                 | 0:10                   | 8.87                                  | 9.00                                | 1.56                | 10     | 6.4                      | 13.6                         | 12.0                       | 12.8                         | 1.27                          |
| 12:56                          | 13:06       | 10.0                                 | N                 | 0:10                   | 9.00                                  | 9.12                                | 1.44                | 10     | 6.9                      | 12.0                         | 10.6                       | 11.3                         | 1.30                          |
| 13:06                          | 13:16       | 10.0                                 | N                 | 0:10                   | 9.12                                  | 9.23                                | 1.32                | 10     | 7.6                      | 10.6                         | 9.2                        | 9.9                          | 1.33                          |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
|                                |             |                                      |                   |                        |                                       |                                     |                     |        |                          |                              |                            |                              |                               |
| <b>Recommended for Design:</b> |             |                                      |                   |                        |                                       |                                     |                     |        |                          | <b>Infiltration Rate</b>     |                            | <b>1.27</b>                  |                               |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A



APPENDIX

B

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

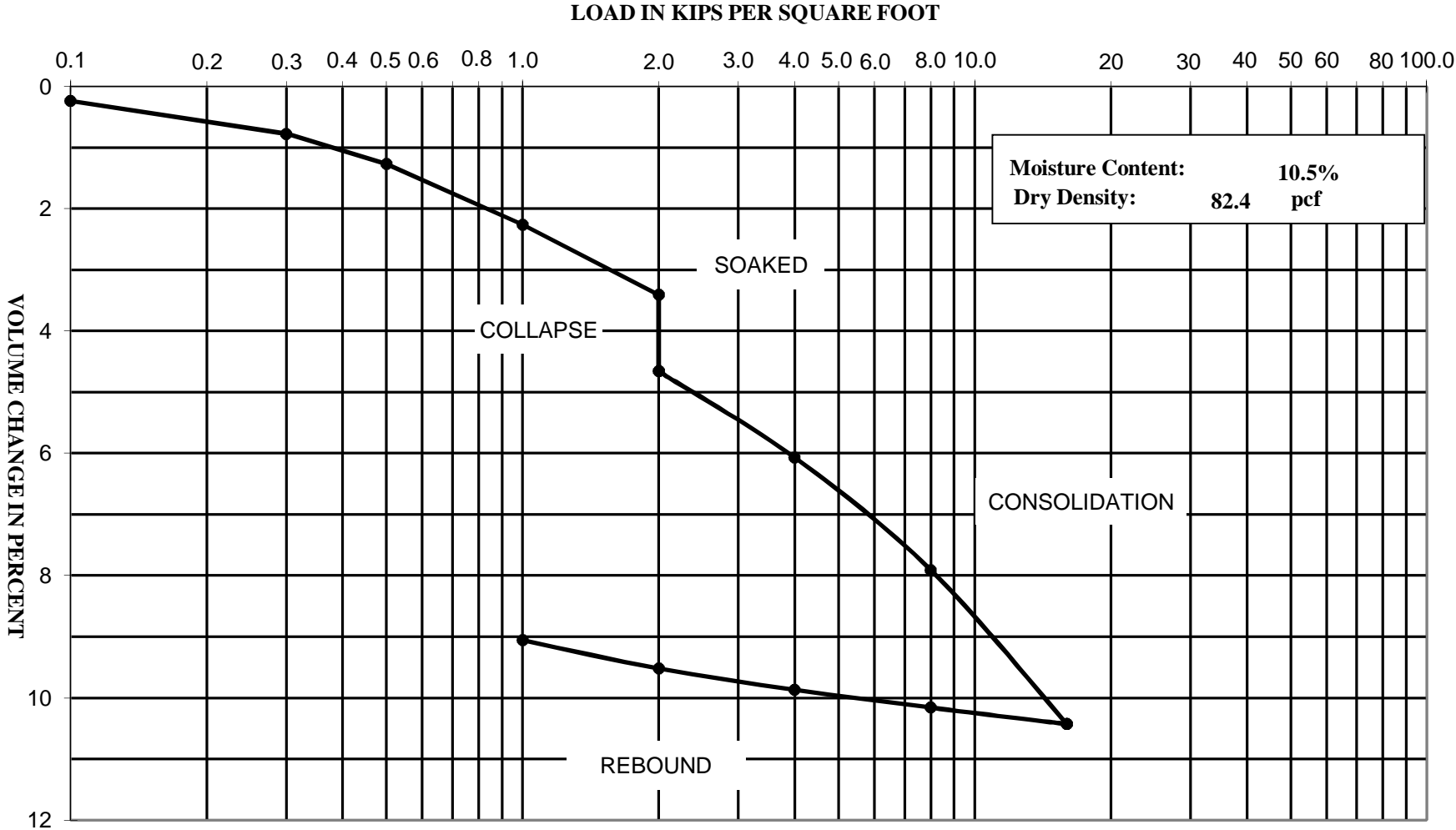


## APPENDIX B LABORATORY TESTING

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, maximum density and optimum moisture content, and grain size distribution. The results of the laboratory tests are summarized in the following figures.

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

### CONSOLIDATION - PRESSURE TEST DATA ASTM D 2435

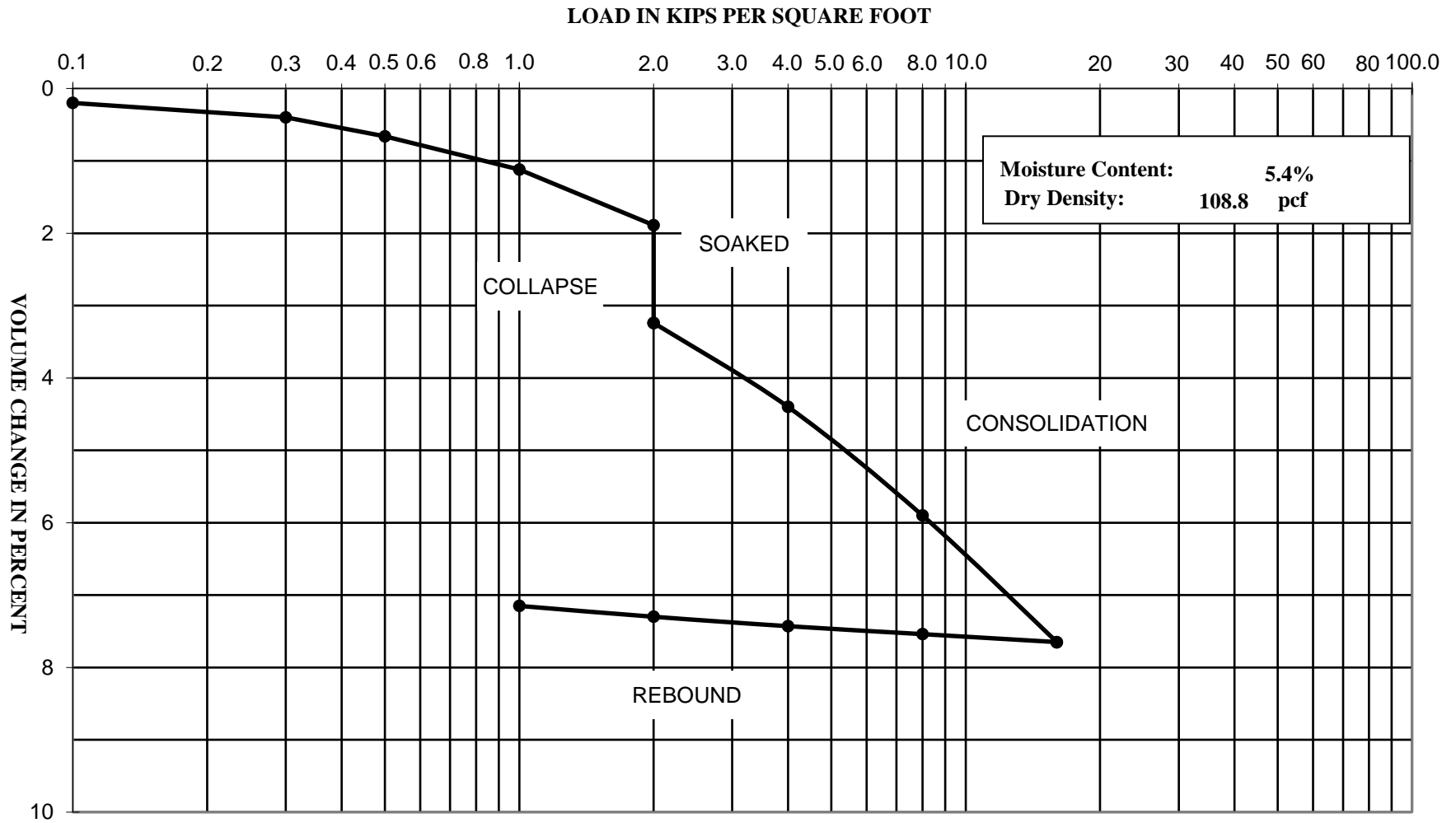


Prop. Arco Station - Moreno Valley, CA  
Project Number: 3-217-1265  
Boring: B-1 @ 2'



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

### CONSOLIDATION - PRESSURE TEST DATA ASTM D 2435



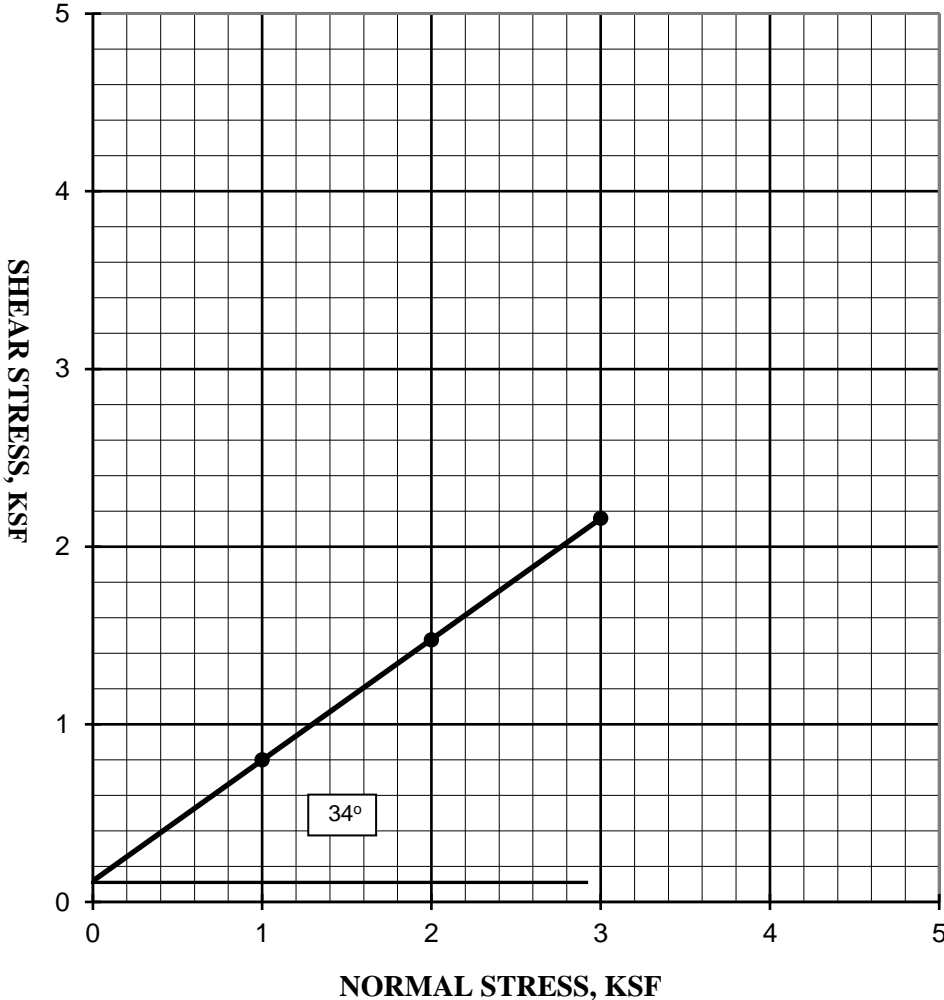
Prop. Arco Station - Moreno Valley, CA  
Project Number: 3-217-1265  
Boring: B-2 @ 5'







# SHEAR STRENGTH DIAGRAM (DIRECT SHEAR) ASTM D - 3080



Prop. Arco Station - Moreno Valley, CA

Project Number: 3-217-1265

Boring: B-1 @ 5'  
Soil Type: Silty SAND (SM)

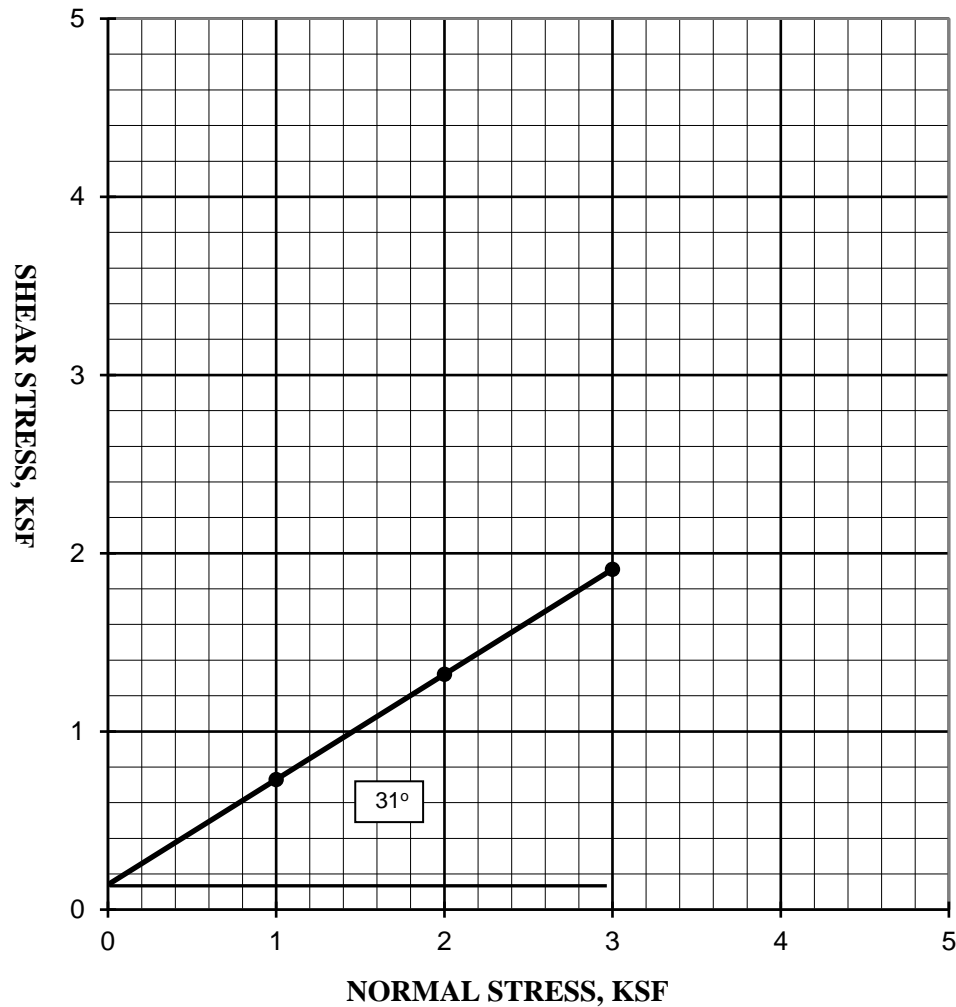
Friction Angle: 34 degrees  
Cohesion: 120 psf

Moisture Content 3.1%  
Dry Density 111.2 pcf



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

# SHEAR STRENGTH DIAGRAM (DIRECT SHEAR) ASTM D - 3080



Prop. Arco Station - Moreno Valley, CA

Project Number: 3-217-1265

Boring: B-2 @ 2'

Soil Type: Silty SAND (SM)

Friction Angle: 31 degrees

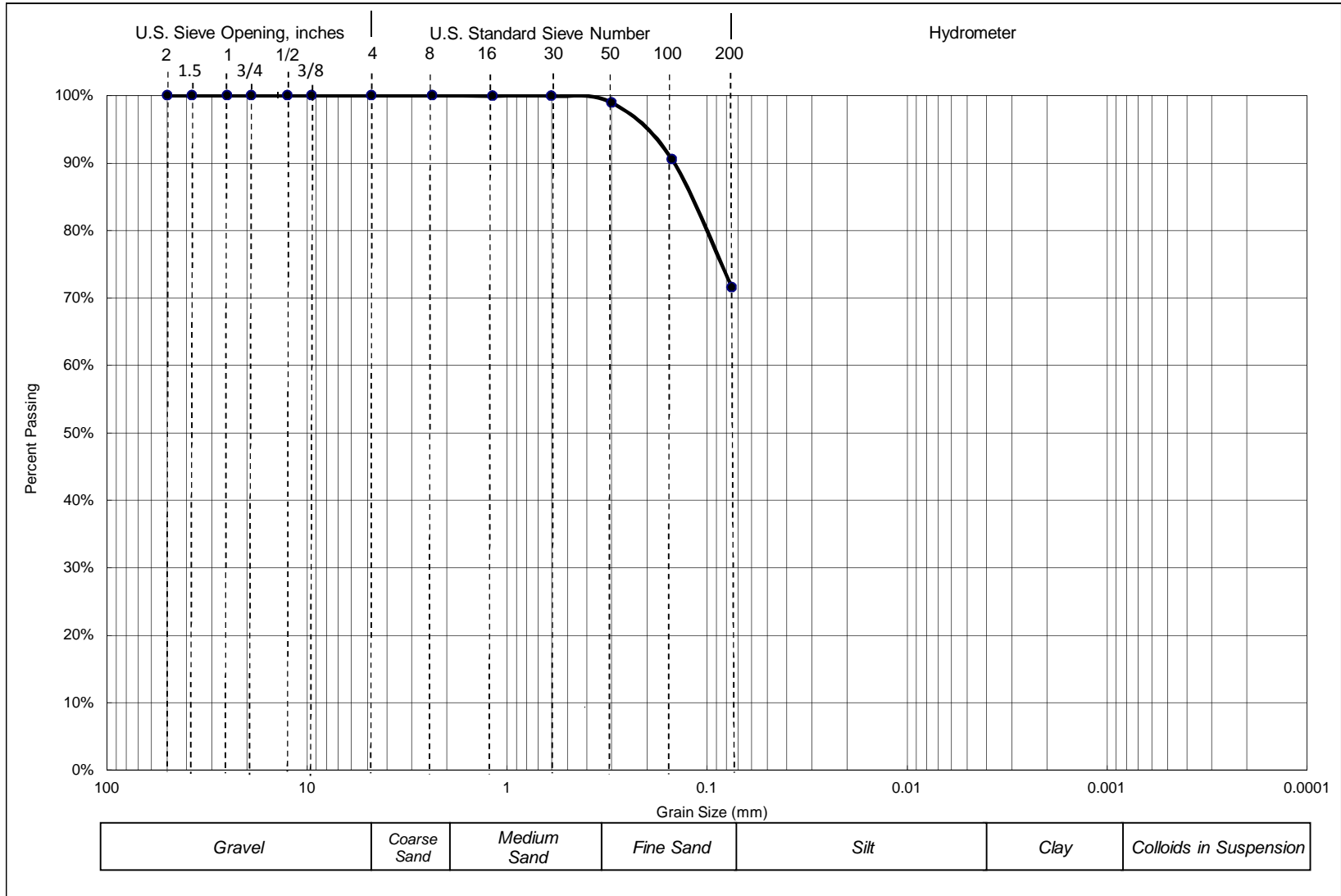
Cohesion: 140 psf

Moisture Content 4.8%

Dry Density 104.0 pcf



### PARTICLE SIZE DISTRIBUTION DIAGRAM GRADATION TEST - ASTM C136



Prop. Arco Station - Moreno Valley, CA  
Project Number: 3-217-1265  
Boring: B-1 @ 2'



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

**DRY SIEVE ANALYSIS**  
**ASTM C136 (without Hydrometer)**

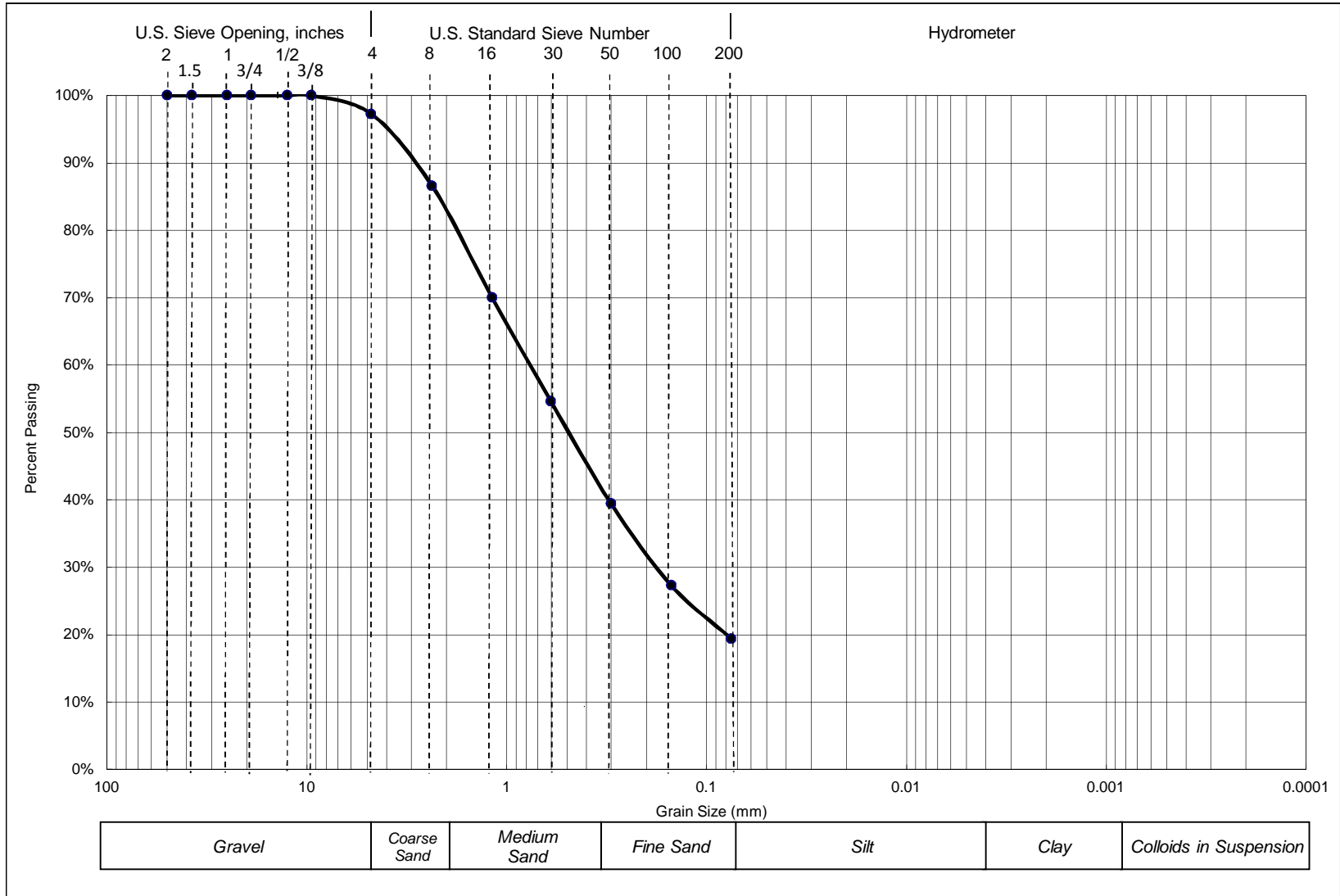
| Sieve Size | Particle Size, mm | Percent Passing |
|------------|-------------------|-----------------|
| 1 1/2-in.  | 37.5              | 100.0%          |
| 1-in.      | 25                | 100.0%          |
| 3/4-in.    | 19                | 100.0%          |
| 1/2-in.    | 12.5              | 100.0%          |
| 3/8-in.    | 9.5               | 100.0%          |
| No. 4      | 4.75              | 100.0%          |
| No. 8      | 2.36              | 100.0%          |
| No. 16     | 1.18              | 100.0%          |
| No. 30     | 0.6               | 100.0%          |
| No. 50     | 0.3               | 99.0%           |
| No. 100    | 0.15              | 90.6%           |
| No. 200    | 0.075             | 71.59%          |

**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 2'**





### PARTICLE SIZE DISTRIBUTION DIAGRAM GRADATION TEST - ASTM C136



**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 5'**



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

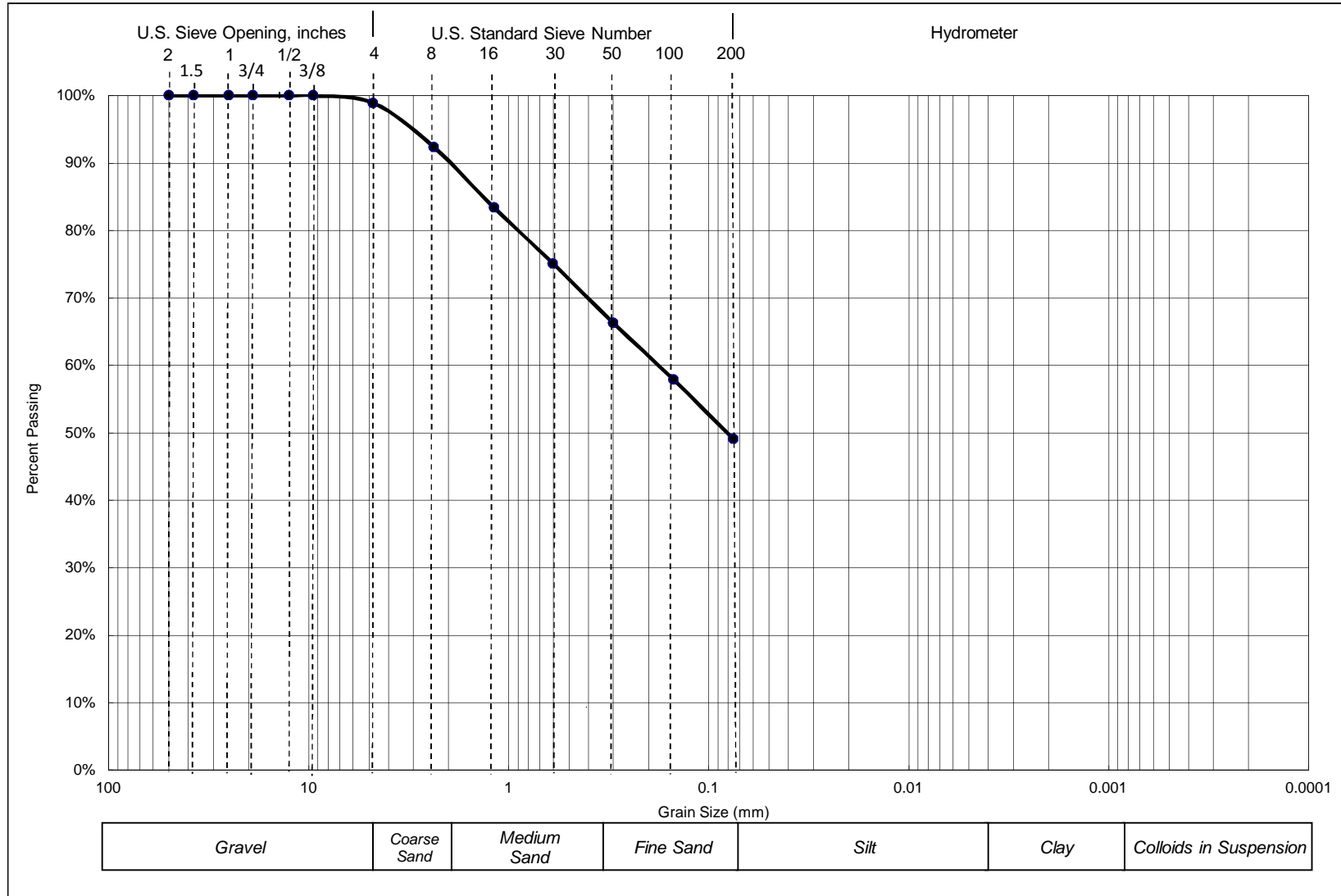
**DRY SIEVE ANALYSIS**  
**ASTM C136 (without Hydrometer)**

| 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              | 97.2%           |
| No. 8      | 2.36              | 86.6%           |
| No. 16     | 1.18              | 70.0%           |
| No. 30     | 0.6               | 54.6%           |
| No. 50     | 0.3               | 39.4%           |
| No. 100    | 0.15              | 27.3%           |
| No. 200    | 0.075             | 19.36%          |

**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 5'**



### PARTICLE SIZE DISTRIBUTION DIAGRAM GRADATION TEST - ASTM C136



**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 15'**



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

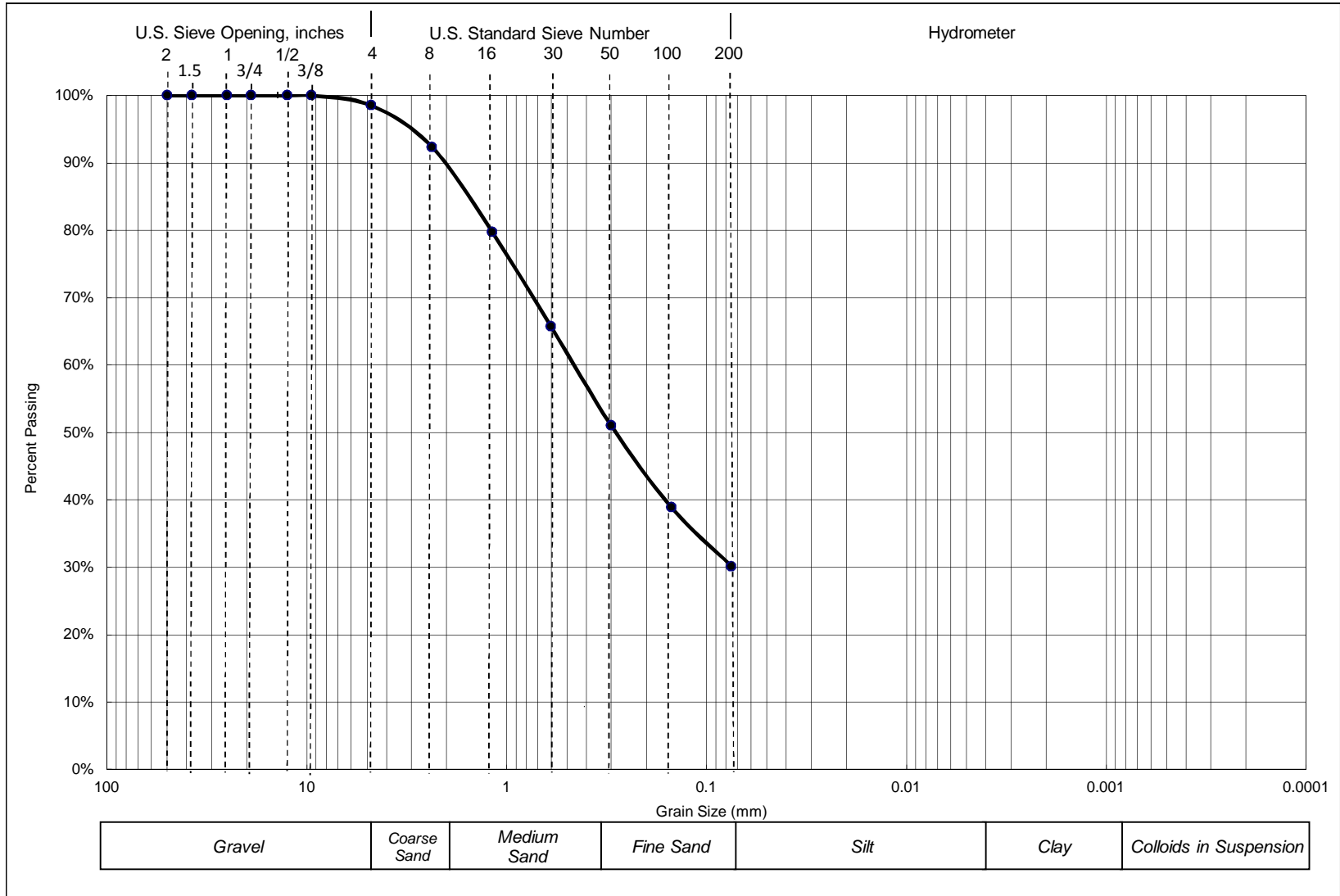
**DRY SIEVE ANALYSIS**  
**ASTM C136 (without Hydrometer)**

| 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              | 98.9%           |
| No. 8      | 2.36              | 92.3%           |
| No. 16     | 1.18              | 83.4%           |
| No. 30     | 0.6               | 75.1%           |
| No. 50     | 0.3               | 66.3%           |
| No. 100    | 0.15              | 57.9%           |
| No. 200    | 0.075             | 49.05%          |

**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 15'**



### PARTICLE SIZE DISTRIBUTION DIAGRAM GRADATION TEST - ASTM C136



**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 30'**



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A



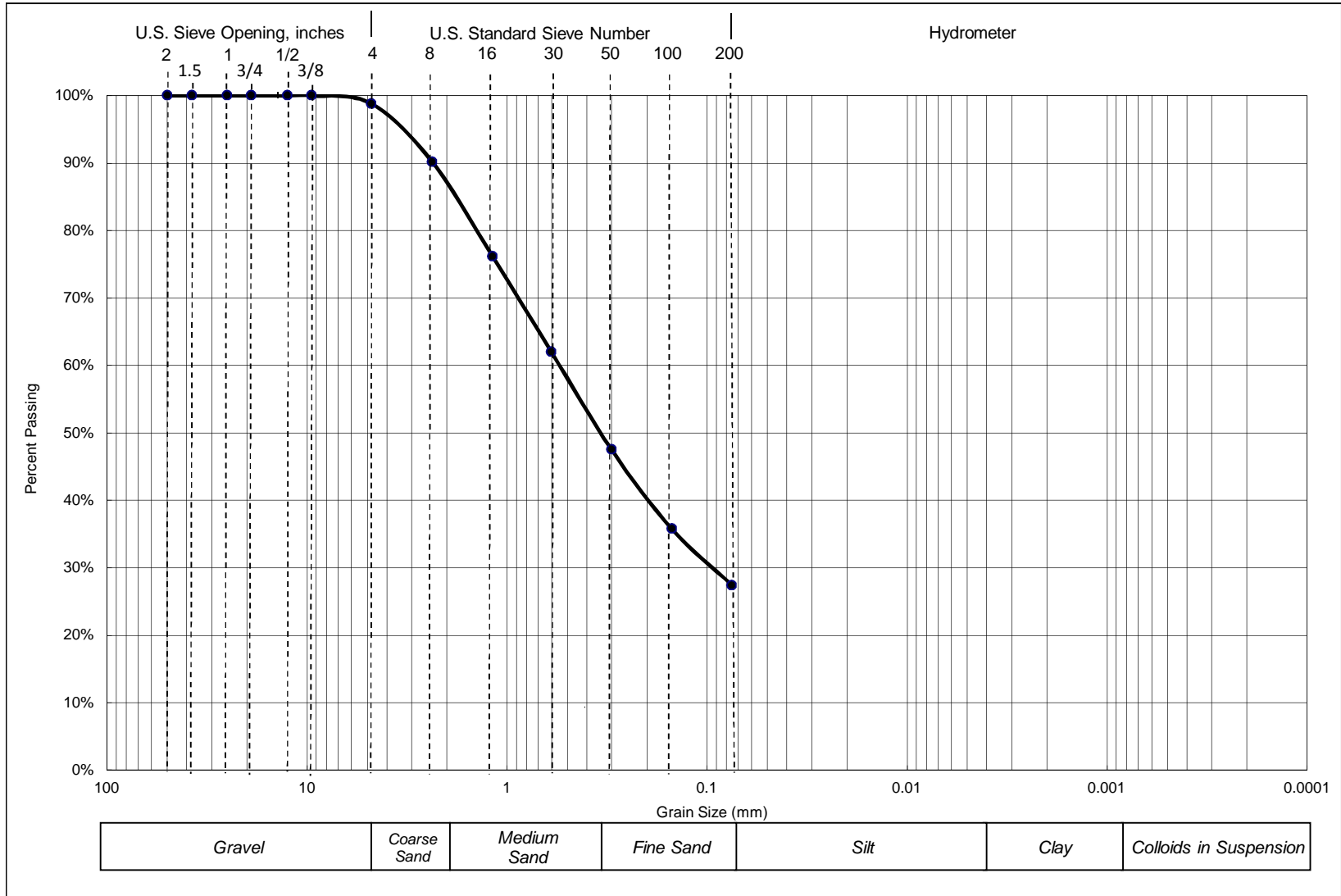
**DRY SIEVE ANALYSIS**  
**ASTM C136 (without Hydrometer)**

| 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              | 98.5%           |
| No. 8      | 2.36              | 92.3%           |
| No. 16     | 1.18              | 79.7%           |
| No. 30     | 0.6               | 65.7%           |
| No. 50     | 0.3               | 51.0%           |
| No. 100    | 0.15              | 38.9%           |
| No. 200    | 0.075             | 30.13%          |

**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 30'**



### PARTICLE SIZE DISTRIBUTION DIAGRAM GRADATION TEST - ASTM C136



**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 40'**



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

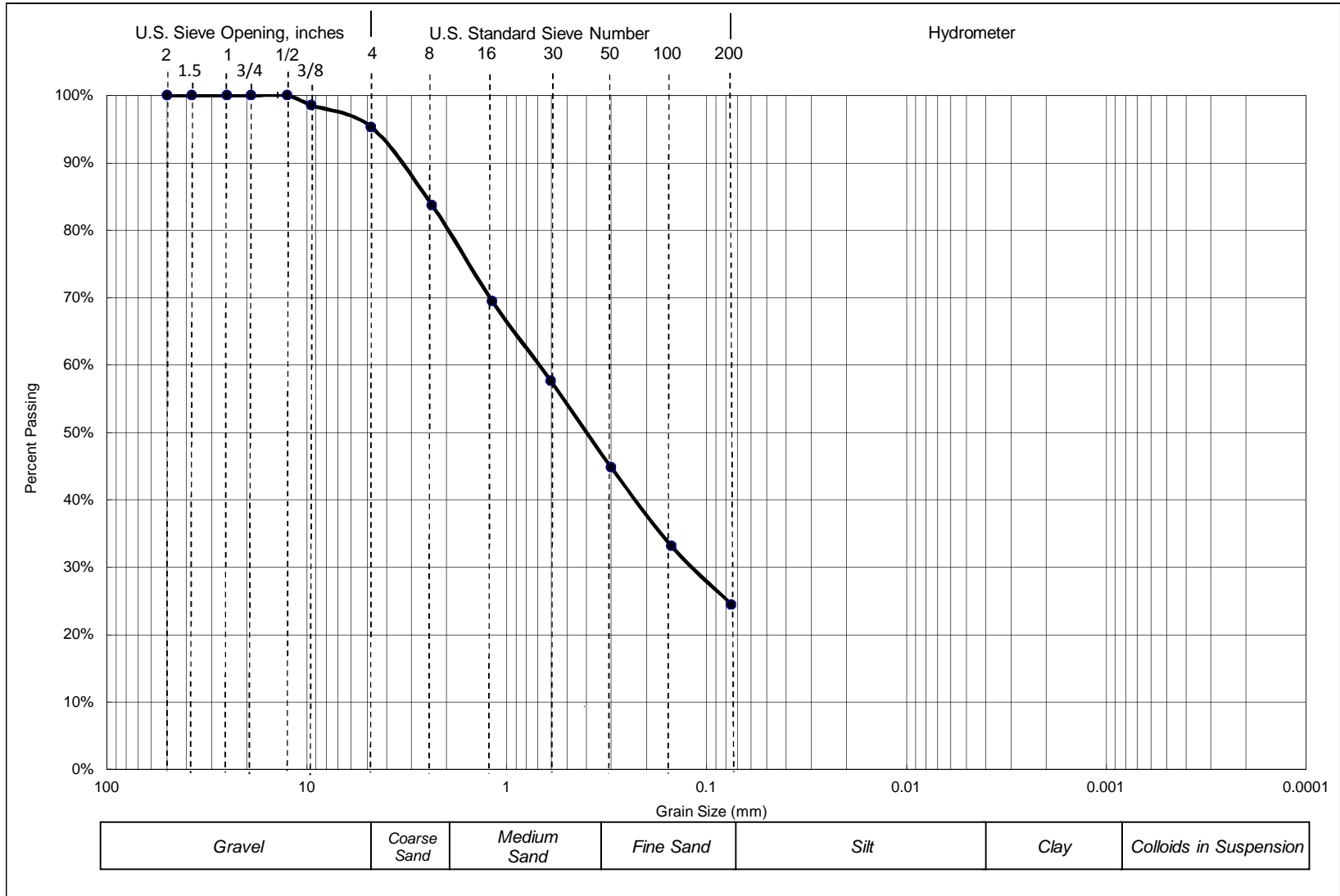
**DRY SIEVE ANALYSIS**  
**ASTM C136 (without Hydrometer)**

| 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              | 98.8%           |
| No. 8      | 2.36              | 90.1%           |
| No. 16     | 1.18              | 76.1%           |
| No. 30     | 0.6               | 62.0%           |
| No. 50     | 0.3               | 47.5%           |
| No. 100    | 0.15              | 35.7%           |
| No. 200    | 0.075             | 27.40%          |

**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-1 @ 40'**



### PARTICLE SIZE DISTRIBUTION DIAGRAM GRADATION TEST - ASTM C136



**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-2 @ 2'**



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

**DRY SIEVE ANALYSIS**  
**ASTM C136 (without Hydrometer)**

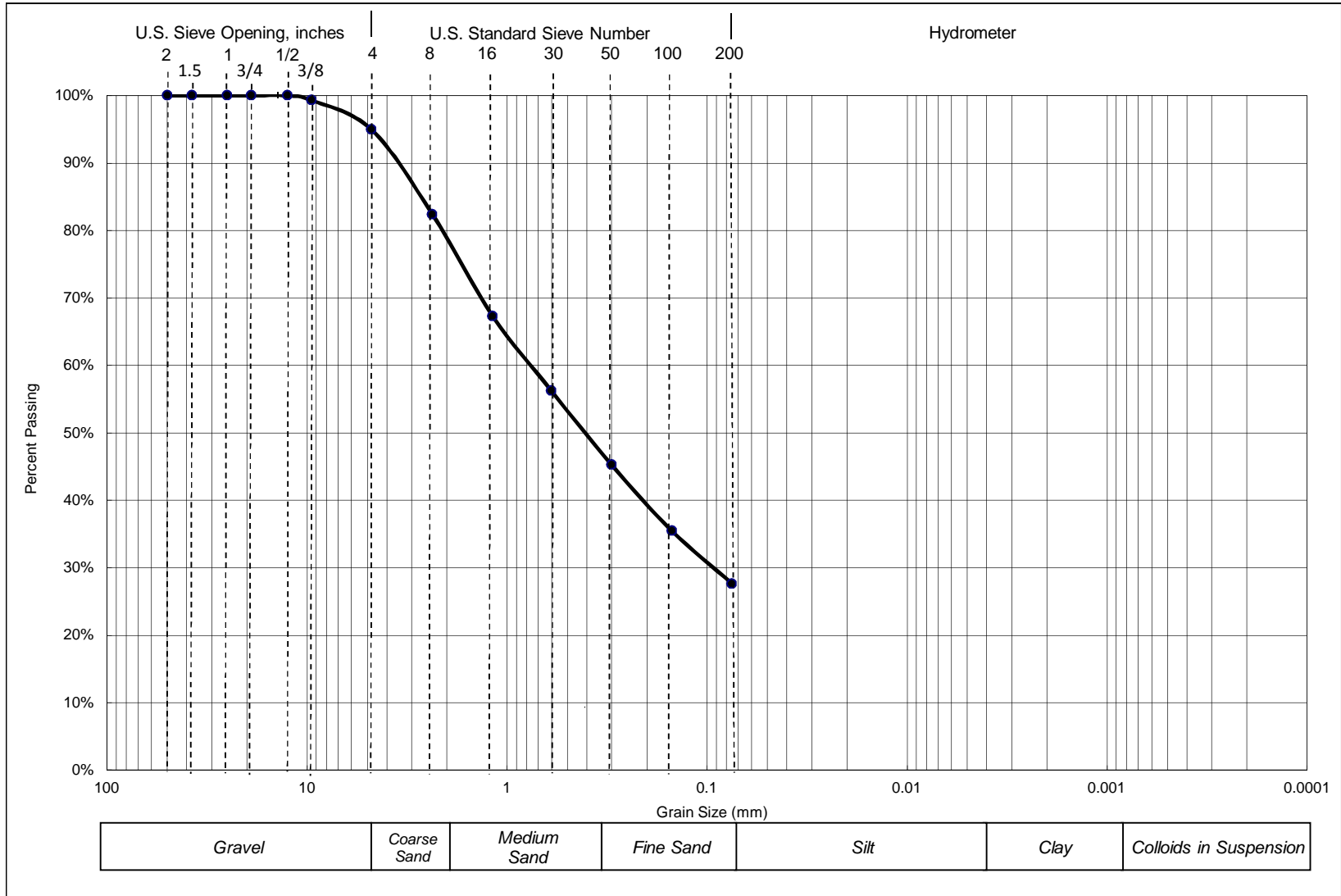
| Sieve Size | Particle Size, mm | Percent Passing |
|------------|-------------------|-----------------|
| 1 1/2-in.  | 37.5              | 100.0%          |
| 1-in.      | 25                | 100.0%          |
| 3/4-in.    | 19                | 100.0%          |
| 1/2-in.    | 12.5              | 100.0%          |
| 3/8-in.    | 9.5               | 98.6%           |
| No. 4      | 4.75              | 95.3%           |
| No. 8      | 2.36              | 83.7%           |
| No. 16     | 1.18              | 69.5%           |
| No. 30     | 0.6               | 57.6%           |
| No. 50     | 0.3               | 44.8%           |
| No. 100    | 0.15              | 33.2%           |
| No. 200    | 0.075             | 24.46%          |

**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-2 @ 2'**





### PARTICLE SIZE DISTRIBUTION DIAGRAM GRADATION TEST - ASTM C136



**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-2 @ 5'**



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A

**DRY SIEVE ANALYSIS**  
**ASTM C136 (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               | 99.3%           |
| No. 4      | 4.75              | 95.0%           |
| No. 8      | 2.36              | 82.4%           |
| No. 16     | 1.18              | 67.3%           |
| No. 30     | 0.6               | 56.2%           |
| No. 50     | 0.3               | 45.2%           |
| No. 100    | 0.15              | 35.5%           |
| No. 200    | 0.075             | 27.65%          |

**Prop. Arco Station - Moreno Valley, CA**  
**Project Number: 3-217-1265**  
**Boring: B-2 @ 5'**



## CHEMICAL ANALYSIS

### SO<sub>4</sub> - Modified Caltrans 417 & Cl - Modified Caltrans 417/422

Prop. Arco Station - Moreno Valley, CA

Project Number: 3-217-1265

Date: 11/17/17

Soil Classification: Silty SAND (SM)

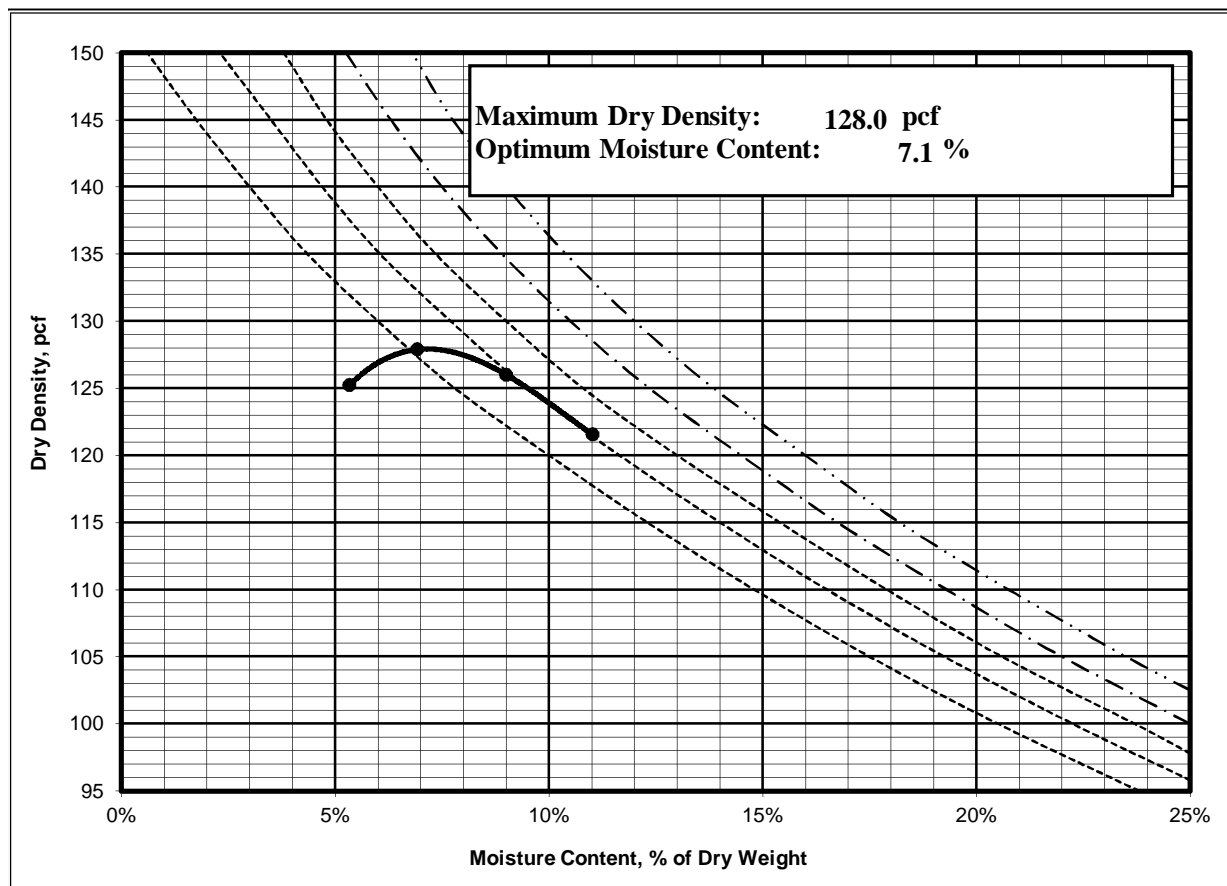
| Sample Number   | Sample Location | Soluble Sulfate<br>SO <sub>4</sub> -S | Soluble Chloride<br>Cl | pH         |
|-----------------|-----------------|---------------------------------------|------------------------|------------|
| 1a.             | B-1 @ 0 - 3'    | 50 mg/kg                              | 21 mg/kg               | 7.0        |
| 1b.             | B-1 @ 0 - 3'    | 50 mg/kg                              | 20 mg/kg               | 7.0        |
| 1c.             | B-1 @ 0 - 3'    | 50 mg/kg                              | 21 mg/kg               | 7.0        |
| <b>Average:</b> |                 | <b>50 mg/kg</b>                       | <b>21 mg/kg</b>        | <b>7.0</b> |

Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

## Laboratory Compaction Curve ASTM D1557

Prop. Arco Station - Moreno Valley, CA  
 Project Number: 3-217-1265  
 Date Tested: 11/17/17  
 Sample Location: B-1 @ 0 - 3'  
 Soil Classification: Silty Sand, Brown, Non-Cohesive  
 Sample/Curve Number: 1  
 Test Method: 1557 A

|                                      | 1      | 2      | 3      | 4      |
|--------------------------------------|--------|--------|--------|--------|
| Weight of Moist Specimen & Mold, (g) | 3991.6 | 4064.2 | 4073.2 | 4037.0 |
| Weight of Compaction Mold, (g)       | 1998.9 | 1998.9 | 1998.9 | 1998.9 |
| Weight of Moist Specimen, (g)        | 1992.7 | 2065.3 | 2074.3 | 2038.1 |
| Volume of mold, (ft <sup>3</sup> )   | 0.0333 | 0.0333 | 0.0333 | 0.0333 |
| Wet Density, (pcf)                   | 131.9  | 136.7  | 137.3  | 134.9  |
| Weight of Wet (Moisture) Sample, (g) | 341.2  | 341.2  | 341.2  | 341.2  |
| Weight of Dry (Moisture) Sample, (g) | 323.9  | 319.1  | 313.0  | 307.3  |
| Moisture Content, (%)                | 5.3%   | 6.9%   | 9.0%   | 11.0%  |
| Dry Density, (pcf)                   | 125.2  | 127.9  | 126.0  | 121.5  |



Attachment: Appendix G - Water Quality Management Plan (3309 : CONDITIONAL USE PERMIT FOR A GAS STATION)

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 than 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.

**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 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 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.

# Appendix 4: Historical Site Conditions

*Phase I Environmental Site Assessment or Other Information on Past Site Use*



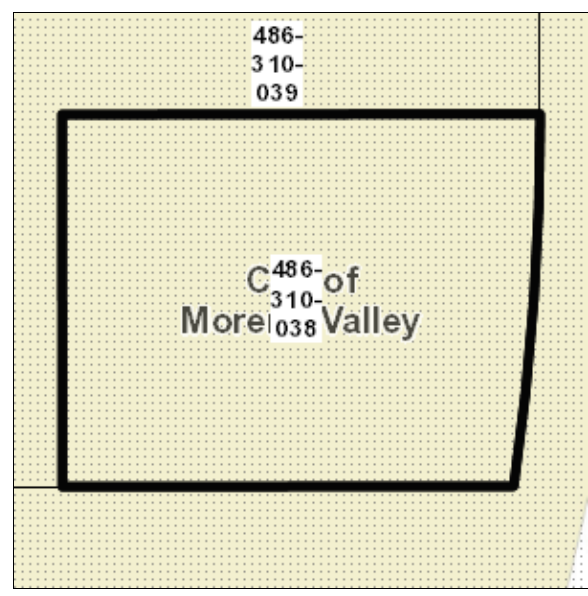
# Riverside County Parcel Report

APN(s):486310038

## DISCLAIMER

Maps, permit information and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

## MAPS/IMAGES



## PARCEL

|                   |  |                                 |  |
|-------------------|--|---------------------------------|--|
| APN               | 486-310-038-3  | Supervisory District            | Boundaries for Districts 2, 4 and 5 will be updated in January, 2023.<br>Boundaries for Districts 1 and 3 will be updated in January, 2025.<br>JEFF HEWITT, DISTRICT 5 |
| Previous APN      | 486310038<br>486310022   | Township/Range                  | T3SR3W SEC 22 NW   |
| Owner Name        | NOT AVAILABLE ONLINE   | Elevation                       | 1558 ft  |
| Address           |  | Thomas Bros. Map<br>Page/Grid   | PAGE: 748, GRID: C1  |
| Mailing Address   | 486310038<br>683 CLIFFSIDE DR<br>SAN DIMAS CA 91773  | Indian Tribal Land              | NOT IN A TRIBAL LAND   |
| Legal Description | 486310038<br>Recorded Book/Page: <a href="#">PM 239/30</a><br>Subdivision Name: PM 33361<br>Lot/Parcel: 1<br>Block:<br>Tract Number: | City Boundary                   | MORENO VALLEY  |
|                   |  | City Spheres of influence       | NOT IN A CITY SPHERE   |
| Lot Size          | 486310038<br>Recorded lot size is 1.31<br>acres  | March Joint Powers<br>Authority | NOT IN THE JURISDICTION OF THE MARCH JOINT POWERS<br>AUTHORITY   |



|                 |  |                     |                              |
|-----------------|--|---------------------|------------------------------|
| Property        | 486310038  | County Service Area | NOT IN A COUNTY SERVICE AREA |
| Characteristics | Year Constructed:<br>Baths:<br>Bedrooms:<br>Construction Type:<br>Garage Type:<br>Property Area (sq ft):<br>Roof Type:<br>Stories:<br>Pool: NO<br>Central Cool: NO<br>Central Heat: NO |                     |                              |

|                 |          |            |          |
|-----------------|----------|------------|----------|
| Annexation Date | 83-101-5 | LAFCO Case | 83-101-5 |
|-----------------|----------|------------|----------|

|           |     |  |  |
|-----------|-----|--|--|
| Proposals | N/A |  |  |
|-----------|-----|--|--|

**PLANNING more...**

|                |                        |                                 |   |
|----------------|------------------------|---------------------------------|---|
| Specific Plans | NOT IN A SPECIFIC PLAN | Historic Preservation Districts | NOT IN A HISTORIC PRESERVATION DISTRICT |
|----------------|------------------------|---------------------------------|---|

|                       |      |                       |                                 |
|-----------------------|------|-----------------------|---------------------------------|
| Land Use Designations | CITY | Agricultural Preserve | NOT IN AN AGRICULTURAL PRESERVE |
|-----------------------|------|-----------------------|---------------------------------|

|                              |     |  |  |
|------------------------------|-----|--|--|
| General Plan Policy Overlays | N/A |  |  |
|------------------------------|-----|--|--|

|                  |                         |                         |                                  |
|------------------|-------------------------|-------------------------|----------------------------------|
| Area Plan (RCIP) | Reche Canyon / Badlands | Airport Influence Areas | NOT IN AN AIRPORT INFLUENCE AREA |
|------------------|-------------------------|-------------------------|----------------------------------|

|                           |                                   |                             |                                      |
|---------------------------|-----------------------------------|-----------------------------|--------------------------------------|
| General Plan Policy Areas | NOT IN A GENERAL PLAN POLICY AREA | Airport Compatibility Zones | NOT IN AN AIRPORT COMPATIBILITY AREA |
|---------------------------|-----------------------------------|-----------------------------|--------------------------------------|

|   |  |                                   |                               |
|---|--|-----------------------------------|-------------------------------|
| <a href="#">Zoning Classifications (ORD. 348)</a> | CHECK WITH THE CITY FOR MORE INFORMATION | Zoning Districts and Zoning Areas | NOT IN A ZONING DISTRICT/AREA |
|---|--|-----------------------------------|-------------------------------|

|                 |                         |                             |                                     |
|-----------------|-------------------------|-----------------------------|-------------------------------------|
| Zoning Overlays | NOT IN A ZONING OVERLAY | Community Advisory Councils | NOT IN A COMMUNITY ADVISORY COUNCIL |
|-----------------|-------------------------|-----------------------------|-------------------------------------|

|                                   |   |  |  |
|-----------------------------------|---|--|--|
| Environmental Justice Communities | NOT IN AN ENVIRONMENTAL JUSTICE COMMUNITY |  |  |
|-----------------------------------|---|--|--|

|                          |     |  |  |
|--------------------------|-----|--|--|
| Residential Permit Stats | N/A |  |  |
|--------------------------|-----|--|--|

**ENVIRONMENTAL more...**

|  |  |   |                     |
|--|--|---|---------------------|
| <a href="#">CVMSHCP (Coachella Valley Multi-Species Habitat Conservation Plan) Plan Area</a> | NOT IN A COACHELLA VALLEY MSHCP FEE AREA | WRMSHCP (Western Riverside County Multi-Species Habitat Conservation Plan) Cell Group | NOT IN A CELL GROUP |
|--|--|---|---------------------|

|  |  |                     |                      |
|--|--|---------------------|----------------------|
| <a href="#">CVMSHCP (Coachella Valley Multi-Species Habitat Conservation Plan) Conservation Area</a> | NOT COACHELLA VALLEY CONSERVATION AREA | WRMSHCP Cell Number | NOT IN A CELL NUMBER |
|--|--|---------------------|----------------------|

|  |  |  |                           |
|--|--|--|---------------------------|
| <a href="#">CVMSHCP Fluvial Sand Transport Special Provision Areas</a> | NOT IN A FLUVIAL SAND TRANSPORT SPECIAL PROVISION AREA | HANS/ERP (Habitat Acquisition and Negotiation Strategy/Expedited Review Process) | NOT IN A HANS/ERP PROJECT |
|--|--|--|---------------------------|

|  |                          |                   |                          |
|--|--------------------------|-------------------|--------------------------|
| <a href="#">WRMSHCP (Western Riverside County Multi-Species Habitat Conservation Plan) Plan Area</a> | WESTERN RIVERSIDE COUNTY | Vegetation (2005) | AGRICULTURE MAPPING UNIT |
|--|--------------------------|-------------------|--------------------------|

**Fire**

|   |                           |                          |                                   |
|---|---------------------------|--------------------------|-----------------------------------|
| Fire Hazard Classification ( <a href="#">Ord. 787</a> ) | NOT IN A FIRE HAZARD ZONE | Fire Responsibility Area | NOT IN A FIRE RESPONSIBILITY AREA |
|---|---------------------------|--------------------------|-----------------------------------|

**DEVELOPMENT FEES**

|   |  |                                       |                                       |
|---|--|---------------------------------------|---------------------------------------|
| <a href="#">CVMSHCP (Coachella Valley Multi-Species Habitat Conservation Plan) Fee Area (Ord 875)</a> | NOT IN A COACHELLA VALLEY MSHCP FEE AREA | RBBB (Road & Bridge Benefit District) | NOT IN A ROAD BRIDGE BENEFIT DISTRICT |
|---|--|---------------------------------------|---------------------------------------|

|   |                   |  |       |
|---|-------------------|--|-------|
| WRMSHCP (Western Riverside County Multi-Species | WESTERN RIVERSIDE | DIF ( <a href="#">Development Impact Fee</a> ) | RECHE |
|---|-------------------|--|-------|

|   |  |  |   |
|---|--|--|---|
| Habitat Conservation Plan) Fee Area (Ord. 810)                | COUNTY                                 | Area Ord. 659)                                   | CANYON/BADLANDS, AREA 4                 |
| Western TUMF (Transportation Uniform Mitigation Fee Ord. 824) | IN OR PARTIALLY WITHIN A TUMF FEE AREA | SKR Fee Area (Stephen's Kagaroo Rat Ord. 663.10) | IN OR PARTIALLY WITHIN THE SKR FEE AREA |
| Eastern TUMF (Transportation Uniform Mitigation Fee Ord. 673) | NOT IN THE EASTERN TUMF FEE AREA       | DA (Development Agreements)                      | NOT IN A DEVELOPMENT AGREEMENT          |

**TRANSPORTATION more...**

|                       |                              |  |                          |
|-----------------------|------------------------------|--|--------------------------|
| Circulation Element   | NOT IN A CIRCULATION ELEMENT | Road Book Page   | 56                       |
| Ultimate Right-of-Way | RIGHT-OF-WAY                 | Transportation Agreements  | NOT IN A TRANS AGREEMENT |
|                       |                              | CETAP (Community and Environmental Transportation Acceptability Process) Corridors | NOT IN A CETAP CORRIDOR  |

**HYDROLOGY**

|                        |   |           |                    |
|------------------------|---|-----------|--------------------|
| Flood Plan Review      | OUTSIDE FLOODPLAIN, REVIEW NOT REQUIRED | Watershed | SAN JACINTO VALLEY |
| Water District         | EASTERN MUNICIPAL WATER DISTRICT        |           |                    |
| Flood Control District | RIVERSIDE COUNTY FLOOD CONTROL DISTRICT |           |                    |

**GEOLOGIC**

|                        |                     |                             |  |
|------------------------|---------------------|-----------------------------|--|
| Fault Zone             | NOT IN A FAULT ZONE | Paleontological Sensitivity | HIGH SENSITIVITY (HIGH B): SENSITIVITY EQUIVALENT TO HIGH A, BUT IS BASED ON THE OCCURRENCE OF FOSSILS AT A SPECIFIED DEPTH BELOW THE SURFACE. THE CATEGORY HIGH B INDICATES THAT FOSSILS ARE LIKELY TO BE ENCOUNTERED AT OR BELOW FOUR FEET OF DEPTH, AND MAY BE IMPACTED DURING EXCAVATION BY CONSTRUCTION ACTIVITIES. |
| Faults                 | NOT IN A FAULT LINE |                             |  |
| Liquefaction Potential | LOW                 |                             |  |
| Subsidence             | SUSCEPTIBLE         |                             |  |

**MISCELLANEOUS**

|                     |   |
|---------------------|---|
| School District     | MORENO VALLEY UNIFIED   |
| Communities         | MORENO VALLEY   |
| Lighting (Ord. 655) | ZONE: B   |
| Census Tract        | 487   |
| Farmland            | LOCAL IMPORTANCE<br>URBAN-BUILT UP LAND   |
| Special Notes       | NO SPECIAL NOTES  |
| Tax Rate Areas      | 021411 - CITY OF MORENO VALLEY<br>021411 - CITY OF MORENO VALLEY LIBRARY<br>021411 - CSA 152<br>021411 - EMWD<br>021411 - EMWD IMP DIST 3<br>021411 - EMWD IMP DST U-22<br>021411 - FLOOD CONTROL ADMIN<br>021411 - FLOOD CONTROL ZN 4<br>021411 - GENERAL<br>021411 - GENERAL PURPOSE<br>021411 - MORENO VALLEY CS<br>021411 - MORENO VALLEY CS ZN A<br>021411 - MORENO VALLEY CS ZN C<br>021411 - MORENO VALLEY CS ZN D<br>021411 - MORENO VALLEY CS ZN E<br>021411 - MORENO VALLEY FIRE<br>021411 - MORENO VALLEY UNIFIED SCHOOL |

021411 - MORENO VALLEY UNIFIED SCHOOL B&I  
 021411 - MWD EAST 1301999  
 021411 - RIVERSIDE CITY COMMUNITY COLLEGE  
 021411 - RIVERSIDE CO OFC OF EDUCATION  
 021411 - SAN JACINTO BASIN RESOURCE CONS  
 021411 - SO. CALIF.,JT(19,30,33,36,37,56)

**Department of Environmental Health Permits**

**Septic Permits**

| Record Id | Application Date | Plan Check Approved Date | Final Inspection Date | Approved Date |
|-----------|------------------|--------------------------|-----------------------|---------------|
| N/A       | N/A              | N/A                      | N/A                   | N/A           |

**Well Water Permits**

| Record Id | PE  | Permit Paid Date | Permit Approved Date | Well Finaled Date |
|-----------|-----|------------------|----------------------|-------------------|
| N/A       | N/A | N/A              | N/A                  | N/A               |

**PLUS PERMITS & CASES**

**Administrative Cases**

| Case | Case Description | Status |
|------|------------------|--------|
| N/A  | N/A              | N/A    |

**Building and Safety Cases**

| Case | Case Description | Status |
|------|------------------|--------|
| N/A  | N/A              | N/A    |

**Code Cases**

| Case | Case Description | Status |
|------|------------------|--------|
| N/A  | N/A              | N/A    |

**Fire Cases**

| Case | Case Description | Status |
|------|------------------|--------|
| N/A  | N/A              | N/A    |

**Planning Cases**

| Case     | Case Description  | Status |
|----------|---|--------|
| PDB04491 | GENERAL BIOLOGICAL STUDY SURVEY DATES: 1/31/06 & 3/17/06 REPORT DATE: 3/20/06 | VOID   |

**Survey Cases**

| Case     | Case Description | Status |
|----------|------------------|--------|
| MAP33361 |                  | ISSUED |

**Transportation Cases**

| Case | Case Description | Status |
|------|------------------|--------|
| N/A  | N/A              | N/A    |

# Appendix 5: LID Infeasibility

## *LID Technical Infeasibility Analysis*

- 1) Treatment is required for the project because the total impervious area of the on and offsite improvements is over 10,000 SF.
  
- 2) Paved areas, such as the parking lot cannot use pervious pavement to decrease the total impervious area used in the calculations because pervious pavement does not meet the definition of a pervious area.
  
- 3) The onsite treatment device (BMP #1 – Underground Infiltration System), will be located at the northwest corner of the project, to mitigate added flows generated by the additional impervious surface.

# Appendix 6: BMP Design Details

*BMP Sizing, Design Details and other Supporting Documentation*



**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 **Blue Engineering and Consulting**

Date **12/19/2022**

Designed by **A. Cesar**

Case No

Company Project Number/Name

**Iris Ave & Commercial Development**

**BMP Identification**

BMP NAME / ID **DA-1**

*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

$D_{85}$  = **0.66** 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) |
|-------------|------------------------|---------------------------|--------------------------------------|-------------------|---------------------------|-------------------------|---|---------------------------------------|
| DMA 1       | 67425                  | Mixed Surface Types       | 0.78                                 | 0.58              | 38859.3                   |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
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|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             | <b>67425</b>           | <b>Total</b>              |                                      |                   | <b>38859.3</b>            | <b>0.66</b>             | <b>2137.3</b>                                 | <b>15791</b>                          |

Notes:

**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 **Blue Engineering and Consulting**

Date **12/19/2022**

Designed by **A. Cesar**

Case No

Company Project Number/Name

**Iris Ave & Commercial Development**

**BMP Identification**

BMP NAME / ID **DA-2**

*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

$D_{85}$  = **0.66** 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) |
|-------------|------------------------|---------------------------|--------------------------------------|-------------------|---------------------------|-------------------------|---|---------------------------------------|
| DMA 2       | 4173                   | Concrete or Asphalt       | 1                                    | 0.89              | 3722.3                    |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
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|             |                        |                           |                                      |                   |                           |                         |   |                                       |
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|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             | <b>4173</b>            |                           |                                      |                   | <b>3722.3</b>             | <b>0.66</b>             | <b>204.7</b>                                  | <b>N/A</b>                            |

Notes: requested variance from the significant threshold of 5% due to public right of way constraints.

**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 **Blue Engineering and Consulting**

Date **12/19/2022**

Designed by **A. Cesar**

Case No

Company Project Number/Name

**Iris Ave & Commercial Development**

**BMP Identification**

BMP NAME / ID **DA-3**

*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

$D_{85}$  = **0.66** 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) |
|-------------|------------------------|---------------------------|--------------------------------------|-------------------|---------------------------|-------------------------|---|---------------------------------------|
| DMA 3       | 1644                   | Mixed Surface Types       | 0.54                                 | 0.37              | 601.1                     |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             |                        |                           |                                      |                   |                           |                         |   |                                       |
|             | <b>1644</b>            | <b>Total</b>              |                                      |                   | <b>601.1</b>              | <b>0.66</b>             | <b>33.1</b>                                   | <b>N/A</b>                            |

Notes:

BMP Design Flow Rate ( $Q_{BMP}$ ) using the the equation in the **Riverside County BMP Design Handbook**:

$$Q_{BMP} = \frac{0.2 \times [A]}{43,560} = \frac{0.2 \times 601}{43,560} = 0.00276 \text{ cfs}$$

where [A] is obtained from the DMA area x runoff factor in the V BMP for DA-3 above.

The bottom width of the swale is determined using the San Bernardino County Technical Document Guidance equation in **Table 5-6**.

$$b = (Q_{design} * N / (1.49 * d^{1.67} * S^{0.5})) = \frac{0.00276 * 0.25}{1.49 * 0.08^{1.67} * 0.03^{0.5}} = 0.18 \text{ ft}$$

Where Q is the flow in cfs, N is manning number of 0.25 (CASQA vegetated swale design guideline), d is the depth of flow for vegetated filter strip in ft (not to exceed 1 inch), S is the slope in direction of flow.

Since  $b_{filter\ strip} \geq \frac{Q_{design}}{0.005}$ , the minimum bottom width required is equal to  $\frac{0.00276}{0.005} = 0.55 \text{ ft}$

### **Conclusion:**

To be conservative in design, we decided to use the entire available width of the existing landscape area to be the width of the proposed vegetated swale of 7.5 ft.

Per the CASQA Design Recommendations for Vegetated Swale (TC-30), swale should be not less than 100 feet in length.



## Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

## Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

## California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

## Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

## Targeted Constituents

|                                     |                |   |
|-------------------------------------|----------------|---|
| <input checked="" type="checkbox"/> | Sediment       | ▲ |
| <input checked="" type="checkbox"/> | Nutrients      | ● |
| <input checked="" type="checkbox"/> | Trash          | ● |
| <input checked="" type="checkbox"/> | Metals         | ▲ |
| <input checked="" type="checkbox"/> | Bacteria       | ● |
| <input checked="" type="checkbox"/> | Oil and Grease | ▲ |
| <input checked="" type="checkbox"/> | Organics       | ▲ |

### Legend (Removal Effectiveness)

- Low
- High
- ▲ Medium





- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

## Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are more susceptible to failure if not properly maintained than other treatment BMPs.

## Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, whichever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

## ***Construction/Inspection Considerations***

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

## **Performance**

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

| Study  | Removal Efficiencies (% Removal) |     |    |                 |          |          | Type            |
|--|----------------------------------|-----|----|-----------------|----------|----------|-----------------|
|  | TSS                              | TP  | TN | NO <sub>3</sub> | Metals   | Bacteria |                 |
| Caltrans 2002  | 77                               | 8   | 67 | 66              | 83-90    | -33      | dry swales      |
| Goldberg 1993  | 67.8                             | 4.5 | -  | 31.4            | 42-62    | -100     | grassed channel |
| Seattle Metro and Washington Department of Ecology 1992  | 60                               | 45  | -  | -25             | 2-16     | -25      | grassed channel |
| Seattle Metro and Washington Department of Ecology, 1992 | 83                               | 29  | -  | -25             | 46-73    | -25      | grassed channel |
| Wang et al., 1981  | 80                               | -   | -  | -               | 70-80    | -        | dry swale       |
| Dorman et al., 1989                                      | 98                               | 18  | -  | 45              | 37-81    | -        | dry swale       |
| Harper, 1988   | 87                               | 83  | 84 | 80              | 88-90    | -        | dry swale       |
| Kercher et al., 1983                                     | 99                               | 99  | 99 | 99              | 99       | -        | dry swale       |
| Harper, 1988.  | 81                               | 17  | 40 | 52              | 37-69    | -        | wet swale       |
| Koon, 1995   | 67                               | 39  | -  | 9               | -35 to 6 | -        | wet swale       |

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

### Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

### Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

## **Additional Design Guidelines**

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

## **Summary of Design Recommendations**

- 1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.
- 2) A design grass height of 6 inches is recommended.
- 3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.
- 4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.
- 5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).
- 6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.
- 7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

**Maintenance**

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.
- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.
- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.
- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.
- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

## **Cost**

### ***Construction Cost***

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately \$0.25 per ft<sup>2</sup>. This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately \$0.50 per ft<sup>2</sup>, which compares favorably with other stormwater management practices.



Table 2 Swale Cost Estimate (SEWRPC, 1991)

| Component                             | Unit            | Extent | Unit Cost |          |         | Total Cost |          |          |
|---------------------------------------|-----------------|--------|-----------|----------|---------|------------|----------|----------|
|                                       |                 |        | Low       | Moderate | High    | Low        | Moderate | High     |
| Mobilization / Demobilization-Light   | Swale           | 1      | \$107     | \$274    | \$441   | \$107      | \$274    | \$441    |
| Site Preparation                      |                 |        |           |          |         |            |          |          |
| Clearing <sup>b</sup> .....           | Acra            | 0.5    | \$2,200   | \$3,800  | \$5,400 | \$1,100    | \$1,900  | \$2,700  |
| Grubbing <sup>c</sup> .....           | Acra            | 0.25   | \$3,800   | \$5,200  | \$6,600 | \$950      | \$1,300  | \$1,650  |
| General Excavation <sup>d</sup> ..... | Yd <sup>3</sup> | 372    | \$2.10    | \$3.70   | \$5.30  | \$781      | \$1,376  | \$1,972  |
| Level and Till <sup>e</sup> .....     | Yd <sup>2</sup> | 1,210  | \$0.20    | \$0.35   | \$0.50  | \$242      | \$424    | \$605    |
| Sites Development                     |                 |        |           |          |         |            |          |          |
| Salvaged Topsoil                      | Yd <sup>2</sup> | 1,210  | \$0.40    | \$1.00   | \$1.60  | \$484      | \$1,210  | \$1,936  |
| Seed, and Mulch <sup>f</sup> .....    | Yd <sup>2</sup> | 1,210  | \$1.20    | \$2.40   | \$3.60  | \$1,452    | \$2,904  | \$4,356  |
| Sods <sup>g</sup> .....               |                 |        |           |          |         |            |          |          |
| Subtotal                              | --              | --     | --        | --       | --      | \$5,116    | \$9,388  | \$13,660 |
| Contingencies                         | Swale           | 1      | 25%       | 25%      | 25%     | \$1,279    | \$2,347  | \$3,415  |
| Total                                 | --              | --     | --        | --       | --      | \$6,395    | \$11,735 | \$17,075 |

Source: (SEWRPC, 1991)

- Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.
- <sup>a</sup> Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.
- <sup>b</sup> Area cleared = (top width + 10 feet) x swale length.
- <sup>c</sup> Area grubbed = (top width x swale length).
- <sup>d</sup> Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).
- <sup>e</sup> Area filled = (top width +  $\frac{8(\text{swale depth})^2}{3(\text{top width})}$ ) x swale length (parabolic cross-section).
- <sup>f</sup> Area seeded = area cleared x 0.5.
- <sup>g</sup> Area sodded = area cleared x 0.5.

# Vegetated Swale

TC-30

**Table 3 Estimated Maintenance Costs (SEWRPC, 1991)**

| Component                                   | Unit Cost   | Swale Size<br>(Depth and Top Width)                      |  | Comment  |
|---|---|--|--|--|
|   |   | 1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width | 3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width |  |
| Lawn Mowing                                 | \$0.85 / 1,000 ft <sup>2</sup> /mowing              | \$0.14 / linear foot                                     | \$0.21 / linear foot                                 | Lawn maintenance area = (top width + 10 feet) x length. Mow eight times per year |
| General Lawn Care                           | \$9.00 / 1,000 ft <sup>2</sup> /year                | \$0.18 / linear foot                                     | \$0.28 / linear foot                                 | Lawn maintenance area = (top width + 10 feet) x length                           |
| Swale Debris and Litter Removal             | \$0.10 / linear foot / year                         | \$0.10 / linear foot                                     | \$0.10 / linear foot                                 | -  |
| Grass Reseeding with Mulch and Fertilizer   | \$0.30 / yd <sup>2</sup>                            | \$0.01 / linear foot                                     | \$0.01 / linear foot                                 | Area revegetated equals 1% of lawn maintenance area per year                     |
| Program Administration and Swale Inspection | \$0.15 / linear foot / year, plus \$25 / inspection | \$0.15 / linear foot                                     | \$0.15 / linear foot                                 | Inspect four times per year  |
| <b>Total</b>                                | --  | <b>\$0.58 / linear foot</b>                              | <b>\$0.75 / linear foot</b>                          | --   |

### **Maintenance Cost**

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately \$2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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## **Information Resources**

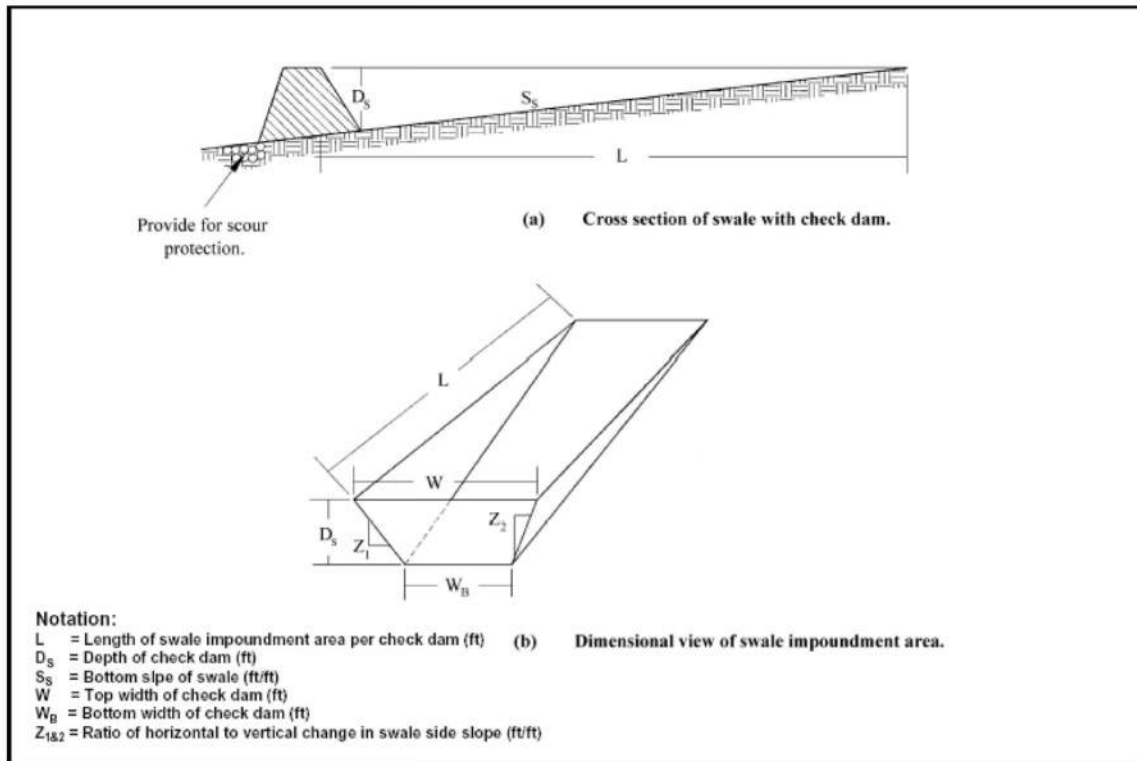
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## User Inputs

|                                      |                    |
|--------------------------------------|--------------------|
| <b>Chamber Model:</b>                | MC-7200            |
| <b>Outlet Control Structure:</b>     | Yes                |
| <b>Project Name:</b>                 | 178 Iris           |
| <b>Engineer:</b>                     | Angel Cesar, PE    |
| <b>Project Location:</b>             | California         |
| <b>Measurement Type:</b>             | Imperial           |
| <b>Required Storage Volume:</b>      | 15237 cubic ft.    |
| <b>Stone Porosity:</b>               | 40%                |
| <b>Stone Foundation Depth:</b>       | 12 in.             |
| <b>Stone Above Chambers:</b>         | 12 in.             |
| <b>Average Cover Over Chambers:</b>  | 24 in.             |
| <b>Design Constraint Dimensions:</b> | (30 ft. x 130 ft.) |

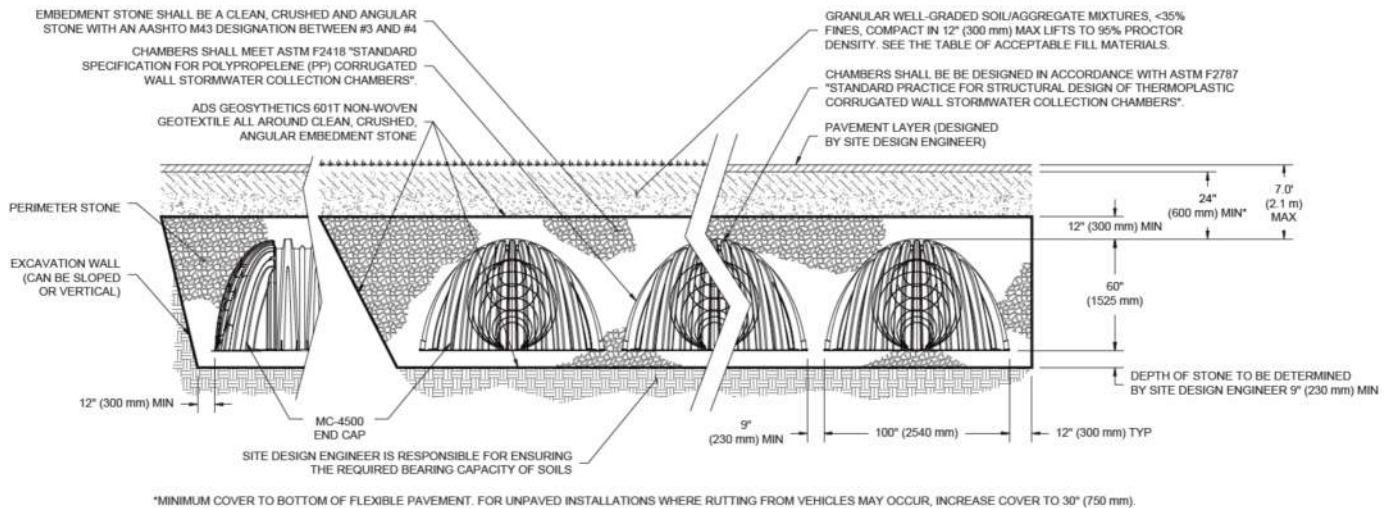
## Results

### System Volume and Bed Size

|                                     |                    |
|-------------------------------------|--------------------|
| <b>Installed Storage Volume:</b>    | 15791.07 cubic ft. |
| <b>Storage Volume Per Chamber:</b>  | 175.90 cubic ft.   |
| <b>Number Of Chambers Required:</b> | 51                 |
| <b>Number Of End Caps Required:</b> | 6                  |
| <b>Chamber Rows:</b>                | 3                  |
| <b>Maximum Length:</b>              | 127.79 ft.         |
| <b>Maximum Width:</b>               | 29.10 ft.          |
| <b>Approx. Bed Size Required:</b>   | 3666.55 square ft. |

### System Components

|  |                   |
|--|-------------------|
| <b>Amount Of Stone Required:</b>                           | 610 cubic yards   |
| <b>Volume Of Excavation (Not Including Fill):</b>          | 951 cubic yards   |
| <b>Total Non-woven Geotextile Required:</b>                | 1271 square yards |
| <b>Woven Geotextile Required (excluding Isolator Row):</b> | 43 square yards   |
| <b>Woven Geotextile Required (Isolator Row):</b>           | 275 square yards  |
| <b>Total Woven Geotextile Required:</b>                    | 317 square yards  |
| <b>Impervious Liner Required:</b>                          | 0 square yards    |



| PROJECT INFORMATION        |  |
|----------------------------|--|
| ENGINEERED PRODUCT MANAGER |  |
| ADS SALES REP              |  |
| PROJECT NO.                |  |



# 178 IRIS

## MORENO VALLEY, CA

### MC-7200 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-7200.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
  - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
  - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
  - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
  - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
  - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
  - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

### IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

1. STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
  - STONESHOOTER LOCATED OFF THE CHAMBER BED.
  - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
  - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

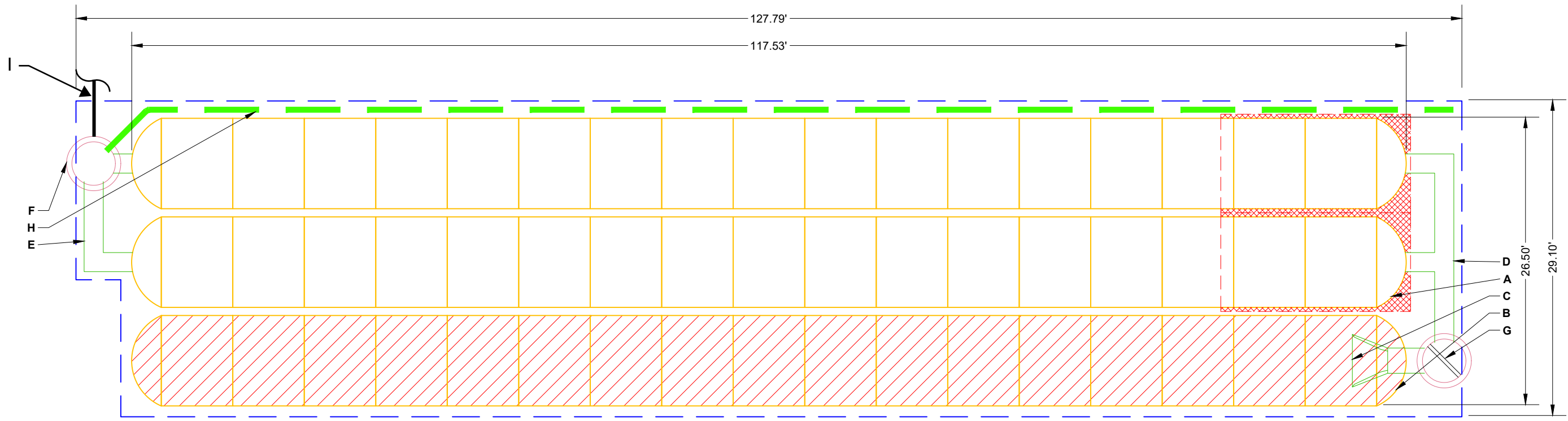
### NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
  - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
  - NO RUBBER TIERED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-7200 CONSTRUCTION GUIDE".
  - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

**USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.**

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

| PROPOSED LAYOUT |   | CONCEPTUAL ELEVATIONS                                     |       | *INVERT ABOVE BASE OF CHAMBER |                |   |         |             |
|-----------------|---|---|-------|-------------------------------|----------------|---|---------|-------------|
|                 |   |   |       | PART TYPE                     | ITEM ON LAYOUT | DESCRIPTION   | INVERT* | MAX FLOW    |
| 51              | STORMTECH MC-7200 CHAMBERS  | MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):        | 13.00 |                               |                |   |         |             |
| 6               | STORMTECH MC-7200 END CAPS  | MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):           | 8.50  |                               |                |   |         |             |
| 12              | STONE ABOVE (in)  | MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):             | 8.00  | PREFABRICATED END CAP         | A              | 18" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS                        | 1.97"   |             |
| 12              | STONE BELOW (in)  | MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT): | 8.00  |                               |                |   |         |             |
| 40              | STONE VOID  | MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):      | 8.00  | PREFABRICATED END CAP         | B              | 24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS | 2.26"   |             |
| 15791           | INSTALLED SYSTEM VOLUME (CF)<br>(PERIMETER STONE INCLUDED)<br>(COVER STONE INCLUDED)<br>(BASE STONE INCLUDED) | TOP OF STONE:   | 7.00  | FLAMP                         | C              | INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MC720024RAMP  |         |             |
|                 |   | TOP OF MC-7200 CHAMBER:                                   | 6.00  | MANIFOLD                      | D              | 18" x 18" BOTTOM MANIFOLD, ADS N-12   | 1.97"   |             |
|                 |   | 24" ISOLATOR ROW PLUS INVERT:                             | 1.19  | MANIFOLD                      | E              | 18" x 18" BOTTOM MANIFOLD, ADS N-12   | 1.97"   |             |
|                 |   | 18" x 18" BOTTOM MANIFOLD INVERT:                         | 1.16  | CONCRETE STRUCTURE            | F              | OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)   |         | 8.0 CFS OUT |
| 3667            | SYSTEM AREA (SF)  | 18" x 18" BOTTOM MANIFOLD INVERT:                         | 1.16  | CONCRETE STRUCTURE            | G              | (DESIGN BY ENGINEER / PROVIDED BY OTHERS)   |         | 11.0 CFS IN |
| 313.8           | SYSTEM PERIMETER (ft)   | 18" BOTTOM CONNECTION INVERT:                             | 1.16  | CONCRETE STRUCTURE            | H              | 6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN  |         |             |
|                 |   | BOTTOM OF MC-7200 CHAMBER:                                | 1.00  | W/WEIR                        |                |   |         |             |
|                 |   | UNDERDRAIN INVERT:  | 0.00  | UNDERDRAIN                    | I              | 6" OUTLET PIPE  |         |             |
|                 |   | BOTTOM OF STONE:  | 0.00  |                               |                |   |         |             |



**NOTES**

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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Chamber System

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178 IRIS

MORENO VALLEY, CA

DATE:

PROJECT #:

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| DATE | CHK | DRW | DESCRIPTION |
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|      |     |     |             |

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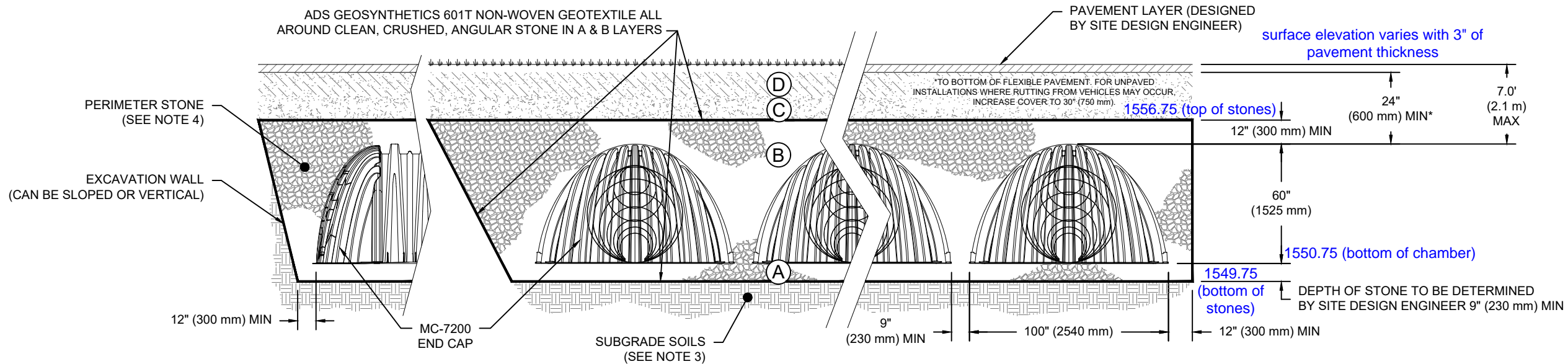
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## ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

| MATERIAL LOCATION |  | DESCRIPTION  | AASHTO MATERIAL CLASSIFICATIONS   | COMPACTION / DENSITY REQUIREMENT  |
|-------------------|--|--|---|---|
| D                 | <b>FINAL FILL:</b> FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER  | ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.  | N/A   | PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.   |
| C                 | <b>INITIAL FILL:</b> FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER. | GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE.<br><br>MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER. | AASHTO M145 <sup>1</sup><br>A-1, A-2-4, A-3<br><br>OR<br><br>AASHTO M43 <sup>1</sup><br>3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10 | BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. |
| B                 | <b>EMBEDMENT STONE:</b> FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.  | CLEAN, CRUSHED, ANGULAR STONE  | AASHTO M43 <sup>1</sup><br>3, 4   | NO COMPACTION REQUIRED.   |
| A                 | <b>FOUNDATION STONE:</b> FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.   | CLEAN, CRUSHED, ANGULAR STONE  | AASHTO M43 <sup>1</sup><br>3, 4   | PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. <sup>2,3</sup>   |

**PLEASE NOTE:**

- THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
- STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
- WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
- ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



**NOTES:**

- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
- MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
- PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
  - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
  - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
  - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

178 IRIS

MORENO VALLEY, CA

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DESCRIPTION

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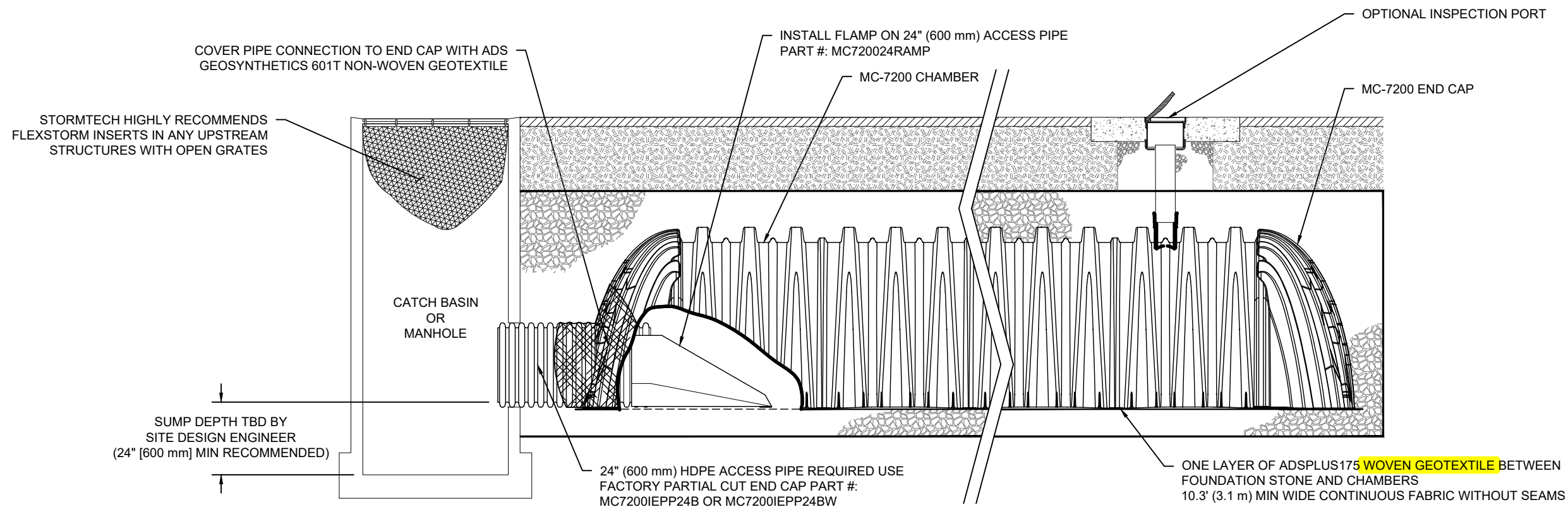
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**MC-7200 ISOLATOR ROW PLUS DETAIL**

NTS

**INSPECTION & MAINTENANCE**

- STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
  - A. INSPECTION PORTS (IF PRESENT)
    - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
    - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
    - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
    - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
    - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
  - B. ALL ISOLATOR PLUS ROWS
    - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
    - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
      - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
      - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
    - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
  - A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
  - B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
  - C. VACUUM STRUCTURE SUMP AS REQUIRED
- STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.
- STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

**NOTES**

- 1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
- 2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

178 IRIS

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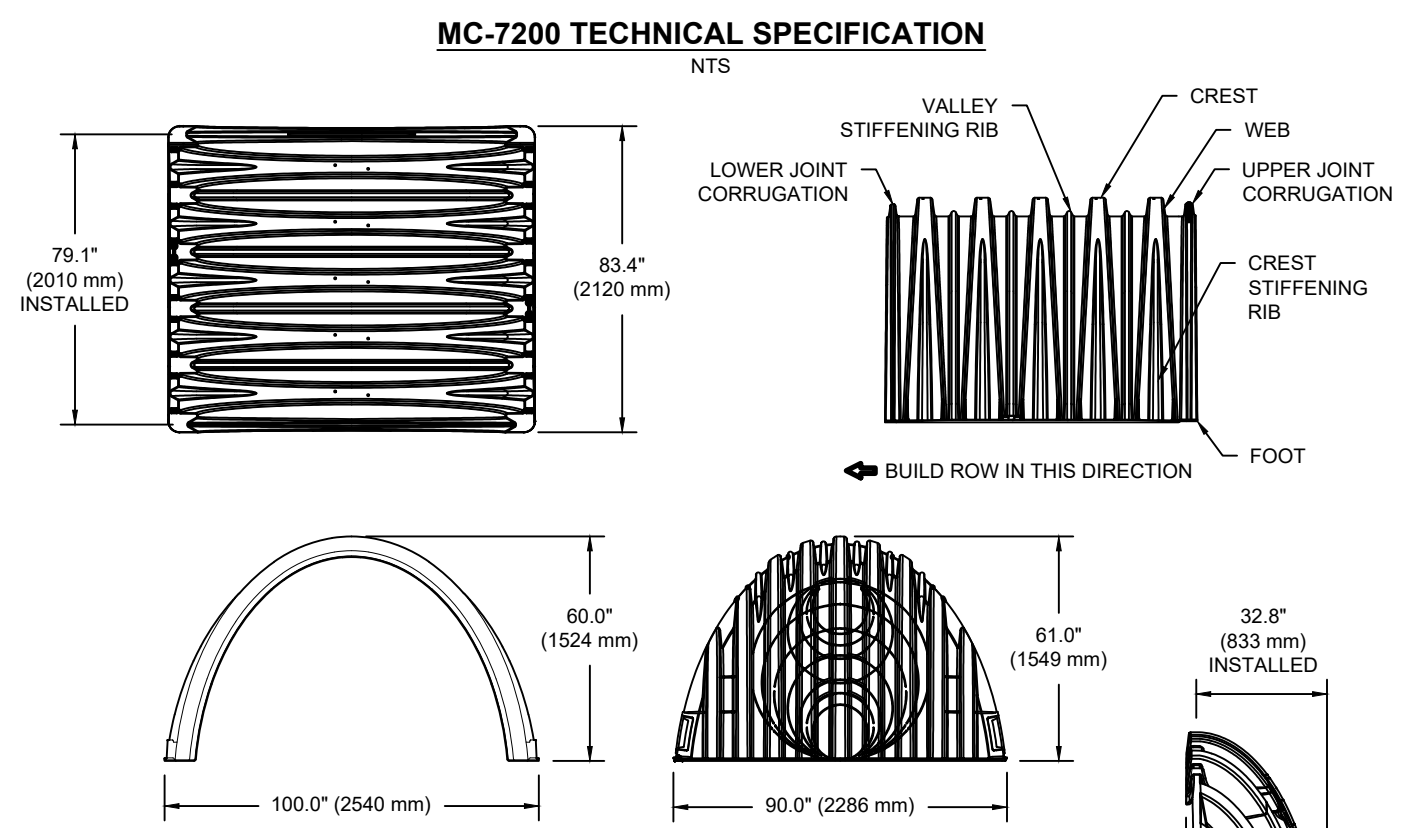
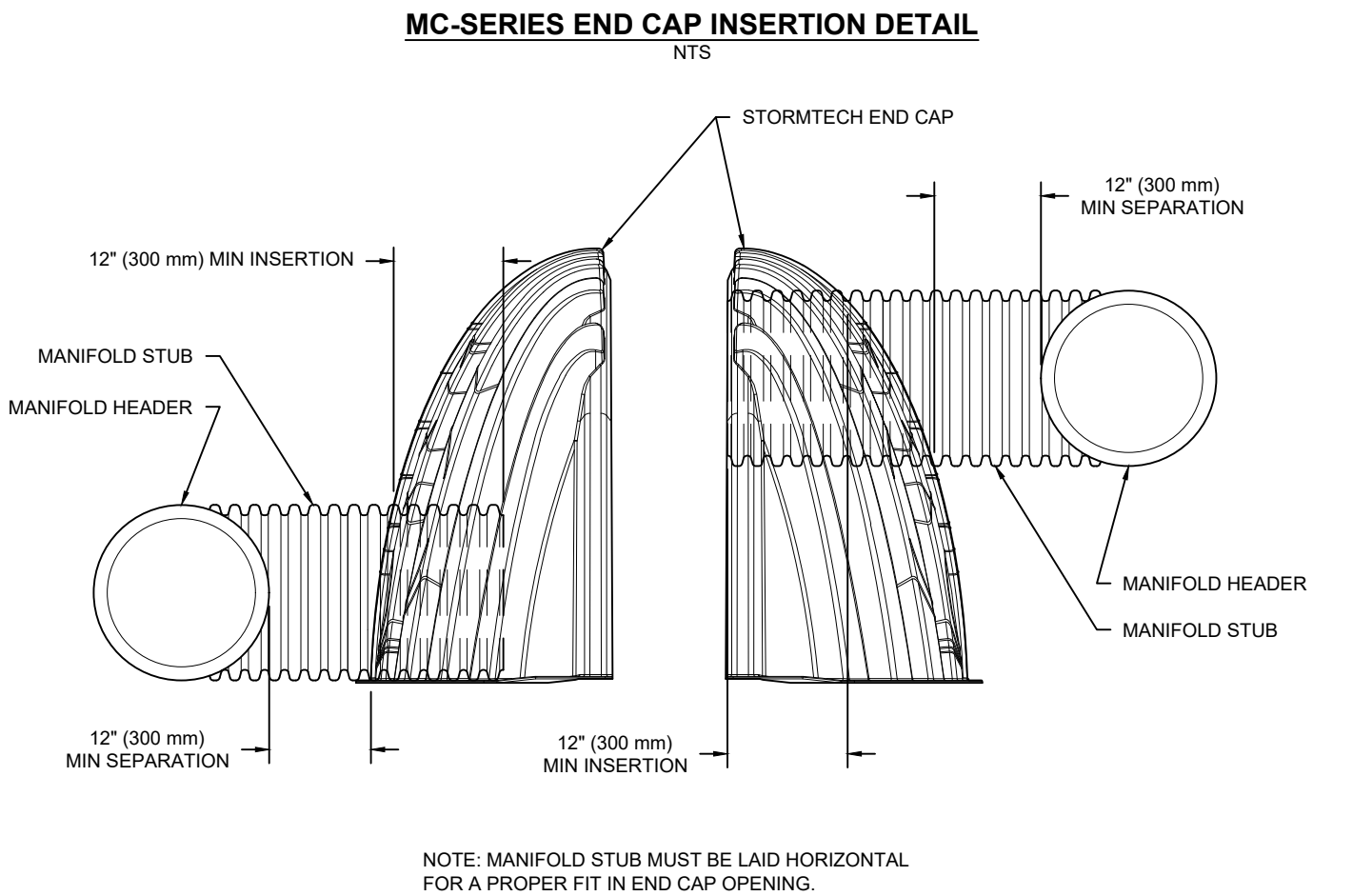
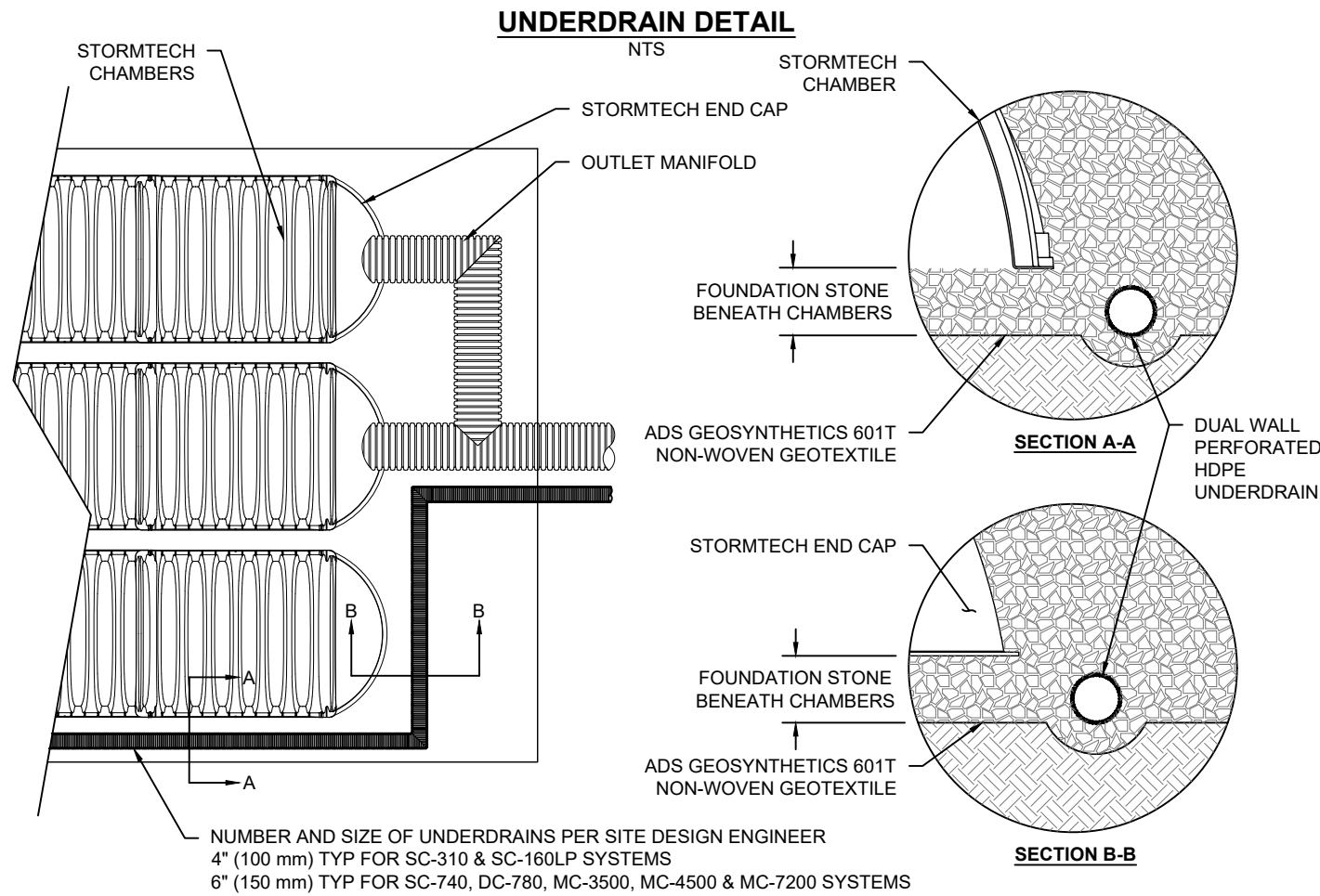
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#### NOMINAL CHAMBER SPECIFICATIONS

|                                 |                        |                               |
|---------------------------------|------------------------|-------------------------------|
| SIZE (W X H X INSTALLED LENGTH) | 100.0" X 60.0" X 79.1" | (2540 mm X 1524 mm X 2010 mm) |
| CHAMBER STORAGE                 | 175.9 CUBIC FEET       | (4.98 m <sup>3</sup> )        |
| MINIMUM INSTALLED STORAGE*      | 267.3 CUBIC FEET       | (7.56 m <sup>3</sup> )        |
| WEIGHT (NOMINAL)                | 205 lbs.               | (92.9 kg)                     |

#### NOMINAL END CAP SPECIFICATIONS

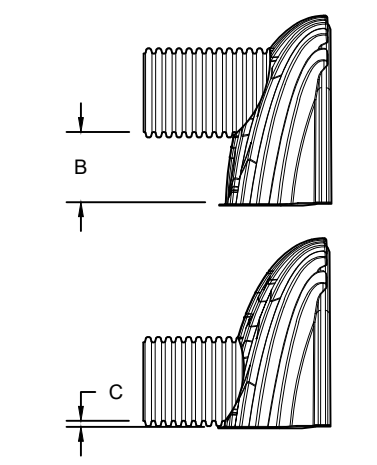
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|---------------------------------|-----------------------|------------------------------|
| SIZE (W X H X INSTALLED LENGTH) | 90.0" X 61.0" X 32.8" | (2286 mm X 1549 mm X 833 mm) |
| END CAP STORAGE                 | 39.5 CUBIC FEET       | (1.12 m <sup>3</sup> )       |
| MINIMUM INSTALLED STORAGE*      | 115.3 CUBIC FEET      | (3.26 m <sup>3</sup> )       |
| WEIGHT (NOMINAL)                | 90 lbs.               | (40.8 kg)                    |

\*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"  
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"  
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

| PART #         | STUB          | B                | C             |
|----------------|---------------|------------------|---------------|
| MC7200IEPP06T  | 6" (150 mm)   | 42.54" (1081 mm) | ---           |
| MC7200IEPP06B  |               | ---              | 0.86" (22 mm) |
| MC7200IEPP08T  | 8" (200 mm)   | 40.50" (1029 mm) | ---           |
| MC7200IEPP08B  |               | ---              | 1.01" (26 mm) |
| MC7200IEPP10T  | 10" (250 mm)  | 38.37" (975 mm)  | ---           |
| MC7200IEPP10B  |               | ---              | 1.33" (34 mm) |
| MC7200IEPP12T  | 12" (300 mm)  | 35.69" (907 mm)  | ---           |
| MC7200IEPP12B  |               | ---              | 1.55" (39 mm) |
| MC7200IEPP15T  | 15" (375 mm)  | 32.72" (831 mm)  | ---           |
| MC7200IEPP15B  |               | ---              | 1.70" (43 mm) |
| MC7200IEPP18T  | 18" (450 mm)  | 29.36" (746 mm)  | ---           |
| MC7200IEPP18TW |               | ---              | 1.97" (50 mm) |
| MC7200IEPP18B  |               | ---              | ---           |
| MC7200IEPP18BW |               | ---              | ---           |
| MC7200IEPP24T  | 24" (600 mm)  | 23.05" (585 mm)  | ---           |
| MC7200IEPP24TW |               | ---              | 2.26" (57 mm) |
| MC7200IEPP24B  | ---           | ---              | ---           |
| MC7200IEPP24BW | ---           | ---              | ---           |
| MC7200IEPP30BW | 30" (750 mm)  | ---              | 2.95" (75 mm) |
| MC7200IEPP36BW | 36" (900 mm)  | ---              | 3.25" (83 mm) |
| MC7200IEPP42BW | 42" (1050 mm) | ---              | 3.55" (90 mm) |

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

178 IRIS  
MORENO VALLEY, CA

DATE: \_\_\_\_\_ PROJECT #: \_\_\_\_\_  
DRAWN: TT CHECKED: N/A

DESCRIPTION

DATE DRW CHK

888-892-2694 | WWW.STORMTECH.COM

**StormTech®**  
Chamber System

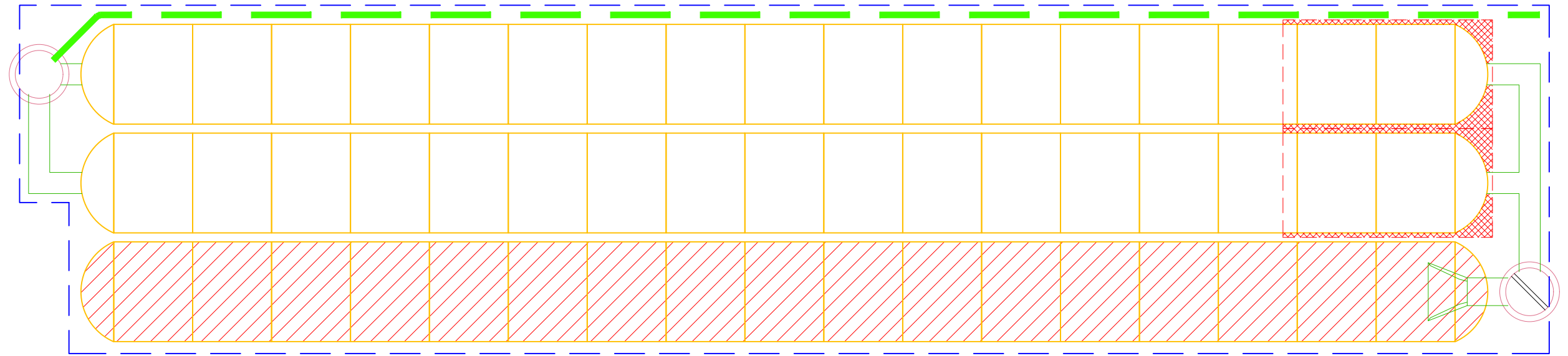
4640 TRUAMAN BLVD  
HILLIARD, OH 43026  
1-800-733-7473

**ADS**

SHEET  
5 OF 5

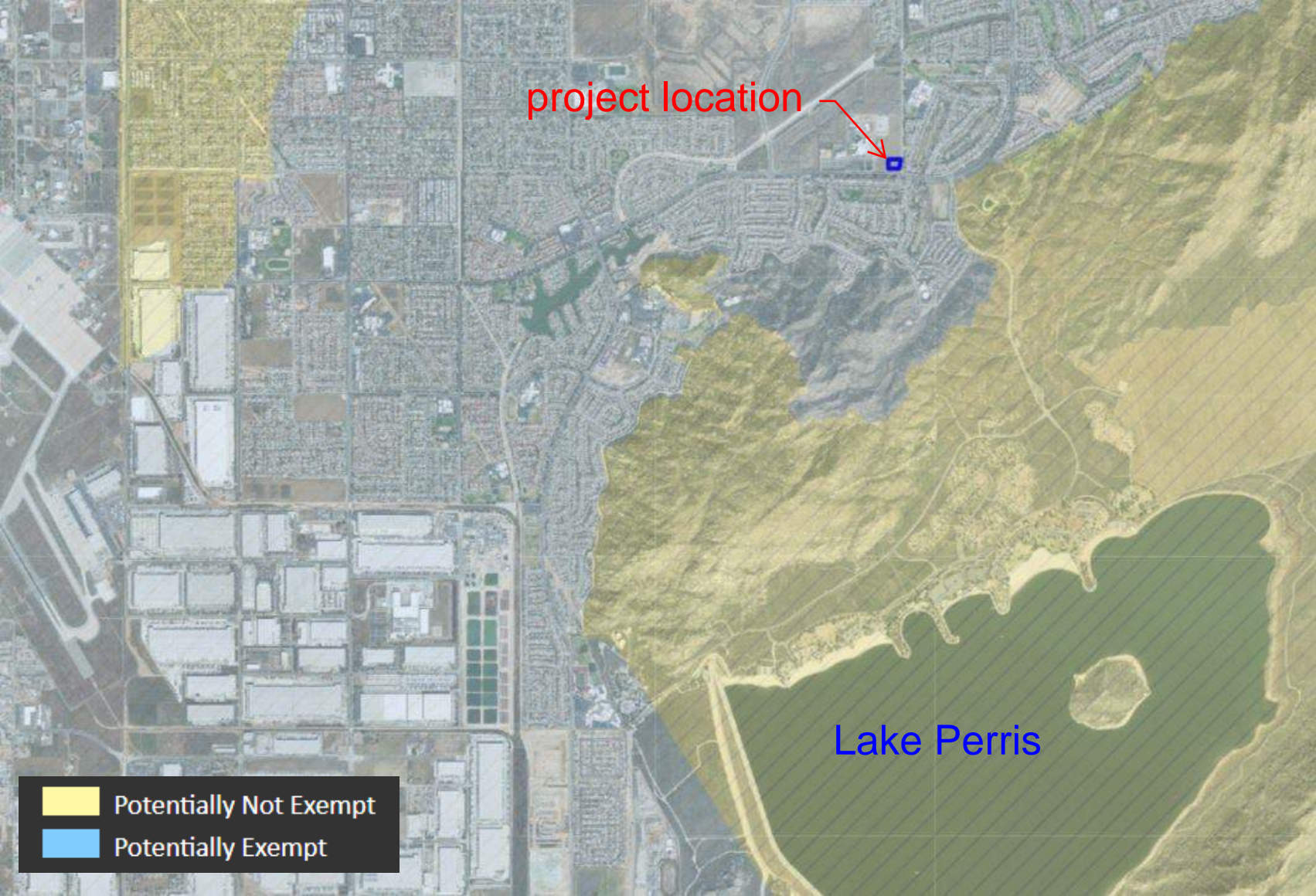
THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.





# Appendix 7: Hydromodification


*Supporting Detail Relating to Hydrologic Conditions of Concern*




project location



Lake Perris

 Potentially Not Exempt

 Potentially Exempt

# Appendix 8: Source Control

*Pollutant Sources/Source Control Checklist*

## 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.1 on 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<br>Potential Sources of Runoff Pollutants                                     | 2<br>Permanent Controls—Show on WQMP Drawings                              | 3<br>Permanent Controls—List in WQMP Table and Narrative   | 4<br>Operational BMPs—Include in WQMP Table and Narrative   |
| <input checked="" type="checkbox"/> A. On-site storm drain inlets               | <input checked="" type="checkbox"/> Locations of inlets.                   | <input checked="" type="checkbox"/> 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. | <input checked="" type="checkbox"/> Maintain and periodically repaint or replace inlet markings.<br><input checked="" type="checkbox"/> Provide stormwater pollution prevention information to new site owners, lessees, or operators.<br><input checked="" type="checkbox"/> See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a><br><input checked="" type="checkbox"/> 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.” |
| <input type="checkbox"/> B. Interior floor drains and elevator shaft sump pumps |  | <input type="checkbox"/> State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.   | <input type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.   |
| <input checked="" type="checkbox"/> C. Interior parking garages                 |  | <input checked="" type="checkbox"/> State that parking garage floor drains will be plumbed to the sanitary sewer.  | <input checked="" type="checkbox"/> Inspect and maintain drains to prevent blockages and overflow.  |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...                              | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE   |   |  |
|---|--|---|--|
| 1<br>Potential Sources of Runoff Pollutants                                   | 2<br>Permanent Controls—Show on WQMP Drawings  | 3<br>Permanent Controls—List in WQMP Table and Narrative  | 4<br>Operational BMPs—Include in WQMP Table and Narrative  |
| <input type="checkbox"/> D1. Need for future indoor & structural pest control |  | <input type="checkbox"/> Note building design features that discourage entry of pests.  | <input type="checkbox"/> Provide Integrated Pest Management information to owners, lessees, and operators.   |
| <input checked="" type="checkbox"/> D2. Landscape/ Outdoor Pesticide Use      | <input type="checkbox"/> Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.<br><input type="checkbox"/> Show self-retaining landscape areas, if any.<br><input type="checkbox"/> Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.) | <p>State that final landscape plans will accomplish all of the following.</p> <input type="checkbox"/> Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.<br><input type="checkbox"/> 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.<br><input type="checkbox"/> Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.<br><input type="checkbox"/> Consider using pest-resistant plants, especially adjacent to hardscape.<br><p>To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.</p> | <input type="checkbox"/> Maintain landscaping using minimum or no pesticides.<br><input type="checkbox"/> See applicable operational BMPs in “What you should know for.....Landscape and Gardening” at <a href="http://rcflood.org/stormwater/Error!">http://rcflood.org/stormwater/Error!</a> <small>Hyperlink reference not valid.</small><br><input type="checkbox"/> Provide IPM information to new owners, lessees and operators. |



STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...  | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE   |  |  |
|---|--|--|--|
| 1<br>Potential Sources of Runoff Pollutants   | 2<br>Permanent Controls—Show on WQMP Drawings  | 3<br>Permanent Controls—List in WQMP Table and Narrative   | 4<br>Operational BMPs—Include in WQMP Table and Narrative  |
| <input type="checkbox"/> E. Pools, spas, ponds, decorative fountains, and other water features. | <input type="checkbox"/> 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.  | <input type="checkbox"/> See applicable operational BMPs in “Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain” at <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a>  |
| <input type="checkbox"/> F. Food service  | <input type="checkbox"/> 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.<br><br><input type="checkbox"/> On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.   | <input type="checkbox"/> Describe the location and features of the designated cleaning area.<br><br><input type="checkbox"/> Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.                 | <input type="checkbox"/> See the brochure, “The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries” at <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a><br><br><b>Provide this brochure to new site owners, lessees, and operators.</b>   |
| <input type="checkbox"/> G. Refuse areas  | <input type="checkbox"/> 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.<br><br><input type="checkbox"/> 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.<br><br><input type="checkbox"/> Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer. | <input type="checkbox"/> State how site refuse will be handled and provide supporting detail to what is shown on plans.<br><br><input type="checkbox"/> State that signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar. | <input type="checkbox"/> State how the following will be implemented:<br><br><b>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 <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a></b> |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...  | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE |  |   |
|---|--|--|---|
| 1<br>Potential Sources of Runoff Pollutants       | 2<br>Permanent Controls—Show on WQMP Drawings                              | 3<br>Permanent Controls—List in WQMP Table and Narrative   | 4<br>Operational BMPs—Include in WQMP Table and Narrative   |
| <input type="checkbox"/> H. Industrial processes. | <input type="checkbox"/> Show process area.                                | <input type="checkbox"/> 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.” | <input type="checkbox"/> See Fact Sheet SC-10, “Non-Stormwater Discharges” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a><br><br>See the brochure “Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities” at <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a> |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...  | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE   |   |  |
|---|--|---|--|
| 1<br>Potential Sources of Runoff Pollutants   | 2<br>Permanent Controls—Show on WQMP Drawings  | 3<br>Permanent Controls—List in WQMP Table and Narrative  | 4<br>Operational BMPs—Include in WQMP Table and Narrative  |
| <p><input type="checkbox"/> I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)</p> | <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> | <p>Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.</p> <p>Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:</p> <ul style="list-style-type: none"> <li>▪ Hazardous Waste Generation</li> <li>▪ Hazardous Materials Release Response and Inventory</li> <li>▪ California Accidental Release (CalARP)</li> <li>▪ Aboveground Storage Tank</li> <li>▪ Uniform Fire Code Article 80 Section 103(b) &amp; (c) 1991</li> <li>▪ Underground Storage Tank</li> </ul> <p><a href="http://www.cchealth.org/groups/hazmat/">www.cchealth.org/groups/hazmat/</a></p> | <p><input type="checkbox"/> 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 <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a></p> |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...                  | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE   |   |  |
|---|--|---|--|
| 1<br>Potential Sources of Runoff Pollutants                       | 2<br>Permanent Controls—Show on WQMP Drawings  | 3<br>Permanent Controls—List in WQMP Table and Narrative  | 4<br>Operational BMPs—Include in WQMP Table and Narrative  |
| <p><input type="checkbox"/> J. Vehicle and Equipment Cleaning</p> | <p><input type="checkbox"/> Show on drawings as appropriate:</p> <p>(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.</p> <p>(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).</p> <p>(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.</p> <p>(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.</p> | <p><input type="checkbox"/> 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.</p> | <p>Describe operational measures to implement the following (if applicable):</p> <p><input type="checkbox"/> 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 <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a></p> <p><input type="checkbox"/> Car dealerships and similar may rinse cars with water only.</p> |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...                                   | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE  |  |   |
|--|---|--|---|
| 1<br>Potential Sources of Runoff Pollutants  | 2<br>Permanent Controls—Show on WQMP Drawings   | 3<br>Permanent Controls—List in WQMP Table and Narrative   | 4<br>Operational BMPs—Include in WQMP Table and Narrative   |
| <p><input type="checkbox"/> <b>K. Vehicle/Equipment Repair and Maintenance</b></p> | <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> | <p><input type="checkbox"/> State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> | <p>In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p> <p>Refer to “Automotive Maintenance &amp; 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 <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a></p> <p>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 <a href="http://rcflood.org/stormwater/">http://rcflood.org/stormwater/</a></p> |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...  | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE  |  |  |
|---|---|--|--|
| 1<br>Potential Sources of Runoff Pollutants       | 2<br>Permanent Controls—Show on WQMP Drawings   | 3<br>Permanent Controls—List in WQMP Table and Narrative | 4<br>Operational BMPs—Include in WQMP Table and Narrative  |
| <input type="checkbox"/> L. Fuel Dispensing Areas | <input type="checkbox"/> Fueling areas <sup>6</sup> 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.<br><br><input type="checkbox"/> 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 <sup>1</sup> .] The canopy [or cover] shall not drain onto the fueling area. |  | <input type="checkbox"/> The property owner shall dry sweep the fueling area routinely.<br><input type="checkbox"/> See the Fact Sheet SD-30 , “Fueling Areas” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a> |

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<sup>6</sup> 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.



STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ... | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE  |  |   |
|--|---|--|---|
| 1<br>Potential Sources of Runoff Pollutants      | 2<br>Permanent Controls—Show on WQMP Drawings   | 3<br>Permanent Controls—List in WQMP Table and Narrative | 4<br>Operational BMPs—Include in WQMP Table and Narrative   |
| <input type="checkbox"/> M. Loading Docks        | <input type="checkbox"/> 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.<br><br><input type="checkbox"/> 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.<br><br><input type="checkbox"/> Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer. |  | <input type="checkbox"/> Move loaded and unloaded items indoors as soon as possible.<br><br><input type="checkbox"/> See Fact Sheet SC-30, “Outdoor Loading and Unloading,” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a> |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...   | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE |   |   |
|--|--|---|---|
| 1<br>Potential Sources of Runoff Pollutants  | 2<br>Permanent Controls—Show on WQMP Drawings                              | 3<br>Permanent Controls—List in WQMP Table and Narrative  | 4<br>Operational BMPs—Include in WQMP Table and Narrative   |
| <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> N. Fire Sprinkler Test Water</li> </ul>   |  | <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Provide a means to drain fire sprinkler test water to the sanitary sewer.</li> </ul>   | <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at <a href="http://www.cabmphandbooks.com">www.cabmphandbooks.com</a></li> </ul> |
| <p>O. Miscellaneous Drain or Wash Water or Other Sources</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Boiler drain lines</li> <li><input type="checkbox"/> Condensate drain lines</li> <li><input type="checkbox"/> Rooftop equipment</li> <li><input type="checkbox"/> Drainage sumps</li> <li><input type="checkbox"/> Roofing, gutters, and trim.</li> <li><input type="checkbox"/> Other sources</li> </ul> |  | <ul style="list-style-type: none"> <li><input type="checkbox"/> Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.</li> <li><input type="checkbox"/> 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.</li> <li><input type="checkbox"/> Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.</li> <li><input type="checkbox"/> Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.</li> <li><input type="checkbox"/> Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.</li> </ul> <p>Include controls for other sources as specified by local reviewer.</p> |   |

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ...  | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE |  |   |
|---|--|--|---|
| 1<br>Potential Sources of Runoff Pollutants   | 2<br>Permanent Controls—Show on WQMP Drawings                              | 3<br>Permanent Controls—List in WQMP Table and Narrative | 4<br>Operational BMPs—Include in WQMP Table and Narrative   |
| <ul style="list-style-type: none"> <li>■ P. Plazas, sidewalks, and parking lots.</li> </ul> |  |  | <ul style="list-style-type: none"> <li>■ 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.</li> </ul> |

## Appendix 9: O&M

*Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms*

# Operation and Maintenance Plan

Project Title: Iris Ave & Oliver St Commercial Development

### Contact Information:

Original Date Prepared: July 08, 2022  
Revision Date(s): \_\_\_\_\_  
Revision Date(s): \_\_\_\_\_  
Revision Date(s): \_\_\_\_\_  
Revision Date(s): \_\_\_\_\_

Prepared for: Rabih Sater  
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Contact: Angel Cesar, P.E.

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## **II. Updates, Revisions and Errata**

See Appendix 2

### **III. Introduction**

The proposed project Iris Ave & Oliver St Commercial development is a 1.58 acres site located on the northwest corner of the intersection of Iris Avenue and Oliver Street in the city of Moreno Valley, County of Riverside, State of California. The site is currently undeveloped and bordered by vacant lots to the west and north, to the south by Iris Avenue and to the east to Oliver Street. The proposed project consist a Carwash, Convenience store and a Gas Station.

### **IV. Responsibility for Maintenance**

#### **General**

Funding will be provided by the owner:

Rabih Sater

4300 Edison Ave Chino, CA 91710

#### **Records**

Maintenance records are to be inserted chronologically in Appendix 1 of this O&M Plan

#### **Safety**

All maintenance procedures shall comply with the latest OSHA standards.

#### **Replacement Cost**

The Underground chambers infiltration system is manufactured BMPs. When the bmp constant fails to infiltrate the mitigated volume within the allowable time. Replacement cost can be \$10,000-\$30,000.

## V. Summary of Drainage Management Areas and Stormwater BMPs.

### Drainage Areas

See Appendix 5 of this O&M Plan for WQMP Site map.

| DMA Name or ID | Surface Type(s)                    | Area (Sq.Ft.) | Area (Acres) |
|----------------|------------------------------------|---------------|--------------|
| 1              | Roofs/Conc/Asphalt and landscaping | 68,783        | 1.58         |
|                |                                    |               |              |
|                |                                    |               |              |

Geo-location of the BMPs using latitude and longitude coordinates.

| BMP No. or ID | BMP Identifier and Description | Corresponding plan Sheet(s) | Latitude  | Longitude   |
|---------------|--------------------------------|-----------------------------|-----------|-------------|
| 1             | Underground Chambers           | WQMP Site Map               | 33.895850 | -117.183296 |

|       |            |                     |  |  |
|-------|------------|---------------------|--|--|
| IB #1 | Pervious   | 15,249 sf (0.35 ac) |  |  |
|       | Impervious | 53,534 sf (1.23 ac) |  |  |

### Structural Post-Construction BMPs

See Appendix 5 of this O&M Plan for WQMP Site map.

### Self-Retaining Areas or Other

## **VI. Stormwater BMP Design Documentation**

### **“As-Built” Drawings of each Stormwater BMP**

See Appendix 6 of this O&M Plan for “as-built” drawings.

### **Manufacturer’s Data, Manuals, and Maintenance Requirements**

Not applicable, there are no manufactured stormwater BMPs.

### **Specific Operation and Maintenance Concerns and Troubleshooting**

Not applicable.

## VII. Maintenance Schedule or Matrix

### Maintenance Schedule

| Schedule   | Inspection and Maintenance Activity   |
|--|---|
| Semi-monthly including just before the annual storm season and following rainfall events.  | <ul style="list-style-type: none"> <li>• Routine maintenance and inspection.</li> <li>• Remove debris and litter from the entire basin to minimize filter clogging and to improve aesthetics.</li> <li>• Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water.</li> <li>• Check for erosion and sediment laden areas in the basins. Repair as needed. Clean forebay of debris, litter, sediment, etc upon discovery.</li> <li>• Revegetate side slopes where needed.</li> </ul>   |
| Annually. Schedule these inspections within 72 hours after a significant rainfall and prior to the rainy season (October 1st). "Significant rainfall" is defined as 0.5 inches or greater of rainfall: <a href="http://www.wrh.noaa.gov/forecast/wxtables/">http://www.wrh.noaa.gov/forecast/wxtables/</a> | <ul style="list-style-type: none"> <li>• Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element.</li> <li>• Check side slopes and embankments for erosion, slumping and overgrowth.</li> <li>• Inspect the sand media at the filter drain to verify it is allowing acceptable infiltration. Scarify the top 3 inches by raking the filter drain's sand surface annually.</li> <li>• Check the filter drain underdrains for damage or clogging. Repair as needed.</li> <li>• Repair basin inlets, outlets, forebays, and energy dissipaters whenever damage is discovered.</li> <li>• No water should be present 72 hours after an event. No long tern standing water should be present at all. No algae formation should be visible. Correct problem as needed.</li> </ul> |
| Every 5 years or sooner depending on the observed drain times (no more than 72 hours to empty the basin)   | <ul style="list-style-type: none"> <li>• Remove the top 3 inches of sand from the filter drain and backfill with 3 inches of new sand to return the sand layer to its original depth. When scarification or removal of the top 3 inches of sand is no longer effective, remove and replace sand filter layer.</li> </ul>  |

### VII.B Service Agreement Information

See Appendix 8 of this O&M Plan for service agreement information with any contractors regarding the O&M of BMPs at the site, if any.



# **Appendix 1: Inspection and Maintenance Logs**

Insert Additional Inspection or Maintenance Logs Here



## **Appendix 2: Updates, Revisions, and Errata**

Insert Additional Updates, Revisions, and Errata Logs Here



## **Appendix 3: Maintenance and Recording Mechanism**

Copy of Covenant Agreement Establishing Notification Process And Responsibility For Water Quality  
Management Plan Implementation And Maintenance

Notification Process and Responsibility

1. Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Phone No.: \_\_\_\_\_

WQMP Responsibilities:

- (1) Routine inspections to evaluate BMP effectiveness.
- (2) Identifying when BMPs require maintenance.
- (3) Working with qualified contractors to maintain the BMP.
- (4) Recordkeeping of inspections and maintenance activities.

2. Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Phone No.: \_\_\_\_\_

WQMP Responsibilities:

- (1) Cleaning, repairing, servicing, and maintenance of BMP.

3. Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Phone No.: \_\_\_\_\_

WQMP Responsibilities:

- (1) In event of failure, and with City Engineer's authorization, modify or replace with an upgraded BMP to prevent future failure.
- (2) Notify successors of BMPs and maintenance requirements.



## **Appendix 4: Training Records**

Insert Training Records with Brief Discussion Here

# **Appendix 5: Site Plan and Details**

WQMP Site Map and BMP Details

## **Appendix 6: “As-Built” Drawings**

Insert “As-Builts” Here When Available

# **Appendix 7: Manufacturer Information**

Brochures, Manuals, and Maintenance Requirements

## **Appendix 8: Service Agreement Information**

Insert Contractor Information (if any)

# **Appendix 10: Educational Materials**

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information



# Saltwater Pools

- Salt water pools, although different from regular pools, are in fact, sanitized using chlorine. A salt-chlorine generator separates the chlorine and sodium molecules in salt and reintroduces them into the pool water. The same harmful effects of chlorine still apply.
- A salt water pool is still maintained with chemicals such as Muriatic acid, soda ash and sodium carbonate to help keep a proper pH, total Alkalinity, Calcium Hardness and Stabilizer levels.



- It may be illegal to discharge salt water to land. The salt may kill plants and the build-up of salt in soil puts animals, plants, and groundwater at risk. Consult your city representatives to determine local requirements regarding salt water drainage.

**NEVER** put unused chemicals into the trash, onto the ground or down a storm drain.

**IMPORTANT:** The discharge of pollutants into the street, gutter, storm drain system or waterways - without a permit or waiver - is strictly prohibited by local ordinances, state and federal law. Violations may result in monetary fines and enforcement actions.

# Helpful telephone numbers and links

## RIVERSIDE COUNTY WATER AGENCIES:

|   |                |
|---|----------------|
| City of Banning.....                          | (951) 922-3130 |
| City of Beaumont/Cherry Valley.....           | (951) 845-9581 |
| City of Blythe.....                           | (760) 922-6161 |
| City of Coachella.....                        | (760) 398-3502 |
| City of Corona.....                           | (951) 736-2263 |
| City of Hemet.....                            | (951) 765-3710 |
| City of Norco.....                            | (951) 270 5607 |
| City of Riverside Public Works.....           | (951) 351-6140 |
| City of San Jacinto.....                      | (951) 654-4041 |
| Coachella Valley Water District.....          | (760) 398-2651 |
| Desert Water Agency (Palm Springs).....       | (760) 323-4971 |
| Eastern Municipal Water District.....         | (951) 928-3777 |
| Elsinore Valley Municipal Water District..... | (951) 674 3146 |
| Elsinore Water District.....                  | (951) 674-2168 |
| Farm Mutual Water Company.....                | (951) 244-4198 |
| Idyllwild Water District.....                 | (951) 659-2143 |
| Indio Water Authority.....                    | (760) 391-4129 |
| Jurupa Community Services District.....       | (951) 685-7434 |
| Lee Lake Water.....                           | (951) 658-3241 |
| Mission Springs Water.....                    | (760) 329-6448 |
| Rancho California Water District.....         | (951) 296-6900 |
| Ripley, CSA #62.....                          | (760) 922-4951 |
| Riverside Co. Service Area #51.....           | (760) 227-3203 |
| Rubidoux Community Services District.....     | (951) 684-7580 |
| Valley Sanitary District.....                 | (760) 347-2356 |
| Western Municipal Water District.....         | (951) 789-5000 |
| Yucaipa Valley Water District.....            | (909) 797-5117 |

## CALL 1-800-506-2555 to:

- Report clogged storm drains or illegal storm drain disposal from residential, industrial, construction and commercial sites into public streets, storm drains and/or water bodies.
- Find out about our various storm drain pollution prevention materials.
- Locate the dates and times of Household Hazardous Waste (HHW) Collection Events.
- Request adult, neighborhood, or classroom presentations.
- Locate other County environmental services.
- Receive grasscycling information and composting workshop information.

Or visit our

Riverside County Flood Control and Water Conservation District  
website at: [www.rcflood.org](http://www.rcflood.org)

## Other links to additional storm drain pollution information:

- County of Riverside Environmental Health: [www.rivcoeh.org](http://www.rivcoeh.org)
- State Water Resources Control Board: [www.waterboards.ca.gov](http://www.waterboards.ca.gov)
- California Stormwater Quality Association: [www.casqa.org](http://www.casqa.org)
- United States Environmental Protection Agency (EPA):  
[www.epa.gov/compliance/assistance](http://www.epa.gov/compliance/assistance) (compliance assistance information)



Riverside County's, "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

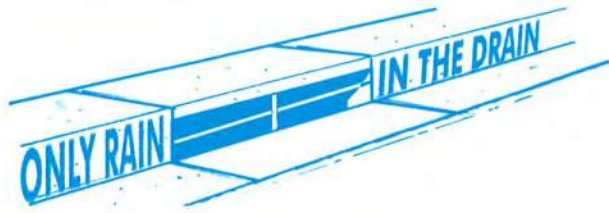
# Guidelines for Maintaining your...



# Swimming Pool, Jacuzzi and Garden Fountain



## Where does the water go?



Pool, Jacuzzi and Fountain wastewater and rain water runoff (also called stormwater) that reach streets can enter the storm drain and be conveyed directly into local streams, rivers and lakes.



A storm drain's purpose is to prevent flooding by carrying rain water away from developed areas. Storm drains are not connected to sanitary sewers systems and treatment plants!

Wastewater, from residential swimming pools, Jacuzzis, fishponds and fountains, often contains chemicals used for sanitizing or cleansing purposes. Toxic chemicals (such as chlorine or copper-based algaecides) may pollute the environment when discharged into a storm drain system.

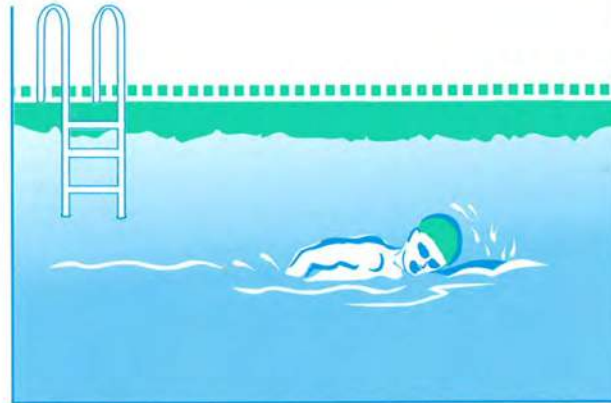
The Cities and County of Riverside have adopted ordinances that prohibit the discharge of wastewater to the street and storm drain system.



## Discharge Regulations

Regulatory requirements for discharging wastewater from your pool may differ from city to city. Chlorinated water should not be discharged into the street, storm drain or surface waters. Check with your water agency to see if disposal to the sanitary sewer line is allowed for pool discharges (see reverse for Riverside County sewer agencies).

If allowed, a hose can be run from the pool Jacuzzi, or fountain to the private sewer cleanout, washing machine drain or a sink or bathtub.



**If you cannot discharge to the sewer**, you may drain your fountain, pool, or jacuzzi to your landscaping by following these guidelines:

**First**, reduce or eliminate solids (e.g. debris, leaves or dirt) in the pool water and allow the chemicals in the pool water to dissipate before draining the pool (this could take up to 7 days, verify using a home pool test kit).

**Second**, slowly drain to a landscaped area away from buildings or structures. Control the flow to prevent soil erosion; it may take more than one day to empty. Do not allow sediment to enter the street, gutter or storm drain.

## Maintenance & Chemicals

### Cleaning Filters

Filter rinse water and backwash must be discharged to the sanitary sewer, on-site septic tank and drain field system (if properly designed and adequately sized), or a seepage pit. Alternatively, rinse water or backwash may be diverted to landscaped or dirt areas. Filter media and other non-hazardous solids should be picked up and disposed of in the trash.



### Algaecides

Avoid using copper-based algaecides unless absolutely necessary. Control algae with chlorine, organic polymers or other alternatives to copper-based pool chemicals. Copper is a heavy metal that can be toxic to aquatic life when you drain your pool.

### Chemical Storage and Handling

- Use only the amount indicated on product labels
- Store chlorine and other chemicals in a covered area to prevent runoff. Keep out of reach of children and pets.
- Chlorine kits, available at retail swimming pool equipment and supply stores, should be used to monitor the chlorine and pH levels before draining your pool.
- Chlorine and other pool chemicals should never be allowed to flow into the gutter or storm drain system.

Take unwanted chemicals to a Household Hazardous Waste (HHW) Collection Event. There's no cost for taking HHW items to collection events – it's FREE! Call 1-800-506-2555 for a schedule of HHW events in your community.





# The Complete Guide to Residential Recycling



**Southwest Riverside County**  
Canyon Lake, Hemet, Lake Elsinore, Menifee,  
Murrieta, Perris, San Jacinto, Temecula, Wildomar



# Used Oil and Filters


Recycling used motor oil and filters is easy!  
Simply take them to one of the certified  
collection centers below. **It's free!**




# Used Oil and Filters

You can also find Certified Collection  
Centers on the Cal Recycle Website:  
[www.calrecycle.ca.gov/recycle](http://www.calrecycle.ca.gov/recycle)

## Hemet

**AutoZone #2820**  
1550 W. Florida Ave.  
(951) 929-0807 

**AutoZone #5556**  
3100 E. Florida Ave.  
(951) 652-1308 

**EZ Lube #112**  
532 W. Florida Ave.  
(951) 766-1996

**Firestone Store #2233**  
350 W. Florida St.  
(951) 929-2424

**Inland Chevrolet**  
350 Carriage Circle  
(951) 658-4401

**Integrity Tire**  
3223 W. Florida Ave.  
(951) 658-3145

**Jiffy Lube #3187**  
330 N Sanderson Ave.  
(951) 487-2001


**Masterlube #101**  
3615 W. Florida St.  
(951) 766-7055

**O'Reilly Autoparts #1332**  
849 W. Florida Ave.  
(951) 929-2210

**Pep Boys #866**  
2050 W. Florida Ave.  
(951) 766-1477

**Ramona Tire**  
2350 W. Menlo Ave.  
(951) 925-6659

**Synfast Oil Change**  
3615 W. Florida Ave.  
(951) 766-7055


**Valvoline Instant  
Oil Change**  
532 W. Florida Ave.  
(951) 766-1996 

## Idyllwild

**Idyllwild Garage**  
25015 Hwy. 243  
(951) 659-2613

## Lake Elsinore

**AutoZone #5558**  
30870 Riverside Dr.  
(951) 674-7806

**AutoZone #5559**  
32231 Mission Trail  
(951) 245-1012 


**Express Tire**  
300 Diamond Dr.  
(951) 674-0794

**EZ Lube #96**  
29285 Central Ave.  
(951) 253-5200


**Firestone Store #2238**  
31748 Mission Trail  
(951) 674-0633

**Jiffy Lube #2681**  
311 Summerhill Dr.  
(951) 471-8445

**O'Reilly Autoparts #1429**  
31660 Grape St.  
(951) 245-8389

**Valvoline Instant Oil Change**  
29285 Central Ave.  
(951) 253-5200 

## Menifee

**AutoZone #5561**  
30123 Antelope Rd.  
(951) 301-7240 


**One Stop Lube & Oil  
Center**  
26825 Newport Rd.  
(951) 301-7479

## Murrieta

**AutoZone #5566**  
40950 California Oaks Rd.  
(951) 677-6206


**Express Tire**  
40615 California Oaks Rd.  
(951) 696-5200

**EZ Lube #115**  
40430 California Oaks Rd.  
(951) 696-2882

**Mountain View Tire and  
Service**  
27584 Clinton Keith Rd.  
(888) 860-0535 

**Murrieta Volkswagen**  
41300 Date St.  
(951) 634-5434

**O'Reilly Autoparts #1430**  
40951 California Oaks Rd.  
(951) 696-2991

**Valvoline Instant Oil Change**  
40430 California Oaks Rd.  
(951) 696-2882 

## Perris

**AutoZone #5570**  
401 E. 4th St.  
(951) 657-0696


**AutoZone #5571**  
1675 Perris Blvd.  
(951) 943-5998

**Jiffy Lube #3294**  
118 E. Ramona Expressway  
(951) 943-2200

**Jiffy Lube #3361**  
3150 Case Rd., Bldg. J.  
(951) 284-0922

**O'Reilly Autoparts #1046**  
119 W. Nuevo Rd.  
(951) 657-1488


## San Jacinto


**AutoZone #5581**  
1540 San Jacinto Ave.  
(951) 654-2216 


**Jiffy Lube #3186**  
635 S. State St.  
(951) 487-2001

**Ramona Auto Services, Inc.**  
2447 S. San Jacinto Ave.  
(951) 925-5117

## Temecula

**AutoZone #5582**  
31837 US Hwy. 79  
(951) 302-8334 

**AutoZone #5936**  
40345 Winchester Rd.  
(951) 296-3973 

**DCH Acura of Temecula**  
26705 Ynez Rd.  
(951) 491-2451 

# Used Oil and Filters



# Used Oil and Filters

## Temecula

### DCH Chrysler Jeep Dodge of Temecula

26845 Ynez Rd.  
(951) 491-2151

### DCH Honda of Temecula

26755 Ynez Rd.  
(951) 491-2351

### Express Tire

40915 Winchester Rd.  
(951) 296-6699

### Express Tire

44092 Margarita Rd.  
(951) 302-5033

### Express Tire

29095 Front St.  
(951) 695-0555

### EZ Lube #85

30625 Highway 79 South  
(951) 553-7399

### Jiffy Lube #1878

30690 Rancho California Rd.  
(951) 694-5460

### John Hine Temecula Mazda

42050 DLR Dr.  
(951) 553-2000

### O'Reilly Autoparts #0483

41125 Winchester Rd., #C1  
(951) 296-5530

### O'Reilly Autoparts #4291

33417 Temecula Pkwy.  
(951) 302-1351

### Paradise Chevrolet Cadillac

27360 Ynez Rd.  
(951) 506-0058

### Pep Boys #800

40605 Winchester Rd.  
(951) 695-2322

### Precision Tune Auto Care

26673 Ynez Rd., #A  
(951) 699-6969

### Promethean Biofuels Cooperative

27635 Diaz Rd.  
(626) 232-7608

### Quality Nissan

41895 Motor Car Pkwy.  
(951) 676-6601

### Ramona Auto Services, Inc.

40385 Winchester Rd.  
(951) 719-1600

### Ramona Auto Services, Inc.

31955 Via Rio Rd.  
(951) 303-3584

### Ramona Tire

40385 Winchester Rd.  
(951) 719-1600

### Rancho Car Wash and Quick Lube

27378 Jefferson Ave.  
(951) 296-5644

### Temecula Hyundai

27430 Ynez Rd.  
(951) 699-6807

### Temecula Quick Lube

29764 Rancho California Rd.  
(951) 587-6624

### Valvoline Instant Oil Change

30625 Highway 79 South  
(951) 553-7399



## Wildomar

### Grease Monkey

32120 Clinton Keith Rd.  
(951) 609-3000

### Jiffy Lube #3412

32374 Clinton Keith Rd.  
(951) 678-5300



## Winchester

### Mountain View Tire/Goodyear

30664 Benton Rd.  
(877) 872-1021

**Curbside pickup of used oil** is available in some cities in Riverside County. Contact your waste hauler for more information. Waste hauler contact information is provided on the back page of this guide.

**You may not need to change your oil every 3000 miles!** Save time, money, and the environment by visiting [www.checkyournumber.org](http://www.checkyournumber.org) to find out what your manufacturer recommended oil change interval is.

Locations marked with a  also accept oil filters.

**Please DO NOT drop off oil when the location is closed.** For more information about used oil collection centers call 800-350-4OIL.

# Household Hazardous Waste

# Household Hazardous Waste

Examples of household waste that are considered hazardous include:

- Batteries (all types)
- Electronic Waste
- Paint
- Used Oil and Antifreeze
- Sharps/ Needles



## Permanent Household Hazardous Waste Collection Centers

**Lake Elsinore Area** (Closed January and December)  
Lake Elsinore Regional Permanent HHW Collection Facility  
512 N. Langstaff Street, Lake Elsinore, 92530  
Open first Saturday of the month\*, 9:00 a.m. to 2:00 p.m.  
\*Except holiday weekends and during inclement weather.

**Riverside Area**  
Agua Mansa Regional Permanent HHW Collection Facility  
1780 Agua Mansa Road, Riverside, 92509  
Open non-holiday Saturdays\*, 9:00 a.m. to 2:00 p.m.  
\*Except during inclement weather.

## Regional ABOP Collection Centers (Antifreeze, Batteries, Oil and Oil Filters, and Latex Paint ONLY)

**Murrieta Area**  
County Road Yard  
25315 Jefferson Avenue, Murrieta, 92562  
Open Non-Holiday Saturdays, 9:00 a.m. to 2:00 p.m.

These sites accept residential waste only. For more information, contact the Riverside County Household Hazardous Waste Department Hotline at **800-304-2226** or **951-486-3200**, or visit, [www.rivcowm.org/opencms/hhw/index.html](http://www.rivcowm.org/opencms/hhw/index.html)

Below is a list of materials accepted at permanent HHW collection sites.\*

### Chemicals and Cleaners

|                       |                           |                           |
|-----------------------|---------------------------|---------------------------|
| Adhesives             | Flea Powder               | Paint - Latex / Oil Based |
| Air Freshener         | Floor / Surface Cleaners  | Paint Stripper / Thinner  |
| Aluminum Cleaners     | Fungicides                | Photo Chemicals           |
| Ammonia               | Furniture Polish          | Pool / Spa Chemicals      |
| Antifreeze            | Gas / Diesel Fuel         | Rodent Bait / Poison      |
| Brake Fluid           | Glue                      | Roof Coating              |
| Carburetor Cleaner    | Gun Cleaner               | Shoe Dye                  |
| Caulking              | Hair Dye                  | Spot Remover              |
| Chlorine Bleach       | Hobby Chemicals           | Transmission Fluid        |
| Chrome Polish         | Insecticides / Pesticides | Turpentine                |
| Disinfectant          | Kerosene / Lamp Oil       | Varnish                   |
| Drain Cleaner         | Lighter Fluid             | Weed Killer / Herbicide   |
| Engine Degreaser      | Motor Oil                 | Wood Preservative         |
| Fertilizer            | Mercury Devices           |                           |
| Fiberglass and Resins | Oven Cleaner              |                           |

### Aerosols and Tanks

Aerosol Insecticides  
Aerosol Cans  
BBQ Propane Tanks  
Camp Propane Tanks

### E-Waste and Batteries

Batteries (all types)  
Electronic Devices  
Fluorescent Bulbs / Tubes  
Old TVs and Computers

### Medical Waste

Sharps / Needles

Please **DO NOT** bring the following types of materials (If you have any of these wastes please call (951) 486-3200):

### Unacceptable Materials

|  |                                  |
|--|----------------------------------|
| Business, Non-Profit, or Out-of-County Waste | Appliances                       |
| Explosives / Ammunition                      | Tires                            |
| Radioactive or Remediation Materials         | 55 or 30 Gallon Drums            |
| Medical / Infectious Waste (Except Sharps)   | Compressed Gas Cylinders >40 lbs |
| Asbestos                                     | Trash                            |

\*Maximum Chemical Load: 5 Gallons or 50lbs per trip. Residential waste only, no business waste accepted.

**What can go into your curbside recycling bins?** Not sure what you can recycle? Check out the list below.

## Paper and Cardboard

- Books and Coloring Books
- Cardboard
- Cardstock and Construction Paper
- Office Paper
- Egg Cartons
- Clean Food Boxes
- Junk Mail and Envelopes
- Magazines and Newspapers
- Notebook Paper
- Paper Bags
- Telephone Books



## Metal

- Aluminum and Steel Cans
- Clean Aluminum Foil
- Scrap Metal



## Glass Jars and Bottles

- Glass Jars
- Beverage Bottles



## Plastic Bottles and Grocery Bags

- Plastic Milk Jugs
- Plastic Beverage Containers
- Plastic Grocery Bags



## Used Tires

Used tires are accepted at various locations in Riverside County. There is generally a fee to dispose of tires. The following locations accept tires:

### Badlands Landfill

31125 Ironwood Ave., Moreno Valley, 92553

### Lamb Canyon Landfill

16411 Lamb Canyon Rd., Beaumont, 92223



Visit [www.rivcowm.org/opencms/landfill\\_info/landfill\\_fees.html](http://www.rivcowm.org/opencms/landfill_info/landfill_fees.html) for information on current landfill pricing.

### BAS Recycling, Inc.

14050 Day St., Moreno Valley, 92553

(909) 383-7050

Call facility for pricing.

## Electronic Waste Recyclers

Badlands, Lamb Canyon, and El Sobrante Landfills accept up to 2 CRT devices (e.g. computer monitors or TVs) per day for recycling at **no cost** during operating hours. The following recyclers also accept electronic waste:

**The Green Guys Recycling**, Hemet - (951) 757-9156

**Starsurplus.com**, Murrieta - (951) 677-5696

**XIT Communications**, Murrieta - (951) 691-5138

**CR&R**, Perris - (800) 755-8112

**Tire Stop & Recycling**, Sun City - (951) 928-9600

**GKAT, INC. dba Temecula Recycling**, Temecula - (951) 693-1500

**Heavy Metal Scrap & Recycling, Inc.**, Temecula - (951) 693-4677

## Other Recycling Facilities

For a complete list of recycling facilities visit [www.calrecycle.ca.gov](http://www.calrecycle.ca.gov) and click on the "Recycle Tab."

[Earth911.com](http://Earth911.com) also provides valuable information and resources about recycling and recycling facilities.



# Recycling Centers

**What should you do with those empty cans and bottles?** Below is a list of centers that accept beverage containers for recycling\*.

## Hemet

**EarthWize Recycling**  
1231 S. Sanderson Ave.  
(909) 933-2773

**Menlo Recycle Center**  
445 E. Menlo Ave.  
(951) 766-8520

**NexCycle**  
1295 S. State St.  
(800) 969-2020

**NexCycle**  
3125 W. Florida Ave.  
(800) 969-2020

**rePlanet**  
43396 US Hwy 74  
(877) 737-5263

**The Green Guys Recycling**  
100 N. State St., #101  
(951) 757-9156

**Valley Metals**  
342 N. Juanita St.  
(951) 925-8577

## Lake Elsinore

**Cans Plus Recycling**  
29170 Riverside Dr., #1  
(951) 245-1178

**Downtown Elsinore Recycling**  
217 N. Main St.  
(323) 204-8308

**Lake Elsinore Recycling Center**  
1315 W. Flint St.  
(951) 579-4102

**Love Earth Recycling**  
31949 Corydon Rd., #160  
(951) 230-6580

**NexCycle**  
31564 Grape St.  
(909) 796-2210

**rePlanet**  
32281 Mission Tr.  
(951) 520-1700

**rePlanet**  
16750 Lakeshore Dr.  
(877) 737-5263

## Menifee

**rePlanet**  
30125 Antelope Rd.  
(951) 520-1700

**rePlanet**  
25904 Newport Rd.  
(877) 737-5263

**Neill's Recycling**  
26026 Sherman Rd.  
(951) 514-8656

**NexCycle**  
27220 Sun City Blvd.  
(909) 796-2210

**Tire Stop and Recycling**  
27491 Ethanac Rd.  
(888) 515-1376

## Murrieta

**EarthWize Recycling**  
27826 Clinton Keith Rd.  
(909) 933-2773

**Go Green Murrieta Recycling**  
40645 Cal. Oaks Rd.  
(818) 220-9540

**Murrieta Recycling**  
38365 Innovation Ct., #1102-1105  
(951) 894-3094

**rePlanet**  
40473 Murrieta Hot Springs Rd.  
(951) 520-1700

**rePlanet**  
23801 Washington Ave.  
(951) 520-1700

**rePlanet**  
4100 Cal. Oaks Rd.  
(951) 520-1700

**rePlanet**  
39140 Winchester Ave.  
(951) 520-1700

**rePlanet**  
28047 Scott Rd.  
(877) 737-5263

**SA Recycling**  
41400 Date St.  
(951) 677-8586

## Perris

**A-1**  
24440 Hwy 74  
(951) 940-4224

**Ecology Auto Parts**  
23332 Cajalco Rd.  
(951) 657-7725

**Go Green Recycling**  
164 Malbert St., #A-2  
(951) 487-5875

**Harb Family Market Recycling**  
22707 San Jacinto Ave.  
(951) 657-7733

**4th Street Recycling**  
510 W. 4th St.  
(323) 204-8308

**Menlo Recycle Center**  
151 W. 7th St.  
(951) 657-8200

**RecycleWise**  
200 Sinclair St. #4  
(951) 443-1894

**Recycling Depot**  
1320 W. Oleander Ave.  
(951) 442-5221

**rePlanet**  
47 W. Nuevo Rd.  
(877) 737-5263

## San Jacinto

**CA Recycling**  
762 S. San Jacinto Ave.  
(951) 651-0010

**rePlanet**  
1271 N. State St.  
(877) 737-5263

**San Jacinto Recycling Center**  
658 W. Esplanade Ave.  
(951) 654-1399

## Temecula

**Heavy Metal Scrap Recycling Inc.**  
43136 Rancho Way  
(951) 693-4677

**NexCycle**  
29530 Rancho California Rd.  
(909) 796-2210

**NexCycle**  
26419 Ynez Rd.  
(909) 796-2210

**rePlanet**  
30530 Rancho California Rd.  
(951) 520-1700

**rePlanet**  
33293 Temecula Pkwy.  
(951) 520-1700

**rePlanet**  
31813 Temecula Pkwy.  
(877) 737-5263

\*Some recycling centers may accept other recyclable materials. It is advisable to call the center and confirm this, as well as operating hours, before visiting.

For more information about local recycling centers visit the **CalRecycle** website: [www.calrecycle.ca.gov](http://www.calrecycle.ca.gov).

# Recycling Centers

**Temecula Recycling**  
27635 Diaz Rd., #120  
(951) 693-1500

## Wildomar

**rePlanet**  
23893 Clinton Keith Rd.  
(951) 520-1700

**rePlanet**  
30712 Benton Rd.  
(877) 737-5263

# Types of Plastic

# Composting Basics

**Confused about the types of plastic and if they can be recycled?** Many plastic containers display an identification code that indicates what they are made from. Below are the 7 codes.



**#1: Polyethylene Terephthalate (PETE or PET)**  
Used to create 2-liter soda bottles, water bottles, cooking oil bottles, peanut butter jars.  
*The most commonly accepted plastic for recycling.*



**#2: High Density Polyethylene**  
Used to create detergent bottles, milk and water jugs, grocery bags, yogurt cups.  
*Commonly accepted for recycling. Bags can be recycled at some large grocery stores.*



**#3: Polyvinyl Chloride**  
Used to create plastic pipes, outdoor furniture, shrink-wrap, liquid detergent containers, flooring, showercurtains.  
*Not currently accepted for recycling.*



**#4: Low Density Polyethylene**  
Used to create food storage containers, cellophane wrap, dry cleaning bags, produce bags, trash can liners.  
*Not commonly recycled, some large grocery stores accept LDPE bags.*



**#5: Polypropylene**  
Used to create ketchup bottles, aerosol caps, drinking straws, yogurt containers.  
*Not commonly accepted for recycling.*



**#6: Polystyrene**  
Also known as "Styrofoam." Used to make coffee cups, take-out food packaging, egg cartons, and packaging "peanuts."  
*Sometimes accepted for recycling and made into the same products.*



**#7: Other**  
All other plastic resins or a mixture of resins used to make reusable water bottles, Tupperware, biodegradable and compostable plastics.  
*Not commonly accepted for recycling.*

**Got food scraps and yardwaste?** Below is a quick guide to Backyard Composting.

## 1. Select a good spot for composting

- Sun or shade
- Convenient to kitchen or garden, and close to a source of water
- Keep away from structures and wood, as moisture can hasten decay
- Place only on bare ground, as organisms from soil are needed

## 2. Know the Ingredients

**Nitrogen** - Green materials - grass clippings, fresh leaves and twigs, vegetable and fruit trimmings, coffee grounds and filters, and non-meat eating animal manures.

**Carbon** - Brown materials that have released their nitrogen - dry and brittle leaves and grasses, straw, wood chips, corn stalks, shredded newspaper, paper towels, napkins, and cardboard.

**Water** - The correct moisture level should be about the same as a damp wrung out sponge. A few drops should fall when squeezed in your hand.

**Air** - Oxygen is very important to the bacteria, fungi, and microorganisms that are working in the pile to breakdown the organic material.

**Do Not Add** - Meat, dairy products, fats, oils, waste from meat eating animals (dogs and cats), thorny plant material, or diseased plant material.

## 2. Know the Methods

**Aerobic** - Pile equal parts green and brown material on ground or in a bin in a 3'x3'x3' heap, water well, and cover with a tarp, carpet or opaque plastic sheet. The pile will heat up (120 to 160 degrees), and needs to be turned after a few days, once it has cooled. Turn the pile weekly and continue composting until the pile has a dark rich look like chocolate cake and the things you put in don't look like their original form. After the compost is done, water well, cover, and let it rest for one to two weeks to make sure it is completely done and the nitrogen has a chance to stabilize. If the compost is used too soon it could rob nutrients from the surrounding plants. Remove large chunks and add them to the next compost pile.

**Anerobic** - Similar to the Aerobic method, but there is no need to actively turn the material. It may take longer (1-2 years), but is still beneficial to your garden. Just pile the stuff, water, cover, and wait.

For more detailed information on composting, free workshops, or other methods, such as **Vermicomposting**, visit [www.rivcowm.org](http://www.rivcowm.org) and search for composting.

# Source Reduction

**The best way to reduce waste is to prevent it!**

## Buy Responsibly

**Reduce packaging waste** - Look for products that reduce packaging, or purchase in bulk to reduce the amount of packaging needed.

**Look for products containing recycled material** - Recycled paper products, motor oil, and even pens and pencils are just a few examples of products that reduce waste.

**Consider reusable products** - Buy reusable water bottles and sturdy utensils and plates that can be washed and used again.

**Get it “For Here,” or bring your own** - Many coffee shops will provide drinks to their customers in ceramic mugs rather than paper cups if requested. Just ask! Reusable tumblers are also a great alternative to paper cups, and many establishments will even give a small discount to those who bring their own!

**Borrow, rent, or share** - Why buy something if you are only going to use it once? Items such as tools, party decorations, and even newspapers and magazines can be shared with your friends, family, and/or community.

**Purchase rebuilt, remanufactured, or refurbished** - Many electronics such as cell phones, computers, and media players can be purchased “refurbished” at a sometimes substantial price reduction. This conserves the resources needed to manufacture a new product.

## Choose Non-Toxic

Choose products that contain only non-toxic materials, or try one of these **homemade alternatives**:

- Instead of glass cleaner, dilute 1 cup of vinegar in 1 quart of water.
- To open clogged drains, flush with a mixture of boiling water, and equal parts baking soda and vinegar.

For more information on non-toxic alternatives, visit the California Coastal Commission website:

<http://www.coastal.ca.gov/ccbn/lesstoxic.html>

# Source Reduction

**Plastic bags and junk mail contribute to a significant amount of un-needed waste.** You can lessen their impact by Reducing, Reusing, and Recycling.



## Plastic Bags

**Reduce: BYOB (Bring Your Own Bag)** - Use reusable canvas or cloth bags rather than plastic bags, and keep them in your car. Not all items need a bag, just say “no, thank you.”

**Reuse** - Plastic grocery bags can serve multiple purposes, such as trash can liners or for pet waste.

**Recycle** - If you find that you must use a plastic bag, recycle it when you are finished. Most large supermarkets and pharmacies offer free recycling of plastic bags.

## Junk Mail Reduction

You can reduce the amount of unwanted junk mail in your mailbox by simply mailing a postcard to the following addresses, requesting your name be removed from their mailing list. Be sure to include your full name, your address(es), your signature, and the date.

Mail Preference Service  
Attn.: Dept. 10088342  
PO Box 282  
Carmel, NY 10512

ADVO  
Consumer Assistance  
PO Box 249  
Windsor, CT 06095

Harte-Hanks Circulation  
C/O Pennysaver  
2830 Orbiter St.  
Brea, CA 92821

Valpak Direct Marketing Systems, Inc.  
8605 Largo Lakes Dr.  
Largo, FL 33773

Credit Card Junk Mail  
Call (888)5-OPT OUT (888-567-8688)

## City / County Resources

**City of Canyon Lake - Waste and Recycling** | (800) 755-8112

<http://www.cityofcanyonlake.com/recycling.asp>

**City of Hemet - Integrated Waste Management** | (951) 765-3712

<http://www.cityofhemet.org/index.aspx?nid=93>

**City of Lake Elsinore - Recycling** | (951) 674-3124

<http://www.lake-elsinore.org/index.aspx?page=751>

**City of Menifee - Public Works Department** | (951) 672-6777

<http://www.cityofmenifee.us/index.aspx?nid=99>

**City of Murrieta - Trash & Recycling** | (951) 461-6007

<http://www.murrieta.org/services/trash>

**City of Perris - Waste & Recycling** | (951) 943-6100

<http://www.cityofperris.org/residents/waste-recycle.html>

**City of San Jacinto - Waste & Recycling** | (951) 487-7330

<http://www.san-jacinto.ca.us/residents/waste.html>

**City of Temecula - Trash & Recycling** | 951-694-6444

<http://www.cityoftemecula.org/temecula/residents/trashrecycling/recycling.htm>

**City of Wildomar - Trash Hauling and Recycling** | (951) 677-7751

<http://www.cityofwildomar.org/trash-hauling-recycling.asp>

**County of Riverside - Riverside County Waste Management Department**

<http://www.rivcowm.org> | (951) 486-3200

**Western Riverside Council of Governments**

<http://www.wrcog.cog.ca.us> | (800) 350-4645

## Waste Haulers

**Waste Management, Inc.** - (951) 280-5400 - [www.wm.com](http://www.wm.com)

Serves: Menifee, Murrieta, and Wildomar

**CR&R Disposal** - (951) 943-1991 - [www.crrwasteservices.com](http://www.crrwasteservices.com)

Serves: Canyon Lake, Hemet, Lake Elsinore, Perris, San Jacinto, and Temecula

**The Complete Guide to Residential Recycling is sponsored by:**



# water efficient

## LANDSCAPES

In California, the largest use of all urban water is watering landscapes. When a landscape or irrigation system is poorly designed or poorly maintained, or the landscape consists of plants not suited to the dry and often hot California climate, water demand increases as a result of excessive evaporation, leaks, and runoff. Water consumption can be greatly reduced with careful planning, good plant selection, efficient irrigation systems, and good water management and maintenance practices.

Since California experiences frequent and sometimes prolonged droughts together with an ever increasing demand, there is a great need for us to use water efficiently. But this doesn't mean we have to give up our gardens. We can use water more efficiently and still have colorful, esthetically pleasing landscapes—including some turf areas for recreation.

This brochure is intended to help you create a landscape that is not only water efficient, but attractive, colorful, and low maintenance.

The designs illustrated here are typical back yards, but the principles of water efficient gardening apply to front yards as well.





## Planning ahead

Planning is the key to a successful water wise landscape. It is very tempting to go to a garden center and buy plants because they catch your eye, but not knowing where to place them and how much water they need are the beginnings of an unnecessarily high water using landscape. By planning ahead, costly mistakes can be avoided.

Contact your local water provider to see if they offer any services such as water audits or landscape planning. Some agencies offer landscaping classes and provide water conservation devices. Some also have demonstration gardens where you can witness water efficient gardens in person, see how attractive they can be, and get ideas for your own site.

To get started, measure the landscape and draw the area and any existing landscape features to scale. This will give you an idea of the numbers of plants you will need, the size of the lawn and how much irrigation pipe, sprinkler heads, and mulch you will need to buy.

Consider the size, sun exposure, and slope of the area to be landscaped. Avoid lawns on slopes that are difficult to mow and water. If possible, reduce slopes in the landscape that encourage runoff and waste water.

Think about who will use the landscape and how they will use it. These factors determine the type of plants required and how it will be maintained. Don't forget the need for shade and privacy screening.

When drawing the actual planting plan, avoid the temptation to place too many plants for the area. A crowded garden will use more water, cost more, be prone to diseases, and require more maintenance.

Consult books such as *Sunset Western Landscaping Book* about garden design. Many books available are very good for useful advice and ideas. Some are written with the dry west in mind and focus on landscaping with the proper types of plants for warm, dry climates.

If this phase of the project is too difficult, hire a licensed landscape architect or designer. A landscape architect might be able to design the irrigation system for you or you can consult with an irrigation design specialist. Be sure to keep a copy of the landscape plans for future reference.

## How much grass do you need?

Lawns use more water than any other part of a landscape and they cover large amounts of acreage statewide. Oftentimes lawns are installed because an alternative was never considered. There are alternatives to lawns, so in the planning stage decide if lawn is really a requirement in your yard. Think of who will use it and how often, who will mow it, fertilize it, remove the thatch, etc.

Perhaps a lawn is not needed at all. If a grass area is really just space filler, consider alternatives such as hardscapes, rock gardens or an unthirsty groundcover. This is especially important on areas with slopes that tend to shed water faster than it can soak in. Water draining into street gutters and storm drains often discharges directly into streams and this runoff from landscapes frequently contains fertilizers, pesticides, and other pollutants.

If you choose to plant a turf area after considering these factors, minimize the size of the lawn and choose a grass type that doesn't require lots of water and fertilizer.

Warm season grasses such as Hybrid Bermuda Grass and St. Augustine Grass use much less water than cool-season grass such as Kentucky Bluegrass. Certain Dwarf Tall Fescues use somewhat less water than Bluegrass.

Warm season grasses typically have a short winter dormant period, but winter dormancy occurs when many people are not actively using their gardens and even dormant, warm season grass provides a usable surface for people and pets. If the look of dormant grass is objectionable, it can be overseeded with another type of grass for the winter.

## Good choices make good landscapes

Once a decision regarding the turf area has been made, choose trees and large shrubs next. Make these choices carefully, they are the "backbone" of any landscape and poor choices will result in high water use, poor performance, and frequently costly maintenance or removal.

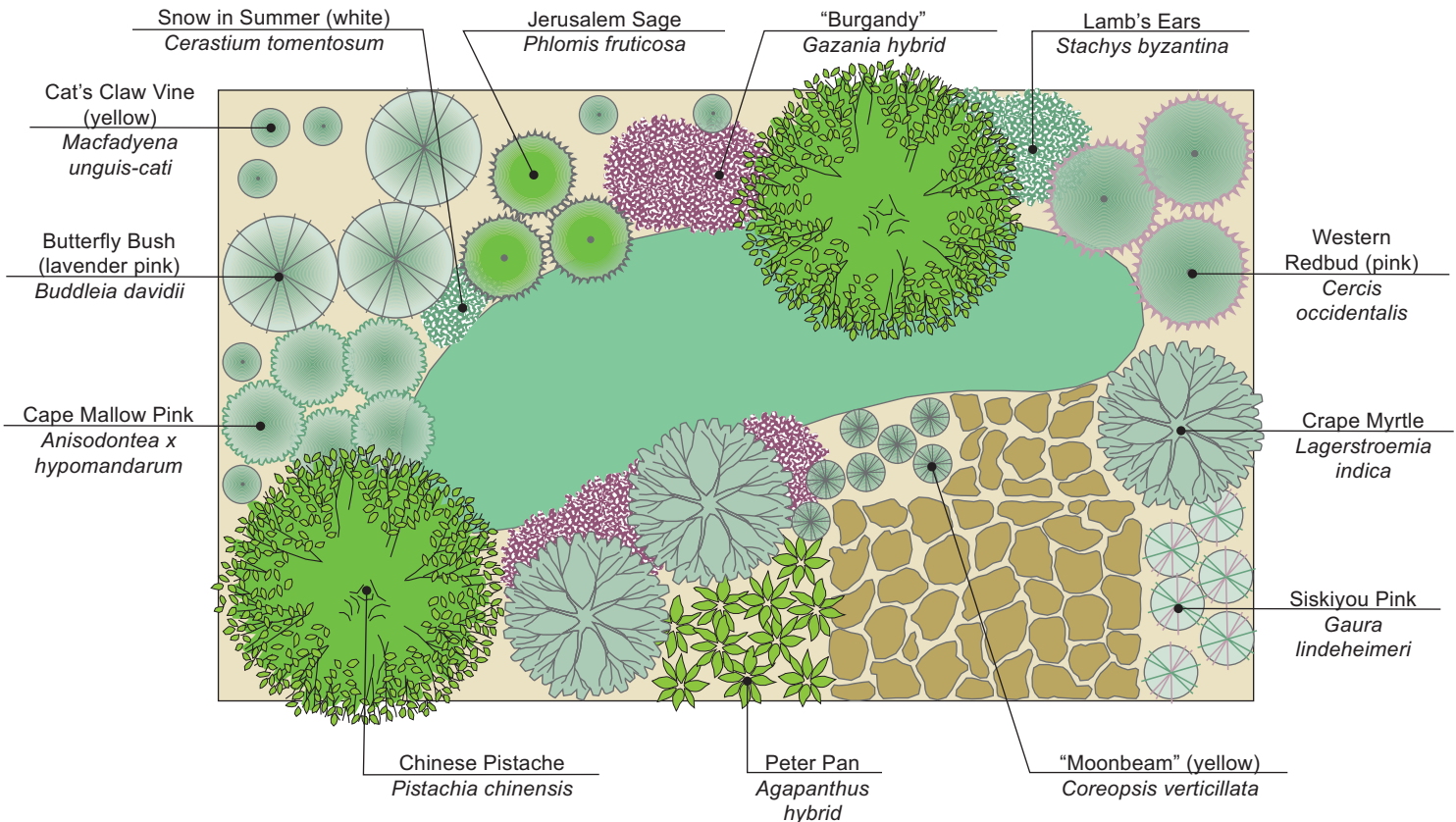
When selecting trees and large shrubs, choose varieties that will still fit into your yard when they mature. Learn what your climate zone is and buy plants that are suited to it. Choose deciduous trees for shade and evergreen trees for screening.



# water efficient landscape

## What's right about this landscape?

Warm-season grass, permeable surface patio, water efficient plants with nearly year-round color, mulch in shrub areas, deciduous trees for summer shade and winter sun, a California native, shrubs attractive to hummingbirds and butterflies. This garden, with a landscaped area of 1,800 sq. ft., requires about 5,800 gallons of water to irrigate for the month of July in the Central Valley. A smaller lawn would make this landscape even more water efficient. A landscape of the same size with thirsty plants and a bluegrass lawn would require an additional 2,000 to 3,000 gallons of water for the month of July.



Try to group plants by water requirements, such as very low (e.g. drought tolerant California natives, such as Blue Oaks, Western Redbud), low (e.g. Rosemary, Lavender), medium (e.g. Photinia, Euonymus), and high (e.g. Australian Tree Fern, Umbrella Sedge). Keep the high water-using plants to a minimum as focal points.

For help with selecting trees, shrubs, and groundcovers consult a good gardening encyclopedia such as *Sunset Western Garden Book*, your local Cooperative Extension, or a reputable nursery. Your local Urban Forester or tree foundation can give valuable advice about which trees grow well in your area.

Another excellent reference is *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California*, which is available on the Department of Water Resources Web site at:  
<http://www.owue.water.ca.gov/docs/wucols00.pdf>

Beginning on page 45, this publication gives the water needs of landscape plants in the six major climate regions of California. Guides of this type are valuable in the design stage by aiding in the selection of plants for groupings with similar water needs. These groupings of plants of similar water requirements are also known as hydrozones.

## Irrigation

After the plants are chosen, design and install an efficient irrigation system—one that will deliver a sufficient amount of water where it's needed. If you need information or help to design an irrigation system, ask at an irrigation supply store or hire a licensed landscape contractor who specializes in irrigation systems to design and install it.

Several of the major irrigation equipment manufacturers sell inexpensive irrigation design manuals online and at supply stores. A good irrigation design manual will

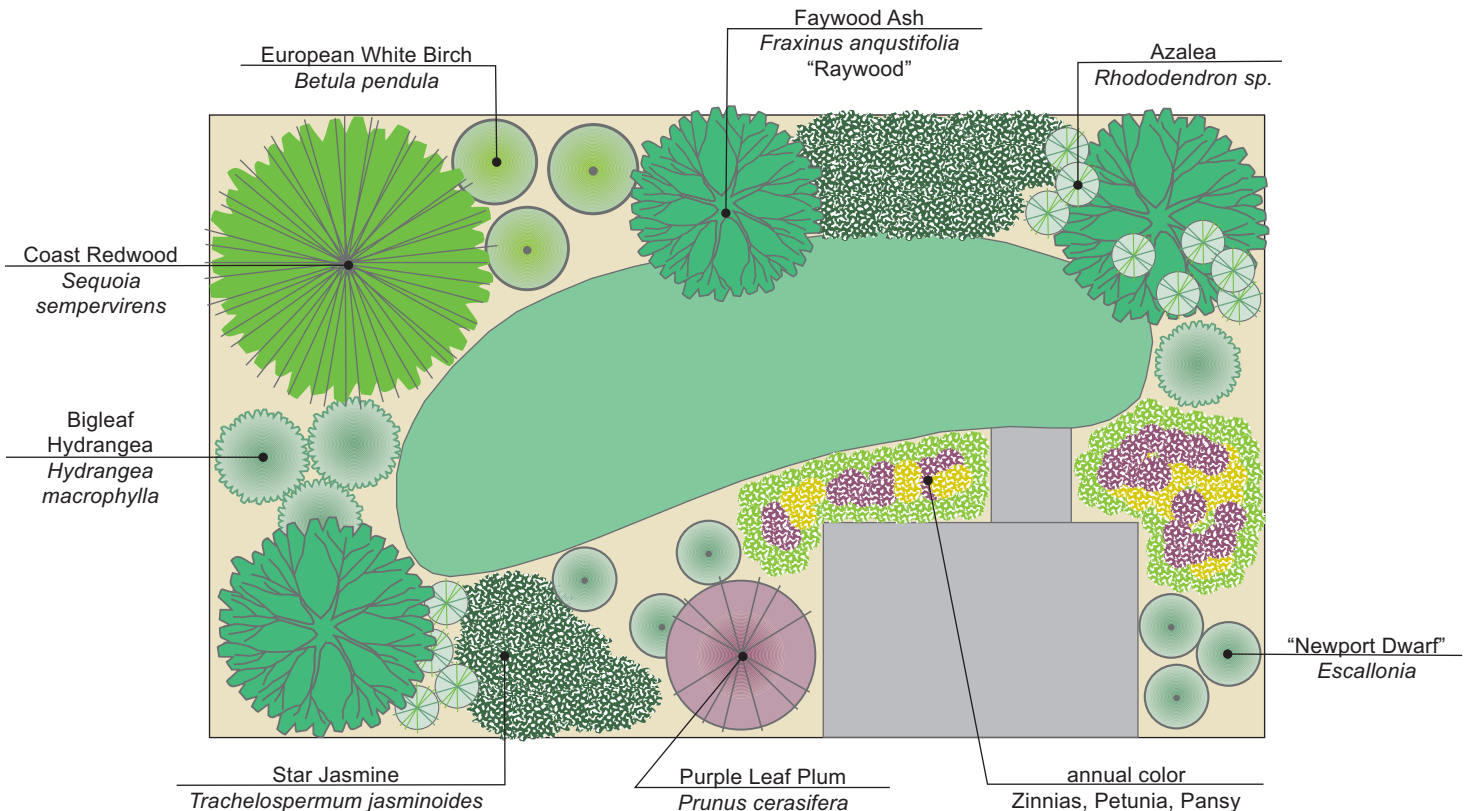
# typical landscape

## What's wrong with this landscape? (from a water conservation point of view)

Large lawn with cool-season grass, impervious patio, and a lot of high water using plants (Hydrangea, Azaleas, Birches, Annual color and Coast Redwood). This garden, with a 1,600 sq. ft. landscaped area, requires about 8,400 gallons of water to irrigate for the month of July in the Central Valley. This landscape requires over 2,500 gallons of water more per month (in July) than the previous example.

## What could be a better version?

Although this landscape uses several water efficient plants, the water use is still high. Smaller lawn, warm season grass, less high water using plants, mulch, and avoiding large trees in smaller yards make landscapes much more resource efficient. For example, Redwoods need a lot of moisture and grow too large.



address important aspects of sprinkler design such as sprinkler layout, water pressure, choosing the right sprinkler for the job, head to head coverage, and matching precipitation rates. Some manufacturers offer free irrigation design services.

Always be sure to keep a drawing of the sprinkler layout and a list of parts used (including brand names and model numbers) for future reference. This will make any future repairs or additions much easier.

Use sprinklers that will apply water evenly. Use stream rotors on lawns and bubblers in shrub and tree areas. The better quality pop-up spray sprinklers work well in smaller areas, but avoid using sprinklers that create a fine mist because much of that water is lost to evaporation and overspray.

Check the operating pressure with a pressure gauge at an outdoor faucet so that you can select the right sprinkler for the job. Sprinklers are labeled to show how far they spray at different pressures. Operation at too high of pressure will create a lot of water-wasting mist and too little pressure will cause uneven coverage.

Microspray and drip irrigation are other good choices for tree and shrub areas. Microspray and drip also work well on container gardens and window boxes. Microspray and drip systems apply water slowly and just where it's needed.

When you water, apply it infrequently, deeply (throughout the root zone), and evenly. This will encourage deep rooting, which will make plants better able to withstand hot, dry spells.

Lawns require water about once or twice a week in warm weather. Trees and shrubs require watering less frequently. Because of this shrubs and trees should always be on separate zones from turf.

In the spring, fall, and winter all plants need much less water than is required in summer. Consequently, watering time should be much shorter and less frequently in the off peak seasons.

One way to make watering much easier is by using an irrigation controller, also called a sprinkler timer or clock. Timers can save gardeners a lot of time by watering automatically, but they can waste a lot of water if not reprogrammed to water less as the seasons change.

If an irrigation controller is to be used, be sure to purchase one with multiple functions. Buy one with extra stations in case you need to add irrigation zones later. Most importantly, adjust the timer monthly, weekly if needed, so that the irrigation time set for the summer is not set during the rest of the year.

During hot or cool spells most controllers can be easily adjusted without disturbing the original program. By using the "seasonal adjust" or "budget adjust" feature, frequent changes to the amount of time watering can easily be accomplished simply by pushing a button.

The amount of water applied can be increased or decreased in 10% increments. When considering that July is usually the peak demand for water, it can be considered to be the 100% mark.

For example, during April the irrigation could be turned on and the controller set for 60% of the amount it will be watered in July. This can be accomplished by pushing the seasonal adjust button until the display shows 60%. The controller can be adjusted upwards gradually as the weather warms.

Likewise in fall, the season adjust can be adjusted downward beginning in August for most areas of California. This can continue through October or November. By November the irrigation system can be turned off in most places in the state.

Rainfall may be enough for most areas, but if supplemental irrigation is required during the winter, use the manual "on" switch to run the irrigation when the landscape shows signs of water stress. The controller can also be reprogrammed to run less frequently than it would during the rest of the year. Consider installing a rain shut-off switch to prevent watering while it's raining.

Use a soil probe or large screwdriver to check the soil moisture. It may look dry on the surface, but be moist underneath. If the soil is still moist, plants probably won't need to be irrigated yet. Always observe how a change in the irrigation schedule affects the landscape.

## water wise plants

There are many water wise plants to choose from that thrive in California's mostly moderate climate. These include both many attractive natives and plants introduced from other Mediterranean-like climates. These unthirsty plants enable any gardener to create a water conserving landscape. In addition to the plants shown in these water efficient landscape designs, here is a list of a few more of the many water wise plants available.

### SHRUBS

Blue Hibiscus, *Alyogyne huegelii*  
Coyote Brush, *Baccharis pilularis*  
Barberry, *Berberis x stenophylla*  
Bush Anemone, *Carpenteria californica*  
Bush Morning Glory, *Convolvulus cneorum*  
Smoke Tree, *Cotinus coggygria*  
Euryops, *Euryops pectinatus*  
Pineapple Guava, *Feijoa sellowiana*  
Texas Ranger, *Leucophyllum sp.*  
Pomegranate, *Punica granatum*

### TREES

Madrone, *Arbutus menziesii*  
Bottle Tree, *Brachychiton populneus*  
Pindo Palm, *Butia capitata*  
Australian Beefwood, *Casuarina stricta*  
Honey Locust, *Gleditsia triacanthos*  
Sweet Bay, *Laurus nobilis*  
Interior Live Oak, *Quercus wislizenii*  
Locust, *Robinia x ambigua*  
Texas Mountain Laurel, *Sophora secundiflora*  
Chaste Tree, *Vitex agnus-castus*

### GROUNDCOVERS

Bearberry, *Arctostaphylos uva-ursi*  
Carmel Creeper, *Ceanothus griseus horizontalis*  
Red Spike Ice Plant, *Cephalophyllum sp.*  
Chamomile, *Chamaemelum nobile*  
Creeping Coprosma, *Coprosma x kirkii*  
Trailing Lantana, *Lantana montedivensis*  
Creeping Mahonia, *Mahonia repens*  
Pork and Beans, *Sedum rubrotinctum*  
Australian Bluebell Creeper, *Sollya heterophylla*  
Wooly Thyme, *Thymus pseudolanuginosus*

### PERENNIALS

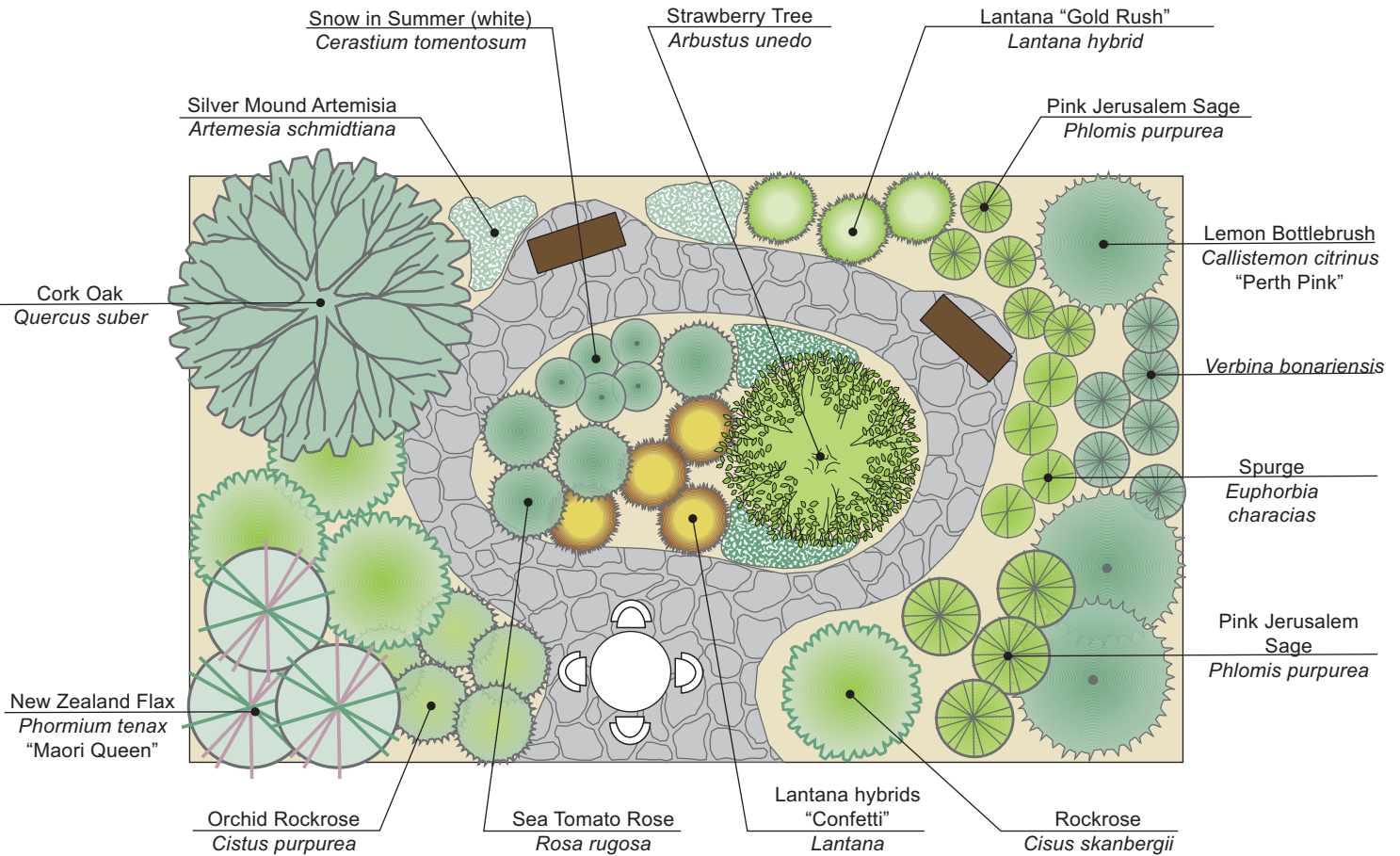
Yarrow, *Achillea millefolium*  
Columbine, *Aquilegia hybrids*  
Wormwood, *Artemisia "Powis Castle"*  
Italian Arum, *Arum italicum*  
Cast Iron Plant, *Aspidistra elatior*  
Fortnight Lily, *Diets iridioides*  
Siberian Wallflower, *Erysimum x allionii*  
Blanketflower, *Gaillardia grandiflora*  
Sunrose, *Helianthemum nummularium*  
Crown Pink, *Lychnis coronaria*



# strolling garden

## Turfless is effortless—well, almost.

If you don't need grass, just a quiet place to enjoy nature and be outside, try installing a strolling garden. Many water efficient plants are not fussy and don't require a lot of maintenance. Occasional pruning to rejuvenate and improve shape is all that many of these plants need. Unthirsty plants, organic mulch, and a permeable gravel path make this garden a real water saver. This garden, with a landscaped area of about 900 sq. ft., requires about 1,550 gallons for July in the Central Valley and only about 1,000 gallons on the Coast during July.



Some features to look for in irrigation controllers are:

- multiple independent programs (for different types of plant zones)
- several start times, cycle and soak (for heavy or compacted soil or sloped areas)
- nonvolatile memory and battery backup (to keep the schedule current after a power failure)
- water budgeting in percentage (%) increments (to water according to what the plants really need)
- rain shut-off device (to save water when the landscape is watered by rain)

These irrigation guidelines are general and may not always reflect the needs of your particular site.

## The fun part

Once the irrigation system is installed, the lawn, trees, and shrubs can be planted. If your site has very sandy or heavy clay soil, amend the soil to increase the fertility and water holding capacity or to improve drainage. Plant shrubs according to the plan so that their leaves will just touch once they become established. This will ensure that the ground will be shaded by foliage but there will be adequate air circulation. This "room to breathe" will make appreciating the foliage and flowers much easier.

Set all shrubs and tree root balls somewhat high in the planting hole so that the top of the root ball will not settle below grade.

If young trees need staking, use two or three stakes tied loosely and just high enough on the trunk to keep the trunk from bending over. Remove them once the trees can stand on their own. While stakes can support a newly planted tree, if left too long, they will actually cause the tree to grow weakly. Shorten the staking poles so that they will not rub the bark of the new tree.

New lawns can be seeded, hydroseeded or planted with sod. There are advantages to all of these methods; therefore, budget, time of year, and availability of products will determine the right grass planting method for your landscape. A good landscaping book will outline the steps to preparing, planting, and maintaining a lawn.

After the plants are planted, cover the ground around trees and shrubs with a two-to-three-inch layer of organic mulch, keeping it away from the plant stems. Mulch will keep the soil cool and moist in warm weather and insulate it during winter. Mulch also has the added benefit of controlling weeds and enriching the soil by adding organic matter.

## Routine maintenance keeps a landscape looking great

Regular maintenance of a landscape will keep it looking great and resource efficient. By working on small tasks on a continuous basis the large tasks will be limited.

- Check the irrigation system frequently for leaks, broken sprinklers, and clogged emitters; repair with the correct parts.
- Adjust the sprinklers as needed. If water runs off the landscaped area before the irrigation cycle is complete, adjust the timer to run several times with a shorter duration each time. For example, instead of running it for 15 minutes continuously, adjust the timer to run three times that day for 5 minutes each time, with an interval in between to let the water soak in. This is especially important on slopes and high traffic areas.
- Check the soil moisture depth with a soil probe or large screwdriver. If you use a screwdriver, push it in to the soil until you feel resistance. That is the approximate depth of where the soil is dry. If the moisture extends well below the root zone cut back on the water somewhat by shortening the time of an irrigation cycle or adding more time between cycles.

- Observe how a decrease in water affects the landscape and make adjustments as needed.
- Refresh the mulch layer in the spring.
- Prune only when necessary to shape the plant or remove dead or diseased parts.
- If fertilizer is necessary, use a balanced fertilizer, avoiding high Nitrogen mixtures that will cause excessive growth and could impact groundwater quality.
- When you mow, "grasscycle" the clippings. The clippings left behind on the grass will break down without causing a buildup of thatch.
- Aerate lawns occasionally to improve water infiltration.
- In times of drought, deep soak shrubs and trees only after they show signs of water stress, and water only in off peak hours. If a drought becomes severe, community leaders may ask people to stop watering their lawns, but any trees planted in lawn areas will still need an occasional soaking to survive. Deep soak these trees as you would any other tree in the landscape by drip, bubbler or garden hose.

If a garden is comprised mostly of water efficient plants, the landscape can be sustained on minimal irrigation through a drought and will be able to recover when water conditions improve.

## The big picture

If good horticultural practices are followed, the dependence on chemicals in the garden can be reduced significantly. Mulching and grasscycling can greatly reduce the need for chemical fertilizers. Likewise, when less water is used, fertilizers and pesticides are not washed away. Less water controls excessive growth and reduces the amount of succulent new growth that is attractive to insect pests.

Since too much water causes many problems with plants, it makes sense to be water wise. It will save money and time, as well as give the gardener the satisfaction of doing his or her part in solving California's real water challenge.

State of California  
The Resources Agency  
Department of Water Resources  
**OFFICE OF WATER USE EFFICIENCY**  
P.O. Box 942836  
Sacramento, CA 94236-0001

**Phone:** (916) 651-9676

**Web site:** [www.owue.water.ca.gov/landscape](http://www.owue.water.ca.gov/landscape)

**e-mail:** [landscape@water.ca.gov](mailto:landscape@water.ca.gov)

(A copy of this brochure is available in PDF format at  
[www.owue.water.ca.gov/landscape/pubs/pubs.cfm](http://www.owue.water.ca.gov/landscape/pubs/pubs.cfm))



This brochure was written by Julie Saare-Edmonds, landscape specialist for DWR's Office of Water Use Efficiency. Design and layout was provided by Alice Dyer of DWR's Division of Planning and Local Assistance.



# For Information:

To report illegal dumping or a clogged storm drain  
1-800-506-2555

Hazardous Materials Disposal,  
Recycling/Disposal Vendors call:  
951-486-3200 or 1-800-506-2555

County Code Enforcement Offices  
(unincorporated area)

Lake Elsinore/Mead Valley .....951-245-3186  
Jurupa Valley .....951-275-8739  
Moreno Valley/Banning .....951-485-5840  
Murrieta So. County .....951-600-6140  
Thousand Palms District .....760-343-4150

Environmental Crimes  
1-800-304-6100

Spill Response Agency  
1-800-304-2226 or 951-358-5172

Recycling and Hazardous Waste Disposal  
1-800-366-SAVE

For pollution prevention brochures or to obtain  
information on other County Environmental  
Services, call 1-800-506-2555

Popular links:

[www.rcflood.org](http://www.rcflood.org)  
[www.cabmphandbooks.com](http://www.cabmphandbooks.com)  
[www.cfpub.epa.gov/npdes](http://www.cfpub.epa.gov/npdes)

ONLY RAIN DOWN THE  
STORM DRAIN  
POLLUTION PREVENTION  
PROGRAM  
1-800-506-2555



Riverside County's "Only Rain Down the Storm Drain"  
Pollution Prevention Program members include:

|                                    |                        |                  |
|------------------------------------|------------------------|------------------|
| Banning                            | Desert Hot Springs     | Palm Desert      |
| Beaumont                           | Hemet                  | Palm Springs     |
| Calimesa                           | Indian Wells           | Perris           |
| Canyon Lake                        | Indio                  | Rancho Mirage    |
| Cathedral City                     | Lake Elsinore          | Riverside County |
| City of Riverside                  | La Quinta              | San Jacinto      |
| Corona                             | Menifee                | Temecula         |
| Coachella                          | Murrieta               | Wildomar         |
| Coachella Valley<br>Water District | Moreno Valley<br>Norco |                  |

# Stormwater Pollution

*What you should know for...*

## Automotive Maintenance and Car Care

Best Management Practices (BMPS)  
for:

- Auto Body Shops
- Auto Repair Shops
- Car Dealerships
- Gas Stations
- Fleet Service Operations



# Stormwater Pollution...What You Should Know

**R**iverside County has three major river systems, or watersheds, that are important to our communities and the environment. Improper automotive maintenance, storage and washing activities can cause pollution that endangers the health of these rivers.

Pollutants that can collect on the ground from automotive repair, storage and washing areas such as antifreeze, oil, grease, gas, lubricants, soaps and dirt can be washed into the street by rain, over-irrigation or wash water runoff. Once these pollutants are in the streets they can be carried to these rivers by the storm drain system. Unlike the sewer system, the storm drain system carries water (and pollution) to our rivers without treatment. Pollution from storm drains is a form of storm water pollution.

A common storm water pollution problem associated with automotive shops and businesses is the activity of hosing down service bays without proper capture of runoff water, illegal dumping of fluids to the street or storm drain inlets and not properly storing hazardous materials. Examples of pollutants that can be mobilized by these activities include oil and grease from cars, copper and asbestos from worn break linings, zinc from tires and toxics from spilled fluids.

The Cities and County of Riverside have adopted ordinances, in accordance with state and federal law, which prohibit the discharge of pollutants into the storm drain system or local lakes, rivers or streams. This brochure provides common practices that can prevent storm water pollution and keep your shop in compliance with the law.

## Best Management Practices for Auto Body & Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations

### Changing Automotive Fluids

- Locate storm drains on or near your property. Do not allow material to flow to these drains.
- Collect, and separately recycle motor oil, antifreeze, transmission fluid and gear oil. Combining waste fluid prevents recycling.
- Drain brake fluid and other non-recyclables into a proper container and handle as a hazardous waste.
- Use a recyclable radiator flushing fluid and discard safely.

*Only rain is allowed down the storm drain! Don't be an offender!! Violations of local ordinances are prosecuted to the fullest extent of the law.*

*Identify specific activities with the potential to cause spills or release pollutants such as oil, grease, fuel, etc. Post signs and train employees on how to prevent and clean up spills during activities.*

# YOU can prevent Stormwater Pollution following these practices...

## *Working on Transmissions, Engines and Miscellaneous Repairs*

- Keep a drip pan or a wide low-rimmed container under vehicles to catch fluids whenever you unclip hoses, unscrew filters, or change parts, to contain unexpected leaks.
- Drain all fluids from wrecked vehicles into proper containers before disassembly or repair.
- Store batteries indoors, on an open rack.
- Return used batteries to a battery vendor.
- Contain cracked batteries to prevent hazardous spills.
- Catch metal filings in an enclosed unit or on a tarpaulin.
- Sweep filing areas to prevent washing metals into floor drains.

## *Cleaning Parts*

- Clean parts in a self-contained unit, solvent sink, or parts washer to prevent solvents and grease from entering a storm drain.



## *Fueling Vehicles*

- Clean-up minor spills with a dry absorbent, rather than allowing them to evaporate.
- Use a damp cloth and a damp mop to keep the area clean rather than a hose or a wet mop.



## *Keeping your shop or work area pollutant clean and environmentally safe*

- Never hose down your work area, as pollutants could be washed into the storm drain.
- Sweep or vacuum the shop floor frequently.
- Routinely check equipment. Wipe up spills and repair leaks.
- Use large pans or an inflatable portable berm under wrecked cars.
- Avoid spills by emptying and wiping drip pans, when they are half-full.
- Keep dry absorbent materials and/or a wet/dry vacuum cleaner on hand for mid-sized spills.
- Train your employees to be familiar with hazardous spill response plans and emergency procedures.

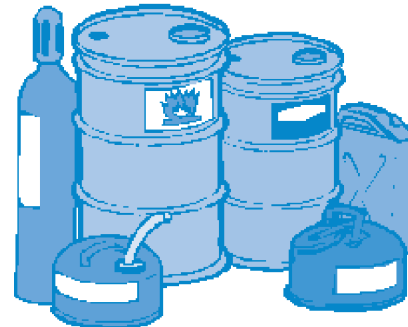
- Immediately report hazardous material spills that have entered the street or storm drain to OES and local authorities.

## *Outdoor Parking and Auto Maintenance*

- Use covered or controlled areas to prevent offsite spills.
- Sweep-up trash and dirt from outdoor parking and maintenance areas. Do not hose down areas. All non-stormwater discharges to the street or storm drain are prohibited.

## *Storing and Disposing of Waste*

- Store recyclable and non-recyclable waste separately.
- Place liquid waste (hazardous or otherwise) in proper containers with secondary containment.
- Cover outdoor storage areas to prevent contact with rain water.
- Collect used parts for delivery to a scrap metal dealer.



## *Washing vehicles and steam cleaning equipment*

- For car washing, minimize wash water used and use designated areas. Never discharge wash water to the street, gutters or storm drain.
- Be sure to keep waste water from engine parts cleaning or steam cleaning from being discharged to the street, gutter or storm drain.
- Wash vehicles and steam clean with environmentally friendly soaps and polishes.



## *Selecting and Controlling Inventory*

- Purchase recyclable or non-toxic materials.
- Select “closed-loop” suppliers and purchase supplies in bulk.






# ILLEGAL DUMPING IS RUBBISH

Properly dump your garbage to reduce California's stormwater pollution!  
Five easy tips to reduce pollutants:



## APPLIANCES



When illegally dumped, appliances can release toxins that get washed away with rain and end up in our water bodies, polluting our water.

**TIP 1: Donate or recycle appliances.**  
**TIP 2: Properly dispose at your local dump.**

---



## FURNITURE




When dumped on the side of the roadway all furniture not only causes a safety hazard, but can also breakdown and get into local water bodies, causing pollution.

**TIP 3: Contact local waste management for bulky pick-up or locate a dump for drop-off.**

---



## VEGETATION



Improperly dumped vegetation can flow to waterways, creating an imbalance of nitrates in water and thus harm aquatic life.

**TIP 4: Tarp loads to reduce biodegradable waste on highways.**  
**TIP 5: Use a green waste bin or consider composting biodegradable waste.**

Don't risk a \$10k fine & up to 6 months in jail

Simple changes in disposal of rubbish can help keep California's highways, waterways and bodies of water clean!

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#ProtectEveryDrop

**FIND US ONLINE**



www.protecteverydrop.com



# STORMWATER POLLUTION

## Metal Pollution Is More Common Than You Think



- Clean waterways start with clean storm drains.
- Clean storm drains start with clean highways.
- Clean highways start with you.

### DID YOU KNOW?

- Metals add to stormwater pollution by entering our waterways via stormwater runoff. They can cause a variety of negative effects on our health and the environment.
- Vehicle tires and brakes are a source of metal pollution.
- Road and highway runoff flow into storm drains often leading directly to waterways.

### COMMON METALS IN HIGHWAY RUNOFF

- Lead: leaded gasoline, lubricating oils and grease
- Zinc: tire wear, motor oil and grease
- Copper: brakes and engine wear



### REDUCE POLLUTION AT THE SOURCE

Take steps to reduce metal pollution from stormwater

- Maintain your vehicle and protect the quality of our water. Well-maintained vehicles pollute less; even a small leak of oil, antifreeze or other toxic auto fluids can find their way into a storm drain.
- Consider alternative transportation. Exercise your commuting options by carpooling, using public transportation or riding a bicycle. Fewer vehicles on California's highways and roadways reduce pollution that can flow into storm drains.
- Learn More! Go online and check out tips and simple solutions to prevent stormwater pollution at [www.protecteverydrop.com](http://www.protecteverydrop.com).

[WWW.PROTECTEVERYDROP.COM](http://WWW.PROTECTEVERYDROP.COM)



# - A CLEAN CAR GOES FAR -

WASH YOUR CAR TO  
KEEP OUR WATERWAYS CLEAN &  
PROTECT WATER QUALITY



## PROTECT OUR WATER

Pollutants from storm drains make their way to our waterways, including streams, rivers, lakes & the ocean.

## SPOT THE SPOTS

Dirty vehicles carry pollutants.



## WHEN IT RAINS

Rain washes pollutants off your vehicle & onto roadways. These pollutants go into storm drains & flow into waterways.

## WASH GRIME AWAY

Washing your car regularly at a facility that recycles water helps reduce pollutants from entering the storm drain and ultimately our water ways.



## WASH, PROTECT, REPEAT

Do your part to reduce pollution & protect water quality!





rcwatershed.org

## RIVERSIDE COUNTY WATERSHED PROTECTION

### 27 Cities + One County + Two Districts = A Team Effort.

Water pollution degrades surface waters which can cause them to be unsafe for drinking, fishing, swimming, and other activities. The Riverside County Watershed Protection program was established to reduce the pollution carried by stormwater into local creeks and waterways that lead to the ocean. The program is managed by the Riverside County Flood Control & Water Conservation District in partnership with 27 Cities, the County of Riverside and the Coachella Valley Water District.

### What is a watershed and how do I affect it?

A watershed is an area of land that catches and drains water into a creek, stream or tributary and eventually ends up in a large body of water such as our lakes, rivers or the ocean. As stormwater flows over land and across the watershed into a waterway, it carries urban runoff such as used motor oil and grease, pesticides, trash and other harmful debris. This is where the public comes in. The more we can prevent polluting the watershed, the healthier our waterways will be and the habitat it supports.

### What is stormwater?

Stormwater runoff is any water, either through rain, sprinklers, or irrigation of yards/gardens, that falls and is transported over land and pavement into local waterbodies through the storm drain system. All water that flows into a storm drain is deposited into creeks, rivers or the ocean without treatment.



### Is there a difference between the storm drain and sewer system?

Yes, an important difference. Stormwater and all the pollutants that flow from our homes, parking lots and streets to the gutter into the storm drains flow directly into our creeks and other water bodies untreated. Water and pollutants that flow into the sanitary sewer, such as water from our sinks, bathtubs and toilets, are sent to a wastewater treatment facility before the water is discharged to the Bay or Ocean.



# Doo Good

**Pick up dog doo. Protect streams**

*Dog doo can pollute our waterways. Rain flows across yards and trails, collecting in storm drains that lead directly to streams without being treated!*

## Bacteria Problems

A single gram of dog doo can contain 23 million fecal coliform bacteria and can spread diseases like Giardia and Salmonella.

Bacteria from dog doo accounts for up to **20%** of the bacteria in urban waterways.

## Nutrient Problems

Nutrients like nitrogen and phosphorus that are found in dog doo act like a fertilizer in streams. They cause algae to grow which reduces the available oxygen for fish. The more poop, the bigger the potential problem. Locally there are over **90,000** dogs that make **11,700 tons** of poop a year.

## Be a "Doo Gooder"

You can make a difference by being a responsible pet owner. Being a "Doo Gooder" means being a model for others and picking up your dog doo. Here are **5 tips** every dog owner should know:

- Be prepared: carry poop bags with you.
- Take extra bags so you don't run out and you can help someone else in need.
- Make sure the bag ends up in a trash can.
- When you hike, never leave a bag on the trail – take it with you.
- Scoop your poop at home or hire someone to keep your yard healthy and to protect streams.



[rcwatershed.org](http://rcwatershed.org)

**RIVERSIDE COUNTY**  
WATERSHED PROTECTION

OUR MISSION

"To protect, preserve and enhance the quality of Riverside County Watersheds by fostering a community-wide commitment to clean water."

@RivCoWatershed





# A Citizen's Guide to Understanding Stormwater



EPA United States Environmental Protection Agency

EPA 833-B-03-002

January 2003

Internet Address (URL): <http://www.epa.gov>  
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## After the Storm

For more information contact:  
[www.epa.gov/nps/stormwater](http://www.epa.gov/nps/stormwater)  
or visit  
[www.epa.gov/nps](http://www.epa.gov/nps)

For more information contact:



## What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

## Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

## The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- ◆ Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- ◆ Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- ◆ Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- ◆ Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- ◆ Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

- ◆ Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.





# Stormwater Pollution Solutions

## Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

### Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.



- ◆ Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- ◆ Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- ◆ Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- ◆ Cover piles of dirt or mulch being used in landscaping projects.

### Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.



- ◆ Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- ◆ Don't dispose of household hazardous waste in sinks or toilets.

### Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.



- ◆ Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- ◆ Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

### Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.



- ◆ When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

## Residential landscaping

**Permeable Pavement**—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

**Rain Barrels**—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.



**Rain Gardens and Grassy Swales**—Specially designed areas planted with native plants can provide natural places for



rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

**Vegetated Filter Strips**—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

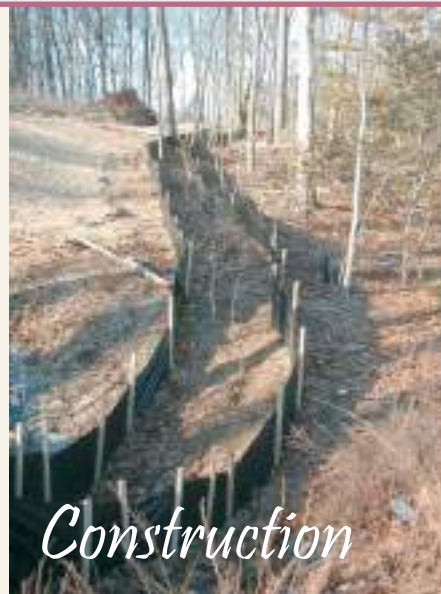
## Commercial

Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- ◆ Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- ◆ Cover grease storage and dumpsters and keep them clean to avoid leaks.
- ◆ Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- ◆ Divert stormwater away from disturbed or exposed areas of the construction site.
- ◆ Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- ◆ Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



## Construction

## Agriculture

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- ◆ Keep livestock away from streambanks and provide them a water source away from waterbodies.
- ◆ Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- ◆ Vegetate riparian areas along waterways.
- ◆ Rotate animal grazing to prevent soil erosion in fields.
- ◆ Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

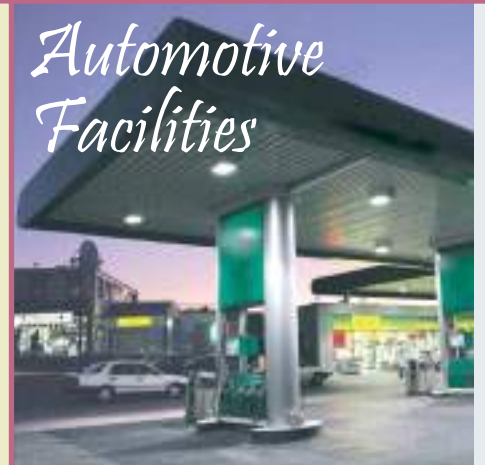


## Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- ◆ Conduct preharvest planning to prevent erosion and lower costs.
- ◆ Use logging methods and equipment that minimize soil disturbance.
- ◆ Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- ◆ Construct stream crossings so that they minimize erosion and physical changes to streams.
- ◆ Expedite revegetation of cleared areas.

## Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- ◆ Clean up spills immediately and properly dispose of cleanup materials.
- ◆ Provide cover over fueling stations and design or retrofit facilities for spill containment.
- ◆ Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- ◆ Install and maintain oil/water separators.





# Stormwater Pollution

# What you should know...

If not properly managed, rainfall and runoff that come into contact with manure, horse care products, and wash water can carry nutrients, sediment, bacteria, salts, and toxic pollutants to storm

drains and streams, negatively affecting water quality and the environment. Listed below are some environmentally responsible steps to keep in mind when caring for your horses, barns and pastures.

## Grooming

- Only use pest control and grooming products (*saddle and tack cleaning and conditioning products, shampoos and conditioners, show shine, hoof polish, etc.*) where needed and avoid use in areas exposed to runoff. Spot-apply pesticides and fungicides to avoid over use and keep from areas exposed to stormwater. Follow instructions on products, use sparingly and clean up spills.
- Store all pest control, grooming, and horse and tack care products in covered areas where they will not come into contact with stormwater, and post signs reminding boarders and staff not to dump any excess products. For proper disposal of unused horse care products, please call **1-800-304-2226** or visit the Riverside County Waste Management Department at **www.rivcowm.org**.
- For indoor wash stalls, ensure that floor drains are connected to septic system or drain to areas where the washwater can soak into the ground. Outside, ensure that washwater can seep into the ground. Always prevent washwater from entering a storm drain or stream. Creating a small berm around the area can prevent washwater from leaving the area.
- Conserving water is an important way to protect streams. Conserve water by using a spray nozzle with an automatic shut-off. Turn off the water when not in use.



## Manure Management

Store manure in a covered, enclosed compost bin located in an area that will not result in any drainage or runoff. Where enclosed bins aren't feasible, manure storage sites should be located under a covered area on a nearly flat surface, 50 - 100 feet from any stream or storm drain.

## Pasture Management

- Sweep or shovel horse holding areas daily to reduce the tracking of manure and soil. **Do not wash down these areas!**
- Fencing horses out of streams is important to protect surface waters. Locate paddock areas and fencing so horses are kept away from streams. Wherever possible, choose paddock areas where runoff will drain into the ground.
- Plant or allow vegetation to grow around the perimeter of paddock areas to provide for natural filtration of runoff.

## Grazing

Over-grazing in a paddock or pasture can lead to exposed soil and soil erosion, which increases runoff to streams and surface waters; allow about one acre per horse and rotate pasturing where possible.

## Responsibility for water quality begins with YOU



## Using and Disposing of Manure and Bedding

- Compost used bedding and manure. See <http://compostingcouncil.org> for more information.
- Composted bedding and manure may be donated to local greenhouses, nurseries, botanical parks, topsoil companies or composting centers.
- Contact your municipality regarding disposal programs and requirements.
- Always protect stables, storage, and compost stockpiles from runoff by keeping them out of stream courses.

## Barn and Stable Design

Have your engineer check with your City or County building department for information about stable design requirements and best practices, such as good surfacing materials, manure and care product storage areas, and locating wash and storage areas away from areas that could affect water quality.

## Resources

Contact your city or county stormwater representative for any applicable local ordinances.

For more information, Please call Riverside County's "Only Rain Down the Storm Drain" at 1-800-506-2555 or visit the website at [rcstormwater.org](http://rcstormwater.org)

# IRRIGATION RUNOFF

## STORMWATER FACT SHEET



**RIVERSIDE COUNTY**  
WATERSHED PROTECTION

**Report Irrigation Runoff or Stormwater Pollution:**  
**800.506.2555**

## OVERWATERING

Overwatering causes irrigation runoff that may contain pollutants such as pesticides, herbicides, fertilizers, pet waste, yard waste, and sediments which can be hazardous to residents and harmful to our environment. Runoff can also serve as a transport mechanism for other pollutants already on the ground or in the curb gutter. Irrigation runoff entering the storm drain system is an illicit discharge.

## BEST PRACTICES

Urban runoff begins when yards and landscaped areas are over-irrigated. Irrigation systems require regular maintenance and visual inspection of the system should be performed to prevent over-spray, leaks, and other problems that result in runoff to storm drains, curbs and gutters.

You can **prevent pollution** by conserving water on your property. Water during cooler times of the day (before 10am and after 6pm).

- Adjust sprinklers to stop overspray and runoff.
- Make needed repairs immediately.
- Use drip irrigation, soaker hoses, or micro-spray systems.
- Use an irrigation timer to pre-set watering times.
- Use a control nozzle or similar mechanism when watering by hand.
- Switch to a water-wise landscape - native plants need less fertilizers, herbicides, pesticides and water.

## PROTECT OUR WATERSHED

Many people think that when water flows into a storm drain it is treated, but the storm drain system and the sanitary sewer system are not connected. Everything that enters storm drains flows untreated directly into our creeks, rivers, lakes, beaches and ultimately the ocean. Storm water often contains pollutants, including chemicals, trash, and automobile fluids, all of which pollute our watershed and harm fish and wildlife.

Whether at home or work, you can help reduce pollution and improve water quality by using the above Best Management Practices (BMP's) as part of your daily clean up and maintenance routine.







**L**andscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call  
1-800-506-2555  
"Only Rain Down the Storm Drain"

**Important Links:**

Riverside County Household Hazardous Waste Collection Information  
1-800-304-2226 or [www.rivcwm.org](http://www.rivcwm.org)

Riverside County Backyard Composting Program  
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions  
[www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu)

California Master Gardener Programs  
[www.mastergardeners.org](http://www.mastergardeners.org)  
[www.camastergardeners.ucdavis.edu](http://www.camastergardeners.ucdavis.edu)

California Native Plant Society  
[www.cnps.org](http://www.cnps.org)

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

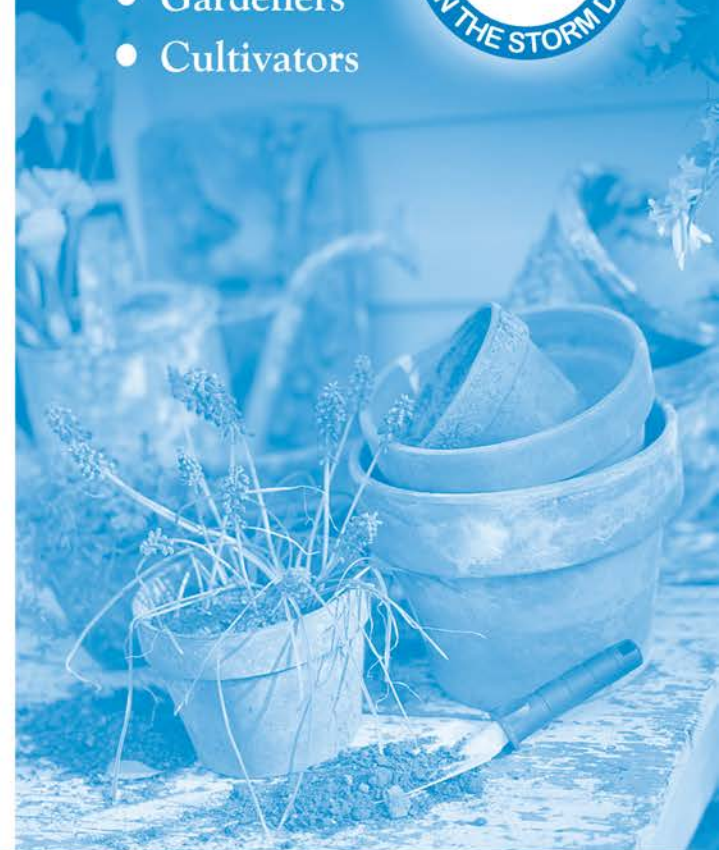


## ...Only Rain Down ...the Storm Drain

*What you should know for...  
Landscape and Gardening*

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators





# Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

## General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.



## Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.

- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.

- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:

- ◆ **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
- ◆ **Biological Controls** - Use predatory insects to control harmful pests.
- ◆ **Chemical Controls** - Check out [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu) before using chemicals. Remember, all chemicals should be used cautiously and in moderation.

- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

[www.bewaterwise.com](http://www.bewaterwise.com) Great water conservation tips and drought tolerant garden designs.

[www.ourwaterourworld.com](http://www.ourwaterourworld.com) Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.



## Helpful telephone numbers and links:

### Riverside County Stormwater Protection Partners

|                            |                |
|----------------------------|----------------|
| Flood Control District     | (951) 955-1200 |
| County of Riverside        | (951) 955-1000 |
| City of Banning            | (951) 922-3105 |
| City of Beaumont           | (951) 769-8520 |
| City of Calimesa           | (909) 795-9801 |
| City of Canyon Lake        | (951) 244-2955 |
| Cathedral City             | (760) 770-0327 |
| City of Coachella          | (760) 398-4978 |
| City of Corona             | (951) 736-2447 |
| City of Desert Hot Springs | (760) 329-6411 |
| City of Eastvale           | (951) 361-0900 |
| City of Hemet              | (951) 765-2300 |
| City of Indian Wells       | (760) 346-2489 |
| City of Indio              | (760) 391-4000 |
| City of Lake Elsinore      | (951) 674-3124 |
| City of La Quinta          | (760) 777-7000 |
| City of Menifee            | (951) 672-6777 |
| City of Moreno Valley      | (951) 413-3000 |
| City of Murrieta           | (951) 304-2489 |
| City of Norco              | (951) 270-5607 |
| City of Palm Desert        | (760) 346-0611 |
| City of Palm Springs       | (760) 323-8299 |
| City of Perris             | (951) 943-6100 |
| City of Rancho Mirage      | (760) 324-4511 |
| City of Riverside          | (951) 361-0900 |
| City of San Jacinto        | (951) 654-7337 |
| City of Temecula           | (951) 694-6444 |
| City of Wildomar           | (951) 677-7751 |

### REPORT ILLEGAL STORM DRAIN DISPOSAL

1-800-506-2555 or e-mail us at  
[fcnpdes@rcflood.org](mailto:fcnpdes@rcflood.org)

- Riverside County Flood Control and Water Conservation District  
[www.rcflood.org](http://www.rcflood.org)

#### Online resources include:

- California Storm Water Quality Association  
[www.casqa.org](http://www.casqa.org)
- State Water Resources Control Board  
[www.waterboards.ca.gov](http://www.waterboards.ca.gov)
- Power Washers of North America  
[www.thepwna.org](http://www.thepwna.org)

# Stormwater Pollution

What you should know for...

## Outdoor Cleaning Activities and Professional Mobile Service Providers



### Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

Do you know where street flows actually go?

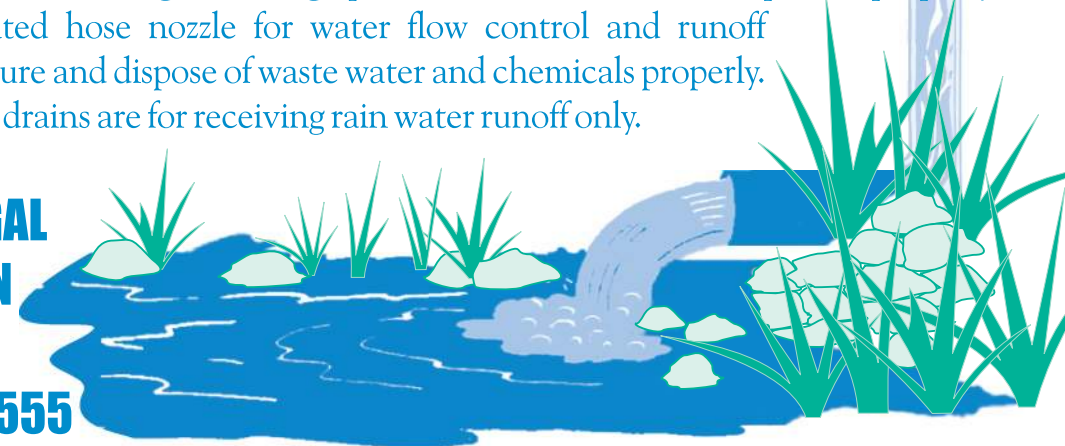
**Storm drains are NOT connected to sanitary sewer systems and treatment plants!**



The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** Always have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

**REPORT ILLEGAL  
STORM DRAIN  
DISPOSAL  
1-800-506-2555**



# Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

**D**id you know that disposing of pollutants into the street, gutter, storm drain or body of water is **PROHIBITED** by law and can result in stiff penalties?

## Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. *Each of us* can do our part to keep stormwater clean by using the suggested BMPs below:

## Simple solutions for both light and heavy duty jobs:

**Do...**consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

**Do...**prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

**Do...**use vacuums or other machines to remove and collect loose debris or litter before applying water.

**Do...**obtain the property owner's permission to dispose of *small amounts* of power washing waste water on to landscaped, gravel or unpaved surfaces.

**Do...**check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

**Do...**be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

**Do...**check to see if local ordinances prevent certain activities.

**Do not let...**wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.



Report illegal storm drain disposal  
Call Toll Free  
**1-800-506-2555**

## Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.



When cleaning surfaces with a *high-pressure washer* or *steam cleaner*, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

## Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

## Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks **with loose paint**, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

## Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

## Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.