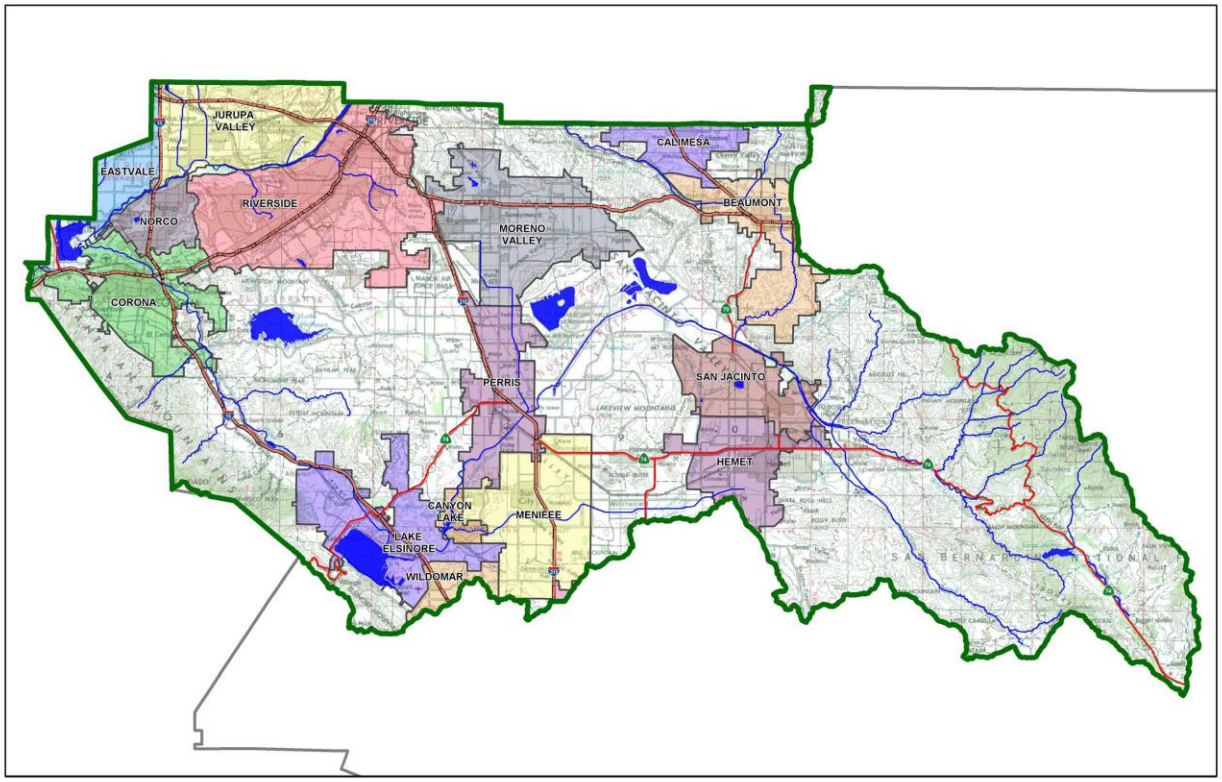
Project Specific Water Quality Management Plan

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

Project Title: Cottonwood Village Residential Development

Development No: TM34544 PEN21-0127

Design Review/Case No: LWQ21-0031



☒ **Preliminary**
☐ **Final**

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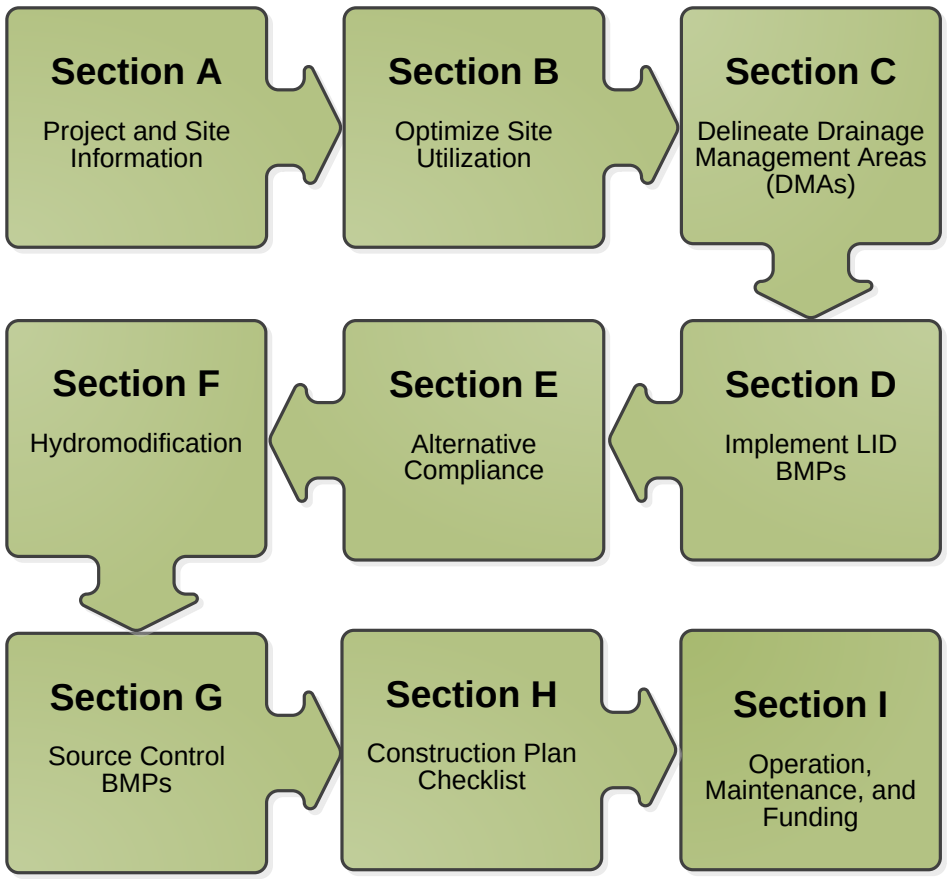
A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Cottonwood 939, LLC by Blue Engineering and Consulting, Inc for the Cottonwood Residential Project.

This WQMP is intended to comply with the requirements of City of Moreno Valley for APN 0479-140-022 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Moreno Valley Water Quality Ordinance (Municipal Code Section8.10).

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

Owner's Signature

1/14/22
Date

Dana Haynes, Cottonwood 939, LLC.
Owner's Printed Name

President
Owner's Title/Position

PREPARER'S CERTIFICATION

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

Preparer's Signature

1/14/2022
Date

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

President/CEO
Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Residential
Planning Area:	Residential
Community Name:	Cottonwood Village
Development Name:	Cottonwood Residential Development

PROJECT LOCATION

Latitude & Longitude (DMS): 33°55'31.83"N, 117°13'23.59"W

Project Watershed and Sub-Watershed: Santa Ana Watershed

Gross Acres: 9.4

APN(s): 0479-140-022

Map Book and Page No.: 717 G-4, 2005 EDITION

PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)	Residential	
Proposed or Potential SIC Code(s)	1522	
Area of Impervious Project Footprint (SF)	291,880	
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	291,880	
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?	0.66	

Project Description

Tentative Tract No 34544 is a subdivision project of approximately 9.40 acres located along the north side of Cottonwood Avenue, east of Perris Boulevard and west of Kitching Street in the City of Moreno Valley.

The site is relatively flat grass area, drains towards the south east into an existing catch basin connecting to an existing 96-inch public storm drain system in Cottonwood Avenue (Sunnymead Line "P"). The existing drainage along the north property line flows north and south. Storm water runoff from the proposed development will maintain same existing drainage pattern and will be collected by on-site drainage system and connect to Sunnymead Line"P".

The on-site storm drain will include biofiltration systems spread throughout the project site. This will allow smaller areas to be used for water mitigation instead of a large area. The biofiltration systems will be connected with a outflow pipe that will connect into Sunnymead Line "P".

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
San Jacinto River Reach 3	NONE	AGR, GWR, REC1, REC2, WARM, WILD	Not designated as RARE
canyon lake (railroad canyon reservior)	Nutrients, Pathogens	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not designated as RARE
San Jacinto River Reach 1	NONE	MUN, AGR, GWR, REC1, REC2, WARM, WILD	Not designated as RARE
Lake Elsinore	Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCB's, Sedimentation/Siltation, Unknown 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)* City of Moreno Valley Building and Grading Permits Riverside County FCD - Connection Permit to public storm drain in Cottonwood.	☒ 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 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 northwest to southeast.

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

No. No trees exist on site. The planting of new vegetation will occur throughout the site to enhance vegetation.

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

Yes, compaction will be limited to non-landscape areas.

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

Yes, drive aisle, parking stall and hardscape is set to city minimals to increase pervious area.

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

Yes, water will be directed to pervious areas.

Section C: Delineate Drainage Management Areas (DMAs)

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

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1][2]	Area (Sq. Ft.)	DMA Type
DMA-A	Mixed Surface	18,108	D
DMA-B	Mixed Surface	25,945	D
DMA-C	Mixed Surface	25,788	D
DMA-D	Mixed Surface	13,798	D
DMA-E	Mixed Surface	63,050	D
DMA-F	Mixed Surface	50,029	D
DMA-G	Mixed Surface	41,651	D
DMA-H	Mixed Surface	123,523	D
DMA-I	Mixed Surface	7,280	D
DMA-J	Mixed Surface	16,300	D
DMA-K	Concrete or Asphalt	55,658	D

[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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
N/A			

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
N/A						

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

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

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Impervious fraction	Product		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]
N/A							

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

DMA Name or ID	BMP Name or ID
A	Bio-Retention Facility "A"
B	Bio-Retention Facility "B"
C	Bio-Retention Facility "C"
D	Bio-Retention Facility "D"
E	Bio-Retention Facility "E"
F	Bio-Retention Facility "F"
G	Bio-Retention Facility "G"
H	Bio-Retention Facility "H"
I	Bio-Retention Facility "I"
J	Bio-Retention Facility "D" & "I"
K	Bio-Retention Facility "K"

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 Co-permittee 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:	Entire site	
…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 Co-permittee).

☐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: 2.70

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: 6.70

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: 1.16

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: 7.77

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)
7.77	2.70

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: 276

Project Type: Residential

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: 6.70

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: 111

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: 744

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)
744	276

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: Projected Average Daily Use (gpd)

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: Insert Area (Acres)

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: Enter Value

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: Minimum use required (gpd)

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)**
Minimum use required (gpd)	Projected Average Daily Use (gpd)

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 Co-permittee 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	
A	☐	☐	☒	☐	☐
B	☐	☐	☒	☐	☐
C	☐	☐	☒	☐	☐
D	☐	☐	☒	☐	☐
E	☐	☐	☒	☐	☐
F	☐	☐	☒	☐	☐
G	☐	☐	☒	☐	☐
H	☐	☐	☒	☐	☐
I	☐	☐	☒	☐	☐
J	☐	☐	X	☐	☐
K	☐	☐	X	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

N/A

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 Co-permittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Co-permittee 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

[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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Bioretention Basin 'A'*		
	[A]		[B]	[C]	[A] x [C]			
A	*18,108*	*Mixed*	*0.81*	*0.61*	*11066.9*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***18,108***			11,066.9	0.66	608.7	624.75

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Bioretention Basin 'B'*		
	[A]		[B]	[C]	[A] x [C]			
B	*25,945*	*Mixed*	*0.81*	*0.61*	*15856.5*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***25,945***			15,856.5	0.66	872.1	882

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Bioretention Basin 'C'*
	[A]		[B]	[C]	[A] x [C]	

C	*25,788*	*Mixed*	*0.79*	*0.59*	*15,155.3*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***25,788***			15,155.3	0.66	833.5	845.25

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Bioretention Basin 'D'***		
	[A]		[B]	[C]	[A] x [C]			
D	*13,798*	*Mixed*	*0.80*	*0.60*	*8269.1*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***13,798***			8,269.1	0.66	454.8	730.5

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Bioretention Basin 'E'***		
	[A]		[B]	[C]	[A] x [C]			
E	*63,050*	*Mixed*	*0.86*	*0.67*	*42526.5*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***63,050***			42,526.5	0.66	2,339	2,436.8

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Bioretention Basin 'F'***		
	[A]		[B]	[C]	[A] x [C]			
F	*50,029*	*Mixed*	*0.80*	*0.60*	*29,982.2*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***50,029***			29,982.2	0.66	1,649	1,660.56

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Bioretention Basin 'G'*		
	[A]		[B]	[C]	[A] x [C]			
G	*41,651*	*Mixed*	*0.79*	*0.59*	*24477.9*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***41,651***			24477.9	0.66	1,346.3	1376.4

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Bioretention Basin 'H'*		
	[A]		[B]	[C]	[A] x [C]			
H	*123,523*	*Mixed*	*0.81*	*0.61*	*75,492.1*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***123,523***			75,492.1	0.66	4152.1	4270

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Bioretention Basin 'I'*		
	[A]		[B]	[C]	[A] x [C]			
I	*7,280*	*Mixed*	*0.62*	*0.42*	*3,090.6*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***7,280***			3,090.6	0.66	170	443.3

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*N/A*		
	[A]		[B]	[C]	[A] x [C]			
J	*16,300*	*Mixed*	*0.81*	*0.61*	*9,961.9*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*

	$A_T = \Sigma[A]$	***16,300***	9961.9	0.66	547.9	

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Bioretention Basin 'K'*		
	[A]		[B]	[C]	[A] x [C]			
K	*55658*	*Concrete or Asphalt*	*1.00*	*0.89*	*49,646.9*	*Design Storm Depth (in)*	*Design Capture Volume,* V_{BMP} *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***55,658***			49,646.9	0.66	2,730.6	2,732.4

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 Co-permittee). 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.

List DMAs here.

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

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]
N/A	
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

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]				
N/A	N/A	N/A	N/A	N/A	N/A	*Design Storm Depth (in)*	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
N/A	N/A	N/A	N/A	N/A	N/A				
N/A	N/A	N/A	N/A	N/A	N/A				
N/A	N/A	N/A	N/A	N/A	N/A				
N/A	N/A	N/A	N/A	N/A	N/A				
N/A	N/A	N/A	N/A	N/A	N/A				
	A_T = Σ[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]

[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 Co-permittee 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	INSERT VALUE	INSERT VALUE	INSERT VALUE
Volume (Cubic Feet)	INSERT VALUE	INSERT VALUE	INSERT VALUE

[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:

Canyon Lake

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

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. Co-permittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-Site Storm Drain 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. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Interior parking garages	Parking garage floor drains will be plumbed to the sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow.
Landscape/Outdoor Pesticide Use	Final landscape plans will accomplish all of the following. Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. Provide IPM information to new owners, lessees and operators. See applicable operational BMPs in "What you should know for…..Landscaping and Gardening" at http://reflood.org/stormwater/

Pools, spas, ponds, decorative fountains, and other water features	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://reflood.org/stormwater/
Refuse areas	State how site refuse will be handled and provide supporting detail to what is shown on plans. State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

Roofing, gutters, and trim; condensate drain lines	Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	
Plazas, sidewalks, and parking lots.		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect wash water containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
Biofiltration 'A'	Biofiltration for DMA-A	WQMP Exhibit – Sheet 5 of 7	33°55'34.10"N, 117°13'26.33"W
Biofiltration 'B'	Biofiltration for DMA-B	WQMP Exhibit – Sheet 5 of 7	33°55'32.32"N, 117°13'26.48"W
Biofiltration 'C'	Biofiltration for DMA-C	WQMP Exhibit – Sheet 5 of 7	33°55'30.25"N, 117°13'26.45"W
Biofiltration 'D'	Biofiltration for DMA-D	WQMP Exhibit – Sheet 5 of 7	33°55'29.29"N, 117°13'24.66"W
Biofiltration 'E'	Biofiltration for DMA-E	WQMP Exhibit – Sheet 5 of 7	33°55'32.20"N, 117°13'23.13"W
Biofiltration 'F'	Biofiltration for DMA-F	WQMP Exhibit – Sheet 5 of 7	33°55'34.24"N, 117°13'20.02"W
Biofiltration 'G'	Biofiltration for DMA-G	WQMP Exhibit – Sheet 5 of 7	33°55'32.54"N, 117°13'19.87"W
Biofiltration 'H'	Biofiltration for DMA-H	WQMP Exhibit – Sheet 5 of 7	33°55'29.97"N, 117°13'19.56"W
Biofiltration 'I'	Biofiltration for DMA-I	WQMP Exhibit – Sheet 5 of 7	33°55'29.18"N, 117°13'26.40"W

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Co-permittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Co-permittee 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: HOA will maintain BMPs.

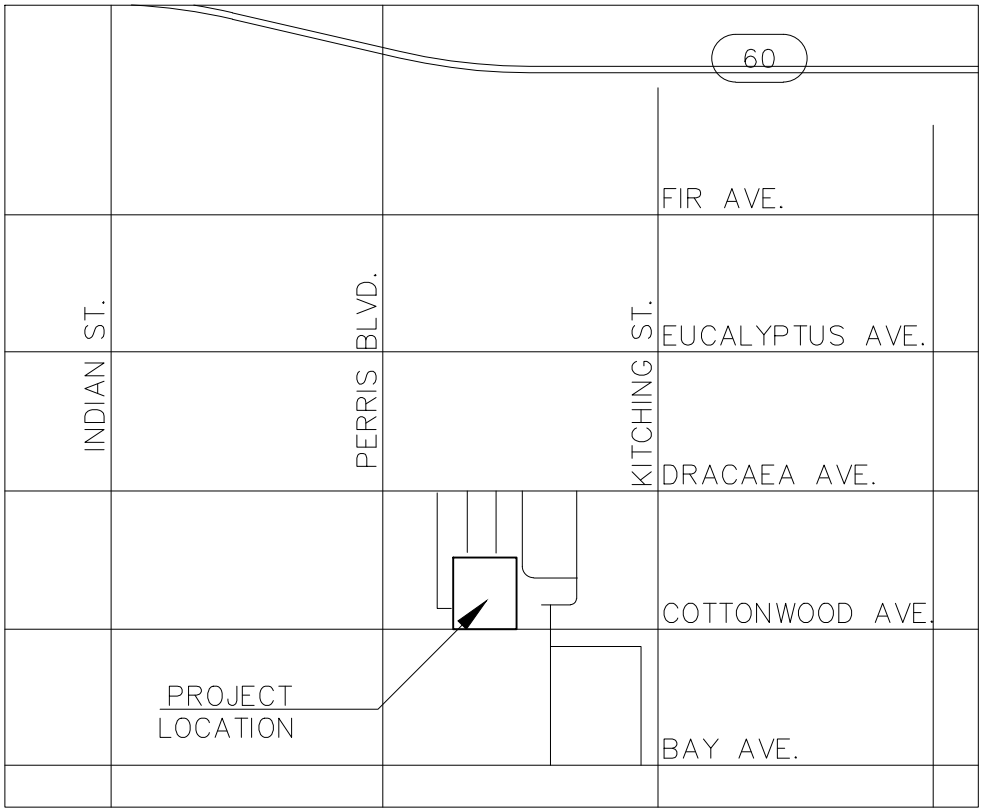
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

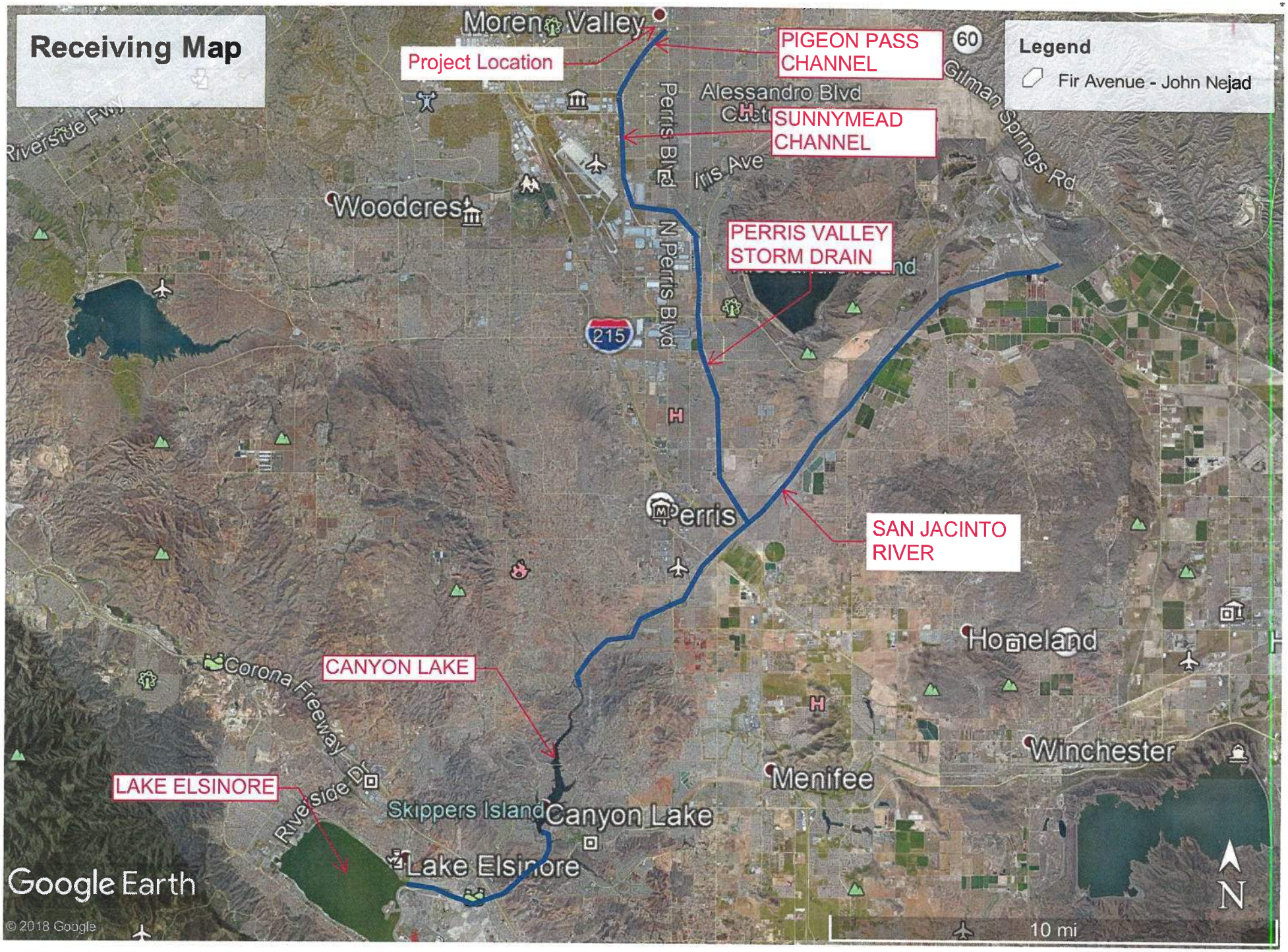
Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



VICINITY MAP

N.T.S.


Receiving Map
Legend
Fir Avenue - John Nejad
Project Location
PIGEON PASS CHANNEL
SUNNYMEAD CHANNEL
PERRIS VALLEY STORM DRAIN
SAN JACINTO RIVER
CANYON LAKE
LAKE ELSINORE
Moreno Valley
Alessandro Blvd
Iris Ave
Perris Blvd
N Perris Blvd
Gilman Springs Rd
Riverside Fwy
Woodcrest
Perris
Homeland
Winchester
Menifee
Canyon Lake
Skippers Island
Lake Elsinore
Corona Freeway
Riverside Dr
215
60
Google Earth
© 2018 Google
10 mi
N

WATER QUALITY MANAGEMENT PLAN EXHIBIT

THIS WATER QUALITY BASIN RECEIVES RUNOFF FROM STREETS, YARDS AND OPEN SPACES. IT HAS BEEN DESIGNED TO TREAT INCIDENTAL POLLUTANTS IN RUNOFF AND IS NOT DESIGNED TO TREAT HOUSEHOLD POLLUTANTS. DUMPING IS PROHIBITED.

AUTHORIZED PERSONNEL ONLY.

MORENO VALLEY PUBLIC WORKS
TO REPORT A PROBLEM WITH THIS FACILITY CALL 951.413.3120
WWW.MORENO-VALLEY.CA.US

0.5" THICK BORDER

NOTES:

1.) SIGNS SHALL BE SECURELY MOUNTED ON OUTSIDE OF TUBULAR IRON FENCE, 1 FOOT BELOW THE TOP OF TUBULAR IRON FENCE. LOCATION PER DIRECTION OF CITY ENGINEER.

2.) OUTSIDE DIMENSIONS SHALL BE 4' x 2'.

3.) LETTERS, BORDER, AND CITY LOGO SHALL BE BLACK ON WHITE BACKGROUND.

4.) TEXT HEIGHT SHALL BE 1" AND TEXT WIDTH SHALL BE 0.6". TEXT SHALL BE ALL UPPERCASE.

5.) FONT STYLE SHALL BE UNIVERSAL.

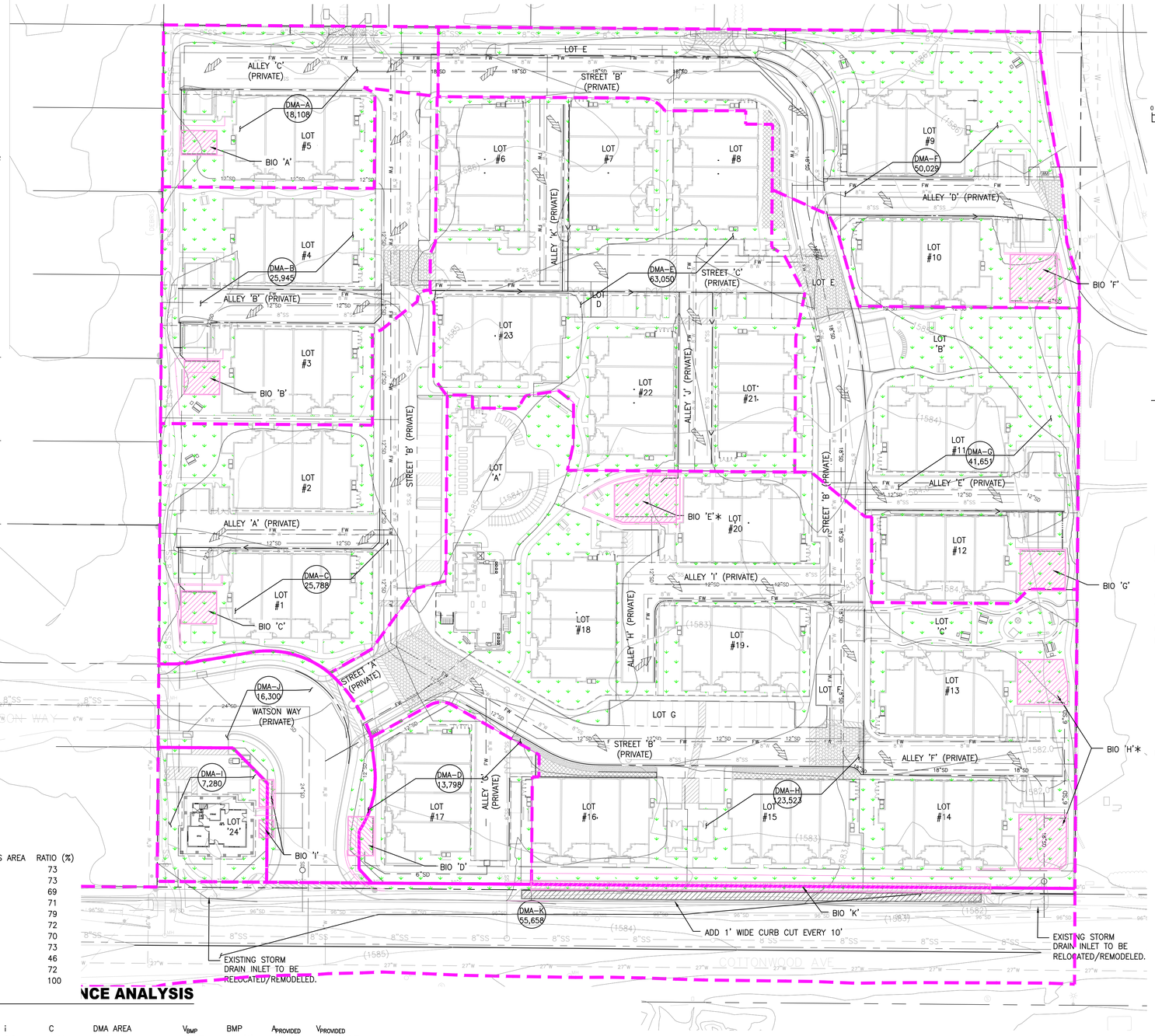
6.) SIGN SHOULD BE MADE OF 5052-H38 ALUMINUM ALLOY AND HAVE A THICKNESS OF 0.08".

7.) MOUNTING HARDWARE SHALL BE STAINLESS STEEL BRACKETS AND MOUNTED TO THE FENCE USING SECURITY SCREWS.

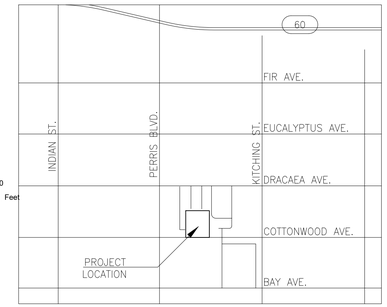
8.) CITY LOGO SHALL BE 3.5" IN HEIGHT BY 4" WIDE.

9.) SIGN SHALL BE PROTECTED WITH AN ANTI-GRAFITTI COATING.

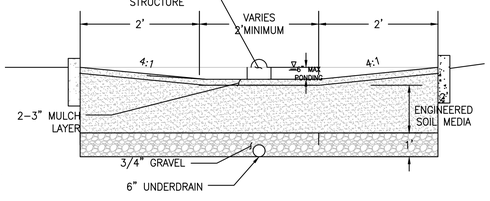
6 PROJECT SIGN
NTS



0 20 40 80 Feet
SCALE 1" = 40'



VICINITY MAP
N.T.S.



BIOFILTRATION TRENCH DETAIL (TYP)
SCALE 1" = 3'

BIOFILTRATION ANALYSIS

NAME	AREA (SF)	DIMENSIONS (L' x W')
A	425	25' x 17'
B	600	25' x 24'
C	575	25' x 23'
D	497	27.5' x 18'
E	1,370	45' x 30.5'
F	1,122	34' x 33'
G	928	32' x 29'
H	2,386	32' x 34.5'; 38' x 33.5'
I	310	12' x 10'; 19' x 10'

PROJECT BMP RATIOS

NAME	AREA (SF)	LANDSCAPE AREA (SF)	RATIO (%)	IMPERVIOUS AREA	RATIO (%)
A	18,108	4,890	27	13,218	73
B	25,945	7,050	27	18,895	73
C	25,788	7,879	31	17,909	69
D	13,798	4,015	29	9,783	71
E	63,050	13,036	21	50,004	79
F	50,029	14,065	28	35,964	72
G	41,651	12,424	30	29,227	70
H	123,523	34,014	27	89,839	73
I	7,280	3920	54	3,360	46
J	16,300	4,500	28	11,800	72
K	55,658	0	0	55,658	100

ENGINEERED SOIL MEDIA REQUIREMENTS

THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT AND 15 PERCENT ORGANIC COMPNENT, 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, 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

NOTE: LANDSCAPING AND IRRIGATION PER LANDSCAPE PLANS

LEGEND

- DRAINAGE MANAGEMENT AREA (DMA)
- 8"SS — SEWER MAIN
- 8"W — DOMESTIC WATER
- 18"SD — STORM DRAIN
- CENTERLINE
- FLOW LINE
- MANHOLE
- DIRECTIONAL FLOW ARROW
- BIOFILTRATION TRENCH
- * 36" SOIL FILTER MEDIA
- LANDSCAPE AREA

DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

NCE ANALYSIS

NAME	AREA (SF)	i	C	DMA AREA	V_{BMP}	BMP	$A_{PROVIDED}$	$V_{PROVIDED}$
DMA A	18,108	0.81	0.61	11,066.9	608.7	BIO 'A'	425 SF	624.75 C.F.
DMA B	25,945	0.81	0.61	15,856.5	872.1	BIO 'B'	600 SF	882 C.F.
DMA C	25,788	0.79	0.59	15,155.3	833.5	BIO 'C'	575 SF	845.3 C.F.
DMA D	13,798	0.80	0.60	8,269.1	454.8	BIO 'D'	497 SF	730.5 C.F.
DMA E	63,050	0.86	0.67	42,526.5	2,339	BIO 'E'	1,370 SF	2,436.8 C.F.
DMA F	50,029	0.80	0.60	29,982.2	1,649	BIO 'F'	1,122 SF	1,660.5 C.F.
DMA G	41,651	0.79	0.59	24,477.9	1,346.3	BIO 'G'	928 SF	1,376.4 C.F.
DMA H	123,523	0.81	0.61	75,492.1	4,152.1	BIO 'H'	2,386 SF	4,270 C.F.
DMA I	7,280	0.62	0.42	3,090.6	170	BIO 'I'	310 SF	443.3 C.F.
DMA J	16,300	0.81	0.61	9,961.9	547.9			
DMA K	55,658	1.00	0.89	49646.9	2730.6	BIO 'K'	1,980 SF	2732.4 C.F.
				TOTAL REQUIRED	15,704 CF			16,000 C.F. TOTAL PROVIDED

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

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2 Working Days Before You Dig
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REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

WQMP
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

DATE PREPARED MARCH 11, 2021

SHEET 6 OF 10

CITY ID No

Appendix 2: Construction Plans

Grading and Drainage Plans

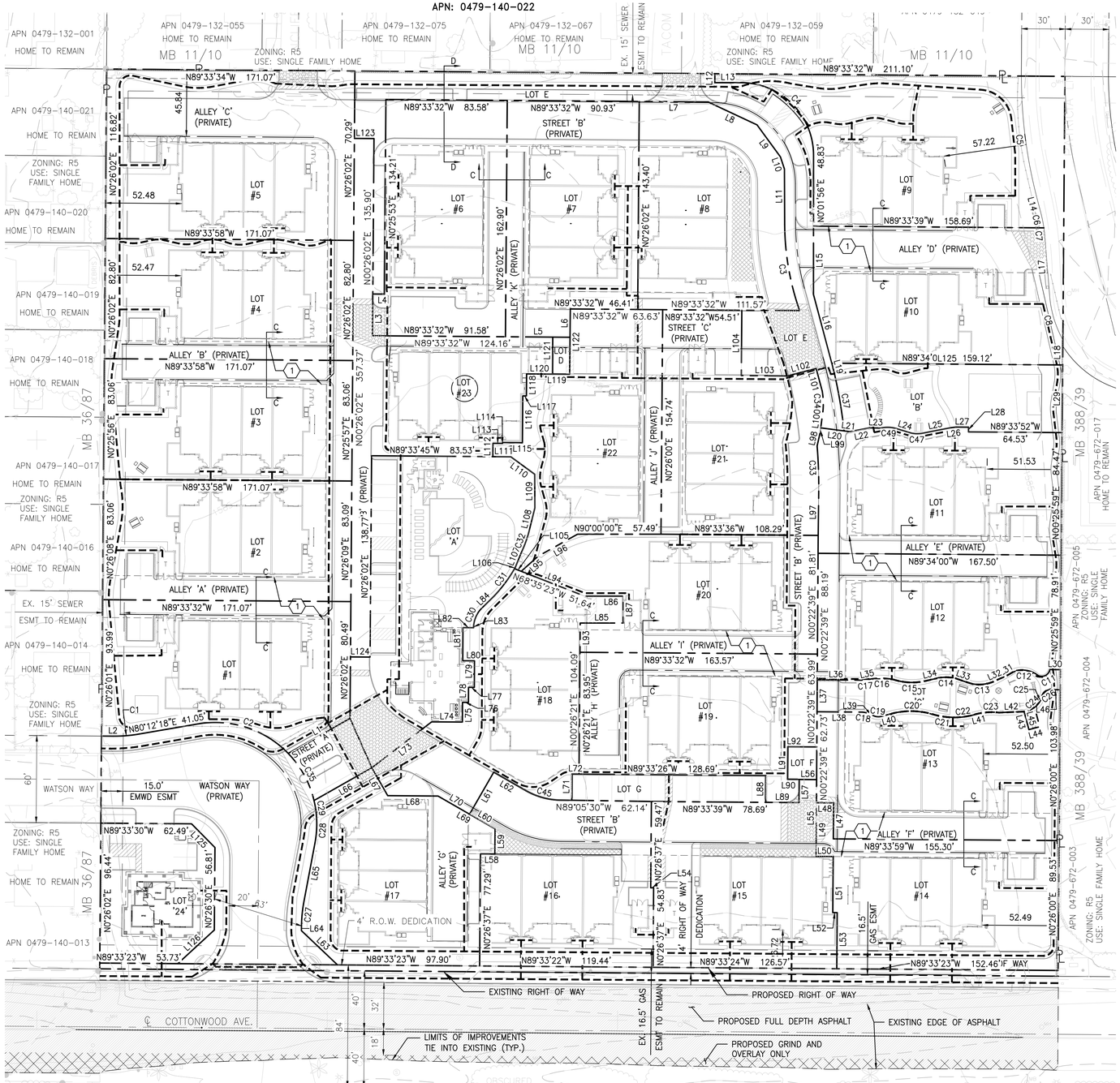
TENTATIVE TRACT MAP 34544

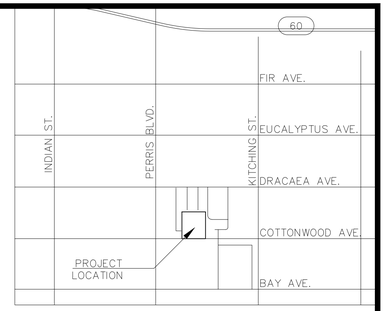
FOR CONDOMINIUM PURPOSES

CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LEGEND DESCRIPTION – 9.39 ACRES M/L IN LOT 6 BLK 73 MB 011 / 011 SB BEAR VALLEY AND ALESSANDRO DEVELOPMENT CO.

APN: 0479-140-022





VICINITY MAP

N.T.S.

DETAILED PROJECT DESCRIPTION

PROPOSED DEVELOPMENT OF 92 ATTACHED MULTIFAMILY HOMES WITH A MANAGER APARTMENT ABOVE OFFICE. A TOTAL OF 23 BUILDINGS WILL BE PROPOSED.

AREA AND DENSITY

GROSS ACREAGE	9.4 ACRES
TOTAL NO. OF UNITS CREATED	93
DENSITY	9.89 U/AC

PARKING

2 CAR GARAGE PER UNIT
ON STREET PARKING PER CITY OF MORENO VALLEY GUEST PARKING

FLOOD HAZARD

THE SUBJECT TRACT OUTSIDE THE 500 YEAR ZONE X FLOOD PLAIN. FLOOD INSURANCE PANEL NO. 065074 0025a. THE SUBJECT TRACT IS WITHIN THE SUNNYMEAD MASTER DRAINAGE PLAN AND SERVED BY LINE "S-2"

SCHOOL

MORENO VALLEY UNIFIED SCHOOL DISTRICT

THOMAS BROTHERS GUIDE

PAGE 717 G-4, 2005 EDITION

LAND USE AND ZONING

CURRENT GENERAL PLAN	R10
CURRENT ZONING MAP	R10
EXISTING LAND USE	VACANT
PROPOSED LAND USE	CONDOMINIUM

FEMA FLOOD ZONE

PROJECT SITE IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN) PER FLOOD INSURANCE RATE MAP NO. 06065C0761G

FIRE SPRINKLER NOTE

EACH 4 PLEX BUILDING WILL CONTAIN A FIRE SPRINKLER SYSTEM THAT WILL BE INSTALLED TO MEET NFPA 13R REQUIREMENTS. THE MANAGER/LEASING OFFICE AND COMMUNITY BUILDING WILL CONTAIN A FIRE SPRINKLER SYSTEM THAT WILL BE INSTALLED TO MEET NFPA 13.

APPLICANT/DEVELOPER/PROPERTY OWNER

COTTONWOOD 939
4340 VON KARMAN AVE., SUITE 110
NEWPORT BEACH, CA 92660
ATTN: DANA HAYNES
949-705-0408
DHAYNES@CITIVESTINC.COM

-TENTATIVE MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND DIVIDER OR ONLY A PORTION THEREOF-

PLAN PREPARER

BLUE ENGINEERING AND CONSULTING, INC
9320 BASELINE RD., STE. D
RANCHO CUCAMONGA, CA 91701
ATTN: ANGEL CESAR
909-248-6557
ANGEL@BLUECIVILENG.COM

STATEMENT

TENTATIVE TRACT MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND DIVIDER OR ONLY A PORTION THEREOF.

DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

LINE DATA		
LINE #	BEARING	DISTANCE
L1	S60°26'21"W	48.93'
L2	N89°33'30"W	8.14'
L3	N00°26'02"E	28.69'
L4	S89°33'40"E	8.00'
L5	S89°33'32"E	32.58'
L6	S00°34'08"W	19.50'
L7	S89°33'32"E	47.40'
L8	S64°53'28"E	37.25'
L9	S36°07'44"E	27.31'
L10	S18°12'00"E	8.80'
L11	S00°16'16"E	38.19'
L12	N00°26'28"E	6.17'
L13	N90°00'00"W	17.99'
L14	S14°50'11"E	8.41'
L15	N00°01'56"E	47.14'
L16	N14°50'26"W	49.01'
L17	S04°35'50"E	41.02'
L18	S00°26'01"W	17.28'
L19	N14°50'26"W	7.23'
L20	S82°31'22"E	20.55'
L21	N82°31'22"W	4.33'
L22	S79°07'19"W	14.12'
L23	N88°43'11"W	7.17'
L24	N73°05'33"W	10.41'
L25	S78°54'44"W	19.13'
L26	S82°57'36"W	4.02'
L27	N89°33'39"W	8.72'
L28	N00°26'21"E	3.24'
L29	S00°26'00"W	46.62'
L30	N89°34'00"W	7.31'
L31	S59°16'32"W	1.96'
L32	S66°21'40"W	9.22'
L33	N70°34'09"W	9.15'
L34	S76°56'21"W	7.79'
L35	S78°52'18"W	2.46'
L36	N89°34'00"W	31.53'
L37	S00°22'39"W	22.00'
L38	S89°33'38"E	30.57'
L39	S67°30'00"E	4.45'
L40	N75°00'34"E	8.73'
L41	N76°45'07"E	7.97'
L42	N87°50'03"E	17.28'
L43	S14°59'49"E	12.85'
L44	N75°00'11"E	7.73'
L45	N14°59'49"W	13.78'
L46	N90°00'00"E	6.82'
L47	N00°00'00"E	24.80'
L48	N89°37'21"W	11.85'
L49	N00°22'39"E	36.98'
L50	N89°33'39"W	11.81'
L51	N00°26'21"E	38.63'
L52	N89°33'39"W	3.04'
L53	N00°26'21"E	38.67'
L54	N90°00'00"W	2.00'
L55	S00°22'39"W	52.94'
L56	S89°33'39"E	12.02'
L57	N00°26'00"E	15.95'
L58	N89°33'39"W	9.91'
L59	S00°29'14"W	17.30'
L60	N60°05'20"W	20.28'
L61	N29°54'40"E	33.50'
L62	S60°05'20"E	25.49'
L63	N46°27'55"W	34.24'

LINE DATA		
LINE #	BEARING	DISTANCE
L64	N00°26'30"E	2.45'
L65	N10°40'42"E	41.04'
L66	N60°26'20"E	45.80'
L67	S29°33'40"E	22.12'
L68	S89°33'39"E	34.64'
L69	S60°05'20"E	45.36'
L70	N60°05'20"W	25.09'
L71	S00°26'37"W	18.06'
L72	N89°33'26"W	4.81'
L73	N52°29'36"E	51.92'
L74	S89°38'47"E	21.17'
L75	N00°22'55"E	13.58'
L76	S89°32'33"E	4.08'
L77	S89°38'47"E	4.00'
L78	N00°21'13"E	10.38'
L79	N00°20'00"E	18.30'
L80	N89°38'47"W	8.08'
L81	N00°22'09"E	22.82'
L82	S89°35'53"E	7.32'
L83	N00°26'21"E	1.05'
L84	N45°26'21"E	12.76'
L85	N90°00'00"E	29.63'
L86	N90°00'00"W	26.74'
L87	N00°00'00"E	18.63'
L88	N00°26'37"E	18.50'
L89	N89°33'39"W	22.95'
L90	S89°33'39"E	8.00'
L91	S00°26'02"W	22.49'
L92	N89°37'21"W	20.00'
L93	N00°26'21"E	20.14'
L94	N68°35'23"W	46.67'
L95	S48°09'47"W	15.54'
L96	S60°45'24"W	31.13'
L97	S00°41'03"W	31.85'
L98	N12°42'25"E	9.30'
L99	N07°28'38"E	3.49'
L100	S07°28'38"W	11.77'
L101	S15°00'01"E	16.20'
L102	N74°59'59"E	20.08'
L103	S89°33'32"E	32.14'
L104	S00°26'28"W	45.00'
L105	N68°35'23"W	4.97'
L106	N29°37'12"E	1.01'
L107	N22°09'22"E	10.99'
L108	N13°56'18"E	17.42'
L109	N00°16'33"W	23.19'
L110	N53°44'29"W	20.37'
L111	N89°33'30"W	12.39'
L112	N00°26'57"E	9.19'
L113	S89°33'03"E	6.56'
L114	N00°26'57"E	0.59'
L115	S89°33'03"E	13.71'
L116	N00°26'57"E	32.26'
L117	S89°33'03"E	2.51'
L118	N00°28'29"E	15.16'
L119	S89°33'07"E	11.83'
L120	N89°33'07"W	17.82'
L121	S00°26'21"W	25.50'
L122	S00°34'08"W	45.00'
L123	S89°33'58"E	13.50'
L124	N89°33'58"W	13.50'
L125	S44°33'30"E	22.97'
L126	S47°21'18"W	34.23'

CURVE DATA			
CURVE #	RADIUS	LENGTH	DELTA
C1	100.00'	17.87'	10°14'12"
C2	70.00'	68.13'	55°46'02"
C3	181.50'	60.64'	19°08'33"
C4	50.00'	78.57'	90°01'56"
C5	335.00'	86.81'	14°50'49"
C6	95.00'	10.87'	6°33'15"
C7	95.00'	6.11'	3°41'06"
C8	75.00'	31.85'	24°19'42"
C11	5.60'	10.51'	107°39'36"
C12	16.72'	20.75'	71°05'37"
C13	24.92'	19.38'	44°33'18"
C14	28.64'	12.78'	25°33'57"
C15	42.00'	22.35'	30°29'34"
C16	38.45'	16.51'	24°35'47"
C17	12.00'	2.42'	11°33'42"
C18	12.00'	4.62'	22°03'38"
C19	8.00'	5.28'	37°46'56"
C20	52.00'	24.93'	27°28'23"
C21	64.77'	18.35'	16°14'01"
C22	41.66'	10.87'	14°57'22"
C23	46.83'	11.28'	13°47'38"
C24	14.30'	2.82'	11°17'59"
C25	14.38'	6.87'	27°22'03"
C26	5.96'	7.58'	72°47'59"
C27	100.00'	17.87'	10°14'12"
C28	70.00'	17.59'	14°23'49"
C29	70.00'	11.80'	9°39'23"
C30	19.18'	13.00'	38°49'56"
C31	99.29'	23.69'	13°40'19"
C32	90.14'	14.84'	9°26'02"
C33	307.48'	29.76'	5°32'44"
C34	52.34'	13.71'	15°00'50"
C35	70.00'	37.45'	30°39'09"

Parcel Area Table		
Parcel #	Area	PROPOSE/USE
1	15,511	RESIDENTIAL
2	14,212	RESIDENTIAL
3	14,210	RESIDENTIAL
4	14,164	RESIDENTIAL
5	19,984	RESIDENTIAL
6	13,845	RESIDENTIAL
7	13,907	RESIDENTIAL
8	13,831	RESIDENTIAL
9	16,469	RESIDENTIAL
10	15,231	RESIDENTIAL
11	14,277	RESIDENTIAL
12	14,338	RESIDENTIAL
13	14,415	RESIDENTIAL
14	14,241	RESIDENTIAL
15	14,109	RESIDENTIAL
16	13,875	RESIDENTIAL
17	13,914	RESIDENTIAL
18	14,039	RESIDENTIAL
19	13,741	RESIDENTIAL
20	13,745	RESIDENTIAL
21	14,451	RESIDENTIAL
22	13,691	RESIDENTIAL
24	7,168	RESIDENTIAL

Parcel Area Table		
Parcel #	Area	PROPOSE/USE
STREET 'A'	1,691	PRIVATE STREET
STREET 'B'	5,208	PRIVATE STREET

Parcel Area Table		
Parcel #	Area	PROPOSE/USE
D	302	MISCELLANEOUS LOT
E	13,173	MISCELLANEOUS LOT
F	450	MISCELLANEOUS LOT
G	2,458	MISCELLANEOUS LOT

Parcel Area Table		
Parcel #	Area	PROPOSE/USE
LOT A	12,380	OPEN SPACE/RECREATION
LOT B	7,080	OPEN SPACE/RECREATION
LOT C	3,880	OPEN SPACE/RECREATION

0 20 40 80 Feet
1:480

LEGEND
- ACCESSIBLE ROUTE
- PROPERTY LINE
- LIMITS OF IMPROVEMENTS

REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

TTM
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

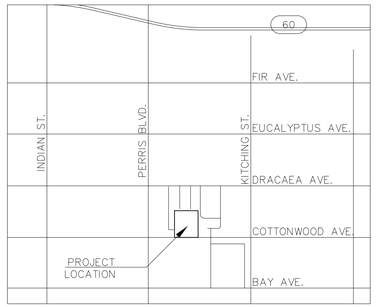
DATE PREPARED MARCH 11, 2021

SHEET 1 OF 10

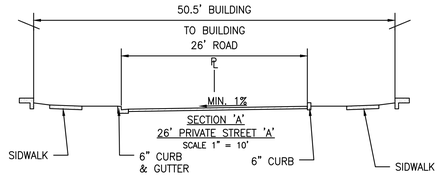
CITY ID No

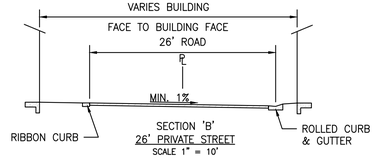
TENTATIVE TRACT MAP 34544

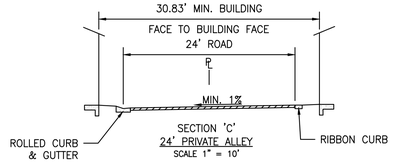
FOR CONDOMINIUM PURPOSES
CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA
LEGEND DESCRIPTION – 9.39 ACRES M/L IN LOT 6 BLK 73 MB 011 / 011 SB BEAR VALLEY AND ALESSANDRO DEVELOPMENT CO.
APN: 0479–140–022

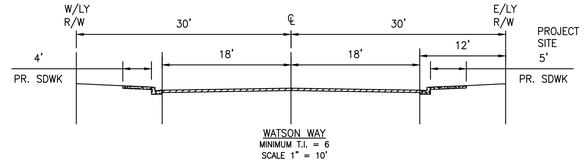


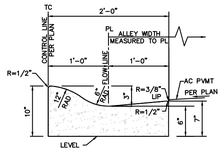
VICINITY MAP
N.T.S.





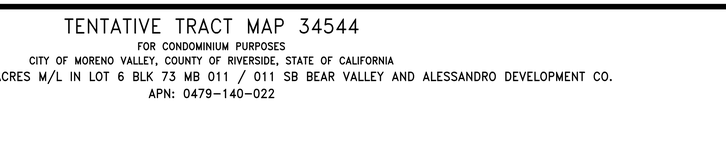




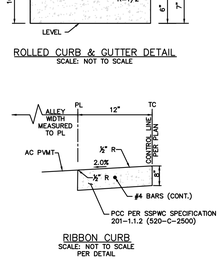


ROLLED CURB & GUTTER DETAIL
SCALE: NOT TO SCALE

PATRICIA LANE
MINIMUM T.I. = 6
SCALE 1" = 10'



COTTONWOOD AVE.
MINIMUM T.I. = 9
SCALE 1" = 10'



RIBBON CURB
SCALE: NOT TO SCALE PER DETAIL

NOTE: PAVEMENT REHABILITATION WILL BE REQUIRED CURB–TO–CURB BETWEEN AND ALONG THE PROJECT FRONTAGE. THIS MAY REQUIRE REMOVAL AND REPLACEMENT OF EXISTING PAVEMENT BASED ON PAVEMENT CORE SAMPLES. AS A MINIMUM, A 1.5 INCH MIN. GRIND AND OVERLAY (FINAL CAP) SPECIFIED BY AS PG 64–16 RHMA WILL BE REQUIRED.

DATE OF PREPARATION MARCH 11, 2021
PEN21–0147

REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

TTM SECTIONS

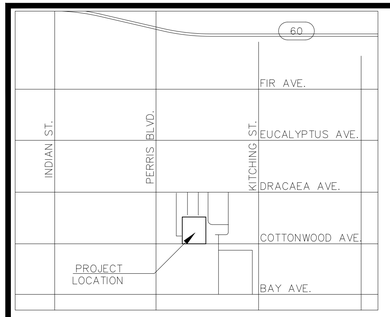
COTTONWOOD VILLAGE
TTM 34544

APN. 479–140–022

DATE PREPARED MARCH 11, 2021

SHEET 2 OF 10

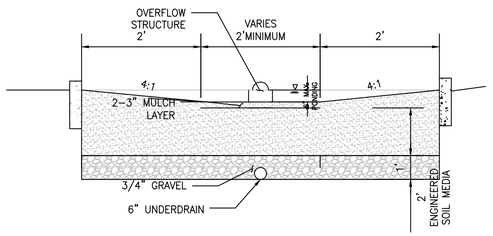
CITY ID No



VICINITY MAP
N.T.S.

BIOFILTRATION ANALYSIS

NAME	AREA (SF)	BASE ELEVATION (FT)	DIMENSIONS (L' x W')
A	425	1586.49	25' x 17'
B	600	1585.34	25' x 24'
C	575	1584.17	25' x 23'
D	497	1584.12	27.5' x 18'
E	1,370	1583.56	45' x 30.5'
F	1,122	1584.81	34' x 33'
G	928	1584.09	32' x 29'
H	2,386	1582.57; 1582.21	32' x 34.5'; 38' x 33.5'
I	310	1583.93; 1584.10	12' x 10'; 19' x 10'
K	1980	1582.54	6' X 330'

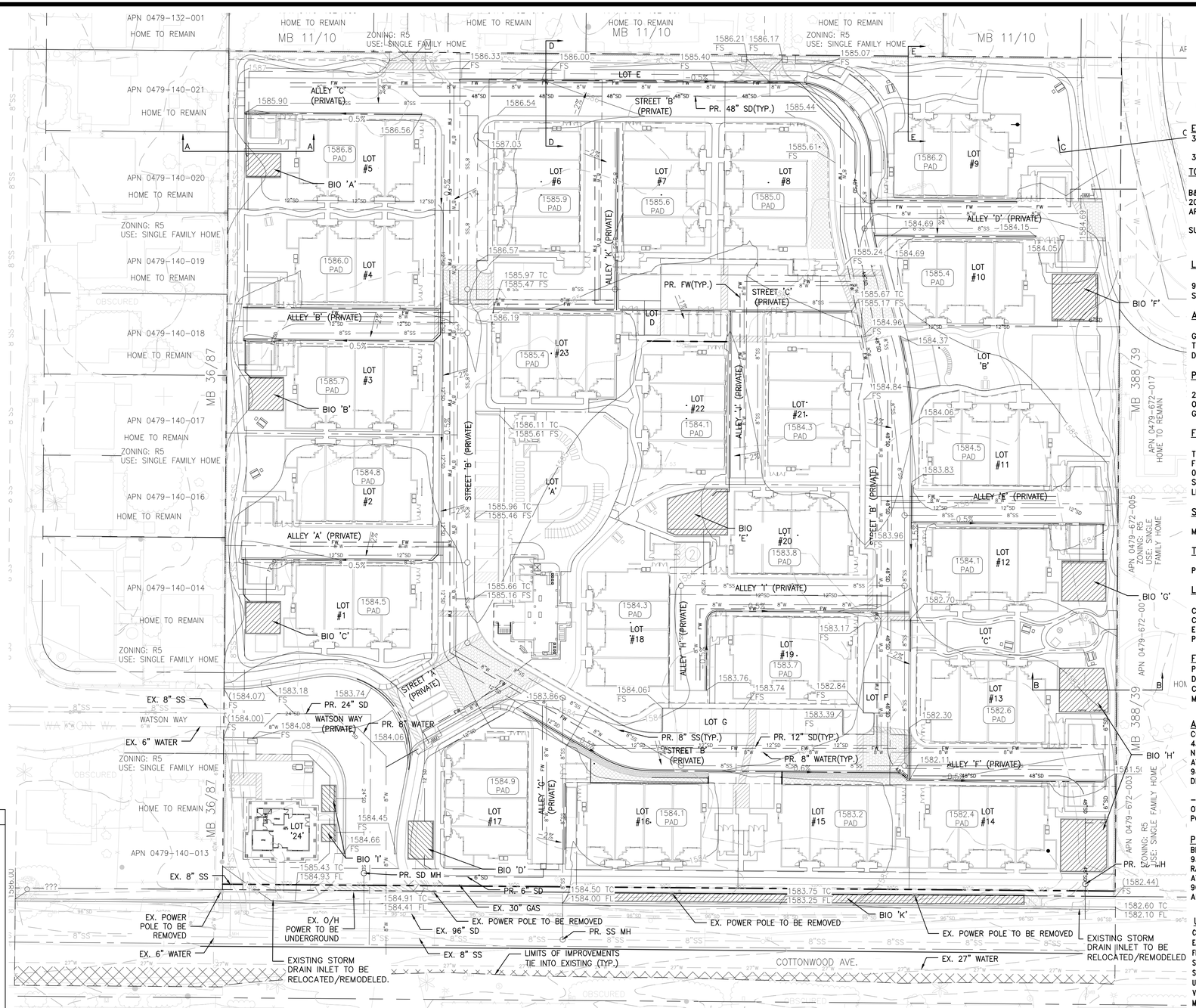


BIORETENTION TYPICAL SECTION

N.T.S.

LOT AREA COVERAGE			
LOT #	LOT (Sq. Ft.)	Building Outline (Sq. Ft.)	%
1	15510.7	5301.2	34
2	14211.7	5301.3	37
3	1420.1	5301.2	37
4	14164.2	5301.2	37
5	19983.9	5301.2	27
6	13844.5	5085.4	37
7	13907.1	5085.4	37
8	13830.6	5085.9	37
9	16468.6	5301.4	32
10	15231.2	5301.0	35
11	14277.0	5305.0	37
12	14505.7	5301.2	37
13	14415.4	5301.2	37
14	14241.0	5301.2	37
15	14109.3	5280.9	37
16	13874.8	5085.4	37
17	14198.2	5245.3	37
18	14039.4	5085.4	36
19	13740.8	5085.4	37
20	13744.9	5085.4	37
21	14450.7	5085.4	35
22	13691.5	5085.4	37
23	13772.3	5085.4	37
24	7452.8	2413.6	32

FLOOR AREA RATIO			
LOT #	LOT (Sq. Ft.)	Building Total (Sq. Ft.)	%
1	15510.7	10602.5	68
2	14211.7	10602.5	75
3	14210.1	10602.5	75
4	14164.2	10602.5	75
5	19983.9	10602.5	53
6	13844.5	10170.7	73
7	13907.1	10170.8	73
8	13830.6	10170.8	74
9	16468.6	10602.7	64
10	15231.2	10601.9	70
11	14277.0	10609.9	74
12	14505.7	10602.5	73
13	14415.4	10602.5	74
14	14241.0	10602.5	74
15	14109.3	10561.8	75
16	13874.8	10170.8	73
17	14198.2	10170.8	74
18	14039.4	10170.8	72
19	13740.8	10170.8	74
20	13744.9	10170.8	74
21	14450.7	10170.8	70
22	13691.5	10170.8	74
23	13772.3	10170.8	74
24	7452.8	4827.2	65



LEGEND

- DOMESTIC WATER LINE (8"W)
- FIRE WATER LINE (FW)
- SEWER LINE (8"SS)
- STORM DRAIN LINE (12"SD)
- PROPOSED PROPERTY LINE
- BIOFILTRATION BASIN
- EXISTING SEWER LINE (8"SS)
- EXISTING WATER LINE (8"W)

LEGEND

- GRIND AND OVERLAY
- LIMITS OF IMPROVEMENTS

EARTHWORK QUANTITIES

3,144 CUT	4,095 FILL	
	+314 SHRINKAGE	
3,144	4,409	1,265 FILL

TOPOGRAPHY SOURCE

B&E ENGINEERS
20 E. FOOTHILL AVE., STE 230
ARCADIA CA. 91006

SURVEY DATE: 04-3-14
04-4-14
04-24-14

LEGEND DESCRIPTION

9.39 ACRES M/L IN LOT 6 BLK 73 MB 011 / 011
SB BEAR VALLEY AND ALESSANDRO DEVELOPMENT CO.

AREA AND DENSITY

GROSS ACREAGE	9.4 ACRES
TOTAL NO. OF UNITS CREATED	93
DENSITY	9.89 U/AC

PARKING

2 CAR GARAGE PER UNIT
ON STREET PARKING PER CITY OF MORENO VALLEY GUEST PARKING

FLOOD HAZARD

THE SUBJECT TRACT OUTSIDE THE 500 YEAR ZONE X FLOOD PLAIN. FLOOD INSURANCE PANEL NO. 065074 0025a. THE SUBJECT TRACT IS WITHIN THE SUNNYMEAD MASTER DRAINAGE PLAN AND SERVED BY LINE "S-2"

SCHOOL

MORENO VALLEY UNIFIED SCHOOL DISTRICT

THOMAS BROTHERS GUIDE

PAGE 717 G-4, 2005 EDITION

LAND USE AND ZONING

CURRENT GENERAL PLAN	R10
CURRENT ZONING MAP	R10
EXISTING LAND USE	VACANT
PROPOSED LAND USE	CONDOMINIUM

FEMA FLOOD ZONE

PROJECT SITE IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN) PER FLOOD INSURANCE RATE MAP NO. 06065C0761G

APPLICANT/DEVELOPER/PROPERTY OWNER

COTTONWOOD 939
4340 VON KARMAN AVE., SUITE 110
NEWPORT BEACH, CA 92660
ATTN: DANA HAYNES
949-705-0408
DHAYNES@CITIVESTINC.COM

-TENTATIVE MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND DIVIDER OR ONLY A PORTION THEREOF-

PLAN PREPARER

BLUE ENGINEERING AND CONSULTING, INC
9320 BASELINE RD., STE. D
RANCHO CUCAMONGA, CA 91701
ATTN: ANGEL CESAR
909-248-6557
ANGEL@BLUECIVILENG.COM

UTILITY COMPANIES	EMERGENCY NUMBERS
CHARTER SPECTRUM	(877) 906-9121
EASTERN MUNICIPAL WATER DISTRICT	(951) 928-3777
FRONTIER COMMUNICATION	(800) 921-8101
SOUTHERN CALIFORNIA EDISON	(800) 655-4555
SOUTHERN CALIFORNIA GAS COMPANY	(800) 427-2200
UNDERGROUND SERVICE ALERT	(800) 422-4133
VERIZON WIRELESS	(800) 922-0204
MORENO VALLEY UNIFIED SCHOOL DISTRICT	(951) 571-7500

CONCEPTUAL GRADING PLAN
TTM 34544
DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

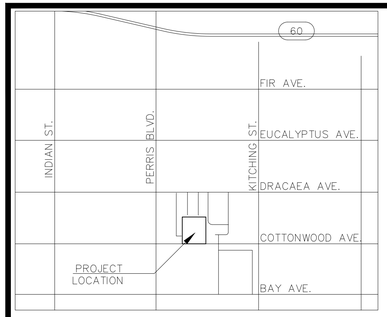
CONCEPTUAL GRADING PLAN
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

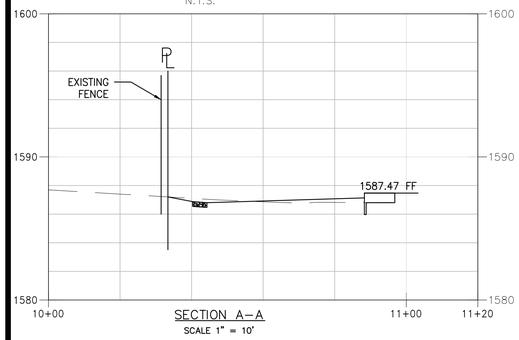
DATE PREPARED MARCH 11, 2021

SHEET 3 OF 10

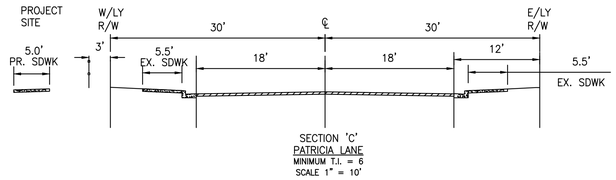
CITY ID No



VICINITY MAP
N.T.S.



SECTION A–A
SCALE 1" = 10'



SECTION 'C'
PATRICIA LANE
MINIMUM T.I. = 6
SCALE 1" = 10'

SECTION B–B
SCALE 1" = 10'

SECTION 'D'
26' PRIVATE STREET
SCALE 1" = 10'

SECTION 'E'
SCALE 1" = 10'

CONCEPTUAL GRADING PLAN SECTIONS
TTM 34544
DATE OF PREPARATION MARCH 11, 2021
PEN21–0147

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CITY OF MORENO VALLEY

CONCEPTUAL GRADING PLAN SECTIONS
COTTONWOOD VILLAGE
TTM 34544

APN. 479–140–022

DATE PREPARED MARCH 11, 2021

SHEET 4 OF 10

CITY ID No

TENTATIVE TRACT MAP 34544

FOR CONDOMINIUM PURPOSES

CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LEGEND DESCRIPTION – 9.39 ACRES M/L IN LOT 6 BLK 73 MB 011 / 011 SB BEAR VALLEY AND ALESSANDRO DEVELOPMENT CO.

APN: 0479-140-022

DETAILED PROJECT DESCRIPTION

PROPOSED DEVELOPMENT OF 92 ATTACHED MULTIFAMILY HOMES WITH A MANAGER APARTMENT ABOVE OFFICE. A TOTAL OF 23 BUILDINGS WILL BE PROPOSED.

AREA AND DENSITY

GROSS ACREAGE	9.4 ACRES
TOTAL NO. OF UNITS CREATED	93
DENSITY	9.89 U/AC

PARKING

2 CAR GARAGE PER UNIT
ON STREET PARKING PER CITY OF MORENO VALLEY GUEST PARKING

FLOOD HAZARD

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SCHOOL

MORENO VALLEY UNIFIED SCHOOL DISTRICT

THOMAS BROTHERS GUIDE

PAGE 717 G-4, 2005 EDITION

LAND USE AND ZONING

CURRENT GENERAL PLAN	R10
CURRENT ZONING MAP	R10
EXISTING LAND USE	VACANT
PROPOSED LAND USE	CONDOMINIUM

FEMA FLOOD ZONE

PROJECT SITE IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN) PER FLOOD INSURANCE RATE MAP NO. 06065C0761G

FIRE SPRINKLER NOTE

EACH BUILDING WILL CONTAIN A FIRE SPRINKLER SYSTEM THAT WILL BE INSTALLED TO MEET NFPA 13R REQUIREMENTS.

APPLICANT/DEVELOPER/PROPERTY OWNER

COTTONWOOD 939
4340 VON KARMAN AVE., SUITE 110
NEWPORT BEACH, CA 92660
ATTN: DANA HAYNES
949-705-0408
DHAYNES@CITIVESTINC.COM

-TENTATIVE MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND DIVIDER OR ONLY A PORTION THEREOF-

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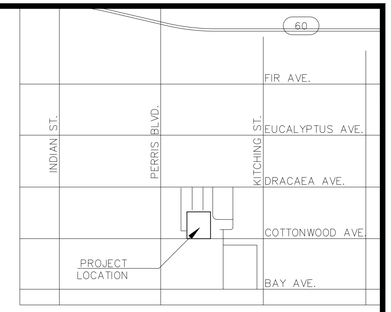


VICINITY MAP
N.T.S.

0 20 40 80 Feet
1:480

LEGEND

ACCESSIBLE ROUTE
PROPERTY LINE

DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

PLOT PLAN
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

DATE PREPARED MARCH 11, 2021

SHEET 5 OF 10

CITY ID No

WATER QUALITY MANAGEMENT PLAN EXHIBIT

THIS WATER QUALITY BASIN RECEIVES RUNOFF FROM STREETS, YARDS AND OPEN SPACES. IT HAS BEEN DESIGNED TO TREAT INCIDENTAL POLLUTANTS IN RUNOFF AND IS NOT DESIGNED TO TREAT HOUSEHOLD POLLUTANTS. DUMPING IS PROHIBITED.

AUTHORIZED PERSONNEL ONLY.

MORENO VALLEY PUBLIC WORKS
TO REPORT A PROBLEM WITH THIS FACILITY CALL 951.413.3120
WWW.MORENO-VALLEY.CA.US

0.5" THICK BORDER

NOTES:

1.) SIGNS SHALL BE SECURELY MOUNTED ON OUTSIDE OF TUBULAR IRON FENCE, 1 FOOT BELOW THE TOP OF TUBULAR IRON FENCE. LOCATION PER DIRECTION OF CITY ENGINEER.

2.) OUTSIDE DIMENSIONS SHALL BE 4' x 2'.

3.) LETTERS, BORDER, AND CITY LOGO SHALL BE BLACK ON WHITE BACKGROUND.

4.) TEXT HEIGHT SHALL BE 1" AND TEXT WIDTH SHALL BE 0.6". TEXT SHALL BE ALL UPPERCASE.

5.) FONT STYLE SHALL BE UNIVERSAL.

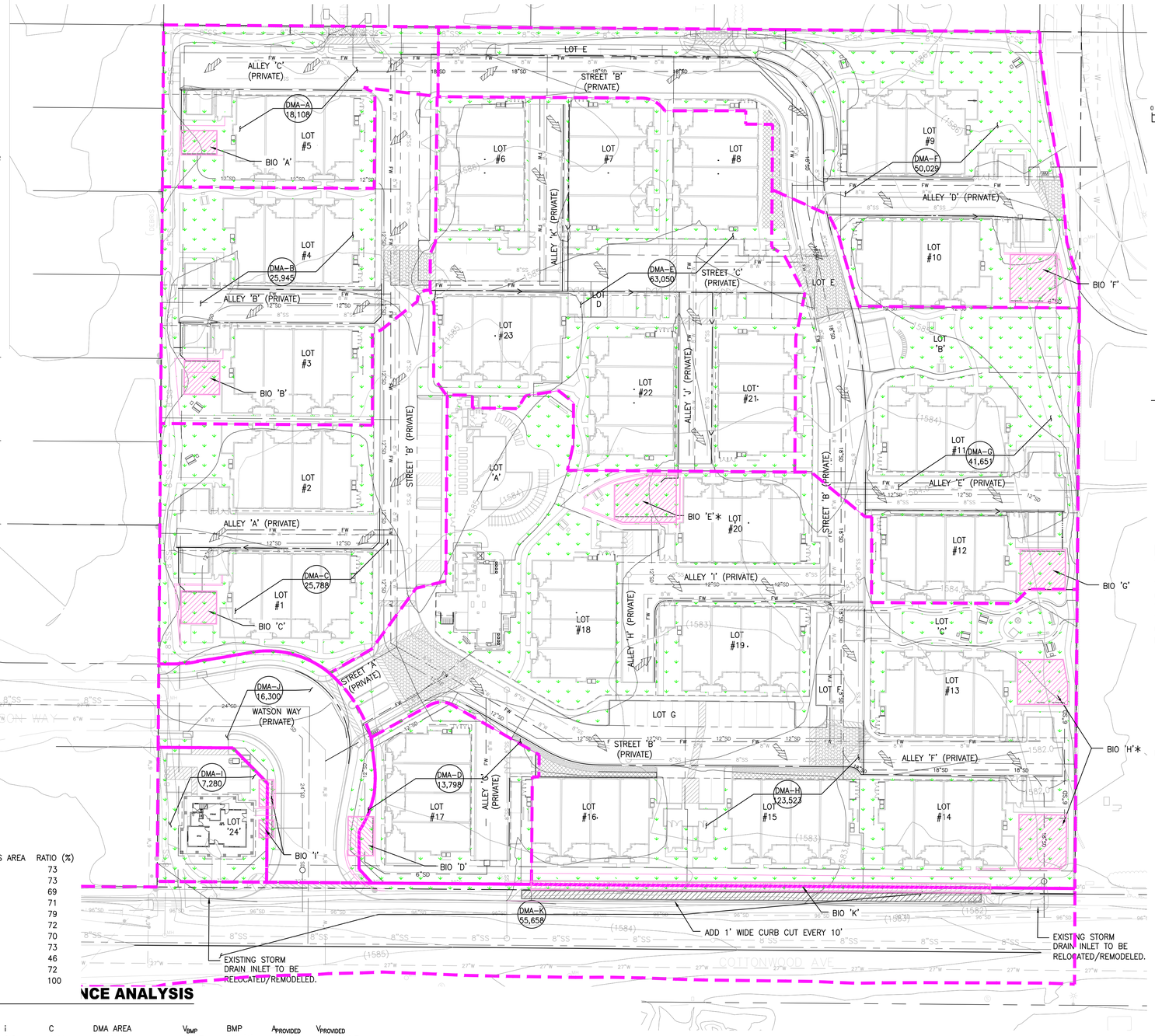
6.) SIGN SHOULD BE MADE OF 5052-H38 ALUMINUM ALLOY AND HAVE A THICKNESS OF 0.08".

7.) MOUNTING HARDWARE SHALL BE STAINLESS STEEL BRACKETS AND MOUNTED TO THE FENCE USING SECURITY SCREWS.

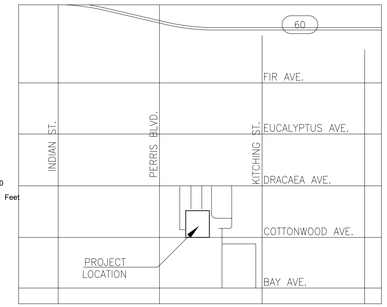
8.) CITY LOGO SHALL BE 3.5" IN HEIGHT BY 4" WIDE.

9.) SIGN SHALL BE PROTECTED WITH AN ANTI-GRAFITTI COATING.

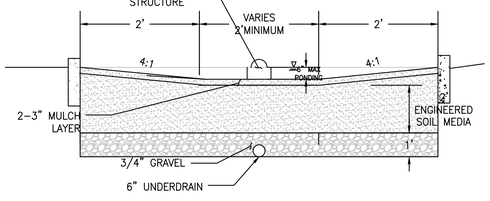
6 PROJECT SIGN
NTS



0 20 40 80 Feet
SCALE 1" = 40'



VICINITY MAP
N.T.S.



BIOFILTRATION TRENCH DETAIL (TYP)
SCALE 1" = 3'

BIOFILTRATION ANALYSIS

NAME	AREA (SF)	DIMENSIONS (L' x W')
A	425	25' x 17'
B	600	25' x 24'
C	575	25' x 23'
D	497	27.5' x 18'
E	1,370	45' x 30.5'
F	1,122	34' x 33'
G	928	32' x 29'
H	2,386	32' x 34.5'; 38' x 33.5'
I	310	12' x 10'; 19' x 10'

PROJECT BMP RATIOS

NAME	AREA (SF)	LANDSCAPE AREA (SF)	RATIO (%)	IMPERVIOUS AREA	RATIO (%)
A	18,108	4,890	27	13,218	73
B	25,945	7,050	27	18,895	73
C	25,788	7,879	31	17,909	69
D	13,798	4,015	29	9,783	71
E	63,050	13,036	21	50,004	79
F	50,029	14,065	28	35,964	72
G	41,651	12,424	30	29,227	70
H	123,523	34,014	27	89,839	73
I	7,280	3920	54	3,360	46
J	16,300	4,500	28	11,800	72
K	55,658	0	0	55,658	100

ENGINEERED SOIL MEDIA REQUIREMENTS

THE ENGINEERED SOIL MEDIA SHALL BE COMPRISED OF 85 PERCENT MINERAL COMPONENT AND 15 PERCENT ORGANIC COMPNENT, 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, 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

NOTE: LANDSCAPING AND IRRIGATION PER LANDSCAPE PLANS

LEGEND

- DRAINAGE MANAGEMENT AREA (DMA)
- 8"SS — SEWER MAIN
- 8"W — DOMESTIC WATER
- 18"SD — STORM DRAIN
- CENTERLINE
- FLOW LINE
- MANHOLE
- DIRECTIONAL FLOW ARROW
- BIOFILTRATION TRENCH
- * 36" SOIL FILTER MEDIA
- LANDSCAPE AREA

DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

NCE ANALYSIS

NAME	AREA (SF)	i	C	DMA AREA	V_{BMP}	BMP	$A_{PROVIDED}$	$V_{PROVIDED}$
DMA A	18,108	0.81	0.61	11,066.9	608.7	BIO 'A'	425 SF	624.75 C.F.
DMA B	25,945	0.81	0.61	15,856.5	872.1	BIO 'B'	600 SF	882 C.F.
DMA C	25,788	0.79	0.59	15,155.3	833.5	BIO 'C'	575 SF	845.3 C.F.
DMA D	13,798	0.80	0.60	8,269.1	454.8	BIO 'D'	497 SF	730.5 C.F.
DMA E	63,050	0.86	0.67	42,526.5	2,339	BIO 'E'	1,370 SF	2,436.8 C.F.
DMA F	50,029	0.80	0.60	29,982.2	1,649	BIO 'F'	1,122 SF	1,660.5 C.F.
DMA G	41,651	0.79	0.59	24,477.9	1,346.3	BIO 'G'	928 SF	1,376.4 C.F.
DMA H	123,523	0.81	0.61	75,492.1	4,152.1	BIO 'H'	2,386 SF	4,270 C.F.
DMA I	7,280	0.62	0.42	3,090.6	170	BIO 'I'	310 SF	443.3 C.F.
DMA J	16,300	0.81	0.61	9,961.9	547.9			
DMA K	55,658	1.00	0.89	49646.9	2730.6	BIO 'K'	1,980 SF	2732.4 C.F.
				TOTAL REQUIRED	15,704 CF			16,000 C.F. TOTAL PROVIDED

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

DIGALERT

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

REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

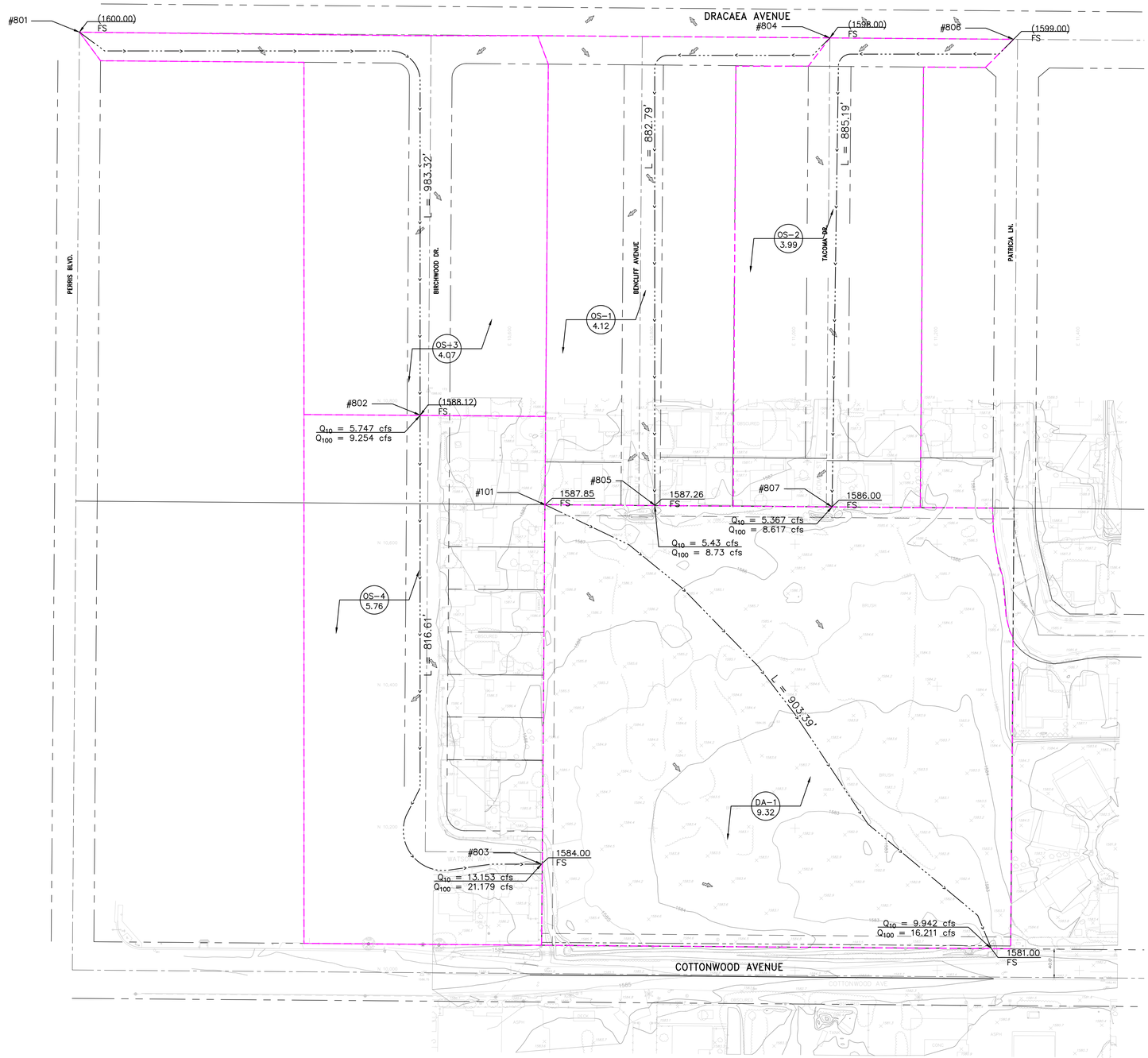
WQMP
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

DATE PREPARED MARCH 11, 2021

SHEET 6 OF 10

CITY ID No



Feet
80 0 80 160
SCALE 1" = 80'

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

DIGALERT

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STATE OF CALIFORNIA

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UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

PRE DEVELOPMENT EXHIBIT

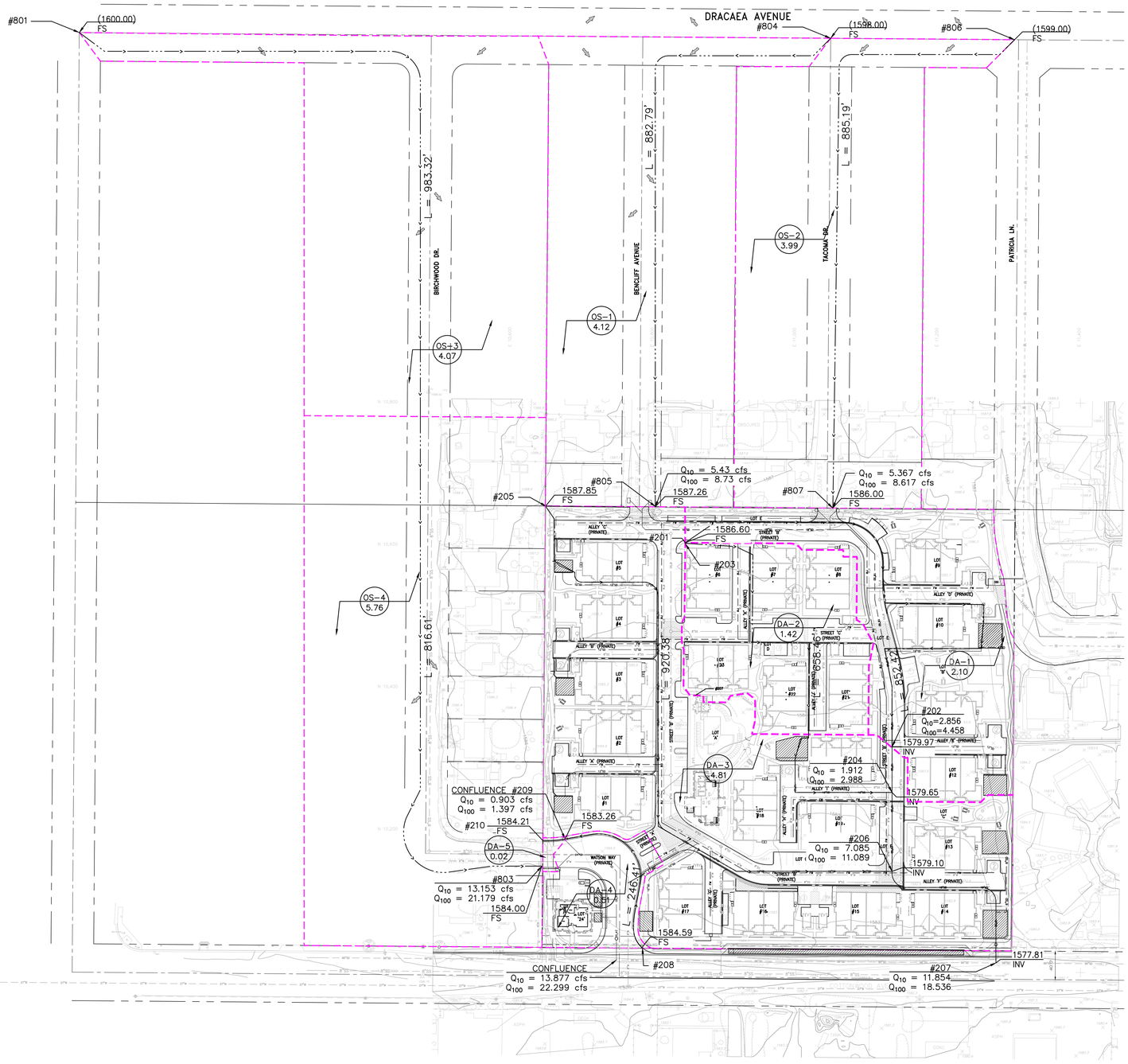
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

DATE PREPARED MARCH 11, 2021

SHEET 7 OF 10

CITY ID No



BIOFILTRATION BASIN DETAIL (TYP)
SCALE 1" = 3'

LEGEND

- DRAINAGE AREA
- SEWER MAIN
- DOMESTIC WATER
- STORM DRAIN
- CENTERLINE
- FLOW LINE
- MANHOLE
- DIRECTIONAL FLOW ARROW
- BIOFILTRATION TRENCH

DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

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ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

POST DEVELOPMENT EXHIBIT

COTTONWOOD VILLAGE
TTM 34544

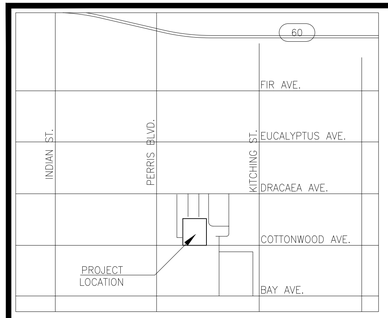
APN. 479-140-022

DATE PREPARED MARCH 11, 2021

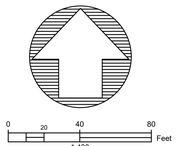
SHEET 8 OF 10

CITY ID No

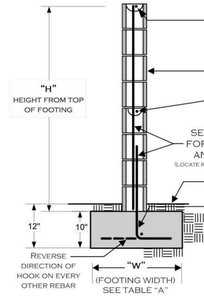
WALL PLAN EXHIBIT



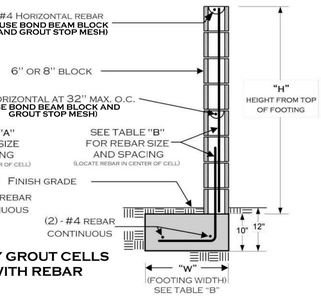
VICINITY MAP
N.T.S.



FOOTING OPTION "A"



FOOTING OPTION "B"



ONLY GROUT CELLS WITH REBAR

TABLE "A"		
"H"	"W"	VERTICAL REINFORCEMENT
3'	17"	#4@48" O.C.
4'	20"	#4@48" O.C.
5'	23"	#4@48" O.C.
6'	29"	#4@24" O.C.

ALL FOOTINGS ADJACENT TO SLOPES TO BE AT LEAST 5' TO DAYLIGHT AS SHOWN BELOW.

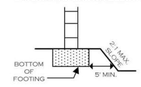


TABLE "B"		
"H"	"W"	VERTICAL REINFORCEMENT
3'	19"	#4@48" O.C.
4'	22"	#4@48" O.C.
5'	29"	#4@48" O.C.
6'	34"	#4@24" O.C.

NOTES:

1) THIS DESIGN DOES NOT ALLOW GRADE DIFFERENTIALS OF MORE THAN 6" ON OPPOSING SIDES OF THE WALL. THIS IS NOT A RETAINING WALL.
2) FENCE HEIGHTS ARE REGULATED – CONSULT ZONING REGULATIONS BEFORE BEGINNING CONSTRUCTION.
3) NO WATER COURSE OR NATURAL DRAINAGE SHALL BE OBSTRUCTED.
4) GROUT ONLY THE CELLS CONTAINING REBAR. THIS WALL IS NOT DESIGNED FOR ALL CELLS TO BE GROUTED.
5) ALL REBAR TO BE ASTM SPEC. A615, GRADE 40 MINIMUM.
6) ALL REBAR LAP SPLICES TO BE 24" MINIMUM.
7) ALL MASONRY UNITS TO BE ASTM C-90 GRADE N.
8) REBAR TO BE CENTERED IN MASONRY CELLS.

SEE PAGE 2 FOR ADDITIONAL INFORMATION

DISCLAIMER:
ALTERNATE DESIGNS MAY BE POSSIBLE WHEN PROVIDED WITH AN ENGINEERED ANALYSIS. USE OF THIS STANDARD DESIGN IS AT THE USER'S RISK AND CARRIES NO IMPLIED OR INFERRED GUARANTEE AGAINST FAILURE OR DEFECTS.

CHECK WITH THE BUILDING DEPARTMENT TO VERIFY IF A BUILDING PERMIT IS REQUIRED.

WHEN A PERMIT IS REQUIRED, THE FOLLOWING INSPECTIONS ARE REQUIRED:

1) FOOTING; EXCAVATION TRENCH CLEAN WITH STEEL IN PLACE AND SUPPORTED 3" ABOVE AND AWAY FROM THE SURROUNDING EARTH/DIRT.
2) REBAR/PRE-GROUT; BOND BEAM REBAR AND VERTICAL REBAR IN PLACE - INSPECTION PRIOR TO PLACING GROUT.
3) FINAL; AFTER GROUT IS PLACED - PRIOR TO ANY DECORATIVE CAP PLACEMENT.

WESTERN RIVERSIDE COUNTY CODE UNIFORMITY PROGRAM

CITY OF MORENO VALLEY
Building & Safety Division

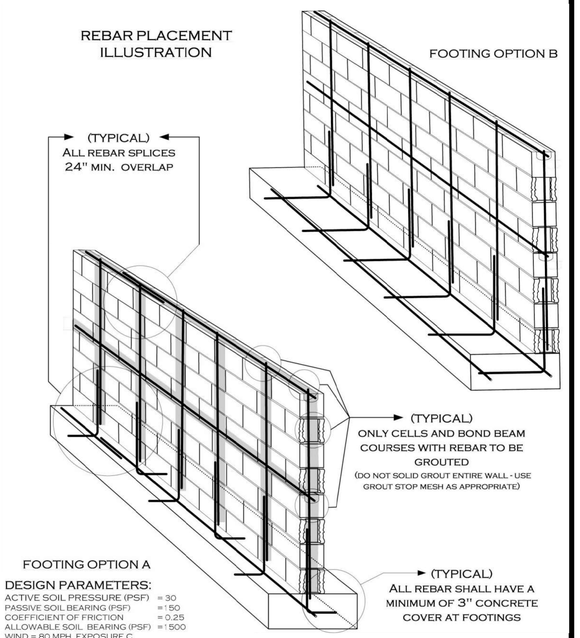
FREESTANDING BLOCK WALL

951.413.3350

14177 FREDRICK ST
MORENO VALLEY CA. 92553

1/23/2014 | GARDENWALLFINAL.VSD | PAGE 1 OF 2

REBAR PLACEMENT ILLUSTRATION



FOOTING OPTION A

DESIGN PARAMETERS:

ACTIVE SOIL PRESSURE (PSF) = 30
PASSIVE SOIL BEARING (PSF) =150
COEFFICIENT OF FRICTION = 0.25
ALLOWABLE SOIL BEARING (PSF) =1500
WIND = 80 MPH, EXPOSURE C
SEISMIC:
Na=1.3, Nv=1.6, Z=0.4, SOIL PROFILE=Sd

DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

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

DIGALERT

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

REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

WALL PLAN
COTTONWOOD VILLAGE
TTM 34544

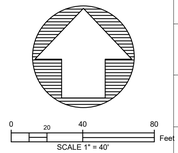
APN. 479-140-022

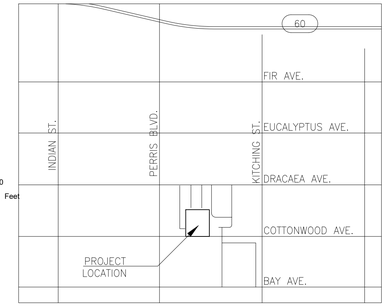
DATE PREPARED MARCH 11, 2021

SHEET 9 OF 10

CITY ID No

LANDSCAPE PLAN EXHIBIT





VICINITY MAP
N.T.S.

LEGEND

- LANDSCAPE AREA
- CENTERLINE
- FLOW LINE

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

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DATE

CITY OF MORENO VALLEY

LANDSCAPE PLAN
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

DATE PREPARED MARCH 11, 2021

SHEET 10 OF 10

CITY ID No

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GeoTek, Inc.
710 E. Parkridge Avenue, Suite 105, Corona, California 92879-1097
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

June 30, 2014
Project No. 1165-CR3

Frontier Enterprises
8300 Utica Avenue, Suite 300
Rancho Cucamonga, California 91730

Attention: Mr. Daniel Pocius

Subject: Infiltration Evaluation
Proposed Residential Development
Tentative Tract Map No. 34544
City of Moreno Valley, Riverside County, California

Reference: *Riverside County Flood Control and Water Conservation District (RCFCWCD), 2011, "Design Handbook for Low Impact Development Best Management Practices."*

Dear Mr. Pocius:

As requested and authorized, GeoTek, Inc. (GeoTek) has performed an infiltration evaluation at the subject property. This report presents the results of the double-ring infiltrometer testing, and provides recommendations from a geotechnical standpoint for a design infiltration rate.

The subject project site (Tentative Tract Map No. 34544) is located adjacent to and to the north of Cottonwood Avenue, approximately 1,000 feet east of Perris Boulevard, in the City of Moreno Valley, Riverside County, California. The project site is currently vacant land.

One (1) excavation was dug with a backhoe, to a depth of about five (5) feet below existing grade in the area of the proposed basin in the southeastern portion of the project site area (see Figure 1). A double-ring infiltrometer test was performed within the excavation (I-1) by a representative from our firm on June 28, 2014 in general conformance with ASTM D 3385 and the *Riverside County Flood Control and Water Conservation District Design Handbook for Low Impact Development Best Management Practices* (RCFCWCD, 2011).

The double-ring infiltrometer test resulted in an infiltration rate of 0.3 inches per hour after the infiltration rate had generally stabilized. The attached Figure 1 shows the approximate location of the infiltration test. A copy of the double-ring infiltrometer test field data is included at the back of this report.

Over the lifetime of the storm water disposal areas, the infiltration rates may be affected by silt build up and biological activities, as well as local variations in near surface soil conditions. An appropriate factor of safety no less than 2.0 should be applied to the measured infiltration rate based on the suitability of the underlying soils for infiltration and the infiltration design.

LIMITATIONS

The materials observed on the project site appear to be representative of the area; however, soil materials vary in character between excavations and natural outcrops or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,
GeoTek, Inc.

Edward H. LaMont
CEG 1892, Exp. 07/31/16
Principal Geologist

Attachments: Figure 1 – Infiltration Test Location Map
Infiltration Test Field Data

Distribution: (1) Addressee via email

G:\Projects\1151 to 1200\1165CR3 Frontier Enterprises Moreno Valley 79\Infiltration\Infiltration Revised\1165CR3 Infiltration Evaluation TTM 34544.doc

Frontier Enterprises
Tentative Tract Map No. 34544
City of Moreno Valley
Riverside County, California

GeoTek Project No. 1165-CR3

N

Figure 1

Infiltration Test Location Map

GEOTEK

FRONTIER ENTERPRISES

DOUBLE RING INFILTROMETER TEST DATA

Project Name and Test Location: 1165-CR3 TTM 34544
Trench No.:
Tested by:
Date of Testing: 6/28/14
Water Table Depth: >50

Liquid Used: WATER
Ground Temperature:
Liquid Level Mainted by Using: HAND MEASUREMENTS
Penetration of Rings Into Soil (in.): 4 6
USCS Classification: SM

TRIAL NO.	START/END	TIME	ELAPSED TIME (Min.)	FLOW READINGS: INNER RING (in.)	FLOW READINGS: RING FLOW (water added in ml)	FLOW READINGS: ANNULAR READING (in.)	FLOW READINGS: SPACE FLOW (water added in ml)	LIQUID TEMP. (F)	INFILTRATION RATE: INNER (in./hr.)	INFILTRATION RATE: ANNULAR (in./hr.)	REMARKS
1	S	520	0	10		12		74			
	E	530	10	9 7/8	232	11 3/4	1390		0.8	1.5	
2	S	531	0	10		12					
	E	541	10	9 7/8	232	11 3/4	1390		0.8	1.5	
3	S	542	0	10		12					
	E	552	10	9 7/8	232	11 3/4	1390		0.8	1.5	
4	S	553	0	10		12					
	E	603	10	9 7/8	232	11 3/4	1390		0.8	1.5	
5	S	604	0	10		12					
	E	614	10	9 15/16	116	11 7/8	695		0.4	0.8	
6	S	615	0	10		12					
	E	625	10	9 15/16	116	11 7/8	695		0.4	0.8	
7	S	626	0	10		12					
	E	656	30	9 13/16	348	11 5/8	2085		0.4	0.8	
8	S	658	0	10		12					
	E	728	30	9 13/16	348	11 5/8	2085		0.4	0.8	
9	S	730	0	10		12					
	E	800	30	9 13/16	348	11 5/8	2085		0.4	0.8	
10	S	802	0	10		12					
	E	832	30	9 13/16	348	11 5/8	2085		0.4	0.8	
11	S	834	0	10		12					
	E	904	30	9 7/8	232	11 11/16	1043		0.3	0.6	
12	S	906	0	10		12					
	E	936	30	9 7/8	232	11 11/16	1043		0.3	0.6	
13	S	938	0	10		12					
	E	1008	30	9 7/8	232	11 11/16	1043		0.3	0.6	
14	S	1010	0	10		12					
	E	1040	30	9 7/8	232	11 11/16	1043		0.3	0.6	
15	S	1042	0	10		12					
	E	1112	30	9 7/8	232	11 11/16	1043		0.3	0.6	
16	S	1114	0	10		12					
	E	1144	30	9 7/8	232	11 11/16	1043		0.3	0.6	
17	S	1146	0	10		12		74			
	E	1216	30	9 7/8	232	11 11/16	1043		0.3	0.6	
18	S										
	E										
19	S										
	E										

GEOTECHNICAL EVALUATION

FOR

PROPOSED SINGLE- FAMILY RESIDENTIAL DEVELOPMENT

APN 479-140-022

CITY OF MORENO VALLEY, RIVERSIDE COUNTY, CALIFORNIA

PREPARED FOR

FRONTIER ENTERPRISES
8300 UTICA AVENUE, SUITE 300
RANCHO CUCAMONGA, CALIFORNIA 91730

PREPARED BY

GEOTEK, INC.
710 EAST PARKRIDGE AVENUE, SUITE 105
CORONA, CALIFORNIA 92879

PROJECT NO. 1165-CR3 **APRIL 10, 2014**

GEOTEK

GeoTek, Inc.
710 E. Parkridge Avenue, Suite 105, Corona, California 92879-1097
(951) 710-1160 Office (951) 710-1167 Fax www.geotekusa.com

April 10, 2014
Project No. 1165-CR3

Frontier Enterprises
8300 Utica Avenue, Suite 300
Rancho Cucamonga, California 91730

Attention: Mr. Daniel Pocius

Subject: Geotechnical Evaluation
Proposed Single-Family Residential Development
APN 479-140-022
City of Moreno Valley, Riverside County, California

Dear Mr. Pocius:

We are pleased to provide herein the results of our Geotechnical Evaluation for the subject project located in the City of Moreno Valley, Riverside County, California. This report presents the results of our evaluation and discussion of our findings. In our opinion, site development appears feasible from a geotechnical viewpoint. Site development and grading plans should be reviewed by this firm as they become available, as it will be necessary to provide appropriate recommendations for intended specific site development as those plans become refined.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,
GeoTek, Inc.

REGISTERED GEOLOGIST
EDWARD H. LaMONT
No. 1892
Exp. _____
Certified Engineering Geologist
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
EDMOND VARDEH
No. 56992
Exp.
CIVIL
STATE OF CALIFORNIA

Edward H. LaMont
CEG 1824, Exp. 07/31/14
Principal Geologist

Edmond Vardeh
RCE 56992, Exp. 06/30/15
Project Engineer

Distribution: (1) Addressee via email
G:\Projects\1151 to 1200\1165CR3 Frontier Enterprises Moreno Valley 79\Geo\1165CR3 Geotechnical Evaluation APN 479-140-022 Moreno Valley.doc

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TABLE OF CONTENTS

ENCLOSURES

1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the general geotechnical conditions on the site. Services provided for this study included the following:

- Research and review of available geologic and geotechnical data, and general information pertinent to the site,
- Site exploration consisting of the excavation, logging and sampling of four (4) exploratory borings by a geologist from our firm,
- Laboratory testing of soil samples collected during the field investigation,
- Review and evaluation of site seismicity, and
- Compilation of this geotechnical report which presents our findings and a general summary of pertinent site geotechnical conditions relevant for site development.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The subject project site is located north of Cottonwood Avenue, west of Patricia Lane and south of the terminus of Tacoma Drive and Bencliff Drive in the City of Moreno Valley, Riverside County, California (see Figure 1). The square-shaped property is comprised of roughly 9.39 acres of vacant land. The property is bounded by existing residential development to the north and west, Cottonwood Avenue to the south and Patricia Lane and residential development to the east.

The site is relatively flat with total relief across the site on the order of roughly five (5) feet, with surface drainage generally directed toward the south. Topographically, the property ranges from approximately 1,588 to approximately 1,593 feet above mean sea level (msl). Figure 2, to the rear of the text of this report, shows historic topographic contours of the site and site area.

2.2 PROPOSED DEVELOPMENT

It is our understanding that proposed development will consist of single-family residential structures and associated streets. For this evaluation it was assumed that the structures will be one (1)- to two (2)-story, wood-framed residences situated atop slab-on-ground

foundations. As site development planning progresses and plans become available, the plans should be provided to GeoTek for review and comment.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

Field exploration was conducted on March 24, 2014 and consisted of excavating four (4) exploratory borings, one (1) to a maximum depth of approximately 50 feet. Approximate locations of the exploratory borings are shown on the Boring Location Map (see Figure 3). A geologist from our firm logged the excavations and collected samples for use in the laboratory testing. The logs of the exploratory borings are included in Appendix A.

3.2 LABORATORY TESTING

Laboratory testing was performed on selected soil samples collected during the field exploration. The purpose of the laboratory testing was to help confirm the field classification of the soil materials encountered and to evaluate their physical and chemical properties for use in the engineering design and analysis. Results of the laboratory testing program, along with a brief description and relevant information regarding testing procedures, are included in Appendix B.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is situated in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. Basically, it extends roughly 975 miles from the north and northeasterly adjacent the Transverse Ranges geomorphic province to the tip of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zones trend northwest-southeast and are found in the near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province.

More specific to the subject property, the site is located in an area geologically mapped to be underlain by Quaternary age alluvium (Dibblee, 2003). No faults are shown in the immediate site vicinity on the maps reviewed for the area.

4.2 GENERAL SOIL CONDITIONS

A brief description of the earth materials encountered during our subsurface exploration is presented in the following section. Based on our site reconnaissance, field observations, our exploratory excavations and review of published geologic maps the subject site area is locally underlain by alluvial deposits. Although not encountered during our subsurface exploration, localized accumulations of undocumented artificial fill materials may exist onsite.

4.2.1 Alluvium

Alluvial deposits were observed to underlie the project site at the explored locations. The alluvial deposits encountered generally consist of sand, silty sand and clayey sand, which is mostly gray brown to red brown, dry to slightly moist, and medium dense to dense (see logs in Appendix A).

Based on the results of the laboratory testing performed on a sample of the near surface onsite materials, these near surface alluvial materials indicated a "low" expansion potential ($21 \leq EI \leq 50$) when tested and classified in accordance with ASTM D 4829. It is likely that most of the onsite materials encountered during grading and construction will have a "very low" to "low" expansion potential. Test results are shown in Appendix B.

4.3 SURFACE WATER AND GROUNDWATER

4.3.1 Surface Water

Surface water was not observed during our site visit. If encountered during earthwork construction, surface water on this site is the result of precipitation or possibly some minor surface run-off from immediately surrounding properties. Overall site area drainage is generally in a southerly direction, as directed by site topography. Provisions for surface drainage will need to be accounted for by the project civil engineer.

4.3.2 Groundwater

Groundwater was encountered in one (1) of our exploratory excavations (Boring B-1) at a depth of approximately 31 feet below ground surface (bgs) (see logs in Appendix A). Perched groundwater or localized seepage can occur due to variations in rainfall, irrigation practices, and other factors not evident at the time of this investigation

4.4 FAULTING AND SEISMICITY

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an *"Alquist-Priolo"* Earthquake Fault Zone or a Special Studies Zone (CGS, 1974; Bryant and Hart, 2007). No faults are identified on geologic maps readily available and reviewed by this firm for the immediate study area. The County of Riverside has designated the site as having a "low" potential for liquefaction, as being "susceptible" to subsidence and not within ½ mile of a Riverside County designated fault zone.

4.4.1 Seismic Design Parameters

The site is located at approximately 33.9255 Latitude and -117.2231 Longitude. Site spectral accelerations (Ss and S_1), for 0.2 and 1.0 second periods for a Class "D" site, were determined from the USGS Website, Earthquake Hazards Program, U.S. Seismic Design Maps for Risk-Targeted Maximum Considered Earthquake (MCE_R) Ground Motion Response Accelerations for the Conterminous 48 States by Latitude/Longitude. The results are presented in the following table:

SITE SEISMIC PARAMETERS	
Mapped 0.2 sec Period Spectral Acceleration, S_s	1.663g
Mapped 1.0 sec Period Spectral Acceleration, S_1	0.724g
Site Coefficient for Site Class "D", F_a	1.0
Site Coefficient for Site Class "D", F_v	1.5
Maximum Considered Earthquake Spectral Response Acceleration for 0.2 Second, S_{MS}	1.663g
Maximum Considered Earthquake Spectral Response Acceleration for 1.0 Second, S_{M1}	1.087g
5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, S_{DS}	1.109g
5% Damped Design Spectral Response Acceleration Parameter at 1 second, S_{D1}	0.724g

4.5 LIQUEFACTION/SEISMIC SETTLEMENT

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, consolidation and settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction has

developed, the effects can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures.

The liquefaction potential on this site is considered to be low due to the dense nature of the underlying materials and overall material types.

4.6 OTHER SEISMIC HAZARDS

Evidence of ancient landslides or slope instabilities at this site was not observed during our investigation as the topography of the site is relatively flat. Thus, the potential for landslides is considered negligible.

The potential for secondary seismic hazards such as seiche and tsunami are considered to be remote due to site elevation and distance from an open body of water.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Development of the site appears feasible from a geotechnical viewpoint. Specific recommendations for site development provided herein will need to be further evaluated when development plans are provided for our review.

5.2 EARTHWORK CONSIDERATIONS

5.2.1 General

Earthwork and grading should be performed in accordance with the applicable grading ordinances of City of Moreno Valley, the 2013 California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix C outline general procedures and do not anticipate all site specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix C.

5.2.2 Site Clearing and Preparation

Site preparation should start with demolition/razing of any existing improvements and removal of deleterious materials and vegetation. These materials should be properly disposed of offsite. Any existing underground improvements, utilities and trench backfill should also be removed or be further evaluated as part of site development operations.

5.2.3 Remedial Grading

Prior to placement of fill materials, the upper loose and compressible materials should be removed for structural site areas. Additionally, all undocumented artificial fill materials should be removed for structural site areas (if encountered). The lateral extent of removals beyond the outside edge of all settlement sensitive structures/foundations should minimally be equivalent to that vertically removed. Depending on actual field conditions encountered during grading, locally deeper and/or shallower areas of removal may be necessary.

Removal depths a minimum of four (4) feet across the site are recommended. At a minimum, removal bottoms in alluvial areas should extend down to relatively uniform material which is not visibly porous. Removal bottoms should also be tested to have a minimum in-place relative compaction of at least 85%.

At a minimum, any proposed cut lots and the cut portion(s) of any transition building pad areas should be overexcavated a minimum of three (3) feet below existing grades or a minimum of one (1) foot below the bottom of the deepest proposed footing, whichever is deeper, if not already mitigated by the removal recommendations provided above. Overexcavations should extend a minimum of five (5) feet outside the proposed building envelope(s), or at a 1:1 projection to a suitable removal bottom. The intent of the recommended overexcavation is to support the improvements on engineered fill with relatively uniform engineering characteristics and decrease the potential for future differential settlement.

The bottom of all removals should be scarified to a minimum depth of eight (8) inches, brought to at or above optimum moisture content, and then compacted to minimum project standards prior to fill placement. The remedial excavation bottoms of should be observed by a GeoTek representative prior to scarification. The resultant voids from remedial grading/overexcavation should be filled with materials placed in accordance with Section 5.2.4 Engineered Fill of this report.

5.2.4 Engineered Fill

Onsite materials are generally considered suitable for reuse as engineered fill provided they are free from vegetation, roots, and rock/concrete or hard lumps greater than six (6) inches in maximum dimension. The earthwork contractor should have the proposed excavated and stockpiled materials to be used as engineered fill at this project approved by the soils engineer prior to placement.

Engineered fill materials should be moisture conditioned to above optimum moisture content and compacted in horizontal lifts not exceeding eight (8) inches in loose thickness to a minimum relative compaction of 90% as determined in accordance with laboratory test procedure ASTM D 1557.

If fill is being placed on slopes steeper than 5:1 (h:v), the fill should be properly benched into the existing slopes and a sufficient size keyway shall be constructed in accordance with the recommendations of the soils engineer.

5.2.5 Excavatability and Oversized Materials

The alluvial materials should excavate easily using conventional heavy equipment in good working condition and modern earthmoving methods. Oversized materials (larger than six (6) inches in dimension) were not encountered during this investigation and are not anticipated to be encountered during rough grading. If encountered, placement of such materials may require special handing. No oversized rocks should be placed within the building footprint or street areas. Oversized materials may be placed in open space, landscape areas, if acceptable to the local agency. Alternatively, the rocks should be reduced in size, removed from the site, or handled as discussed in Appendix C.

Additional recommendations may be necessary based on exposed conditions during earthwork construction. General grading guidelines are included in Appendix C at the back of this report.

5.2.6 Shrinkage and Subsidence

Several factors will impact earthwork balancing on the site, including shrinkage, subsidence, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage and subsidence are primarily dependent upon the degree of compactive effort achieved during construction, depth of fill and underlying site conditions. For planning purposes, a shrinkage factor of up to 5 to 10 percent may be considered for the

materials requiring removal and recompaction. Subsidence on the order of approximately 0.1 foot may occur. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of site earthwork construction.

5.2.7 Trench Excavations and Backfill

Temporary excavations within the onsite materials should be stable at 1:1 inclinations for short durations during construction, and where cuts do not exceed 10 feet in height. Temporary cuts to a maximum height of 4 feet can be excavated vertically.

Trench excavations should conform to Cal-OSHA regulations. The contractor should have a competent person, per OSHA requirements, on site during construction to observe conditions and to make the appropriate recommendations.

Utility trench backfill should be compacted to at least 90% relative compaction (as determined per ASTM D 1557). Under-slab trenches should also be compacted to project specifications. Where applicable, based on jurisdictional requirements, the top 12 inches of backfill below subgrade for road pavements should be compacted to at least 95 percent relative compaction. Onsite materials may not be suitable for use as bedding material, but should be suitable as backfill provided particles larger than 6± inches are removed.

Compaction should be achieved with a mechanical compaction device. Ponding or jetting of trench backfill is not recommended. If backfill soils have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

5.3 DESIGN RECOMMENDATIONS

5.3.1 Foundation Design Criteria

Preliminary foundation design criteria, in general conformance with the 2013 CBC, are presented herein. These are typical design criteria and are not intended to supersede the design by the structural engineer.

Based on the results of our recent testing, the anticipated onsite soils near subgrade may be preliminary classified as having an expansion potential "low" ($21 \leq EI \leq 50$) in accordance with ASTM D 4829. Presented below are foundation design parameters for the proposed single-family residences.

Foundations should be designed in accordance with the *2013 California Building Code* (CBC).

Additional testing of the soils should be performed during construction to evaluate the as-graded conditions. Final foundation recommendations will be based on the as-graded soils conditions.

MINIMUM DESIGN REQUIREMENTS

DESIGN PARAMETER	0≤EI≤20	21≤EI≤50
Foundation Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent grade)	One-Story Exterior Footing – 12" One-Story Interior Footing – 12" Two-Story Exterior Footing – 18" Two-Story Interior Footing – 18"	One-Story Exterior Footing – 12" One-Story Interior Footing – 12" Two-Story Exterior Footing – 18" Two-Story Interior Footing – 18"
Minimum Foundation Width	One-Story - 12" Two-Story – 15"	One-Story - 12" Two-Story – 15"
Minimum Slab Thickness (actual)	4"	4"
Minimum Slab Reinforcing	No. 3 rebar 24" on-center, placed in the middle 1/3 of the slab	No. 3 rebar 24" on-center, placed in the middle 1/3 of the slab
Minimum Footing Reinforcement	Two (2) No. 4 Reinforcing Bars-one (1) top and one (1) bottom	Two (2) No. 4 Reinforcing Bars-one (1) top and one (1) bottom
Effective Plasticity Index	N/A	10
Presaturation of Subgrade Soil (Percent of Optimum/Depth in Inches)	100% to a depth of 12 inches	110% to a depth of 12 inches

It should be noted that the above recommendations are based on soil support characteristics only. The structural engineer should design the slab and beam reinforcement based on actual loading conditions. If it is desired to utilize post-tensioned foundations, then those recommendations can be provided at the appropriate time.

5.3.1.1 An allowable bearing capacity of 1500 pounds per square foot (psf) may be used for design of continuous and perimeter footings 12 inches deep and 12 inches wide, and pad footings 24 inches square and 12 inches deep. This value may be increased by 200 pounds per square foot for each additional 12 inches in depth and 100 pounds per square foot for each additional 12 inches in width to a maximum value of 2000 psf. Additionally, an increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind loads).

5.3.1.2 Based on our experience in the area, foundations may experience a total settlement of approximately one (1) inch as a result of structural loading. Differential settlement of up to one-half of the total settlement over a horizontal distance of 40 feet could result

from structural loading. The foundation engineer should incorporate these settlement estimates from the structural loads into the design of the slab, as appropriate.

5.3.1.3 The passive earth pressure may be computed as an equivalent fluid having a density of 150 psf per foot of depth, to a maximum earth pressure of 2,000 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.30 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

5.3.1.4 A grade beam, a minimum of 12 inches wide and 12 inches deep, should be utilized across large entrances. The base of the grade beam should be at the same elevation as the bottom of the adjoining footings.

5.3.1.5 A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2013 California Green Building Standards Code (CALGreen) Section 4.505.2 and the 2013 CBC Section 1907.1 It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g. stake penetrations, tears, punctures from walking on the aggregate layer, etc.). These occurrences should be limited as much as possible during construction.

Thicker membranes are generally more resistant to accidental puncture that thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6 mil vapor retarder membrane, it is GeoTek's opinion that a minimum 10 mil membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e. thickness, composition, strength and permeance) to achieve the desired performance level. Consideration should be given to consulting with an individual possessing specific expertise in this area for additional evaluation.

5.3.1.6 We recommend that control joints be placed in two directions spaced approximately 24 to 36 times the thickness of the slab in inches. These joints are a widely accepted means to control cracks and should be reviewed by the project structural engineer.

5.3.2 Miscellaneous Foundation Recommendations

5.3.2.1 To minimize moisture penetration beneath the slab on grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.

5.3.2.2 Isolated exterior footings should be tied back to the main foundation system in two orthogonal directions.

5.3.2.3 Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

5.3.2.4 Unsuitable soil removals along the property lines will likely be restricted due to adjacent improvements. Special considerations will be required for foundation elements in these areas. Such considerations may include deepening of foundations, reduced bearing capacity, or other measures. This issue should be further evaluated once site plans become available.

5.3.3 Foundation Set Backs

Where applicable, the following setbacks should apply to all foundations. Any improvements not conforming to these setbacks may be subject to lateral movements and/or differential settlements:

- The outside bottom edge of all footings should be set back a minimum of H/3 (where H is the slope height) from the face of any descending slope. The setback should be at least 7 feet and need not exceed 40 feet.
- The bottom of all footings for structures near retaining walls should be deepened so as to extend below a 1:1 projection upward from the bottom inside edge of the wall stem. This applies to the existing retaining walls along the perimeter, if they are to remain.
- The bottom of any existing foundations for structures should be deepened so as to extend below a 1:1 projection upward from the bottom of the nearest excavation.

5.3.4 Soil Corrosivity

The soil resistivity at this site was tested in the laboratory on a sample collected during the field investigation. The results of the testing indicate that the onsite soils are considered "moderately corrosive" to buried metal in accordance with current standards used by corrosion engineers. These characteristics are considered typical of soils commonly found in southern California. We recommend that a corrosion engineer be consulted to provide recommendations for protection of buried metal at this site.

5.3.5 Soil Sulfate Content

The sulfate content was determined in the laboratory for onsite soil sample. The results indicate that the water soluble sulfate range is less than 0.1 percent by weight, which is considered "not applicable" (negligible) as per Table 4.2.1 of ACI 318.

5.4 RETAINING WALL DESIGN AND CONSTRUCTION

5.4.1 General Design Criteria

Recommendations presented herein may apply to typical masonry or concrete vertical retaining walls to a maximum height of 10 feet. Additional review and recommendations should be requested for higher walls.

Retaining wall foundations embedded a minimum of 18 inches into engineered fill or dense formational materials should be designed using an allowable bearing capacity of 1500 psf. An increase of one-third may be applied when considering short-term live loads (e.g. seismic and wind loads). The passive earth pressure may be computed as an equivalent fluid having a density of 200 psf per foot of depth, to a maximum earth pressure of 2,000 psf. A coefficient of friction between soil and concrete of 0.25 may be used with dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

An equivalent fluid pressure approach may be used to compute the horizontal active pressure against the wall. The appropriate fluid unit weights are given in the table below for specific slope gradients of retained materials.

Surface Slope of Retained Materials (H:V)	Equivalent Fluid Pressure (PCF) Select Backfill*
Level	35
2:1	55

*Select backfill should consist of imported sand other approved materials with an SE>30 and an EI≤20.

The above equivalent fluid weights do not include other superimposed loading conditions such as expansive soil, vehicular traffic, structures, seismic conditions or adverse geologic conditions.

Additional lateral forces can be induced on retaining walls during an earthquake. For level backfill and a Site Class "D", the minimum earthquake-induced force (F_{eq}) should be $20H^2$ (lbs/linear foot of wall) for cantilever walls. This force can be assumed to act at a distance of 0.6H above the base of the wall, where "H" is the height of the retaining wall measured from the base of the footing (in feet).

5.4.2 Wall Backfill and Drainage

Wall backfill should include a minimum one (1) foot wide section of ¾ to 1-inch clean crushed rock (or approved equivalent). The rock should be placed immediately adjacent to the back of wall and extend up from the backdrain to within approximately 12 inches of finish grade. The upper 12 inches should consist of compacted onsite materials. If the walls are designed using the "select" backfill design parameters, then the "select" materials shall be placed within the active zone as defined by a 1:1 (H:V) projection from the back of the retaining wall footing up to the retained surface behind the wall. Presence of other materials might necessitate revision to the parameters provided and modification of wall designs.

The backfill materials should be placed in lifts no greater than eight (8) inches in thickness and compacted at 90% relative compaction in accordance with ASTM Test Method D 1557. Proper surface drainage needs to be provided and maintained. Water should not be allowed to pond behind retaining walls. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.

Retaining walls should be provided with an adequate pipe and gravel back drain system to reduce the potential for hydrostatic pressures to develop. A 4-inch diameter perforated collector pipe (Schedule 40 PVC, or approved equivalent) in a minimum of one cubic foot per lineal foot of 3/8 to one inch clean crushed rock or equivalent, wrapped in filter fabric should be placed near the bottom of the backfill and be directed (via a solid outlet pipe) to an

appropriate disposal area. Maximum horizontal spacing between drain outlets should be 100 feet.

Walls from two (2) to four (4) feet in height may be drained using localized gravel packs behind weep holes at 10 feet maximum spacing (e.g. approximately 1.5 cubic feet of gravel in a woven plastic bag). Weep holes should be provided or the head joints omitted in the first course of block extended above the ground surface. However, nuisance water may still collect in front of the wall.

Drain outlets should be maintained over the life of the project and should not be obstructed or plugged by adjacent improvements.

5.4.3 Restrained Retaining Walls

Any retaining wall that will be restrained prior to placing backfill or walls that have male or reentrant corners should be designed for at-rest soil conditions using an equivalent fluid pressure of 60 pcf (select backfill), plus any applicable surcharge loading. For areas having male or reentrant corners, the restrained wall design should extend a minimum distance equal to twice the height of the wall laterally from the corner, or as otherwise determined by the structural engineer.

5.5 CONCRETE CONSTRUCTION

5.5.1 General

Concrete construction should follow the 2013 CBC and ACI guidelines regarding design, mix placement and curing of the concrete. If desired, we could provide quality control testing of the concrete during construction.

5.5.2 Concrete Mix Design

As indicated in Section 5.3.5, no special concrete mix design is required by Code to resist sulfate attack based on the existing test results. However, additional testing should be performed during grading so that specific recommendations can be formulated based on the as-graded conditions.

5.5.3 Concrete Flatwork

Exterior concrete flatwork (patios, walkways, driveways, etc.) is often some of the most visible aspects of site development. They are typically given the least level of quality control, being considered "non-structural" components. Cracking of these features is fairly common due to

various factors. While cracking is not usually detrimental, it is unsightly. We suggest that the same standards of care be applied to these features as to the structure itself.

Flatwork may consist of 4 inch thick concrete and the use of reinforcement is suggested. The project structural engineer should provide final design recommendations.

5.5.4 Concrete Performance

Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than 1/8 inch in width. Most cracks in concrete while unsightly do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, also is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek suggests that control joints be placed in two directions and located a distance apart roughly equal to 24 to 36 times the slab thickness.

5.6 POST CONSTRUCTION CONSIDERATIONS

5.6.1 Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff, and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. The soils should be maintained in a solid to semi-solid state as defined by the materials Atterberg Limits. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not recommended. An abatement program to control ground-burrowing rodents

should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundation. This type of landscaping should be avoided. If used, then extreme care should be exercised with regard to the irrigation and drainage in these areas. Waterproofing of the foundation and/or subdrains may be warranted and advisable. We could discuss these issues, if desired, when plans are made available.

5.6.2 Drainage

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground. Pad drainage should be directed toward approved area(s) and not be blocked by other improvements.

It is the owner's responsibility to maintain and clean drainage devices on or contiguous to their lot. In order to be effective, maintenance should be conducted on a regular and routine schedule and necessary corrections made prior to each rainy season.

5.7 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

We recommend that site grading, specifications, retaining wall plans and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. Additional recommendations may be necessary based on these reviews. We also recommend that GeoTek representatives be present during site grading and foundation construction to check for proper implementation of the geotechnical recommendations. The owner/developer should have GeoTek's representative perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement, and collect soil samples for laboratory testing when necessary.
- Observe the fill for uniformity during placement including utility trenches.

- Test the fill for field density and relative compaction.
- Observe and probe foundation excavations to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, which can comply with the requirements of the governmental agencies having jurisdiction over the project. We recommend that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

6. LIMITATIONS

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in Section 5 of this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of our evaluation is limited to the area explored that is shown on the Boring Location Map (Figure 2). This evaluation does not and should in no way be construed to encompass any areas beyond the specific area of proposed construction as indicated to us by the client. Further, no evaluation of any existing site improvements is included. The scope is based on our understanding of the project and the client's needs, our proposal (Proposal No. P3-0302114) dated March 14, 2014 and geotechnical engineering standards normally used on similar projects in this region.

The materials observed on the project site appear to be representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Since our recommendations are based on the site conditions observed and encountered, and laboratory testing, our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

7. SELECTED REFERENCES

Bryant, W.A., and Hart, E.W., 2007, Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps, California Geological Survey: Special Publication 42.

California Code of Regulations, Title 24, 2013 "California Building Code," 3 volumes.

Dibblee, Jr., T.W., 2003, "Geologic Map of the Sunnymead/South ½ of Redlands Quadrangles, San Bernardino and Riverside Counties, California," Dibblee Geology Center Map #DF-110, map scale 1:24000.

GeoTek, Inc., In-house proprietary information.

Seismic Design Values for Buildings (http://geohazards.usgs.gov/designmaps/us/application.php).

Frontier Enterprises
APN 479-140-022
City of Moreno Valley
Riverside County, California

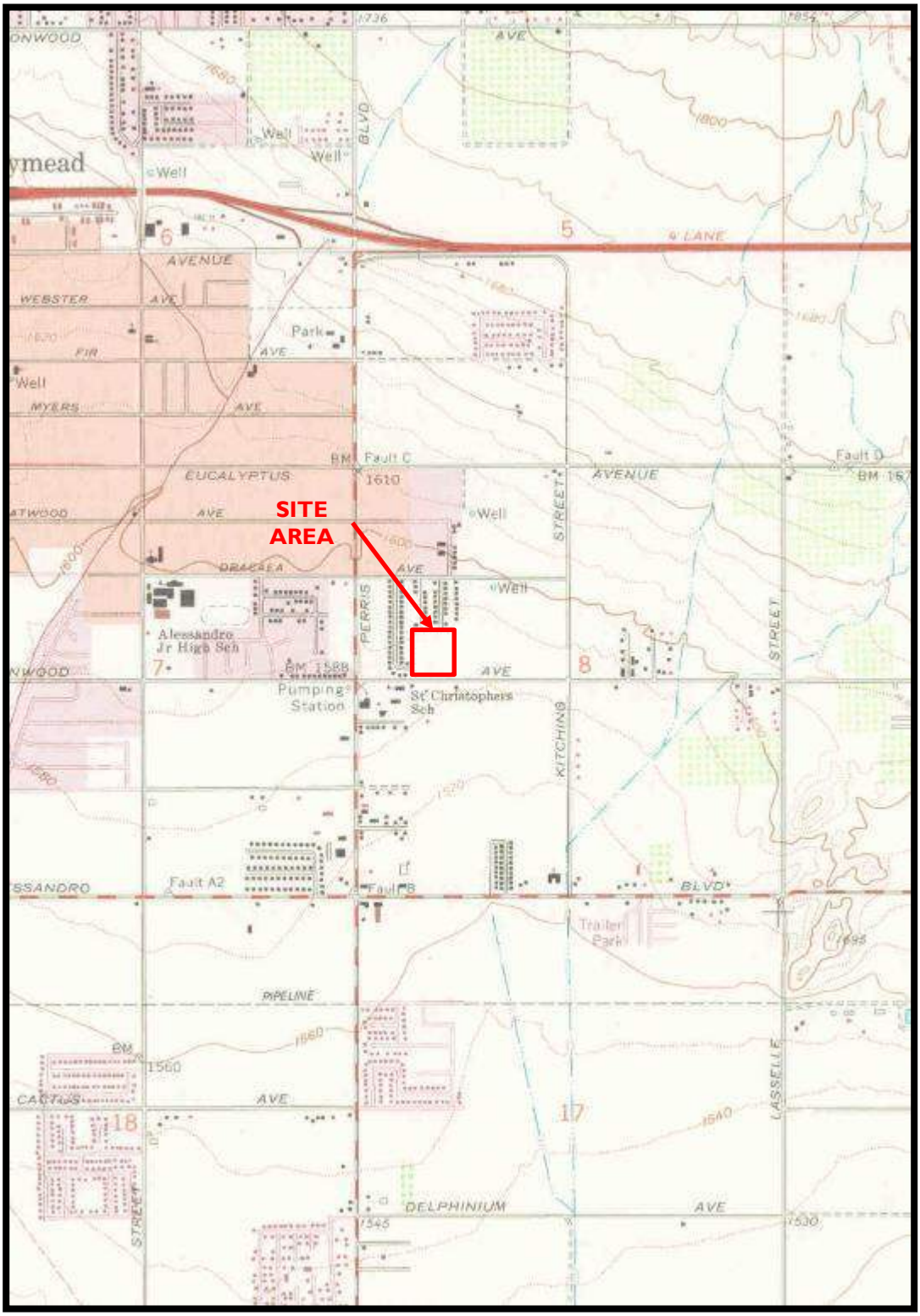
GeoTek Project No. 1165-CR3

N

Figure 1

Site Location Map

GEOTEK



Frontier Enterprises
APN 479-140-022
City of Moreno Valley
Riverside County, California

GeoTek Project No. 1165-CR3

N

Modified from USGS
7.5 Topographic Map

Figure 2

General Site Topography Map

GEOTEK

Frontier Enterprises
APN 479-140-022
City of Moreno Valley
County of Riverside, California

GeoTek Project No. 1165-CR3

N

Figure 3

Boring Location Map

GEOTEK

APPENDIX A

LOGS OF EXPLORATORY BORINGS

APN 479-140-022
City of Moreno Valley, County of Riverside, California
Project No. 1165-CR3

GEOTEK

A - FIELD TESTING AND SAMPLING PROCEDURES

The Modified Split-Barrel Sampler (Ring)

The Ring sampler is driven into the ground in accordance with ASTM Test Method D 3550. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

Bulk Samples (Large)

These samples are normally large bags of representative earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

B - BORING LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings:

SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip
C:	Contact line
……..	Dashed line denotes USCS material change
_____	Solid Line denotes unit / formational change
_____	Thick solid line denotes end of boring

(Additional denotations and symbols are provided on the log of boring)

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Frontier Enterprises	**DRILLER:**	2R Drilling	**LOGGED BY:**	AMS
PROJECT NAME:	APN 479-140-022	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jerry
PROJECT NO.:	1165-CR3	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	3/24/2014

BORING NO.: B-1

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
				SM	**Alluvium:** 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			SH, EI, MD, SR
5		35 50-4.5"	B1-1		5': Silty f-m SAND with some clay, red brown, slightly moist, dense	5.0	130.9	HC
10		50	B1-2		10': SAME	6.8	112.1	
15		11 19 22	B1-3		15': SAME	18.1	109.4	
20		50	B1-4		20': SAME	8.7	119.7	
25		43 50-5.5"	B1-5		25': Silty f-c SAND, gray brown to red brown, slightly moist, dense			
30 ▽		40 50-4.5"	B1-6	SP	30': m-c SAND with gravel, gray brown, wet, dense			

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Frontier Enterprises	**DRILLER:**	2R Drilling	**LOGGED BY:**	AMS
PROJECT NAME:	APN 479-140-022	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jerry
PROJECT NO.:	1165-CR3	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	3/24/2014

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	BORING NO.: B-1 (continued) / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
					Alluvium (continued)			
40	Ring	18 50-5.5"	B1-7	SM	40': Silty f-c SAND, gray brown to red brown, wet, dense			
45	Ring	36 50-5"	B1-8		45': SAME			
50	Ring	18 50-2.5"	B1-9		50': Silty f-c SAND with trace gravel, red brown to gray brown, wet, dense			
					BORING TERMINATED AT 50 FEET			
					No groundwater encountered Boring backfilled with cuttings			
55								
60								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Frontier Enterprises	**DRILLER:**	2R Drilling	**LOGGED BY:**	AMS
PROJECT NAME:	APN 479-140-022	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jerry
PROJECT NO.:	1165-CR3	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	3/24/2014

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	BORING NO.: B-2 / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				SM	**Alluvium:** 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			
5		22 24 18	B2-1		5': Clayey silty f-c SAND, red brown, slightly moist, dense	7.9	130.0	
10		33 46 48	B2-2		10': Silty f-c SAND, gray to red brown, slightly moist, dense	10.7	127.9	
15		13 27 33	B2-3	SC	15': Clayey f-c SAND, red, slightly moist, dense	13.8	122.5	
20		16 22 25	B2-4		20': SAME	9.1	126.1	
					BORING TERMINATED AT 21.5 FEET No groundwater encountered Boring backfilled with cuttings			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Frontier Enterprises	**DRILLER:**	2R Drilling	**LOGGED BY:**	AMS
PROJECT NAME:	APN 479-140-022	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jerry
PROJECT NO.:	1165-CR3	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	3/24/2014

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	BORING NO.: B-3 / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				SM	**Alluvium:** 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			
5		15 14 16	B3-1		5': Silty fine SAND, medium brown, slightly moist, dense	9.6	109.7	
10		20 50-4.5"	B3-2		10': Silty fine SAND, orange brown mottled, slightly moist, dense	12.5	124.2	HC
15		24 47 50-5"	B3-3	SC	15': Silty clayey f-c SAND, red, slightly moist, dense	14.8	120.2	
20		21 50	B3-4		20': SAME	13.2	122.2	
					BORING TERMINATED AT 20 FEET No groundwater encountered Boring backfilled with cuttings			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Frontier Enterprises	**DRILLER:**	2R Drilling	**LOGGED BY:**	AMS
PROJECT NAME:	APN 479-140-022	**DRILL METHOD:**	8" Hollow Stem	**OPERATOR:**	Jerry
PROJECT NO.:	1165-CR3	**HAMMER:**	Auto 140#/30"	**RIG TYPE:**	CME 75
LOCATION:	See Boring Location Map			**DATE:**	3/24/2014

BORING NO.: B-4

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
				SM	**Alluvium:** 0': Silty f-m SAND with some clay, red brown, slightly moist, loose to medium dense			
5	▬	18 27 28	B4-1		5': Silty fine SAND, medium brown, slightly moist, dense	12.1	125.1	
10	▬	24 43 50-5.5"	B4-2	SC	10': Silty clayey f-c SAND, red brown, slightly moist, dense	10.4	128.1	
15	▬	43 50-3"	B4-3		15': SAME	13.1	122.0	
20	▬	12 23 42	B4-4		20': SAME	12.3	124.3	
					BORING TERMINATED AT 21.5 FEET No groundwater encountered Boring backfilled with cuttings			
25								
30								

LEGEND

Sample type: ▬ ---Ring ▬ ---SPT ╱ ---Small Bulk ☒ ---Large Bulk ☐ ---No Recovery ▽ ---Water Table

Lab testing:

AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test
SR = Sulfate/Resisitivity Test	SH = Shear Test	HC= Consolidation	MD = Maximum Density

APPENDIX B

RESULTS OF LABORATORY TESTING

APN 479-140-022
City of Moreno Valley, County of Riverside, California
Project No. 1165-CR3

GEOTEK

SUMMARY OF LABORATORY TESTING

Classification

Soils were classified visually in general accordance to the Unified Soil Classification System (ASTM Test Method D 2487). The soil classifications are shown on the logs of exploratory test borings in Appendix A.

Moisture-Density Relations

Laboratory testing was performed on a selected sample collected during the recent subsurface exploration. The laboratory maximum dry density and optimum moisture content for the sample tested was determined in general accordance with test method ASTM Test Method D 1557. The results are included herein.

Expansion Index

Expansion Index testing was performed in general accordance with ASTM Test Method D 4829. The test results are included herein.

Consolidation

Consolidation testing was performed on selected samples of the site soils according to ASTM Test Method D 2435. The results of this testing is presented herein.

Direct Shear Test

Shear testing was performed on a remolded sample of the site soil materials in general accordance with ASTM Test Method D 3080. The test results are included herein.

Sulfate Content, Resistivity and Chloride Content

Testing to determine the water-soluble sulfate content was performed by others in general accordance with California Test No. 417. Resistivity testing was completed by others in general accordance with California Test 643. Testing to determine the chloride content was performed by others in general accordance with California Test No. 422. The results of the testing are included herein.

Atterberg Limits

Laboratory testing to determine the liquid and plastic limits was performed in general accordance with ASTM D4318. The results of the testing are included herein.

GEOTEK

MOISTURE/DENSITY RELATIONSHIP

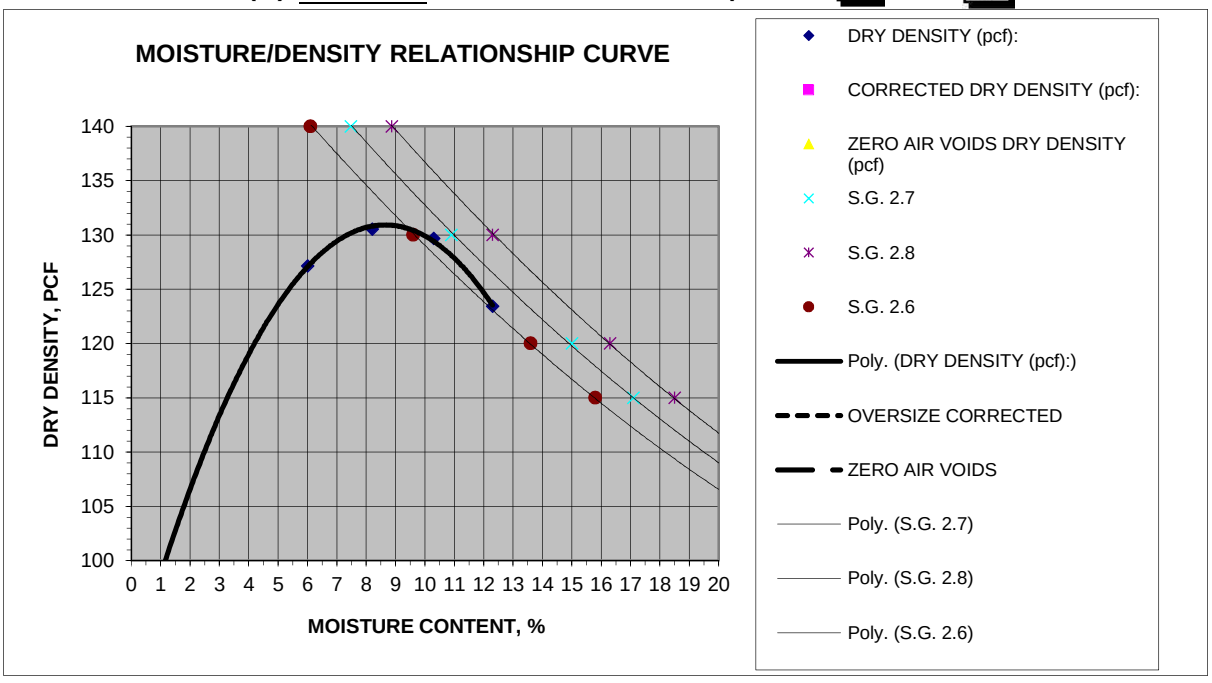
Client: Frontier Enterprises
Project: APN 479-140-022
Location: Moreno Valley
Material Type: Red Brown Silty Sand
Material Supplier:
Material Source:
Sample Location: B-1 @ 0-5'

Job No.: 1165-CR3
Lab No.: Corona

Sampled By: AMS
Received By: DI
Tested By: DI
Reviewed By:

Date Sampled: 24-Mar-14
Date Received: 24-Mar-14
Date Tested: 29-Mar-14
Date Reviewed: 8-Apr-14

Test Procedure: ASTM 1557 **Method:** A
Oversized Material (%): 0.0 **Correction Required:** [ ] yes [x] no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	131.0	**@ Optimum Moisture, %**	9.0
Corrected Maximum Dry Density, pcf		**@ Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

Classification:

Unified Soils Classification:
AASHTO Soils Classification:

GEOTEK

EXPANSION INDEX TEST

(ASTM D4829)

Client:	Frontier Enterprises	***Tested/ Checked By:***	DI Lab No Corona
Project Number:	1165-CR3	***Date Tested:***	3/31/2014
Project Location:	APN 479-140-022, Moreno Valley	***Sample Source:***	B-1 @ 0-5'
		Sample Description:	Silty Clayey Sand

Ring #:_____ Ring Dia. : 4.01" Ring Ht.1"

Loading weight: 5516. grams

DENSITY DETERMINATION

A	Weight of compacted sample & ring (gm)	778.3
B	Weight of ring (gm)	369.1
C	Net weight of sample (gm)	409.2
D	Wet Density, lb / ft3 (C*0.3016)	123.4
E	Dry Density, lb / ft3 (D/1.F)	**114.0**

SATURATION DETERMINATION

F	Moisture Content, %	8.2
G	Specific Gravity, assumed	2.64
H	Unit Wt. of Water @ 20°C, (pcf)	62.3
I	% Saturation	**48.9**

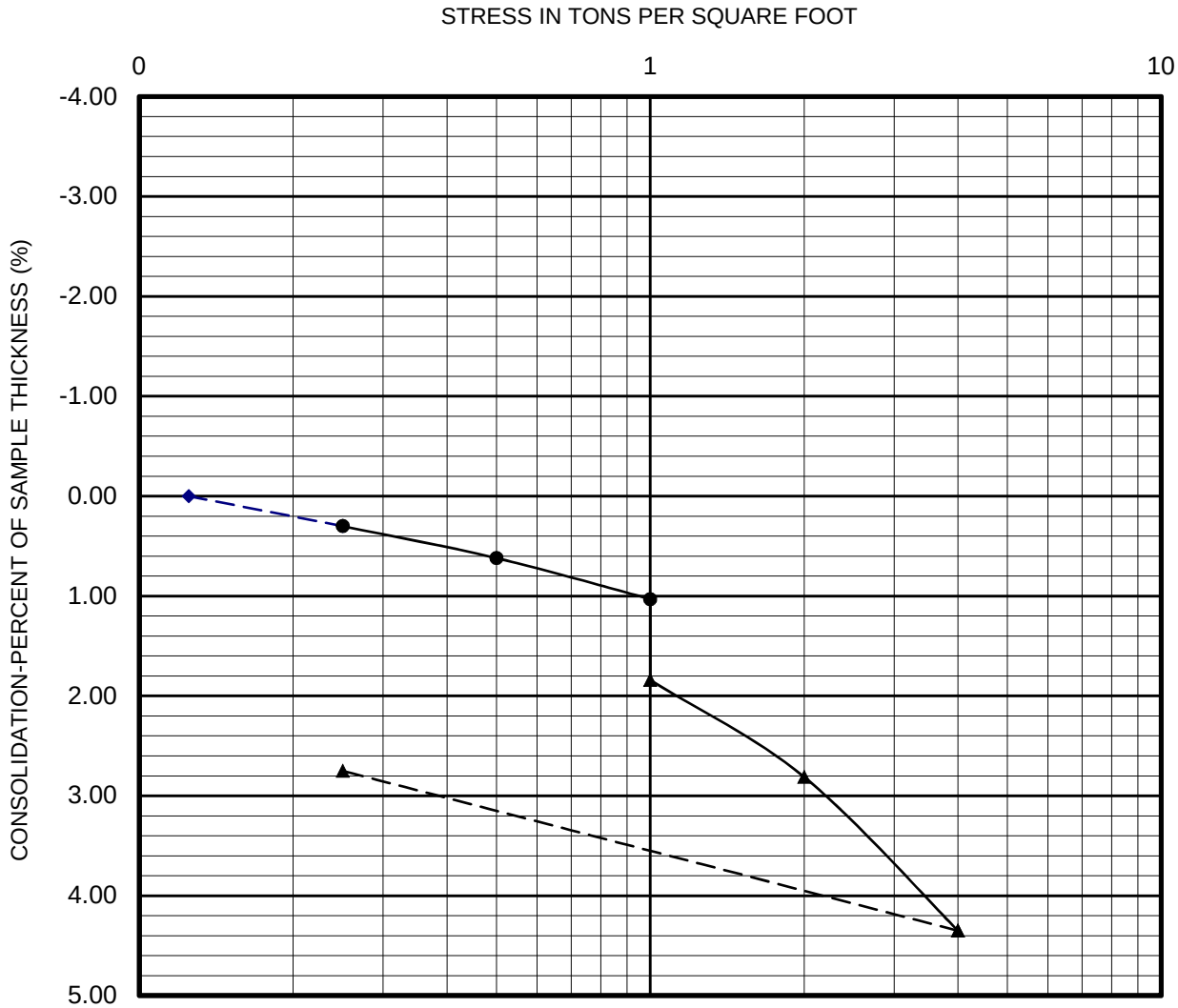
READINGS

DATE	TIME	READING	
3/31/2014	9:00	0.3270	Initial
	9:10	0.3270	10 min/Dry
	10:20	0.3510	
	12:10	0.3530	
4/1/2014	5:05	0.3540	Final

FINAL MOISTURE

Weight of wet sample & tare	Weight of dry sample & tare	Tare	% Moisture
555.5	494.8	150.1	**17.6%**

EXPANSION INDEX = 27



Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

GEOTEK

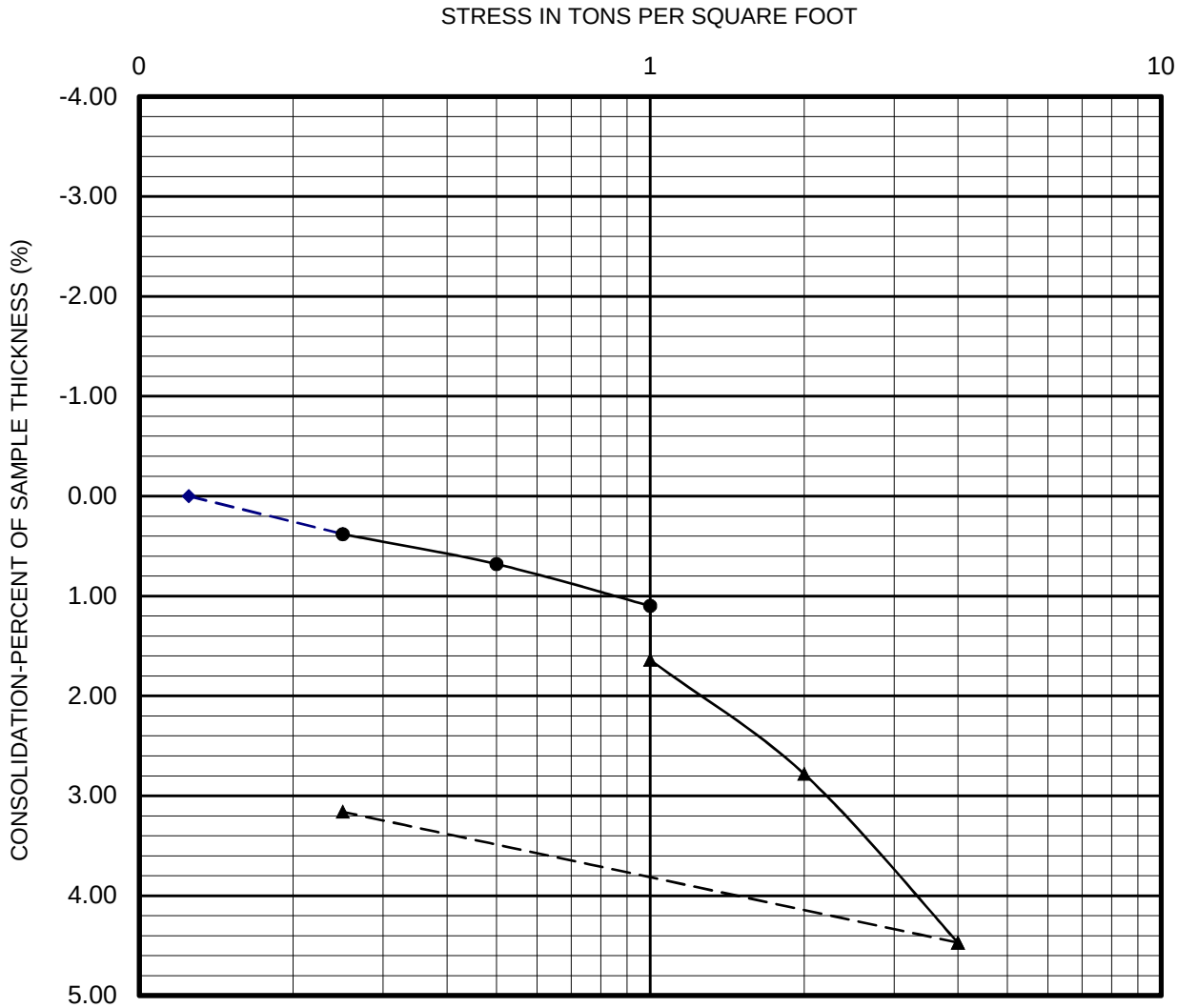
CHECKED BY: EHL	Lab: DI
PROJECT NO.: 1165-CR3	Date: 04/14

CONSOLIDATION REPORT

Sample: B-1 @ 5'

APN 479-140-022
Moreno Valley, California

Plate C-1



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

GEOTEK

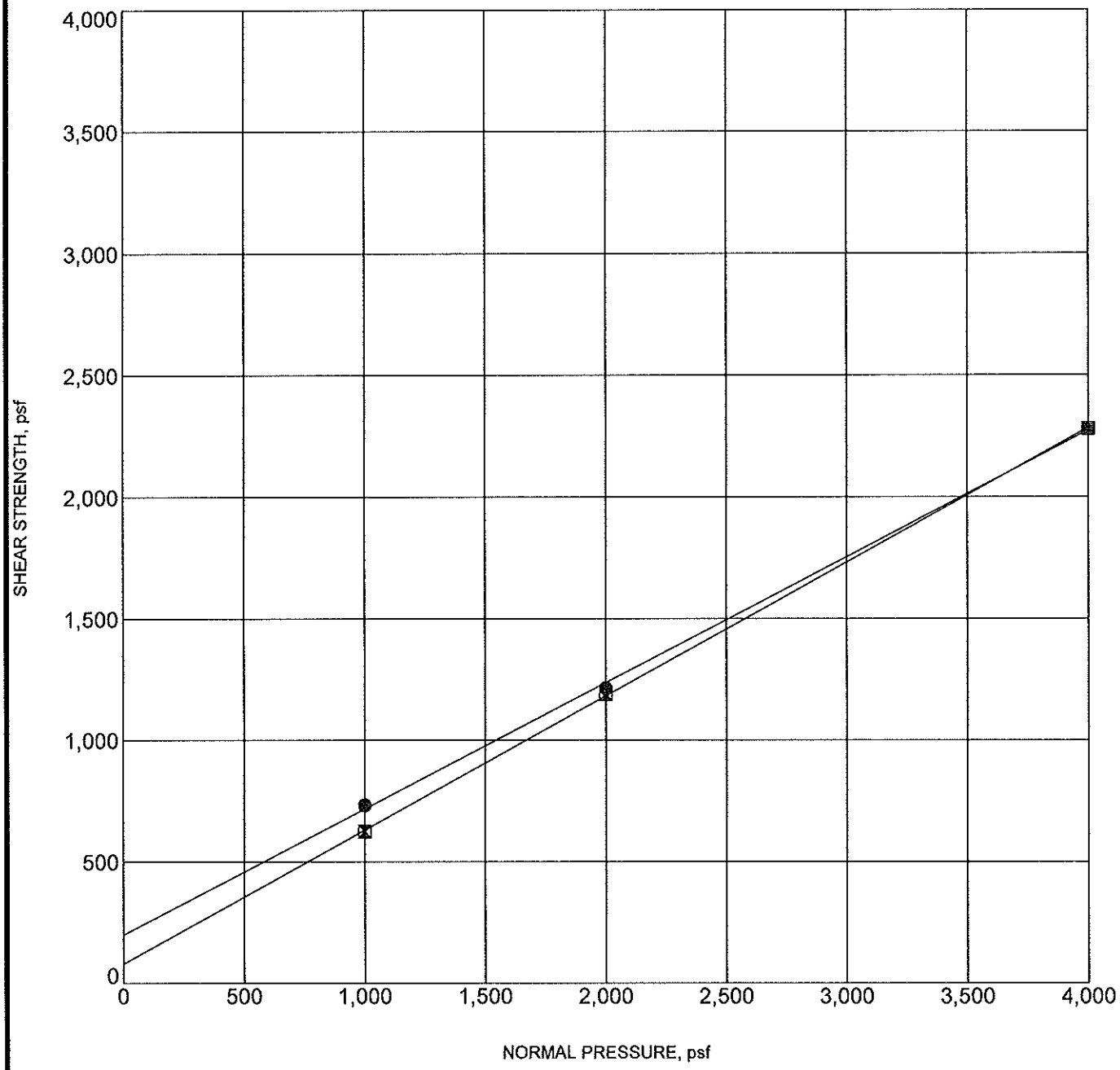
CHECKED BY: EHL	Lab: DI
PROJECT NO.: 1165-CR3	Date: 04/14

CONSOLIDATION REPORT

Sample: B-3 @ 10'

APN 479-140-022
Moreno Valley, California

Plate C-2



Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	B-1; 1165 CR-3	0.0	0-5 ft, Remolded, Peak Stress			198	27
⊠	B-1; 1165 CR-3	0.1	0-5 ft, Remolded, Ultimate Stress			78	29

TGR GEOTECHNICAL, INC.
3037 S. Harbor Blvd.
Santa Ana, CA
Telephone:
Fax:

DIRECT SHEAR TEST

Project Number: 10-2700

Project Name: GeoTek (1165-CR3)

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

GeoTek, Inc.
710 East Parkridge Avenue, Suite 105
Corona, California 92879

Date: April 4, 2014
QCI Project No.: 14-167-04h
Summarized by: ABK

Client: Frontier
W.O.: 1165-CR3
Project: Moreno Valley

Corrosivity Test Results

Sample ID	Depth (Feet)	pH CT-532 (643)	Chloride CT-422 (ppm)	Sulfate CT-417 (% By Weight)	Resistivity CT-532 (643) (ohm-cm)
B-1	0-5’	7.33	98	0.0035	2,900

APPENDIX C

GENERAL EARTHWORK GRADING GUIDELINES

APN 479-140-022
City of Moreno Valley, County of Riverside, California
Project No. 1165-CR3

GEOTEK

GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code, CBC (2013) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.
4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.

5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
    a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
    b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed unless otherwise specifically indicated in the text of this report.

2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
   a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
   b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
   a) They are not placed in concentrated pockets;
   b) There is a sufficient percentage of fine-grained material to surround the rocks;
   c) The distribution of the rocks is observed by, and acceptable to, our representative.
5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal. On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.
6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable

methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

UTILITY TRENCH CONSTRUCTION AND BACKFILL

Utility trench excavation and backfill is the contractors responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.

2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.
3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

JOB SAFETY

General

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

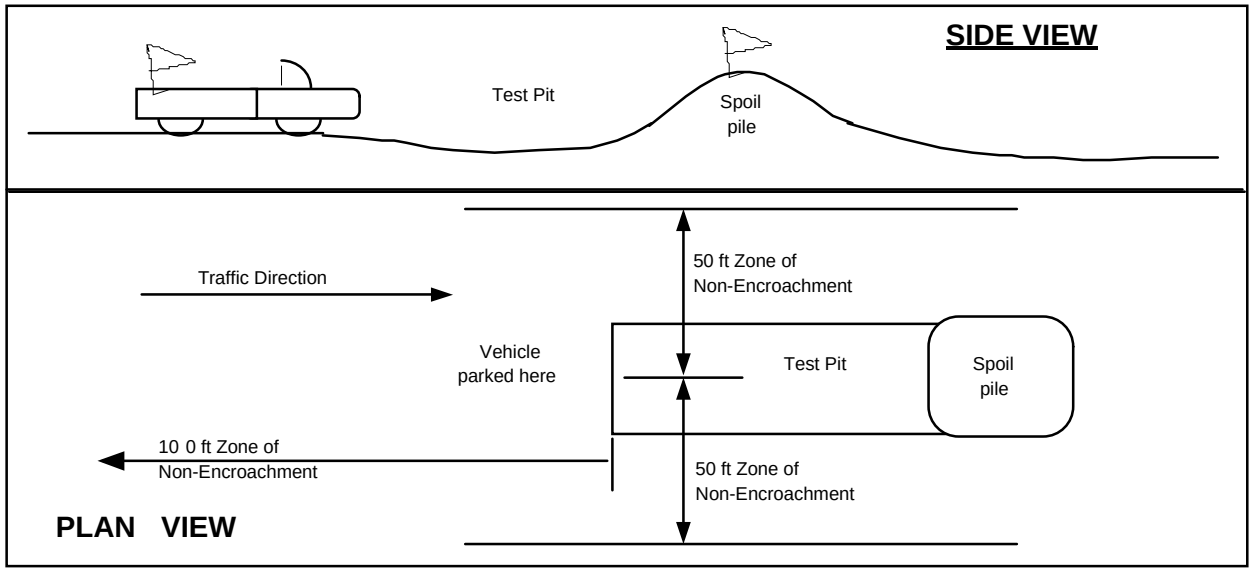
Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

TEST PIT SAFETY PLAN



Slope Tests

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractors representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

Procedures

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians attention and notify our project

manager or office. Effective communication and coordination between the contractors' representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

Appendix 4: Historical Site Conditions

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

The site consists of an almost square shaped parcel, approximately 9.4 acres in size. The site is currently undeveloped and appears to have been graded in the past. Ground surface cover consists of exposed soil.

The site topography appears to have been a low spot at the southeast corner of the property. There is an estimated 6 feet of elevation differential across the site. The existing flow drains into an existing inlet that is in the public right-of-way just north of Cottonwood Avenue. This inlet is the ultimate outfall of the site and is connected into the Riverside County Flood Control District Sunnymead Line P. The existing drainage along the north property line flows north and south.

The site will be developed into attached multi-family homes. The site will contain twenty-three residential buildings, a multi-purpose building and pool, and two recreational areas. Each residential building will contain 4 units. Each unit will have approximately 1,045 square feet footprint.

The project site has been vacant in its recent history. Below is an image from Esri 2002.

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

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
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

APPROXIMATE SITE LOCATION

0.85 MiraLoma
0.61 RiversideNorth
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.90 HurkeyCreek
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Santa Ana River Watershed
Santa Margarita Watershed

JURUPA VALLEY | EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | HEMET | CANYON LAKE | LAKE ELSINORE | MENIFEE | WILDOMAR | MURRIETA | TEMECULA

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}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Blue Engineering and Consulting — Date: 10/18/2020
Designed by: A. Cesar — Case No:
Company Project Number/Name: Cottonwood Residential Development

BMP Identification

BMP NAME / ID: Bioretention Basin 'A'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious 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	*18108*	*Mixed Surface Types*	*0.81*	*0.61*	*11066.9*			
	18108	**Total**			**11066.9**	**0.66**	**608.7**	**624.75**

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}	Legend:	Required Entries Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Blue Engineering and Consulting — Date: 10/18/2020
Designed by: A. Cesar — Case No:
Company Project Number/Name: Cottonwood Residential Development

BMP Identification

BMP NAME / ID: Bioretention Basin 'B'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious 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	*25945*	*Mixed Surface Types*	*0.81*	*0.61*	*15856.5*			
	25945	***Total***			**15856.5**	**0.66**	***872.1***	***882***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	10/18/2020
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'C'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-C	*25788*	*Mixed Surface Types*	*0.79*	*0.59*	*15155.3*			
	25788	*Total*			15155.3	0.66	*833.5*	*845.25*

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	10/18/2020
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'D'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-D	*13798*	*Mixed Surface Types*	*0.8*	*0.60*	*8269.1*			
	13798		***Total***		**8269.1**	**0.66**	***454.8***	***730.5***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Blue Engineering and Consulting — Date: 7/9/2019

Designed by: A. Cesar — Case No:

Company Project Number/Name: Cottonwood Residential Development

BMP Identification

BMP NAME / ID: Bioretention Basin 'E'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-E	*63050*	*Mixed Surface Types*	*0.86*	*0.67*	*42526.5*			
	63050	**Total**			**42526.5**	**0.66**	**2339**	**2436.8**

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	7/9/2019
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'F'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-F	*50029*	*Mixed Surface Types*	*0.8*	*0.60*	*29982.2*			
	50029		*Total*		*29982.2*	*0.66*	*1649*	*1660.56*

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	10/18/2020
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'G'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-G	*41651*	*Mixed Surface Types*	*0.79*	*0.59*	*24477.9*			
	41651	**Total**			**24477.9**	**0.66**	**1346.3**	**1376.4**

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	7/9/2019
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'H'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-H	*123523*	*Mixed Surface Types*	*0.81*	*0.61*	*75492.1*			
	123523		***Total***		**75492.1**	**0.66**	***4152.1***	***4270***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	7/9/2019
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'I'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-I	*7280*	*Mixed Surface Types*	*0.62*	*0.42*	*3090.6*			
	7280	***Total***			**3090.6**	**0.66**	***170***	***443.3***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	7/9/2019
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'J'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-J	*16300*	*Mixed Surface Types*	*0.81*	*0.61*	*9961.9*			
	16300		**Total**		**9961.9**	**0.66**	**547.9**	**547.9**

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Blue Engineering and Consulting	Date	7/9/2019
Designed by	A. Cesar	Case No	
Company Project Number/Name	Cottonwood Residential Development		

BMP Identification

BMP NAME / ID: Bioretention Basin 'K'

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-K	*55658*	*Concrete or Asphalt*	*1*	*0.89*	*49646.9*			
	55658		***Total***		**49646.9**	**0.66**	***2730.6***	***2732.4***

Notes:

Effective Impervious Fraction

Developed Cover Types	Effective Impervious Fraction
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40
Mixed Surface Types	

Use this table to determine the effective impervious fraction for the V_{BMP} and Q_{BMP} calculation sheets

Bioretention Facility - Design Procedure	BMP ID: Bio A	Legend:	Required Entries / Calculated Cells

Company Name: Blue Engineering and Consulting, Inc — Date: 10/18/2020 2020

Designed by: A Cesar — County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T = 0.4157025 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 609 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 25.0 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 = 1.47 ft

Minimum Surface Area, A_m

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

A_M = 414 ft^2

Proposed Surface Area — A= 425 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'B'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 0.5956152 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 872 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 25.0 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 = 1.47 ft

Minimum Surface Area, A_m

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

A_M = 593 ft^2

Proposed Surface Area — A= 600 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'C'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature	A_T=	0.592011	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	834	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 =	2.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	23.0	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 =	1.47	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	568	ft^2
Proposed Surface Area	A=	575	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:			

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'D'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 0.3167585 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 455 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 25.0 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 = 1.47 ft

Minimum Surface Area, A_m

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

A_M = 309 ft^2

Proposed Surface Area — A= 497 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'E'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 1.4474288 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 2,339 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 3.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 37.0 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 = 1.78 ft

Minimum Surface Area, A_m

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

A_M = 1,314 ft^2

Proposed Surface Area — A= 1,369 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'F'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 1.1485078 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 1,649 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 30.0 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 = 1.48 ft

Minimum Surface Area, A_m

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

A_M = 1,117 ft^2

Proposed Surface Area — A= 1,122 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'G'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 0.9561754 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 1,346 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 30.0 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 = 1.48 ft

Minimum Surface Area, A_m

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

A_M = 912 ft^2

Proposed Surface Area — A= 928 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'H'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 2.8356979 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 4,152 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 3.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 49.0 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 = 1.79 ft

Minimum Surface Area, A_m

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

A_M = 2,326 ft^2

Proposed Surface Area — A= 2,386 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'I'	Legend:	Required Entries / Calculated Cells

Company Name: Blue Engineering and Consulting — Date: 18-Oct 2020

Designed by: A. Cesar — County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T = 0.1671258 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 170 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.43 ft

Minimum Surface Area, A_m

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

A_M = 119 ft^2

Proposed Surface Area — A= 310 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'K'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 1.2777319 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 2,731 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 6.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.38 ft

Minimum Surface Area, A_m

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

A_M = 1,974 ft^2

Proposed Surface Area — A= 1,980 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:

Notes:

Bioretention Facility - Design Procedure	BMP ID: Bio 'J'	Legend:	Required Entries / Calculated Cells

Company Name:	Blue Engineering and Consulting	Date:	18-Oct 2020
Designed by:	A. Cesar	County/City Case No.:	

Design Volume

Enter the area tributary to this feature — A_T = 0.3741965 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 548 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 = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 10.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.43 ft

Minimum Surface Area, A_m

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

A_M = 384 ft^2

Proposed Surface Area — A= 1,980 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

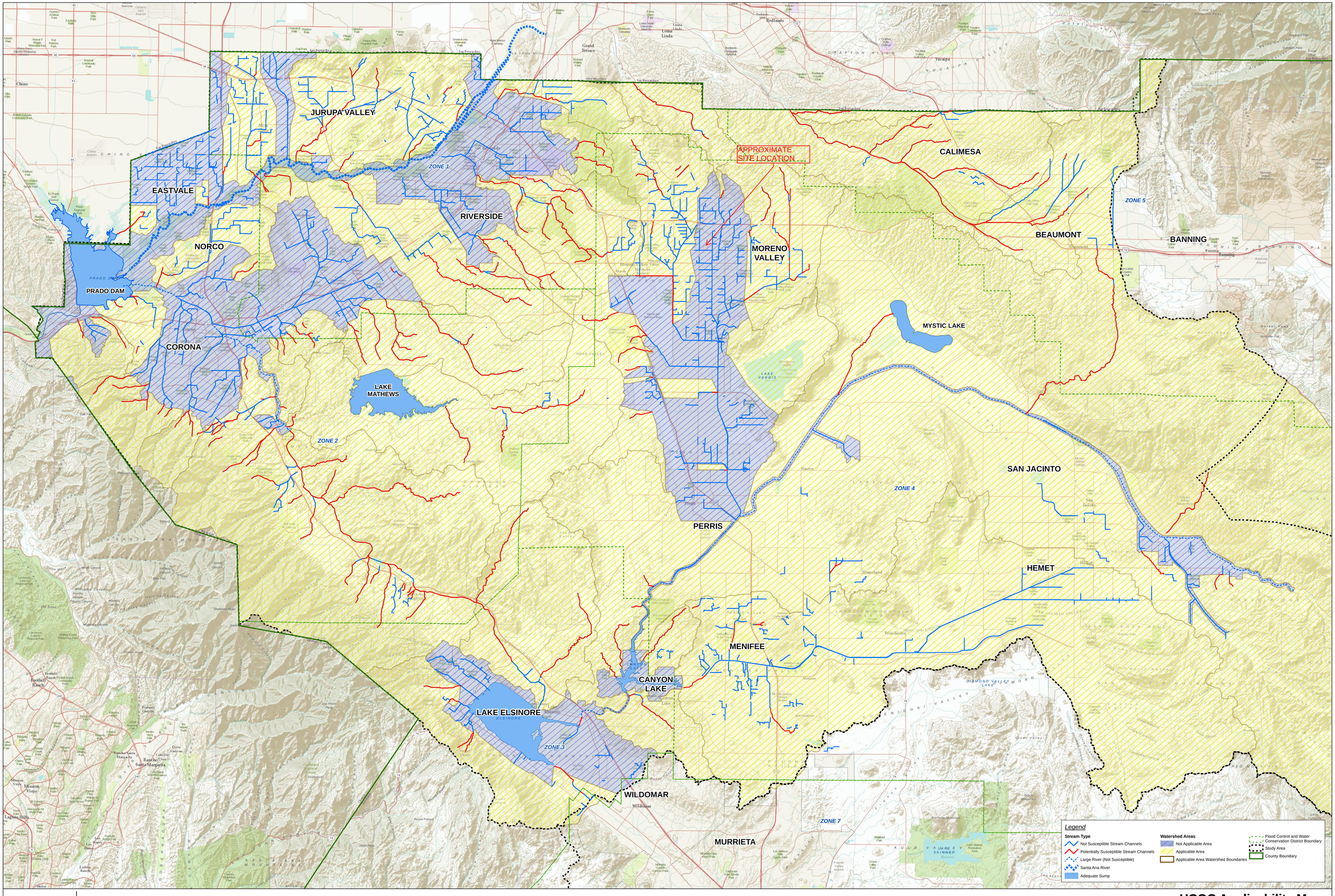
Describe Vegetation:

Notes:

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Drainage ultimately flows to Canyon Lake by way of Kitching Street Channel, to Perris Valley Channel, then to San Jacinto River, that flows into Canyon Lake.



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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
■ A. **On-site storm drain inlets**	■ **Locations of inlets.**	■ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	■ **Maintain and periodically repaint or replace inlet markings.** ■ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ■ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ■ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
❑ B. **Interior floor drains and elevator shaft sump pumps**		❑ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	❑ **Inspect and maintain drains to prevent blockages and overflow.**
■ C. **Interior parking garages**		■ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	■ **Inspect and maintain drains to prevent blockages and overflow.**

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

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
■ E. **Pools, spas, ponds, decorative fountains, and other water features.**	■ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	■ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
❑ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
■ G. **Refuse areas**	■ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ■ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ■ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	■ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ■ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	■ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑ **Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
■ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	■ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ M. **Loading Docks**	❑ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		❑ **Move loaded and unloaded items indoors as soon as possible.** ❑ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
■ N. **Fire Sprinkler Test Water**		■ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	■ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ❑ **Boiler drain lines** ● **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ■ **Roofing, gutters, and trim.** ❑ **Other sources**		■ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ■ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ■ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ■ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ■ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
■ P. **Plazas, sidewalks, and parking lots.**			■ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

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

Operation and Maintenance Plan

Project Title: Cottonwood Village Residential Development

Original Date Prepared: March 11, 2021
Revision Date(s): _May 24, 2021_____
Revision Date(s): _January 12, 2022____
Revision Date(s): _____
Revision Date(s): _____

Contact Information:

Prepared for: Dana Haynes
4340 Von Karman Ave. Suite 110
Newport Beach, CA 92660
(949)-705-0408

Prepared by: Blue Engineering and Consulting, Inc
Rancho Cucamonga, CA 91739
(909)-248-6557

Contact: Angel Cesar, P.E.

Client Signature:

_____

_____

Table of Contents

List of Appendices

I. Inspection and Maintenance Log

Date	Observations/Actions	Inspector

II. Updates, Revisions and Errata

See Appendix 2

III. Introduction

The project site is located in the City of Moreno Valley at the North portion of Cottonwood Avenue between Perris Boulevard and Kitching Street. The project proposes an approximate 9.4-acre development consisting of 23, 4-unit multi-family apartment homes, open space, and detention/water quality basin. The site is bounded by single family homes to the north, east and west, and Cottonwood Avenue to the south.

IV. Responsibility for Maintenance

General

Funding will be provided by the owner:

Dana Haynes
4340 Von Karman Ave. Suite 110
Newport Beach, CA 92660

Records

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

Safety

All maintenance procedures shall comply with the latest OSHA standards.

Replacement Cost

A bioretention basin is a non-manufactured BMP. The basin must be replaced if it fails to infiltrate the mitigated volume within the allowable time. The cost to replace the basin would be the cost to remove approximately the top 4 feet of soil and replace with native as a minimal compaction to allow for infiltration. That cost can vary depending on time, approximation of native sand. Replacement cost can be $10,000-$30,000.

V. Summary of Drainage Management Areas and Stormwater BMPs.

Drainage Areas

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

DMA Name or ID	Surface Type(s)	Area (Sq.Ft.)	DMA Type
DMA-A	Mixed Surface	18,108	Type D
DMA-B	Mixed Surface	25,945	Type D
DMA-C	Mixed Surface	25,788	Type D
DMA-D	Mixed Surface	13,798	Type D
DMA-E	Mixed Surface	63,050	Type D
DMA-F	Mixed Surface	50,029	Type D
DMA-G	Mixed Surface	41,651	Type D
DMA-H	Mixed Surface	123,523	Type D
DMA-I	Mixed Surface	7,280	Type D
DMA-I	Mixed Surface	7,280	Type D
DMA-J	Mixed Surface	16,300	Type D
DMA-K	Concrete Asphalt	55658	Type D

Structural Post-Construction BMPs

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

VI. Stormwater BMP Design Documentation

“As-Built” Drawings of each Stormwater BMP

Not applicable.

Manufacturer’s Data, Manuals, and Maintenance Requirements

Not applicable, there are no manufactured stormwater BMPs.

Specific Operation and Maintenance Concerns and Troubleshooting

Not applicable.

VII. Maintenance Schedule or Matrix

Maintenance Schedule

Schedule	Inspection and Maintenance Activity
Ongoing	Routine maintenance and inspection: • Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities. • Remove trash and debris and rake surface soils to mitigate ponding • Replace damaged grass and/or plants • Replace surface mulch layer as needed to maintain a 2-3 inch soil cover. • Eradicate weeds and prune back excess plant growth that interferes with facility operation. Remove invasive vegetation and replace with non-invasive species
After storm events	Inspect areas for ponding
Annually	Inspect/clean inlets and outlets

VII.B Service Agreement Information

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

Appendix 1: Inspection and Maintenance Logs

Insert Additional Inspection or Maintenance Logs Here

Date	Observations/Actions	Inspector

Appendix 2: Updates, Revisions, and Errata

Insert Additional Updates, Revisions, and Errata Logs Here

Revision Number	Date	Brief Description of Update/Revision/Errata, include section and page number	Prepared and Approved by

Appendix 3: Maintenance and Recording Mechanism

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

Notification Process and Responsibility

1. Name: _____
   Title: _____
   Phone No.: _____

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

2. Name: _____
   Title: _____
   Phone No.: _____

   WQMP Responsibilities:
   (1) Cleaning, repairing, servicing, and maintenance of BMP.

3. Name: _____
   Title: _____
   Phone No.: _____

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

Appendix 4: Training Records

Insert Training Records with Brief Discussion Here

Appendix 5: Site Plan and Details

WQMP Site Map and BMP Details

Appendix 6: Service Agreement Information

Insert Contractor Information (if any)

RECORDING REQUESTED BY
AND WHEN RECORDED MAIL TO:

LAND DEVELOPMENT DIV.
CITY OF MORENO VALLEY
PO BOX 88005
14177 FREDERICK STREET
MORENO VALLEY, CA 92552-0805

EXEMPT FROM FEE PER G.C. Section 6103

SPACE ABOVE THIS LINE FOR RECORDER'S USE

APN:
PEN (LGL)

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND MAINTENANCE COVENANT

THIS INSTRUMENT is made and entered into this _____ day of _____, by and between Dana Haynes, hereinafter referred to as "Owner," and the City of Moreno Valley, a municipal corporation, hereinafter referred to as "City."

RECITALS

WHEREAS, the Owner owns real property ("Property") in the City specifically described in Exhibit "A," which is attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of approval of the development project known as TM34544 Cottonwood Village Residential Development (the "Project") for the Property, the City required the Project to employ on-site stormwater and non-stormwater control measures to mitigate the Project impacts to water quality and minimize pollutants in urban stormwater runoff; and

WHEREAS, the City and Owner, its successors, and assigns, agree that the health, safety and welfare of the residents of the City, require that on-site stormwater and non-stormwater management control measures be constructed and implemented and adequately maintained on the Property; and

WHEREAS, the Owner has chosen to install BMPs, hereinafter referred to as the "Device" and other control measures all as described in the Final Water Quality Management Plan (WQMP) to minimize pollutants in urban stormwater and non-stormwater runoff; and

WHEREAS, the Device and other control measures have been installed and/or implemented in accordance with the WQMP, project plans and specifications approved by the City; and

WHEREAS, the Device and other control measures, being installed on private property and draining only private property are private facilities with all maintenance or replacement therefore being the sole responsibility of the Owner; and

WHEREAS, the Owner is aware that periodic and continuous maintenance including, but not necessarily limited to, filter material replacement and sediment removal is required to assure discharges from the Device, other control measures and the Project are in compliance with the City's Municipal Code for stormwater and non-stormwater discharges and that such maintenance activity will require compliance with all Federal, State and local laws and regulations, including

those pertaining to confined space and waste disposal methods in effect at the time such maintenance occurs;

NOW, THEREFORE, in consideration of City's approval of the Project and the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the City and Owner agree as follows:

1. The Owner hereby provides the City and its designees with full right of access to the Device and other control measures and the immediate vicinity of the property at any time, upon reasonable notice; or in the event of emergency, as determined by City's Public Works Director/City Engineer or designees, no advance notice; for the purpose of inspection, sampling and testing of the Device and other control measures, and in cases of emergency, where the public health, safety, or welfare is compromised, such emergency shall be declared a "nuisance" as defined in the Municipal Code. Such conditions that created the emergency shall be abated as provided for in the Municipal Code and at the Owner's expense as provided for in Section 3, below.

2. The Owner shall diligently maintain the Device and other control measures in a manner assuring all discharges from the Device, other control measures and the Project are in compliance with the Municipal Code for stormwater and non-stormwater discharges at all times. All reasonable precautions shall be exercised by the Owner and the Owner's representatives in the removal and extraction of

materials from the Device and other control measures, and the ultimate disposal of the materials in a manner consistent with all applicable laws. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the materials removed, the quantity and the recycle of disposal destinations, as appropriate.

3. In the event the Owner fails to perform the necessary maintenance contemplated by this Instrument, within five (5) days of being given written notice by the City, the lack of maintenance shall be considered a public health and safety concern and declared a "nuisance", the City shall take all necessary actions as provided in the Municipal Code, to abate the nuisance and charge the entire cost and expense to the Owner, including administrative costs, attorneys' fees and interest thereon at the maximum rate authorized by law from the date of the notice of expense until paid in full. Additionally, any discharge as a result from the lack of maintenance prescribed herein from the Device to the City's maintained Municipal Separate Storm Sewer System shall be considered an illegal discharge and considered a violation of the Municipal Code and shall cease immediately. Such cessation may include a yellow or red tag issued to the Project.

4. This Instrument shall be recorded in the Official Records of the County of Riverside at the expense of the Owner and shall constitute notice to all successors and assigns to the title to the Property of the obligations herein set forth. This Instrument shall also constitute a lien against the Property in such amount as will

fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

5. It is the intent of the Owner that the burdens and benefits herein undertaken shall constitute covenants that run with the Property and shall constitute a lien against the Property.

6. This covenant imposes no liability of any kind whatsoever on the City and the Owner agrees to hold the City harmless from any liability in the event the Device and other control measures fail to operate in accordance with the plans and specification submitted to the City.

7. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the Owner hereto. The term "Owner" shall include not only the Owner, but also its heirs, successors, executors, administrators, lessees and assigns. The Owner shall notify any successor to title of all or part of the Property about the existence of this Instrument. The Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. The Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

8. Time is of the essence in the performance of this Instrument.

9. Any notice to a party required or called for in this Instrument shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change notice address only by providing written notice thereof to the other party.

CITY:

Public Works Director/City Engineer

City of Moreno Valley

PO Box 88005

14177 Frederick Street

Moreno Valley, CA 92552-0805

OWNER:

Name: Dana Haynes

Company: Cottonwood 939, LLC.

Address: 4340 Von Karman Ave., Ste. 110

City/State/ZIP: Newport Beach, CA, 92660

10. This Instrument represents the entire Covenant of the parties hereto as to the matters contained herein and supersedes any and all prior written or verbal agreements between the parties as to the subject matter hereof.

11. This Instrument shall be governed by and construed in accordance with the laws of the State of California.

12. No amendment to this Instrument shall be made without prior written approval by the City.

OWNER:

Dana Haynes, President
(Name, Title)

Cottonwood 939, LLC.
(Name of company/partnership/corp./entity)

CITY:

CITY OF MORENO VALLEY

APPROVED AS TO FORM:

_____
City Attorney

By: _____ Date: _____
Mike Lee, City Manager

Attest:

By: _____ Date: _____
City Clerk

EXHIBIT "A"

Legal Description

Lot 6, Block 73, Map No. 2, Bear Valley and Alessandro Development Co., together with that portion of Cottonwood Avenue within said Block lying between the southerly prolongation of the west lines of said Lot, in the City of Moreno Valley, County of Riverside, State of California, as per map recorded in Book 11, Page 10, of Maps, in the office of the county recorder of San Bernardino County.

EXHIBIT "A-1"

(Include 8.5x11 project site map and show location(s) of treatment control BMPs)

WATER QUALITY MANAGEMENT PLAN EXHIBIT

THIS WATER QUALITY BASIN RECEIVES RUNOFF FROM STREETS, YARDS AND OPEN SPACES. IT HAS BEEN DESIGNED TO TREAT INCIDENTAL POLLUTANTS IN RUNOFF AND IS NOT DESIGNED TO TREAT HOUSEHOLD POLLUTANTS. DUMPING IS PROHIBITED.

AUTHORIZED PERSONNEL ONLY.

MORENO VALLEY PUBLIC WORKS
TO REPORT A PROBLEM WITH THIS FACILITY CALL 951.413.3120
WWW.MORENO-VALLEY.CA.US

0.5" THICK BORDER

NOTES:

1.) SIGNS SHALL BE SECURELY MOUNTED ON OUTSIDE OF TUBULAR IRON FENCE, 1 FOOT BELOW THE TOP OF TUBULAR IRON FENCE. LOCATION PER DIRECTION OF CITY ENGINEER.

2.) OUTSIDE DIMENSIONS SHALL BE 4' x 2'.

3.) LETTERS, BORDER, AND CITY LOGO SHALL BE BLACK ON WHITE BACKGROUND.

4.) TEXT HEIGHT SHALL BE 1" AND TEXT WIDTH SHALL BE 0.6". TEXT SHALL BE ALL UPPERCASE.

5.) FONT STYLE SHALL BE UNIVERSAL.

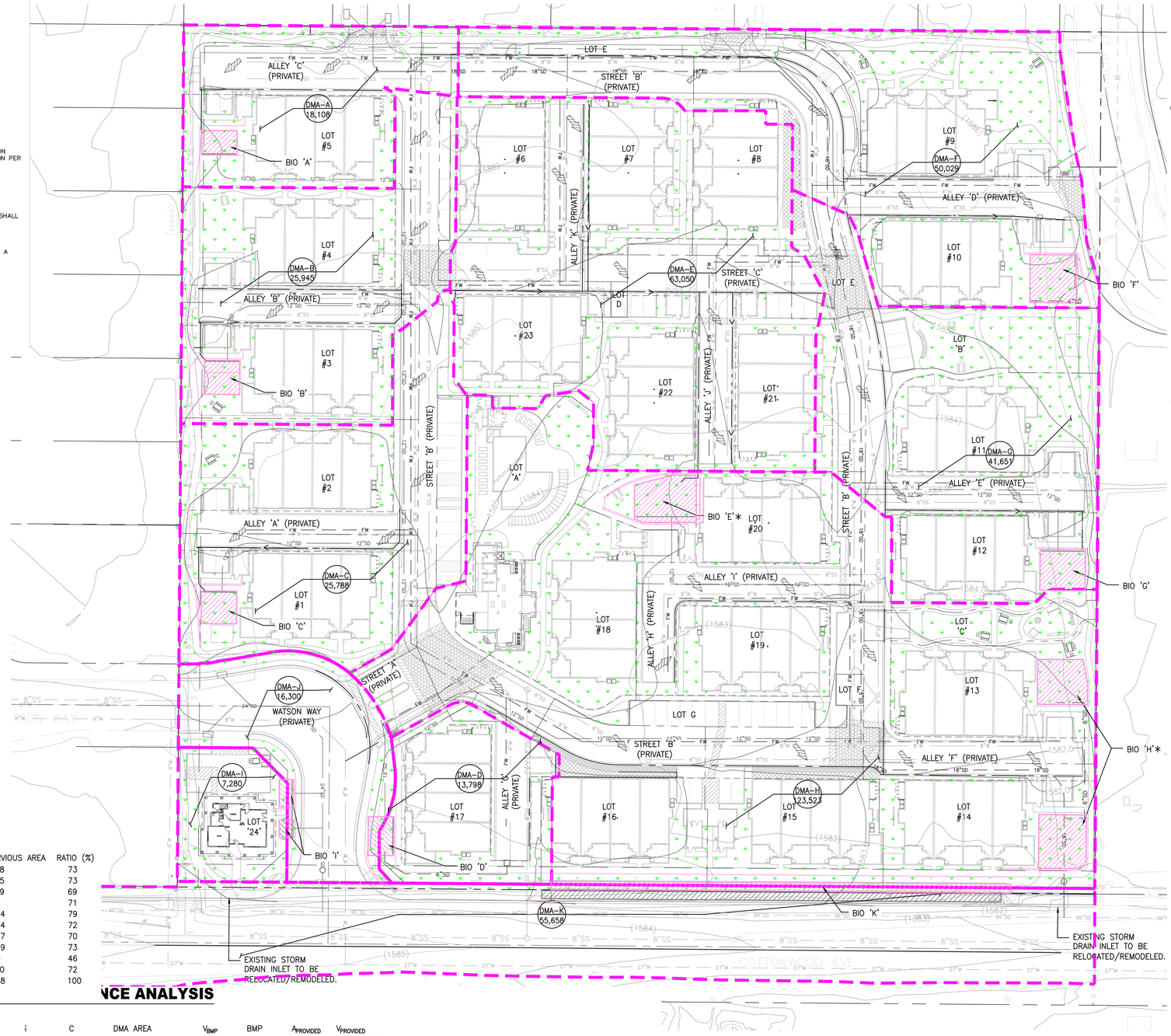
6.) SIGN SHOULD BE MADE OF 5052-H38 ALUMINUM ALLOY AND HAVE A THICKNESS OF 0.08".

7.) MOUNTING HARDWARE SHALL BE STAINLESS STEEL BRACKETS AND MOUNTED TO THE FENCE USING SECURITY SCREWS.

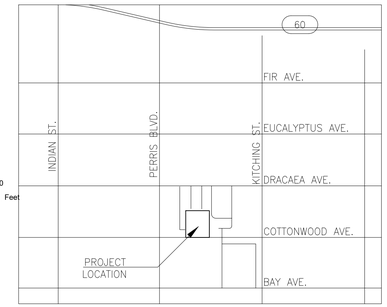
8.) CITY LOGO SHALL BE 3.5" IN HEIGHT BY 4" WIDE.

9.) SIGN SHALL BE PROTECTED WITH AN ANTI-GRAFITTI COATING.

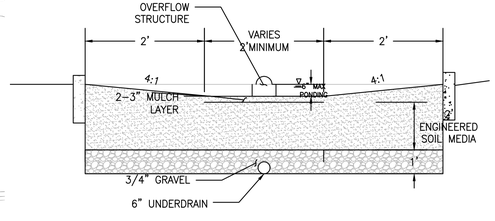
(6) PROJECT SIGN
NTS



0 20 40 80 Feet
SCALE 1" = 40'



VICINITY MAP
N.T.S.



BIOFILTRATION TRENCH DETAIL (TYP)
SCALE 1" = 3'

BIOFILTRATION ANALYSIS

NAME	AREA (SF)	DIMENSIONS (L' x W')
A	425	25' x 17'
B	600	25' x 24'
C	575	25' x 23'
D	497	27.5' x 18'
E	1,370	45' x 30.5'
F	1,122	34' x 33'
G	928	32' x 29'
H	2,386	32' x 34.5'; 38' x 33.5'
I	310	12' x 10'; 19' x 10'

PROJECT BMP RATIOS

NAME	AREA (SF)	LANDSCAPE AREA (SF)	RATIO (%)	IMPERVIOUS AREA	RATIO (%)
A	18,108	4,890	27	13,218	73
B	25,945	7,050	27	18,895	73
C	25,788	7,879	31	17,909	69
D	13,798	4,015	29	9,783	71
E	63,040	13,036	21	50,004	79
F	50,029	14,065	28	35,964	72
G	41,651	12,424	30	29,227	70
H	123,853	34,014	27	89,839	73
I	7,280	3920	54	3,360	46
J	16,300	4,500	28	11,800	72
K	55,658	0	0	55,658	100

LEGEND

- DRAINAGE MANAGEMENT AREA (DMA)
- SEWER MAIN
- DOMESTIC WATER
- STORM DRAIN
- CENTERLINE
- FLOW LINE
- MANHOLE
- DIRECTIONAL FLOW ARROW
- BIOFILTRATION TRENCH
- 36" SOIL FILTER MEDIA
- LANDSCAPE AREA

NCE ANALYSIS

NAME	AREA (SF)	i	C	DMA AREA	V_{BMP}	BMP	$A_{PROVIDED}$	$V_{PROVIDED}$
DMA A	18,108	0.81	0.61	11,066.9	608.7	BIO 'A'	425 SF	624.75 C.F.
DMA B	25,945	0.81	0.61	15,856.5	872.1	BIO 'B'	600 SF	882 C.F.
DMA C	25,788	0.79	0.59	15,155.3	833.5	BIO 'C'	575 SF	845.3 C.F.
DMA D	13,798	0.80	0.60	8,269.1	454.8	BIO 'D'	497 SF	730.5 C.F.
DMA E	63,040	0.86	0.67	42,526.5	2,339	BIO 'E'	1,370 SF	2,436.8 C.F.
DMA F	50,029	0.80	0.60	29,982.2	1,649	BIO 'F'	1,122 SF	1,660.5 C.F.
DMA G	41,651	0.79	0.59	24,477.9	1,346.3	BIO 'G'	928 SF	1,376.4 C.F.
DMA H	123,523	0.81	0.61	75,492.1	4,152.1	BIO 'H'	2,386 SF	4,270 C.F.
DMA I	7,280	0.62	0.42	3,090.6	170	BIO 'I'	310 SF	443.3 C.F.
DMA J	16,300	0.81	0.61	9,961.9	547.9			
DMA K	55,658	1.00	0.89	49646.9	2730.6	BIO 'K'	1,980 SF	2732.4 C.F.
				TOTAL REQUIRED	15,704 CF			16,000 C.F. TOTAL PROVIDED

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

DIGALERT

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

DATE OF PREPARATION MARCH 11, 2021
PEN21-0147

REGISTERED PROFESSIONAL ENGINEER
ANGEL CESAR
No. 87222
CIVIL
STATE OF CALIFORNIA

BLUE Engineering & Consulting, Inc

UNDER THE SUPERVISION OF:

ANGEL CESAR
RCE 87222

DATE

CITY OF MORENO VALLEY

WQMP
COTTONWOOD VILLAGE
TTM 34544

APN. 479-140-022

DATE PREPARED MARCH 11, 2021

SHEET 6 OF 10

CITY ID No

Appendix 10: Educational Materials

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

Educational Materials Table of Contents

Drain Inserts MP-52

Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer's guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

- ✓ Sediment
- ✓ Nutrients
- ✓ Trash
- ✓ Metals
- Bacteria
- ✓ Oil and Grease
- ✓ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

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one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than $100 to about $2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Hrachovec, R., and G. Minton, 2001, Field testing of a sock-type catch basin insert, Planet CPR, Seattle, Washington

Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998

Woodward Clyde, June 11, 1996, Parking Lot Monitoring Report, Santa Clara Valley Nonpoint Source Pollution Control Program.

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

CASQA California Stormwater Quality Association

- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabrie or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Site Design & Landscape Planning SD-10

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.
- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

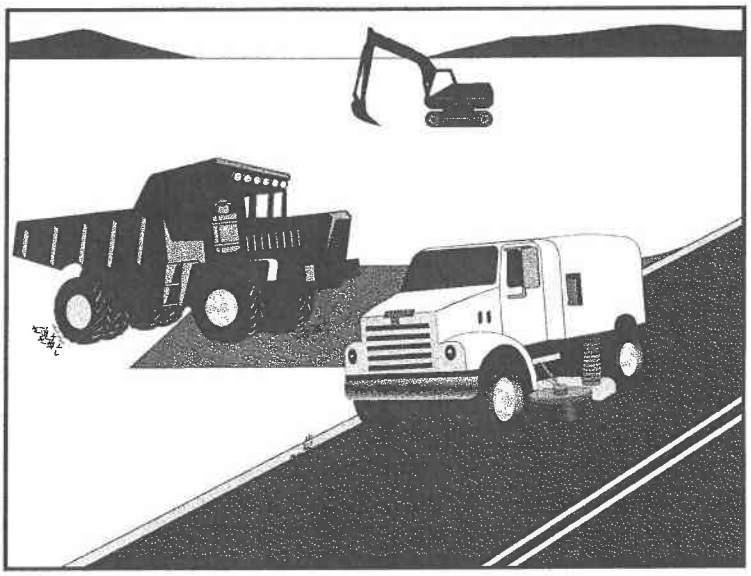
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Street Sweeping and Vacuuming SE-7



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

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- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

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:

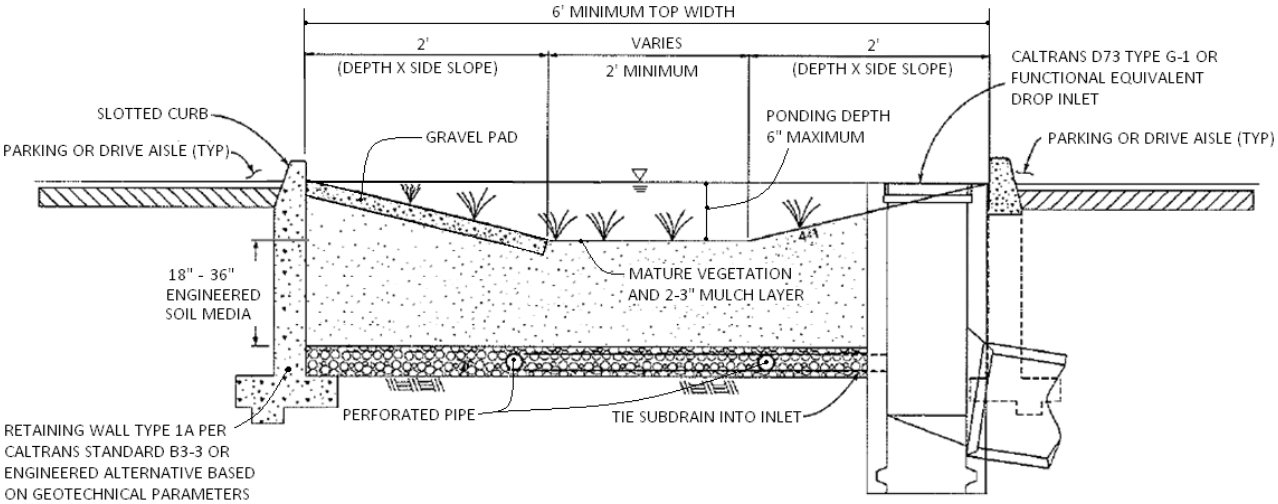
- *Depressing* landscaped areas below adjacent impervious surfaces, rather than elevating those areas
- Grading the site to direct runoff from those impervious surfaces *into* the Bioretention Facility, rather than away from the landscaping
- Sizing and designing the depressed landscaped area as a Bioretention 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. Curb cut flow lines must be at or above the V_{BMP} water surface level.

[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.

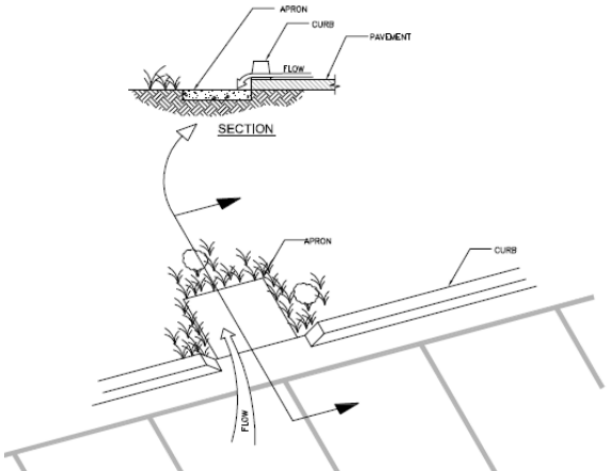


Figure 3: Apron located in a Bioretention Facility

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

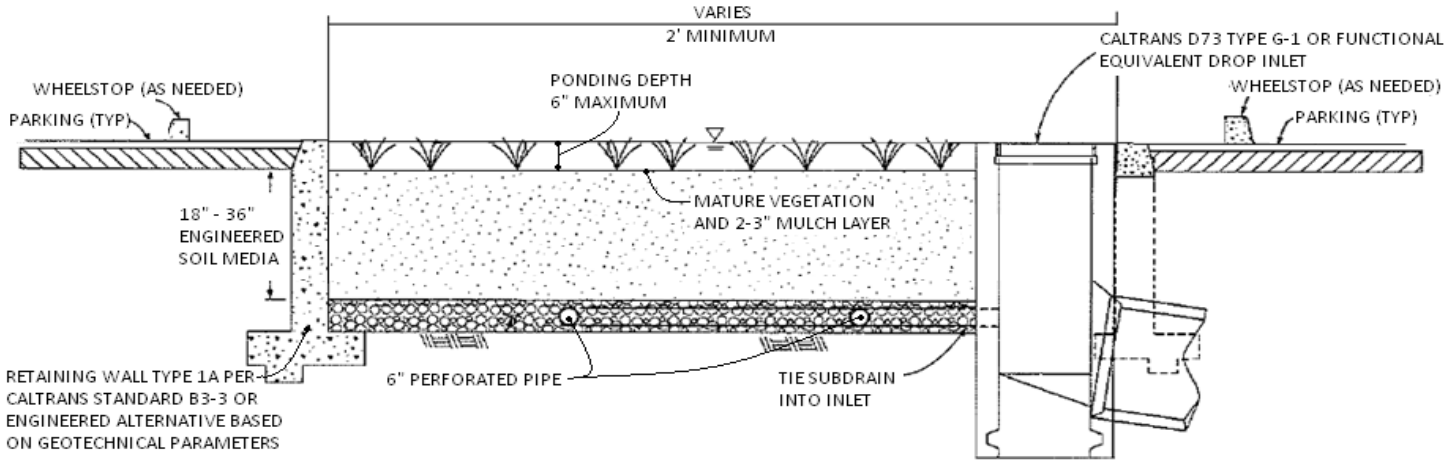
Bioretention Facilities Requiring Side Slopes

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 **not** 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. • Remove trash and debris • Replace damaged grass and/or plants • 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.

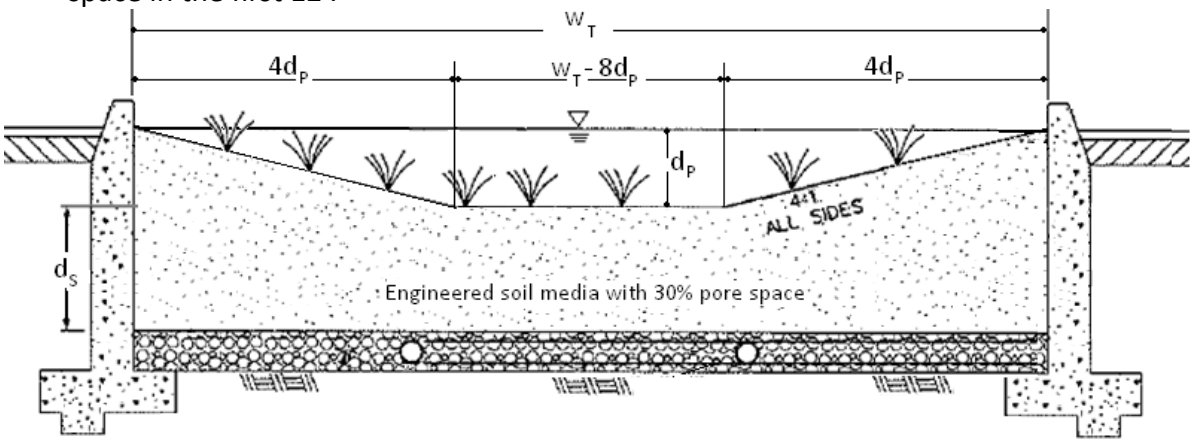
2) Enter the Design Volume, $V_{BMP,}$ determined from Section 2.1 of this Handbook.

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:

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

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:

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

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.

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

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.

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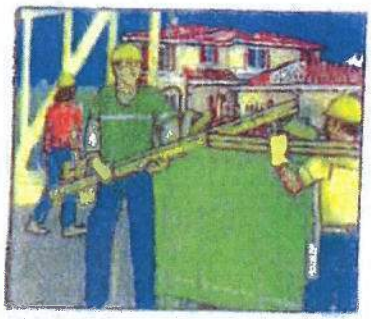
STORMWATER Pollution Prevention

CONSTRUCTION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Store Materials Safely
Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Ordering Materials & Recycling Waste
Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.

Cleaning & Preventing Spills
Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 911.

Preventing Erosion
Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydromulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Channels can be lined with grass or roughened pavement to reduce runoff velocity.

Maintaining Vehicles & Equipment
Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

To report illegal dumping or for more information on stormwater pollution prevention, call:

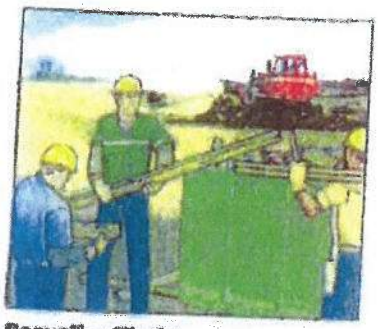
1 (800) CLEANUP

www.1800cleanup.org

STORMWATER Pollution Prevention

EXCAVATION AND GRADING

Sediment, cement wash, asphalt and vehicle fluids from soil excavation and grading often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Recycling Waste
Recycle broken asphalt, concrete, wood, and cleared vegetation whenever possible. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.

Maintaining Vehicles & Equipment
Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutters and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks. Use gravel approaches where truck traffic is heavy to reduce soil compaction and limit the tracking of sediment into the street.

Cleaning & Preventing Spills
Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids. To report serious spills, call 911.

Storing Materials
Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

Preventing Erosion
Avoid excavation or grading during wet weather. Plant temporary vegetation on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff. Channels can be lined with grass or reinforced pavement to reduce runoff velocity.

To report illegal dumping or for more information on stormwater pollution prevention, call

1 (800) CLEANUP

www.1800cleanup.org

STORMWATER Pollution Prevention

FRESH CONCRETE & MORTAR APPLICATION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Storing Materials

Keep construction materials and debris away from the street, gutter and storm drains. Secure open bags of cement and cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

Ordering Materials & Recycling Waste

Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. When breaking up paving, recycle the pieces at a crushing company. You can also recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. Call (909) 386-8401 for recycling and disposal information.

During Construction

Schedule excavation and grading during dry weather. Prevent mortar and cement from entering the street and storm drains by placing erosion controls. Setup small mixers on tarps or drop cloths, for easy cleanup of debris. Never bury waste material. Recycle or dispose of it as hazardous waste.

Cleaning Up

Wash concrete dust onto designated dirt areas, not down driveways or into the street or storm drains. Wash out concrete mixers and equipment in specified washout areas, where water can flow into a containment pond. Cement washwater can be recycled by pumping it back into cement mixers for reuse. Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.

To report illegal dumping or to learn more about stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org

STORMWATER Pollution Prevention

ROADWORK AND PAVING

Asphalt, saw-cut slurry and excavated materials from road paving, surfacing and pavement removal often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Preventing Erosion

Schedule excavation and grading work during dry weather. Develop and implement erosion and sediment control plans for exposed embankments. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

During Construction

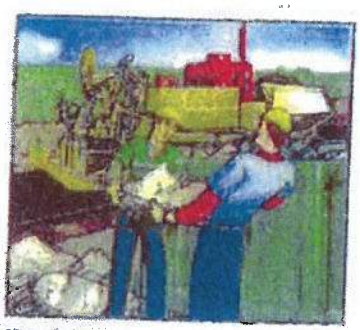
Cover catch basins and maintenance holes when applying seal coat, slurry seal or fog seal. Use check dams, ditches or berms around excavations, and avoid over applying water for dust control. Never wash excess materials from exposed aggregate or concrete into the street, gutter or a storm drain.

Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

Asphalt & Concrete Removal

Barricade storm drain openings during saw-cutting, and recycle broken up pavement at a crushing company. For recycling information, call (909) 386-8401.



Cleaning & Preventing Spills

Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Sweep up dry spills, instead of hosing. Prevent spills from paver machines by using drip pans, or by placing absorbent materials like cloths or rags under the machines when not in use. To report serious spills, call 911.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org

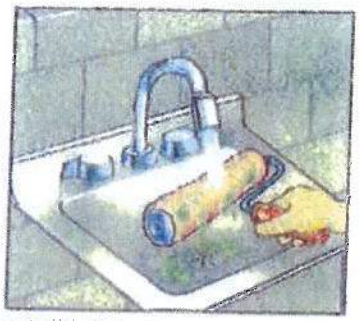
Stormwater Pollution Prevention

PAINTING

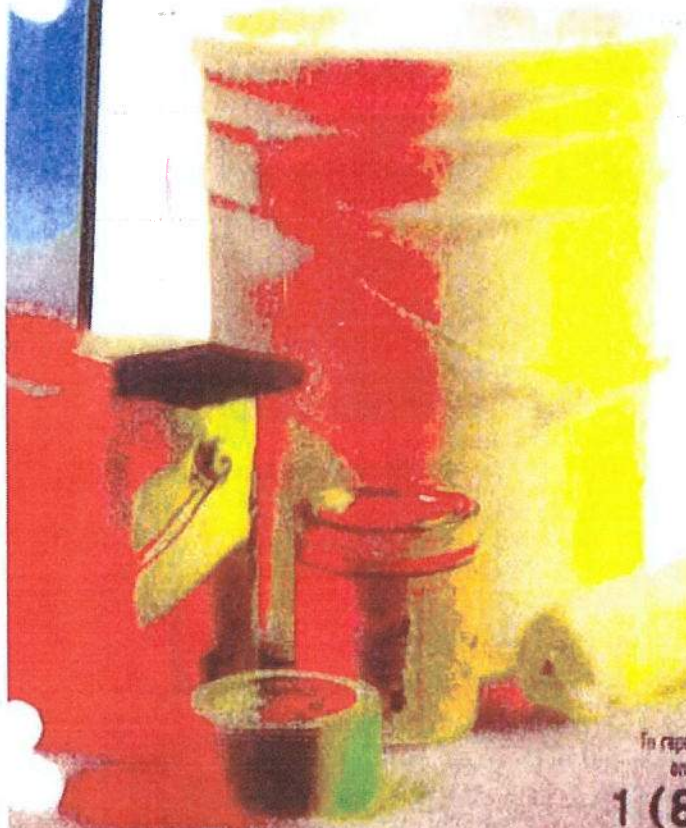
Paints, solvents, adhesives and other toxic chemicals used in painting often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect our health.

Water-Based Paints
Use water-based paints whenever possible. They are less toxic than oil-based paints and easier to clean up. Look for products labeled "latex" or "cleans with water."

Paint Removal
Sweep up paint stripping residue, chips and dust instead of hosing into the street and dispose of them safely at a household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.



Painting Cleanup
Never clean brushes or rinse paint containers in the street, gutter or near a storm drain. Clean water-based paints in the sink. Clean oil-based paints with thinner, which can be reused by putting it in a jar to settle out the paint particles and then pouring off the clear liquid for future use. Wrap dried paint residue in newspaper and dispose of it in the trash.



Exterior Paint Removal
When stripping or cleaning building exteriors with high-pressure water, block nearby storm drains and divert washwater onto a designated dirt area. Ask your local wastewater treatment authority if you can collect building cleaning water and discharge it to the sewer.

Recycling Paint
Recycle leftover paint at a household hazardous waste collection facility, save it for touch ups or give it to someone who can use it, like a theatre group, school, city or community organization.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org

STORMWATER Pollution Prevention

HOME & GARDEN

Yard waste and household toxics like paints and pesticides often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.

Recycle Household Hazardous Waste

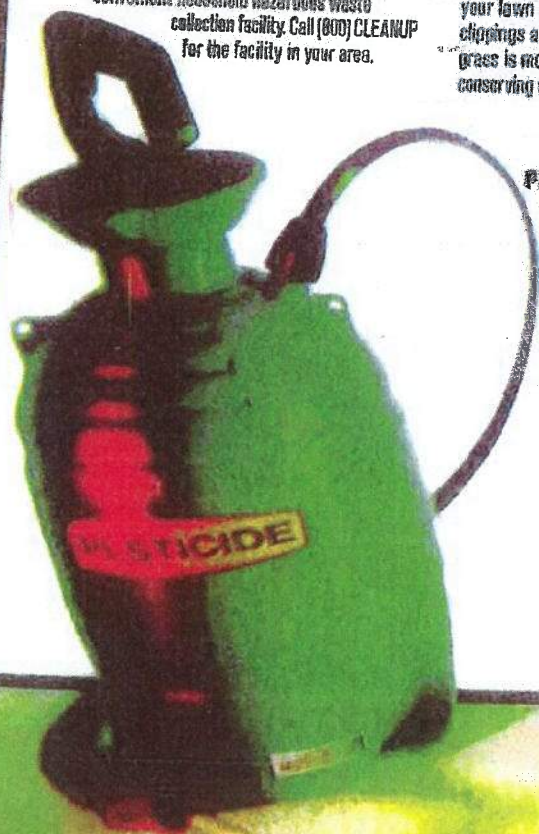
Household products like paint, pesticides, solvents and cleaners are too dangerous to dump and too toxic to trash. Take them to be recycled at a convenient household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.

Disposing of Yard Waste

Recycle leaves, grass clippings and other yard waste, instead of blowing, sweeping or hosing into the street. Try grasscycling, leaving grass clippings on your lawn instead of using a grass catcher. The clippings act as a natural fertilizer, and because grass is mostly water, it also irrigates your lawn, conserving water.

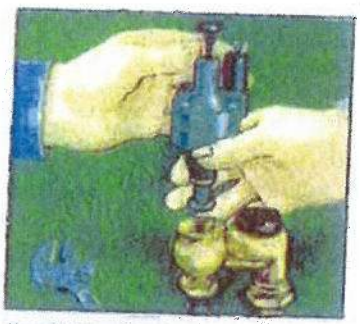
Use Fertilizers & Pesticides Safely

Fertilizers and pesticides are often carried into the storm drain system by sprinkler runoff. Try using organic or non-toxic alternatives. If you use chemical fertilizers or pesticides, avoid applying near curbs and driveways and never apply before a rain.



Planting in the Yard

Produce less yard waste and save water by planting low maintenance, drought-tolerant trees and shrubs. Using drip irrigation, soaker hoses or micro-spray systems for flower beds and vegetation can also help reduce your water bill and prevent runoff.



Use Water Wisely

Cut your water costs and prevent runoff by controlling the amount of water and direction of sprinklers. The average lawn needs about an inch of water a week, including rainfall, or 10 to 20 minutes of watering. A half-inch per week is enough for fall and spring. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org

Prevención de Contaminación del Desagüe

TRABAJO DE CARRETERAS & PAVIMENTO

Asfalto, mezcla y materiales de excavaciones del pavimento acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciéndola peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y proteger la salud publica.

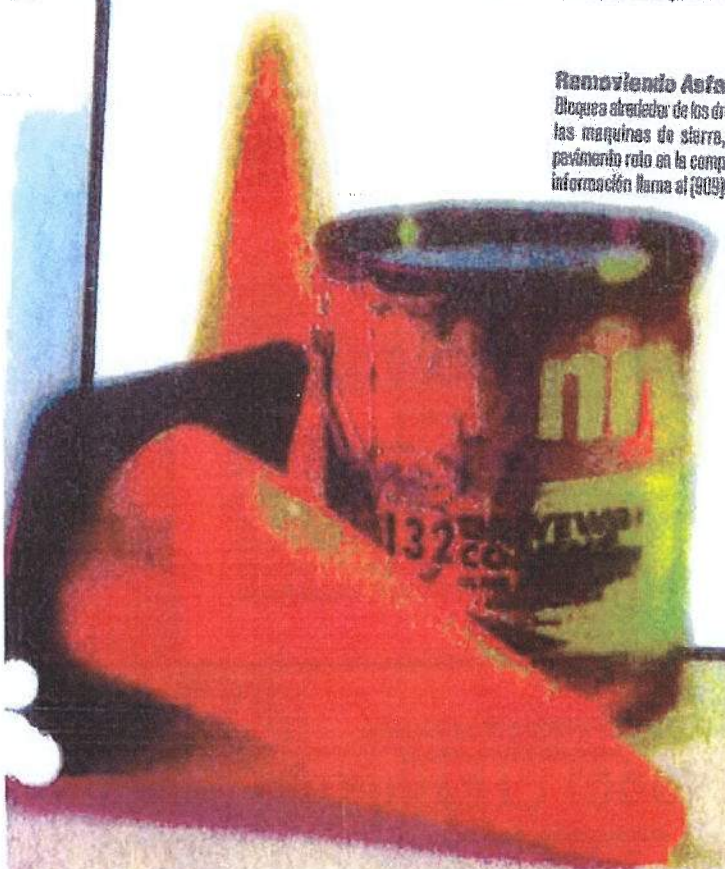
Previniendo Erosiones
Planea las excavaciones trabajo de jardineria durante el clima seco. Desarrolla e implementa planes de embancamientos de control de sedimento y excavaciones. Cubre montones de tierra, grave y otros materiales con un plastico para protejarlos de la lluvia, aire y desagüe.

Durante Construcción
Cubre los lavados y de mantenimiento a los hoyos al aplicar soldadura o mazcla. Revisa las areas de excavaciones, y evita pasarte de agua para prevenir polvadura. Nunca laves los materiales llenos de concreto en la calla, drenajes o en el desagüe.

Mantenimiento de Vehiculos & Herramientas
Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura y evita goteaduras de autos que no se usan vaciandoles la gasolina, aceite de transmision, frenos y liquidos del radiador.

Removiendo Asfalto & Concreto
Bloquea alrededor de los drenajes cuando estas usando las maquinas de sierra, tambien recicla todo el pavimento roto en la compañia demolidora. Para mas información llama al (909) 386-8401.

Limpiando & Previniendo Derrames
Mantente siempre preparado para cualquier derrame, usa alrededor los herramientos de seguridad al igual que materiales como, tierra para desechos de gato o aserrin. Barre los derrames en vez de lavarlos con la manguera. Previene los derrames de las maquinas usando embudos o colocando garros para absorver cualquier liquido. Para reportar derrames llame al 911.



Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al:

1 (800) CLEANUP

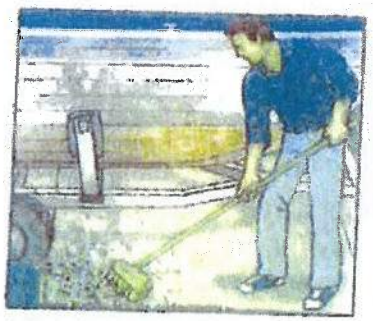
www.1800cleanup.org

Prevención de Contaminación del Desagüe

PINTURA Pintura, solventes y otros químicos peligrosos que se usan al pintar acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciendole peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

Pinturas de Agua

Usa pinturas de agua cuando sea posible. Son menos toxicos que las pinturas de aceite y mas faciles para limpiar. Busca los productos "latex" or "cleans with water".



Removiendo Pintura

Residuos de pintura, polvo de pintura y pinturas que contienen plomo son peligrosas. Barrelos en vez de lavarlos con la manguera y desechalos en unlugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu area.

Limpiando Pintura

Nunca laves los brochas o los contenedores de pintura en la calle, coladeras o desagües. Las de pintura de agua limpialas en el labavo y las de pintura de aceite con thiner, y vuelvalas a guardar en un frasco, para un uso futuro. Envuelve los residues de pintura en un periodico y tiralos a la basura.

Removiendo Pintura en Exteriores

Al despintar o lavar exteriores de los edificios con agua de alta presión bloquea los drenajes cercanos y desvia el desagüe. Pregunta las autoridades si puedes desecharla en las alcantarillas.

Reciclando Pintura

Recicla la pintura que sobra en un lugar de colección de materiales peligrosos, guardela para re-toques or regalele a alguien que la use, como a un teatro, a la escuela, una organizacion de la ciudad o de la comunidad.

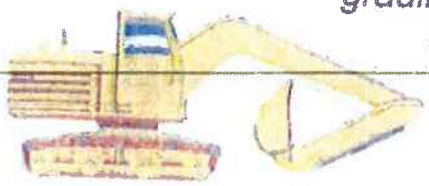
Para reportar actividades ilegales o tóxicas o información de la prevención de contaminación llamar al

1 (800) CLEANUP

www.1800cleanup.org

EXCAVATION & GRADING OPERATIONS

Sediment, cement wash, asphalt, and motor oil from soil excavation and grading operations often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.



Follow these practices to help prevent stormwater pollution...

Erosion Prevention...

Reduce erosion by avoiding excavation or grading activities during wet weather, and by planting

temporary vegetation on slopes where construction is not immediately planned. Plant permanent vegetation as soon as possible, once excavation and grading activities are complete. Diversion dikes can be constructed to channel runoff around the site; channels can be lined with grass or roughened pavement to reduce runoff velocity. For information on erosion control, call 799-7407.

General Business Practices...

Cover exposed piles of soil and other construction materials with plastic sheeting to prevent contact with rain water.

Recycling...

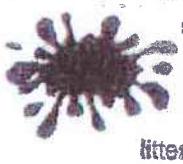
Recycle broken asphalt, concrete, wood, and cleared vegetation whenever possible. Unrecyclable materials must be taken to an appropriate landfill or disposed of as hazardous waste. For recycling or disposal information, call 386-8401.

Equipment Maintenance...

Maintain all vehicles and equipment by inspecting them frequently for leaks. Also, conduct maintenance and refueling at one location -- away from storm drains, and perform major equipment repairs and washings off site. Finally, use gravel approaches where truck traffic is frequent to reduce soil compaction and limit the tracking of sediment into the streets.

Spills...

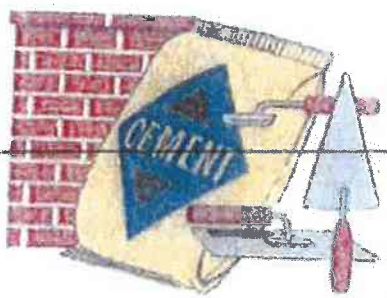
Avoid accidental spills by using a drip pan and funnel when draining or pouring fluids. Be ready for unexpected spills by preparing and using easy to find



spill containment and cleanup kits. Kits should include safety equipment and cleanup materials such as kitty litter, sawdust or commeal. Furthermore, prevent leaks from stored vehicles by draining gas, hydraulic oil, and transmission, brake & radiator fluid. REMEMBER: Never hose down dirty surfaces. To report serious spills, call 1-800-33-TOXIC.

For more information, call your city's stormwater representative

FRESH CONCRETE & MORTAR APPLICATION

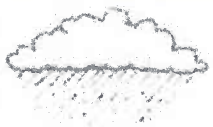


Cement, cement wash, gravel, asphalt, solvents, and motor oil from fresh concrete and mortar activities often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

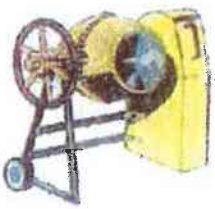
General Business Practices...

Schedule excavation and grading work during dry weather, and in case it rains, prevent materials from contacting stormwater by storing them under cover. Also, secure open bags of cement to keep wind-blown cement powder away from streets, gutters and storm drains.



During Construction...

Prevent mortar and cement from entering the storm drains by placing erosion controls (i.e., berms or temporary vegetation) down-slope to capture runoff. When breaking up paving, be sure to pick up all pieces and recycle them at a crushing company; small amounts of excess dry concrete, grout and mortar can be disposed of in the trash. Setup small mixers on tarps or heavy drop cloths to allow for easy cleanup of debris. REMEMBER: Never bury waste material -- recycle or dispose of it as hazardous waste. Call 386-8401 for recycling and disposal information.



Handling Materials & Wastes...

Minimize wastes when ordering materials by ordering only the amounts needed to complete the job. Whenever possible, use recycled or recyclable materials. Recycle broken asphalt, concrete, wood, and cleared vegetation. Unrecyclable materials must be taken to an appropriate landfill or disposed of as hazardous waste. For recycling and disposal information, call 386-8401.

Cleaning up...

When cleaning up after driveway or sidewalk construction, wash concrete dust onto designated dirt areas, not down the driveway or into the street or storm drain. Also, wash out concrete mixers and equipment only in specified wash-out areas, where the water flows into containment ponds. Cement washwater can be recycled by pumping it back into cement mixers for reuse. REMEMBER: Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.

For more information, call your city's stormwater representative

GENERAL CONSTRUCTION

Soil, cement wash, asphalt and motor oil from construction sites often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

General Business Practices...

Cover exposed piles of soil and other construction materials with plastic sheeting to prevent contact with rain water.

Erosion Prevention...

Reduce erosion by avoiding excavation or grading activities during wet weather, and by planting temporary vegetation on slopes where construction is not immediately planned.

Plant permanent vegetation as soon as possible, once excavation and grading activities are complete. Diversion dikes can be constructed to channel runoff around the site; channels can be lined with grass or roughened pavement to reduce runoff velocity. For information on erosion control, call 799-7407.

Equipment Maintenance...

Maintain all vehicles and equipment by inspecting them frequently for leaks. Also, conduct maintenance and refueling at one location -- away from storm drains, and perform major equipment repairs and washings off site.

Handling Materials & Waste...

Minimize wastes when ordering materials by ordering only the amounts needed to complete the job. Whenever possible, use recycled or recyclable materials. Recycle broken asphalt, concrete, wood, and cleared vegetation. Unrecyclable materials must be taken to an appropriate landfill or disposed of as hazardous waste. For recycling and disposal information, call 386-8401.

Spills...

Avoid accidental spills by using a drip pan and funnel when draining or pouring fluids. Be ready for unexpected spills by preparing and using easy to find spill containment and cleanup kits. Kits should include safety equipment and cleanup materials such as kitty litter, sawdust or cornmeal. Furthermore, prevent leaks from stored vehicles by draining gas, hydraulic oil, and transmission, brake & radiator fluid. REMEMBER: Never hose down dirty surfaces; instead, sweep regularly. To report serious spills, call 1-800-33-TOXIC.

For more information, call your city's stormwater representative

HOME & GARDEN

Yard waste and household toxics such as paints, solvents, and pesticides often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

In Your Home...

Household products such as paints, paint thinners, drain openers, motor oil, wood polishes, insecticides & herbicides, oven cleaners, and many other general cleaners frequently get dumped on the ground, or into a gutter, street or storm drain. Instead of polluting our stormwaters, take these items to a household hazardous waste collection facility. Call 1-800-OILY-CAT for a facility in your area.

Fertilizers and Pesticides...

Fertilizers and pesticides are often carried into our storm drains by sprinkler runoff. To minimize stormwater pollution, use organic or non-toxic pesticides and fertilizers as directed, and keep them away from ditches, gutters and storm drains. Store them in a covered area, off the ground, to prevent contact with water. For additional gardening questions, call the San Bernardino Master Gardeners at 387-2182.

Trimmin' the Garden...

Decaying organic materials that enter our storm drains, such as grass, leaves, yard clippings, and pet waste, will use up oxygen in nearby streams, stressing aquatic life. Prevent stormwater pollution by not blowing, sweeping, raking or hosing yard waste into the street, gutter, or storm drain. Alternatively, leave grass clippings on your lawn after mowing, or compost your clippings and yard waste. Pet waste should not be composted, but rather disposed of in the trash to prevent the potential spread of diseases.

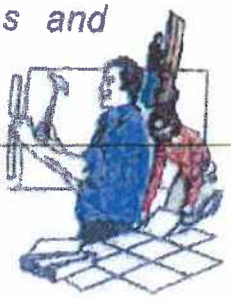
Planting In The Yard

Produce less yard waste and save water by planting low maintenance trees and shrubs. Also, conserve water and minimize unwanted runoff by using drip irrigation, soaker hoses, or micro-spray systems to water vegetation.

For more information, call your city's stormwater representative

HOME REPAIR & REMODELING

Paints, solvents, adhesives, dusts, sediments, pesticides and household toxics commonly associated with home repair and remodeling activities often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.



Follow these practices to help prevent stormwater pollution...

Household Hazardous Wastes...

Common household cleaners, paint products, and wallpaper & tile adhesives contain toxic substances. Dispose of these products properly. REMEMBER: Toxic wastes should never enter the storm drain system. For disposal information, call 1-800-OILY-CAT.

Construction...

Keep all construction debris away from the street, gutter and storm drain, and if possible, schedule grading and excavation projects for dry weather. Cover excavated material and stockpiles of asphalt, sand, etc. with plastic tarps, and prevent erosion by planting fast-growing annual and perennial grasses, which will shield and bind the soil.

Landscape & Gardening...

Use fertilizers and pesticides as directed. Keep them away from ditches, gutters and storm drains, and store them in a covered area to prevent contact with rain water. Also, minimize runoff and conserve water by using drip irrigation, soaker hoses, or micro-spray systems. REMEMBER: Do not deposit leaves into the street, gutter, or storm drain.

Painting...

CLEANUP... Avoid cleaning brushes or rinsing paint containers into a street, gutter, or storm drain. For water-based paints, "brush out" as much paint as possible, and rinse in the sink. For oil-based paints, "brush out" as much paint as possible, clean with thinner, and then filter and reuse thinner or solvent.

REMOVAL... Paint stripping residue, chips & dust from marine paints, and paints containing lead or tributyl tin are hazardous wastes. Sweep them up and call 1-800-OILY-CAT for disposal information.

RECYCLING... Recycle or reuse leftover paint by using it for touch-ups, or by giving it to someone who can us it, such as a theatre group, school, city or other community organization. If you're unable to give it away, contact 1-800-OILY-CAT for disposal information.

Concrete & Masonry...

Store bags of cement and plaster away from gutters and storm drains, and under cover, protected from rainfall, runoff and wind. REMEMBER: Never dispose of cement washout or concrete dust onto driveways, streets, gutters or storm drains.

For more information, call your city's stormwater representative

PAINTING

Paints, solvents, adhesives, and toxic chemicals from painting operations often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

General Business Practices...

Keep all paint products and wastes away from the street, gutter, and storm drains. Reuse paint thinner by setting used thinner aside in a closed, labeled jar to settle out paint particles, and then pouring off the clear liquid for future use. Wrap dried paint residue in newspaper and dispose of it in the trash.

Water-Based Paints...

Purchase water-based paints whenever possible. Look for products labeled "latex" or "clean up with water."

Recycle or Reuse Paints...

Recycle/reuse leftover paint by using it for touch-ups, or by giving it to someone who can use it, such as a theatre group, school, city or other community organization. If you're unable to give it away, contact 386-8401 for information on hazardous waste pick-up.

Paint Cleanup...

Avoid cleaning brushes and rinsing paint containers in a street, gutter, or storm drain. For water-based paints, "brush out" as much paint as possible and and rinse in the sink. For oil-based paints, "brush out" as much paint as possible, clean with thinner, and then filter and reuse thinner or solvent.

Paint Removal...

Chemical paint stripping residue, chips & dust from marine paints, and paints containing lead or tributyl tin are hazardous wastes. For disposal information, call 386-8401.

Also, when stripping or cleaning building exteriors with high-pressure water, block storm drains and divert the washwater onto a designated dirt area. Check with your local wastewater treatment authority to find out if you can collect building cleaning water and discharge it to the sewer.

For more information, call your city's stormwater representative

ROADWORK & PAVING

Asphalt, saw-cut slurry, and excavated materials from Road paving, surfacing and pavement removal operations often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

During Construction...

Cover catch basins and maintenance holes when applying seal coat, slurry seal, fog seal, etc. Use check dams, ditches or berms around excavations, and avoid over-application of water for dust control. REMEMBER: Never wash excess materials from exposed aggregate or concrete into a street, gutter, or storm drain; collect and recycle them.

Asphalt & Concrete Removal...

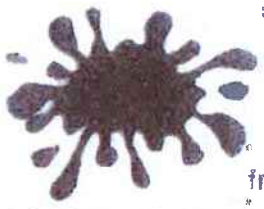
Barricade storm drain openings during saw-cutting, and after breaking up paving, be sure to remove all chunks and pieces and recycle them at a crushing company. For recycling information, call 386-8401.

Equipment Maintenance...

Maintain all vehicles and equipment by inspecting them frequently for leaks. Also, conduct maintenance and refueling at one location -- away from storm drains, and perform major equipment repairs and washings off site.

Spills...

Be ready for unexpected spills by preparing and using spill containment and cleanup kits. Kits should include safety equipment and cleanup materials such as kitty litter, sawdust or cornmeal. Prevent drips from paver machines by catching fluids with drip pans or by placing absorbent material (cloth, rags, etc....) underneath the machines when they're not in use. To report serious spills, call 1-800-33-TOXIC.



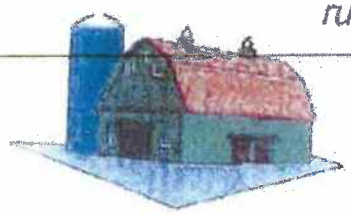
General Business Practices...

Schedule excavation and grading work during dry weather, and develop and implement erosion and sediment control plans for excavated embankments. In case it rains, cover exposed piles of soil and other construction materials with plastic sheeting to prevent contact with rain water.

For more information, call your city's stormwater representative

RURAL HOMES

*Pesticides, fertilizers, septic system overflows, soil, and animal manure from rural homes often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These **wastes** pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.*



Follow these practices to help prevent stormwater pollution...

Protecting Your Well...

Since old, uncapped and abandoned wells can serve as direct conduits to our groundwater, it s important to maintain these areas. Keep all livestock confinement areas away from wells, and keep septic drain fields and chemical storage areas down slope from wells. Install anti-siphoning devices between your well and water pipes to prevent backflow of pollutants and drinking water contamination. REMEMBER: Never dispose of anything in wells.

Fertilizers and Pesticides...

Avoid buying and mixing more pesticide than you need, and never apply more than the recommended amount. Consider spot treatments, rather than spraying pesticides everywhere. REMEMBER: Don t dispose of excess chemicals by dumping them on the ground, pouring them down a well, or draining them into ditches, sewers, drains or septic systems. Call 1-800-OILY-CAT for disposal information. Finally, store chemicals in a covered area, with an impermeable lined floor to prevent contact with rainwater.

That Rural Landscape...

Reduce soil erosion by covering parking areas with gravel, and by covering other exposed soils with vegetation. Gravel and vegetation will not only improve the appearance of your home, but will also assist in filtering out pollutants from water. For information on reducing erosion, call 799-7407.

Autos & Other Equipment...

Repair vehicles and other equipment away from wells, ditches and drains. Avoid accidental spills by using a drip pan and funnel when draining or pouring fluids. Prevent leaks from stored vehicles by draining gas, hydraulic oil, and transmission, brake & radiator fluid. For recycling information, call 1-800-OILY-CAT

Septic Systems

Septic systems should never be piped into a road ditch, storm sewer, stream or farm drain tile system. Also, avoid washing or flushing grease, alcohol, or strong chemicals into your septic system; these substances kill the bacteria needed to break down wastes.

For more information, call your city s stormwater representative