

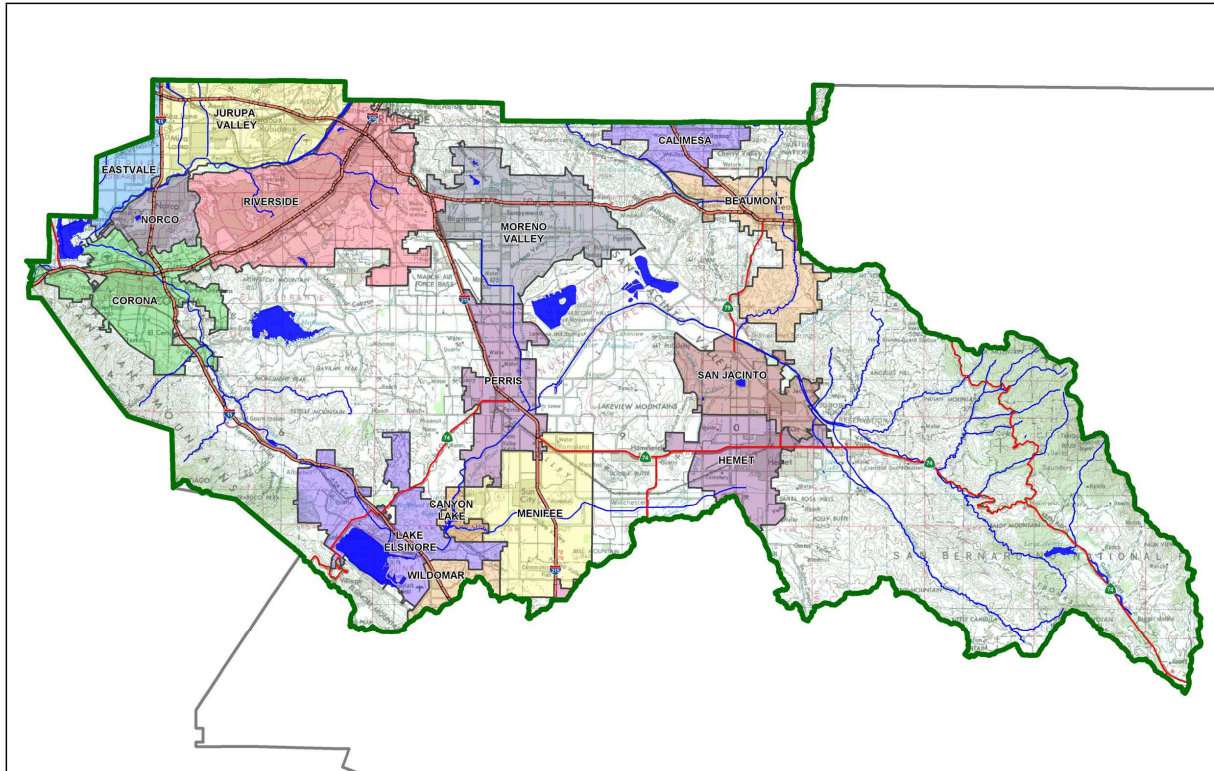
Project Specific Water Quality Management Plan

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

Project Title: Menifee Riverwalk Townhomes

Development No: TBD

Design Review/Case No: Preliminary



- Preliminary
- Final

Original Date Prepared: April 19, 2021

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

Template revised June 30, 2016

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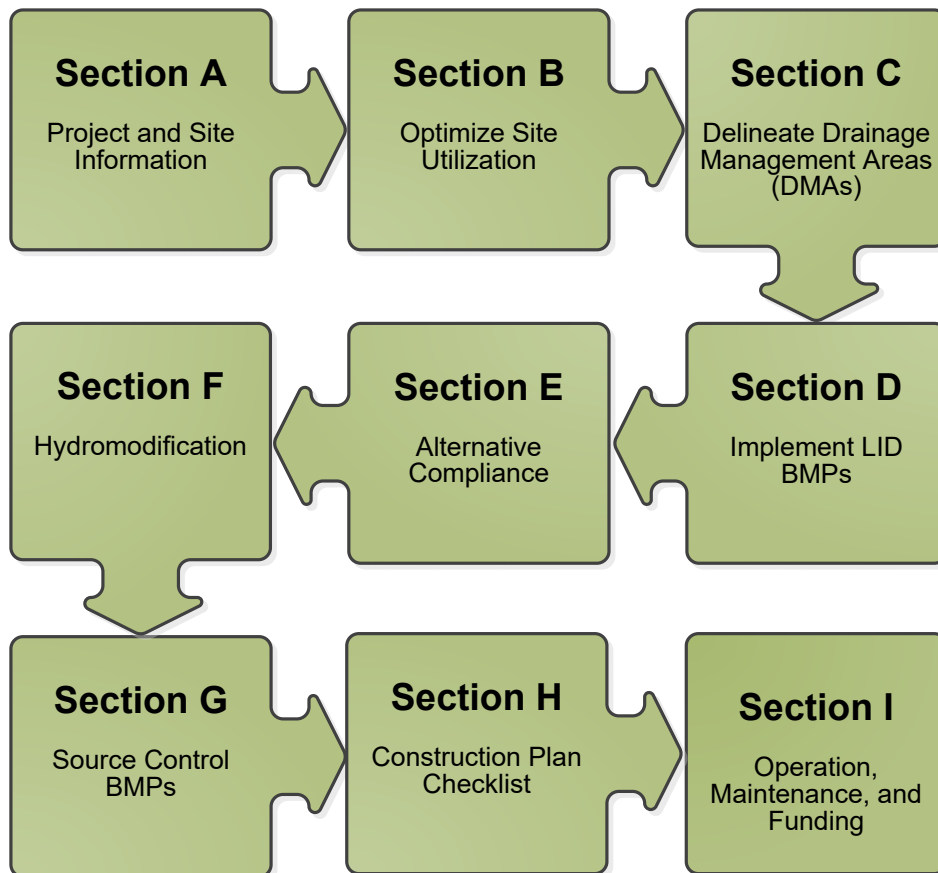
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A Brief Introduction

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



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Washington Murrieta 5, LLC by Kolibri Engineering for the Menifee Riverwalk Townhomes project.

This WQMP is intended to comply with the requirements of City of Menifee for Ordinance No. 754.2 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 Menifee Water Quality Ordinance (Municipal Code Section 754.2).

"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."

WASHINGTON MURRIETA 5
Albert Womble

Owner's Signature

Date

7/6/2021

Albert Womble

Owner's Printed Name

Owner's Title/Position

PREPARER'S CERTIFICATION

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

[Signature]

Preparer's Signature

4-19-2021

Date

John Johnson, P.E.

Preparer's Printed Name

Professional Engineer

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:	N/A
Community Name:	N/A
Development Name:	Menifee Riverwalk Townhomes
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°41'27"N, 117°11'24"W	
Project Watershed and Sub-Watershed: Santa Ana Watershed, San Jacinto River Sub-Watershed	
Gross Acres: 15.14 Acres	
APN(s): 338-150-029; 338-150-031	
Map Book and Page No.: Book 338, Page 15	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Residential
Proposed or Potential SIC Code(s)	N/A
Area of Impervious Project Footprint (SF)	659,228
Total Area of <u>proposed</u> Impervious Surfaces within the Project Footprint (SF)/or Replacement	518,311
Does the project consist of offsite road improvements?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
Does the project propose to construct unpaved roads?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Is the project part of a larger common plan of development (phased project)?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
EXISTING SITE CHARACTERISTICS	
Total area of <u>existing</u> Impervious Surfaces within the Project limits Footprint (SF)	0
Is the project located within any MSHCP Criteria Cell?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Is a Geotechnical Report attached?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	D
What is the Water Quality Design Storm Depth for the project?	0.60

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
Bradley Road Channel	N/A	N/A	Not a RARE-designated water body.
Salt Creek	N/A	REC1, REC2, WARM, WILD	Not a RARE-designated water body.
Canyon Lake	Nutrients, Pathogens	MUN, AGR, GWR, REC1, REC2, WAR, WILD	Not a RARE-designated water body.
San Jacinto River – Reach 1	N/A	MUN, AGR, GWR, REC1, REC2, WAR, WILD	Not a RARE-designated water body.
Lake Elsinore	Metals (Mercury), Nutrients, Organic Enrichment/Low Dissolved Oxygen, Polychlorinated biphenyl, Sediment Toxicity, Sedimentation/Siltation, Unknown Toxicity	REC1, REC2, WARM, WILD	Not a RARE-designated water body.

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
US Army Corps of Engineers, CWA Section 404 Permit	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
Statewide Construction General Permit Coverage	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N
Statewide Industrial General Permit Coverage	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	<input type="checkbox"/> Y	<input checked="" type="checkbox"/> N
Other (please list in the space below as required)	<input type="checkbox"/> Y	<input type="checkbox"/> N

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

Section B: Optimize Site Utilization (LID Principles)

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?

Project site drains from the south east to the north west, and these flow patterns are preserved.

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

The project site currently does not have significant vegetation, only dry brush and weeds. This vegetation will not be preserved in the post-project condition.

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

The project site has low infiltration rates, with only one test out of 8 tests performed resulting in an infiltration rate greater than 1.6 in/hr. Therefore, infiltration based BMPs are not utilized, however, the use of site and ornamental landscaping and the bioretention basin will promote small areas of infiltration.

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

The project minimized the impervious surface to the maximum extent practicable for a high density residential project site.

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

The project site will discharge into a bioretention basin prior to discharging into the Bradley Road Channel. Additionally, impervious surfaces will drain to adjacent landscaping, where feasible for impervious area dispersion.

Section C: Delineate Drainage Management Areas (DMAs)

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

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s) ¹²	Area (Sq. Ft.)	DMA Type
DMA A1	Roof/Concrete, Asphalt, Landscape	608,969	Type D
DMA B1	Asphalt, Concrete, Landscape	50,632	Type D
DMA B2 OFFSITE	Asphalt, Concrete, Landscape	38,144	Type D

¹Reference Table 2-1 in the WQMP Guidance Document to populate this column

²If 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)

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

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

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

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

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

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

DMA Name or ID	BMP Name or ID
DMA A1	Bioretention Basin BR A1
DMA B1	Modular Wetlands B
DMA B2 OFFSITE	Modular Wetlands B

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 Copermitee 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? If Yes, list affected DMAs:		X
...have any DMAs located within 100 feet of a water supply well? If Yes, list affected DMAs:		X
...have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact? If Yes, list affected DMAs:		X
...have measured in-situ infiltration rates of less than 1.6 inches / hour? If Yes, list affected DMAs: DMA A and B	X	
...have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface? If Yes, list affected DMAs:		X
...geotechnical report identify other site-specific factors that would preclude effective and safe infiltration? Describe here:		X

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.

The project site has low infiltration rates as shown in the infiltration tests included in Appendix 3. The lowest infiltration rate is 0, and the highest is 1.66 in/hr at only one location out of 8. The remaining

infiltration tests resulted in test values less than 1.6 in/hr. Therefore, infiltration based BMPs were not utilized for the project site.

D.2 Harvest and Use Assessment

Please check what applies:

- Reclaimed water will be used for the non-potable water demands for the project.
- Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).
- The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If none of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 3.24 acres

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

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

Total Area of Impervious Surfaces: 11.90 acres

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

Enter your EIATIA factor: 0.79

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 9.40 acres

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

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
9.40 acres	3.24 acres

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 464

Project Type: High Density 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: 11.90 acres

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

Enter your TUTIA factor: 101

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: 1,201

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)
1,201	464

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: N/A

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

Total Area of Impervious Surfaces: N/A

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

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

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

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

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment per Section 3.4.2 of the WQMP Guidance Document.

Based upon the harvest and use assessment, the project site does not have the minimum landscaped area or toilet users required to utilize Harvest and Use BMPs.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

- LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).
- A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DMA B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

The project site is a proposed high density residential development that will construct 201 residential units, a recreational area, a bioretention basin and a modular wetlands unit. Onsite flows will be intercepted via sheet flow, collected in an onsite storm drain network with catch basin filter inserts, and discharged into the bioretention basin for water quality treatment. The project site is exempt from hydromodifications since the project site discharges directly into the Bradley Road Channel, which is an EHM channel. Additionally, all conveyances to Canyon Lake downstream of the Bradley Road Channel are engineered and maintained, which feed into downstream Canyon Lake and Lake Elsinore.

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First, calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	<i>Bioretention Basin BR A1</i>		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	[A]		[B]	[C]	[A] x [C]			
A1-A	202092	Roofs	1.0	0.89	180266.1			
A1-B	272904	Concrete or Asphalt	1.0	0.89	243430.4			
A1-C	133973	Ornamental Landscaping	0.1	0.11	14798.4			
	608969				438494.9	0.60	21997.8	22560

[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 Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	<i>Modular Wetlands B</i>		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	[A]		[B]	[C]	[A] x [C]			
B1-A	32911	Concrete or Asphalt	1.0	0.89	29356.6			
B1-B	17721	Ornamental Landscaping	0.1	0.11	1957.4			
	50632				31314	0.60	1570.9	5853

[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 Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas \times Runoff Factor	<i>Modular Wetlands B</i>		
	[A]		[B]	[C]	[A] \times [C]			
B2-A	32804	Concrete or Asphalt	1.0	0.89	29261.2	<i>Design Storm Depth (in)</i>	<i>Design Capture Volume, V_{BMP} (cubic feet)</i>	<i>Proposed Volume on Plans (cubic feet)</i>
B2-B	5340	Ornamental Landscaping	0.1	0.11	589.8			
	38144				29851	0.60	1497.5	5853

[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

The required water quality volume to be treated was determined using the Santa Ana BMP Design Volume Spreadsheet. The rainfall depth utilized was 0.60 inches, and was obtained from the Isohyetal Map for the 85th Percentile 24-hour Storm Event (included in Appendix 6).

During the preliminary stages, impervious percentages were measured and calculated for DMA's A and B. DMA A is the onsite residential area, which consists of a total of 201 lots on 13.98 acres, which is consistent with high density residential. An impervious percentage of 78% was calculated for the onsite area, and the remaining 22% is pervious area. The offsite street area (DMA B) was analyzed as 86% and 65% impervious for each sub area.

Bioretention Basin A consists of 3 feet of surface depth, 2 feet of soil media, and a gravel bedding layer that will incorporate the underdrain system. The water quality volume ponds within the first 0.5 feet above the soil media, and the remaining 1 foot of depth will be utilized to convey flows greater than the water quality volume out to the Bradley Road Channel.

In order to determine the minimum elevations for the bioretention basin, normal depth calculations were performed for the 2-year flow rate and the 100-year flow rate. The 100-year flow rate of 906 ft³/s was obtained from the Bradley Road Channel Improvement plans (Dwg. No. 4-550, included in Appendix 2), and the 2-year flow rate of 349 ft³/s was obtained from multiplying the 100-year flow rate by the ratio of the 2-year rainfall value of 0.50 divided by the 100-year rainfall value of 1.30, resulting in a ratio of 0.385. Multiplying 906 ft³/s by 0.385 results in 349 ft³/s. Based upon the normal depth calculations, the ponded depths are 2.23 feet and 3.82 feet for the 2-year and 100-year flow rates, respectively. This results in water surface elevations within the channel at the connection point with the bioretention basin outlet pipe of approximately 1413.3 and 1415.0 (when added to the invert of 1411.1 and rounded up to the nearest tenth place), respectively. Therefore the finished surface of the soil media has been located at elevation 1416.3 (which is higher than the 2-year water surface elevation) and the 100-year flows will begin to exit from the bioretention basin at elevation 1416.8, which is higher than the channel water surface elevation and the upstream water surface elevation within the outlet structure of approximately 1415.8. The required water quality volume to be stored within bioretention basin A is 21,998 cu. ft., and the volume provided up to 0.5 feet of depth above the

soil media (including the storage within the soil media and the gravel) is 22,560 cu. ft., which is sufficient volume to treat for water quality.

The modular wetlands will be located within the Bradley Road right-of-way as currently proposed on the Bradley Bridge Improvement Plans. The improvement plans account for offsite improvements for the bridge project in the ultimate condition. The modular wetlands will be constructed (Model No. MWS-L-4-21), which has a treatment capacity of 5,853 cu.ft for a 24-hour drawdown time. The required water quality volume to be treated is 3,069 cu. ft., therefore this is sufficient to treat the easterly Bradley Road roadway as proposed on the bridge improvement plans. The modular wetlands will then discharge directly into Salt Creek. The bridge plans account for Bradley road in it's ultimate condition and no further improvements are proposed or necessary for mitigation.

The water quality calculations and spreadsheets have been included in Appendix 6.

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- Or -

The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
<input type="checkbox"/> Detached Residential Development	P	N	P	P	N	P	P	P
<input checked="" type="checkbox"/> Attached Residential Development	P	N	P	P	N	P	P	P ⁽²⁾
<input type="checkbox"/> Commercial/Industrial Development	P ⁽³⁾	P	P ⁽¹⁾	P ⁽¹⁾	P ⁽⁵⁾	P ⁽¹⁾	P	P
<input type="checkbox"/> Automotive Repair Shops	N	P	N	N	P ^(4, 5)	N	P	P
<input type="checkbox"/> Restaurants (>5,000 ft ²)	P	N	N	N	N	N	P	P
<input type="checkbox"/> Hillside Development (>5,000 ft ²)	P	N	P	P	N	P	P	P
<input type="checkbox"/> Parking Lots (>5,000 ft ²)	P ⁽⁶⁾	P	P ⁽¹⁾	P ⁽¹⁾	P ⁽⁴⁾	P ⁽¹⁾	P	P
<input type="checkbox"/> Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

P = Potential

N = Not Potential

⁽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	N/A
<i>Total Credit Percentage¹</i>	

¹Cannot Exceed 50%

²Obtain 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]				
						Design Storm Depth (in)	Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)	Total Storm Water Credit % Reduction	Proposed Volume or Flow on Plans (cubic feet or cfs)
	$A_T = \sum[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D] \times [E]}{[G]}$	$[F] \times (1-[H])$	[I]

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

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

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

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

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

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High:** equal to or greater than 80% removal efficiency
- **Medium:** between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID 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 Copermitttee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? Y N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration¹ 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 and Lake Elsinore

F.2 HCOC Mitigation

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

- a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.
- b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.
- c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

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

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site Storm Drain Inlets	<ul style="list-style-type: none"> · Mark all inlets with “Only Rain Down the Storm Drain” or similar. Catch Basin Markers may be available from RCFC & WCD. 	<ul style="list-style-type: none"> · Maintain & 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

		<ul style="list-style-type: none"> · 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”
C. Interior parking garages	<ul style="list-style-type: none"> · Parking garage floor drains will be plumbed to the sanitary sewer. 	<ul style="list-style-type: none"> · Inspect and maintain drains to prevent blockages and overflows.
D1. Need for future indoor & Outdoor Pesticide Use	<ul style="list-style-type: none"> · Building design features will be implemented that discourage entry of pests. 	<ul style="list-style-type: none"> · Provide Integrated Pest Management information to owners, lessees, and operators.
D2. Landscape/ Outdoor Pesticide Use	<p>Final landscape plans will accomplish the following:</p> <ul style="list-style-type: none"> · Design landscaping to minimize irrigation & runoff and to minimize the use of fertilizers & pesticides that can contribute to stormwater pollution · Consider using pest-resistant plants, especially adjacent to hardscape <p>To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, & plant interactions.</p>	<ul style="list-style-type: none"> · Maintain landscaping using minimum or no pesticides · See applicable operational BMPs in “What you should know.....Landscape and Gardening” at http://rcflood.org/stormwater/ · Provide IPM information to new owners, lessees and operators
E. Pools, spas, ponds, decorative fountains, and other water features		<ul style="list-style-type: none"> · See Applicable operational BMPs in “Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain” at http://rcflood.org/stormwater/
G. Refuse Areas	<ul style="list-style-type: none"> · Refuse will be maintained by a private contractor at a minimum of once per week. · Signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar. 	<ul style="list-style-type: none"> · 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 .
N. Roofing, gutters and trim	<ul style="list-style-type: none"> · Avoid roofing, gutters, and trim made of copper or other 	

	unprotected metals that may leach into runoff.	
O. Sidewalks		· Sweep sidewalks regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into storm drain system.

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)
A	Bioretention Planter and Subsurface System	To be provided with Final WQMP.	
B1	Modular Wetlands	To be provided with Final WQMP.	
B2	Modular Wetlands	To be provided with Final WQMP.	

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

Section I: Operation, Maintenance and Funding

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

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. 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: Property Owner

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

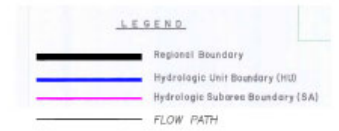
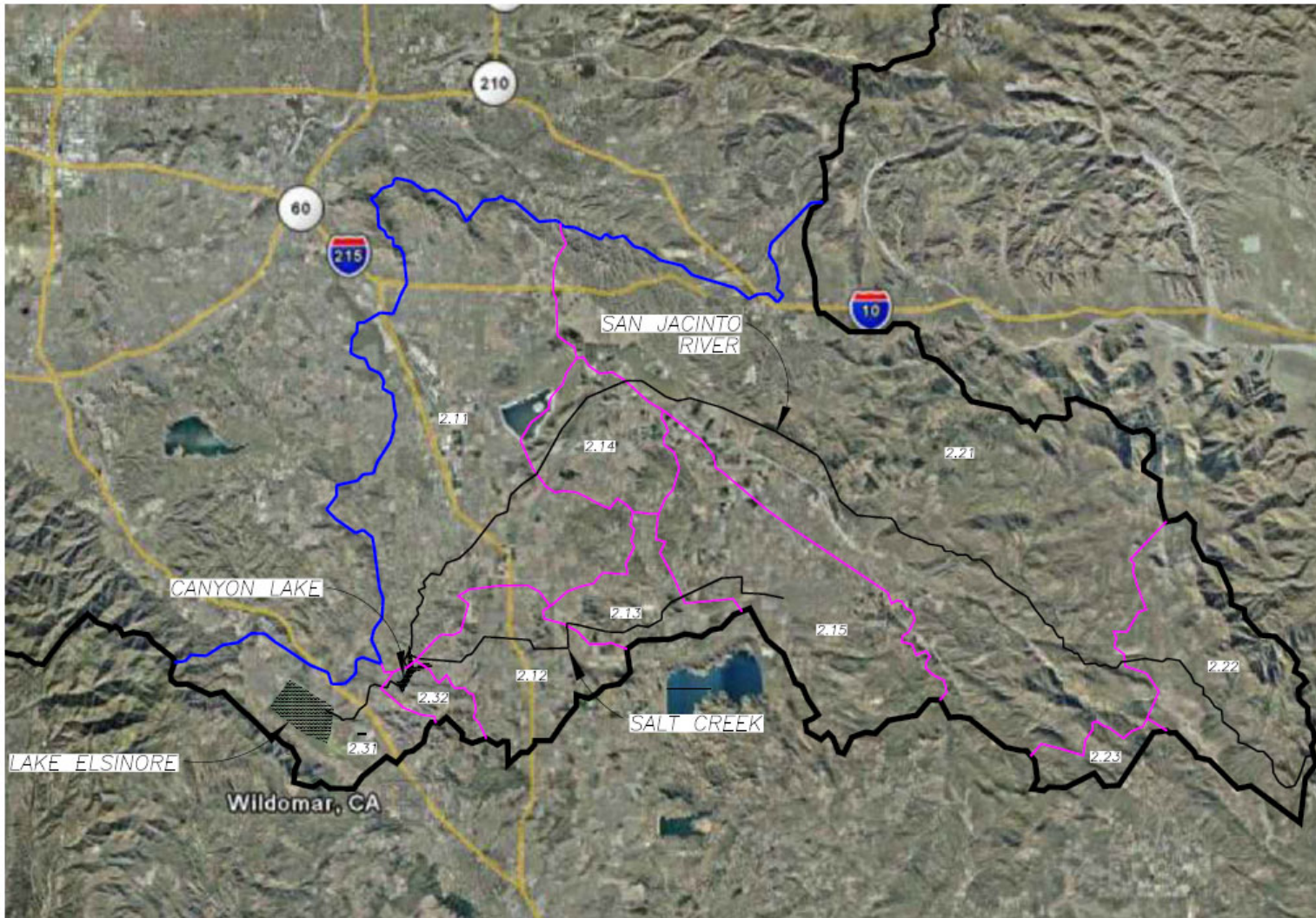
Location Map, WQMP Site Plan and Receiving Waters Map



MENIFEE RIVERWALK TOWNHOMES

VICINITY MAP

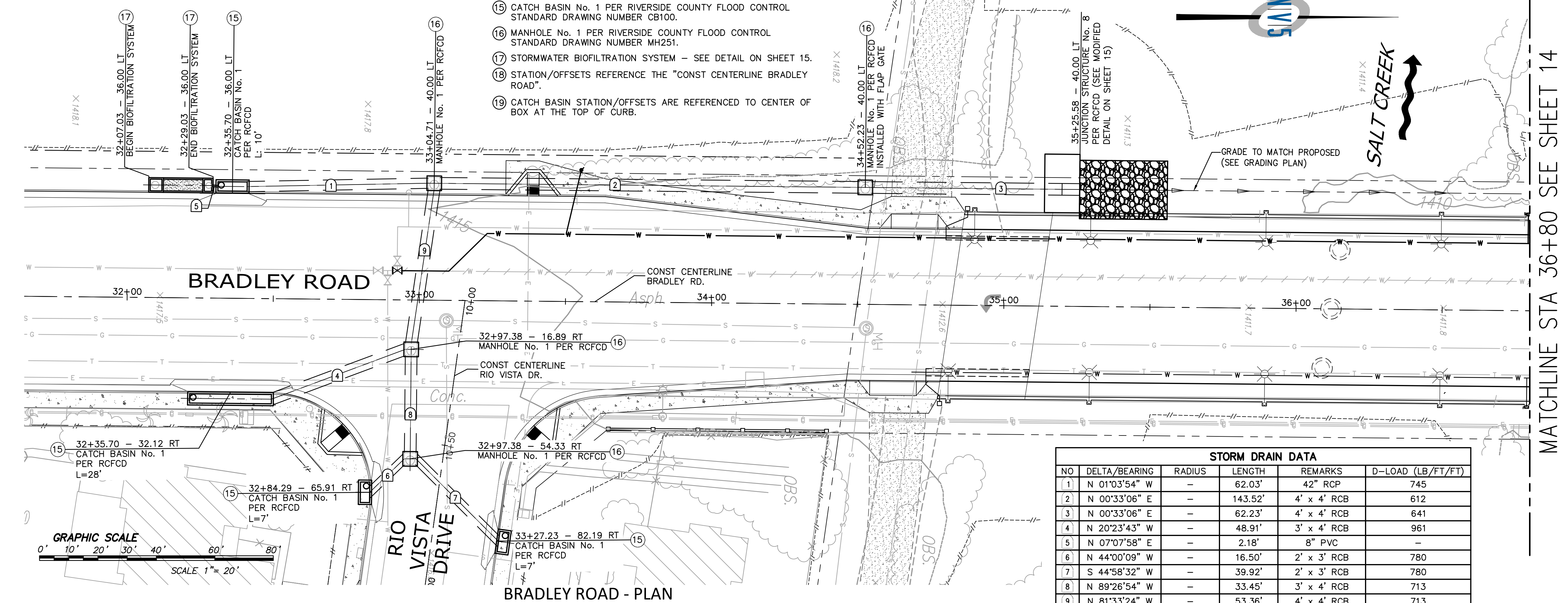
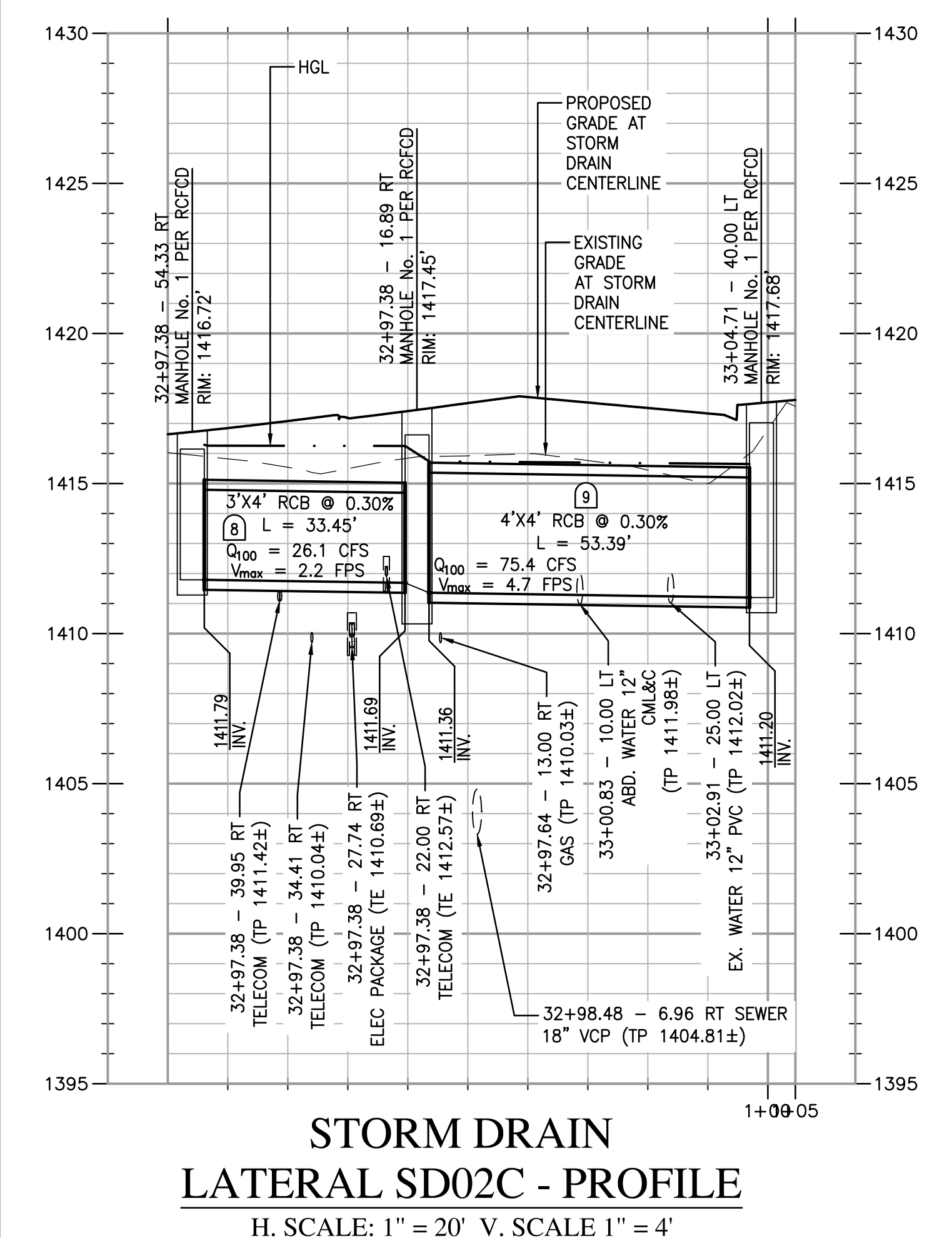
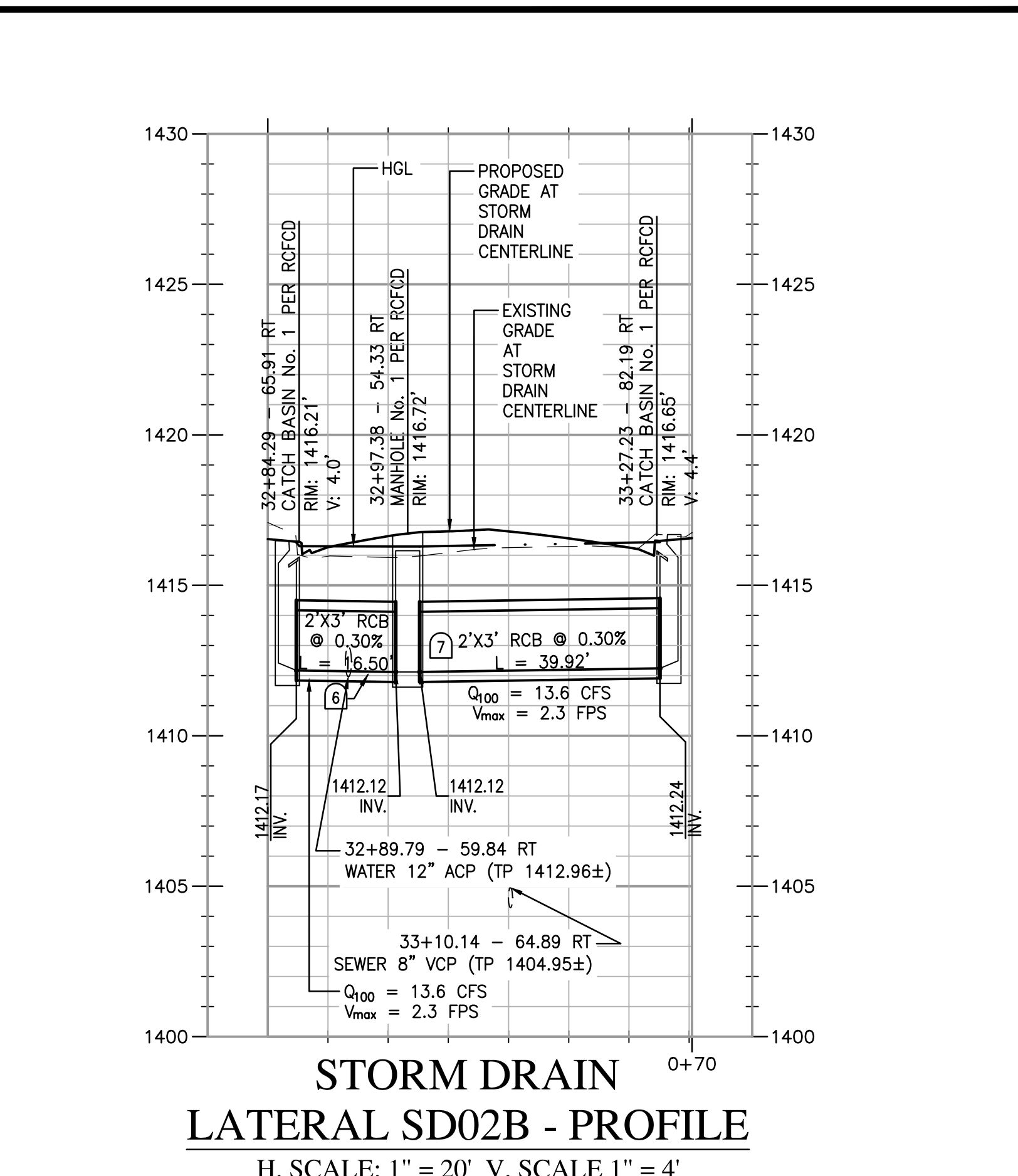
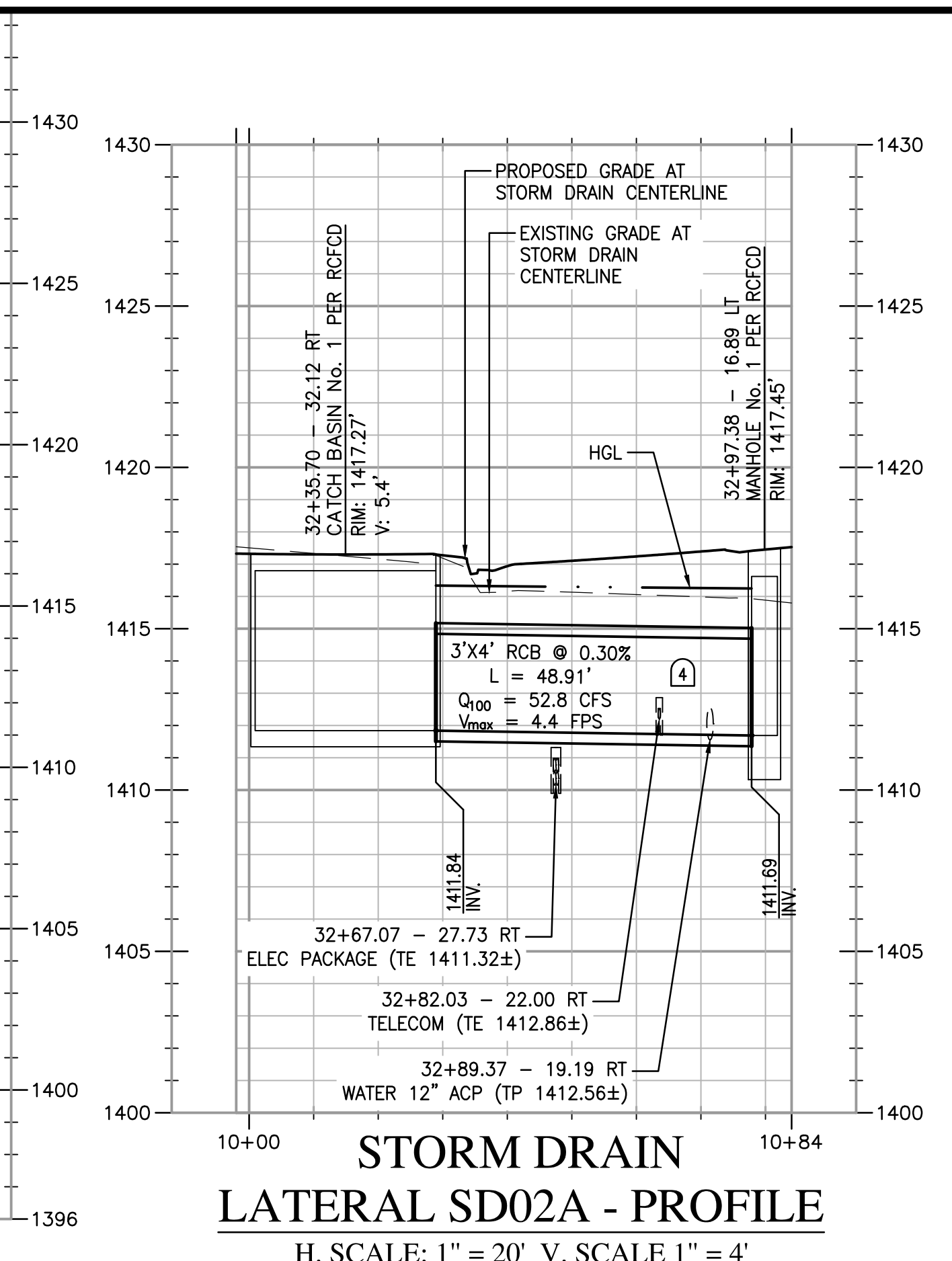
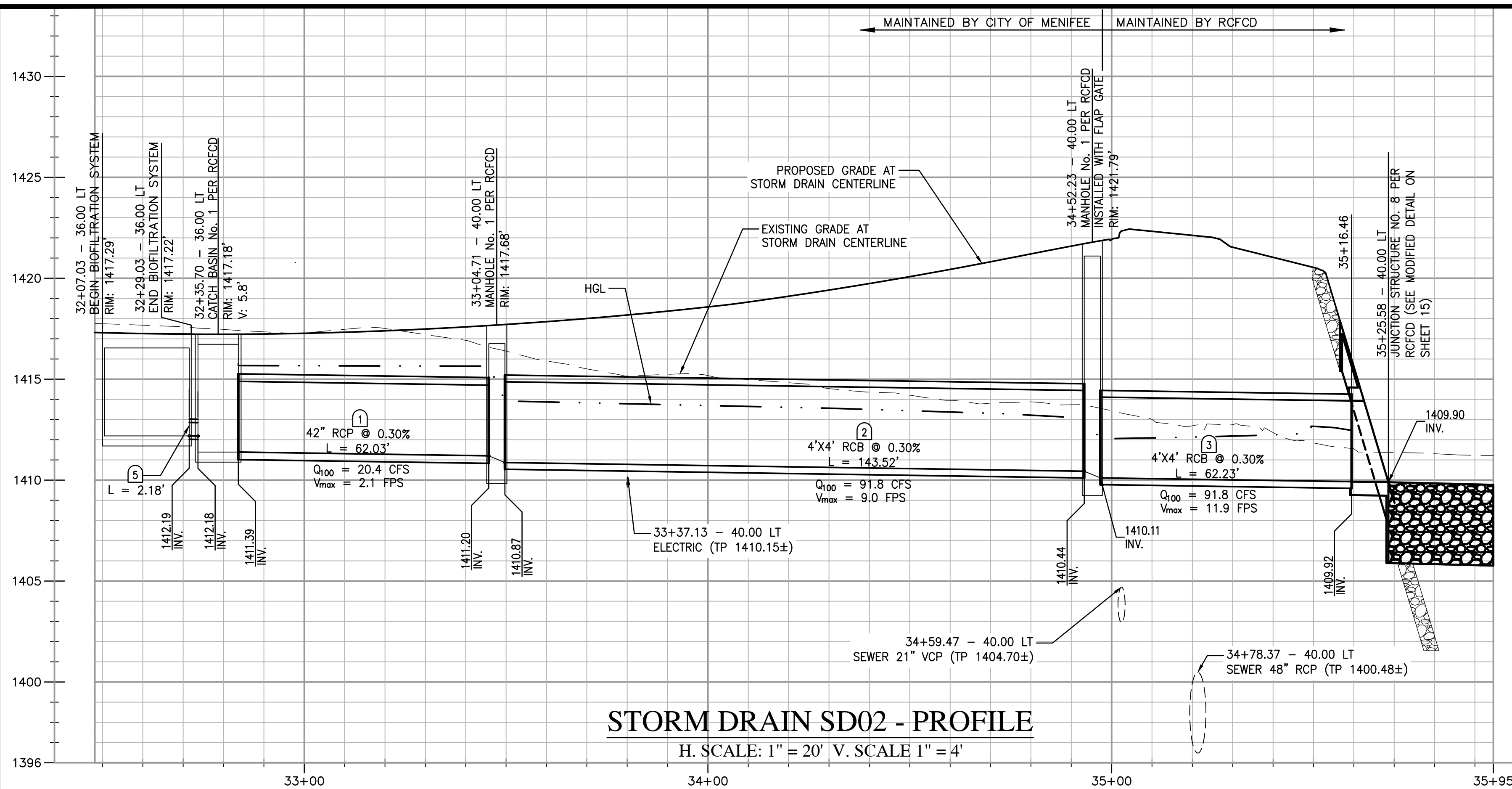




MENIFEE RIVERWALK TOWNHOMES
RECEIVING WATERS MAP

Appendix 2: Construction Plans

Grading and Drainage Plans

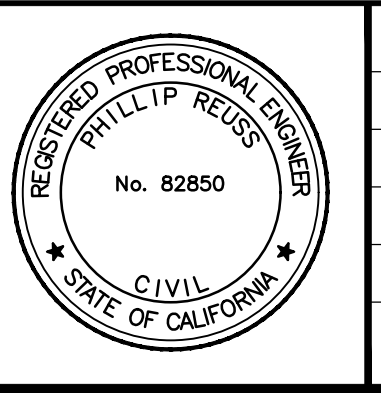


- CONSTRUCTION NOTES**
- (15) CATCH BASIN No. 1 PER RIVERSIDE COUNTY FLOOD CONTROL STANDARD DRAWING NUMBER CB100.
 - (16) MANHOLE No. 1 PER RIVERSIDE COUNTY FLOOD CONTROL STANDARD DRAWING NUMBER MH251.
 - (17) STORMWATER BIOFILTRATION SYSTEM - SEE DETAIL ON SHEET 15.
 - (18) STATION/OFFSETS REFERENCE THE "CONST CENTERLINE BRADLEY ROAD".
 - (19) CATCH BASIN STATION/OFFSETS ARE REFERENCED TO CENTER OF BOX AT THE TOP OF CURB.

NO	DELTA/BEARING	RADIUS	LENGTH	REMARKS	D-LOAD (LB/FT/FT)
1	N 01°03'54" W	-	62.03'	42" RCP	745
2	N 00°33'06" E	-	143.52'	4' x 4' RCB	612
3	N 00°33'06" E	-	62.23'	4' x 4' RCB	641
4	N 20°23'43" W	-	48.91'	3' x 4' RCB	961
5	N 07°07'58" E	-	2.18'	8" PVC	-
6	N 44°00'09" W	-	16.50'	2' x 3' RCB	780
7	S 44°58'32" W	-	39.92'	2' x 3' RCB	780
8	N 89°26'54" W	-	33.45'	3' x 4' RCB	713
9	N 81°33'24" W	-	53.36'	4' x 4' RCB	713

NO.	REVISIONS	DATE	BY	APPR
1	SHT.			

N|V|5
15092 AVENUE OF SCIENCE, SUITE 200
SAN DIEGO, CA 92128
P: 656.385.0500 WWW.NV5.COM



SCALE: 1"=20'
DESIGN: PR
DRAWN: PR
CHECKED:
APPROVED:
DATE: August 31, 2018

CITY OF MENEFEE
ENGINEERING DEPARTMENT
JONATHAN G. SMITH
DIRECTOR OF PUBLIC WORKS/
CITY ENGINEER
RECOMMENDED BY:
CARLOS E. GERONIMO

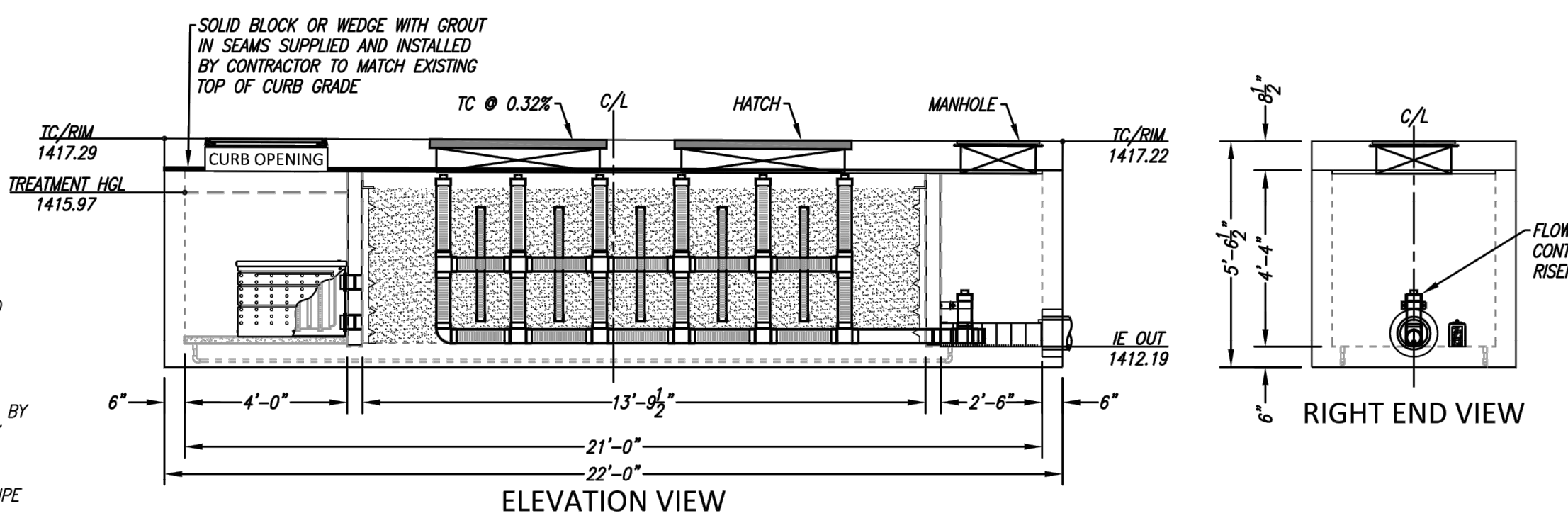
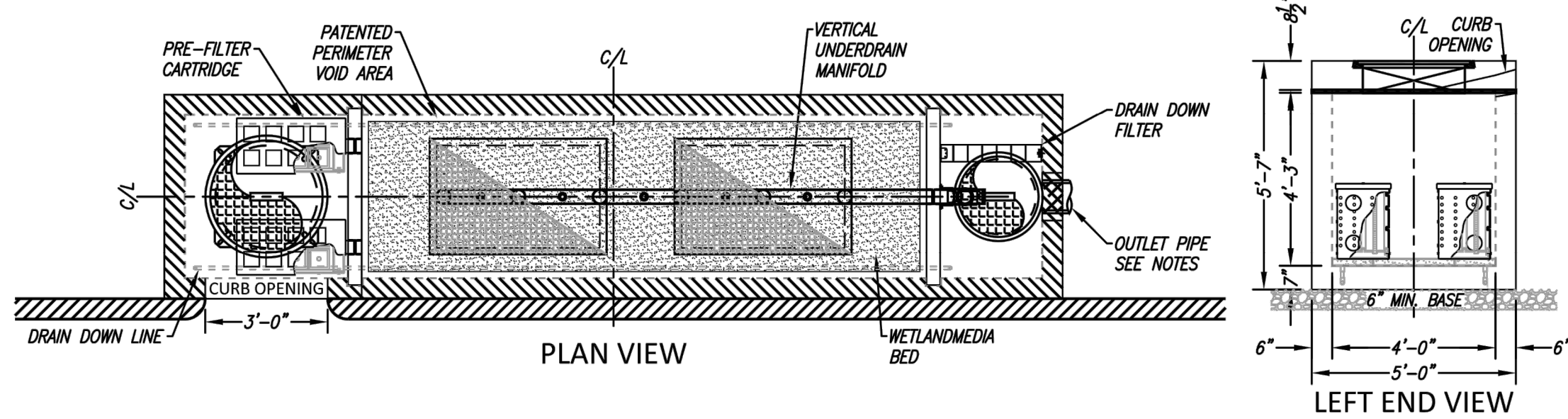


CITY OF MENEFEE
ENGINEERING DEPARTMENT
BRADLEY ROAD BRIDGE
OVER SALT CREEK
STORM DRAIN PLAN & PROFILE STA 31+10 TO STA 36+80

SHEET NO.
13
13 OF 58
PROJECT NO: CIP 13-04

MATCHLINE STA 36+80 SEE SHEET 14

SITE SPECIFIC DATA			
PROJECT NUMBER	4128		
PROJECT NAME	BRADLEY RD BRIDGE		
PROJECT LOCATION	MENEFEE, CA		
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
	0.27		
TREATMENT HGL AVAILABLE (FT)	N/A		
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE	FLOW-BY		
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	N/A	N/A	N/A
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	1412.19	N/K	8"
PRETREATMENT BIOFILTRATION DISCHARGE			
RIM ELEVATION	1417.29	VARIABLE	1417.22
SURFACE LOAD	PEDESTRIAN	PEDESTRIAN	PEDESTRIAN
FRAME & COVER	#30"	2 EA 30" X 48"	#24"
WETLANDMEDIA VOLUME (CY)	7.79		
WETLANDMEDIA DELIVERY METHOD	PER CONTRACT		
ORIFICE SIZE (DIA. INCHES)	#2.30"		
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

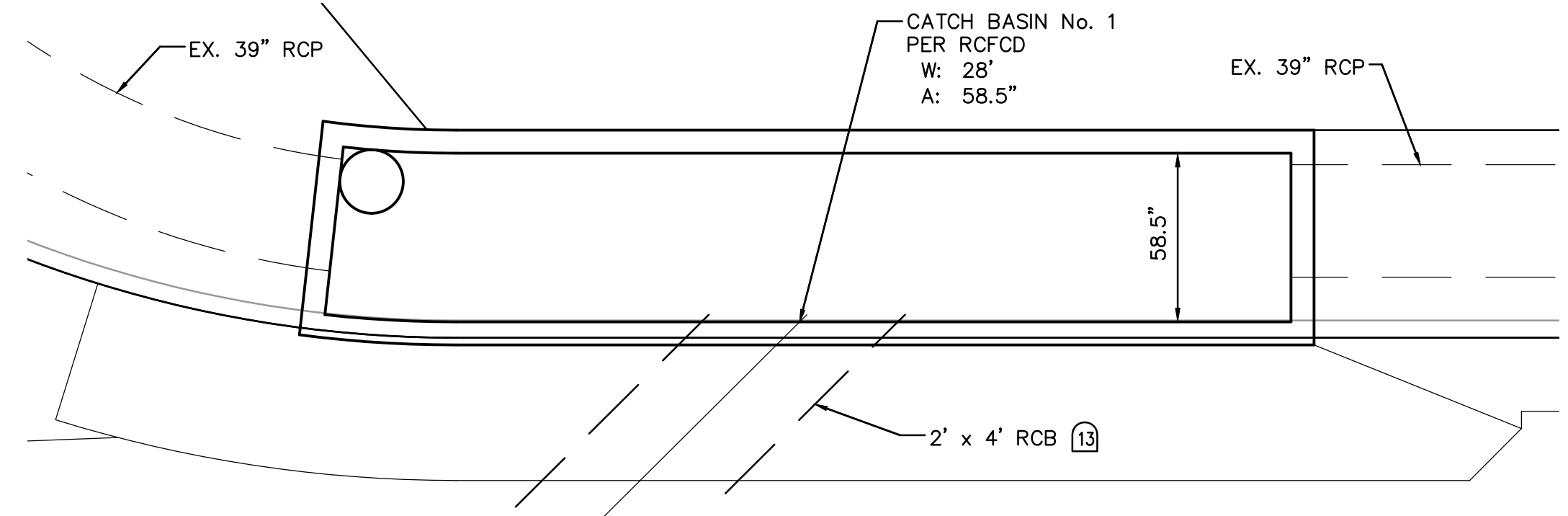
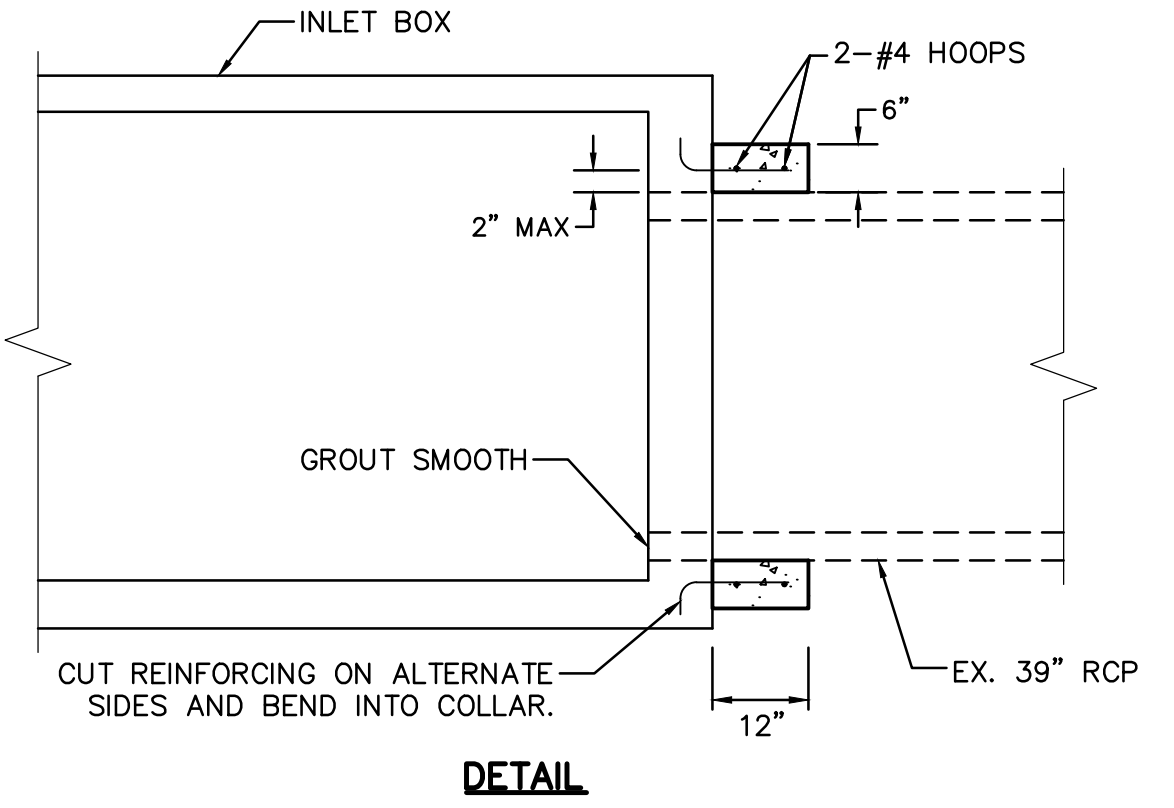


TREATMENT FLOW (CFS)	0.27
OPERATING HEAD (FT)	3.7
PRETREATMENT LOADING RATE (GPM/SF)	2.4
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

- INSTALLATION NOTES**
- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
 - UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
 - ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURER'S STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
 - CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
 - CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.
- GENERAL NOTES**
- MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
 - ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

STORMWATER BIOFILTRATION SYSTEM DETAIL

NO SCALE

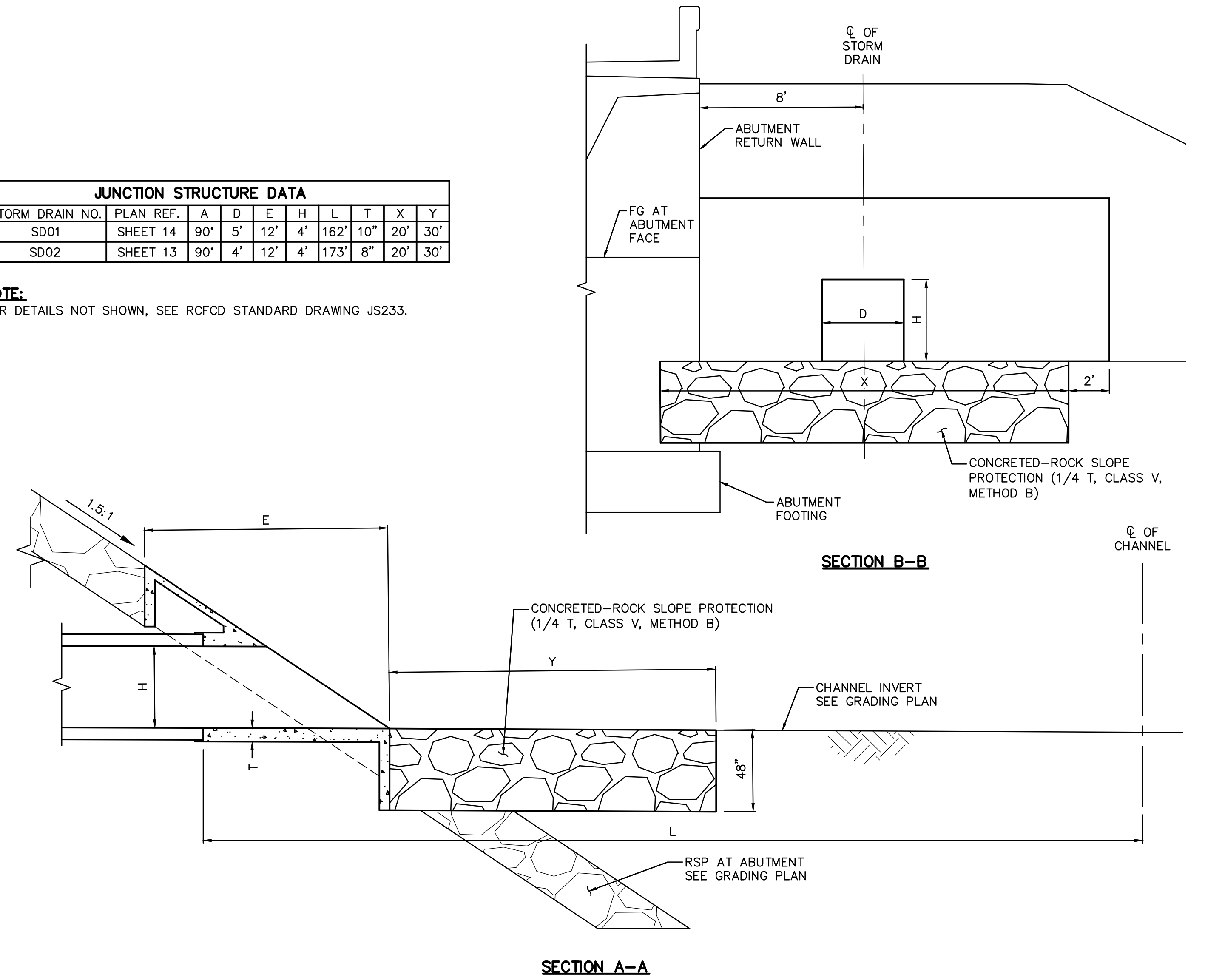


EXISTING STORM DRAIN CONNECTION DETAIL

NO SCALE

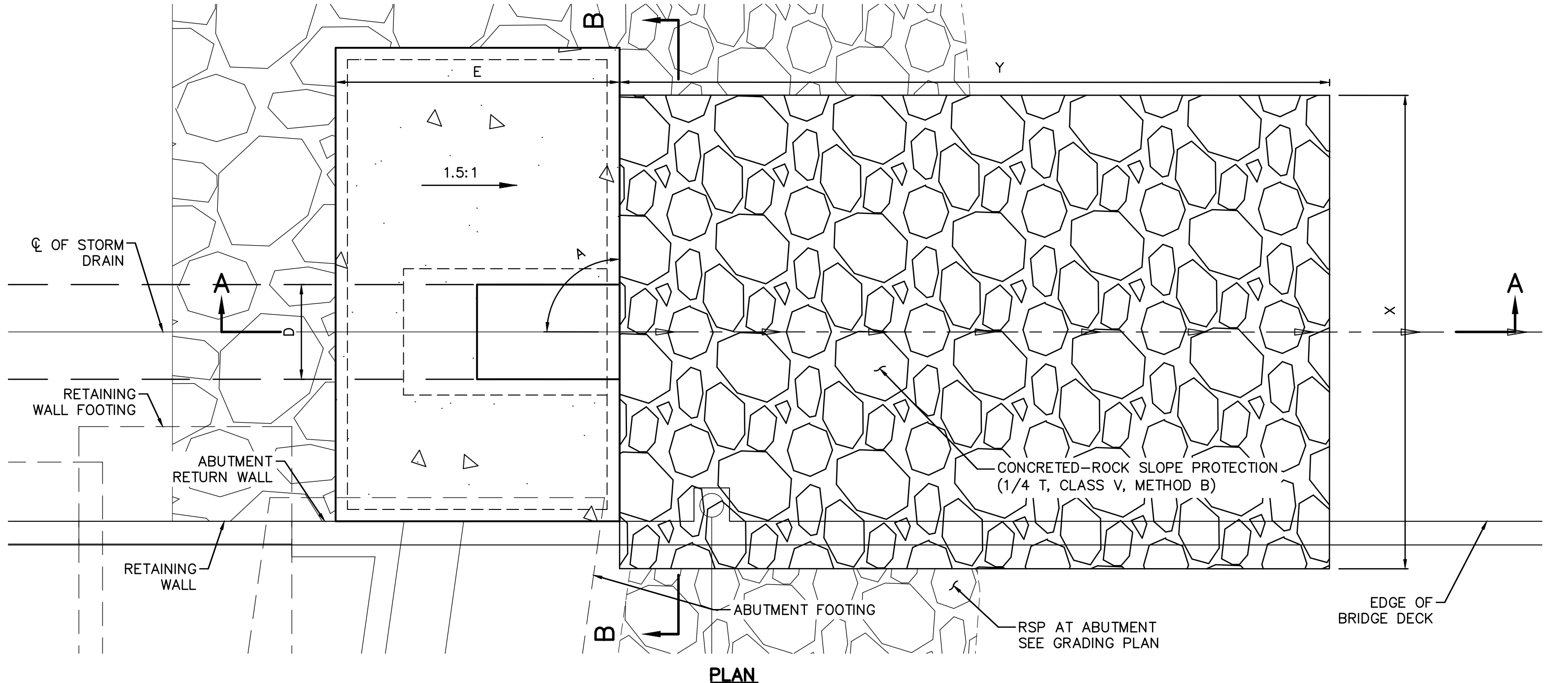
JUNCTION STRUCTURE DATA									
STORM DRAIN NO.	PLAN REF.	A	D	E	H	L	T	X	Y
SD01	SHEET 14	90'	5'	12'	4'	162'	10"	20'	30'
SD02	SHEET 13	90'	4'	12'	4'	173'	8"	20'	30'

NOTE:
FOR DETAILS NOT SHOWN, SEE RCFCD STANDARD DRAWING JS233.



JUNCTION STRUCTURE No. 8 MODIFIED DETAIL

NO SCALE



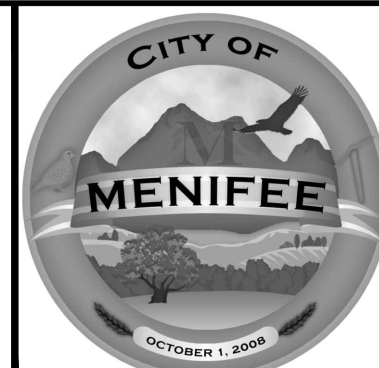
NO.	REVISIONS	DATE	BY	APPR
1	SHT.			

N|V|5
15092 AVENUE OF SCIENCE, SUITE 200
SAN DIEGO, CA 92128
P: 858.385.0500 WWW.NV5.COM



SCALE:	1"=20'
DESIGN:	PR
DRAWN:	PR
CHECKED:	
APPROVED:	
DATE:	August 31, 2018

CITY OF MENEFEE ENGINEERING DEPARTMENT	
JONATHAN G. SMITH DIRECTOR OF PUBLIC WORKS/ CITY ENGINEER	RCE 61253 DATE
RECOMMENDED BY: CARLOS E. GERONIMO	RCE 75635 DATE



CITY OF MENEFEE
ENGINEERING DEPARTMENT
BRADLEY ROAD BRIDGE
OVER SALT CREEK
STORM DRAIN DETAILS

SHEET NO.
15
15 OF 58
PROJECT NO: CIP 13-04

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data



Geotechnical • Geologic • Coastal • Environmental

26590 Madison Avenue • Murrieta, California 92562 • (951) 677-9651 • FAX (951) 677-9301 • www.geosoilsinc.com

September 19, 2016

W.O. 5431-A1-SC

The Womble Group
P.O. Box 3609
Seal Beach, California 90740

Attention: Mr. Al Womble

Subject: Feasibility Level Infiltration/Percolation Feasibility Study, ±15-Acre Site,
APN's 338-150-029 and 031, City of Menifee, Riverside County, California.

Dear Mr. Womble:

In accordance with your request, GeoSoils, Inc. (GSI) is pleased to submit this report with the results of our percolation/infiltration feasibility study at the subject site. The purpose of the percolation/infiltration study was to evaluate the existing soil materials underlying the property with regard to their nature and infiltration characteristics related to proposed development, as required by the City of Menifee and/or County of Riverside. The study was intended to develop a reasonable representation of the infiltration capacity of the onsite earth materials, and to provide site specific infiltration rates for basin and bio-swale designs in general conformance with the controlling authority's guidelines.

PROPOSED DEVELOPMENT

According to the preliminary concept drainage and water quality control plan by Stryker Engineering (2007), rough grading will create building pad areas for some ±258 multi-family residential units. Typical cut and fill grading techniques would be required to bring the site to design elevations. It is also our understanding that the buildings would be one- and/or two-story structures, utilizing typical wood-frame construction with slabs-on-grade. Building loads are assumed to be typical for this type of relatively light construction. It is assumed that sewage disposal would be accommodated by tying into the regional system. The need for import of fill soils is unknown at this time. Currently a storm water basin for water quality purposes is proposed near northwest corner of the site and a series of bio-swales are proposed along the central portion of the site.

SITE DESCRIPTION

The subject site consists of a nearly square-shaped ± 15 -acre parcel bounded on the north by Salt Creek, on the west by a Riverside County Flood Control (RCFC) channel, on the south by existing church property, and on the east by Bradley Road in the City of Menifee, Riverside County, California

Topographically, the site consists of near flat-lying terrain ranging in elevation from approximately $\pm 1,420$ feet in the northwest corner to $\pm 1,413$ feet in the southeast corner of the property. Natural site drainage sheet flows to the northwest; however, is locally variable depending on relief.

It is our understanding that the controlling authorities generally require Best Management Practices (BMPs) to clarify onsite storm water run-off within newly developed residential projects. Remedial grading for the project is anticipated to consist of the removal and recompaction of the near surface soils.

SITE GEOLOGY

Based on our review (GSI, 2007), site observations, subsurface explorations, and published mapping (Morton, 2003), the site is mantled by localized undocumented artificial fill, which is underlain by topsoil/colluvium, and in turn underlain by Quaternary-age young alluvial valley deposits to old alluvial fan deposits. The alluvial valley and fan deposits extend from the north to south portions of the property, respectively. The USDA website indicates that site soils belong to Hydrologic Soil Group (HSG) "D."

GROUNDWATER

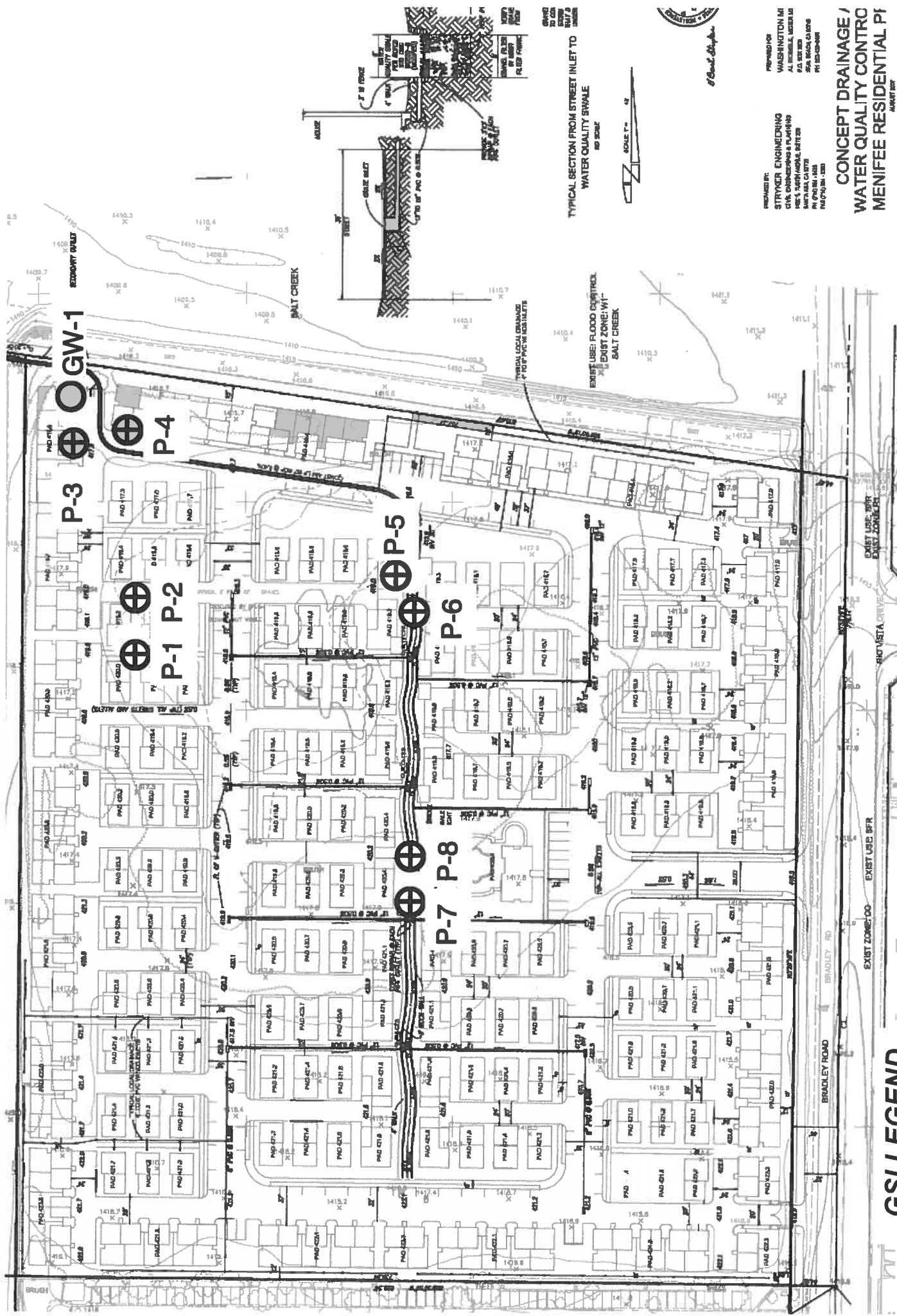
Groundwater was not encountered in any borings during our recent field work up to a maximum depth of ± 15 feet below the ground surface. Likewise, seeps, springs, or other indications of a high groundwater level were not noted on the subject property during the time of our field investigations. Based on our review of the California Department of Water Resources [CDWR], Water Data Library (2015), the depth to groundwater in a nearby well just west of the site was found to be approximately ± 44 feet below the ground surface from readings in September 2015. During our site reconnaissance, no surface water was noted within the RCFC drainage channel to the west of the site, nor within Salt Creek north of the project site. Based on our review, GSI estimates that the down-groundwater gradient is in a south-southwesterly direction. These observations reflect site conditions at the time of our field work and do not prevent future changes in local groundwater conditions from excessive irrigation, precipitation, or that were not evident, at the time of our field investigation and review.

FIELD PERCOLATION/INFILTRATION TESTING

Eight (8) percolation/infiltration tests were conducted within the site at four (4) specific locations, at a depth of between $\pm 4\frac{1}{2}$ to ± 5 feet, to approximate the anticipated depth of proposed detention/infiltration basins/bio-swales within the project, as provided by representatives of JLC Engineering. An additional boring was advanced to a depth of ± 15 feet to observe for potential ground water below the proposed onsite BMPs. The borings advanced for this study were excavated utilizing a hollow stem drill rig. The percolation/infiltration tests were conducted within the native Quaternary-age young alluvial valley deposits to old alluvial fan deposits. Percolation/infiltration testing was performed to evaluate site conditions with respect to proposed onsite BMPs construction to retain and filter onsite storm water. Onsite testing was performed in general conformance with the County of Riverside Department of Environmental Health (CORDEH, 2009) and the 2015 Uniform Plumbing Code ([UPC, 2015], International Association of Plumbing & Mechanical Officials, 2015) guidelines for percolation testing. Testing was performed by an engineering geologist from our firm. The percolation test rates (minutes/inch) were then converted to infiltration rates (inches/hour) per the Porchet Method (RCFCWCD, 2011). The approximate locations of the exploratory borings for this study are provided on Figure 1 (Exploration Location Map), which utilizes the Concept Drainage and Water Quality Control Plan by Stryker Engineering (2007), as a base map. The procedures for testing are outlined briefly below:

Procedures

- Test Holes:**
1. Eight (8) test borings drilled to a depth of between $\pm 4\frac{1}{2}$ to ± 5 feet, and one groundwater observation boring to a depth of ± 15 feet (GW-1).
 2. Percolation test hole diameter - 8 inches.
 3. After the removal of all loose material, approximately 2 inches of gravel was placed on the bottom of the excavation.
 4. A perforated pipe was then installed within the percolation test hole to facilitate accurate field measurements and prevent caving during testing and the pre-soak period.
- Pre-Soaking:** A full 5-gallon bottle of clear water was periodically inverted over each test hole, so the test hole was filled continuously to approximately 8 inches over the gravel. The pre-soak period continued overnight, as the water did not all seep away while the tester was present.
- Testing:** Percolation testing measurements were made the following day after required minimum 15-hour pre-soak period. After the pre-soak, the drop in water level was measured from a fixed reference point, refilling to ± 6 inches over the gravel after each measurement. During the percolation test, a series of measurements were taken utilizing



GSILEGEND

ate Location of Percolation/Infiltration Test

ALL LOCATIONS ARE APPROXIMATE

This document or e-file is not part of the Construction

TYPICAL SECTION FROM STREET INLET TO WATER QUALITY SWALE



PROPOSED FOR WASHINGTON MI
 CIVIL ENGINEERING & PLANNING
 1000 N. WEST HAVEN DRIVE
 WEST HAVEN, MI 48391
 PHONE: (313) 281-1100
 FAX: (313) 281-1101
 WWW: WWW.WHEP.COM

CONCEPT DRAINAGE / WATER QUALITY CONTROL MENIFEE RESIDENTIAL PROJECT



approved Riverside County guidelines (CORDEH, 2009). The field test results and calculated rates are provided in Figure 2.

Locations: The locations of the percolation/infiltration tests performed were chosen to correspond with the anticipated location of the basin and bio-swales as indicated on the drainage study provided by Stryker Engineering (SE, 2007). The locations of test areas were easily identified by measurements to property boundaries and existing stockpile locations.

Accuracy: All test measurements were read to the nearest ¼-inch.

Test Results: Calculations from our field testing indicate percolation rates (P-1 through P-8), at a depth of between $\pm 4\frac{1}{2}$ to ± 5 feet, vary from 0.0 to 120 minutes/inch. As discussed previously, the percolation rates obtained were then converted to infiltration rates utilizing the Porchet Method (RCFCWCD, 2011). The converted infiltration rates obtained varied between 0.00 and 1.66 inches/hour. The converted infiltration rates for each of the test locations, along with the formulas utilized, are provided in Figure 2.

CONCLUSIONS AND RECOMMENDATIONS

The above infiltration rates, may be utilized for design of the proposed BMP's, provided the bottom area of the BMP is founded entirely in native Quaternary-age young alluvial valley deposits to old alluvial fan deposits. In addition to the above, an appropriate factor of safety, per the controlling authorities requirements, should also be incorporated into the design calculations. The following comments and/or recommendations should also be considered during design (structural and civil) and implementation of any BMP system onsite:

- Site soils belong to HSG type "D." USDA infiltration rates for HSG type "D" soils are typically very low (0.00 inches/hour) to moderately low (0.06 inches/hour). Based on final design and proximity to structures, basin liners may be warranted.
- As with any BMP, localized ponding and groundwater seepage and mounding should be anticipated.
- Similarly, as with any BMP, proper maintenance and care will need to be provided. Best management maintenance practices should be followed at all times, especially during inclement weather. Should regular inspection and/or maintenance not be performed, the potential for malfunctioning of the BMP system will increase.


Percolation Rate to Infiltration Rate Conversion

$$* \text{ Infiltration Rate } (I_t) = \frac{\Delta H \pi r^2 60}{\Delta t(\pi r^2 + 2\pi r H_{\text{avg}})} = \frac{\Delta H 60 r}{\Delta t}$$

Where: I_t = tested infiltration rate, inches/hour
 ΔH = change in head over the time interval, inches
 Δt = time interval, minutes
 r = effective radius of test
 H_{avg} = average head over the time interval, inches

		Δt	Init Level	FnI Level	ΔH	H_{avg}	I_t		
Percolation Test Num- bers	P-1 @ 5.0 ft.	30	6	5 3/4	1/4	5 7/8	0.13	Low = 0.00 High = 1.66 Average = 0.66	
	P-2 @ 5.0 ft.	30	6	0	0	0	0.00		
	P-3 @ 4.5 ft.	30	6	5 1/4	3/4	5 5/8	0.39		
	P-4 @ 5.0 ft.	30	6	4 1/2	1 1/2	5 1/4	0.83		
	P-5 @ 4.5 ft.	30	6	4 1/2	1 1/2	5 1/4	0.83		
	P-6 @ 5.0 ft.	30	6	5 3/4	1/4	5 7/8	0.13		
	P-7 @ 5.0 ft.	30	6	3 3/4	2 1/4	4 7/8	1.31		
	P-8 @ 4.5 ft.	30	6	3 1/4	2 3/4	4 5/8	1.66		

* Conversion per the "Porchet Method" (RCFWCD, 2011)



GeoSoils, Inc.

INFILTRATION RATE CONVERSION

Figure 2

W.O. 5431-A1-SC	DATE: 09/16
-----------------	-------------

- Provisions for the maintenance of any siltation, debris within the BMP, and/or overgrown vegetation (i.e., root systems) should be considered. An appropriate inspection and maintenance schedule will need to be adopted and provided to all interested/affected parties.
- Any proposed utility backfill materials located within the proposed area of the BMP may become saturated. This is due to the potential for piping, water migration, and/or seepage along the utility trench line backfill. Backfill for utilities/storm drains in this area should consist of slurry (2-sack mix). If utility trenches enter, cross, and/or are proposed near the BMP system, cut-off walls or other water barriers will likely need to be installed to mitigate the potential for piping and excess water entering the utility backfill materials and/or detrimentally affecting hardscape.
- Any proposed footings and/or foundations should maintain a minimum of 1:1 (horizontal to vertical [h:v]) distance from the base of the footing and/or foundation to any adjacent BMP system. If a 1:1 (h:v) distance cannot be maintained, a deepened footing and/or foundation will be required.
- The landscape architect should be notified of the location of the proposed BMP system. If landscaping is proposed within the BMP, consideration should be given to the type of vegetation chosen and their potential effect upon subsurface improvements (i.e., some trees/shrubs will have an effect on subsurface improvements with their extensive root systems).
- The potential for surface flooding, in the case of system blockage, should be evaluated by the design engineer.
- As the percolation/infiltration testing conducted for this study is site specific, any changes to the location of the proposed BMP and/or estimated size of the BMP, should be reviewed by this office. Depending upon the nature of any changes, and the requirements of the reviewing entity, additional percolation/infiltration testing may be considered warranted.
- Final grading and improvement plans, as well as structural foundation plans, should be submitted to this office for review and comment, as they become available, to minimize any misunderstandings between the preliminary plans currently reviewed and preliminary recommendations presented herein. If project designs are found to differ substantially from those stated herein, appropriate recommendations would be offered at that time.

LIMITATIONS

The materials encountered on the project site and utilized for our analysis are believed representative of the area; however, soil and alluvial materials may vary in character between excavations and natural outcrops or conditions exposed during mass grading. Site conditions may vary due to seasonal changes or other factors.

Inasmuch as our study is based upon our review and engineering analyses and field test data, the conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty, either express or implied, is given. Standards of practice are subject to change with time. GSI assumes no responsibility or liability for work or testing performed by others, or their inaction; or work performed when GSI is not requested to be onsite, to evaluate if our recommendations have been properly implemented. Use of this report constitutes an agreement and consent by the user to all the limitations outlined above, notwithstanding any other agreements that may be in place. In addition, this report may be subject to review by the controlling authorities. Thus, this report brings to completion our scope of services for this portion of the project.

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

Respectfully submitted,

GeoSoils, Inc.

Todd M. Page

Todd M. Page
Project Geologist, CEG 2083



David W. Skelly

David W. Skelly
Civil Engineer, RCE 47857



TMP/TAG/DWS/jh

Enclosure: Appendix - References

Distribution: (3) Addressee (2 wet signed)
(1) JLC Engineering, Attention: Mr. Joe Castaneda P.E. (pdf email)

APPENDIX

REFERENCES

- Allen, V., Connerton, A., and Carlson, C., 2011, Introduction to infiltration best management practices (BMP), Contech Construction Products, Inc., professional development series, dated December.
- California Department of Water Resources, 2016, Water Data Library interactive website, (<http://www.water.ca.gov/waterdatalibrary/>) (Accessed September 12, 2016)
- California Stormwater Quality Association, 2003, New development and redevelopment handbook, infiltration basin design considerations, No. TC-11, dated January.
- County of Riverside Department of Environmental Health, 2009, Onsite wastewater treatment systems, technical guidance manual, Version A, effective July 1.
- GeoSoils, Inc., 2007, Geotechnical review/update and preliminary geotechnical evaluation, ±15-Acre Site, APN's 338-150-029 and 031, Sun City, Riverside County, California, W.O. 5431-A-SC, dated May 9.
- International Association of Plumbing and Mechanical Officials, 2015, Uniform plumbing code (UPC): Walnut, California.
- Morton, D.M., 2003, Geologic map of the Romoland 7.5' quadrangle, Riverside County, California, U.S. Geological Survey Open File Report 03-102, version 1.0.
- Riverside County Flood Control and Water Conservation District, 2011, Design handbook for low impact development best management practices, dated September.
- _____, 2006, Stormwater quality best management practice design handbook, dated July 21.
- Stryker Engineering, 2007, Concept Drainage and Water Quality Control Plan, Menifee Residential Project, dated August.

Appendix 4: Historical Site Conditions

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

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

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

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

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

Company Name **KOLIBRIEN CORP.**

Date **10/3/2021**

Designed by **JJ**

Case No **1**

Company Project Number/Name **Menifee Riverwalk Townhomes**

BMP Identification

BMP NAME / ID **BR A1 - Bioretention**

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} = **0.60** inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
A1-A	202092	Roofs	1	0.89	180266.1			
A1-B	272904	Concrete or Asphalt	1	0.89	243430.4			
A1-C	133973	Ornamental Landscaping	0.1	0.11	14798.4			
	608969				438494.9	0.60	21997.8	22560

Notes:

Bioretention Facility - Design Procedure		BMP ID BR A1	Legend:	Required Entries
				Calculated Cells
Company Name:	Kolibrien Corp.		Date:	10/3/2021
Designed by:	JJ		County/City Case No.:	
Design Volume				
Enter the area tributary to this feature			$A_T =$	13.98 acres
Enter V_{BMP} determined from Section 2.1 of this Handbook			$V_{BMP} =$	21,998 ft ³
Type of Bioretention Facility Design				
<input type="radio"/> Side slopes required (parallel to parking spaces or adjacent to walkways) <input checked="" type="radio"/> 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			$w_T =$	90.0 ft
Total Effective Depth, d_E				
$d_E = [(0.3) \times d_S + (0.4) \times 1] + 0.5$			$d_E =$	1.50 ft
Minimum Surface Area, A_m				
$A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$			$A_M =$	14,666 ft ²
Proposed Surface Area			$A =$	15,040 ft ²
Minimum Required Length of Bioretention Facility, L			$L =$	163.0 ft
Bioretention Facility Properties				
Side Slopes in Bioretention Facility			$z =$	4 :1
Diameter of Underdrain				6 inches
Longitudinal Slope of Site (3% maximum)				0 %
6" Check Dam Spacing				0 feet
Describe Vegetation:			Natural Grasses	
Notes: Volume = 15040 x 1.50 = 22,560				
Shrubs and natural grass vegetation, dg maintenance ramp, 4:1 side slopes, 6" perforated pipe				

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

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

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

Company Name **KOLIBRIEN CORP.**

Date **4/26/2021**

Designed by **JJ**

Case No **1**

Company Project Number/Name **Menifee Riverwalk Townhomes**

BMP Identification

BMP NAME / ID **MODULAR WETLANDS B1**

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} = **0.60** inches

Drainage Management Area Tabulation

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)			
B1-A	32911	Concrete or Asphalt	1	0.89	29356.6						
B1-B	17721	Ornamental Landscaping	0.1	0.11	1957.4						
50632		Total			31314				0.60	1570.9	2280

Notes:

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

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

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

Company Name **KOLIBRIEN CORP.**

Date **4/26/2021**

Designed by **JJ**

Case No **1**

Company Project Number/Name **Menifee Riverwalk Townhomes**

BMP Identification

BMP NAME / ID **MODULAR WETLANDS B2**

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} = **0.60** 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)
B2-A	32804	Concrete or Asphalt	1	0.89	29261.2			
B2-B	5340	Ornamental Landscaping	0.1	0.11	589.8			
	38144		Total		29851	0.60	1497.5	2280

Notes:

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:

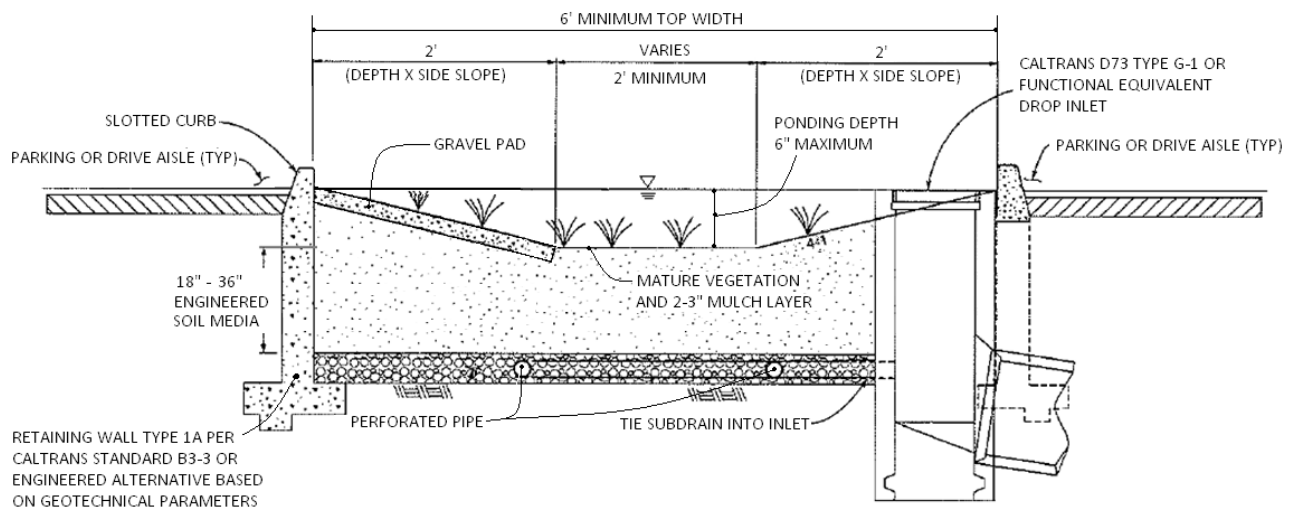
- *Depressing* landscaped areas below adjacent impervious surfaces, rather than elevating those areas
- Grading the site to direct runoff from those impervious surfaces *into* the Bioretention Facility, rather than away from the landscaping
- Sizing and designing the depressed landscaped area as a Bioretention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

BIORETENTION FACILITY BMP FACT SHEET

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 compost¹, 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/>

BIORETENTION FACILITY BMP FACT SHEET



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.

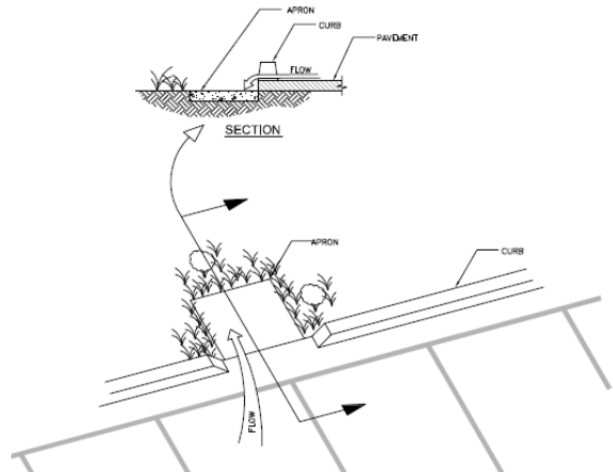


Figure 3: Apron located in a Bioretention Facility

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'

BIORETENTION FACILITY BMP FACT SHEET

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.

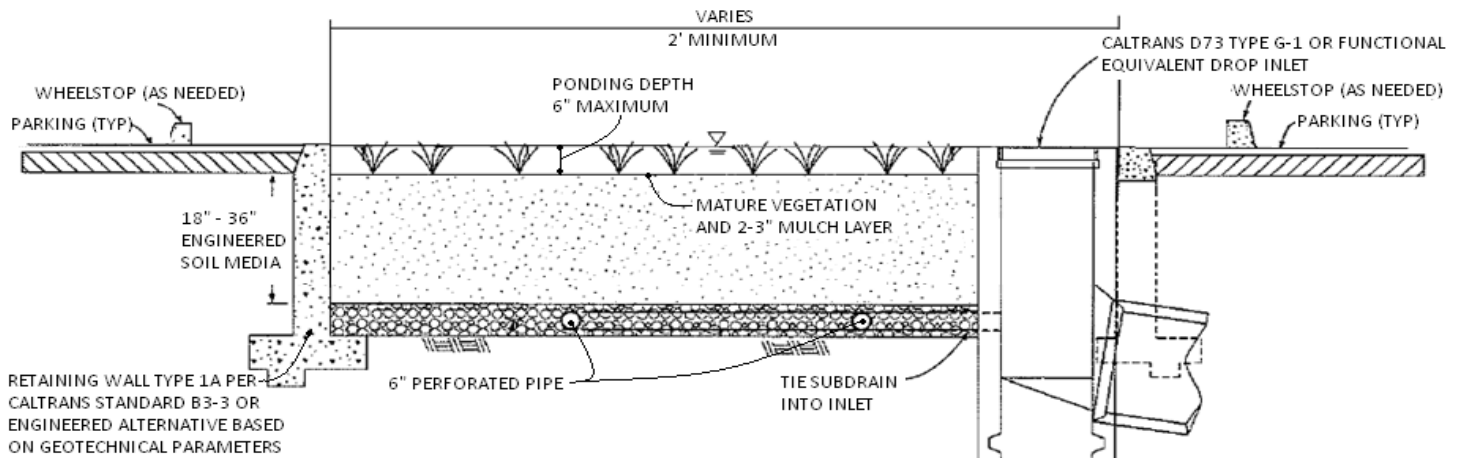
Side Slope Requirements

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.



BIORETENTION FACILITY BMP FACT SHEET

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.

BIORETENTION FACILITY BMP FACT SHEET

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.

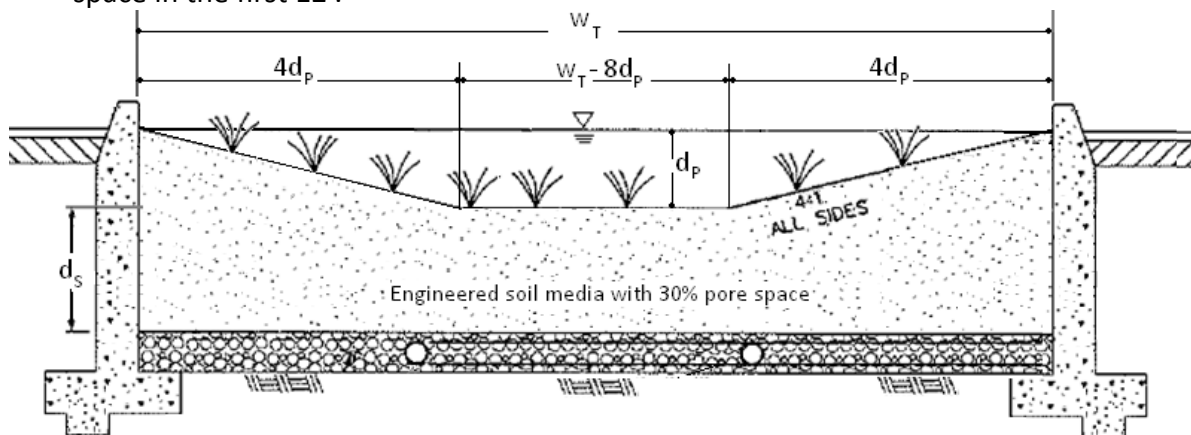
Inspection and Maintenance Schedule

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	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Inspect areas for ponding
Annually	<ul style="list-style-type: none">• 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.

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

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:

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

- 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.

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

- 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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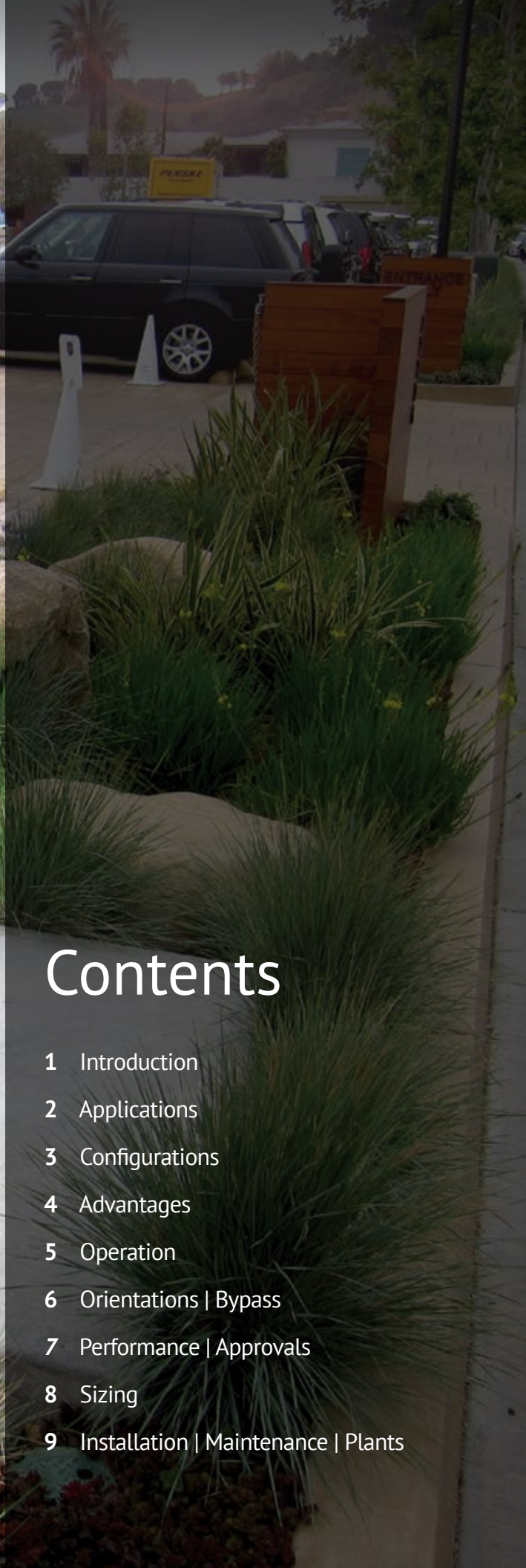


MODULAR
WETLANDS™

Advanced Stormwater Biofiltration



MWS Linear



Contents

- 1 Introduction
- 2 Applications
- 3 Configurations
- 4 Advantages
- 5 Operation
- 6 Orientations | Bypass
- 7 Performance | Approvals
- 8 Sizing
- 9 Installation | Maintenance | Plants

The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.



Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.



MWS Linear

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.



Industrial

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.



Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.



Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.



Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.



Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.



Mixed Use

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

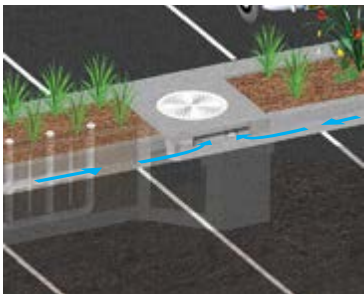
More applications are available on our website: www.ModularWetlands.com/Applications

- Agriculture
- Low Impact Development
- Reuse
- Waste Water



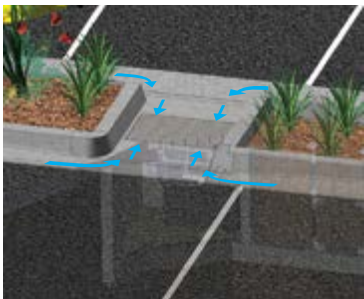
Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available “pipe-in” options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.



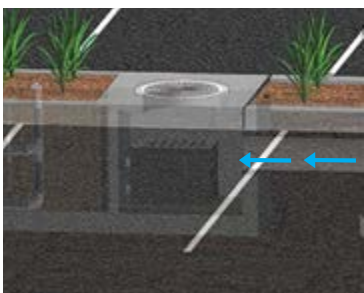
Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



Vault Type

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the “pipe in” design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.



Downspout Type

The *Downspout Type* is a variation of the *Vault Type* and is designed to accept a vertical downspout pipe from roof top and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

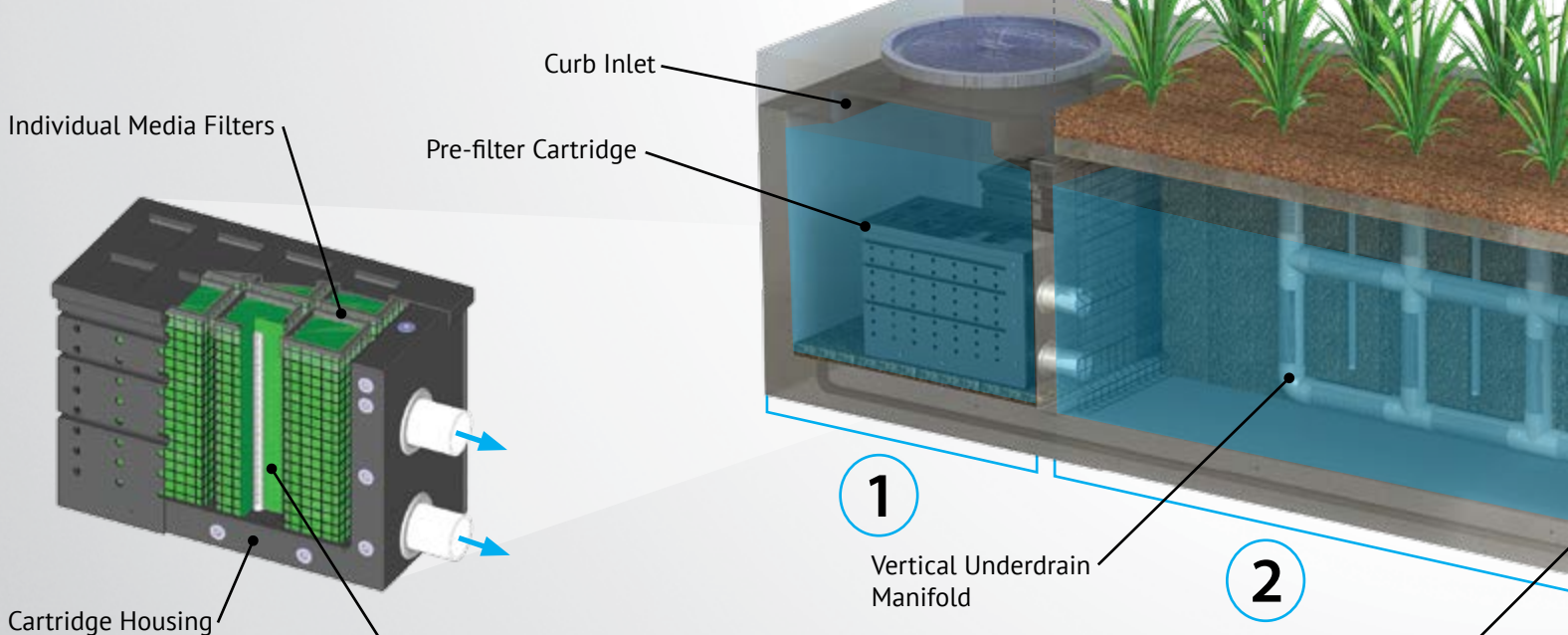
1 Pre-Treatment

Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

Pre-Filter Cartridges

- Over 25 ft² of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



BioMediaGREEN

Wetland
MEDIA™

Drain-

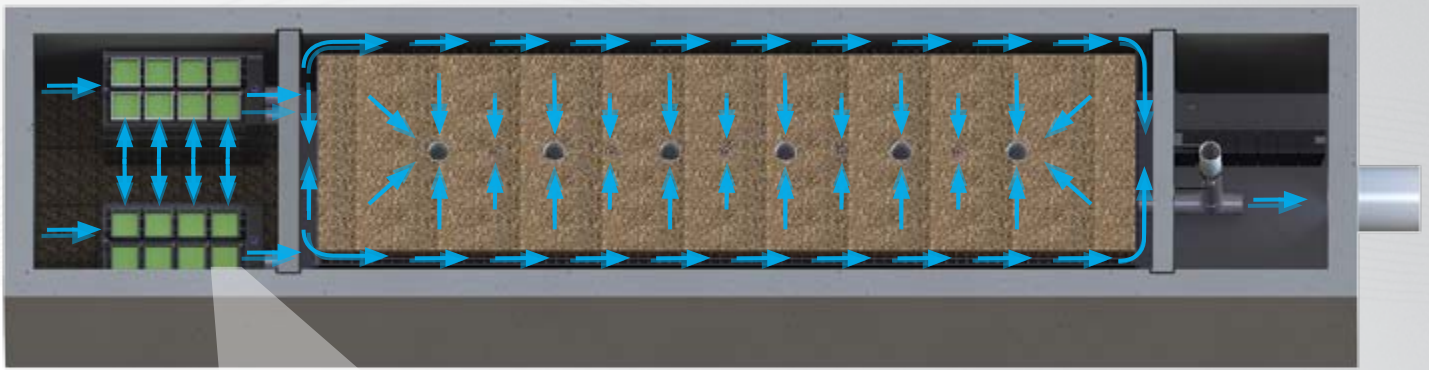


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.

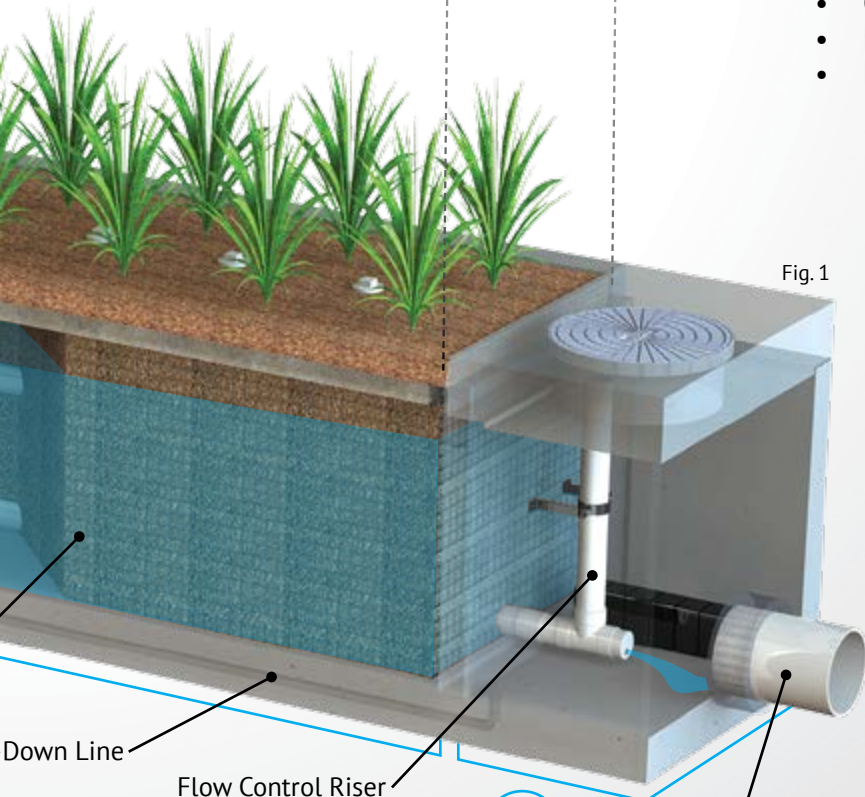
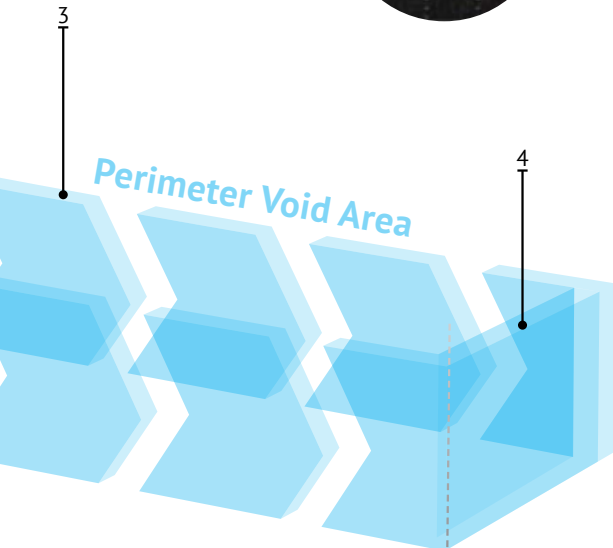


Fig. 1

2 Biofiltration

Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

3 Discharge

Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

Drain-Down Filter

- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

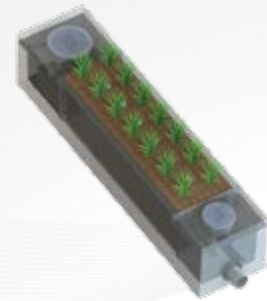
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Orientations



Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

Bypass

Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

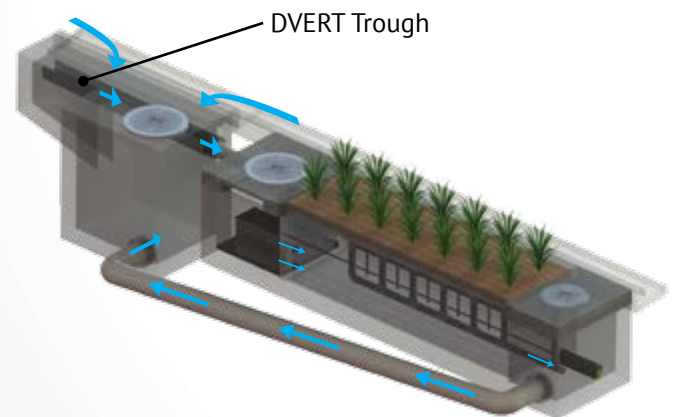
External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.



Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With its advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses nature's ability to process, transform, and remove even the most harmful pollutants.

Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.



Washington State TAPE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft² loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%



DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.



Maryland Department Of The Environment Approved

Granted ESD (Environmental Site Design) status for new construction, redevelopment and retrofitting when designed in accordance with the Design Manual.



MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.



Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus, and 30% Total Nitrogen.

Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

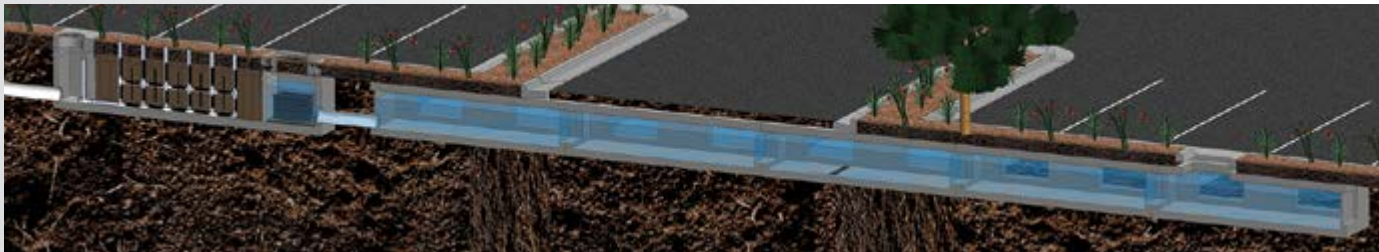


Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft ²	0.052
MWS-L-4-6	4' x 6'	32 ft ²	0.073
MWS-L-4-8	4' x 8'	50 ft ²	0.115
MWS-L-4-13	4' x 13'	63 ft ²	0.144
MWS-L-4-15	4' x 15'	76 ft ²	0.175
MWS-L-4-17	4' x 17'	90 ft ²	0.206
MWS-L-4-19	4' x 19'	103 ft ²	0.237
MWS-L-4-21	4' x 21'	117 ft ²	0.268
MWS-L-8-8	8' x 8'	100 ft ²	0.230
MWS-L-8-12	8' x 12'	151 ft ²	0.346
MWS-L-8-16	8' x 16'	201 ft ²	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.



Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.



Plant Selection

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit www.ModularWetlands.com/Plants for more information and various plant lists.





Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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

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

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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 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
<input checked="" type="checkbox"/> E. Pools, spas, ponds, decorative fountains, and other water features.	<input type="checkbox"/> Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	<p>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.</p>	<input checked="" type="checkbox"/> See applicable operational BMPs in “Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain” at http://rcflood.org/stormwater/
<input type="checkbox"/> F. Food service	<input type="checkbox"/> For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. <input type="checkbox"/> On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	<input type="checkbox"/> Describe the location and features of the designated cleaning area. <input type="checkbox"/> Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	<input type="checkbox"/> See the brochure, “The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries” at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
<input checked="" type="checkbox"/> G. Refuse areas	<input checked="" type="checkbox"/> Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. <input type="checkbox"/> If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. <input type="checkbox"/> Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	<input checked="" type="checkbox"/> State how site refuse will be handled and provide supporting detail to what is shown on plans. <input checked="" type="checkbox"/> State that signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.	<input checked="" type="checkbox"/> 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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 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
<input type="checkbox"/> H. Industrial processes.	<input type="checkbox"/> Show process area.	<input type="checkbox"/> If industrial processes are to be located on site, state: “All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.”	<input type="checkbox"/> See Fact Sheet SC-10, “Non-Stormwater Discharges” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure “Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities” at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 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
<input type="checkbox"/> I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	<input type="checkbox"/> Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. <input type="checkbox"/> Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. <input type="checkbox"/> Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	<p>Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.</p> <p>Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:</p> <ul style="list-style-type: none"> ▪ 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 <p>www.cchealth.org/groups/hazmat/</p>	<input type="checkbox"/> See the Fact Sheets SC-31, “Outdoor Liquid Container Storage” and SC-33, “Outdoor Storage of Raw Materials ” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 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
<input type="checkbox"/> J. Vehicle and Equipment Cleaning	<input type="checkbox"/> 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.	<input type="checkbox"/> If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): <input type="checkbox"/> Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to “Outdoor Cleaning Activities and Professional Mobile Service Providers” for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ <input type="checkbox"/> Car dealerships and similar may rinse cars with water only.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 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
<input type="checkbox"/> L. Fuel Dispensing Areas	<input type="checkbox"/> 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. <input type="checkbox"/> Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area ¹ .] The canopy [or cover] shall not drain onto the fueling area.		<input type="checkbox"/> The property owner shall dry sweep the fueling area routinely. <input type="checkbox"/> 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.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 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
<input type="checkbox"/> N. Fire Sprinkler Test Water		<input type="checkbox"/> Provide a means to drain fire sprinkler test water to the sanitary sewer.	<input type="checkbox"/> See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
<p>O. Miscellaneous Drain or Wash Water or Other Sources</p> <input type="checkbox"/> Boiler drain lines <input type="checkbox"/> Condensate drain lines <input type="checkbox"/> Rooftop equipment <input type="checkbox"/> Drainage sumps <input checked="" type="checkbox"/> Roofing, gutters, and trim. <input type="checkbox"/> Other sources		<input type="checkbox"/> Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. <input type="checkbox"/> Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Rooftop equipment with potential to produce pollutants shall be <input type="checkbox"/> roofed and/or have secondary containment. Any drainage sumps on-site shall <input type="checkbox"/> feature a sediment sump to reduce the quantity of sediment in pumped water. <input checked="" type="checkbox"/> 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.	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 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
<input checked="" type="checkbox"/> P. Plazas, sidewalks, and parking lots.			<input type="checkbox"/> 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

Stormwater BMP Operation & Maintenance Plan

I. Inspection Log

Site Inspection Log

Maintenance Engineer/Company:					
Date:					
Reason for Inspection:					
Inspection Item	A	M	U	N/A	Corrective Action Required
I Landscaping					
Are grounds in good condition, clean and free of debris?					
Are lawn areas mowed and trimmed?					
Are plant beds and/or planter boxes well maintained?					
Are shrubs trimmed and maintained?					
Are dead trees or shrubs evident?					
Are lawn sprinkler systems operable?					
Are areas around trash receptacles clean?					
Do a sufficient quantity of receptacles exist?					
II. Hardscape					
Are sidewalks and trails in good condition, clean, and free of debris?					
III. Storm Drain System					
Are all stencils in good condition, visible and legible?					
Are all drains clean and free of obstructions?					
IV. Bioretention BMPs					
Is the BMP in good condition, clean and free of debris?					
Is the BMP free of burrows?					
Is the BMP free of sediment accumulation?					
Is the BMP free of standing water?					
V. Tree Wells					
Is the Tree Well in good condition, clean and free of debris?					
Is the vegetation healthy and the planter mix at a proper depth?					
Is the BMP free of sediment accumulation?					
Is the BMP free of standing water?					
Comments:					

A Acceptable
M Marginal
U Unacceptable
N/A Not Applicable

II. Updates, Revisions, Errata

Revision No.	Date	Brief Description of Revision, include section and page number	Prepared and Approved By:
			Name: Title:
			Name: Title:
			Name: Title:
			Name: Title:
			Name: Title:
			Name: Title:
			Name: Title:

III. Introduction

Drainage on the site flows to bioretention basin. Impervious areas, such as the parking and walkways, drain to the bioretention basin. Impervious areas should be maintained clean by sweeping and collecting trash and debris. The basin should be maintained for landscaping, sediment and debris removal.

IV. Responsibility for Maintenance and Funding

A. General

1) Responsible Party during Construction

Identify the parties responsible for maintenance during construction phase of BMPs identified and source controls specified.

Developer's Name	Washington Murrieta 5, LLC		
Address	P.O. Box 3809		
	Seal Beach	State: CA	Zip: 90740
Email Address			
Phone Number	760-489-9563		
Engineer of Work	Kolibrien Corp.		
Engineer's Phone Number	(562) 538 - 9484		

2) Responsible Party for Ongoing Maintenance

Owner Responsible for Negotiating and Executing Contracts Responsible for Maintenance

Owner's Name			
Address			
	City:	State:	Zip:
Email Address			
Phone Number			

Supervisor Responsible for Responding to problems with Stormwater BMPs

Supervisor's Name	TBD		
Address			
	City:	State:	Zip:
Email Address			
Phone Number			

3) Employees or Contractors Responsible for conducting Stormwater BMP Operation and Maintenance

Employees	
Name	TBD
Title	
Phone	
Email	
Contractors	
Company	TBD
Employee	
Title	
Phone	
Email	

4) Funding

Funding for installation, operation, and maintenance of all stormwater BMPs will be the responsibility of the property owner. Funding for stormwater facility maintenance shall be paid for from ordinary incomes generated from the apartment complex. Any future owners will be required to maintain BMPs as per manufacturer's specifications.

Budget for Maintenance will be determined by property owner/management.

B. Training

Training of employees responsible for BMP maintenance procedures will be provided by the owner and the type of training will be at the discretion of the owner. Any contractors will be trained by their respective company and this will not be the property owner's responsibility.

C. Records

Insert maintenance records here.

D. Safety

Insert Company's Safety Training Documentation here.

V. Summary of Drainage Management Areas and Stormwater BMPs

A. Drainage Areas

This site includes landscaping. These areas will not require specialized O&M or inspections, but will require typical landscape maintenance. Landscape maintenance activities are described in Section VII. Maintenance Schedule.

Stormwater runoff from the areas are directed to the bioretention basin.

B. Structural Post-Construction BMPs

VI. Stormwater BMP Design Documentation

These BMPs will be "As Built" by a licensed civil/geotechnical engineer registered in the state of California and submitted to the Co-Permittee.

VII. Maintenance Schedule or Matrix

A. Maintenance Schedule

BMP	Responsible Party	Maintenance Activity	Inspection/Maintenance Frequency
Self-Treating Areas			
Landscape Maintenance	Property Owner	Inspect landscape areas for litter and debris daily. Weekly preform landscape area inspections and preform required landscape maintenance activities when it is needed. These maintenance activities include irrigating, weeding, applying fertilizers and pesticides in minimum required quantities, remulching, trimming vegetation, raking leaves, removing detritus, and replacing diseased or dead plants.	Continuous, as needed
Source Control BMPs {Structural and Nonstructural}			
Education for Property Owner	Property Owner	Education program as it would apply to future tenants and maintenance staff. The owner shall prepare manual(s) for tenants and maintenance staff.	Continuous. Provide regular training to field employees regarding all the BMPs proposed in this document.
Activity Restriction	Property Owner	No sidewalk or driveway washing.	Continuous
Common Area Landscape Maintenance	Property Owner	Manage landscaping in accordance with: the City Regulations, and with management guidelines for use of fertilizers and pesticides and with the County of Riverside.	Monthly during regular maintenance.
BMP Maintenance	Property Owner	The maintenance staff and tenants will be instructed in environmental procedures regarding contamination and cleanup.	Per established maintenance BMP schedule.
Common Area Litter Control/ Refuse	Property Owner	A contract for trash management and litter control and landscaped maintenance will be made with outside contractors as necessary.	Daily, during regular maintenance. Litter patrol and emptying trash receptacles.
Employee Training	Property Owner	Educational materials.	When maintenance staff are hired or for new tenants, and once every six months.

Common catch basin Inspection	Property Owner	Inspect inlet for debris and clean with required.	Monthly, after rain events and prior to October 1 st each year.
Private Street Sweeping	Property Owner	Post "No Littering" signs and enforce anti-litter laws. A contract for street sweeping and litter control will be mad with outside contractors as necessary. The contractor will clean out and cover litter receptacles frequently to prevent spillage. The contractor will routinely sweep, shovel, and dispose of litter in the trash. The contractor will use dry cleaning methods to prevent the discharge of pollutants into the stormwater conveyance system. A contract for oil and petroleum hydrocarbons removal will be made with cleaning services contractor.	Sweep private alleys and parking lots weekly and prior to the storm season. Remove oil and petroleum hydrocarbons if any at the drive-way once every 6 months.
Storm Drain System Stenciling and Signage	Property Owner	Inspect for re-stenciling needs and re-stencil as necessary.	Once every 6 months.
Efficient Irrigation System	Property Owner	Verify that the runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to landscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of day or night time temperatures.	Once a week with maintenance activities.

BMP Maintenance			
Bioretention Basin	Property Owner or City if BMP is in Public ROW	<p>Inspection Activities</p> <ul style="list-style-type: none"> • Inspect soil and repair eroded areas. • Inspect for erosion or damage to vegetation, preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the strips are ready for winter. However, additional inspection after periods of heavy runoff is desirable. • Inspect to ensure grass is well established. If not, either prepare soil and reseed or replace with alternative species. Install erosion control blanket. • Check for debris and litter, and areas of sediment accumulation. • Inspect health of trees and shrubs. <p>Maintenance Activities</p> <ul style="list-style-type: none"> • Water plants daily for 2 weeks after project completion. • Remove litter and debris monthly. • Remove sediment as needed. • Remulch void areas as needed. • Treat diseased trees and shrubs as needed. • Mow turf areas as needed. • Repair erosion at inflow points as needed. • Repair outflow structures as needed. • Unclog underdrain as needed. • Regulate soil pH regulation as needed. • Remove and replace dead and diseased vegetation semi-annually. 	Monthly, after rain events and prior to October 1 st each year.

B. Service Agreement Information

Insert Service Agreement here.

Appendix 10: Educational Materials

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



A Citizen's Guide to Understanding Stormwater



United States Environmental Protection Agency
EPA

EPA 833-B-03-002

January 2003

Internet Address (URL): <http://www.epa.gov>
Recycled/Recyclable • Printed With Vegetable Oil Based Inks on 100% Postconsumer Process Chlorine Free Recycled Paper



After the Storm

For more information contact:
www.epa.gov/nps/stormwater
or visit
www.epa.gov/nps



What is stormwater runoff?



Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?



Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- ◆ Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- ◆ Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- ◆ Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- ◆ Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- ◆ Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.



- ◆ Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.



Stormwater Pollution Solutions

Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.



- ◆ Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- ◆ Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- ◆ Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- ◆ Cover piles of dirt or mulch being used in landscaping projects.

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.



- ◆ Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- ◆ Don't dispose of household hazardous waste in sinks or toilets.

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.



- ◆ Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- ◆ Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.



- ◆ When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.



Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.



Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Commercial

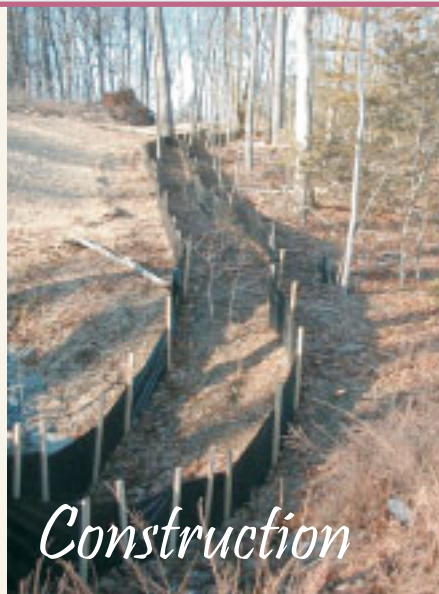
Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- ◆ Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- ◆ Cover grease storage and dumpsters and keep them clean to avoid leaks.
- ◆ Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- ◆ Divert stormwater away from disturbed or exposed areas of the construction site.
- ◆ Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- ◆ Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.

Construction



Agriculture

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- ◆ Keep livestock away from streambanks and provide them a water source away from waterbodies.
- ◆ Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- ◆ Vegetate riparian areas along waterways.
- ◆ Rotate animal grazing to prevent soil erosion in fields.
- ◆ Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

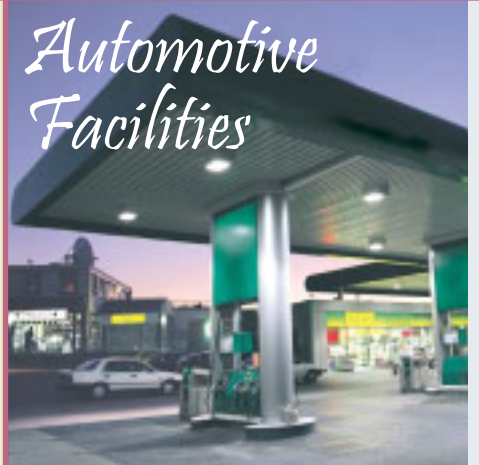


Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- ◆ Conduct preharvest planning to prevent erosion and lower costs.
- ◆ Use logging methods and equipment that minimize soil disturbance.
- ◆ Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- ◆ Construct stream crossings so that they minimize erosion and physical changes to streams.
- ◆ Expedite revegetation of cleared areas.

Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- ◆ Clean up spills immediately and properly dispose of cleanup materials.
- ◆ Provide cover over fueling stations and design or retrofit facilities for spill containment.
- ◆ Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- ◆ Install and maintain oil/water separators.



For Information:

For more information on the General Industrial Storm Water Permit contact:

State Water Resources Control Board (SWRCB)
(916) 657-1146 or www.swrcb.ca.gov/ or, at your
Regional Water Quality Control Board (RWQCB).

Santa Ana Region (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
(909) 782-4130

San Diego Region (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952

Colorado River Basin Region (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

SPILL RESPONSE AGENCY:

HAZ-MAT: (909) 358-5055

HAZARDOUS WASTE DISPOSAL: (909) 358-5055

RECYCLING INFORMATION: 1-800-366-SAVE

TO REPORT ILLEGAL DUMPING OR A CLOGGED

STORM DRAIN: 1-800-506-2555

To order additional brochures or to obtain information
on other pollution prevention activities, call:
(909) 955-1111.



Riverside County gratefully acknowledges the State Water Quality Control Board and the American Public Works Association, Storm Water Quality Task Force for the information provided in this brochure.

DID YOU KNOW . . .

YOUR FACILITY MAY NEED A STORM WATER PERMIT?



Many industrial facilities
and manufacturing operations
must obtain coverage under the
Industrial Activities Storm Water
General Permit

***FIND OUT
IF YOUR FACILITY
MUST OBTAIN A PERMIT***

StormWater Pollution . . . What you should know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

In recent years, awareness of the need to protect water quality has increased. As a result, federal, state, and local programs have been established to reduce polluted stormwater discharges to our waterways. The emphasis of these programs is to prevent stormwater pollution since it's much easier, and less costly, than cleaning up "after the fact."



National Pollutant Discharge Elimination System (NPDES)

In 1987, the Federal Clean Water Act was amended to establish a framework for regulating industrial stormwater discharges under the NPDES permit program. In California, NPDES permits are issued by the State Water Resources Control Board (SWRCB) and the nine (9) Regional Water Quality Control Boards (RWQCB). In general, certain industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit if the type of facilities or operations falls into one of the several categories described in this brochure.

How Do I Know If I Need A Permit?

Following are **general descriptions** of the industry categories types that are regulated by the Industrial Activities Storm Water General Permit. Contact your local Region Water Quality Control Board to determine if your facility/operation requires coverage under the Permit.

→ Facilities such as cement manufacturing; feedlots; fertilizer manufacturing; petroleum refining; phosphate manufacturing; steam electric power generation; coal mining; mineral mining and processing; ore mining and dressing; and asphalt emulsion;

→ Facilities classified as lumber and wood products (except wood kitchen cabinets); pulp, paper, and paperboard mills; chemical producers (except some pharmaceutical and biological products); petroleum and coal products; leather production and products; stone, clay and glass products; primary metal industries; fabricated structural metal; ship and boat building and repairing;

→ Active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations;

→ Hazardous waste treatment, storage, or disposal facilities;

→ Landfills, land application sites and open dumps that receive or have received any industrial waste; unless there is a new overlying land use such as a golf course, park, etc., and there is no discharge associated with the landfill;

→ Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards;

→ Steam electric power generating facilities, facilities that generate steam for electric power by combustion;

→ Transportation facilities that have vehicle maintenance shops, fueling facilities, equipment cleaning operations, or airport deicing operations. This includes school bus maintenance facilities operated by a school district;

→ Sewage treatment facilities;

→ Facilities that have areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water.

How do I obtain coverage under the Industrial Activities Storm Water General Permit?

Obtain a permit application package from your local Regional Water Quality Control Board listed on the back of this brochure or the State Water Resources Control Board (SWRCB). Submit a completed Notice of Intent (NOI) form, site map and the appropriate fee (\$250 or \$500) to the SWRCB. Facilities must submit an NOI thirty (30) days prior to beginning operation. Once you submit the NOI, the State Board will send you a letter acknowledging receipt of your NOI and will assign your facility a waste discharge identification number (WDID No.). You will also receive an annual fee billing. These billings should roughly coincide with the date the State Board processed your original NOI submittal.

What are the requirements of the Industrial Activities Storm Water General Permit?

The basic requirements of the Permit are:

1. The facility must eliminate any non-stormwater discharges or obtain a separate permit for such discharges.
2. The facility must develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must identify sources of pollutants that may be exposed to stormwater. Once the sources of pollutants have been identified, the facility operator must develop and implement Best Management Practices (BMPs) to minimize or prevent polluted runoff.

Guidance in preparing a SWPPP is available from a document prepared by the California Storm Water Quality Task Force called the California Storm Water Best Management Practice Handbook.

3. The facility must develop and implement a Monitoring Program that includes conducting visual observations and collecting samples of the facility's storm water discharges associated with industrial activity. The General Permit requires that the analysis be conducted by a laboratory that is certified by the State of California.
4. The facility must submit to the Regional Board, every July 1, an annual report that includes the results of its monitoring program.

A Non-Storm Water Discharge is... any discharge to a storm drain system that is not composed entirely of storm water. The following non-storm water discharges are authorized by the General Permit: fire hydrant flushing; potable water sources, including potable water related to the operation, maintenance, or testing of potable water systems; drinking fountain water; atmospheric condensates including refrigeration, air conditioning, and compressor condensate; irrigation drainage; landscape watering; springs; non-contaminated ground water; foundation or footing drainage; and sea water infiltration where the sea waters are discharged back into the sea water source.

A BMP is . . . a technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge. BMPs may include simple, non-structural methods such as good housekeeping, staff training and preventive maintenance. Additionally, BMPs may include structural modifications such as the installation of berms, canopies or treatment control (e.g. setting basins, oil/water separators, etc.)



WARNING: There are significant penalties for non-compliance: a minimum fine of \$5,000 for failing to obtain permit coverage, and, up to \$10,000 per day, per violation plus \$10 per gallon of discharge in excess of 1,000 gallons.



Riverside County Stormwater Program Members

City of Banning
(951) 922-3105

City of Beaumont
(951) 769-8520

City of Calimesa
(909) 795-9801

City of Canyon Lake
(951) 244-2955

City of Cathedral City
(760) 770-0340

City of Coachella
(760) 398-3502

City of Corona
(951) 736-2447

City of Desert Hot Springs
(760) 329-6411

City of Eastvale
(951) 361-0900

City of Hemet
(951) 765-2300

City of Indian Wells
(760) 346-2489

City of Indio
(760) 391-4000

City of Jurupa Valley
(951) 332-6464

City of Lake Elsinore
(951) 674-3124

City of La Quinta
(760) 777-7000

City of Menifee
(951) 672-6777

City of Moreno Valley
(951) 413-3000

City of Murrieta
(951) 304-2489

City of Norco
(951) 270-5607

City of Palm Desert
(760) 346-0611

City of Palm Springs
(760) 323-8299

City of Perris
(951) 943-6100

City of Rancho Mirage
(760) 324-4511

City of Riverside
(951) 826-5311

City of San Jacinto
(951) 487-7330

City of Temecula
(951) 694-6444

City of Wildomar
(951) 677-7751

Coachella Valley Water District
(760) 398-2651

County of Riverside
(951) 955-1000

Riverside County Flood Control District
(951) 955-1200

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities



YOU can prevent Stormwater Pollution following these practices...

Industrial and Commercial Facilities

The Riverside County Stormwater Program has identified a number of Best Management Practices (BMPs) for Industrial and Commercial Facilities. These BMPs control and reduce stormwater pollutants from reaching our storm drain system and ultimately our local water bodies. City and County ordinances require businesses to use these BMPs to protect our water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.

Prohibited Discharges

Discontinue all non-stormwater discharges to the storm drain system. It is *prohibited* to discharge any chemicals, paints, debris, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage BMPs

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, at all times when not in use.
- Sweep outdoor areas instead of using a hose or pressure washer.
- Move all process operations including vehicle/equipment maintenance inside of the building or under a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to local standards and discharged to a sanitary sewer or take them to a commercial car wash.



Spills and Clean Up BMPs

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep up the area.
- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials or sweep followed by proper disposal of materials.

- Always have a spill kit available near chemical loading dock doors and vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the local Fire Department.
- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator as listed on the back of this pamphlet.
- Report hazardous materials spills to 951-358-5055 or call after hours to 951-782-2973 or, if an emergency, call the Fire Department's Haz Mat Team at 911.



Plastic Manufacturing Facilities BMPs

AB 258 requires plastic product manufacturers to use BMPs, such as safe storage and clean-up procedures to prevent plastic pellets (nurdles) from entering the waterway. The plastic pellets are released into the environment during transporting, packaging and processing and migrate to waterways through the storm drain system. AB 258 will help protect fish and wildlife from the hazards of plastic pollution.

Training BMPs

As prescribed by your City and County Stormwater Ordinance(s), train employees in spill procedures and prohibit non-stormwater discharges to the storm drain system. Applicable BMP examples can be found at www.cabmphandbooks.com.

Permitting

Stormwater discharges associated with specific categories for industrial facilities are regulated by the State Water Resources Control Board through an Industrial Stormwater General Permit. A copy of this General Permit and application forms are available at: www.waterboards.ca.gov, select stormwater then the industrial quick link.

To report illegal dumping or for more information on stormwater pollution prevention call: 1-800-506-2555 or e-mail us at: fcnpdes@rcflood.org.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners	
Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 771-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL

1-800-506-2555 or e-mail us at fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
www.rcflood.org

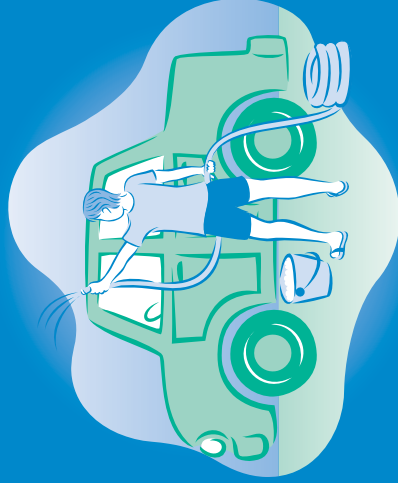
Online resources include:

- California Storm Water Quality Association
www.casqa.org
- State Water Resources Control Board
www.waterboards.ca.gov
- Power Washers of North America
www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers



Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

Do you know where street flows actually go?

Storm drains are NOT connected to sanitary sewer systems and treatment plants!



The primary purpose of storm drains is to carry rain water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** Always have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555

Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is **PROHIBITED** by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. *Each of us* can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do....consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do....prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do....use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do....obtain the property owner's permission to dispose of *small amounts* of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do....check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do....be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do....check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.



Report illegal storm drain disposal

Call Toll Free

1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.



When cleaning surfaces with a **high-pressure washer** or **steam cleaner**, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks **with loose paint**, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

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.



SD-10 Site Design & Landscape Planning

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

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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.

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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.



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 $\frac{1}{4}$ to $\frac{1}{2}$ 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



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.

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.

Design Objectives

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



- 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.

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