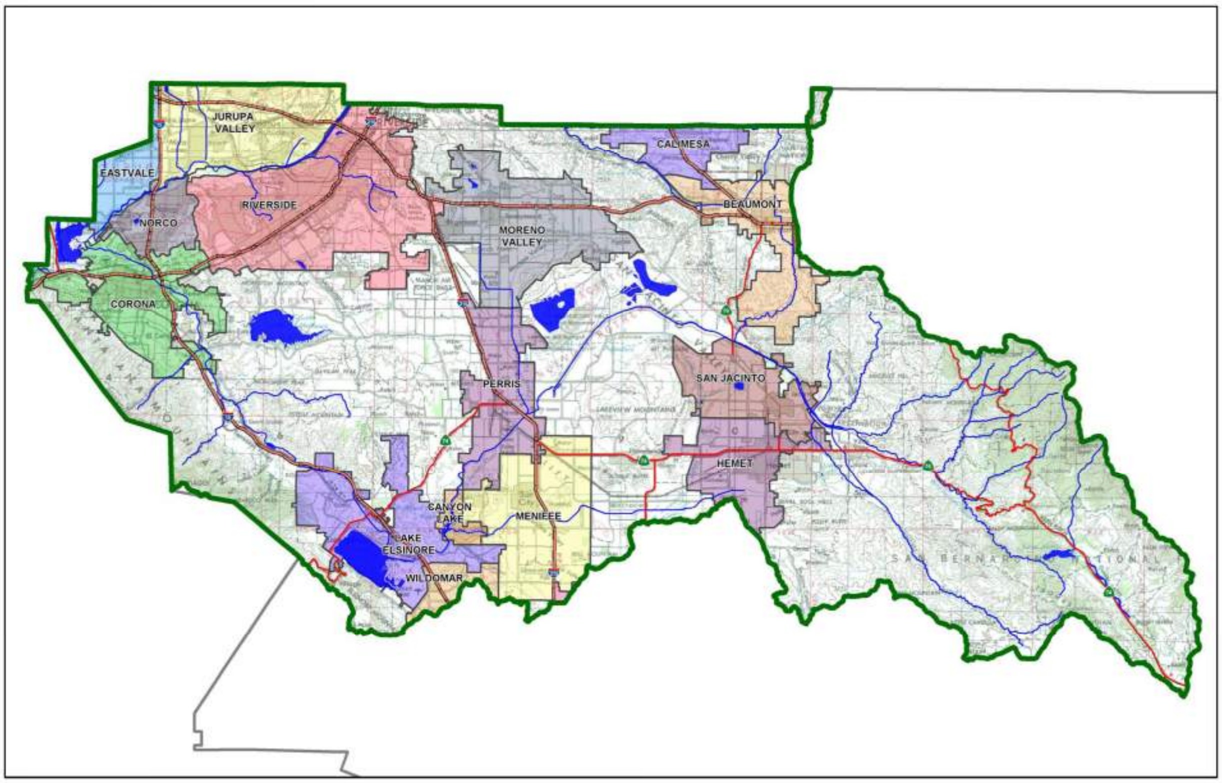
# Project Specific Water Quality Management Plan

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

**Project Title:** BCIF Harvill Business Center LP - Harvill at Water Industrial

**Development No:** TBD

**Design Review/Case No:** PPT220002




**Contact Information:**

**Prepared for:**
BCIF Harvill Business Center LP
c/o Ares Management LLC
4675 MacArthur Court, Suite 625
Newport Beach, CA 92660
949-892-4911

**Prepared by:**
Huitt-Zollars, Inc.
3990 Concours, Suite 330
Ontario, CA 91764
909-941-7799

☒ **Preliminary**
☐ **Final**

**Original Date Prepared**: 11-15-2021

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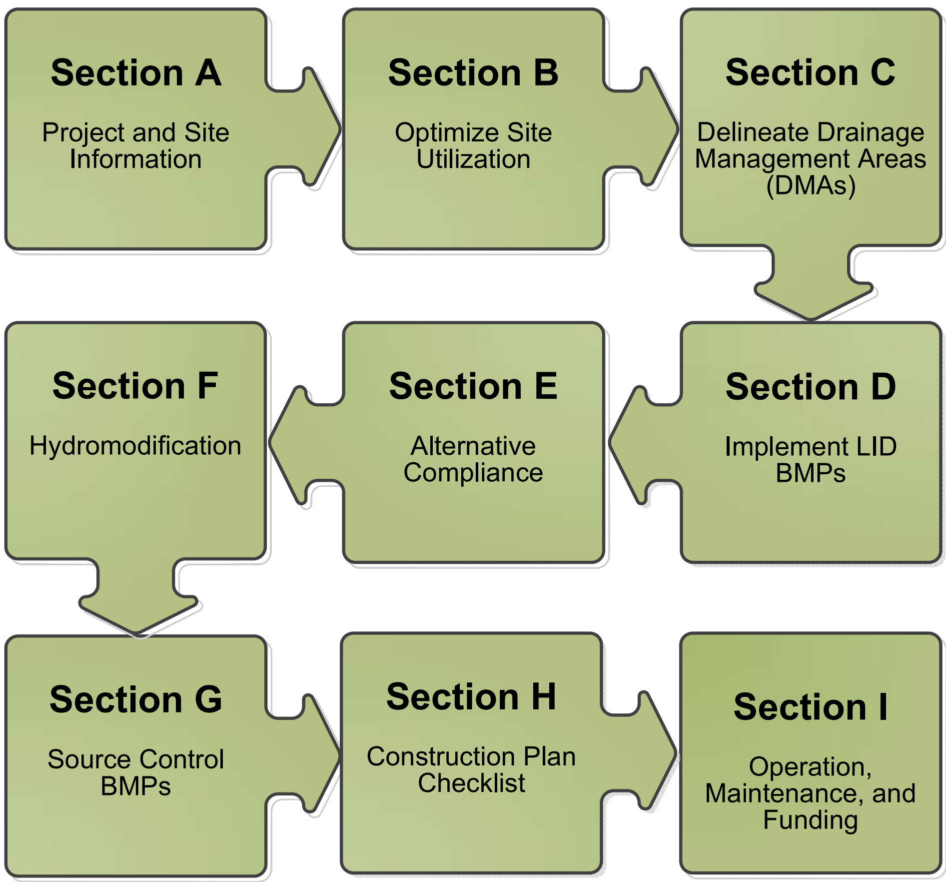
*Prepared for Compliance with*
*Regional Board Order No.* **R8-2010-0033**
**Template revised June 30, 2016**

## 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 BCIF Harvill Business Center LP (c/o Ares Management LLC) by Huitt-Zollars, inc for the Harvill at Water Industrial project.

This WQMP is intended to comply with the requirements of County of Riverside for Order No. R8-2010-0033 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 County of Riverside Order No. R8-2010-0033.

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

| | |
|---|---|
| Owner's Signature | Date |
| Peter Schafer | Vice President, Development |
| Owner's Printed Name | Owner's Title/Position |

## FINAL WQMP TO BE SIGNED

## PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

| | |
|---|---|
| Preparer's Signature | Date |
| Manuel (Manny) Gonzales, PE | Project Manager |
| Preparer's Printed Name | Preparer's Title/Position |

## FINAL WQMP TO BE SIGNED

Preparer's Licensure:

## Table of Contents

## List of Tables



## List of Appendices

# Section A: Project and Site Information

| | | |
|---|---|---|
| **PROJECT INFORMATION** | | |
| Type of Project: | Warehouse Industrial | |
| Planning Area: | 974,756 SF | |
| Community Name: | County of Riverside | |
| Development Name: | BCIF Harvill Business Center LP - Harvill at Water Industrial | |
| **PROJECT LOCATION** | | |
| Latitude & Longitude (DMS): 33°49'3.25"N, 117°14'49.71"W | | |
| Project Watershed and Sub-Watershed: Santa Ana Watershed, San Jacinto Sub-Watershed | | |
| Gross Acres: 20.08 | | |
| APN(s): 317-270-006, 010, 015, 016 | | |
| Map Book and Page No.: Thomas Brothers Page 777 | | |
| **PROJECT CHARACTERISTICS** | | |
| Proposed or Potential Land Use(s) | | Warehouse Industrial |
| Proposed or Potential SIC Code(s) | | 4225 |
| Area of Impervious Project Footprint (SF) | | 813,587 |
| Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement | | 813,587 |
| Does the project consist of offsite road improvements? | | ☒ Y ☐ N |
| Does the project propose to construct unpaved roads? | | ☐ Y ☒ N |
| Is the project part of a larger common plan of development (phased project)? | | ☐ Y ☒ N |
| **EXISTING SITE CHARACTERISTICS** | | |
| Total area of existing Impervious Surfaces within the Project limits Footprint (SF) | | 0 |
| Is the project located within any MSHCP Criteria Cell? | | ☐ Y ☒ N |
| If so, identify the Cell number: | | N/A |
| Are there any natural hydrologic features on the project site? | | ☐ Y ☒ N |
| Is a Geotechnical Report attached? | | ☒ Y ☐ N |
| If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D) | | N/A |
| What is the Water Quality Design Storm Depth for the project? | | 0.59 |

The proposed project is located to the west of Harvill Avenue between Water Avenue and Orange Avenue in the unincorporated area of the County of Riverside, California. The site is currently vacant and covered with open brush. The proposed project will consist of an industrial warehouse building totaling 434,823+/- SF on approximately 20.08 acres. The site will also allow car parking, drive aisles, truck docks and a truck court. A specific business use is not known at this time, but outdoor storage will not be allowed.

For the onsite water quality treatment, the development will have three (3) drainage areas (DMAs 1, 2 & 3). The storm water from the DMA 1 will be conveyed to the designated bio-retention basin on the east side of the project site through two onsite storm drain lines. The basin has been sized to help detain the design capture volume and the post construction runoff to levels equivalent to the pre-developed condition. DMA 2 will convey runoff to gravel trenches within the Water Street parkway. DMA 3 will convey runoff to gravel trenches within the Orange Avenue parkway. Optional pre-treatment devices for added redundancy may include downspout filters at the roof drain. See Appendix 1 for Post-Construction BMP Site Plan.

The site landscaping areas will not be irrigated with recycled water, and "harvest and use" is not feasible for this development. New trash enclosures will be installed at the site, and the details will be provided in the final Post-Construction BMP Site Map.

## A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling
- BMP Locations (Lat/Long)

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

## A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

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

| Receiving Waters | EPA Approved 303(d) List Impairments | Designated Beneficial Uses | Proximity to RARE Beneficial Use |
|---|---|---|---|
| Perris Valley Channel | N/A | - | Not designated as RARE |
| San Jacinto River Reach 3, HU#802.11 | NONE | AGR, GWR, REC1, REC2, WARM, WILD | Not designated as RARE |
| Canyon Lake (Railroad Canyon Reservoir), HU#802.11, 802.12 | Nutrients, Pathogens | MUN, AGR, GWR, REC1, REC2, WARM, WILD | Not designated as RARE |
| San Jacinto River Reach 1, HU#802.32,802.31 | NONE | MUN, AGR, GWR, REC1, REC2, WARM, WILD | Not designated as RARE |
| Lake Elsinore | PCBs (Polychlorinated biphenyls), Toxicity | MUN, REC1, REC2, WARM, WILD | Not designated 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 | ☐ Y | ☒ N |
| State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert. | ☐ Y | ☒ N |
| US Army Corps of Engineers, CWA Section 404 Permit | ☐ Y | ☒ N |
| US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion | ☐ Y | ☒ N |
| Statewide Construction General Permit Coverage | ☒ Y | ☐ N |
| Statewide Industrial General Permit Coverage | ☒ Y | ☐ N |
| Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP) | ☐ Y | ☒ N |
| Other *(please list in the space below as required)*<br><br>Riverside County FCD – Connection Permit to public storm drain in Indian Street | ☐ Y | ☒ N |

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

# Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Consideration of "highest and best use" of the discharge should also be considered. For example, Lake Elsinore is evaporating faster than runoff from natural precipitation can recharge it. Requiring infiltration of 85% of runoff events for projects tributary to Lake Elsinore would only exacerbate current water quality problems associated with Pollutant concentration due to lake water evaporation. In cases where rainfall events have low potential to recharge Lake Elsinore (i.e. no hydraulic connection between groundwater to Lake Elsinore, or other factors), requiring infiltration of Urban Runoff from projects is counterproductive to the overall watershed goals. Project proponents, in these cases, would be allowed to discharge Urban Runoff, provided they used equally effective filtration-based BMPs.

**Site Constraint:**

Base on the site specific infiltration tests and report prepared by Southern California Geotechnical, Inc, dated June 17, 2021 (see Appendix 3). The site soils have very poor infiltration characteristics and the use of infiltration facilities is not recommended.

**Solution:**

The site drainage design has incorporated a bio-retention basin located on the east side of the project site. All site drainage will be conveyed to the bio-retention area where the runoff will be allowed to pass through a filter media, stone section, and through perforated a pipe network beneath the basin footprint which will ultimately convey the runoff out to the proposed public storm drain system located in Harvill Avenue. The Water St and Orange Ave street runoff will each be conveyed via a parkway pipe drain to a gravel trench located in the parkway. Self-treating landscape areas (DMA 2B and 3B) will overflow to street. The streets are being treated to the maximum extent possible. Although only half of the street from the center line to the right-of-way drain to the gravel trench self-retaining area, the trench will be sized to convey more.

## Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

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

*Yes. The site mimics the existing topography by draining from west to east.*

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

*No, existing vegetation was not protected within the developed site. Currently the site is vacant and covered with open brush. The developed condition will utilize drought tolerant plants within the landscaped areas to maximize water conservation.*

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

*Yes. Natural infiltration capacity was calculated by the soil and infiltration report, however it is below the minimum rate and is not expected to be feasible on this project site as a BMP type. However, the low infiltration is considered acceptable within the parkway to size the treatment to the maximum extent possible.*

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

*No. However, the site maintains the minimum amount of landscape required per code.*

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

*No, runoff from impervious areas is not able to drain into pervious areas. Onsite storm drain systems and surface flow will convey the runoff to the basin on the east side of the project site, and the basin will treat the runoff before allowing it to exit the project site.*

# Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

**Table C.1** DMA Classifications

| DMA Name or ID | Surface Type(s)[12] | Area (Sq. Ft.) | DMA Type |
|---|---|---|---|
| DMA 1 | Roofs, Concrete, asphalt and landscape | 849,893 | D |
| DMA 2A | Roofs, Concrete, asphalt and landscape | 40,953 | B/C |
| DMA 2B | Ornamental Landscaping | 15,493 | A |
| DMA 3A | Roofs, Concrete, asphalt and landscape | 40,537 | B/C |
| DMA 3B | Ornamental Landscaping | 3,074 | A |

*[1]Reference Table 2-1 in the WQMP Guidance Document to populate this column*
*[2]If multi-surface provide back-up*

**Table C.2** Type 'A', Self-Treating Areas (Included with mixed DMA1 above)

| DMA Name or ID | Area (Sq. Ft.) | Stabilization Type | Irrigation Type (if any) |
|---|---|---|---|
| DMA 2B | 15,493 | Planted and Irrigated | Efficient |
| DMA 3B | 3,074 | Planted and Irrigated | Efficient |
| | | | |
| | | | |

**Table C.3** Type 'B', Self-Retaining Areas (included with mixed DMA1)

<table>
<tr><th colspan="4">Self-Retaining Area</th><th colspan="3">Type 'C' DMAs that are draining to the Self-Retaining Area</th></tr>
<tr><th rowspan="2">DMA Name/ ID</th><th rowspan="2">Post-project surface type</th><th>Area (square feet)</th><th>Storm Depth (inches)</th><th rowspan="2">DMA Name / ID</th><th>[C] from Table C.4 =</th><th>Required Retention Depth (inches)</th></tr>
<tr><th>[A]</th><th>[B]</th><th>[C]</th><th>[D]</th></tr>
<tr><td>DMA 2A.1</td><td>Landscape/gravel</td><td>1840</td><td>0.59</td><td>DMA 2A.2</td><td>38,775</td><td>13 inches</td></tr>
<tr><td>DMA 3A.1</td><td>Landscape/gravel</td><td>1840</td><td>0.59</td><td>DMA 3A.2</td><td>38,231</td><td>12.8 inches</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

**The calculations do not meet the 2:1 ratio, but meet the maximum extent possible (MEP) due to the parkway size limitation and BMP restrictions. Using the hierarchy established for the Santa Ana River Watershed that is documented in the Riverside County LID BMP design Handbook, and knowing that BMP's are not allowed in public right-of-way, it was determined that self-retaining areas with low infiltration within the parkway was the best (and only) treatment option. The treatment is enhanced by the deeper gravel thickness. It is important to note that the impervious area used is very conservative. We accounted for both sides of the street, but in reality, only one side gets to the self-retaining areas.**

**Table C.4** Type 'C', Areas that Drain to Self-Retaining Areas

| DMA | | | | | Receiving Self-Retaining DMA | | |
|---|---|---|---|---|---|---|---|
| DMA Name/ ID | Area (square feet) [A] | Post-project surface type | Impervious fraction [B] | Product [C] = [A] x [B] | DMA name /ID | Area (square feet) [D] | Ratio [C]/[D] |
| DMA 2A.2 | 38,533 | AC Pvmt/ SW/DWY | 1 | 38,533 | | | |
| | 2,420 | Landscape | 0.1 | 242 | | | |
| | 40,953 | | | 38,775 | DMA 2A.1 | 1840 | 21.1 |
| DMA 3A.2 | 37,975 | AC Pvmt SW/DWY | 1 | 37,975 | | | |
| | 2,562 | | 0.1 | 256 | | | |
| | 40,537 | | | 38,231 | DMA 3A.1 | 1840 | 20.8 |

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

| DMA Name or ID | BMP Name or ID |
|---|---|
| DMA 1 | Bio-retention Basin |
| | |
| | |

*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.*

# 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 Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

### Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

**Table D.1** Infiltration Feasibility

| Does the project site… | YES | NO |
|---|---|---|
| …have any DMAs with a seasonal high groundwater mark shallower than 10 feet? | | X |
| If Yes, list affected DMAs: | | |
| …have any DMAs located within 100 feet of a water supply well? | | X |
| If Yes, list affected DMAs: | | |
| …have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact? | | X |
| If Yes, list affected DMAs: | | |
| …have measured in-situ infiltration rates of less than 1.6 inches / hour? | X | |
| If Yes, list affected DMAs: | A | |
| …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.

## 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 none 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*: 131,380 SF (3.02 Acres)

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

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

*Total Area of Impervious Surfaces:* 737,080 (16.92 Acres)

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*: 0.79

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*: 13.37 Acres

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

| Minimum required irrigated area (Step 4) | Available Irrigated Landscape (Step 1) |
|---|---|
| 13.37 Acres | 3.02 Acres |

### 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: 100*

*Project Type: Industrial*

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: 16.94 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 or toilet users per tributary impervious acre (TUTIA).

*Enter your TUTIA factor: 172*

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: 2,914*

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

| **Minimum required Toilet Users (Step 4)** | **Projected number of toilet users (Step 1)** |
|---|---|
| 2,914 Users | 100 Users |

### 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).

| **Minimum required non-potable use (Step 4)** | **Projected average daily use (Step 1)** |
|---|---|
| N/A | N/A |

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment 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 | ☐ | ☐ | ☒ | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | ☐ |
| | ☐ | ☐ | ☐ | ☐ | ☐ |

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.

**Base on the information provided in Section D, bio-retention LID BMP will be utilized for the entire site, except for the self-treating areas (DMA 2B and DMA 3B). The street areas will be treated by parkway gravel trenches. See Appendix 1 Post-Construction BMP Site Plan for bio-retention basin detail.**

## 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 | ***Bio-Retention Basin*** | | |
|---|---|---|---|---|---|---|---|---|
| | [A] | | [B] | [C] | [A] x [C] | | | |
| ***DMA 1*** | *429,823* | *Roof* | *1* | *0.89* | *383402.1* | *Design Storm Depth (in)* | *Design Capture Volume,* **$V_{BMP}$** *(cubic feet)* | *Proposed Volume on Plans (cubic feet)* |
| | *307,257* | *Conc or Asphalt* | *1* | *0.89* | *274073.2* | | | |
| | *112,813* | *Ornamental Landscaping* | *0.1* | *0.11* | *12461.1* | | | |
| | $A_T = \Sigma[A]$ 849,893 | | | | $\Sigma=$ [D] 669,936 | [E] 0.59 | $[F] = \frac{[D]x[E]}{12}$ 32,939 | [G] 37,671 |

[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 |
| ☐ Detached Residential Development | P | N | P | P | N | P | P | P |
| ☐ Attached Residential Development | P | N | P | P | N | P | P | P(2) |
| ☒ Commercial/Industrial Development | P(3) | P | P(1) | P(1) | P(5) | P(1) | P | P |
| ☐ Automotive Repair Shops | N | P | N | N | P(4, 5) | N | P | P |
| ☐ Restaurants (>5,000 ft$^2$) | P | N | N | N | N | N | P | P |
| ☐ Hillside Development (>5,000 ft$^2$) | P | N | P | P | N | P | P | P |
| ☐ Parking Lots (>5,000 ft$^2$) | P(6) | P | P(1) | P(1) | P(4) | P(1) | P | P |
| ☐ Retail Gasoline Outlets | N | P | N | N | P | N | P | P |
| **Project Priority Pollutant(s) of Concern** | ☒ | ☒ | ☒ | ☒ | ☒ | ☒ | ☒ | ☒ |

*P = Potential*

*N = Not Potential*

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

*(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected*

*(3) A potential Pollutant is land use involving animal waste*

*(4) Specifically petroleum hydrocarbons*

*(5) Specifically solvents*

*(6) Bacterial indicators are routinely detected in pavement runoff*

## E.2 Stormwater Credits (N/A)

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[2] |
|---|---|
| | |
| | |
| | |
| *Total Credit Percentage[1]* | |

*[1]Cannot Exceed 50%*

*[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document*

## E.3 Sizing Criteria (N/A)

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, $I_f$** | **DMA Runoff Factor** | **DMA Area x Runoff Factor** | | ***Enter BMP Name / Identifier Here*** | | |
|---|---|---|---|---|---|---|---|---|---|
| | [A] | | [B] | [C] | [A] x [C] | | | | |
| | | | | | | *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)* |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | $A_T = \Sigma[A]$ | | | | Σ= [D] | [E] | $[F] = \frac{[D]x[E]}{[G]}$ | [F] X (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[1] | Priority Pollutant(s) of Concern to Mitigate[2] | Removal Efficiency Percentage[3] |
|---|---|---|
| N/A. APPLIES TO PROPRIETARY TREATMENT ONLY PER CITY COMMENTS. | | |
| | | |
| | | |
| | | |

*[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.*
*[2] Cross Reference Table E.1 above to populate this column.*
*[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.*

# Section F: Hydromodification

## F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

**HCOC EXEMPTION 1**: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

**HCOC EXEMPTION 2**: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

**Table F.1** Hydrologic Conditions of Concern Summary

| | **2 year – 24 hour** | | |
|---|---|---|---|
| | **Pre-condition** | **Post-condition** | **% Difference** |
| **Time of Concentration** | N/A | N/A | N/A |
| **Volume (Cubic Feet)** | N/A | N/A | N/A |

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

**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 Susceptibility 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:

### 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.

**Site is located within mapped HCOC Exemption area as presented in the approved WAP dated April 20, 2017.**

# Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*****:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*****:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*****:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

**Table G.1** Permanent and Operational Source Control Measures

| Potential Sources of Runoff pollutants | Permanent Structural /Non-Structural Source Control BMPs | Operational Source Control BMPs |
|---|---|---|
| On-Site Storm Drain Inlet | Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify. | • Maintain and periodically repaint or replace inlet markings.<br>• Provide stormwater pollution prevention information to new site owners, lessees, or operators.<br>• See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com<br>• 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." |
| Loading Docks | The project site will have truck docks which shown on the Post-Construction | • Move loaded and unloaded items indoors as soon as possible. See Fact Sheet SC-30, |

| | | |
|---|---|---|
| | BMP Site Plan. The truck docks shall be inspected on a weekly basis to help ensure that any trash and debris are collected prior to being washed into the underground storm drain system. All storm water runoff from the loading dock areas will be discharged into infiltration basins and/or underground infiltration chambers prior to conveyance to the public storm drain system. Documentation of such inspection/maintenance shall be kept by the owner in perpetuity. | "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com |
| Fire Sprinkler Test Water | Underground fire protection service and fire sprinklers test will be provided per the uniform fire code and the requirements of the County of Riverside | • Provide a means to drain fire sprinkler test water to the sanitary sewer. |
| Drive aisles, Sidewalks, and parking lots. | Documentation of such sweeping shall be kept by the owner in perpetuity. Frequency of sweeping shall be adjusted as needed to maintain a clean site. | • Drive aisle, 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 wash water containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain. |
| Refuse Trash Storage Areas | Trash container storage areas shall be paved with an impervious surface designed not to allow run-on from adjoining areas. They shall be designed to divert drainage from adjoining roofs and pavements from the surrounding area, and screened or walled to prevent off-site transport of trash. Trash dumpsters (containers) shall be leak proof and have attached covers and lids. Trash enclosures shall be roofed per City standards and the details on the WQMP exhibit in Appendix 1. Trash compactors shall be roofed and set on a concrete pad per City standards. The pad shall be a minimum of one foot larger all around than the trash compactor and sloped to drain to a sanitary sewer line. Connection of trash area drains to the MS4 is prohibited. See CASQA SD-32 BMP fact sheet in Appendix 10 for additional information. Signs shall be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar. | Adequate number of receptacles shall be provided. 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 onsite. See fact sheet SC-34 "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbook at www.cabmphandbooks.com and in Appendix 10. |

# Section H: Construction Plan Checklist

"This section will be completed and addressed at the time of the final WQMP submittal"

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) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

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

"This section will be completed and addressed at the time of the final WQMP submittal"

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

**Maintenance Mechanism:**

| BMP | Responsible Party(s) | Inspection/Maintenance Activities Required | Minimum Frequency of Activities |
|---|---|---|---|
| Landscape and Irrigation | Owner | See CASQA BMP Fact Sheet SD-10 in Appendix 10<br><br>-Site landscaping design shall be implemented in accordance with the requirements of the site specific WQMP and local agency requirements.<br><br>-Site landscaping maintenance shall begin immediately after it has been planted.<br><br>-Maintenance of landscaping shall occur on a weekly basis and adjusted accordingly based on current conditions and seasonal needs.<br><br>-Inspection of irrigation system shall be provided on a bi-weekly basis to ensure proper function of the irrigation system, no significant overspray is occurring.<br><br>-Malfunctioning systems shall be repaired or replaced immediately.<br><br>-Inspect plant health on a monthly basis. Repair or replace unhealthy plants as needed.<br><br>-Inspect side slopes of basins and sloped areas on a bi-weekly basis and repair as needed. Re-plant and apply erosion protection to those areas to help prevent erosion in the future.<br>-Landscape clippings shall be swept and picked up immediately to prevent it from entering the storm drain system or adjacent sedimentation basins and filtration basins. Dispose of landscape clippings in a legal manner | Weekly |
| MS4 Stenciling and Signage | Owner | See CASQA BMP Fact Sheet SD-13 in Appendix 10<br>-MS4 Stenciling and signage shall be placed during construction and inspection and maintenance shall begin upon completion of construction.<br><br>-Inspect catch basin stenciling on a bi-monthly basis. Replace any damaged, missing or faded stencils in a timely manner. | Bi-monthly |
| Common area litter control, loading docks and trash storage areas | Owner | See CASQA BMP Fact Sheet SD-32 in Appendix 10<br><br>-Inspection and Maintenance of common areas, loading docks and trash storage areas shall begin upon completion of construction.<br><br>-Visual inspection of trash storage areas shall take place on a weekly basis and adjusted on an as needed basis.<br>-Inspect areas for trash and debris. Remove any found trash and debris immediately. Dispose of trash and debris in a legal manner.<br>-Inspect areas for any spills. Pick up/clean up found spills immediately. Dispose of spill material in a legal manner. | Daily |
| Parking lot sweeping | | See CASQA BMP Fact Sheet SE-7 in Appendix 10<br>-Parking lot sweeping shall being after the completion of construction and take place on a monthly basis. | Monthly |

| | | | |
|---|---|---|---|
| | | Dispose of picked up material in a legal manner. | |
| Drainage facility (including roof drains) inspection and maintenance | | -Inspection and maintenance of site drainage facilities and roof drains shall begin immediately upon completion of construction.<br>-Catch basins and roof drain inlet shall be clear of any debris - prior to any storm event to ensure proper function of the roof drains. Collected debris shall be disposed of in a legal manner. Catch basin filters shall be inspected on a monthly basis. Catch basin filters that have exceeded 50% of the storage capacity shall be cleaned immediately.<br>-Catch basin filters shall be maintained per the manufacturer's specifications.<br>-Damaged catch basin filters shall be replaced with an approved equal prior to the next storm event or as soon as practicable. | Monthly & after rain event |
| Bioretention Basin | | See Appendix 10<br><br>-Once the basin has gone on-line, inspections should occur after every major storm for the first year to ensure that proper stabilization and function is achieved. Continuous inspection and maintenance shall be provided once every six months. Special attention should be paid to how long water remains standing in the basin after a storm; standing water within the basin more than 48 hours after a storm indicates that the filtration rates are insufficient and maintenance of the filter basin bottom is needed. If standing water remains after 48 hours, the standing water shall be removed in accordance with the local agency guidelines and maintenance of the filter basin bottom shall be scheduled immediately. Factors that are typically responsible for clogging the filter basin bottom include upstream sediment erosion and excessive compaction of the basin bottom. These should be repaired immediately to help achieve the desired filtration rates.<br><br>-Observe and document evidence of collected sediments, trash, debris and oils/greases.<br>-Sediments, trash, debris and oils/greases shall be removed and disposed of in a legal manner.<br>-Observe and document evidence of erosion of side slopes or flowlines.<br>-Schedule repair of eroded side slopes or flowlines immediately.<br>-Protection measures against further erosion shall be placed until the eroded areas are repaired. Protection measures should be at a minimum placement of gravel bags and fiber rolls to prevent further erosion of the affected areas until the areas have been repaired and vegetation has been established. | Every 6 months |

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

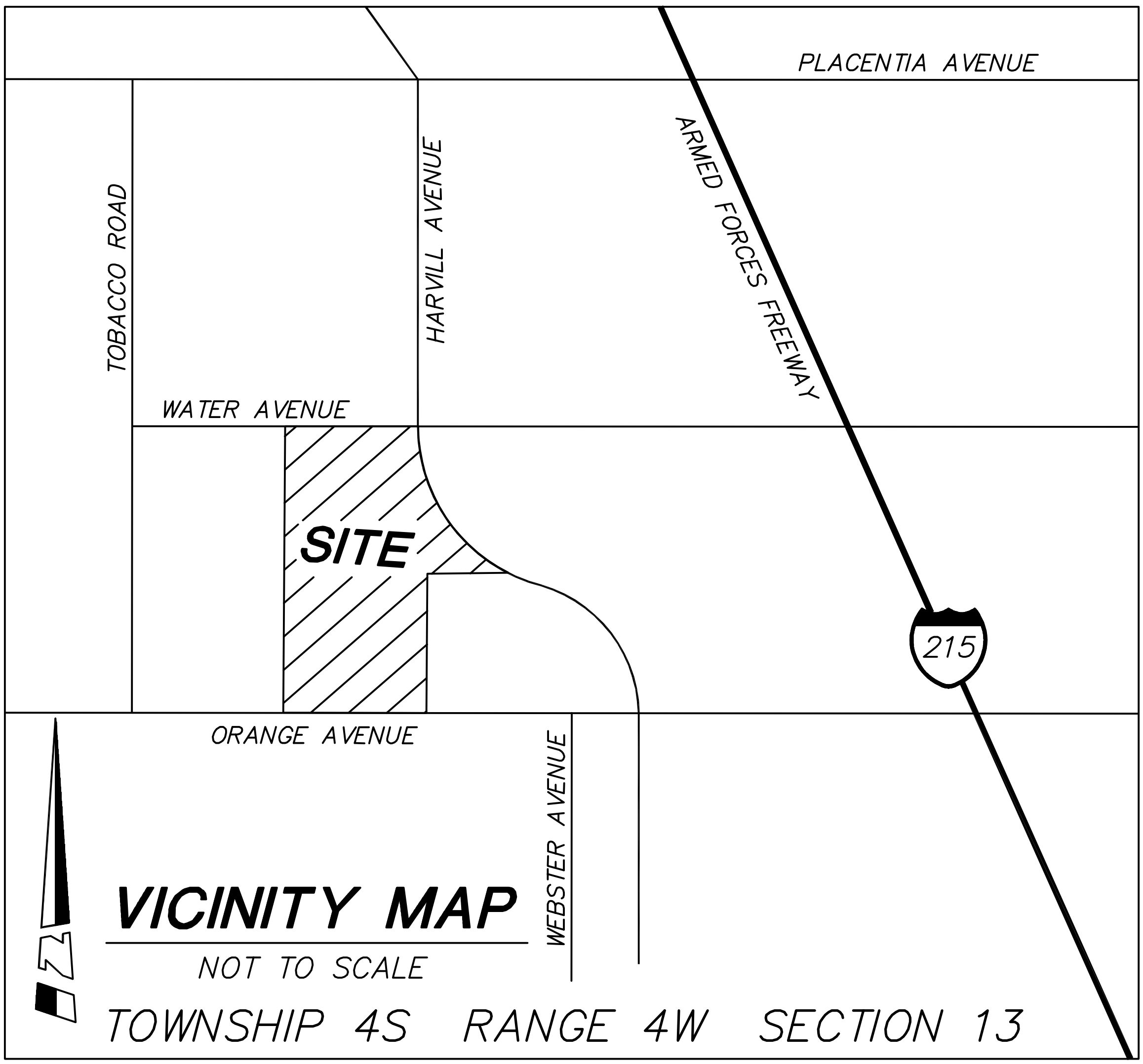
☐ Y ☒ N

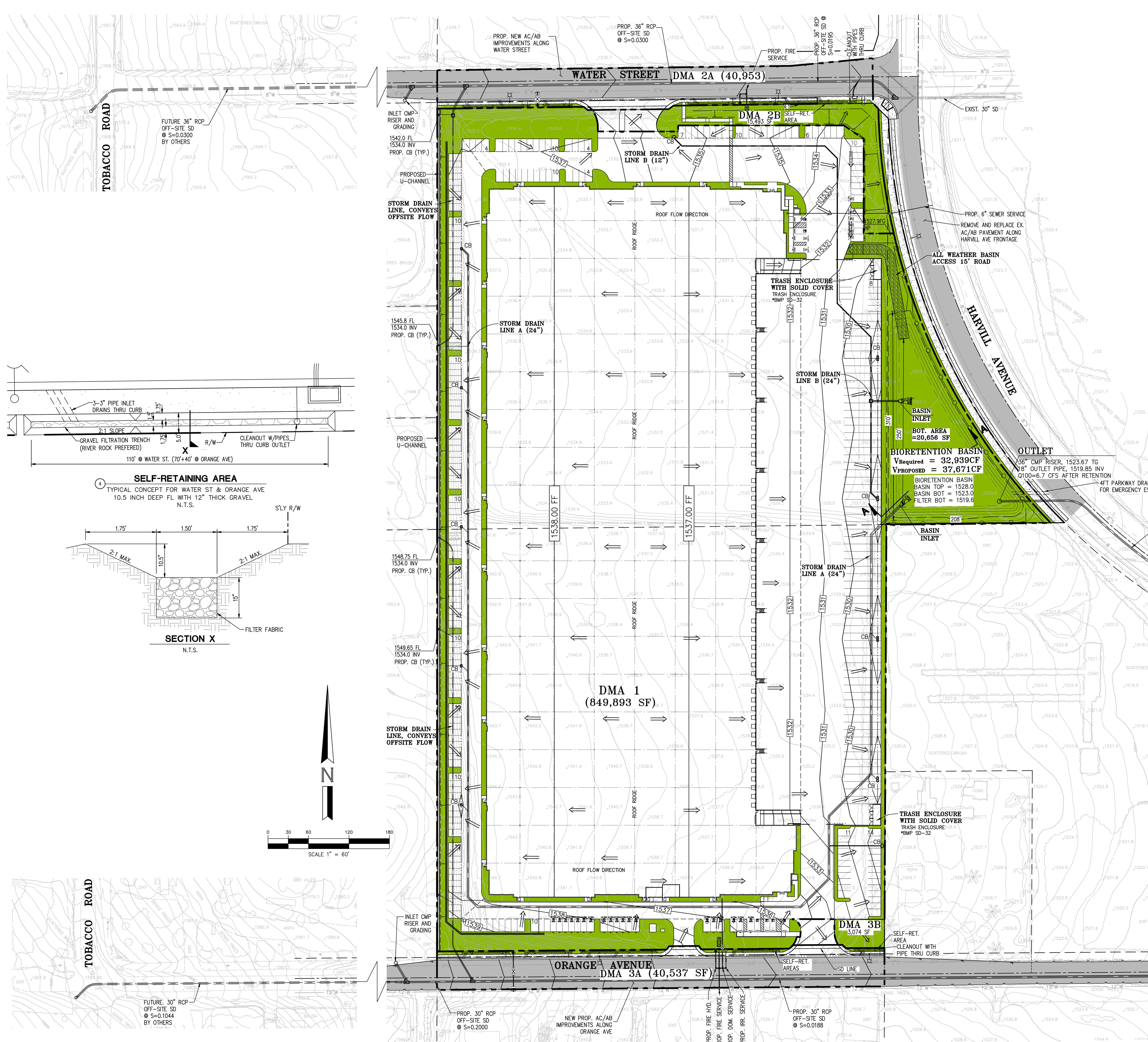
**Owner Information:**
Peter Schafer
Vice President, Development
BCIF Harvill Business Center LP
4675 MacArthur Court, Suite 625
Newport Beach, CA 92660
949-892-4904

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*


PLACENTIA AVENUE
TOBACCO ROAD
HARVILL AVENUE
ARMED FORCES FREEWAY
WATER AVENUE
SITE
215
ORANGE AVENUE
WEBSTER AVENUE
N
VICINITY MAP
NOT TO SCALE
TOWNSHIP 4S RANGE 4W SECTION 13

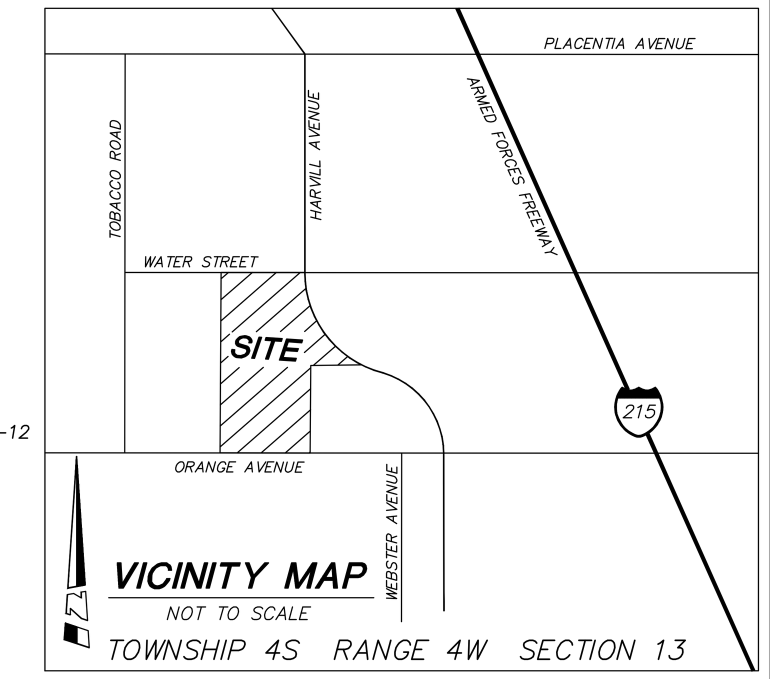



## WQMP BMP NOTES

1. BIORETENTION BASIN, SEE DETAIL HEREON
2. INSTALL BIO-CLEAN GRATE INLET FILTER SEE DETAIL HERON
3. INSTALL BIO-CLEAN CURB INLET FILTER SEE DETAIL HERON
4. CONSTRUCT GRAVEL FILTRATION TRENCH IN PARKWAY

## LEGEND

- PROPOSED STORM DRAIN
- WQMP BOUNDARY / LIMIT FOR *BMP SC-41 BUILDING & GROUND MAINTENANCE
- PROPOSED CURB OPENING INLET W/ FILTER INSERT
- PROPOSED LANDSCAPING AREA – *BMP SD-10 & SD-12
- CB CATCH BASIN
- TG TOP OF GRATE
- FLOW DIRECTION
- CLEANOUT
- TRASH ENCLOSURE WITH SOLID ROOF



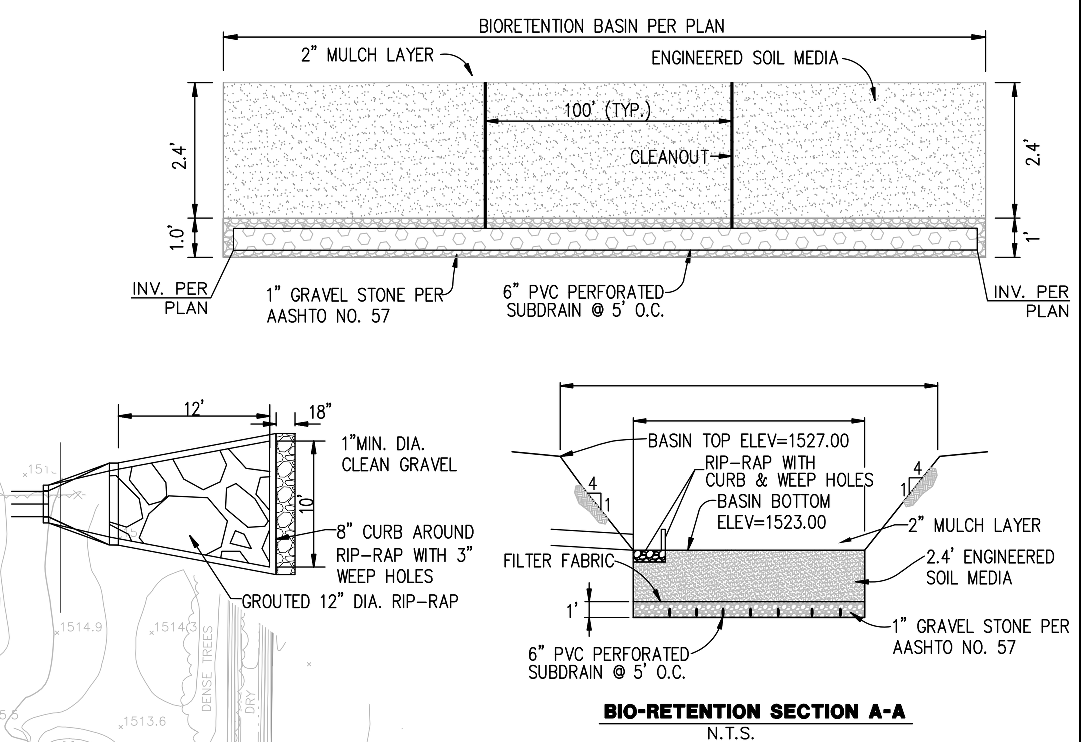

| NAME | $d_P$(FT) | $d_S$(FT) | $W_T$(FT) | $d_E$(FT) | $A_{PROVIDED}$(SF) | $V_{PROVIDED}$(CF) |
|---|---|---|---|---|---|---|
| BIORETENTION BASIN | 0.50 | 2.4 | 330 | 1.62 | 20,656 | **37,671** |

### 1 BIORETENTION BASIN A

N.T.S.

## PROJECT BMP CONFORMANCE ANALYSIS

| NAME | AREA (SF) | IMPERVIOUS AREA (SF) | PERVIOUS AREA (SF) | i | C | $V_{BMP}$(CF) | BMP | $A_{PROVIDE}$(SF) | $V_{PROVIDE}$(CF) |
|---|---|---|---|---|---|---|---|---|---|
| DMA 1 | 429,823 | 429,823 | 0 | 1 | 0.89 | | | | |
| | 307,257 | 307,257 | 0 | 1 | 0.89 | | | | |
| | 112,813 | 0 | 112,813 | 0.1 | 0.11 | **32,939** | BIORETENTION BASIN | 20,656 | **37,671** |




NOTE: ALL ROCK PLACED IN POST-CONSTRUCTION BMP'S SHALL BE CLEAN-WASHED

| ENGINEERED SOIL MEDIA REQUIREMENTS | |
|---|---|
| PERCENT RANGE | COMPONENT |
| 70–80 | SAND |
| 15–20 | SILT |
| 5–10 | CLAY |

*SEE WQMP REPORT APPENDIX 10 FOR BMP FACT SHEETS

## NOTES

1. NO RUN-ON FLOW TO THE PROJECT SITE.
2. ROOF DRAIN OUTLET LOCATION AND TRASH ENCLOSURE DETAIL WILL BE PROVIDED IN FINAL POST-CONSTRUCTION BMP SITE MAP
3. PROJECT AREA PLAZA, SIDEWALK, AND PARKING LOT WILL BE SWEPT REGULARLY ON A MONTHLY BASIS PER *BMP SD-7


**DEVELOPER/APPLICANT**
BCIF HARVILL BUSINESS CENTER LP
4675 MACARTHUR COURT, SUITE 625
NEWPORT BEACH, CA 92660
PHONE: (949) 892–4904
CONTACT: PETER SCHAFER

**ENGINEER**
HUITT–ZOLLARS
3990 CONCOURS, SUITE 330
ONTARIO, CA 91764
PHONE: (909) 941–7799
CONTACT: JOHNNY MURAD
EMAIL: jmurad@huitt–zollars.com

HUITT-ZOLLARS
Huitt-Zollars, Inc. Ontario
3990 CONCOURS, SUITE 330 * ONTARIO, CALIFORNIA 91764 * (909) 941–7799


**COUNTY OF RIVERSIDE**

**POST-CONSTRUCTION BMP SITE MAP**
**BCIF HARVILL BUSINESS CENTER**
**WATER STREET, HARVILL AVENUE & ORANGE AVENUE**
**PERRIS AREA, CA**

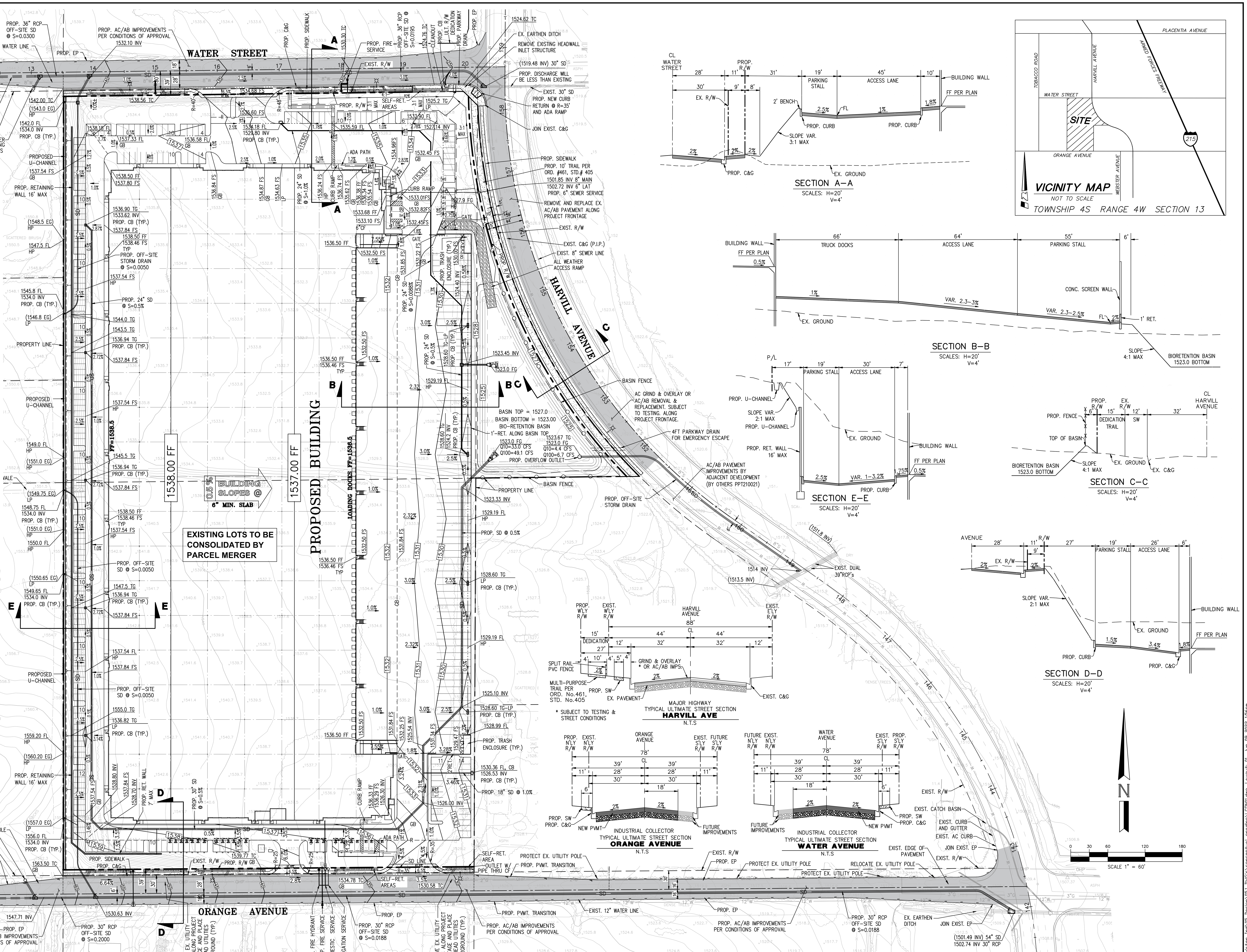
**SHEET 1 OF 1**

# Appendix 2: Construction Plans

*Grading and Drainage Plans*

Attached Conceptual Grading and Drainage Plans

This section will be completed and addressed at the time of the final WQMP submittal




## LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN AN UNINCORPORATED AREA IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

PARCEL A:

LOT 10 IN THE SOUTHEAST QUARTER OF SECTION 13, TOWNSHIP 4 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN, AS SHOWN BY MAP OF OAKES AND SAWYER'S SUBDIVISION ON FILE IN BOOK 1, PAGE 5 OF MAPS, RIVERSIDE COUNTY RECORDS.

EXCEPTING THEREFROM THAT PORTION IN WATER STREET;

ALSO EXCEPTING THAT PORTION IN "A" STREET AS CONVEYED TO THE COUNTY OF RIVERSIDE BY DEED RECORDED NOVEMBER 22, 1991 AS INSTRUMENT NO. 408203, OFFICIAL RECORDS.

PARCEL B:

THAT PORTION OF LOT 9 IN THE SOUTHEAST QUARTER OF SECTION 13, TOWNSHIP 4 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN, AS SHOWN BY MAP OF OAKES AND SAWYER'S SUBDIVISION ON FILE IN BOOK 1, PAGE 5 OF MAPS, RIVERSIDE COUNTY RECORDS, WHICH LIES WESTERLY OF THE WEST LINE OF "A" STREET AS DESCRIBED AS PARCEL 12-A IN THE DEED RECORDED APRIL 8, 1992 AS INSTRUMENT NO. 125711, OFFICIAL RECORDS.

EXCEPTING THEREFROM THAT PORTION DESCRIBED AS FOLLOWS:

COMMENCING AT THE INTERSECTION OF THE WESTERLY LINE OF SAID LOT 9, WITH THE SOUTHERLY LINE OF WATER STREET, 40.00 FEET IN WIDTH, AS ACCEPTED BY RESOLUTION RECORDED OCTOBER 8, 1952 IN BOOK 1406, PAGE 243, OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA;
THENCE SOUTH 00°15'31" EAST, ALONG THE WESTERLY LINE OF SAID LOT 9, A DISTANCE OF 7.54 FEET TO THE POINT OF BEGINNING OF THE PARCEL TO BE DESCRIBED.

THENCE CONTINUING SOUTH 00°15'31" EAST, ALONG THE WESTERLY LINE OF SAID LOT 9, A DISTANCE OF 34.12 FEET;

THENCE SOUTH 45° 10' 19" EAST, A DISTANCE OF 1.09 FEET TO THE WESTERLY LINE OF THE ABOVE MENTIONED 88.00 FOOT STRIP OF LAND;

THENCE NORTHERLY ALONG SAID WESTERLY LINE ON A NON-TANGENT CURVE CONCAVE EASTERLY, HAVING A RADIUS OF 894.0 FEET, THROUGH AN ANGLE OF 02°14'10", AN ARC LENGTH OF 34.69 FEET TO THE POINT OF BEGINNING, (THE INITIAL RADIAL LINE BEARS SOUTH 87°62'02" WEST).

PARCEL C:

LOT 15 OF OAKES AND SAWYERS SUBDIVISION OF THE SOUTHEAST QUARTER OF SECTION 13, TOWNSHIP 4 SOUTH, RANGE 4 WEST, SAN BERNARDINO MERIDIAN IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 1 PAGE 5 OF MAPS, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA;

EXCEPT ANY PORTION LYING WITHIN ORANGE AVENUE.

## LEGEND

| | |
|---|---|
| G | EXIST. GAS LINE |
| S | EXIST. SEWER LINE |
| W | EXIST. WATER LINE |
| OHP | EXIST. OVERHEAD POWER LINE |
| | PROPOSED STORM DRAIN |
| S | PROPOSED SEWER |
| W | PROPOSED WATER LINE |
| R | RIDGE |
| | EXISTING PROPERTY LINE |
| | PROPOSED CURB OPENING INLET |
| | GRATE INLET |
| CF | CURB FACE |
| CB | CATCH BASIN |
| C&G | CURB & GUTTER |
| CL | CENTERLINE |
| DWY | DRIVEWAY |
| EP | EDGE OF PAVEMENT |
| EXIST. | EXISTING |
| FF | FINISH FLOOR ELEVATION |
| FS | FINISHED SURFACE |
| FL | FLOWLINE |
| GB | GRADE BREAK |
| INV | INVERT |
| N.A.P. | NOT A PART |
| P.I.P. | PROTECT IN PLACE |
| L.D. | LOCAL DEPRESSION |
| PP | POWER POLE |
| PL | PROPERTY LINE |
| PVMT | PAVEMENT |
| PROP. | PROPOSED |
| R/W | RIGHT-OF-WAY |
| R | RIDGE |
| STL | STREET LIGHT |
| TP | TOP OF PAVEMENT |
| TC | TOP OF CURB |
| | STREET LIGHT |
| WQ | WATER QUALITY UNIT |

## ASSESSOR'S PARCEL NUBER(S):

317-270-006, 317-270-010, 317-270-015, 317-270-016

## LAND USE/ZONING:

| | |
|---|---|
| EXISTING LAND USE: | VACANT |
| LAND USE: | WAREHOUSE FACILITY |
| EXISTING ZONING: | M-SC |
| EXISTINGGENERAL PLAN LAND USE: | BUSINESS PARK (BP) |
| RIVERSIDE COUNTY SPECIFIC PLAN: | "A" STREET SPECIFIC PLAN NO. 100 |

## ACREAGE:

GROSS AREA: 20.57± ACRES
NET AREA: 20.08± ACRES

## DEVELOPER/APPLICANT


BCIF HARVILL BUSINESS CENTER LP
4675 MACARTHUR COURT, SUITE 625
NEWPORT BEACH, CA 92660
PHONE: (949) 892-4904
CONTACT: PETER SCHAFER


## CIVIL ENGINEER


HUITT-ZOLLARS, INC.
3990 CONCOURS, SUITE 330
ONTARIO, CALIFORNIA 91764
PHONE: (909) 941-7799, X11450
CONTACT: MANUEL GONZALES


| EARTHWORK VOLUMES | | |
|---|---|---|
| | CUT (CY) | FILL (CY) |
| RAW* | 47,418 | 53,104 |
| ADJUSTED | 110,000 | 110,000 |

NET* SITE CLOSE TO BALANCE

* ALL EARTHWORK VOLUMES SHOWN HERE ARE FOR REFERENCE ONLY AND DO NOT REFLECT FINAL EARTHWORK VOLUMES.

REGISTERED PROFESSIONAL ENGINEER JOHNNY MURAD NO. 67512 EXPIRATION 6-30-2023 CIVIL STATE OF CALIFORNIA


HUITT-ZOLLARS
Huitt-Zollars, Inc. Ontario
3990 CONCOURS, SUITE 330 * ONTARIO, CALIFORNIA 91764 * (909) 941-7799


PREPARED UNDER THE SUPERVISION OF:

JOHNNY MURAD
R.C.E. NO. 67512 EXP. 6/30/23 DATE

# COUNTY OF RIVERSIDE

## CONCEPTUAL GRADING, DRAINAGE & UTILITY PLAN
## BCIF HARVILL BUSINESS CENTER
## WATER STREET, HARVILL AVENUE & ORANGE AVENUE - PPT220002

| | |
|---|---|
| DESIGNED BY | M.G. |
| DRAWN BY | H-Z STAFF |
| CHECKED BY | J.M. |
| FIELD BOOK | |
| SHEET | 1 OF 1 SHEETS |
| JOB NO. | R313963.01 |

# Appendix 3: Soils Information

*Geotechnical Study and Other Infiltration Testing Data*

June 17, 2021

BCIF Acquisitions LLC
4675 MacArthur Court, Suite 625
Newport Beach, California 92660

Attention: Mr. Peter F. Schafer
AVP, Development

Project No.: **21G171-2**

Subject: **Results of Infiltration Testing**
Proposed Warehouse
SWC Water Street and Harvill Avenue
Riverside County (Perris Area), California

Reference: Geotechnical Investigation, Proposed Warehouse, SWC Water Street and Harvill Avenue, Riverside County (Perris Area), California, prepared for BCIF Acquisitions, LLC, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 21G171-1, dated June 10, 2021.

Mr. Schafer:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

## Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 21P239, dated May 4, 2021. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

## Site and Project Description

The site is located at the southwest corner of Water Street and Harvill Avenue in an unincorporated portion of Riverside County near Perris, California. The site is bounded to the north by Water Street, to the west by a single-family residence and vacant lots, to the south by Orange Avenue, and to the east by vacant lots and Harvill Avenue. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The site consists of multiple contiguous parcels, which total 20.56± acres in size. The site is presently vacant and undeveloped. A row of medium-sized trees are present in the northeast corner of the site. Debris, composed of house hold items and trash, is present just west of the row of trees. An ascending slope is present along the northern, western and a portion of the southern property lines. The western slope possesses five (5) concrete-lined drainages that

22885 Savi Ranch Parkway ▾ Suite E ▾ Yorba Linda ▾ California ▾ 92887
voice: (714) 685-1115 ▾ fax: (714) 685-1118 ▾ www.socalgeo.com

empty into the site. Another north facing descending slope bisects the site. The ground surface consists of exposed soil with moderate to very dense native grass and weed growth.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth and visual observations made at the time of the subsurface investigation, the site slopes gently to the east at a gradient of 2½± percent. The slopes located along the property lines possess a 3h:1v slope face. The slope is approximately 3 to 8± feet higher than the surrounding topography. The slope that bisects the site is approximately 3± feet in height.

## Proposed Development

A preliminary site plan (Scheme 1) prepared by HPA Architecture was provided to our office. Based on this plan, the site will be developed with one (1) new warehouse, 452,000± ft² in size, located in the central area of the site. Dock-high doors will be constructed along a portion of the east building wall. The building is expected to be surrounded by asphaltic concrete pavements in the parking and drive areas, Portland cement concrete pavements in the truck court areas, and limited areas of concrete flatwork and landscape planters throughout.

The proposed development will include on-site storm water infiltration. The infiltration system will consist of an infiltration basin in the eastern region of the site. In addition, a below-grade chamber system will be constructed in the eastern region of the site within the proposed parking area. Based on conversations with the project civil engineer, the bottom of the infiltration systems will be 10± feet below the existing site grades.

## Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site, which is referenced above. As part of this study, eight (8) borings were advanced to depths of 10 to 25± feet below existing site grades. Native alluvium was encountered at the ground surface at all of the boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The younger alluvium generally consists of loose to very dense silty fine sands, silty fine to medium sands, fine to coarse sands and clayey fine to medium sands. Older native alluvial soils were encountered beneath the younger alluvium at Boring No. B-3, extending to a depth of 20± feet below ground surface. The older alluvium generally consists of medium dense to very dense fine to coarse sand and slightly cemented silty fine to coarse sand. Val Verde Tonalite bedrock was encountered beneath the alluvium at Boring Nos. B-2 and B-6, extending to at least the maximum depth explored of 25± feet below ground surface. The bedrock generally consists of medium dense to very dense highly decomposed, friable fine- to medium-grained tonalite.

### Groundwater

Free water was not encountered during any of our subsurface explorations. Based on the lack of any water within the borings and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the groundwater depths in this area is the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 1.24 miles northeast of the site. Water level readings within this monitoring well indicate high groundwater levels of 54± feet below the ground surface in November 2020.

## Subsurface Exploration

### Scope of Exploration

The subsurface exploration for the infiltration testing consisted of four (4) backhoe-excavated trenches, extending to a depth of 10± feet below existing site grades. The trenches were logged during excavation by a member of our staff. The approximate locations of the infiltration trenches (identified as I-1 through I-4) are indicated on the Infiltration Test Location Plans, enclosed as Plate 2 of this report.

### Geotechnical Conditions

Artificial fill soils were encountered at the ground surface of Infiltration Trench No. I-1, extending to 2± feet below existing site grades. The artificial fill soil consists of medium dense silty fine to coarse sands. The fill soils possess a disturbed appearance, resulting in the classification of artificial fill. Native alluvium was encountered at the ground surface at all of the remaining infiltration testing locations, extending to at least the maximum explored depth of 10± feet below existing site grades. The younger alluvial soils consist of loose to medium dense silty fine to coarse sands and fine to medium sands. Variable clay content was encountered within the younger alluvium. The Trench Logs, which illustrate the conditions encountered at the infiltration test locations, are presented in this report.

## Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration system that will be used at the subject site. As previously mentioned, the infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at both of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 5, 10, and 20-minute increments. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

| **Infiltration Test No.** | **Depth (feet)** | **Soil Description** | **Infiltration Rate (inches/hour)** |
|---|---|---|---|
| I-1 | 10 | Brown Silty fine to coarse Sand to fine to coarse Sandy Silt, trace Clay | 0.8 |
| I-2 | 10 | Brown Silty fine to coarse Sand | 6.9 |
| I-3 | 10 | Brown Silty fine to coarse Sand | 8.1 |
| I-4 | 10 | Brown Silty fine to coarse Sand, trace Clay | 0.6 |

## Design Recommendations

Four (4) infiltration tests were performed at the subject site. As note above, the calculated infiltration rates at the infiltration test locations range from 0.6 to 8.1 inches per hour. **Based on the results of infiltration testing, we recommend the following infiltration rates to be used for the design of the proposed infiltration systems:**

| Infiltration Test No. | Infiltration System | Location | Infiltration Rate (Inches per Hour) |
|---|---|---|---|
| **I-1 & I-2** | **"A"** | **Northern Basin** | **0.8** |
| **I-3 & I-4** | **"B"** | **Northern Parking Area** | **0.6** |

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration system to identify the soil classification at the base of the infiltration basin. It should be confirmed that the soils at the base of the proposed infiltration system corresponds with those presented in this report to ensure that the performance of the system will be consistent with the rates reported herein.

The design of the storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. It is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above is based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rate.** It should be noted that the recommended infiltration rates are based on infiltration testing at four (4) discrete locations and that the overall infiltration rates of the proposed infiltration systems could vary considerably.

## Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

## Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

## Basin Maintenance

The proposed project may include infiltration basins. Water flowing into these basins will carry some level of sediment. Wind-blown sediments and erosion of the basin side walls will also contribute to sediment deposition at the bottom of the basin. This layer has the potential to significantly reduce the infiltration rate of the basin subgrade soils. Therefore, a formal basin maintenance program should be established to ensure that these silt and clay deposits are removed from the basin on a regular basis. Appropriate vegetation on the basin sidewalls and bottom may reduce erosion and sediment deposition.

Basin maintenance should also include measures to prevent animal burrows, and to repair any burrows or damage caused by such. Animal burrows in the basin sidewalls can significantly increase the risk of erosion and piping failures.

## Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

**The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils.** Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

## Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

**SOUTHERN CALIFORNIA GEOTECHNICAL, INC.**

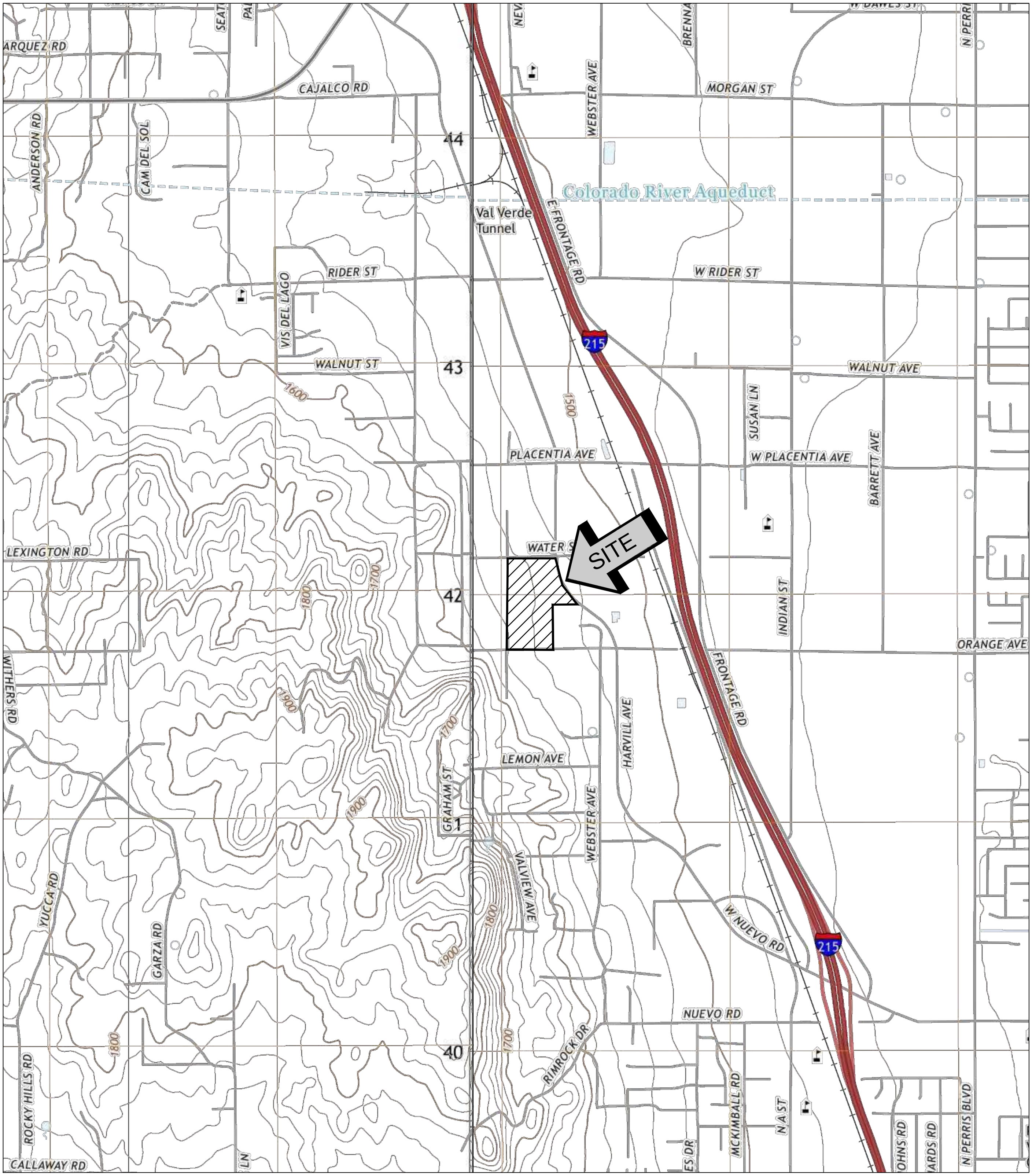
Ryan Bremer
Staff Geologist

Robert G. Trazo, GE 2655
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER ROBERT TRAZO No. 2655 GEOTECHNICAL STATE OF CALIFORNIA

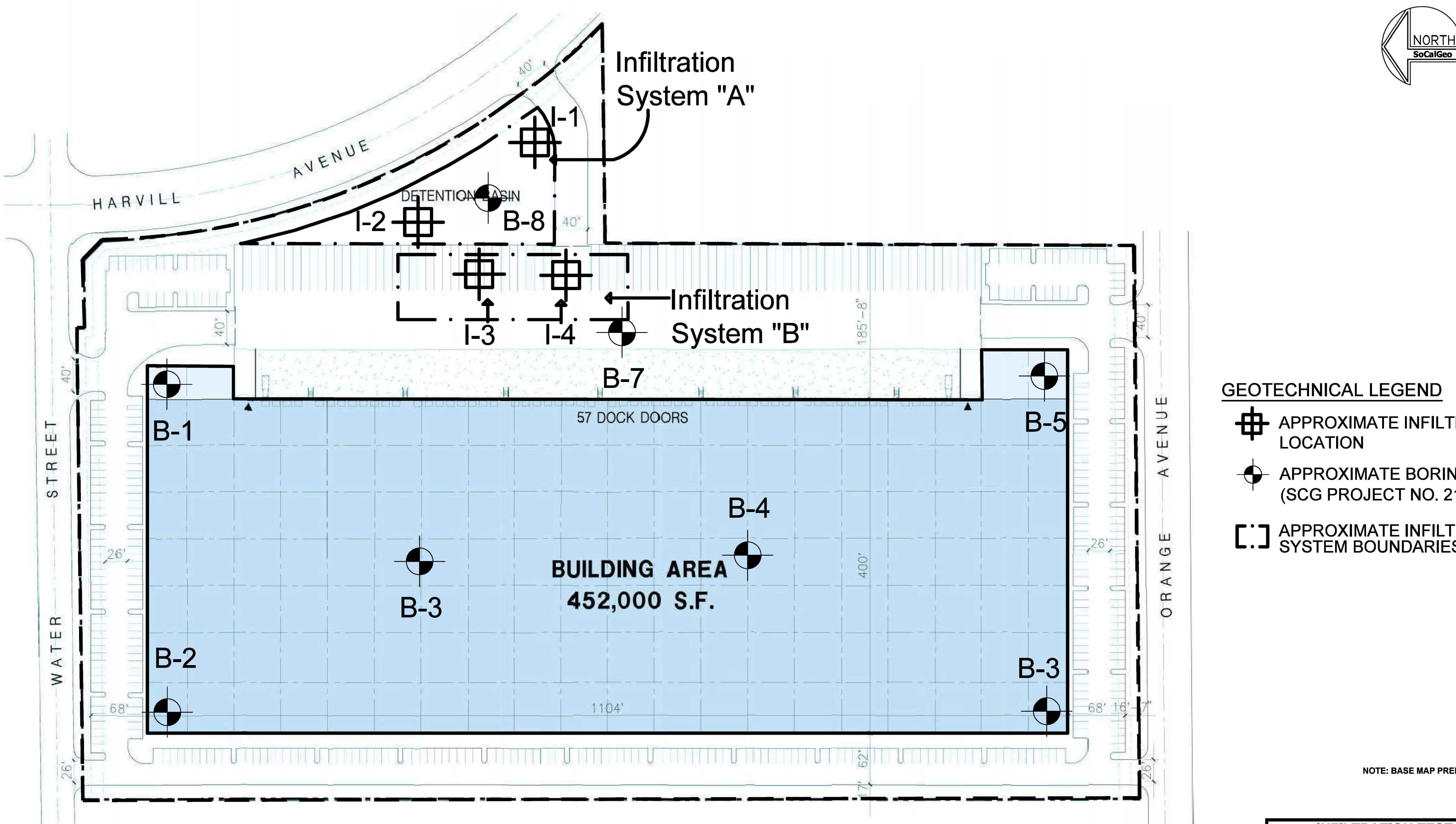
Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2: Infiltration Test Location Plan
Trench Log Legend and Logs (6 pages)
Infiltration Test Results Spreadsheets (4 pages)
Grainsize Distribution Graphs (4 pages)




SOURCE: USGS TOPOGRAPHIC MAP OF THE STEELE PEAK AND PERRIS QUADRANGLES, RIVERSIDE COUNTY, CALIFORNIA, 2018.

| SITE LOCATION MAP | |
|---|---|
| PROPOSED WAREHOUSE | |
| RIVERSIDE COUNTY (PERRIS AREA), CALIFORNIA | |
| SCALE: 1" = 2000' | SOUTHERN CALIFORNIA GEOTECHNICAL |
| DRAWN: JAZ<br>CHKD: RF | |
| SCG PROJECT<br>21G171-2 | |
| **PLATE 1** | |




## GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 21G171-1)
- APPROXIMATE INFILTRATION SYSTEM BOUNDARIES

NOTE: BASE MAP PREPARED BY HPA, INC.

**INFILTRATION TEST LOCATION PLAN**

PROPOSED WAREHOUSE

RIVERSIDE COUNTY (PERRIS AREA), CALIFORNIA

SCALE: 1" = 120'

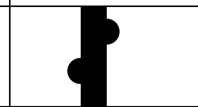
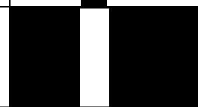
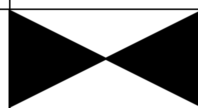
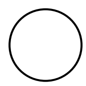
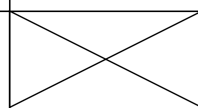
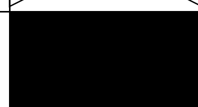
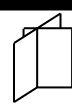
DRAWN: JAZ
CHKD: RF

SCG PROJECT 21G171-2

PLATE 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL

# TRENCH LOG LEGEND

| SAMPLE TYPE | GRAPHICAL SYMBOL | SAMPLE DESCRIPTION |
|---|---|---|
| **AUGER** |  | SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED) |
| **CORE** |  | ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK. |
| **GRAB** |  | SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED) |
| **CS** |  | CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED) |
| **NSR** |  | NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL. |
| **SPT** |  | STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED) |
| **SH** |  | SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED) |
| **VANE** |  | VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED. |

**COLUMN DESCRIPTIONS**

**DEPTH:** Distance in feet below the ground surface.

**SAMPLE**: Sample Type as depicted above.

**BLOW COUNT**: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

**POCKET PEN.**: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

**GRAPHIC LOG**: Graphic Soil Symbol as depicted on the following page.

**DRY DENSITY**: Dry density of an undisturbed or relatively undisturbed sample in $lbs/ft^3$.

**MOISTURE CONTENT**: Moisture content of a soil sample, expressed as a percentage of the dry weight.

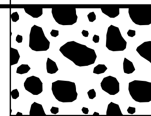
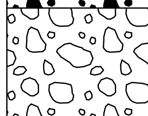
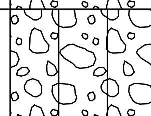
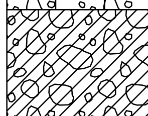
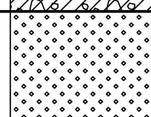
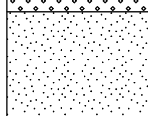
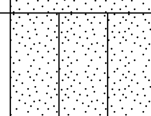
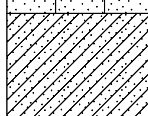
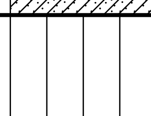
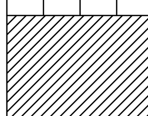
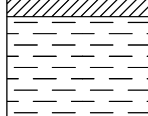
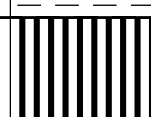
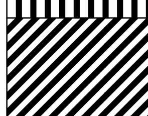
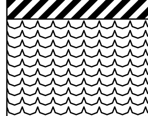
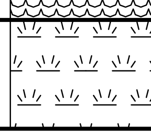
**LIQUID LIMIT**: The moisture content above which a soil behaves as a liquid.

**PLASTIC LIMIT**: The moisture content above which a soil behaves as a plastic.

**PASSING #200 SIEVE**: The percentage of the sample finer than the #200 standard sieve.

**UNCONFINED SHEAR**: The shear strength of a cohesive soil sample, as measured in the unconfined state.

# SOIL CLASSIFICATION CHART

| MAJOR DIVISIONS | | | SYMBOLS: GRAPH | SYMBOLS: LETTER | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| COARSE GRAINED SOILS<br><br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br><br>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | CLEAN GRAVELS<br><br>(LITTLE OR NO FINES) |  | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | |  | GP | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | GRAVELS WITH FINES<br><br>(APPRECIABLE AMOUNT OF FINES) |  | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES |
| | | |  | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES |
| | SAND AND SANDY SOILS<br><br>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE | CLEAN SANDS<br><br>(LITTLE OR NO FINES) |  | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | |  | SP | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES |
| | | SANDS WITH FINES<br><br>(APPRECIABLE AMOUNT OF FINES) |  | SM | SILTY SANDS, SAND - SILT MIXTURES |
| | | |  | SC | CLAYEY SANDS, SAND - CLAY MIXTURES |
| FINE GRAINED SOILS<br><br>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 |  | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | |  | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | |  | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| | SILTS AND CLAYS | LIQUID LIMIT GREATER THAN 50 |  | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS |
| | | |  | CH | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | |  | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| HIGHLY ORGANIC SOILS | | |  | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

# TRENCH NO. I-1

JOB NO.: 21G171-2
PROJECT: Proposed Warehouse
LOCATION: Perris, California

EXCAVATION DATE: 5/20/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: ---

| FIELD RESULTS | | | | | DESCRIPTION | LABORATORY RESULTS | | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | GRAPHIC LOG | SURFACE ELEVATION: --- MSL | DRY DENSITY (PCF) | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | PASSING #200 SIEVE (%) | ORGANIC CONTENT (%) | |
| | | | | | FILL: Light Brown Silty fine to coarse Sand, trace fine to coarse Gravel, medium dense-dry | | | | | | | |
| 5 | | | | | YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand to fine to coarse Sandy Silt, trace Clay, medium dense-damp | | | | | | | |
| 10 | Bulk (hand) | | | | | | 6 | | | 49 | | |
| | | | | | Boring Terminated at 10' | | | | | | | |

TBL 21G171-2.GPJ SOCALGEO.GDT 6/17/21

TEST TRENCH LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

# TRENCH NO. I-2

JOB NO.: 21G171-2
PROJECT: Proposed Warehouse
LOCATION: Perris, California

EXCAVATION DATE: 5/21/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Oscar Sandoval

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: ---

| FIELD RESULTS | | | | | | LABORATORY RESULTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | GRAPHIC LOG | DESCRIPTION<br>SURFACE ELEVATION: --- MSL | DRY DENSITY (PCF) | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | PASSING #200 SIEVE (%) | ORGANIC CONTENT (%) | COMMENTS |
| | | | | | YOUNGER ALLUVIUM: Light Brown Silty fine to medium Sand, trace coarse Sand, trace fine root fibers, medium dense-dry to damp | | | | | | | |
| 5 | | | | | YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, medium dense-damp | | | | | | | |
| 10 | (bag) | | | | | | 5 | | | 33 | | |
| | | | | | Boring Terminated at 10' | | | | | | | |

TBL 21G171-2.GPJ SOCALGEO.GDT 6/17/21

## TEST TRENCH LOG

PLATE B-2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

# TRENCH NO. I-3

JOB NO.: 21G171-2
PROJECT: Proposed Warehouse
LOCATION: Perris, California

EXCAVATION DATE: 5/20/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: ---

| FIELD RESULTS | | | | | | LABORATORY RESULTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | GRAPHIC LOG | DESCRIPTION<br>SURFACE ELEVATION: --- MSL | DRY DENSITY (PCF) | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | PASSING #200 SIEVE (%) | ORGANIC CONTENT (%) | COMMENTS |
| 0–4 | | | | | YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace fine to coarse Gravel, trace fine root fibers, loose-damp | | | | | | | |
| 4–10 | | | | | YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, medium dense-dry to damp | | | | | | | |
| 9–10 | Bulk | | | | | | 3 | | | 42 | | |
| 10 | | | | | Boring Terminated at 10' | | | | | | | |



TEST TRENCH LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

# TRENCH NO. I-4

JOB NO.: 21G171-2
PROJECT: Proposed Warehouse
LOCATION: Perris, California

EXCAVATION DATE: 5/20/21
EXCAVATION METHOD: Backhoe
LOGGED BY: Ryan Bremer

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: ---

SURFACE ELEVATION: --- MSL

| FIELD RESULTS | | | | | | LABORATORY RESULTS | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH (FEET) | SAMPLE | BLOW COUNT | POCKET PEN. (TSF) | GRAPHIC LOG | DESCRIPTION | DRY DENSITY (PCF) | MOISTURE CONTENT (%) | LIQUID LIMIT | PLASTIC LIMIT | PASSING #200 SIEVE (%) | ORGANIC CONTENT (%) | COMMENTS |
| | | | | | YOUNGER ALLUVIUM: Light Brown Silty fine to coarse Sand, trace fine to coarse Gravel, little fine root fibers, loose-dry | | | | | | | |
| | | | | | YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay, weakly cemented, medium dense-dry to damp | | | | | | | |
| 5 | | | | | | | | | | | | |
| 10 | (hand sample) | | | | | | 3 | | | 23 | | |
| | | | | | Boring Terminated at 10' | | | | | | | |

TBL 21G171-2.GPJ SOCALGEO.GDT 6/17/21

**INFILTRATION CALCULATIONS**

| | |
|---|---|
| Project Name | Proposed Warehouse |
| Project Location | Perris, California |
| Project Number | 21G171-2 |
| Engineer | Ryan Bremer |

Infiltration Test No: I-1

| Constants | Diameter (ft) | Area ($ft^2$) | Area ($cm^2$) |
|---|---|---|---|
| Inner | 1 | 0.79 | 730 |
| Anlr. Spac | 2 | 2.36 | 2189 |

*Note: The infiltration rate was calculated based on current time interval

| Test Interval | | Time (hr) | Interval **Elapsed** (min) | Flow Readings: Inner Ring (ml) | Flow Readings: Ring Flow ($cm^3$) | Flow Readings: Annular Ring (ml) | Flow Readings: Space Flow ($cm^3$) | Infiltration Rates: Inner Ring* (cm/hr) | Infiltration Rates: Annular Space* (cm/hr) | Infiltration Rates: Inner Ring* (in/hr) | Infiltration Rates: Annular Space* (in/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Initial | 1:24 PM | 20 | 725 | 425 | 1100 | 2400 | 1.75 | 3.29 | 0.69 | 1.30 |
| | Final | 1:44 PM | **20** | 1150 | | 3500 | | | | | |
| 2 | Initial | 1:44 PM | 20 | 1150 | 500 | 3500 | 2200 | 2.06 | 3.02 | 0.81 | 1.19 |
| | Final | 2:04 PM | **40** | 1650 | | 5700 | | | | | |
| 3 | Initial | 2:05 PM | 20 | 750 | 550 | 5000 | 1600 | 2.26 | 2.19 | 0.89 | 0.86 |
| | Final | 2:25 PM | **61** | 1300 | | 6600 | | | | | |
| 4 | Initial | 2:26 PM | 20 | 800 | 550 | 1000 | 1500 | 2.26 | 2.06 | 0.89 | 0.81 |
| | Final | 2:46 PM | **82** | 1350 | | 2500 | | | | | |
| 5 | Initial | 2:48 PM | 20 | 500 | 500 | 1000 | 1500 | 2.06 | 2.06 | 0.81 | 0.81 |
| | Final | 3:08 PM | **104** | 1000 | | 2500 | | | | | |
| 6 | Initial | 3:09 PM | 20 | 500 | 500 | 1000 | 1600 | 2.06 | 2.19 | 0.81 | 0.86 |
| | Final | 3:29 PM | **125** | 1000 | | 2600 | | | | | |

**INFILTRATION CALCULATIONS**

| | |
|---|---|
| Project Name | Proposed Warehouse |
| Project Location | Perris, California |
| Project Number | 21G171-2 |
| Engineer | Oscar Sandovol |

Infiltration Test No: I-2

| Constants | Diameter (ft) | Area ($ft^2$) | Area ($cm^2$) |
|---|---|---|---|
| Inner | 1 | 0.79 | 730 |
| Anlr. Spac | 2 | 2.36 | 2189 |

*Note: The infiltration rate was calculated based on current time interval

| Test Interval | | Time (hr) | Interval **Elapsed** (min) | Flow Readings: Inner Ring (ml) | Ring Flow ($cm^3$) | Annular Ring (ml) | Space Flow ($cm^3$) | Infiltration Rates: Inner Ring* (cm/hr) | Annular Space* (cm/hr) | Inner Ring* (in/hr) | Annular Space* (in/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Initial | 8:45 AM | 5 | 0 | 1550 | 0 | 3500 | 25.49 | 19.19 | 10.04 | 7.55 |
| | Final | 8:50 AM | **5** | 1550 | | 3500 | | | | | |
| 2 | Initial | 8:51 AM | 5 | 0 | 1200 | 100 | 3400 | 19.74 | 18.64 | 7.77 | 7.34 |
| | Final | 8:56 AM | **11** | 1200 | | 3500 | | | | | |
| 3 | Initial | 9:01 AM | 5 | 0 | 1300 | 0 | 3000 | 21.38 | 16.45 | 8.42 | 6.48 |
| | Final | 9:06 AM | **21** | 1300 | | 3000 | | | | | |
| 4 | Initial | 9:08 AM | 5 | 0 | 1200 | 0 | 3200 | 19.74 | 17.54 | 7.77 | 6.91 |
| | Final | 9:13 AM | **28** | 1200 | | 3200 | | | | | |
| 5 | Initial | 9:14 AM | 5 | 250 | 1050 | 0 | 3200 | 17.27 | 17.54 | 6.80 | 6.91 |
| | Final | 9:19 AM | **34** | 1300 | | 3200 | | | | | |
| 6 | Initial | 9:20 AM | 5 | 0 | 1250 | 0 | 3000 | 20.56 | 16.45 | 8.09 | 6.48 |
| | Final | 9:25 AM | **40** | 1250 | | 3000 | | | | | |
| 7 | Initial | 9:26 AM | 5 | 0 | 1100 | 0 | 3200 | 18.09 | 17.54 | 7.12 | 6.91 |
| | Final | 9:31 AM | **46** | 1100 | | 3200 | | | | | |
| 8 | Initial | 9:32 AM | 5 | 0 | 1050 | 0 | 3100 | 17.27 | 16.99 | 6.80 | 6.69 |
| | Final | 9:37 AM | **52** | 1050 | | 3100 | | | | | |
| 9 | Initial | 9:42 AM | 5 | 0 | 1050 | 0 | 3300 | 17.27 | 18.09 | 6.80 | 7.12 |
| | Final | 9:47 AM | **62** | 1050 | | 3300 | | | | | |

**INFILTRATION CALCULATIONS**

| | |
|---|---|
| Project Name | Proposed Warehouse |
| Project Location | Perris, California |
| Project Number | 21G171-2 |
| Engineer | Ryan Bremer |

Infiltration Test No: I-3

| Constants | Diameter (ft) | Area ($ft^2$) | Area ($cm^2$) |
|---|---|---|---|
| Inner | 1 | 0.79 | 730 |
| Anlr. Spac | 2 | 2.36 | 2189 |

*Note: The infiltration rate was calculated based on current time interval

| Test Interval | | Time (hr) | Interval **Elapsed** (min) | Flow Readings: Inner Ring (ml) | Ring Flow ($cm^3$) | Annular Ring (ml) | Space Flow ($cm^3$) | Infiltration Rates: Inner Ring* (cm/hr) | Annular Space* (cm/hr) | Inner Ring* (in/hr) | Annular Space* (in/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Initial | 9:11 AM | 10 | 450 | 2500 | 0 | 8900 | 20.56 | 24.40 | 8.09 | 9.60 |
| | Final | 9:21 AM | **10** | 2950 | | 8900 | | | | | |
| 2 | Initial | 9:22 AM | 10 | 500 | 2550 | 400 | 8100 | 20.97 | 22.20 | 8.26 | 8.74 |
| | Final | 9:32 AM | **21** | 3050 | | 8500 | | | | | |
| 3 | Initial | 9:33 AM | 10 | 500 | 2600 | 400 | 8200 | 21.38 | 22.48 | 8.42 | 8.85 |
| | Final | 9:43 AM | **32** | 3100 | | 8600 | | | | | |
| 4 | Initial | 9:47 AM | 10 | 200 | 2550 | 200 | 8200 | 20.97 | 22.48 | 8.26 | 8.85 |
| | Final | 9:57 AM | **46** | 2750 | | 8400 | | | | | |
| 5 | Initial | 9:59 AM | 10 | 500 | 2500 | 400 | 8400 | 20.56 | 23.03 | 8.09 | 9.07 |
| | Final | 10:09 AM | **58** | 3000 | | 8800 | | | | | |
| 6 | Initial | 10:10 AM | 10 | 600 | 2500 | 200 | 8200 | 20.56 | 22.48 | 8.09 | 8.85 |
| | Final | 10:20 AM | **69** | 3100 | | 8400 | | | | | |

**INFILTRATION CALCULATIONS**

| | |
|---|---|
| Project Name | Proposed Warehouse |
| Project Location | Perris, California |
| Project Number | 21G171-2 |
| Engineer | Ryan Bremer |

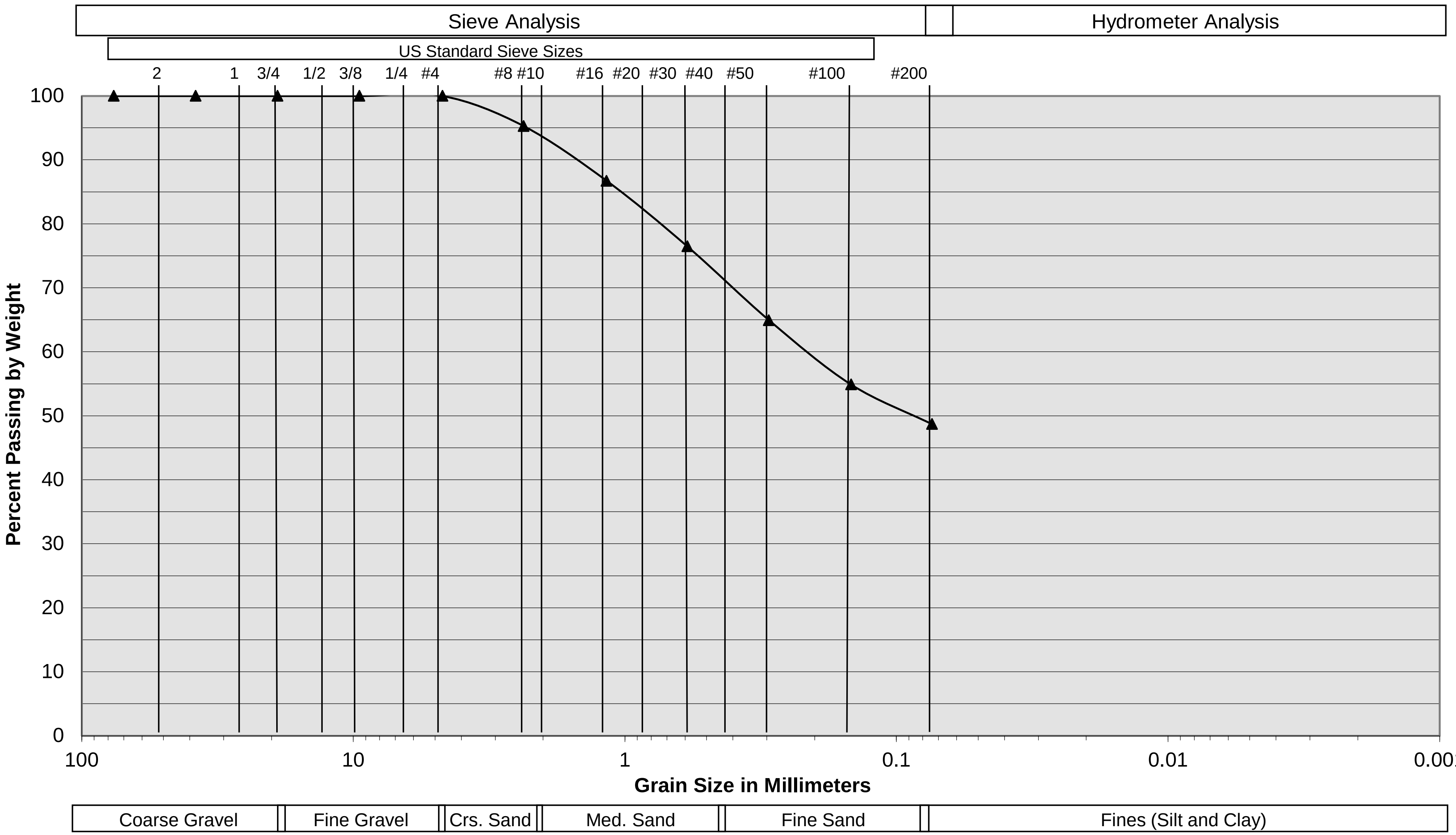
Infiltration Test No: I-4

| Constants | Diameter (ft) | Area ($ft^2$) | Area ($cm^2$) |
|---|---|---|---|
| Inner | 1 | 0.79 | 730 |
| Anlr. Spac | 2 | 2.36 | 2189 |

*Note: The infiltration rate was calculated based on current time interval

| Test Interval | | Time (hr) | Interval **Elapsed** (min) | Flow Readings: Inner Ring (ml) | Ring Flow ($cm^3$) | Annular Ring (ml) | Space Flow ($cm^3$) | Infiltration Rates: Inner Ring* (cm/hr) | Annular Space* (cm/hr) | Inner Ring* (in/hr) | Annular Space* (in/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Initial | 10:53 AM | 20 | 500 | 250 | 0 | 4200 | 1.03 | 5.76 | 0.40 | 2.27 |
| | Final | 11:13 AM | **20** | 750 | | 4200 | | | | | |
| 2 | Initial | 11:16 AM | 20 | 450 | 350 | 500 | 3500 | 1.44 | 4.80 | 0.57 | 1.89 |
| | Final | 11:36 AM | **43** | 800 | | 4000 | | | | | |
| 3 | Initial | 11:56 AM | 20 | 800 | 300 | 4000 | 3200 | 1.23 | 4.39 | 0.49 | 1.73 |
| | Final | 12:16 PM | **83** | 1100 | | 7200 | | | | | |
| 4 | Initial | 12:17 PM | 20 | 850 | 450 | 700 | 3300 | 1.85 | 4.52 | 0.73 | 1.78 |
| | Final | 12:37 PM | **104** | 1300 | | 4000 | | | | | |
| 5 | Initial | 12:40 PM | 20 | 900 | 400 | 4000 | 3000 | 1.64 | 4.11 | 0.65 | 1.62 |
| | Final | 1:00 PM | **127** | 1300 | | 7000 | | | | | |
| 6 | Initial | 1:02 PM | 20 | 950 | 350 | 4000 | 3000 | 1.44 | 4.11 | 0.57 | 1.62 |
| | Final | 1:22 PM | **149** | 1300 | | 7000 | | | | | |

# Grain Size Distribution

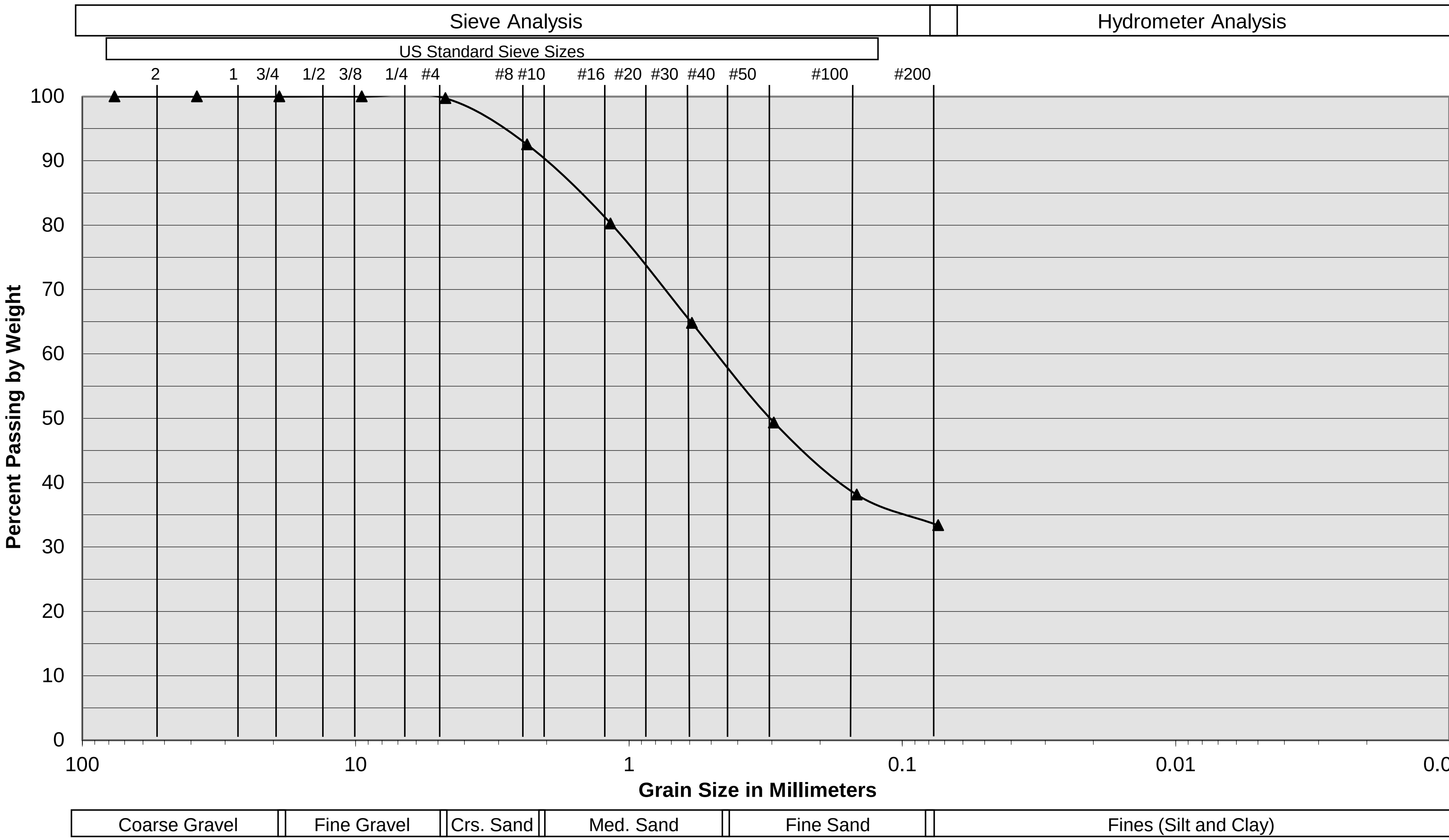



| | |
|---|---|
| Sample Description | I-1 @ 10' |
| Soil Classification | Brown Silty fine to coarse Sand to fine to coarse Sandy Silt, trace Clay |

Proposed Warehouse
Perris, California
Project No. 21G171-2
**PLATE C- 1**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

# Grain Size Distribution

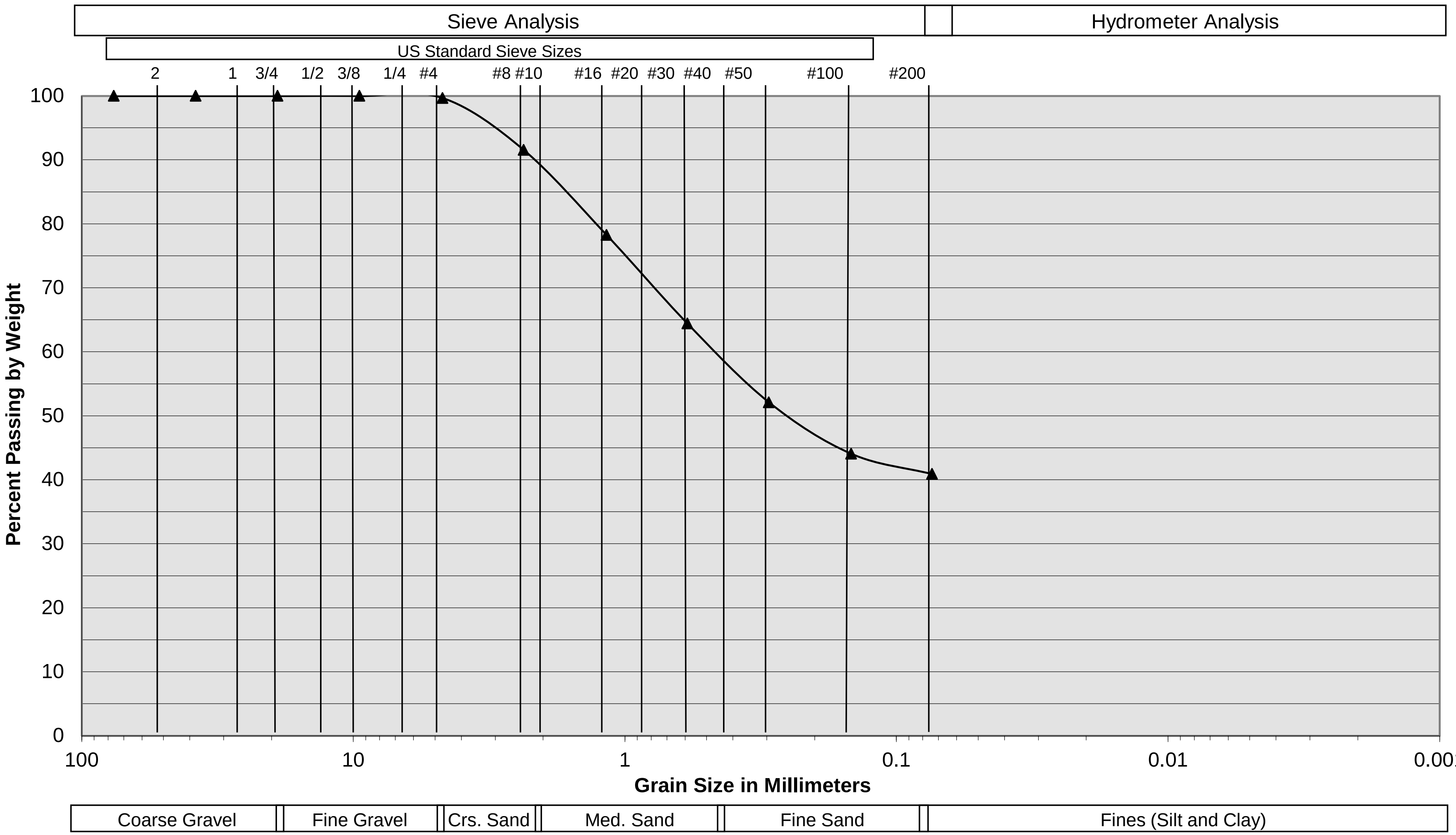



| | |
|---|---|
| Sample Description | I-2 @ 10' |
| Soil Classification | Brown to Dark Brown Silty fine to coarse Sand |

Proposed Warehouse
Perris, California
Project No. 21G171-2
**PLATE C- 2**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

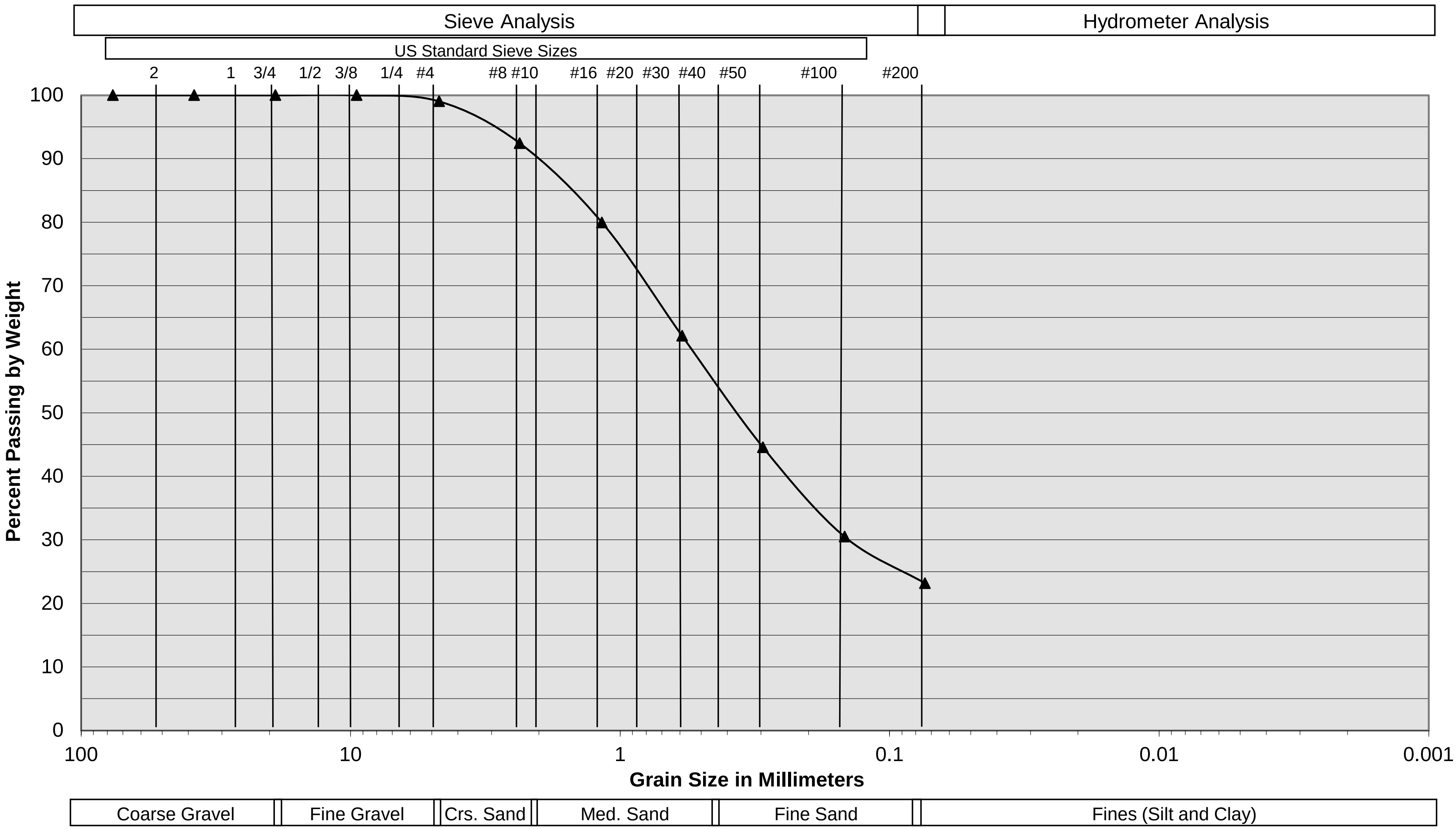
# Grain Size Distribution




| | |
|---|---|
| Sample Description | I-3 @ 10' |
| Soil Classification | Brown Silty fine to coarse Sand |

| | | |
|---|---|---|
| Proposed Warehouse<br>Perris, California<br>Project No. 21G171-2<br>**PLATE C- 3** | | SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL A California Corporation |

# Grain Size Distribution




| | |
|---|---|
| Sample Description | I-4 @ 10' |
| Soil Classification | Brown Silty fine to coarse Sand, trace Clay |

Proposed Warehouse
Perris, California
Project No. 21G171-2
**PLATE C- 4**

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL A California Corporation

# Appendix 4:  Historical Site Conditions(N/A)

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

# Appendix 5: LID Infeasibility

*LID Technical Infeasibility Analysis*

Reference page 59 form Riverside County WQMP Guidance



TABLE 3-4. LID BMP Applicability

| **LID BMP Hierarchy** | A | B | C | D |
|---|---|---|---|---|
| | $K_{SAT}$> 1.6"/hr., and no restrictions on infiltration | Are Harvest and Use BMPs feasible? | 0.3"/hr. < $K_{SAT}$ < 1.6"/hr., or unpredictable or unknown | $K_{SAT}$ < 0.3"/hr. |
| LID Infiltration BMPs* | ✓ | | | |
| Harvest and Use BMPs | | ✓ | | ✓ |
| LID Bioretention | ✓ | | ✓ | ✓ |
| LID Biotreatment | | | | ✓ |

*Notes for Table 3-5:*

***See also*** *Figure 3-6 for guidance in selecting appropriate BMPs*

***Column A:*** *Selections from this column may be used in locations where the infiltration rate of underlying soils is at least 1.6" per hour and no restrictions on infiltration apply to these locations.*

***Column B:*** *Harvest and Use BMPs may be used where it can be shown that there is sufficient demand for harvested water and where LID Infiltration BMPs are not feasible.*

***Column C:*** *Selections in this column may be used in locations where the measured infiltration rate of underlying soils is between 0.3" and 1.6" per hour or where, in accordance with recommendations of a licensed geotechnical engineer, the post-development saturated hydraulic conductivity is uncertain or unknown or cannot be reliably predicted because of soil disturbance or fill, anisotropic soil characteristics, presence of clay lenses, or other factors.*

***Column D:*** *Selections in this column may be used in locations where the infiltration rate of underlying soils is 0.3" per hour or less. See Chapter 2 for more information.*

** Permeable Pavement, when designed with a maximum of a 2:1 ratio of impervious area to pervious pavement areas, or less, is considered a self-retaining area, and is not considered an LID BMP for the purposes of this table. This table focuses on the 'special case' included in the discussion of 'areas draining to self-retaining areas' above, where a project proponent can choose to design the pervious pavement as a LID BMP in accordance with an approved design, such as the LID BMP Design handbook, and in return drain additional impervious area onto the pervious pavement beyond the 2:1 ratio.*

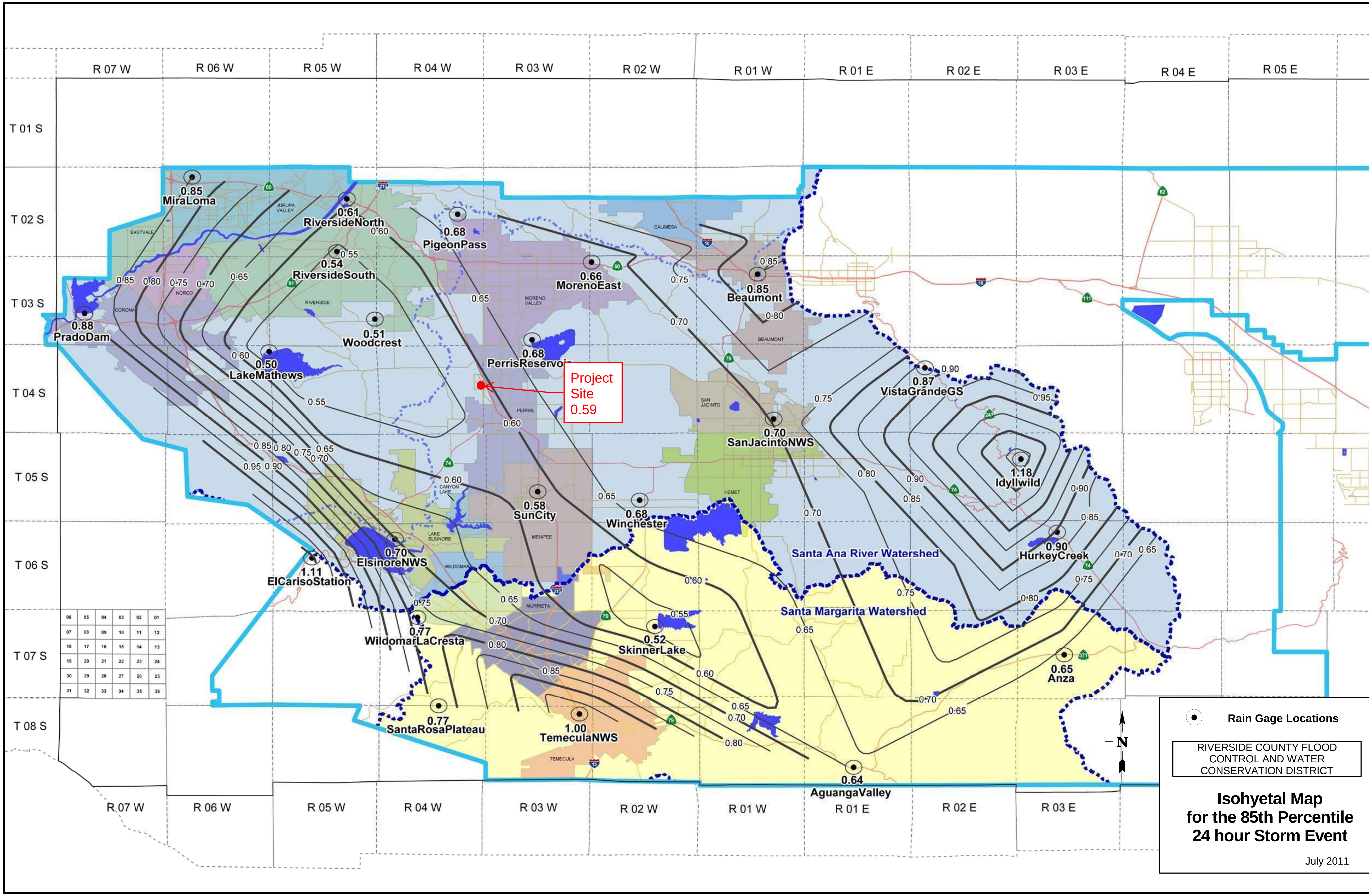
### *3.4.2.a. Laying out your LID BMPs*

Finding the right location for LID BMPs on your site involves a careful and creative integration of several factors:

- ✓ To make the most efficient use of the site and to maximize aesthetic value, **integrate BMPs with site landscaping**. Many local zoning codes may require landscape setbacks or buffers, or may specify that a minimum portion of the site be landscaped. It may be possible to locate some or all of your site's Stormwater BMPs within this same area, or within utility easements or other non-buildable areas.
- ✓ Bioretention BMPs must be **level or nearly level** all the way around. When configured in a linear fashion (similar to swales) bioretention BMPs may be gently sloped end to end, but opposite sides must be at the same

# Appendix 6: BMP Design Details

*BMP Sizing, Design Details and other Supporting Documentation*



R 07 W
R 06 W
R 05 W
R 04 W
R 03 W
R 02 W
R 01 W
R 01 E
R 02 E
R 03 E
R 04 E
R 05 E
T 01 S
T 02 S
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T 04 S
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T 07 S
T 08 S
0.85 MiraLoma
0.61 RiversideNorth
0.68 PigeonPass
0.54 RiversideSouth
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.68 PerrisReservoir
0.50 LakeMathews
Project Site 0.59
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.90 HurkeyCreek
0.70 ElsinoreNWS
1.11 ElCarisoStation
Santa Ana River Watershed
Santa Margarita Watershed
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley
N
Rain Gage Locations
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
Isohyetal Map for the 85th Percentile 24 hour Storm Event
July 2011

# **Santa Ana Watershed** - BMP Design Volume, $V_{BMP}$

(Rev. 10-2011)

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: Huitt-Zollars, Inc — Date: 4/5/2022

Designed by: Manny Gonzales — Case No:

Company Project Number/Name: R313963.01 Black Creek Harvill @ Water Ind

## BMP Identification

BMP NAME / ID: DMA 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 — $D_{85}$= 0.59 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 | 429823 | Roofs | 1 | 0.89 | 383402.1 | | | |
| | 307257 | Concrete or Asphalt | 1 | 0.89 | 274073.2 | | | |
| | 112813 | Ornamental Landscaping | 0.1 | 0.11 | 12461.1 | | | |
| | 849893 | Total | | | 669936.4 | 0.59 | 32938.5 | 37,671 |

Notes:

| Bioretention Facility - Design Procedure | BMP ID | Legend: | Required Entries |
|---|---|---|---|
| | For DMA 1 | | Calculated Cells |

Company Name: Huitt-Zollars, Inc — Date: 4/6/2022

Designed by: Manny Gonzales — County/City Case No.: verside County

## Design Volume

Enter the area tributary to this feature — $A_T$= 19.5 acres

Enter $V_{BMP}$ determined from Section 2.1 of this Handbook — $V_{BMP}$= 32,939 $ft^3$

## Type of Bioretention Facility Design

- (●) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

## Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — $d_S$ = 2.4 ft

Top Width of Bioretention Facility, excluding curb — $w_T$ = 330.0 ft

Total Effective Depth, $d_E$

$$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$$

$d_E$ = 1.62 ft

Minimum Surface Area, $A_m$

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

$A_M$ = 20,360 $ft^2$

Proposed Surface Area — A= 20,656 $ft^2$

## Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation: Natural Grasses

Notes:

## **Santa Ana Watershed** - BMP Design Volume, $V_{BMP}$

(Rev. 10-2011)

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: Huitt-Zollars, Inc
Date: 6/3/2022
Designed by: Manny Gonzales
Case No:
Company Project Number/Name: R313963.01 Black Creek Harvill @ Water Ind

### BMP Identification

BMP NAME / ID: DMA 2A

*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

$D_{85}$= 0.59 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 2A* | *38533* | *Concrete or Asphalt* | *1* | *0.89* | *34371.4* | | | |
| | *2420* | *Ornamental Landscaping* | *0.1* | *0.11* | *267.3* | | | |
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| | | | | | | | | |
| | **40953** | ***Total*** | | | **34638.7** | **0.59** | ***1703.1*** | ***1,840*** |

Notes:

## **Santa Ana Watershed** - BMP Design Volume, $V_{BMP}$

(Rev. 10-2011)

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: Huitt-Zollars, Inc — Date: 6/3/2022

Designed by: Manny Gonzales — Case No:

Company Project Number/Name: R313963.01 Black Creek Harvill @ Water Ind

### BMP Identification

BMP NAME / ID: DMA 3A

*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 — $D_{85}$= 0.59 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 3A* | *37974* | *Concrete or Asphalt* | *1* | *0.89* | *33872.8* | | | |
| | *2563* | *Ornamental Landscaping* | *0.1* | *0.11* | *283.1* | | | |
| | ***40537*** | ***Total*** | | | **34155.9** | **0.59** | ***1679.3*** | ***1,840*** |

Notes:

## **Santa Ana Watershed** - BMP Design Flow Rate, $Q_{BMP}$

(Rev. 10-2011)

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: Huitt-Zollars, Inc    Date: 4/6/2022
Designed by: Manny Gonzales    Case No:
Company Project Number/Name: Water at Harvill Industrial

### BMP Identification

BMP NAME / ID: DMA 2A

*Must match Name/ID used on BMP Design Calculation Sheet*

### Design Rainfall Depth

Design Rainfall Intensity    I = 0.20 in/hr

### 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 (use pull-down menu) | Effective Imperious Fraction, $I_f$ | DMA Runoff Factor | DMA Areas x Runoff Factor | *Design Rainfall Intensity (in/hr)* | *Design Flow Rate (cfs)* | *Proposed Flow Rate (cfs)* |
|---|---|---|---|---|---|---|---|---|
| *DMA 3* | *38533* | *Concrete or Asphalt* | *1* | *0.89* | *34371.4* | | | |
| | *2420* | *Ornamental Landscaping* | *0.1* | *0.11046* | *267.3* | | | |
| | ***40953*** | ***Total*** | | | **34638.7** | **0.20** | ***0.2*** | ***0.2*** |

DMAs

Notes:

## **Santa Ana Watershed** - BMP Design Flow Rate, $Q_{BMP}$

(Rev. 10-2011)

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: Huitt-Zollars, Inc — Date: 4/6/2022

Designed by: Manny Gonzales — Case No:

Company Project Number/Name: Water at Harvill Industrial

### BMP Identification

BMP NAME / ID: DMA 3A

*Must match Name/ID used on BMP Design Calculation Sheet*

### Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

### Drainage Management Area Tabulation

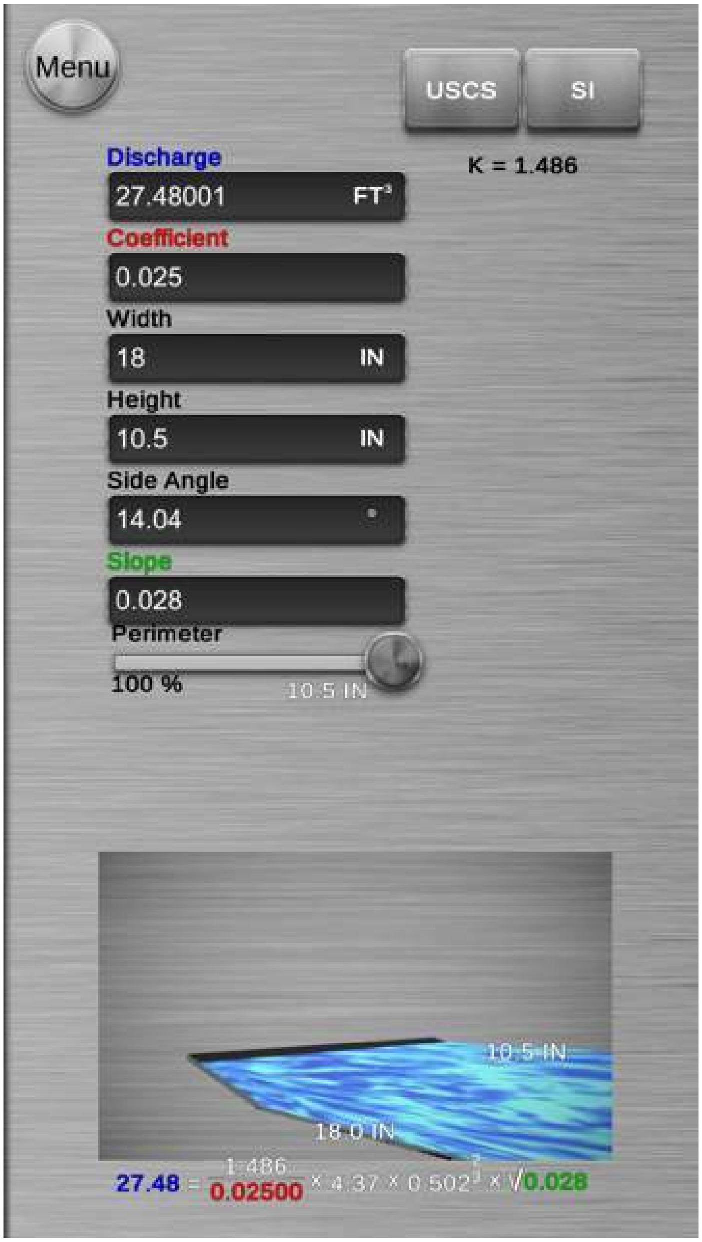
*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

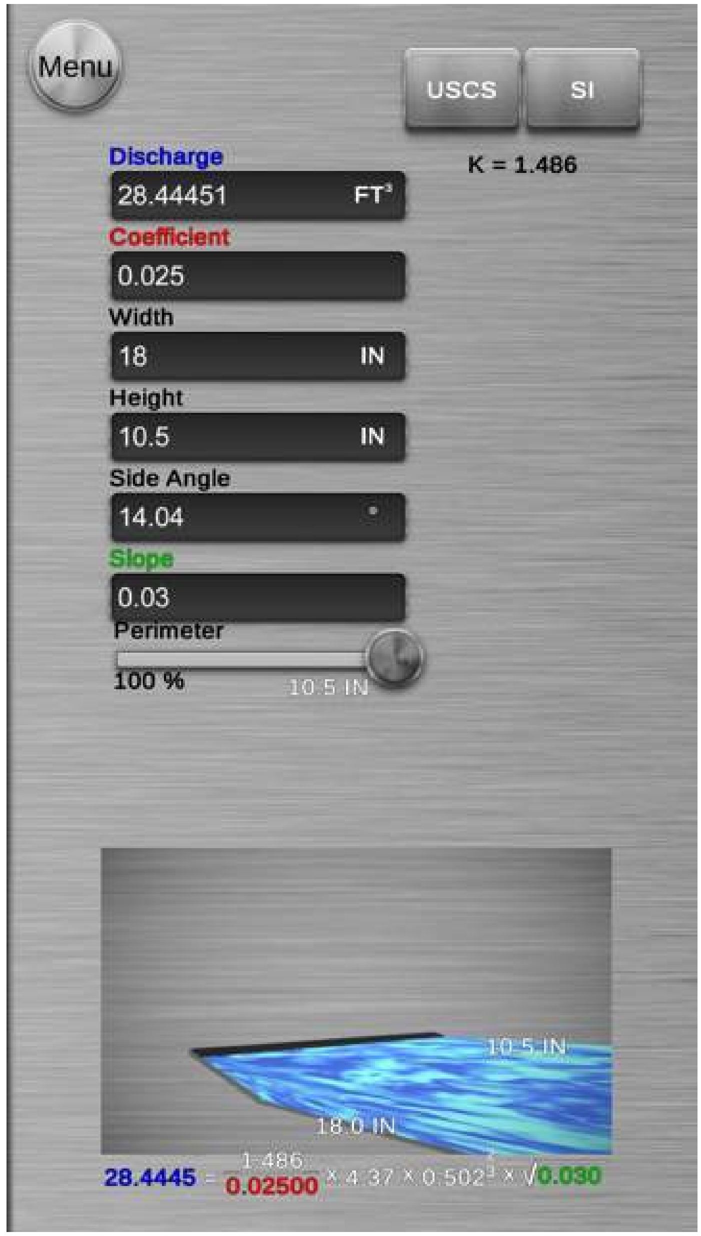
DMAs

| DMA Type/ID | DMA Area (square feet) | Post-Project Surface Type (use pull-down menu) | Effective Impervious Fraction, $I_f$ | DMA Runoff Factor | DMA Areas x Runoff Factor | *Design Rainfall Intensity (in/hr)* | *Design Flow Rate (cfs)* | *Proposed Flow Rate (cfs)* |
|---|---|---|---|---|---|---|---|---|
| *DMA 3* | *37974* | *Concrete or Asphalt* | *1* | *0.89* | *33872.8* | | | |
| | *2563* | *Ornamental Landscaping* | *0.1* | *0.11046* | *283.1* | | | |
| | ***40537*** | ***Total*** | | | **34155.9** | **0.20** | ***0.2*** | ***0.2*** |

Notes:

**GRAVEL FILTRATION TRENCH CAPACITY**




USING 40% VOIDS, THE FILTRATION TRENCH CAPACITY IS:

0.4 x 27.5 CFS = 11.0 CFS (ORANGE AVE)

0.4 x 28.4 CFS = 11.4 CFS (WATER ST.)

## Harvill at Water Industrial
## Basin Routing Study Summary

**Stage Storage Table**

| # | Depth | Elevation | Area (sf) | Incremental volume (cf) | Total Volume (cf) | Total Volume (acre-ft) | Outflow Q | Notes |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 1,519.60 | 20,656 | 0 | 0.0 | - | 0.0 | ****Bottom of the rock** |
| 2 | 0.25 | 1,519.85 | 20,656 | 2,066 | 2,066 | 0.05 | 0.0 | **Invert of 6" outlet pipe** |
| 3 | 1.00 | 1,520.60 | 20,656 | 8,262 | 8,262 | 0.19 | 0.8 | |
| 4 | 2.00 | 1,521.60 | 20,656 | 6,197 | 14,459 | 0.33 | 1.3 | ****Top of the rock / Bottom of Eng. Media** |
| 5 | 3.00 | 1,522.60 | 20,656 | 6,197 | 20,656 | 0.47 | 1.6 | |
| 6 | 3.40 | 1,523.00 | 20,656 | 2,479 | 23,135 | 0.53 | 1.7 | ****Top of Eng. Media / Bottom of Basin** |
| 7 | 4.07 | 1,523.67 | 22,736 | 14,536 | 37,671 | 0.86 | 1.8 | ***Outlet TG / Basin WQMP Volume** |
| 8 | 4.40 | 1,524.00 | 23,740 | 22,198 | 45,333 | 1.04 | 3.8 | |
| 9 | 5.40 | 1,525.00 | 26,990 | 25,365 | 70,698 | 1.62 | 5.4 | |
| 10 | 6.40 | 1,526.00 | 30,414 | 28,702 | 99,400 | 2.28 | 6.5 | |
| 11 | 7.40 | 1,527.00 | 34,144 | 32,279 | 131,679 | 3.02 | 7.4 | |
| 12 | 8.40 | 1,528.00 | 38,100 | 36,122 | 167,801 | 3.85 | 8.3 | **Top of the basin** |

*WQMP Design Capture Volume is **32,939 CF**

**Rock = 40% voids, Eng. Media = 30% voids

System releases water after basin volume reaches to 37,671 CF

| | Orifice Qout 6" pipe | Weir Qout 6" Pipe | Orifice Qout riser top 10" opening | Weir Qout riser top 10" opening | Total Qout from 6" Pipe and CMP 10" opening |
|---|---|---|---|---|---|
| **1519.60** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1519.85** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1520.60** | 0.8 | 3.4 | 0.0 | 0.0 | 0.8 |
| **1521.60** | 1.3 | 12.0 | 0.0 | 0.0 | 1.3 |
| **1522.60** | 1.6 | 23.6 | 0.0 | 0.0 | 1.6 |
| **1523.00** | 1.7 | 29.0 | 0.0 | 0.0 | 1.7 |
| **1523.50** | 1.8 | 36.1 | 0.0 | 0.0 | 1.8 |
| **1524.00** | 1.9 | 43.8 | 1.9 | 4.3 | 3.8 |
| **1525.00** | 2.1 | 60.6 | 3.2 | 13.0 | 5.4 |
| **1526.00** | 2.3 | 79.0 | 4.2 | 21.6 | 6.5 |
| **1527.00** | 2.5 | 99.1 | 4.9 | 30.2 | 7.4 |
| **1528.00** | 2.7 | 120.5 | 5.6 | 38.9 | 8.3 |

Q out from bioretention basin

| 10 YEAR STORM | 1 Hour | 3 Hour | 6 Hour | 24 Hour | |
|---|---|---|---|---|---|
| Existing Q Out (CFS) | **22.3** | **14.5** | **12.5** | **3.8** | * |
| Max. Q Out (CFS) after Routing | **2.8** | **4.2** | **4.5** | **4.1** | ** |
| WSE | **1523.83** | **1524.27** | **1524.42** | **1524.19** | |

**Basin A Routing Summary Table**

| 100 YEAR STORM | 1 Hour | 3 Hour | 6 Hour | 24 Hour | |
|---|---|---|---|---|---|
| Existing Q Out (CFS) | **41.8** | **27.9** | **24.7** | **11.1** | * |
| Max. Q Out (CFS) after Routing | **5.4** | **6.3** | **6.7** | **6.7** | ** |
| WSE | **1524.97** | **1525.80** | **1526.19** | **1526.26** | |

Note:

**1. Peak discharge of 6.7 CFS occurs during the 100 year 24 hour event, which is less than the existing Q out 11.1 CFS.**

**2. WSE is 1526.26 for 100 year storm.**

*From Unit Hydrograph Study for Existing Condition

**From Routing Study

## 3.5 Bioretention Facility

| | |
|---|---|
| **Type of BMP** | LID – Bioretention |
| **Treatment Mechanisms** | Infiltration, Evapotranspiration, Evaporation, Biofiltration |
| **Maximum Drainage Area** | This BMP is intended to be integrated into a project's landscaped area in a distributed manner. Typically, contributing drainage areas to Bioretention Facilities range from less than 1 acre to a maximum of around 10 acres. |
| **Other Names** | Rain Garden, Bioretention Cell, Bioretention Basin, Biofiltration Basin, Landscaped Filter Basin, Porous Landscape Detention |

### Description

Bioretention Facilities are shallow, vegetated basins underlain by an engineered soil media. Healthy plant and biological activity in the root zone maintain and renew the macro-pore space in the soil and maximize plant uptake of pollutants and runoff. This keeps the Best Management Practice (BMP) from becoming clogged and allows more of the soil column to function as both a sponge (retaining water) and a highly effective and self-maintaining biofilter. In most cases, the bottom of a Bioretention Facility is unlined, which also provides an opportunity for infiltration to the extent the underlying onsite soil can accommodate. When the infiltration rate of the underlying soil is exceeded, fully biotreated flows are discharged via underdrains. Bioretention Facilities therefore will inherently achieve the maximum feasible level of infiltration and evapotranspiration and achieve the minimum feasible (but highly biotreated) discharge to the storm drain system.

### Siting Considerations

These facilities work best when they are designed in a relatively level area. Unlike other BMPs, Bioretention Facilities can be used in smaller landscaped spaces on the site, such as:

- ✓ Parking islands
- ✓ Medians
- ✓ Site entrances

Landscaped areas on the site (such as may otherwise be required through minimum landscaping ordinances), can often be designed as Bioretention Facilities. This can be accomplished by:

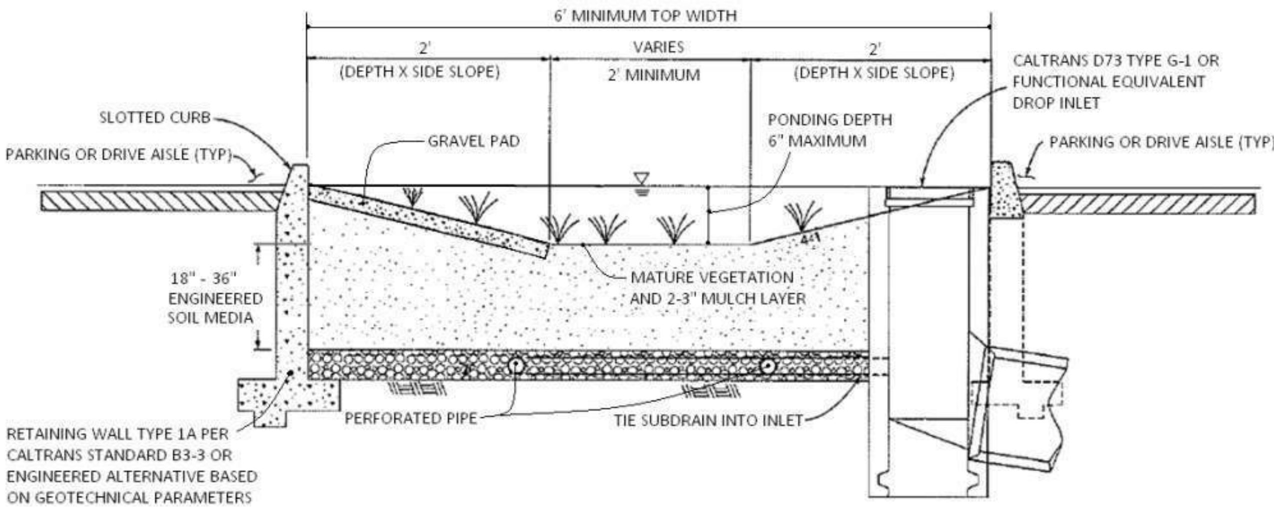
- *Depressing* landscaped areas below adjacent impervious surfaces, rather than elevating those areas
- Grading the site to direct runoff from those impervious surfaces *into* the Bioretention Facility, rather than away from the landscaping
- Sizing and designing the depressed landscaped area as a Bioretention Facility as described in this Fact Sheet

Bioretention Facilities should however not be used downstream of areas where large amounts of sediment can clog the system. Placing a Bioretention Facility at the toe of a steep slope should also be avoided due to the potential for clogging the engineered soil media with erosion from the slope, as well as the potential for damaging the vegetation.

## Design and Sizing Criteria

The recommended cross section necessary for a Bioretention Facility includes:

- Vegetated area
- 18' minimum depth of engineered soil media
- 12' minimum gravel layer depth with 6' perforated pipes (added flow control features such as orifice plates may be required to mitigate for HCOC conditions)




While the 18-inch minimum engineered soil media depth can be used in some cases, it is recommended to use 24 inches or a preferred 36 inches to provide an adequate root zone for the chosen plant palate. Such a design also provides for improved removal effectiveness for nutrients. The recommended ponding depth inside of a Bioretention Facility is 6 inches; measured from the flat bottom surface to the top of the water surface as shown in Figure 1.

Because this BMP is filled with an engineered soil media, pore space in the soil and gravel layer is assumed to provide storage volume. However, several considerations must be noted:

- Surcharge storage above the soil surface (6 inches) is important to assure that design flows do not bypass the BMP when runoff exceeds the soil’s absorption rate.
- In cases where the Bioretention Facility contains engineered soil media deeper than 36 inches, the pore space within the engineered soil media can only be counted to the 36-inch depth.
- A maximum of 30 percent pore space can be used for the soil media whereas a maximum of 40 percent pore space can be use for the gravel layer.



**Figure 1: Standard Layout for a Bioretention Facility**

**Engineered Soil Media Requirements**

The engineered soil media shall be comprised of 85 percent mineral component and 15 percent organic component, by volume, drum mixed prior to placement. The mineral component shall be a Class A sandy loam topsoil that meets the range specified in Table 1 below. The organic component shall be nitrogen stabilized compost[1], such that nitrogen does not leach from the media.

**Table 1: Mineral Component Range Requirements**

| Percent Range | Component |
|---|---|
| **70-80** | Sand |
| **15-20** | Silt |
| **5-10** | Clay |

The trip ticket, or certificate of compliance, shall be made available to the inspector to prove the engineered mix meets this specification.

**Vegetation Requirements**

Vegetative cover is important to minimize erosion and ensure that treatment occurs in the Bioretention Facility. The area should be designed for at least 70 percent mature coverage throughout the Bioretention Facility. To prevent the BMP from being used as walkways, Bioretention Facilities shall be planted with a combination of small trees, densely planted shrubs, and natural grasses. Grasses shall be native or ornamental; preferably ones that do not need to be mowed. The application of fertilizers and pesticides should be minimal. To maintain oxygen levels for the vegetation and promote biodegradation, it is important that vegetation not be completely submerged for any extended period of time. Therefore, a maximum of 6 inches of ponded water shall be used in the design to ensure that plants within the Bioretention Facility remain healthy.

A 2 to 3-inch layer of standard shredded aged hardwood mulch shall be placed as the top layer inside the Bioretention Facility. The 6-inch ponding depth shown in Figure 1 above shall be measured from the top surface of the 2 to 3-inch mulch layer.

**Curb Cuts**

To allow water to flow into the Bioretention Facility, 1-foot-wide (minimum) curb cuts should be placed approximately every 10 feet around the perimeter of the Bioretention Facility. Figure 2 shows a curb cut in a Bioretention Facility. <u>Curb cut flow lines must be at or above the $V_{BMP}$ water surface level</u>.

[1] For more information on compost, visit the US Composting Council website at: http://compostingcouncil.org/

**Figure 2: Curb Cut located in a Bioretention Facility**

To reduce erosion, a gravel pad shall be placed at each inlet point to the Bioretention Facility. The gravel should be 1- to 1.5-inch diameter in size. The gravel should overlap the curb cut opening a minimum of 6 inches. The gravel pad inside the Bioretention Facility should be flush with the finished surface at the curb cut and extend to the bottom of the slope.

In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet. See Figure 3.

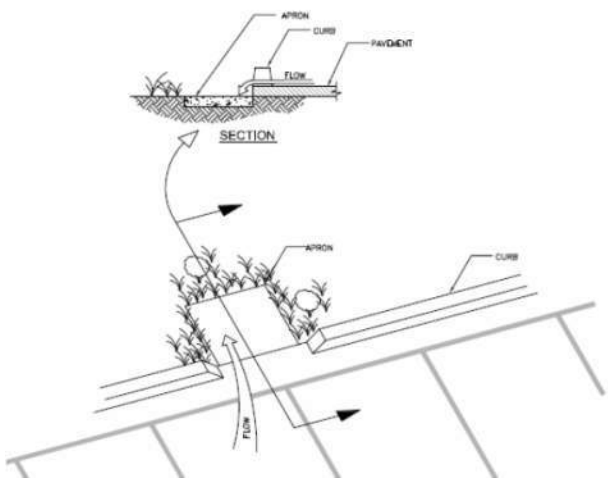



**Figure 3: Apron located in a Bioretention Facility**

**Terracing the Landscaped Filter Basin**

It is recommended that Bioretention Facilities be level. In the event the facility site slopes and lacks proper design, water would fill the lowest point of the BMP and then discharge from the basin without being treated. To ensure that the water will be held within the Bioretention Facility on sloped sites, the BMP must be terraced with nonporous check dams to provide the required storage and treatment capacity.

The terraced version of this BMP shall be used on non-flat sites with no more than a 3 percent slope. The surcharge depth cannot exceed 0.5 feet, and side slopes shall not exceed 4:1. Table 2 below shows the spacing of the check dams, and slopes shall be rounded up (i.e., 2.5 percent slope shall use 10' spacing for check dams).

**Table 2: Check Dam Spacing**

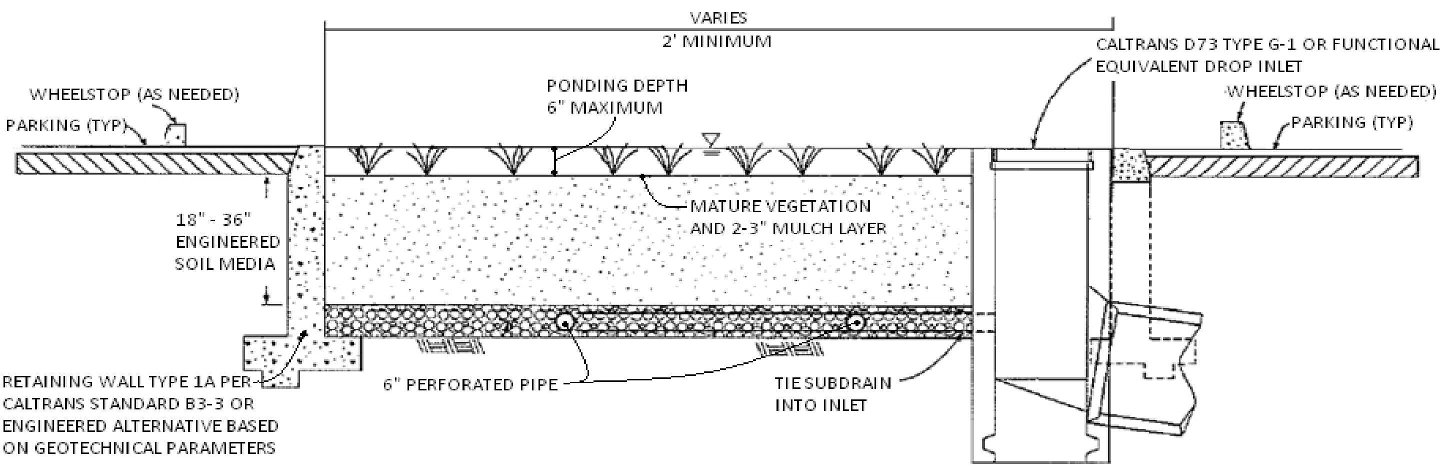
| 6" Check Dam Spacing | |
|---|---|
| **Slope** | **Spacing** |
| **1%** | *25'* |
| **2%** | *15'* |
| **3%** | *10'* |

**Roof Runoff**
Roof downspouts may be directed towards Bioretention Facilities. However, the downspouts must discharge onto a concrete splash block to protect the Bioretention Facility from erosion.
**Retaining Walls**
It is recommended that Retaining Wall Type 1A, per Caltrans Standard B3-3 or equivalent, be constructed around the entire perimeter of the Bioretention Facility. This practice will protect the sides of the Bioretention Facility from collapsing during construction and maintenance or from high service loads adjacent to the BMP. Where such service loads would not exist adjacent to the BMP, an engineered alternative may be used if signed by a licensed civil engineer.

**Side Slope Requirements**

***Bioretention Facilities Requiring Side Slopes***
The design should assure that the Bioretention Facility does not present a tripping hazard. Bioretention Facilities proposed near pedestrian areas, such as areas parallel to parking spaces or along a walkway, must have a gentle slope to the bottom of the facility. Side slopes inside of a Bioretention Facility shall be 4:1. A typical cross section for the Bioretention Facility is shown in Figure 1.

***Bioretention Facilities Not Requiring Side Slopes***
Where cars park perpendicular to the Bioretention Facility, side slopes are not required. A 6-inch maximum drop may be used, and the Bioretention Facility must be planted with trees and shrubs to prevent pedestrian access. In this case, a curb is not placed around the Bioretention Facility,
but wheel stops shall be used to prevent vehicles from entering the Bioretention Facility, as shown in Figure 4.



**Planter Boxes**

Bioretention Facilities can also be placed above ground as planter boxes. Planter boxes must have a minimum width of 2 feet, a maximum surcharge depth of 6 inches, and no side slopes are necessary. Planter boxes must be constructed so as to ensure that the top surface of the engineered soil media will remain level. This option may be constructed of concrete, brick, stone or other stable materials that will not warp or bend. Chemically treated wood or galvanized steel, which has the ability to contaminate stormwater, should not be used. Planter boxes must be lined with an impermeable liner on all sides, including the bottom. Due to the impermeable liner, the inside bottom of the planter box shall be designed and constructed with a cross fall, directing treated flows within the subdrain layer toward the point where subdrain exits the planter box, and subdrains shall be oriented with drain holes oriented down. These provisions will help avoid excessive stagnant water within the gravel underdrain layer. Similar to the in-ground Bioretention Facility versions, this BMP benefits from healthy plants and biological activity in the root zone. Planter boxes should be planted with appropriately selected vegetation.

**Figure 5: Planter Box**

Source: LA Team Effort

**Overflow**

An overflow route is needed in the Bioretention Facility design to bypass stored runoff from storm events larger than $V_{BMP}$ or in the event of facility or subdrain clogging. Overflow systems must connect to an acceptable discharge point, such as a downstream conveyance system as shown in Figure 1 and Figure 4. The inlet to the overflow structure shall be elevated inside the Bioretention Facility to be flush with the ponding surface for the design capture volume ($V_{BMP}$) as shown in Figure 4. This will allow the design capture volume to be fully treated by the Bioretention Facility, and for larger events to safely be conveyed to downstream systems. The overflow inlet shall **<u>not</u>** be located in the entrance of a Bioretention Facility, as shown in Figure 6.

**Underdrain Gravel and Pipes**

An underdrain gravel layer and pipes shall be provided in accordance with Appendix B – Underdrains.

**Figure 6: Incorrect Placement of an Overflow Inlet.**

## Inspection and Maintenance Schedule

The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Bioretention Facility should be minimized.

| Schedule | Activity |
|---|---|
| Ongoing | • Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities.<br>• Remove trash and debris<br>• Replace damaged grass and/or plants<br>• Replace surface mulch layer as needed to maintain a 2-3 inch soil cover. |
| After storm events | • Inspect areas for ponding |
| Annually | • Inspect/clean inlets and outlets |

## Bioretention Facility Design Procedure

1) Enter the area tributary, $A_T$, to the Bioretention Facility.

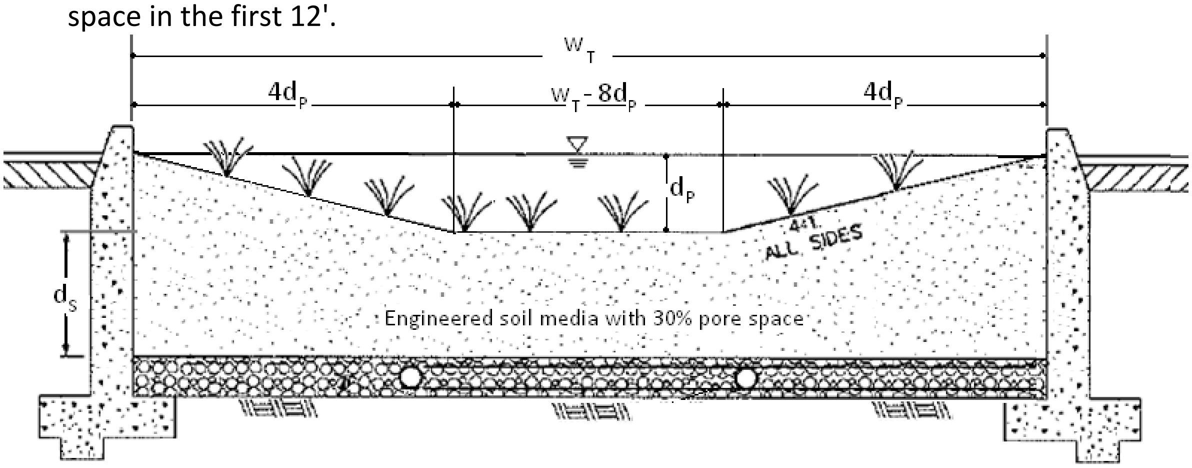
2) Enter the Design Volume, $V_{BMP,}$ determined from Section 2.1 of this Handbook.

3) Select the type of design used. There are two types of Bioretention Facility designs: the standard design used for most project sites that include side slopes, and the modified design used when the BMP is located perpendicular to the parking spaces or with planter boxes that do not use side slopes.

4) Enter the depth of the engineered soil media, $d_S$. The minimum depth for the engineered soil media can be 18' in limited cases, but it is recommended to use 24' or a preferred 36' to provide an adequate root zone for the chosen plant palette. Engineered soil media deeper than 36' will only get credit for the pore space in the first 36'.

5) Enter the top width of the Bioretention Facility.

6) Calculate the total effective depth, $d_E$, within the Bioretention Facility. The maximum allowable pore space of the soil media is 30% while the maximum allowable pore space for the gravel layer is 40%. Gravel layer deeper than 12' will only get credit for the pore space in the first 12'.




a. For the design with side slopes the following equation shall be used to determine the total effective depth. Where, $d_P$ is the depth of ponding within the basin.

$$d_E(\text{ft}) = \frac{0.3 \times \left[\left(w_T(\text{ft}) \times d_S(\text{ft})\right) + 4\left(d_P(\text{ft})\right)^2\right] + 0.4 \times 1(\text{ft}) + d_P(\text{ft})\left[4d_P(\text{ft}) + \left(w_T(\text{ft}) - 8d_P(\text{ft})\right)\right]}{w_T(\text{ft})}$$

This above equation can be simplified if the maximum ponding depth of 0.5' is used. The equation below is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$d_E(\text{ft}) = (0.3 \times d_S(\text{ft}) + 0.4 \text{ x } 1(\text{ft})) - \left(\frac{0.7\ (\text{ft}^2)}{w_T(\text{ft})}\right) + 0.5(\text{ft})$$

b. For the design without side slopes the following equation shall be used to determine the total effective depth:

$$d_E(ft) = d_P(ft) + [(0.3) \times d_S(ft) + (0.4) \times 1(ft)]$$

The equation below, using the maximum ponding depth of 0.5', is used on the worksheet to find the minimum area required for the Bioretention Facility:

$$d_E(ft) = 0.5\ (ft) + [(0.3) \times d_S(ft) + (0.4) \times 1(ft)]$$

7) Calculate the minimum surface area, $A_M$, required for the Bioretention Facility. This does not include the curb surrounding the Bioretention Facility or side slopes.

$$A_M(ft^2) = \frac{V_{BMP}(ft^3)}{d_E\ (ft)}$$

8) Enter the proposed surface area. This area shall not be less than the minimum required surface area.

9) Verify that side slopes are no steeper than 4:1 in the standard design, and are not required in the modified design.

10) Provide the diameter, minimum 6 inches, of the perforated underdrain used in the Bioretention Facility. See Appendix B for specific information regarding perforated pipes.

11) Provide the slope of the site around the Bioretention Facility, if used. The maximum slope is 3 percent for a standard design.

12) Provide the check dam spacing, if the site around the Bioretention Facility is sloped.

13) Describe the vegetation used within the Bioretention Facility.

## References Used to Develop this Fact Sheet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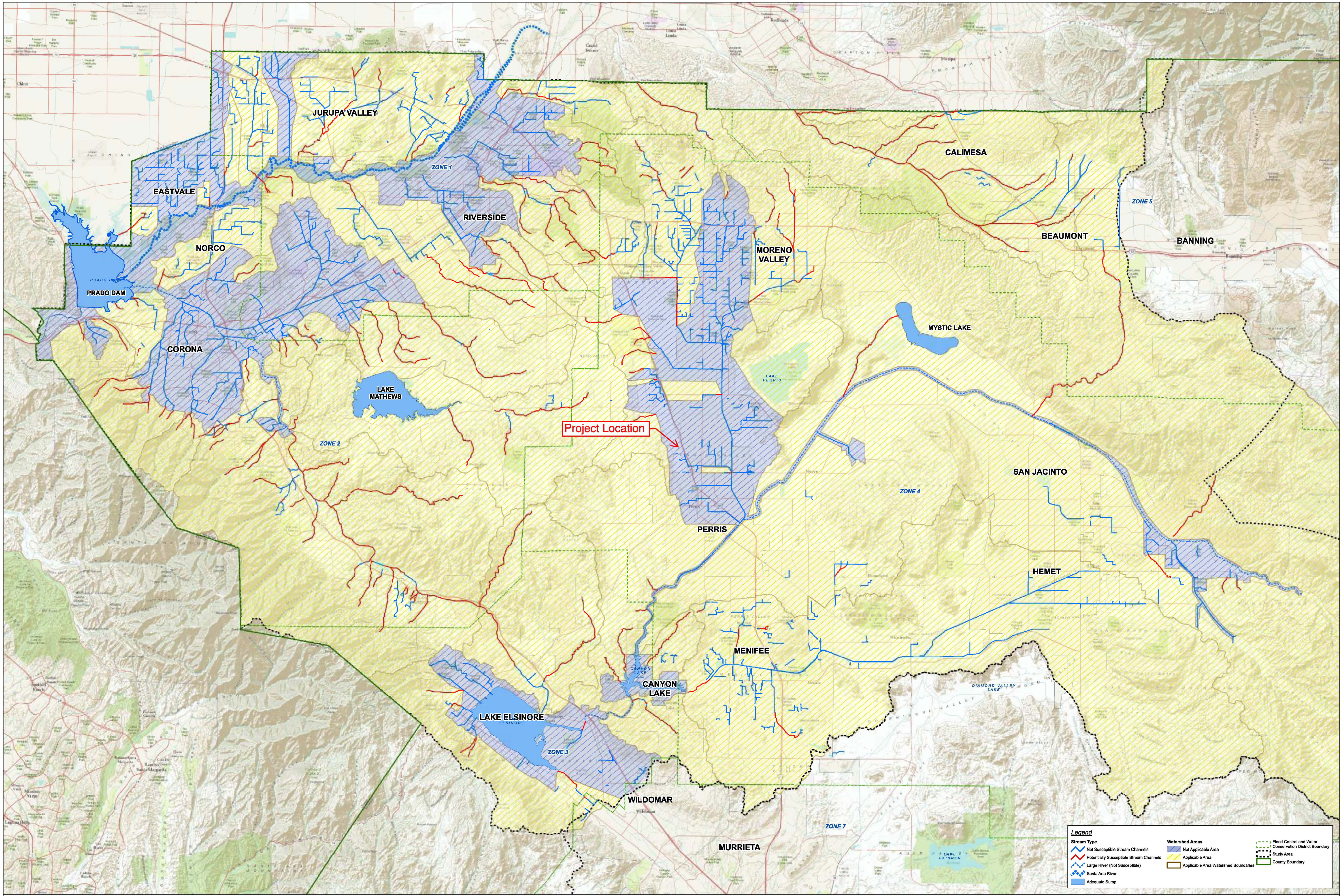
# Appendix 7: Hydromodification

*Supporting Detail Relating to Hydrologic Conditions of Concern*

**Site is located within mapped HCOC Exemption area as presented in the approved WAP dated April 20, 2017.**




# HCOC Applicability Map

Hydromodification Susceptibility Documentation Report and Mapping
Riverside County Flood Control and Water Conservation District

Map 2

# Appendix 8: Source Control

*Pollutant Sources/Source Control Checklist*

This section will be completed and addressed at the time of the final WQMP submittal

# Appendix 9: O&M

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

This section will be completed and addressed at the time of the final WQMP submittal

# Appendix 10: Educational Materials

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

This section will be completed and addressed at the time of the final WQMP submittal