APPENDIX D15

Water Quality Management Plan

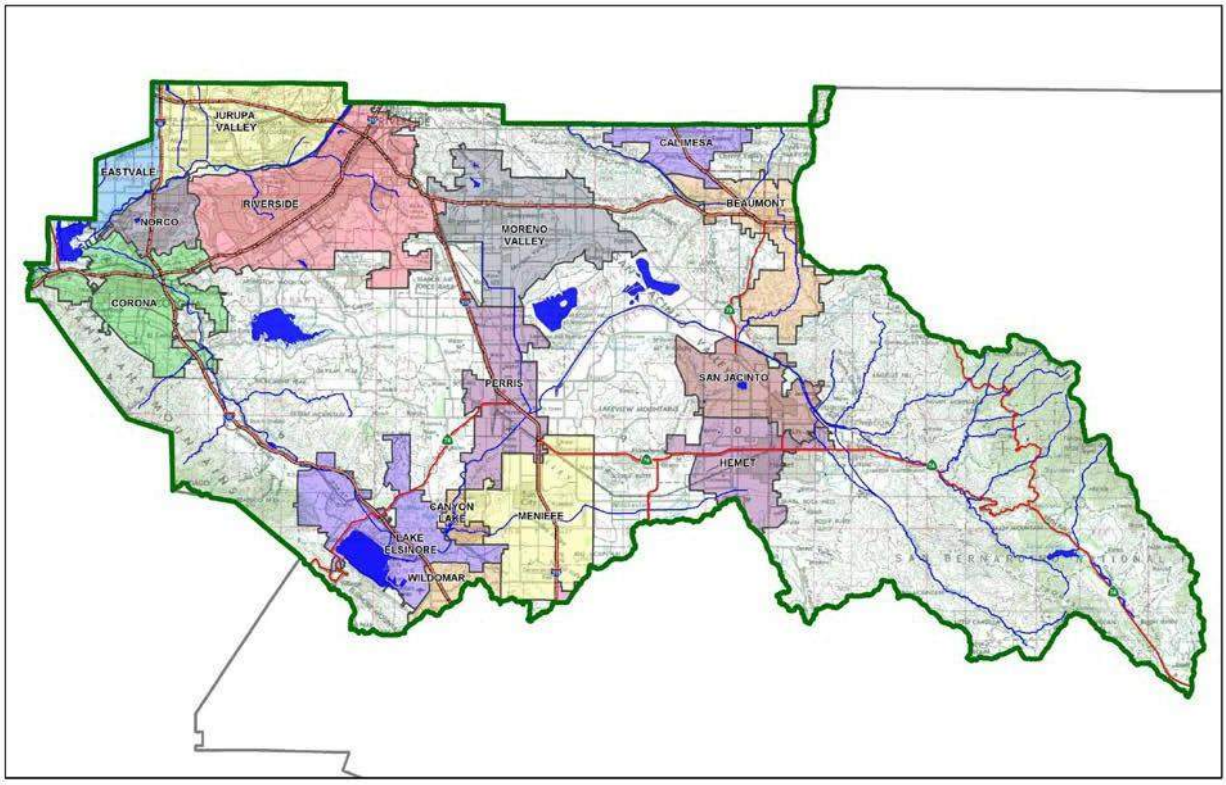
Project Specific Water Quality Management Plan

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

Project Title: The District at Jurupa Valley

Development No: Insert text here

Design Review/Case No: Insert text here



Contact Information:
Prepared for: EM Ranch Owner, LLC,
484 S. San Vincente Blvd
Los Angeles, CA 90048

Prepared by:
Richard Lucera, PE
Kimley Horn and Associates
1100 W Town and County, Suite 700
Orange, CA 92868

Preliminary ☑
Final ☐

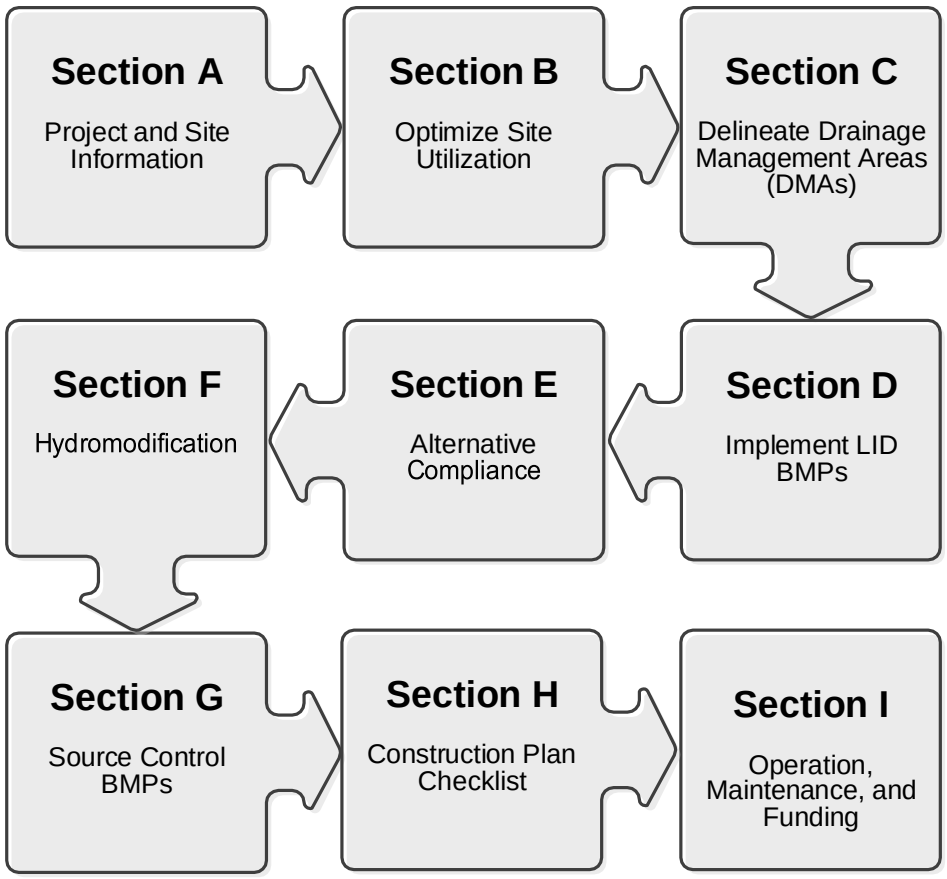
Original Date Prepared: October 13, 2021

Revision Date(s): June 30, 2022

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

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 EM Ranch Owner, LLC by Kimley Horn for the District at Jurupa Valley project.

This WQMP is intended to comply with the requirements of City of Jurupa Valley for Ordinance 2012-07 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 Jurupa Valley Ordinance (Municipal Code Section 2012-17).

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

Owner's Signature	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

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

Preparer's Signature	June 30, 2022 Date
Richard Lucera, PE Preparer's Printed Name	Senior Project Manager Preparer's Title/Position

Preparer's Licensure:



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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Multi-Use Master Plan Area
Planning Area:	N/A
Community Name:	Jurupa Valley, CA
Development Name:	The District at Jurupa Valley
PROJECT LOCATION	
Latitude & Longitude (DMS):	
Latitude 33°59'59.94"N	
Longitude117°23'35.66"W	
Project Watershed and Sub-Watershed: Insert text here	
Watershed 801 Sub-Watershed 801.27	
APN(s): Project is comprised of several dozen APNs. Refer to Entitlement Application	
Map Book and Page No.: Project is comprised of several dozen existing parcels. Refer to Entitlement Application	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	
Residential, Mixed Use, Commercial Hospitality, Commercial Retail, Industrial, Open Space	
Proposed or Potential SIC Code(s)	TBD
Area of Impervious Project Footprint (SF)	
10,832,479	
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	
9,749,231.12 (Conservatively Assumed)	
Insert text here	
Does the project consist of offsite road improvements?	☒ Y ☐ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0.00 Acres
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	n/a
Are there any natural hydrologic features on the project site?	☒ Y ☐ N
Is a Geotechnical Report attached?	☐ Y ☒ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	See Appendix 3
What is the Water Quality Design Storm Depth for the project?	0.65 inches

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

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
Santa Ana River Reach 4	Indicator Bacteria	MUN GWR SPWN REC2 REC1 RARE WILD WARM	Directly Adjacent
Sunny Slope Channel	n/a	MUN RARE REC1 REC2 SPWN WARM WILD	0.92 Miles
Santa Ana River Reach 3	Lead, Copper	AGR GWR MUN RARE REC1 REC2 SPWN WARM WILD	3 miles
Santa Ana River Reach 2	n/a	AGR GWR WARM WILD MUN RARE REC1 REC2	15 Miles
Santa Ana River Reach 1	n/a	MUN WILD WARM REC2 REC1	n/a
Santa Ana River Salt Marsh	n/a	MUN REC1 REC2 BIOL WILD RARE MAR EST	41 Miles
Pacific Ocean/Tidal Prism Santa Ana River	n/a	MUN REC1 REC2 COMM WILD RARE MAR	41 Miles

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

Table A.2 Other Applicable Permits

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

If yes is answered to any of the questions above, the Co-Permittee may require proof ofapproval/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.

Site Optimization

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

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

Yes- The existing drainage patterns have been maintained by the proposed grading and storm drain layout (north to south). However, there are some drainage modifications near existing residents that was addressed in conceptual grading plans.

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

No - the project will not protect existing vegetation due the proposed development but includes an open space component.

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

Yes- The project involves construction of 15 bioretention areas to facilitate infiltration to the extent feasible given soil characteristics and subsurface conditions.

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

Yes- The project involves dedication of open space. The project also proposed clustered and mixed use areas.

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

Yes- The project involves construction of 15 bioretention areas to reduce and attenuate runoff.

Section C: Delineate Drainage Management Areas (DMAs)

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

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
Area B.1.a.	Composite 1	94,983	Developed Planning Area
Area B.1.b.	Composite 1	99,604	Developed Planning Area
Area B.1.c.	Composite 1	147,938	Developed Planning Area
Area B.1.d.	Composite 1	682,921	Developed Planning Area
Area B.2.a.	Composite 1	1,102,687	Developed Planning Area
Area B.2.b.	Composite 1	935,464	Developed Planning Area
Area B.2.c.	Composite 1	1,368,211	Developed Planning Area
Area B.3.	Composite 1	102,653	Developed Planning Area
Area B.4.	Composite 1	205,307	Developed Planning Area
Area B.5.	Composite 1	371,388	N/A
Area B.6.	Composite 1	407,452	Developed Planning Area
Area B.7.	Composite 1	117,333	N/A
Area C.1.	Composite 1	3,152,895	Developed Planning Area
Area C.2.	Composite 1	1,219,602	Developed Planning Area
Area S.1.a.	Composite 2	48,609	Street Right of Way
Area S.1.b.	Composite 2	49,205	Street Right of Way
Area S.2.a.	Composite 2	45,119	Street Right of Way
Area S.2.b.	Composite 2	44,475	Street Right of Way
Area S.3.	Composite 2	73,603	Street Right of Way
Area S.4.a.	Composite 2	46,470	Street Right of Way
Area S.4.b.1.	Composite 2	52,856	Street Right of Way
Area S.4.b.2.	Composite 2	52,856	Street Right of Way
Area S.5.a.1.	Composite 2	51,292	Street Right of Way
Area S.5.a.2.	Composite 2	50,364	Street Right of Way
Area S.5.b.1.	Composite 2	51,470	Street Right of Way
Area S.5.b.2.	Composite 2	52,276	Street Right of Way
Area S.6.a.	Composite 2	48,948	Street Right of Way
Area S.6.b	Composite 2	42,319	Street Right of Way
Area S.7.a.1.	Composite 2	31,272	Street Right of Way
Area S.7.a.2.	Composite 2	31,272	Street Right of Way
Area S.7.b.1.	Composite 2	21,675	Street Right of Way
Area S.7.b.2.	Composite 2	29,961	Street Right of Way

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

Composite 1 is a mix of Roofs, Concrete, Asphalt and Ornamental Landscaping
Composite 2 is a mix of Concrete, Asphalt and Ornamental Landscaping

Note: Drainage area B.5. and B.7. is not a part of this project (NAP).

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
PENDING IF APPLICABLE			

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

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

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

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	Runoff factor	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]
PENDING IF APPLICABLE							

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

DMA Name or ID	BMP Name or ID
Area B.1.a.	Future BMP
Area B.1.b.	Future BMP
Area B.1.c.	Future BMP
Area B.1.d.	Future BMP
Area B.2.a.	Future BMP
Area B.2.b.	Future BMP
Area B.2.c.	Future BMP
Area B.3.	Future BMP
Area B.4.	Future BMP
Area B.5.	N/A
Area B.6.	Future BMP
Area B.7.	N/A
Area C.1.	Future BMP
Area C.2.	Future BMP
Area S.1.a.	MWS-L-4-15
Area S.1.b.	MWS-L-4-15
Area S.2.a.	MWS-L-4-15
Area S.2.b.	MWS-L-4-15
Area S.3.	MWS-L-4-21
Area S.4.a.	MWS-L-4-15
Area S.4.b.1.	MWS-L-4-17
Area S.4.b.2.	MWS-L-4-17
Area S.5.a.1.	MWS-L-4-17 (2X)
Area S.5.a.2.	MWS-L-4-15
Area S.5.b.1.	MWS-L-4-17 (2X)
Area S.5.b.2.	MWS-L-4-17
Area S.6.a.	MWS-L-4-15
Area S.6.b	MWS-L-4-15
Area S.7.a.1.	MWS-L-4-8
Area S.7.a.2.	MWS-L-4-8
Area S.7.b.1.	MWS-L-4-8
Area S.7.b.2.	MWS-L-4-8

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

***Note: Each private zone will need its own form of water quality as a part of its development plan, and the type of BMPs to be determined (TBD) by others.**

Note: Drainage area B.5. and B.7. is not a part of this project (NAP)

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y N☒

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

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

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

Infiltration Feasibility

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

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?	X	
If Yes, list affected DMAs:	S.5.A.1 & S.5.B.1	
…have any DMAs located within 100 feet of a water supply well?	X	
If Yes, list affected DMAs:	S.5.A.1 & S.5.B.1	
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?	X	
If Yes, list affected DMAs:	All Street areas	
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below. Infiltration is not feasible due to shallow ground water, steep roadway, and limited parkway widths for the street drainage areas.

D.2 Harvest and Use Assessment

Please check what applies*:*

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

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

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

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

Total Area of Irrigated Landscape: 1.90 (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, orparts 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: 17.12 (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: 1.05

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: 18 (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)
18 (Acres)	1.9 (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 accountfor any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 0 *Project*

Type: Commercial

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, orparts 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: 17.12 (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 141

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: 528

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 oftoilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
2,414 (Toilet Users)	N/A (Toilet Users)

Other Non-Potable Use Feasibility

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

Insert narrative description here.

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: 17.12 (Acres)

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

Enter the factor from Table 2-3: 1,018

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: 17,428 (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the projectby comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
17,428 (gpd)	N/A (gpd)

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

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

Select one of the following:

☑ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

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

	LID BMP Hierarchy				
DMA Name/ID	**Infiltration**	**Harvest and Use**	**Bioretention**	**Biotreatment**	**No LID**
Area B.1.a.					
Area B.1.b.					
Area B.1.c.					
Area B.1.d.					
Area B.2.a.					
Area B.2.b.					
Area B.2.c.					
Area B.3.					
Area B.4.					
Area B.5.					
Area B.6.					
Area B.7.					
Area C.1.					
Area C.2.					
Area S.1.a.				X	
Area S.1.b.				X	
Area S.2.a.				X	
Area S.2.b.				X	
Area S.3.				X	
Area S.4.a.				X	
Area S.4.b.1.				X	
Area S.4.b.2.				X	
Area S.5.a.1.				X	
Area S.5.a.2.				X	
Area S.5.b.1.				X	
Area S.5.b.2.				X	
Area S.6.a.				X	
Area S.6.b				X	
Area S.7.a.1.				X	
Area S.7.a.2.				X	
Area S.7.b.1.				X	
Area S.7.b.2.				X	

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

*<u>Note</u>: **Each private zone will need its own form of water quality as a part of its development plan, and the type of LID BMPs to be determined (TBD) by others.***

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 additionalrows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

BMP Name	DMA Type/ID	Onsite DMA Area SF [A]	Post Project Surface Type	Effective Impervious Fraction [B]	DMA Runoff Factor [C]	DMA Areas Runoff Factor [D] = [A] x [C]	Design Storm Depth, inch [E]	Design Capture Volume, cubic feet [F]=[D]x[E]/[G]	Total Storm Water Credit % Reduction	Proposed Volume on Plans cubic feet [I]
Future BMP	Area B.1.a.	94,983	Developed Planning Area	0.90	0.73	69,364.07	0.65	3,757	n/a	4,748
Future BMP	Area B.1.b.	99,604	Developed Planning Area	0.90	0.73	72,739.22	0.65	3,940	n/a	4,987
Future BMP	Area B.1.c.	147,938	Developed Planning Area	0.90	0.73	108,036.80	0.65	5,852	n/a	7,405
Future BMP	Area B.1.d.	682,921	Developed Planning Area	0.90	0.73	498,724.63	0.65	27,014	n/a	34,151
Future BMP	Area B.2.a.	1,102,687	Developed Planning Area	0.90	0.73	805,272.14	0.65	43,619	n/a	55,125
Future BMP	Area B.2.b.	935,464	Developed Planning Area	0.90	0.73	683,152.57	0.65	37,004	n/a	46,761
Future BMP	Area B.2.c.	1,368,211	Developed Planning Area	0.90	0.73	999,179.78	0.65	54,122	n/a	68,410
Future BMP	Area B.3.	102,653	Developed Planning Area	0.90	0.73	74,966.00	0.65	4,061	n/a	5,140
Future BMP	Area B.4.	205,307	Developed Planning Area	0.90	0.73	149,932.00	0.65	8,121	n/a	10,258
N/A	Area B.5.	371,388	Developed Planning Area	0.90	0.73	271,218.12	0.65	14,691	n/a	n/a
Future BMP	Area B.6.	407,452	Developed Planning Area	0.90	0.73	297,554.52	0.65	16,118	n/a	20,364
N/A	Area B.7.	117,333	Developed Planning Area	0.90	0.73	85,686.34	0.65	4,641	n/a	n/a
Future BMP	Area C.1.	3,152,895	Developed Planning Area	0.90	0.73	2,302,502.16	0.65	124,719	n/a	157,600
Future BMP	Area C.2.	1,219,602	Developed Planning Area	0.90	0.73	890,653.09	0.65	48,244	n/a	60,984

BMP Name	DMA Type/ID	Offsite DMA Area SF [A]	Post Project Surface Type	Effective Impervious Fraction [B]	DMA Runoff Factor [C]	DMA Areas Runoff Factor [D] = [A] x [C]	Design Storm Intensity, inch per hour [E]	Design Capture Flowrate, Qbmp cfs [F]=[D]x[E]/[G]	Total Storm Water Credit % Reduction	Proposed flowrate on Plans cfs [I]
MWS-L-4-15	Area S.1.a.	48,609	Street Right of Way	0.90	0.73	35,497.99	0.2	0.163	n/a	0.175
MWS-L-4-15	Area S.1.b.	49,205	Street Right of Way	0.90	0.73	35,933.80	0.2	0.165	n/a	0.175
MWS-L-4-15	Area S.2.a.	45,119	Street Right of Way	0.90	0.73	32,949.92	0.2	0.151	n/a	0.175
MWS-L-4-15	Area S.2.b.	44,475	Street Right of Way	0.90	0.73	32,479.12	0.2	0.149	n/a	0.175
MWS-L-4-21	Area S.3.	73,603	Street Right of Way	0.90	0.73	53,751.19	0.2	0.247	n/a	0.268
MWS-L-4-15	Area S.4.a.	46,470	Street Right of Way	0.90	0.73	33,936.06	0.2	0.156	n/a	0.175
MWS-L-4-17	Area S.4.b.1.	52,856	Street Right of Way	0.90	0.73	38,599.57	0.2	0.177	n/a	0.206
MWS-L-4-17	Area S.4.b.2.	52,856	Street Right of Way	0.90	0.73	38,599.57	0.2	0.177	n/a	0.206
MWS-L-4-17 (2X)	Area S.5.a.1.	51,292	Street Right of Way	0.90	0.73	37,457.55	0.2	0.172	n/a	0.412
MWS-L-4-15	Area S.5.a.2.	50,364	Street Right of Way	0.90	0.73	36,779.98	0.2	0.169	n/a	0.175
MWS-L-4-17 (2X)	Area S.5.b.1.	51,470	Street Right of Way	0.90	0.73	37,587.98	0.2	0.173	n/a	0.412
MWS-L-4-17	Area S.5.b.2.	52,276	Street Right of Way	0.90	0.73	38,176.48	0.2	0.175	n/a	0.206
MWS-L-4-15	Area S.6.a.	48,948	Street Right of Way	0.90	0.73	35,746.12	0.2	0.164	n/a	0.175
MWS-L-4-15	Area S.6.b	42,319	Street Right of Way	0.90	0.73	30,904.47	0.2	0.142	n/a	0.175
MWS-L-4-8	Area S.7.a.1.	31,272	Street Right of Way	0.90	0.73	22,837.18	0.2	0.105	n/a	0.115
MWS-L-4-8	Area S.7.a.2.	31,272	Street Right of Way	0.90	0.73	22,837.18	0.2	0.105	n/a	0.115
MWS-L-4-8	Area S.7.b.1.	21,675	Street Right of Way	0.90	0.73	15,829.20	0.2	0.073	n/a	0.115
MWS-L-4-8	Area S.7.b.2.	29,961	Street Right of Way	0.90	0.73	21,879.66	0.2	0.100	n/a	0.115

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

[E] is for Flow-based Treatment Control BMPs [E]=0.2, for Volume-Based Control Treatment BMP, [E] is 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.

[I] the volume indicated represents the amount of storage within 1' of finish grade.

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.

List DMAs here.

E.1 Identify Pollutants of Concern

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

Table E.1 Potential Pollutants by Land Use Type

Priority DevelopmentProject 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
☑ **Residential Detached Development**	**P**	**N**	**P**	**P**	**N**	**P**	**P**	**P**
☑ **Attached Residential Development**	**P**	**N**	**P**	**P**	**N**	**P**	**P**	**P(2)**
☑ **Commercial/ Industrial Development**	**P(3)**	**P**	**P(1)**	**P(1)**	**P(5)**	**P(1)**	**P**	**P**
☑ **Parking Lots (>5,000 ft2)**	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☑	☑	☑	☑	☐	☑	☑	☑

P = Potential

N = Not Potential

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

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

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

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

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

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1]*Cannot Exceed 50%*

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

E.3 Sizing Criteria

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

Table E.3 Treatment Control BMP Sizing

BMP Name	DMA Type/ID	Onsite DMA Area SF [A]	Post Project Surface Type	Effective Impervious Fraction [B]	DMA Runoff Factor [C]	DMA Areas Runoff Factor [D] = [A] x [C]	Design Storm Depth, inch [E]	Design Capture Volume, cubic feet [F]=[D]x[E]/[G]	Total Storm Water Credit % Reduction	Proposed Volume on Plans cubic feet [I]
Future BMP	Area B.1.a.	94,983	Developed Planning Area	0.90	0.73	69,364.07	0.65	3,757	n/a	4,748
Future BMP	Area B.1.b.	99,604	Developed Planning Area	0.90	0.73	72,739.22	0.65	3,940	n/a	4,987
Future BMP	Area B.1.c.	147,938	Developed Planning Area	0.90	0.73	108,036.80	0.65	5,852	n/a	7,405
Future BMP	Area B.1.d.	682,921	Developed Planning Area	0.90	0.73	498,724.63	0.65	27,014	n/a	34,151
Future BMP	Area B.2.a.	1,102,687	Developed Planning Area	0.90	0.73	805,272.14	0.65	43,619	n/a	55,125
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Future BMP	Area B.2.c.	1,368,211	Developed Planning Area	0.90	0.73	999,179.78	0.65	54,122	n/a	68,410
Future BMP	Area B.3.	102,653	Developed Planning Area	0.90	0.73	74,966.00	0.65	4,061	n/a	5,140
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Future BMP	Area B.6.	407,452	Developed Planning Area	0.90	0.73	297,554.52	0.65	16,118	n/a	20,364
N/A	Area B.7.	117,333	Developed Planning Area	0.90	0.73	85,686.34	0.65	4,641	n/a	n/a
Future BMP	Area C.1.	3,152,895	Developed Planning Area	0.90	0.73	2,302,502.16	0.65	124,719	n/a	157,600
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BMP Name	**DMA Type/ID**	**Offsite DMA Area SF [A]**	**Post Project Surface Type**	**Effective Impervious Fraction [B]**	**DMA Runoff Factor [C]**	**DMA Areas Runoff Factor [D] = [A] x [C]**	**Design Storm Intensity, inch per hour [E]**	**Design Capture Flowrate, Qbmp cfs [F]=[D]x[E]/[G]**	**Total Storm Water Credit % Reduction**	**Proposed flowrate on Plans cfs [I]**
MWS-L-4-15	Area S.1.a.	48,609	Street Right of Way	0.90	0.73	35,497.99	0.2	0.163	n/a	0.175
MWS-L-4-15	Area S.1.b.	49,205	Street Right of Way	0.90	0.73	35,933.80	0.2	0.165	n/a	0.175
MWS-L-4-15	Area S.2.a.	45,119	Street Right of Way	0.90	0.73	32,949.92	0.2	0.151	n/a	0.175
MWS-L-4-15	Area S.2.b.	44,475	Street Right of Way	0.90	0.73	32,479.12	0.2	0.149	n/a	0.175
MWS-L-4-21	Area S.3.	73,603	Street Right of Way	0.90	0.73	53,751.19	0.2	0.247	n/a	0.268
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MWS-L-4-17	Area S.4.b.1.	52,856	Street Right of Way	0.90	0.73	38,599.57	0.2	0.177	n/a	0.206
MWS-L-4-17	Area S.4.b.2.	52,856	Street Right of Way	0.90	0.73	38,599.57	0.2	0.177	n/a	0.206
MWS-L-4-17 (2X)	Area S.5.a.1.	51,292	Street Right of Way	0.90	0.73	37,457.55	0.2	0.172	n/a	0.412
MWS-L-4-15	Area S.5.a.2.	50,364	Street Right of Way	0.90	0.73	36,779.98	0.2	0.169	n/a	0.175
MWS-L-4-17 (2X)	Area S.5.b.1.	51,470	Street Right of Way	0.90	0.73	37,587.98	0.2	0.173	n/a	0.412
MWS-L-4-17	Area S.5.b.2.	52,276	Street Right of Way	0.90	0.73	38,176.48	0.2	0.175	n/a	0.206
MWS-L-4-15	Area S.6.a.	48,948	Street Right of Way	0.90	0.73	35,746.12	0.2	0.164	n/a	0.175
MWS-L-4-15	Area S.6.b	42,319	Street Right of Way	0.90	0.73	30,904.47	0.2	0.142	n/a	0.175
MWS-L-4-8	Area S.7.a.1.	31,272	Street Right of Way	0.90	0.73	22,837.18	0.2	0.105	n/a	0.115
MWS-L-4-8	Area S.7.a.2.	31,272	Street Right of Way	0.90	0.73	22,837.18	0.2	0.105	n/a	0.115
MWS-L-4-8	Area S.7.b.1.	21,675	Street Right of Way	0.90	0.73	15,829.20	0.2	0.073	n/a	0.115
MWS-L-4-8	Area S.7.b.2.	29,961	Street Right of Way	0.90	0.73	21,879.66	0.2	0.100	n/a	0.115

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

[E] is 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. Bioretention 1-8 are multi-function stormwater BMPs. The volume indicated represents the amount of storage within 1' of finish grade. Bioretention 9-15 are dedicated solely for treatment of street areas.

[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]
Offsite – Bio Clean Modular Wetland	TSS and Hydrocarbons	80% of TSS and 90% of Hydrocarbons

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

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

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

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

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

If Yes, HCOC criteria do not apply.

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

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

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

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

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	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 willbe adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

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

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

INSERT TEXT HERE

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.

As shown in Table 1, post development flows at both primary site discharge points are less than or equal to 110% predevelopment for the 2-year frequency storm. For additional backup (maps, computational output, etc.) refer to Appendix 7.

Table 1 Summary of Discharge Hydrologic Conditions of Concern

Point of Comparison	**Model Element**	**Q2 Pre-Development (cfs)**	**Model Element**	**Q2 Mitigated Post Development (cfs)**
Onsite Flows from "Area B" towards 34th Street	J6 Pre-development PC SWMM Model = AES Node 105	3.1 (24 hour)	J6 Post Development PC SWMM Model	3.0 (24 hour)
Onsite Flows from "Area C" towards Santa Ana River Levee	J4 Pre-development PC SWMM Model (Lateral Inflow only) = AES Node 103	3.5 cfs (24 hour)	OR10+OR11 Post Development PC SWMM Model	0.0 cfs (24 hour)

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
Sidewalks and paved areas	sidewalks and paved area surfaces drain to Modular Wetlands.	Sweep sidewalks and Paved areas 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.

Storm Drain Inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	Maintain and periodically repaint or replace inlet markings.

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)

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: Insert text here.

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

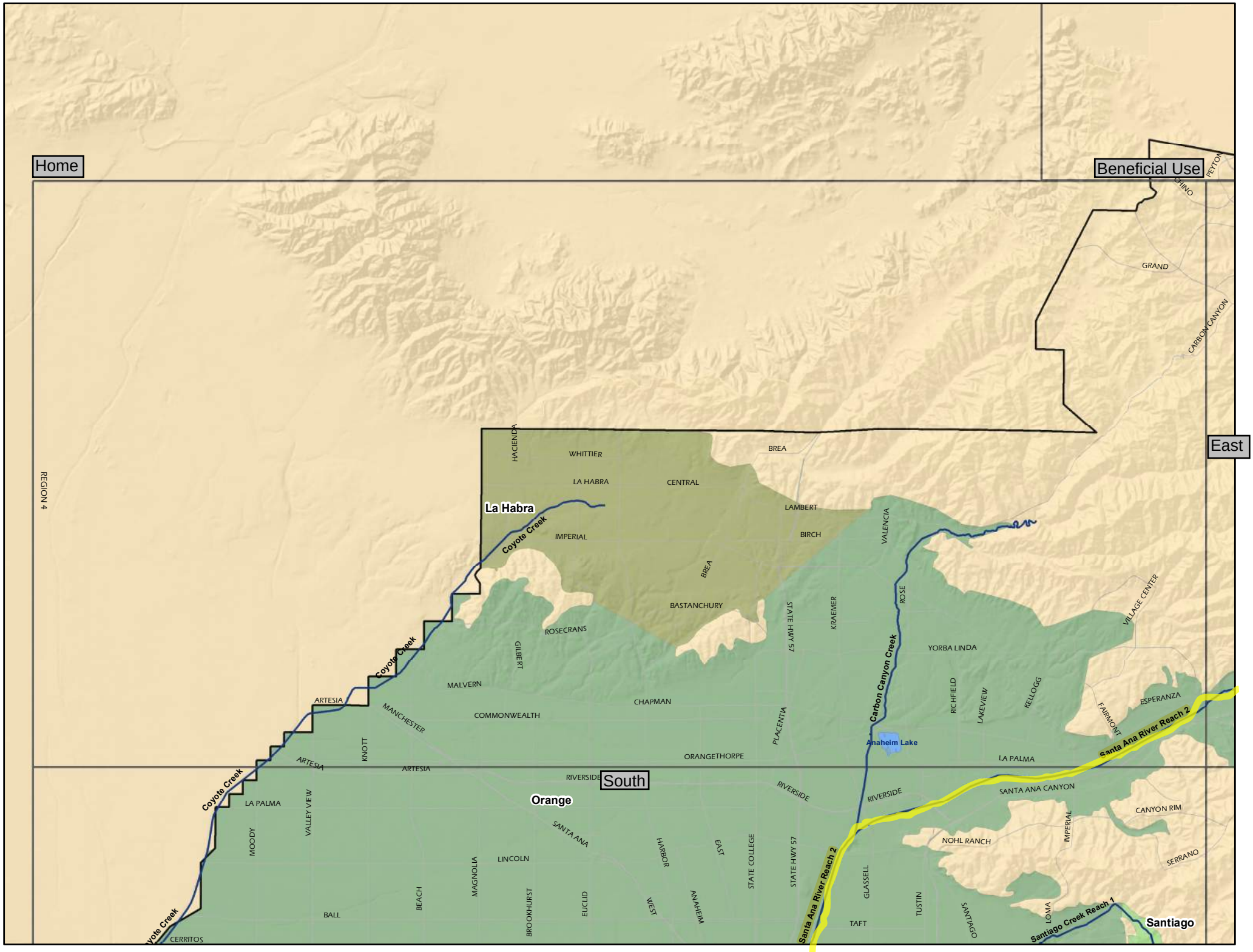
Regional Water Quality Control Board

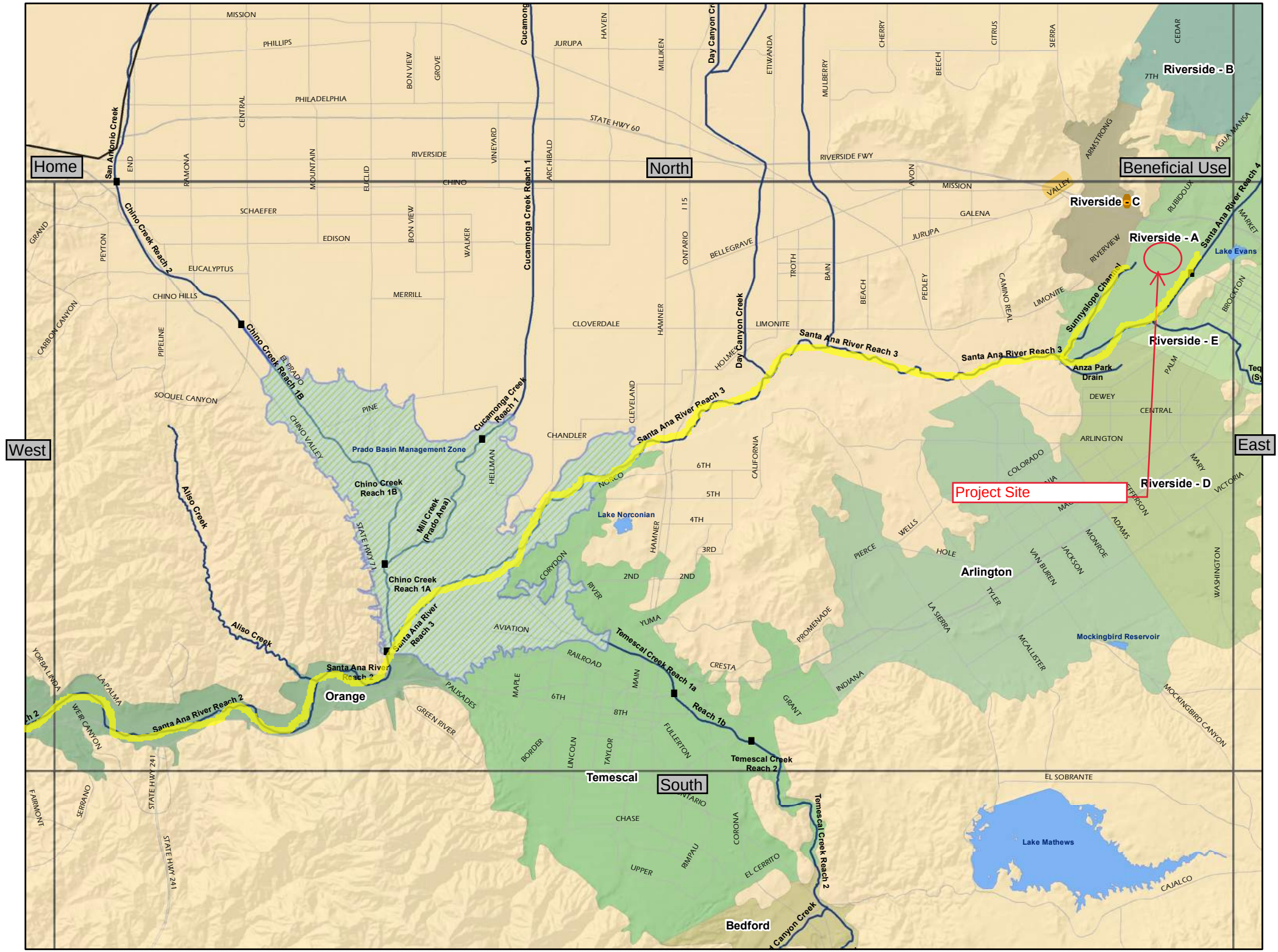
Region 8 Basin Plan map - Beneficial Uses

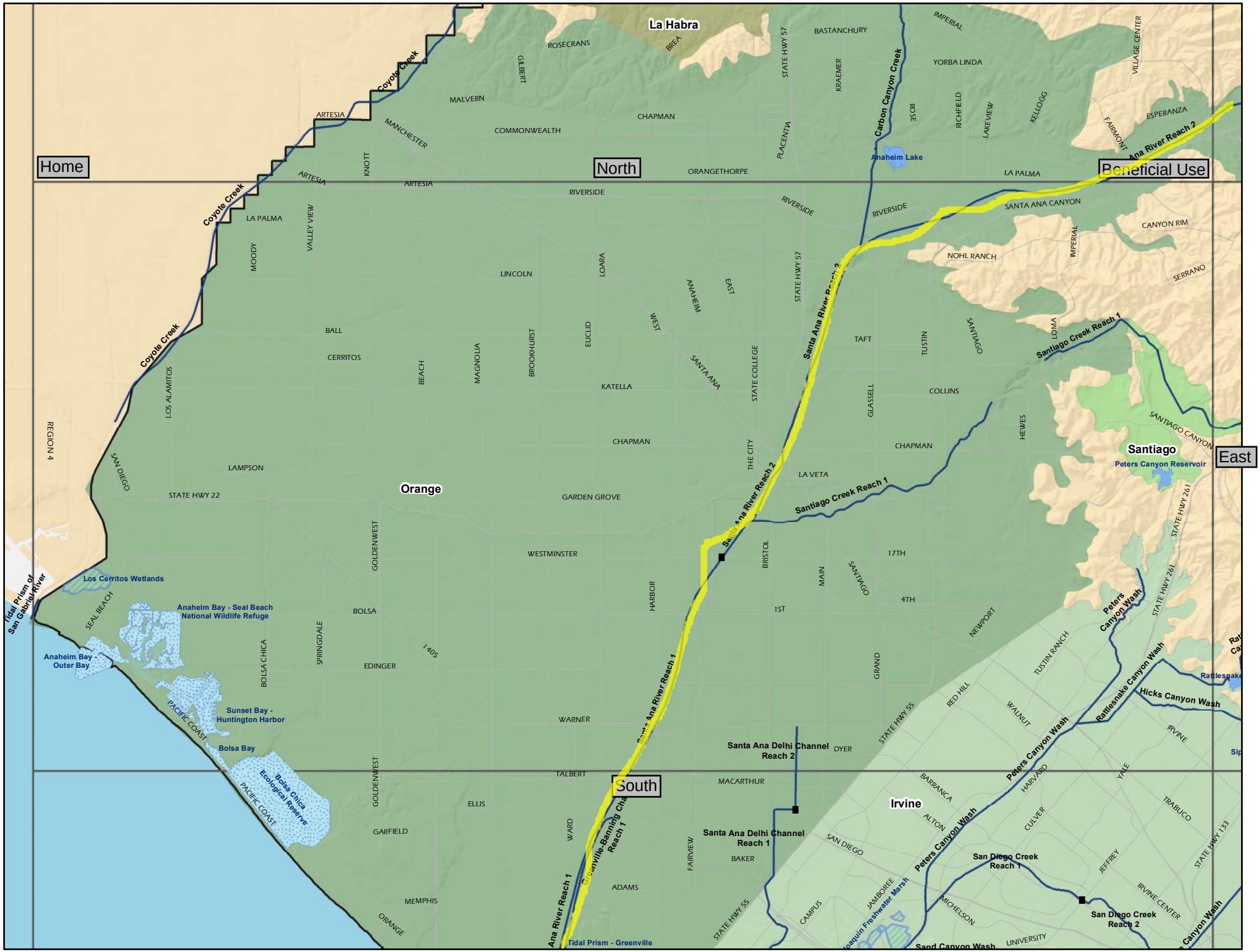


To navigate, click an individual cell to view an area in more detail.
Once navigating, use buttons (ie HOME, NORTH, etc) to move from place to place.

To view Table of Contents, click here


Home
Beneficial Use
East
South
REGION 4
La Habra
Coyote Creek
Carbon Canyon Creek
Santa Ana River Reach 2
Santiago Creek Reach 1
Anaheim Lake
Orange
Santiago
PEYTON
CHINO
GRAND
CARBON CANYON
HACIENDA
WHITTIER
BREA
LA HABRA
CENTRAL
LAMBERT
IMPERIAL
BIRCH
VALENCIA
BASTANCHURY
ROSECRANS
STATE HWY 57
KRAEMER
ROSE
VILLAGE CENTER
YORBA LINDA
GILBERT
MALVERN
ARTESIA
MANCHESTER
CHAPMAN
COMMONWEALTH
PLACENTIA
RICHFIELD
LAKEVIEW
KELLOGG
FAIRMONT
ESPERANZA
KNOTT
ORANGETHORPE
LA PALMA
RIVERSIDE
SANTA ANA CANYON
CANYON RIM
NOHL RANCH
IMPERIAL
SERRANO
VALLEY VIEW
MOODY
SANTA ANA
HARBOR
EAST
STATE COLLEGE
LINCOLN
MAGNOLIA
BEACH
BROOKHURST
EUCLID
WEST
ANAHEIM
GLASSELL
TUSTIN
SANTIAGO
LOMA
TAFT
BALL
CERRITOS


Home
North
Beneficial Use
West
East
South
Project Site
Riverside - A
Riverside - B
Riverside - C
Riverside - D
Riverside - E
Santa Ana River Reach 3
Santa Ana River Reach 2
Santa Ana River Reach 4
Chino Creek Reach 1B
Chino Creek Reach 2
Chino Creek Reach 1A
Cucamonga Creek Reach 1
Day Canyon Creek
Aliso Creek
Mill Creek (Prado Area)
Temescal Creek Reach 1a
Temescal Creek Reach 1b
Temescal Creek Reach 2
Sunnyslope Channel
Anza Park Drain
Prado Basin Management Zone
Lake Norconian
Lake Evans
Mockingbird Reservoir
Lake Mathews
Arlington
Orange
Temescal
Bedford
San Antonio Creek
STATE HWY 60
STATE HWY 71
STATE HWY 241
RIVERSIDE FWY
MISSION
PHILLIPS
PHILADELPHIA
RIVERSIDE
CHINO
SCHAEFER
EDISON
EUCALYPTUS
CHINO HILLS
MERRILL
CLOVERDALE
CHANDLER
JURUPA
GALENA
LIMONITE
DEWEY
CENTRAL
ARLINGTON
AVIATION
CRESTA
YUMA
CORONA
CHASE
EL SOBRANTE
SOQUEL CANYON
CARBON CANYON
LAPALMA
YORBA LINDA
FAIRMONT
SERRANO
PALISADES
GREEN RIVER
WEIR CANYON
MOCKINGBIRD CANYON


Home
North
Beneficial Use
East
South
Orange
La Habra
Santiago
Peters Canyon Reservoir
Irvine
Anaheim Lake
Coyote Creek
Santa Ana River Reach 2
Santa Ana River Reach 1
Santiago Creek Reach 1
Carbon Canyon Creek
Peters Canyon Wash
Hicks Canyon Wash
Rattlesnake Canyon Wash
Santa Ana Delhi Channel Reach 2
Santa Ana Delhi Channel Reach 1
Greenville-Banning Channel Reach 1
San Diego Creek Reach 1
San Diego Creek Reach 2
Tidal Prism - Greenville
Tidal Prism of San Gabriel River
Los Cerritos Wetlands
Anaheim Bay - Seal Beach National Wildlife Refuge
Anaheim Bay - Outer Bay
Sunset Bay - Huntington Harbor
Bolsa Bay
Bolsa Chica Ecological Reserve
Sand Canyon Wash
Rattlesnake
REGION 4
LA PALMA
ARTESIA
CERRITOS
BALL
LINCOLN
ANAHEIM
EAST
WEST
SANTA ANA
CHAPMAN
ORANGETHORPE
PLACENTIA
YORBA LINDA
BASTANCHURY
IMPERIAL
VILLAGE CENTER
ESPERANZA
FAIRMONT
RICHFIELD
LAKEVIEW
KELLOGG
KRAEMER
ROSECRANS
BREA
GILBERT
MALVERN
COMMONWEALTH
MANCHESTER
KNOTT
VALLEY VIEW
MOODY
LOARA
EUCLID
BROOKHURST
MAGNOLIA
BEACH
LOS ALAMITOS
SAN DIEGO
STATE HWY 22
STATE HWY 57
STATE COLLEGE
THE CITY
TAFT
TUSTIN
SANTIAGO
LOMA
GLASSELL
COLLINS
HEWES
LA VETA
GARDEN GROVE
KATELLA
WESTMINSTER
GOLDENWEST
HARBOR
BRISTOL
MAIN
17TH
4TH
1ST
NEWPORT
GRAND
BOLSA
EDINGER
SPRINGDALE
BOLSA CHICA
SEAL BEACH
1405
WARNER
TALBERT
MACARTHUR
DYER
ELLIS
GARFIELD
WARD
FAIRVIEW
BAKER
ADAMS
MEMPHIS
ORANGE
PACIFIC COAST
STATE HWY 55
RED HILL
WALNUT
BARRANCA
HARVARD
YALE
IRVINE
TRABUCO
CULVER
ALTON
JEFFREY
IRVINE CENTER
STATE HWY 133
STATE HWY 261
TUSTIN RANCH
SAN DIEGO
CAMPUS
JAMBOREE
MICHELSON
UNIVERSITY
NOHL RANCH
CANYON RIM
SERRANO
IMPERIAL
SANTIAGO CANYON
SANTA ANA CANYON
RIVERSIDE

9	Riverside - A (GW Mgmt Zone)	MUN	X
		AGR	X
		IND	X
		PROC	X
9	Riverside - C (GW Mgmt Zone)	MUN	X
		AGR	X
		IND	X
		PROC	X
9	Riverside - D (GW Mgmt Zone)	MUN	X
		AGR	X
		IND	X
		PROC	X
9	Riverside - E (GW Mgmt Zone)	MUN	X
		AGR	X
		IND	X
		PROC	X
9	San Sevaine Creek	MUN	I
		REC1	I
		REC2	I
		WILD	I
		COLD	I
		GWR	I
9	Santa Ana River Reach 2	GWR	X
		AGR	X
		REC2	X
		REC1	X
		RARE	X
		MUN	+
		WILD	X
		WARM	X
9	Santa Ana River Reach 3	AGR	X
		GWR	X
		MUN	+
		RARE	X
		REC1	X
		REC2	X
		SPWN	X
		WARM	X
		WILD	X
9	Santa Ana River Reach 4	MUN	+
		GWR	X

		SPWN	X
		REC2	X
		REC1	X
		RARE	X
		WILD	X
		WARM	X
9	Sunnyslope Channel	MUN	X
		RARE	X
		REC1	X
		REC2	X
		SPWN	X
		WARM	X
		WILD	X
9	Temescal	MUN	X
		AGR	X
		IND	X
		PROC	X
9	Temescal Creek Reach 1A	MUN	+
		REC1	U
		REC2	X
		WARM	X
		WILD	X
9	Temescal Creek Reach 1B	MUN	+
		REC1	U
		REC2	U
		WARM	X
		WILD	X
9	Temescal Creek Reach 2	AGR	X
		GWR	X
		IND	X
		WILD	X
		MUN	+
		REC1	X
		REC2	X
		WARM	X
9	Tequesquite Arroyo (Sycamore Creek)	GWR	X
		MUN	+
		WILD	X
		REC1	X
		REC2	X
		SPWN	X

		REC2	X
		WARM	X
		WILD	X
12	Peters Canyon Wash	REC2	I
		WARM	I
		WILD	I
		GWR	I
		MUN	+
		REC1	I
12	Rattlesnake Canyon Wash	WILD	I
		GWR	I
		MUN	+
		REC1	I
		REC2	I
		WARM	I
12	Santa Ana River Reach 1	REC1	X
		REC2	X
		WARM	I
		WILD	I
		MUN	+
12	Santa Ana River Reach 2	AGR	X
		GWR	X
		WARM	X
		WILD	X
		MUN	+
		RARE	X
		REC1	X
		REC2	X
12	Santa Ana-Delhi Channel Reach 2	MUN	+
		REC1	U
		REC2	X
		WARM	X
		WILD	X
12	Santiago (GW Mgmt Zone)	MUN	X
		AGR	X
		IND	X
12	Santiago Creek Reach 1	GWR	X
		WILD	X
		MUN	X
		REC1	X
		REC2	X

		WILD	X
16	San Diego Creek Reach 2	GWR	I
		MUN	+
		REC1	I
		REC2	I
		WARM	I
		WILD	I
16	San Joaquin Freshwater Marsh	MUN	+
		REC1	X
		REC2	X
		WARM	X
		BIOL	X
		WILD	X
		RARE	X
16	Sand Canyon Reservoir	MUN	+
		AGR	X
		REC1	X
		REC2	X
		WARM	X
		WILD	X
16	Sand Canyon Wash	GWR	I
		MUN	+
		RARE	I
		REC1	I
		REC2	I
		WARM	I
		WILD	I
16	Santa Ana River Reach 1	MUN	+
		WILD	I
		WARM	I
		REC2	X
		REC1	X
16	Santa Ana River Salt Marsh	MUN	+
		REC1	X
		REC2	X
		BIOL	X
		WILD	X
		RARE	X
		MAR	X
		EST	X
16	Santa Ana-Delhi Channel Reach 1	MUN	+



THE DISTRICT AT JURUPA VALLEY
WQMP SITE PLAN

Kimley»Horn

STRUCTURAL BMP NOTES

(1) TREATMENT CONTROL BMP – STORM DRAIN INLET WITH MODULAR WETLAND AND STORM DRAIN STENCILING AND SIGNAGE. SEE SIZING GUIDE.

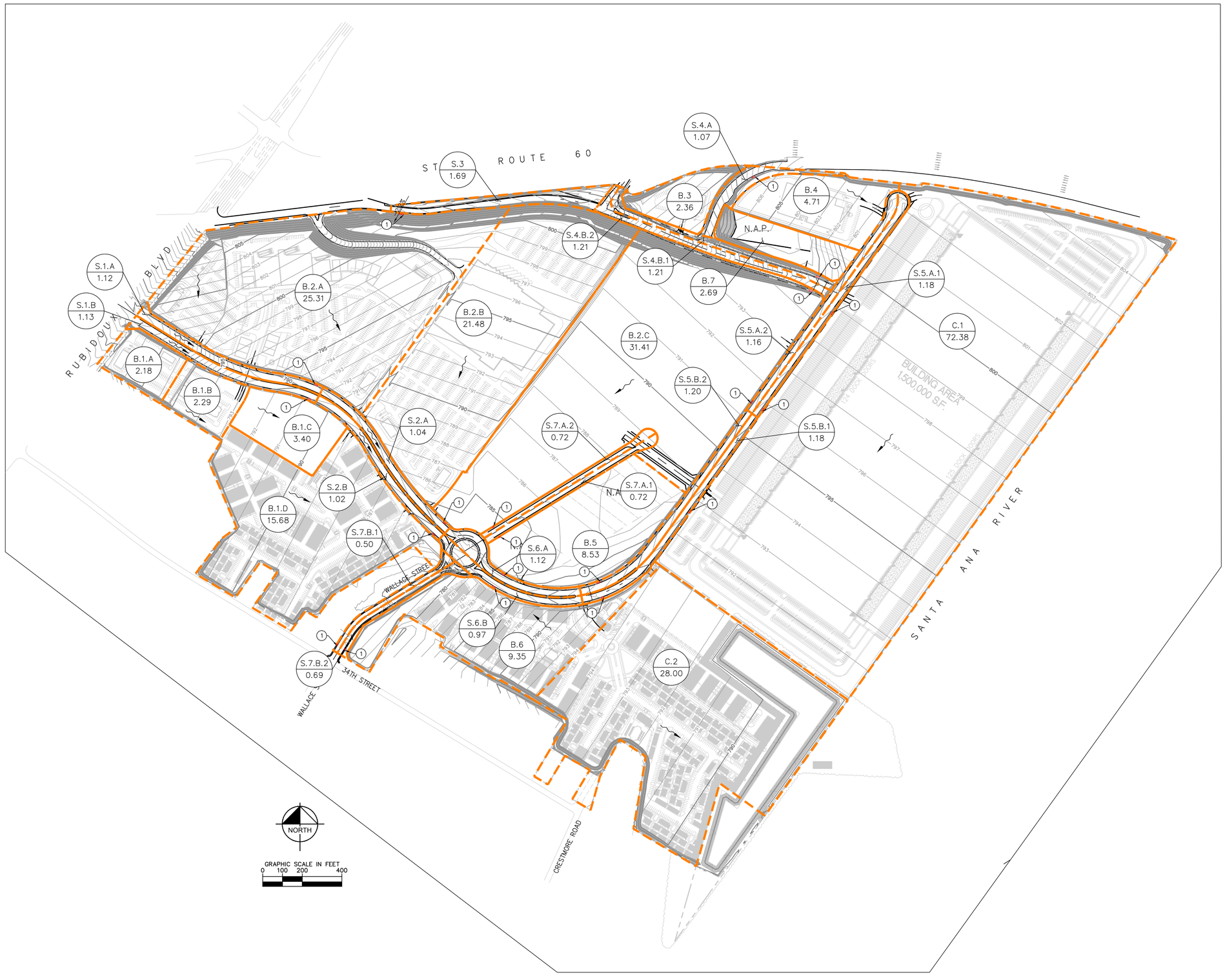
LEGEND

- RIGHT OF WAY/ PROPERTY LINE
- CENTERLINE
- 147 PROPOSED CONTOURS
- FLOW LINE
- DMA BOUNDARY
- PROPOSED MODULAR WETLAND
- DIRECTION OF WATER FLOW
- DMA ID / ACRES — DRAINAGE AREA LABEL

DMA	AREA (ACRES)	MWS MODEL	TREATMENT FLOWRATE REQUIRED (CFS)	TREATMENT FLOWRATE PROVIDED (CFS)
S.1.A	1.1159	MWS-L-4-15	0.163	0.175
S.1.B	1.1296	MWS-L-4-15	0.165	0.175
S.2.A	1.0358	MWS-L-4-15	0.151	0.175
S.2.B	1.021	MWS-L-4-15	0.149	0.175
S.3.	1.6897	MWS-L-4-21	0.247	0.268
S.4.A	1.0668	MWS-L-4-15	0.156	0.175
S.4.B.1	1.2134	MWS-L-4-17	0.177	0.206
S.4.B.2	1.2134	MWS-L-4-17	0.177	0.206
S.5.A.1	1.1775	MWS-L-4-17 (2X)	0.172	0.412
S.5.A.2	1.1562	MWS-L-4-15	0.169	0.175
S.5.B.1	1.1816	MWS-L-4-17 (2X)	0.173	0.412
S.5.B.2	1.2001	MWS-L-4-17	0.175	0.206
S.6.A	1.1237	MWS-L-4-15	0.164	0.175
S.6.B	0.9715	MWS-L-4-15	0.142	0.175
S.7.A.1	0.7179	MWS-L-4-8	0.105	0.115
S.7.A.2	0.7179	MWS-L-4-8	0.105	0.115
S.7.B.1	0.4976	MWS-L-4-8	0.073	0.115
S.7.B.2	0.6878	MWS-L-4-8	0.100	0.115

DMA	AREA (ACRES)	BMP TYPE	DESIGN CAPTURE VOLUME REQUIRED (CF)	PROPOSED VOLUME ON PLAN
B.1.A	2.18	TBD	3,757	TBD
B.1.B	2.29	TBD	3,940	TBD
B.1.C	3.40	TBD	5,852	TBD
B.1.D	15.68	TBD	27,014	TBD
B.2.A	25.31	TBD	43,619	TBD
B.2.B	21.48	TBD	37,004	TBD
B.2.C	31.41	TBD	54,122	TBD
B.3.	2.36	TBD	4,061	TBD
B.4.	4.71	TBD	8,121	TBD
B.5.	8.53	TBD	14,691	TBD
B.6.	9.35	TBD	16,118	TBD
B.7.	2.69	TBD	4,641	TBD
C.1.	72.38	TBD	124,719	TBD
C.2.	28.00	TBD	48,244	TBD

NOTE:
EACH PRIVATE ZONE WILL NEED ITS OWN FORM OF WATER QUALITY AS A PART OF ITS DEVELOPMENT PLANS.



Plotted By:Divalar, Hans Sheet Set:Kha Layout:WQMP Exhibit June 19, 2022 08:25:33pm K:\ORA_LOEV\194399001 Districts at Rubidoux\CAD\Exhibits\WQMP Exhibit.dwg
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Kimley»Horn
© 2022 KIMLEY-HORN AND ASSOCIATES, INC.
1100 W TOWN AND COUNTRY ROAD,SUITE 700, ORANGE, CA 92868
PHONE: 714-939-1030 FAX: 714-938-9488
WWW.KIMLEY-HORN.COM

KHA PROJECT	194399001
DATE	6/19/2022
SCALE	AS SHOWN
DESIGNED BY	HS
DRAWN BY	NS/KM
CHECKED BY	MR

THE DISTRICT
JURUPA VALLEY

WQMP EXHIBIT

SHEET NUMBER 1 OF 1

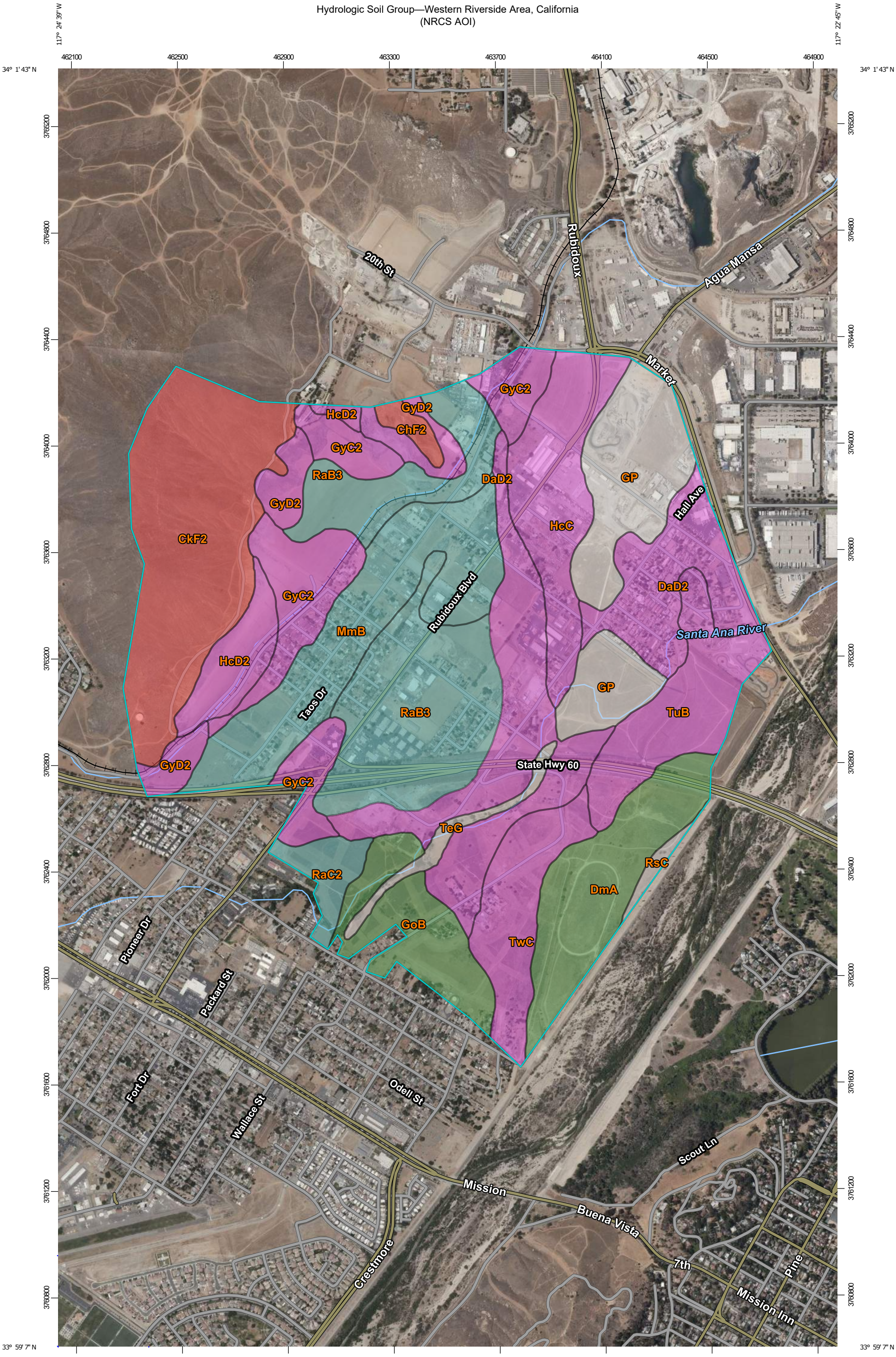
Appendix 2: Construction Plans

Grading and Drainage Plans

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Hydrologic Soil Group—Western Riverside Area, California
(NRCS AOI)



Map Scale: 1:13,500 if printed on B portrait (11" x 17") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 14, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 17, 2018—Jun 28, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ChF2	Cieneba sandy loam, 15 to 50 percent slopes, eroded	D	6.4	0.6%
CkF2	Cieneba rocky sandy loam, 15 to 50 percent slopes, eroded	D	138.1	12.6%
DaD2	Delhi fine sand, 2 to 15 percent slopes, wind-eroded	A	152.0	13.9%
DmA	Dello loamy sand, poorly drained, 0 to 2 percent slopes	A/D	69.3	6.4%
GoB	Grangeville loamy fine sand, drained, 0 to 5 percent slopes	A/D	48.3	4.4%
GP	Gravel pits		85.0	7.8%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	A	84.1	7.7%
GyD2	Greenfield sandy loam, 8 to 15 percent slopes, eroded	A	32.4	3.0%
HcC	Hanford coarse sandy loam, 2 to 8 percent slopes	A	67.4	6.2%
HcD2	Hanford coarse sandy loam, 8 to 15 percent slopes, eroded	A	27.7	2.5%
MmB	Monserate sandy loam, 0 to 5 percent slopes	C	100.2	9.2%
RaB3	Ramona sandy loam, 0 to 5 percent slopes, severely eroded	C	142.3	13.0%
RaC2	Ramona sandy loam, 5 to 8 percent slopes, eroded	C	16.5	1.5%
RsC	Riverwash		4.0	0.4%
TeG	Terrace escarpments		11.0	1.0%
TuB	Tujunga loamy sand, 0 to 5 percent slopes	A	58.2	5.3%
TwC	Tujunga gravelly loamy sand, 0 to 8 percent slopes	A	48.6	4.5%
Totals for Area of Interest			**1,091.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix 4: Historical Site Conditions

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

Appendix 5: LID Infeasibility

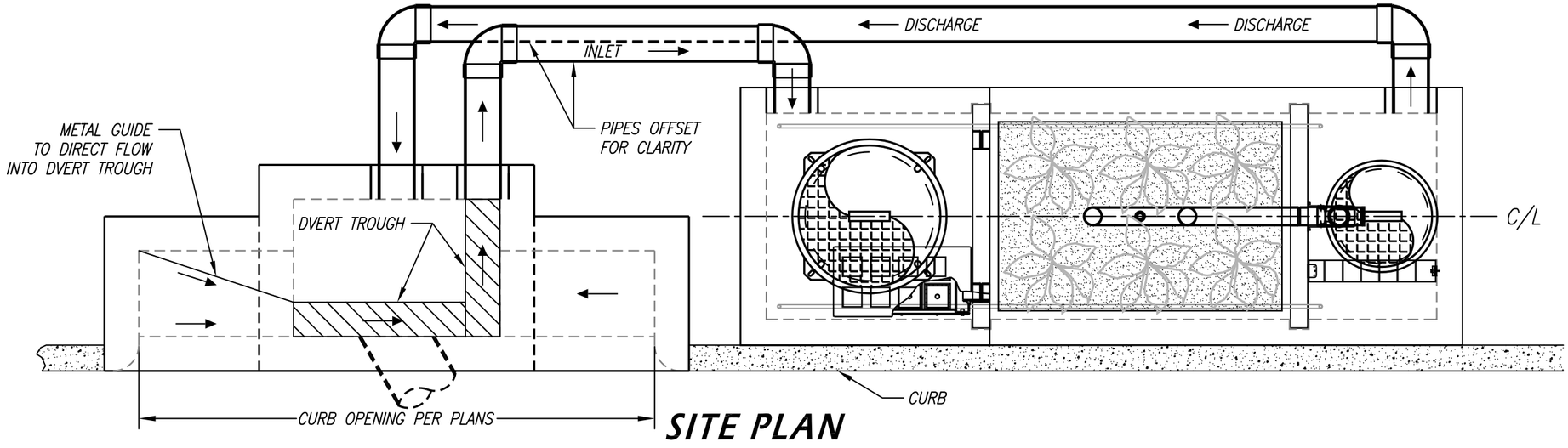
LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

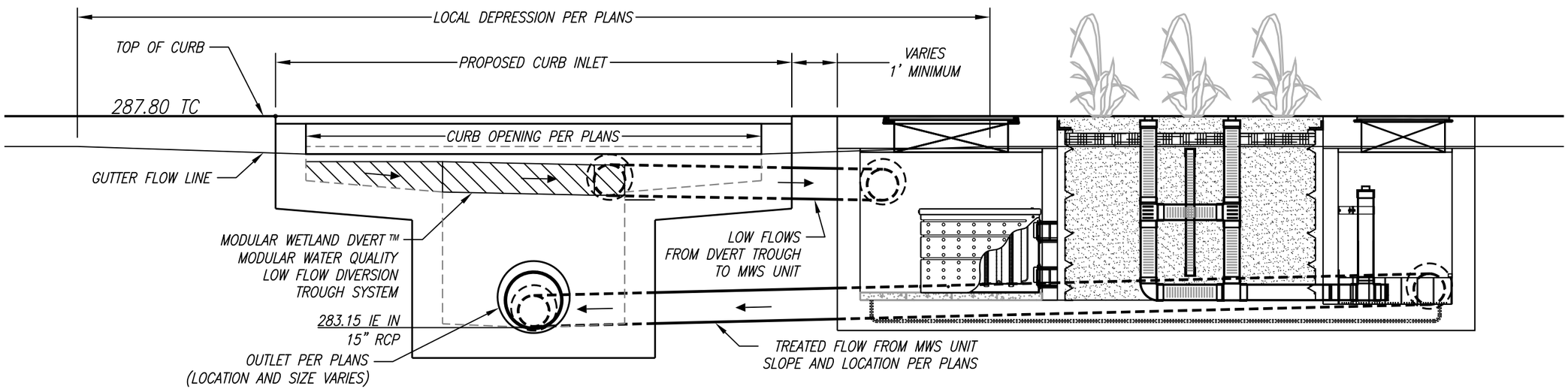
BMP Sizing, Design Details and other Supporting Documentation

DVERT ™

MODULAR WATER QUALITY DIVERSION WEIR SYSTEM



SITE PLAN



TYPICAL SECTION VIEW

INSTALLATION NOTES:

1. TROUGH TO BE CONNECTED TO CONCRETE BELOW CURB OPENING USING 1/2" x 1-1/2" 316 STAINLESS STEEL SPIKE MUSHROOM HEAD DRIVE ANCHORS SPACED 12" ON CETNTER
2. USE DAP CONCRETE WATERTIGHT FILLER & SEALANT TO SEAL SEAM BETWEEN FIBERGLASS WEIR & CONCRETE WALL OF CATCH BASIN.

MODULAR WETLAND SYSTEMS INC.
P.O. BOX 869
OCEANSIDE, CA 92049
www.ModularWetlands.com

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	NAME	DATE
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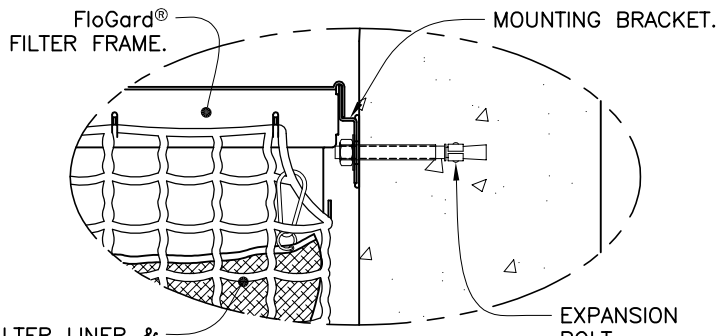
COMMENTS:

TITLE: DVERT SYSTEM

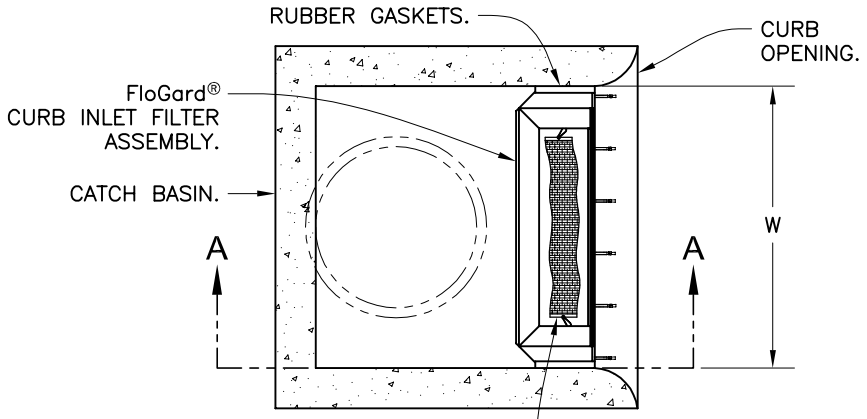
SIZE	DWG. NO.	REV

SCALE NTS | UNITS = INCHES | SHEET 1 OF 1

FGP-0002

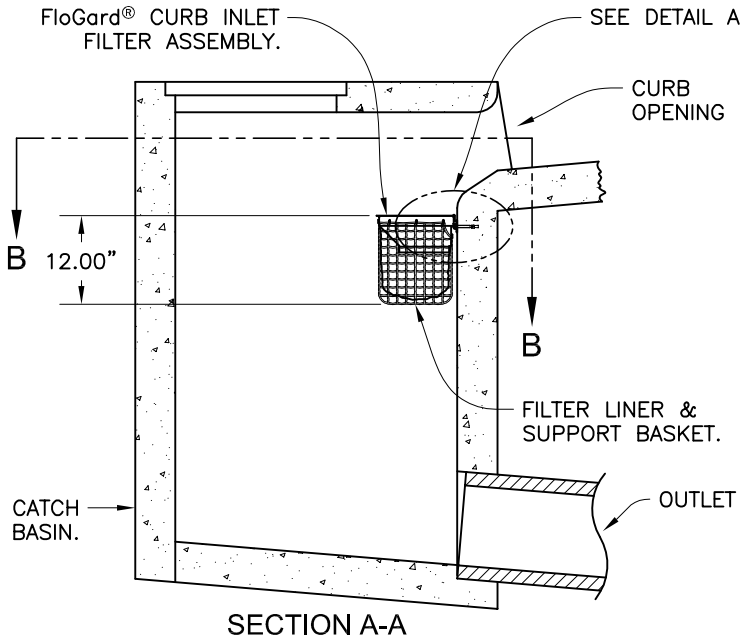


DETAIL A
MOUNTING BRACKET & EXPANSION BOLTS
SEE NOTE 2
SCALE: 6X



SECTION B-B
TOP VIEW
SCALE: 1X

SPECIFIER CHART				
MODEL NO.	Curb Opening Width - W -	Storage Capacity - Cu. Ft. -	Filtered Flow Rate - GPM/CFS -	Bypass Flow Rate - GPM/CFS -
FGP-24CI	2.0' (24")	.95	338 / .75	2,513 / 5.6
FGP-30CI	2.5' (30")	1.20	450 / 1.00	3,008 / 6.7
FGP-36CI	3.0' (36")	1.50	563 / 1.25	3,547 / 7.9
FGP-42CI	3.5' (42")	1.80	675 / 1.50	3,951 / 8.8
FGP-48CI	4.0' (48")	2.10	768 / 1.76	4,445 / 9.9
FGP-5.0CI	5.0' (60")	2.40	900 / 2.00	5,208 / 11.6
FGP-6.0CI	6.0' (72")	3.05	1,126 / 2.51	6,196 / 13.8
FGP-7.0CI	7.0' (84")	3.65	1,350 / 3.01	7,139 / 15.9
FGP-8.0CI	8.0' (96")	4.25	1,576 / 3.51	8,082 / 18.0
FGP-10.0CI	10.0' (120")	4.85	1,800 / 4.01	9,833 / 21.9
FGP-12.0CI	12.0' (144")	6.10	2,252 / 5.02	11,764 / 26.2
FGP-14.0CI	14.0' (168")	7.30	2,700 / 6.02	13,515 / 30.1
FGP-16.0CI	16.0' (192")	8.55	3.152 / 7.02	15,446 / 34.4
FGP-18.0CI	18.0' (216")	9.45	3,490 / 7.78	17,152 / 38.2
FGP-21.0CI	21.0' (252")	10.95	4,050 / 9.02	19,891 / 44.3
FGP-28.0CI	28.0 (336")	14.60	5,400 / 12.03	26,311 / 58.6



SECTION A-A
SIDE VIEW
SCALE: 1X

NOTES:

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

Inlet
Filtration

FloGard®

Catch Basin Insert Filter

Curb Inlet Style

Oldcastle®
Stormwater Solutions

7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

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Biofilter Products

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.

The Modular Wetland System Linear™ (MWS 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 applications treating rooftops, streetscapes, parking lots, and industrial sites. The MWS Linear can be used for the following applications: industrial, residential, streets, parking lots, commercial, mixed use, agricultural, reuse, low impact development and waste water.

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

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.

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.

Biofilter Products





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.

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.

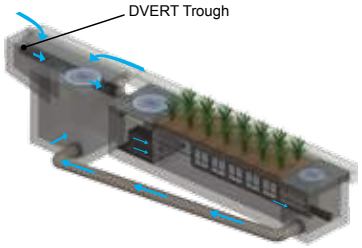
End-To-End

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.



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.



Flow Based Sizing

Model#	Dimensions	Wetland Media Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4'x4'	23 sq.ft.	0.052
MWS-L-4-6	4'x6'	32 sq.ft.	0.073
MWS-L-4-8	4'x8'	50 sq.ft.	0.115
MWS-L-4-13	4'x13'	63 sq.ft.	0.144
MWS-L-4-15	4'x15'	76 sq.ft.	0.175
MWS-L-4-17	4'x17'	90 sq.ft.	0.206
MWS-L-4-19	4'x19'	103 sq.ft.	0.237
MWS-L-4-21	4'x21'	117 sq.ft.	0.268
MWS-L-6-8	7'x9'	64 sq.ft.	0.147
MWS-L-8-8	8'x8'	100 sq.ft.	0.230
MWS-L-8-12	8'x12'	151 sq.ft.	0.346
MWS-L-8-16	8'x16'	201 sq.ft.	0.462
MWS-L-8-20	9'x21'	252 sq.ft.	0.577
MWS-L-8-24	9'x25'	302 sq.ft.	0.693

Volume Based Sizing

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-6-8	3191	6382
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145
MWS-L-8-20	12560	25120
MWS-L-8-24	15108	30216

Biofilter Products

featured advantages

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

Advantages & Operation

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 sq.ft. 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.

② Bio Filtration

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.

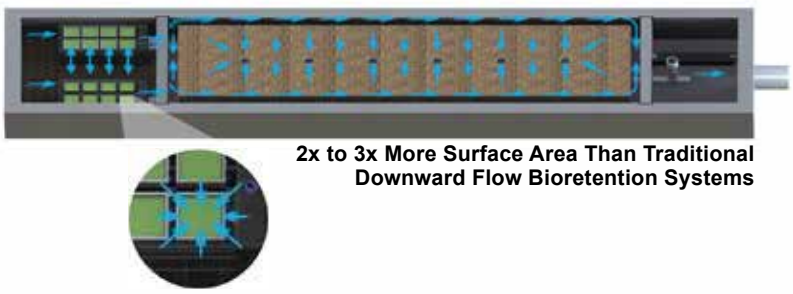
WetlandMEDIA
Contains no organics and removes phosphorus. Greater surface area and 48% void space. Maximum evapo-transpiration. High ion exchange capacity and light weight.

③ Discharge

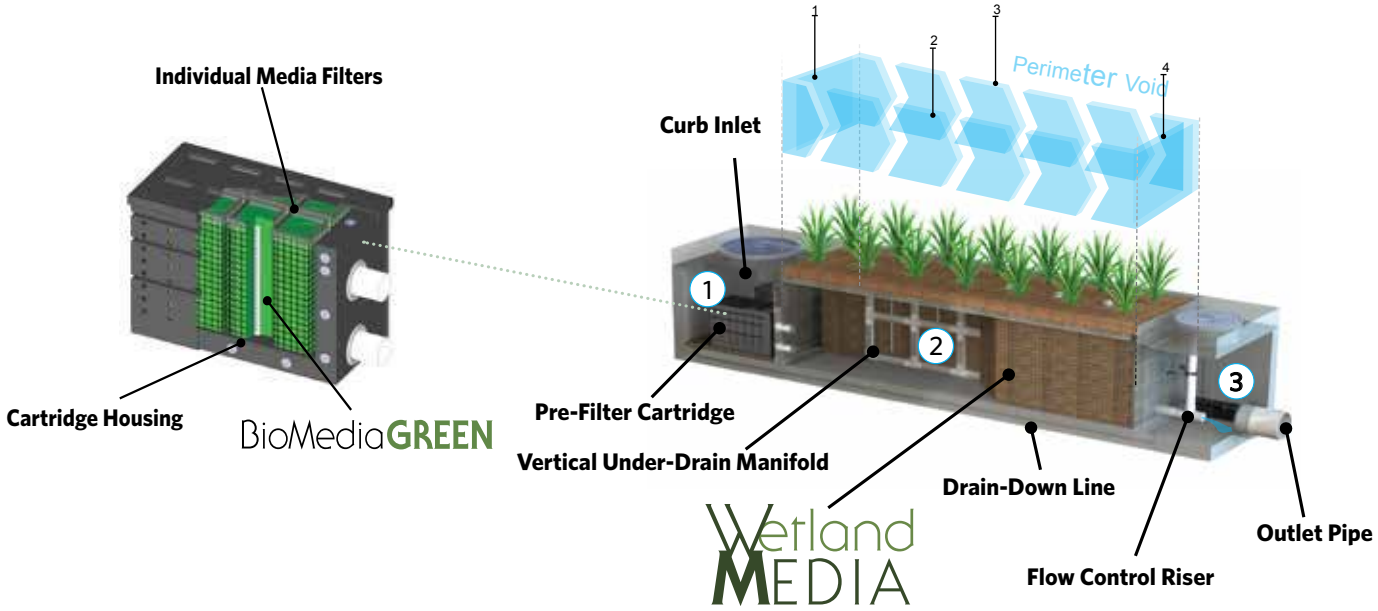
Flow Control
Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity. Extends the life of the media and improves performance.

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.

Top View



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



Biofilter Products



Configurations

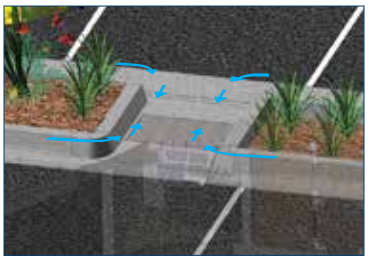
Curb Type

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 system's 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.



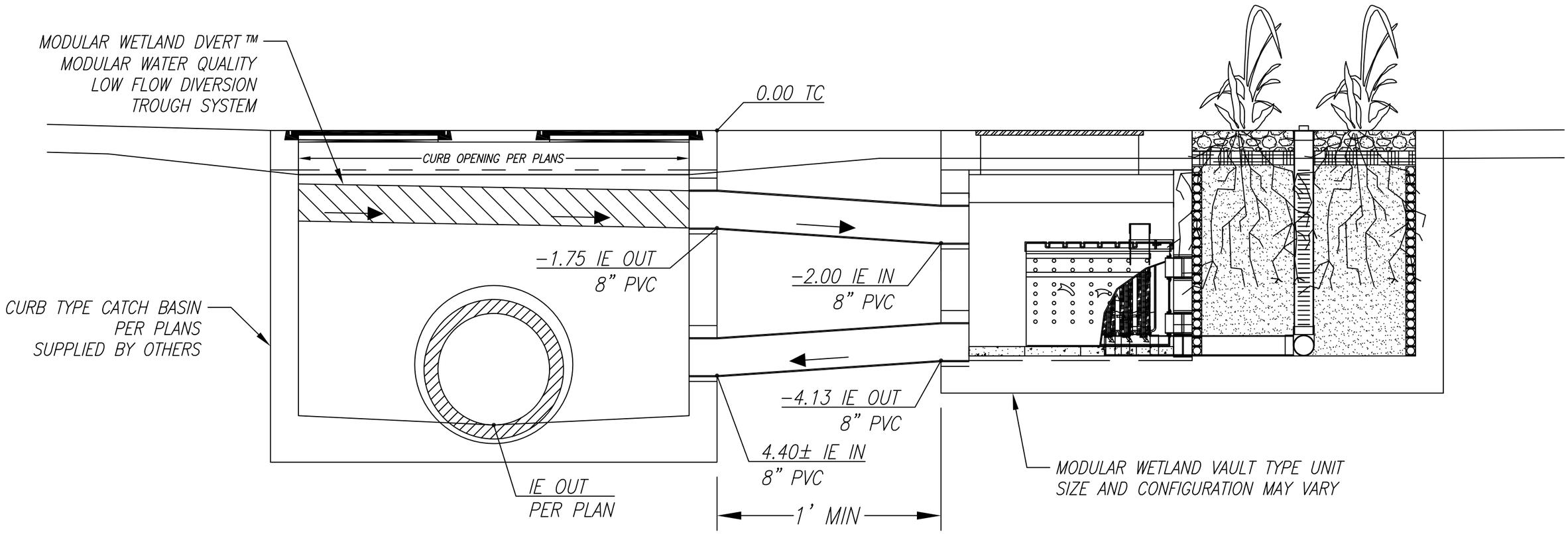
Downspout Type

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.





MODULAR WETLAND SYSTEMS - LINEAR 2.0
STANDARD DVERT ELEVATIONS



TYPICAL ELEVATION VIEW

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TITLE: MWS LINEAR 2.0 DVERT SETUP

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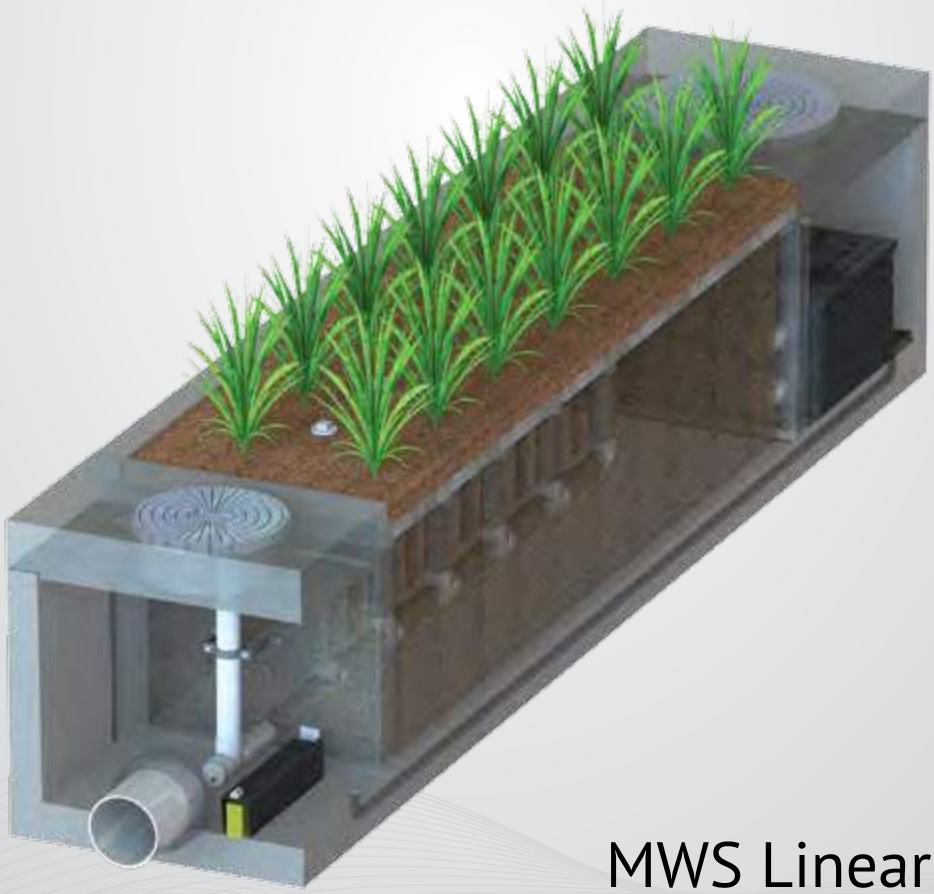
MODULAR WETLANDS™

*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
- Reuse
- Low Impact Development
- Waste Water





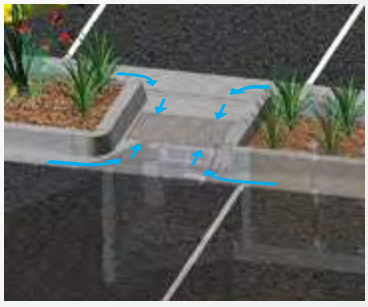
Configurations

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

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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

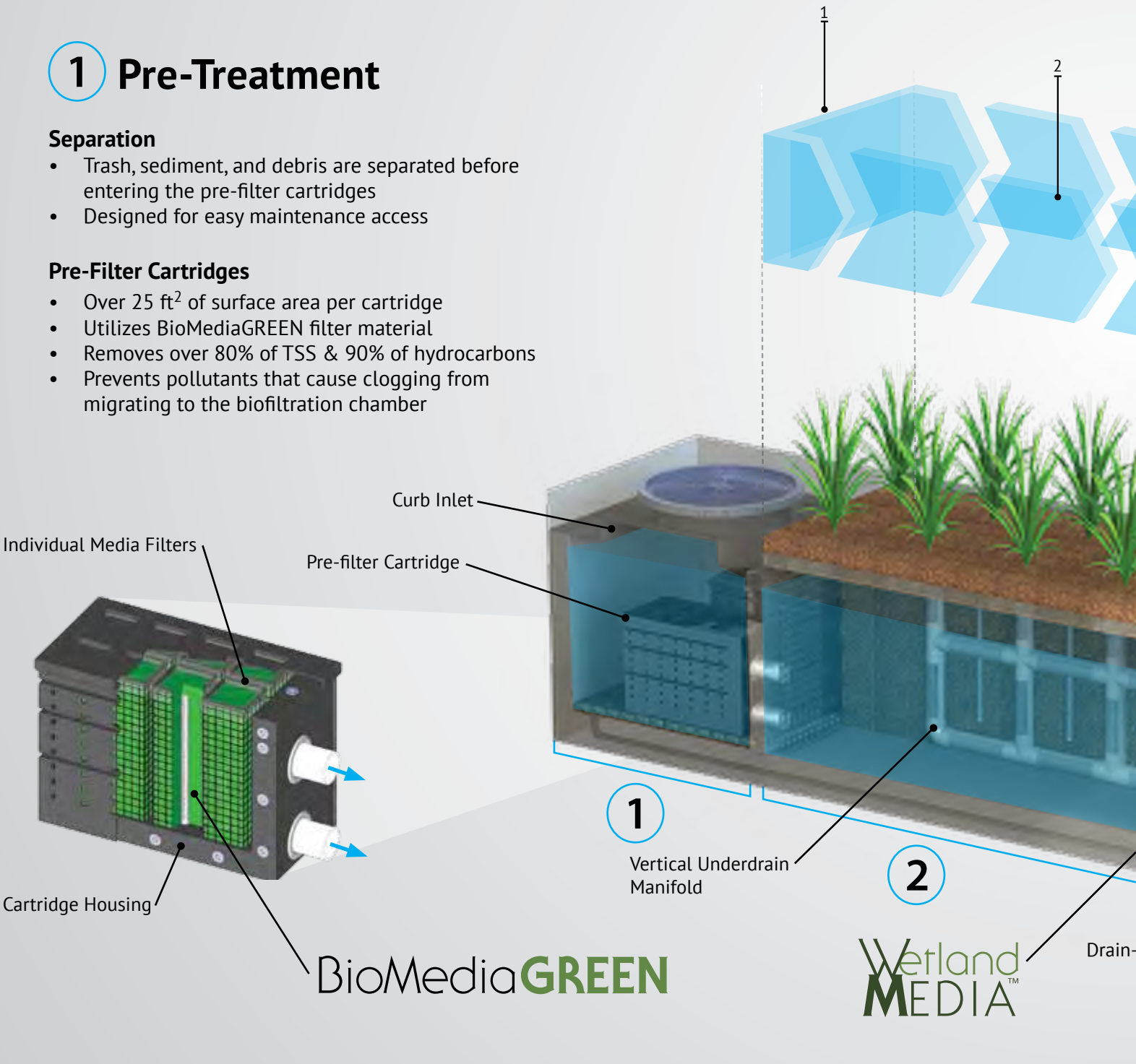
1 Pre-Treatment

Separation

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

Pre-Filter Cartridges

- Over 25 ft^2 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



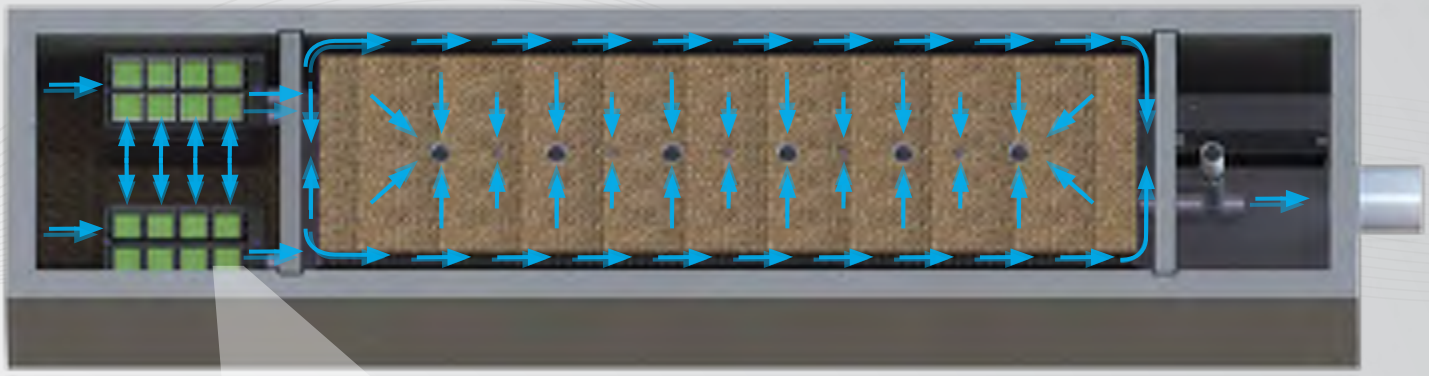


Fig. 2 - Top View

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



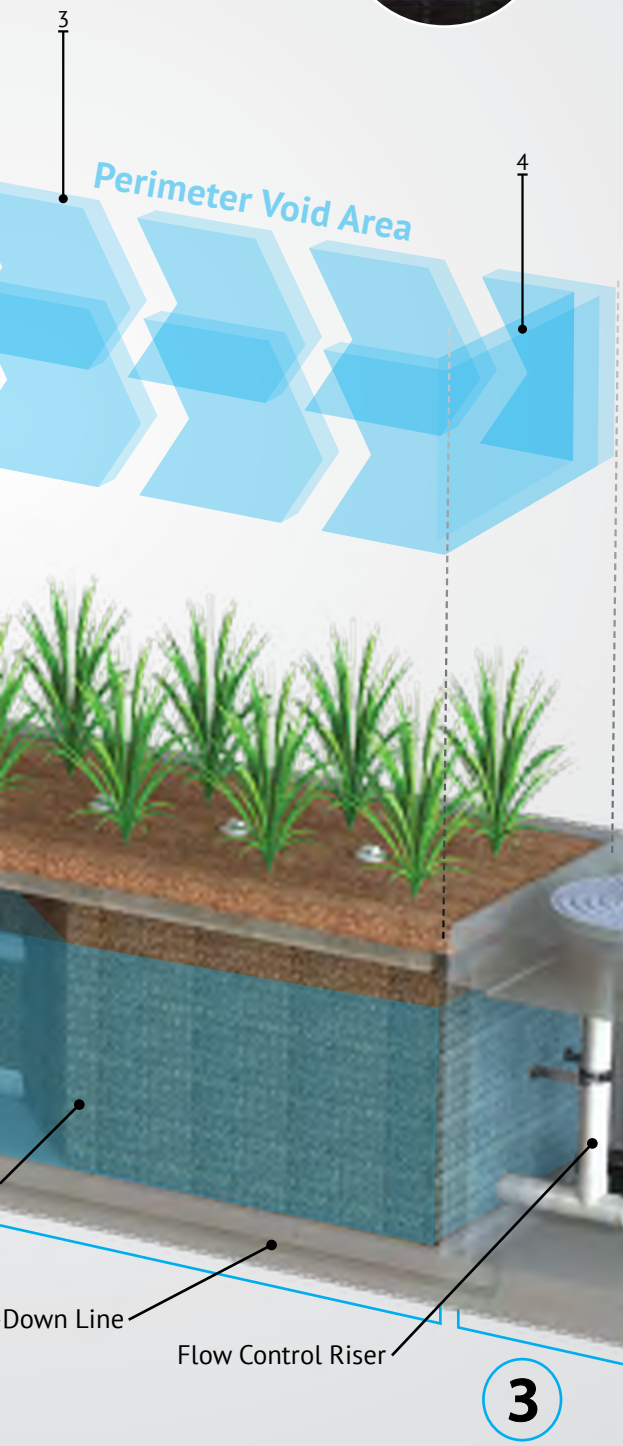


Fig. 1

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

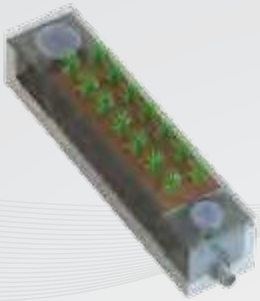
- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

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.

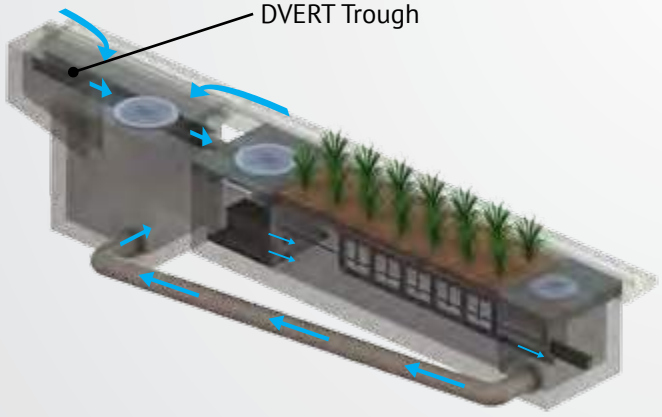
External Diversion Weir Structure

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 it's 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 natures 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 DOE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 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.



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 for discharges to freshwater systems, and 30% Total Nitrogen for discharges to saltwater or tidal systems.

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.



MWS Linear 2.0 Flow Based Sizing Calculations - *State of California*

Model #	Physical Depth of Model from TC, FS, TC to INVERT OUT	Wetland Perimiter (ft)	**Wetland Chamber Max HGL Height (ft)	Wetland Surface Area (sq ft)	Treatment Capacity for Flow Based Design **FLOW DESIGN**	
					GPM	CFS
MWS-L-4-4	4.13'	6.7	3.40	22.78	**23.46**	**0.052**
MWS-L-4-6	4.13'	9.4	3.40	31.96	**32.92**	**0.073**
MWS-L-4-8	4.13'	14.8	3.40	50.32	**51.83**	**0.115**
MWS-L-4-13	4.13'	18.4	3.40	62.56	**64.44**	**0.144**
MWS-L-4-15	4.13'	22.4	3.40	76.16	**78.44**	**0.175**
MWS-L-4-17	4.13'	26.4	3.40	89.76	**92.45**	**0.206**
MWS-L-4-19	4.13'	30.4	3.40	103.36	**106.46**	**0.237**
MWS-L-4-21	4.13'	34.4	3.40	116.96	**120.47**	**0.268**
MWS-L-8-12	4.13'	44.4	3.40	150.96	**155.49**	**0.346**
MWS-L-8-16	4.13'	59.2	3.40	201.28	**207.32**	**0.462**

Shallow or Deeper Units Available. Change in Height Will Affect Treatment Capacity

** Not the physical height of the unit but the max HGL in the system at peak treatment flow rate

Based on loading rate of 100 in/hr or 1.03 gpm/sq ft

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info@modularwetlands.com **P: 760-433-7640** **2972 San Luis Rey Rd, Oceanside CA 92058**

MWS Linear 2.0 Volume Based Sizing Calculations - *All States*

Model #	Physical Depth of Model from TC, FS, TC to INVERT OUT	Wetland Perimiter (ft)	**Wetland Chamber Max HGL Height (ft)	Wetland Surface Area (sq ft)	Treatment Capacity for Volume Based Design **VOLUME DESIGN**	
					24 Hour Drain Down	48 Hour Drain Down
MWS-L-4-4	4.13'	6.7	3.40	22.78	**1139.96**	**2279.93**
MWS-L-4-6	4.13'	9.4	3.40	31.96	**1599.35**	**3198.71**
MWS-L-4-8	4.13'	14.8	3.40	50.32	**2518.13**	**5036.26**
MWS-L-4-13	4.13'	18.4	3.40	62.56	**3130.65**	**6261.30**
MWS-L-4-15	4.13'	22.4	3.40	76.16	**3811.22**	**7622.45**
MWS-L-4-17	4.13'	26.4	3.40	89.76	**4491.80**	**8983.60**
MWS-L-4-19	4.13'	30.4	3.40	103.36	**5172.37**	**10344.75**
MWS-L-4-21	4.13'	34.4	3.40	116.96	**5852.95**	**11705.90**
MWS-L-8-12	4.13'	44.4	3.40	150.96	**7554.39**	**15108.78**
MWS-L-8-16	4.13'	59.2	3.40	201.28	**10072.52**	**20145.04**
MWS-L-10-20	4.13'	88.8	3.40	301.92	**15108.78**	**30217.56**

Shallow or Deeper Units Available. Change in Height Will Affect Treatment Capacity

** Not the physical height of the unit but the max HGL in the system at peak treatment flow rate

Based on loading rate of 25 in/hr or 0.26 gpm/sq ft

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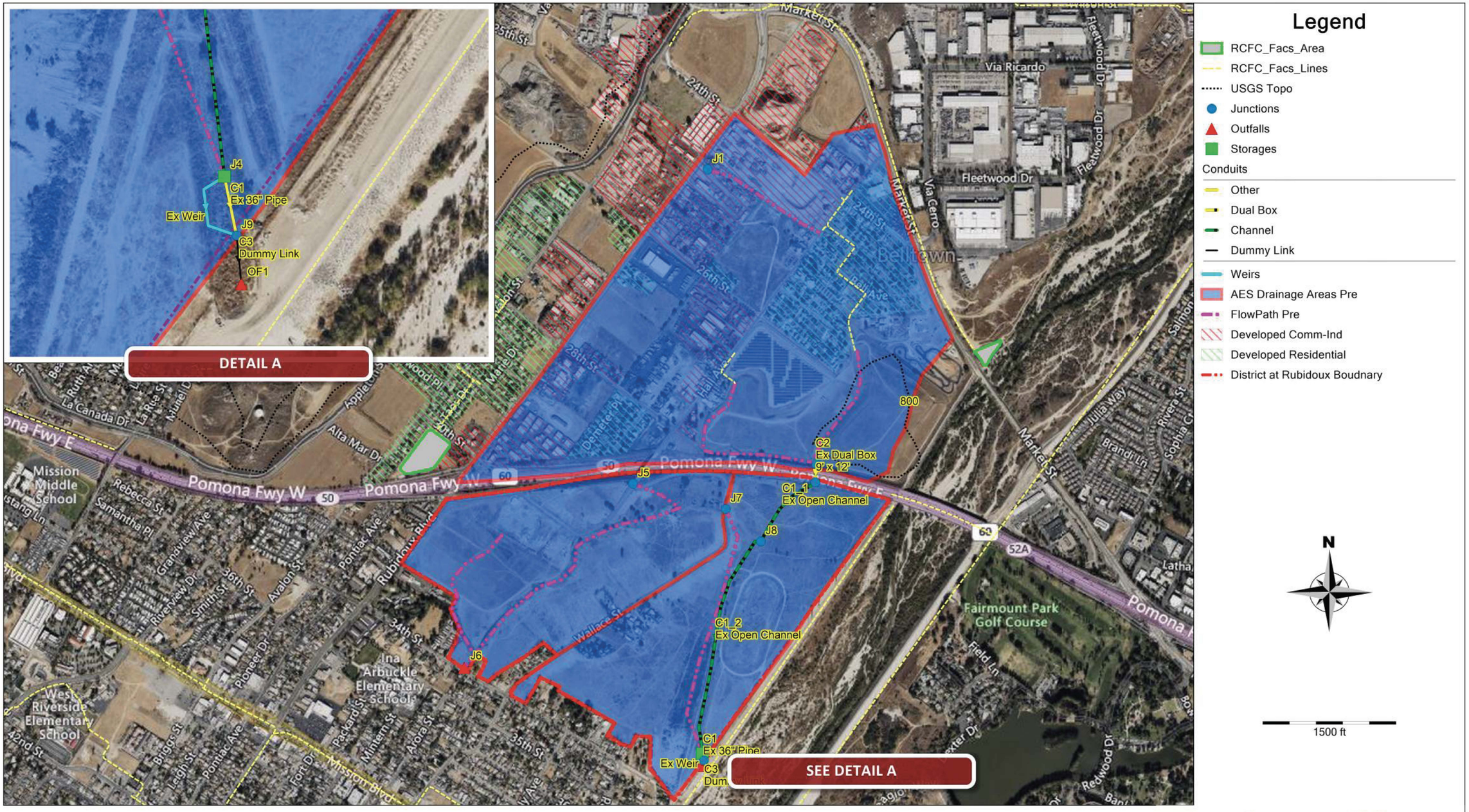
Modular Wetland Sizing: The District at Jurupa Valley

KH 2022.06.17

Drainage Management Area	Area (AC)	Impervious Percentage	Intensity (in/hr)	Composite Runoff Factor	Required Treatment Flow (cfs)	Treatment Device	Provided Treatment Flow (cfs)
Area S.1.a	1.1159	90%	0.2	0.73	0.16	MWS-L-4-15	0.175
Area S.1.b	1.1296	90%	0.2	0.73	0.16	MWS-L-4-15	0.175
Area S.2.a	1.0358	90%	0.2	0.73	0.15	MWS-L-4-15	0.175
Area S.2.b	1.021	90%	0.2	0.73	0.15	MWS-L-4-15	0.175
Area S.3.	1.6897	90%	0.2	0.73	0.25	MWS-L-4-21	0.268
Area S.4.a	1.0668	90%	0.2	0.73	0.16	MWS-L-4-15	0.175
Area S.4.b1	1.2134	90%	0.2	0.73	0.18	MWS-L-4-17	0.206
Area S.4.b2	1.2134	90%	0.2	0.73	0.18	MWS-L-4-17	0.206
Area S.5.a1	1.1775	90%	0.2	0.73	0.17	MWS-L-4-17 (2X)	0.412
Area S.5.a2	1.1562	90%	0.2	0.73	0.17	MWS-L-4-15	0.175
Area S.5.b1	1.1816	90%	0.2	0.73	0.17	MWS-L-4-17 (2X)	0.412
Area S.5.b2	1.2001	90%	0.2	0.73	0.18	MWS-L-4-17	0.206
Area S.6.a	1.1237	90%	0.2	0.73	0.16	MWS-L-4-15	0.175
Area S.6.b	0.9715	90%	0.2	0.73	0.14	MWS-L-4-15	0.175
Area S.7.a1	0.7179	90%	0.2	0.73	0.10	MWS-L-4-8	0.115
Area S.7.a2	0.7179	90%	0.2	0.73	0.10	MWS-L-4-8	0.115
Area S.7.b1	0.4976	90%	0.2	0.73	0.07	MWS-L-4-8	0.115
Area S.7.b2	0.6878	90%	0.2	0.73	0.10	MWS-L-4-8	0.115

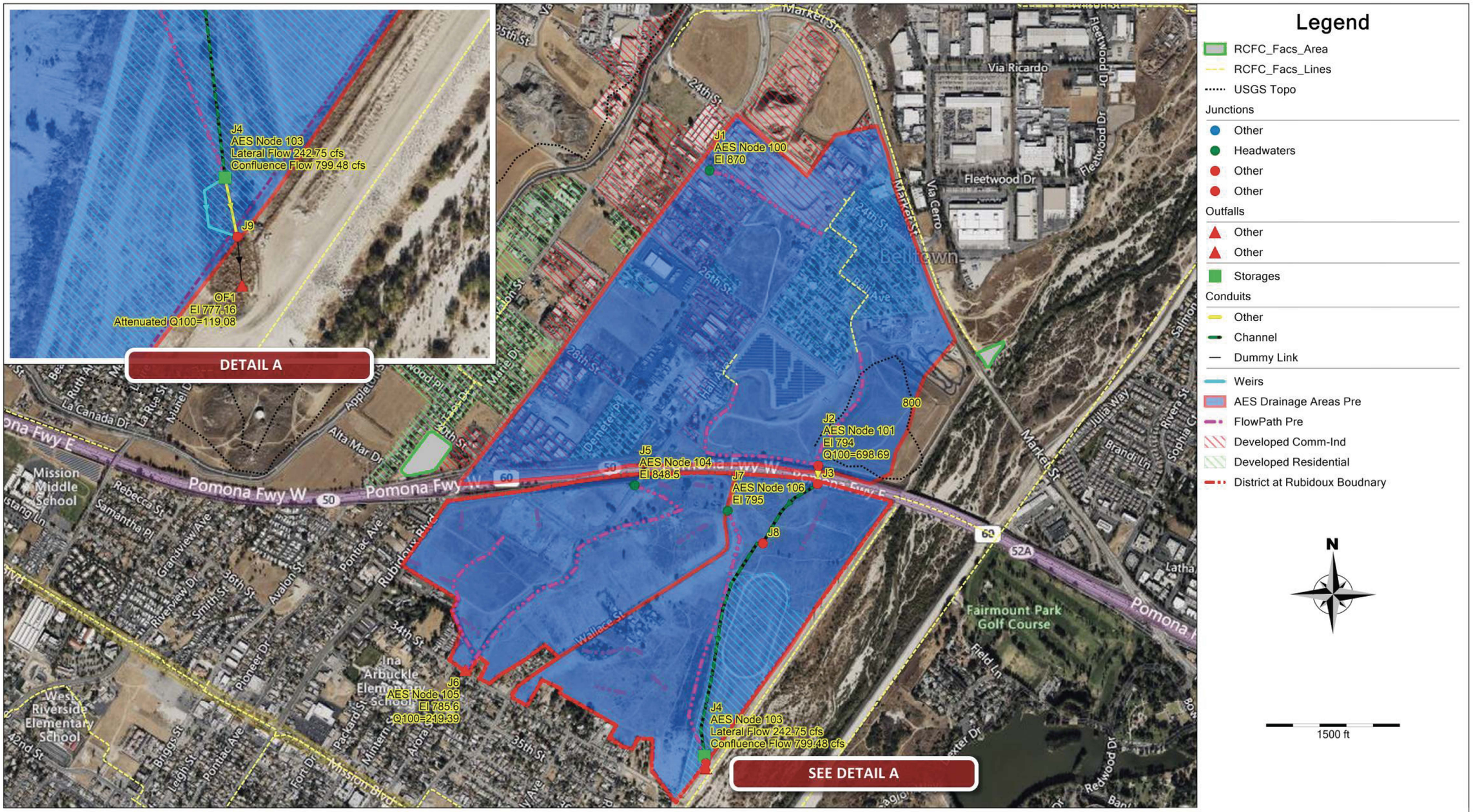
Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern



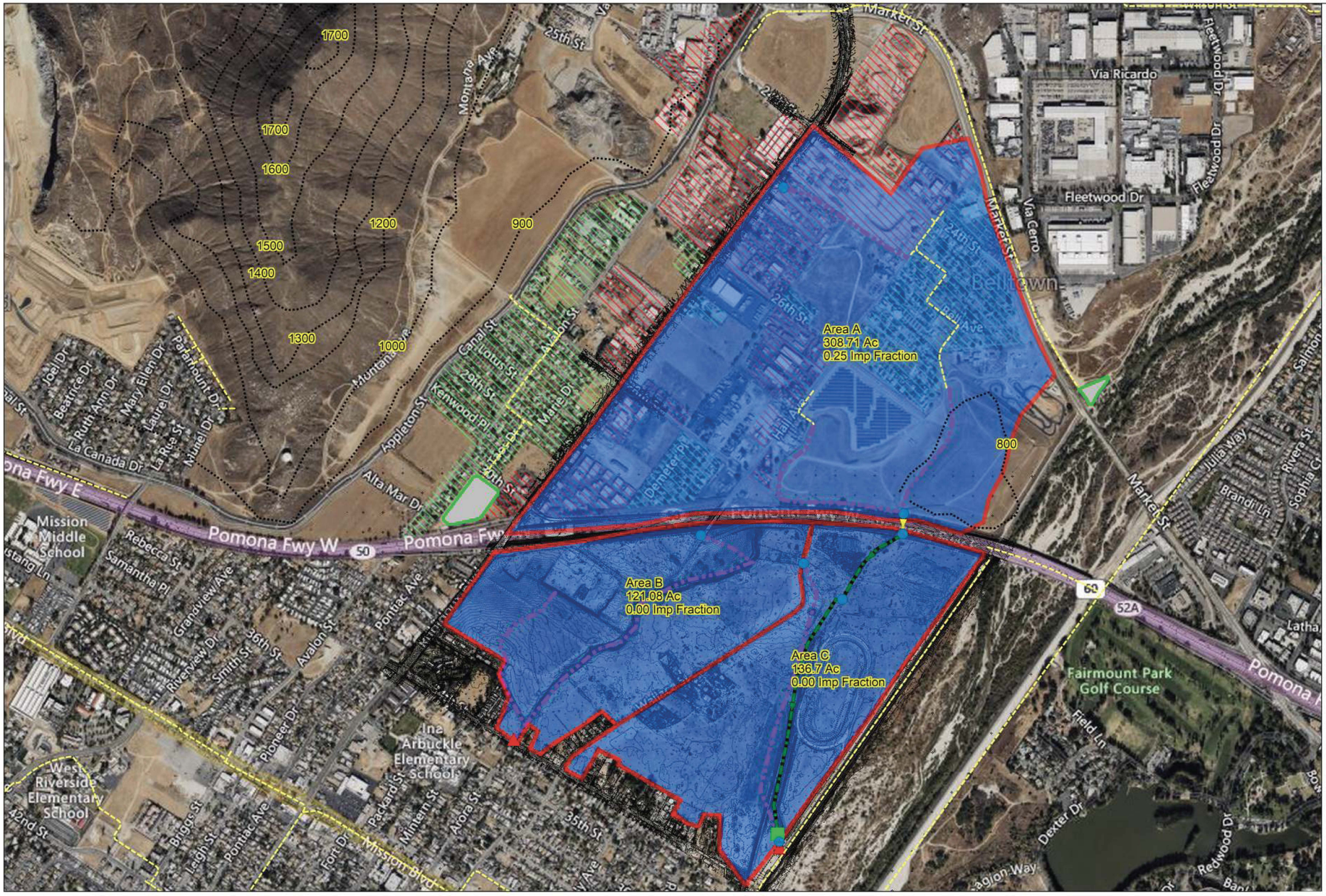
THE DISTRICT AT JURUPA VALLEY
PRE DEVELOPMENT CONDUITS

Kimley»Horn



THE DISTRICT AT JURUPA VALLEY
PRE DEVELOPMENT JUNCTIONS

Kimley»Horn



Legend

- RCFC_Facs_Area
- RCFC_Facs_Lines
- USGS Topo
- Junctions
- Outfalls
- Storages

Conduits

- Other
- Channel

- Weirs
- AES Drainage Areas Pre
- FlowPath Pre
- ExContours
- Developed Comm-Ind
- Developed Residential
- District at Rubidoux Boudnary

N

1500 ft

THE DISTRICT AT JURUPA VALLEY
PRE DEVELOPMENT SUBCATCHMENTS

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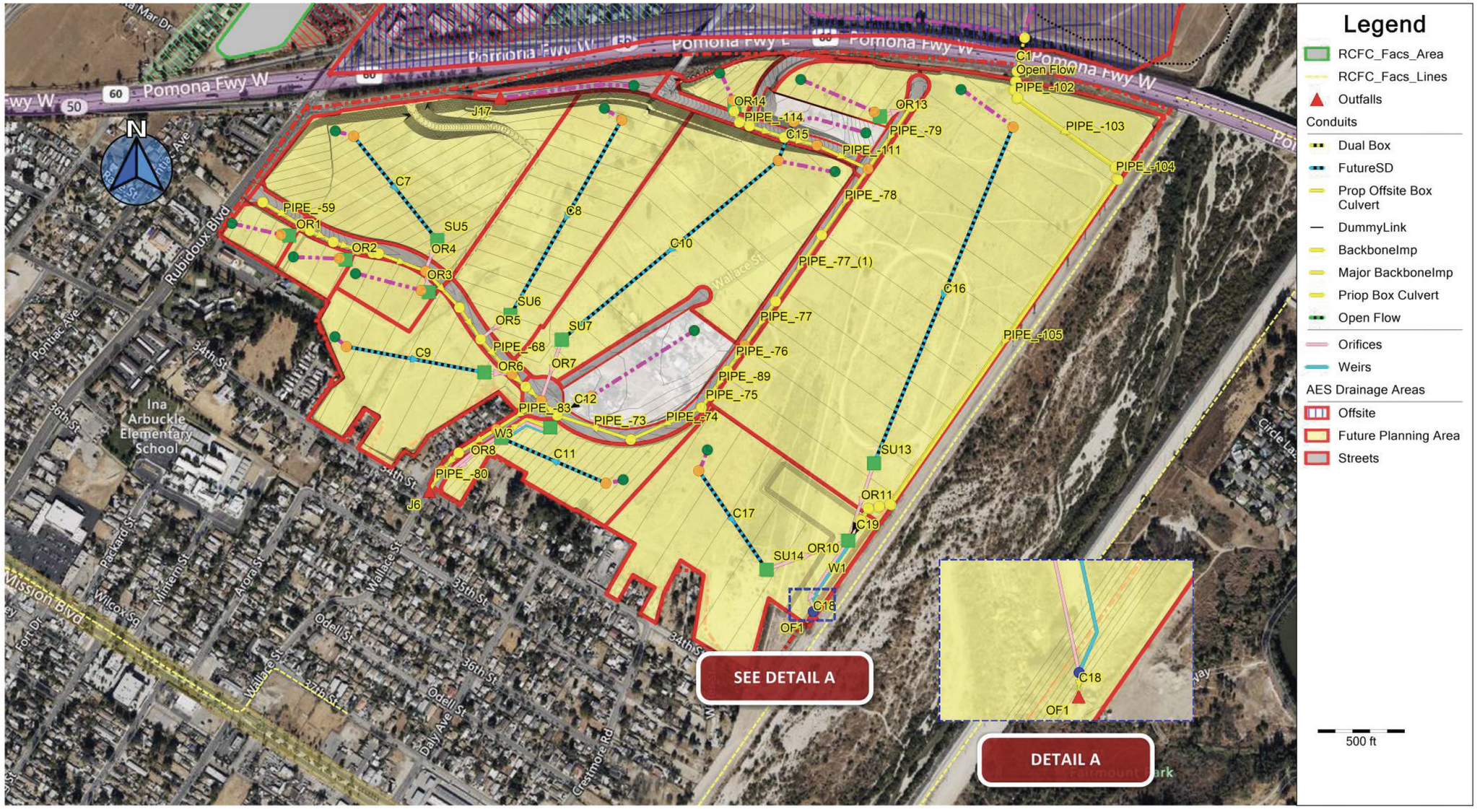

THE DISTRICT AT JURUPA VALLEY
POST DEVELOPMENT CONDUITS

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THE DISTRICT AT JURUPA VALLEY
POST DEVELOPMENT JUNCTIONS

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THE DISTRICT AT JURUPA VALLEY
POST DEVELOPMENT SUBCATCHMENTS

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PCSWMM Report

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PreDevelopment 2Yr 24 Hour HCOC

Model Rubidoux Existing Conditions.inp

Kimley-Horn and Associates Inc.

May 31, 2022

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Table 1: AES Drainage Areas Pre

NAME	AREA	Impervious Area Fraction	Upstream Node	Downstream Node	Longest Watercourse	Length From Centroid	Elevation Difference	Watershed N Value	SGRAPH	Slope of Intensity Curve	Depth Adjustment Factor
Area A	308.71	0.25	100	101	4582	2749	76	.015	Foothill	0.55	1
Area B	121.08	0.00	104	105	3781	2268	62.9	.03	Foothill	0.55	1.00
Area C	136.7	0.00	106	103	2948	1768	14.7	.03	Foothill	0.55	1.00

Table 2A: Conduits Report

Name	Inlet Node	Length (ft)	Roughness	Inlet Offset (ft)	Outlet Offset (ft)	Entry Loss Coeff.	Cross-Section	Geom1 (ft)	Barrels	Transect	Slope (ft/ft)	Max. |Flow| (cfs)	Max. |Velocity| (ft/s)	Contributing Area (ac)
C1	J4	77.166	0.013	0	0	0.5	CIRCULAR	3	1		0.00648	28.36	16.33	0
C1_1	J3	925.789	0.024	0	0	0	TRAPEZOIDAL	5	1		0.00864	30.21	2.45	0
C1_2	J8	2565.133	0.024	0	0	0	TRAPEZOIDAL	10	1		0.00273	29.52	1.53	0
C2	J2	205.396	0.013	0	0	1	RECT_CLOSED	9	2		0.00487	30.24	3.18	0
C3	J9	63.024	0.01	0	0	0	DUMMY	0	1		0.00539	28.36	0	0

Table 2B: Conduits Report

Name	Contributing Imp. Area (ac)	Description
C1	0	
C1_1	0	
C1_2	0	
C2	0	
C3	0	

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Table 3: Outfalls Report

Name	Inflows	Invert Elev. (ft)	Rim Elev. (ft)	Outlet	Max. HGL (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Max. Surcharge (ft)	Total Flood Vol. (MG)	Contributing Area (ac)	Description	Total inflow (MG)
J6	YES	785.6	786.6		785.6	3.12	3.12	0	0	0		0.641
OF1	NO	777.16	795		785	0	28.36	0	0	0		6.76

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Table 4: Storages

Name	Invert Elev. (ft)	Rim Elev. (ft)	Depth (ft)	Storage Curve	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Min. Freeboard (ft)	Max. Percent Full (%)	Contributing Area (ac)	Contributing Imp. Area (ac)	Description
J4	778	795	17	TABULAR	0.54	1.55	779.55	32.95	0.72	6.76	15.45	0	0	0	

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Table 5: Weirs

Name	Inlet Node	Outlet Node	Type	Height (ft)	Length (ft)	Side Slope (ft/ft)	Inlet Offset (ft)	Discharge Coeff. (CFS)	Max. |Flow| (cfs)	Max/Full Depth	Description
W1	J4	J9	TRANSVERSE	6	150	0	11	3.33	0	0	

Table 6: Junctions 1D

Name	Inflows	Invert Elev. (ft)	Rim Elev. (ft)	Depth (ft)	Surcharge Depth (ft)	Max. HGL (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Max. Surcharge (ft)	Total Flood Vol. (MG)	Description	Scale Factor
J1	NO	870	871	1	0	870	0	0	0	0		1
J2	YES	794	812	18	5	794.35	30.21	30.21	0	0		1
J3	NO	793	812	19	0	793.45	0	30.24	0	0		1
J5	NO	848.5	849.5	1	0	848.5	0	0	0	0		1
J7	NO	795	796	1	0	795	0	0	0	0		1
J8	NO	785	790	5	0	785.73	0	30.21	0	0		1
J9	NO	777.5	795	17.5	0	777.72	0	28.36	0	0		1

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PCSWMM Report

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PostDevelopment 2Yr 24 Hour HCOC

Model Rubidoux Proposed Conditions.inp

Kimley-Horn and Associates Inc.

June 15, 2022

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Table 7: Junctions 1D 10

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Table 1: AES Drainage Areas

NAME	AREA
Area S.7.c.	0.54
Area S.7.b.	0.38
Area S.2.c.	1.57
Area S.2.a.	0.87
Area S.2.b.	1.09
Area S.4.	3.42
Area S.7.a.	1.44
Area S.6.	3.88
Area S.5.a	1.30
Area S.5.b.	1.97
Area B.4.	4.71
Area S.3.	1.69
Area B.1.c.	3.40
Area B.1.b.	2.29
Area B.5.	8.52
Area B.2.c.	31.41
Area B.7.	2.69
Area S.1	0.77
Area B.2.b.	21.47
Area B.3.	2.36
Area C.2	28.00
Area B.6.	9.35
Area B.2.a.	25.31
Area B.1.a	2.18
Area B.1.d.	15.68
Area C.1	72.36
Area A	308.71

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Table 2: Orifices

Name	Inlet Node	Outlet Node	Type	Cross-Section	Height (ft)	Inlet Offset (ft)	Discharge Coeff.	Flap Gate	Max. |Flow| (cfs)
OR1	SU1	70	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR10	SU14	SU15	SIDE	RECT_CLOSED	1	2.5	0.65	YES	0
OR11	SU13	SU15	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR13	SU9	90	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR14	SU8	133	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR15	SU15	J4	SIDE	CIRCULAR	3	0	0.65	NO	71.91
OR2	SU2	73	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR3	SU3	76	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR4	SU5	76	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR5	SU6	78	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR6	SU4	80	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR7	SU7	82	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR8	SU11	92	SIDE	RECT_CLOSED	1	2.5	0.65	NO	0
OR9	SU10	92	SIDE	CIRCULAR	0.65	0	0.65	NO	2.85

Table 3A: Conduits Report

Name	Inlet Node	Length (ft)	Roughness	Inlet Offset (ft)	Outlet Offset (ft)	Entry Loss Coeff.	Cross-Section	Geom1 (ft)	Barrels	Transect
C1	J3	59.834	0.025	0	0	0	RECT_OPEN	6	1	
C10	J28	1617.564	0.013	0	0	0.5	CIRCULAR	4	1	
C11	J32	656.105	0.01	0	0	0	CIRCULAR	2	1	
C12	J30	224.87	0.01	0	0	0	DUMMY	0	1	
C13	J19	27.937	0.01	0	0	0	DUMMY	0	1	
C14	J21	40.164	0.01	0	0	0	DUMMY	0	1	
C15	J22	238.647	0.01	0	0	0	CIRCULAR	1.5	1	
C16	J23	2089.708	0.013	0	0	0.5	RECT_CLOSED	4	1	
C17	J26	690.03	0.013	0	0	0.5	CIRCULAR	3.5	1	
C18	J4	15.862	0.01	0	0	0	CIRCULAR	3	1	
C19	128	145.306	0.01	0	0	0	DUMMY	0	1	
C2	J2	197.281	0.013	0	0	1	RECT_CLOSED	9	2	
C20	122	141.03	0.01	0	0	0	DUMMY	0	1	
C3	J3	62.706	0.025	0	0	0	RECT_OPEN	6	1	
C4	J10	48.065	0.01	0	0	0	DUMMY	0	1	
C5	J12	38.438	0.01	0	0	0	DUMMY	0	1	
C6	J13	46.177	0.01	0	0	0	DUMMY	0	1	

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Table 3A: Conduits Report (continued...)

Name	Inlet Node	Length (ft)	Roughness	Inlet Offset (ft)	Outlet Offset (ft)	Entry Loss Coeff.	Cross-Section	Geom1 (ft)	Barrels	Transect
C7	J15	767.982	0.013	0	0	0.5	CIRCULAR	3	1	
C8	J16	1290.738	0.01	0	0	0	CIRCULAR	3	1	
C9	J14	809.99	0.01	0	0	0	CIRCULAR	2.5	1	
PIPE_-101	117	50.357	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-102	118	52.595	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-103	119	691.84	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-104	120	63.638	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-105	121	2282.402	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-105_(1)	142	80.674	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-106	123	49.239	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-107	124	47.059	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-108	125	690.51	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-109	126	73.537	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-110	127	2282.402	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-110_(1)	137	80.674	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-111	129	323.894	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-112	130	193.054	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-113	131	210.946	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-114	132	62.943	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-115	133	70.858	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-117	138	53.74	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-118	139	73.538	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-119	143	63.639	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-120	144	63.639	0.013	0	0	0.5	RECT_CLOSED	5	1	
PIPE_-59	69	272.938	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-60	70	44.563	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-61	71	148.577	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-62	72	148.577	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-63	73	88.222	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-64	74	35.138	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-65	75	287.159	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-66	76	287.158	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-67	77	219.443	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-68	78	219.443	0.013	0	0	0.5	CIRCULAR	2	1	
PIPE_-69	79	50.65	0.013	0	0	0.5	CIRCULAR	2	1	
PIPE_-70	80	106.481	0.013	0	0	0.5	CIRCULAR	2	1	
PIPE_-71	81	120.477	0.013	0	0	0.5	CIRCULAR	2	1	

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Table 3A: Conduits Report (continued...)

Name	Inlet Node	Length (ft)	Roughness	Inlet Offset (ft)	Outlet Offset (ft)	Entry Loss Coeff.	Cross-Section	Geom1 (ft)	Barrels	Transect
PIPE_-72	83	124.993	0.013	0	0	0.5	RECT_CLOSED	2	1	
PIPE_-73	84	447.151	0.013	0	0	0.5	CIRCULAR	2	1	
PIPE_-74	85	447.151	0.013	0	0	0.5	CIRCULAR	2	1	
PIPE_-75	86	83.535	0.013	0	0	0.5	CIRCULAR	2	1	
PIPE_-76	87	176.016	0.013	0	0	0.5	CIRCULAR	2	1	
PIPE_-77	102	309.74	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-77_(1)	88	464.61	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-78	89	464.61	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-79	90	435.736	0.013	0	0	0.5	CIRCULAR	1.5	1	
PIPE_-80	92	136.34	0.013	0	0	0.5	CIRCULAR	3.5	1	
PIPE_-81	93	142.205	0.013	0	0	0.5	CIRCULAR	3.5	1	
PIPE_-82	94	255.962	0.013	3.7	0	0.5	RECT_CLOSED	2	1	
PIPE_-83	82	305.558	0.013	0	0	0.5	CIRCULAR	3.5	1	
PIPE_-89	101	176.016	0.013	0	0	0.5	CIRCULAR	2	1	
W2	94	344.214	0.01	0	0	0	RECT_CLOSED	2	1	

Table 3B: Conduits Report

Name	Slope (ft/ft)	Max. |Flow| (cfs)	Max. |Velocity| (ft/s)	Contributing Area (ac)	Contributing Imp. Area (ac)	Description
C1	0.02508	15.29	4.88	0	0	
C10	0.00371	6.99	4.41	0	0	
C11	0.01524	2.06	6.33	0	0	
C12	0.00076	0.22	0	0	0	
C13	0.18191	0.52	0	0	0	
C14	0.12547	1.04	0	0	0	
C15	0.02934	0.07	0.18	0	0	
C16	0.00335	15.94	3.24	0	0	
C17	0.00435	6.17	4.65	0	0	
C18	0.02144	104.65	14.8	0	0	
C19	0.01115	14.68	0	0	0	
C2	0.00507	30.24	3.07	0	0	Ex Box Culvert
C20	0.01149	15.03	0	0	0	
C3	0.02393	14.93	4.83	0	0	
C4	0.10459	0.48	0	0	0	
C5	0.13119	0.5	0	0	0	

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Table 3B: Conduits Report (continued...)

Name	Slope (ft/ft)	Max. |Flow| (cfs)	Max. |Velocity| (ft/s)	Contributing Area (ac)	Contributing Imp. Area (ac)	Description
C6	0.13105	0.75	0	0	0	
C7	0.01563	5.58	6.91	0	0	
C8	0.01007	4.74	6.77	0	0	
C9	0.00741	3.46	5.66	0	0	
PIPE_-101	0.00238	15.28	2.77	0	0	
PIPE_-102	0.00209	15.28	3.01	0	0	
PIPE_-103	0.00236	15.28	3.07	0	0	
PIPE_-104	0.00251	15.26	3.08	0	0	
PIPE_-105	0.00234	15.18	3.1	0	0	
PIPE_-105_(1)	0.00223	15.03	6.97	0	0	
PIPE_-106	0.00244	14.93	2.78	0	0	
PIPE_-107	0.00234	14.93	3	0	0	
PIPE_-108	0.00235	14.93	3.02	0	0	
PIPE_-109	0.00231	14.91	3.03	0	0	
PIPE_-110	0.00234	14.83	3.04	0	0	
PIPE_-110_(1)	0.00223	14.68	6.89	0	0	
PIPE_-111	0.03661	0.75	2.8	0	0	
PIPE_-112	0.03592	0	0	0	0	
PIPE_-113	0.03596	0	0	0	0	
PIPE_-114	0.03593	0	0	0	0	
PIPE_-115	0.03601	0	0	0	0	
PIPE_-117	0.00279	14.68	3.22	0	0	
PIPE_-118	0.00258	14.68	2.96	0	0	
PIPE_-119	0.00236	15.03	3.21	0	0	
PIPE_-120	0.00299	15.03	2.97	0	0	
PIPE_-59	0.0461	0	0	0	0	
PIPE_-60	0.04605	0.17	2.23	0	0	
PIPE_-61	0.0035	0.17	1.49	0	0	
PIPE_-62	0.00303	0.17	1.07	0	0	
PIPE_-63	0.00306	0.36	1.73	0	0	
PIPE_-64	0.00285	0.36	1.74	0	0	
PIPE_-65	0.00303	0.36	1.51	0	0	
PIPE_-66	0.00303	0.6	2.06	0	0	
PIPE_-67	0.00301	0.6	2.18	0	0	
PIPE_-68	0.00301	0.6	1.97	0	0	
PIPE_-69	0.00316	0.6	1.68	0	0	
PIPE_-70	0.00291	0.94	2.8	0	0	

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Table 3B: Conduits Report (continued...)

Name	Slope (ft/ft)	Max. |Flow| (cfs)	Max. |Velocity| (ft/s)	Contributing Area (ac)	Contributing Imp. Area (ac)	Description
PIPE_-71	0.01004	0.94	1.64	0	0	
PIPE_-72	0.0184	1.66	0.97	0	0	
PIPE_-73	0.00309	1.45	4.55	0	0	
PIPE_-74	0.00306	1.46	2.46	0	0	
PIPE_-75	0.00299	1.46	2.57	0	0	
PIPE_-76	0.00301	1.46	2.57	0	0	
PIPE_-77	0.003	1.04	2.32	0	0	
PIPE_-77_(1)	0.00299	1.04	2.45	0	0	
PIPE_-78	0.00299	1.04	2.44	0	0	
PIPE_-79	0.01591	0	0	0	0	
PIPE_-80	0.00301	3.02	2.98	0	0	
PIPE_-81	0.00302	0.02	0.07	0	0	
PIPE_-82	0.01751	0	0	0	0	
PIPE_-83	0.00301	3.5	3.42	0	0	
PIPE_-89	0.00301	1.46	2.52	0	0	
W2	0.00177	3.23	0.95	0	0	

Table 4: Outfalls Report

Name	Inflows	Invert Elev. (ft)	Rim Elev. (ft)	Outlet	Max. HGL (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Max. Surcharge (ft)	Total Flood Vol. (MG)	Contributing Area (ac)	Description	Total inflow (MG)
J17	YES	838	839		838	0.37	0.37	0	0	0		0.073
J6	NO	774.99	781		775.55	0	3.02	0	0	0		0.78
OF1	NO	777.16	795		785	0	104.65	0	0	0		9.38

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Table 5: Storages

Name	Invert Elev. (ft)	Rim Elev. (ft)	Depth (ft)	Storage Curve	Avg. Depth (ft)	Max. Depth (ft)	Max. HGL (ft)	Max. Total Inflow (cfs)	Total Lat. Inflow (MG)	Total inflow (MG)	Min. Freeboard (ft)	Max. Percent Full (%)	Contributing Area (ac)	Contributing Imp. Area (ac)	Description
SU1	794	799	5	TABULAR	1.09	2.11	796.11	0.48	0	0.095	2.89	42	0	0	Future Basin
SU11	776	781	5	TABULAR	1.06	2.06	778.06	2.06	0	0.406	2.94	41	0	0	Future Basin
SU13	787	792	5	TABULAR	1.04	2.03	789.03	15.94	0	3.13	2.97	41	0	0	Future Basin
SU14	785	790	5	TABULAR	1.07	2.08	787.08	6.17	0	1.21	2.92	42	0	0	Future Basin
SU15	782	790	8	TABULAR	2.88	3.39	785.39	71.91	0	9.77	9.61	39	0	0	RCFC Basin
SU2	788	793	5	TABULAR	1.08	2.1	790.1	0.5	0	0.099	2.9	42	0	0	Future Basin
SU3	784	790	6	TABULAR	1.09	2.11	786.11	0.75	0	0.147	3.89	35	0	0	Future Basin
SU4	781	786	5	TABULAR	1.06	2.06	783.06	3.46	0	0.68	2.94	41	0	0	Future Basin
SU5	787	792	5	TABULAR	1.07	2.08	789.08	5.58	0	1.1	2.92	42	0	0	Future Basin
SU6	782	787	5	TABULAR	1.05	2.05	784.05	4.74	0	0.932	2.95	41	0	0	Future Basin
SU7	780	785	5	TABULAR	1.06	2.07	782.07	6.99	0	1.38	2.93	41	0	0	Future Basin
SU8	824	829	5	TABULAR	1.09	2.11	826.11	0.52	0	0.102	2.89	42	0	0	Future Basin
SU9	796	801	5	TABULAR	1.09	2.11	798.11	1.04	0	0.205	2.89	42	0	0	Future Basin
SU10	776	781	5	TABULAR	1.04	3.03	779.03	3.23	0	0.765	2.47	61	0	0	Streets Basin

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Table 6: Weirs

Name	Inlet Node	Outlet Node	Type	Height (ft)	Length (ft)	Side Slope (ft/ft)	Inlet Offset (ft)	Discharge Coeff. (CFS)	Max. |Flow| (cfs)	Max/Full Depth	Description
W1	SU15	J4	TRANSVERSE	6	150	0	7	3.33	0	0	
W3	SU10	92	TRANSVERSE	2.5	4	0	3	3.33	0.08	0.01	

Table 7: Junctions 1D

Name	Inflows	Invert Elev. (ft)	Rim Elev. (ft)	Depth (ft)	Surcharge Depth (ft)	Max. HGL (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Max. Surcharge (ft)	Total Flood Vol. (MG)	Description	Scale Factor
101	NO	783.36	791.999	8.639	0	783.83	0	1.46	0	0		1
102	NO	784.82	794.636	9.816	0	785.25	0	1.04	0	0		1
117	NO	791.5	798	6.5	0	792.06	0	15.29	0	0		1
118	NO	791.38	803.5	12.12	0	791.92	0	15.28	0	0		1
119	NO	791.27	803.5	12.23	0	791.75	0	15.28	0	0		1
120	NO	789.64	803.5	13.86	0	790.16	0	15.28	0	0		1
121	NO	789.48	803.1	13.62	0	789.96	0	15.26	0	0		1
122	NO	783.62	789	5.38	0	783.62	0	15.03	0	0		1
123	NO	791.5	798	6.5	0	792.05	0	14.93	0	0		1
124	NO	791.38	803.5	12.12	0	791.91	0	14.93	0	0		1
125	NO	791.27	803.5	12.23	0	791.74	0	14.93	0	0		1
126	NO	789.65	803.5	13.85	0	790.17	0	14.93	0	0		1
127	NO	789.48	803.1	13.62	0	789.95	0	14.91	0	0		1
128	NO	783.62	789	5.38	0	783.62	0	14.68	0	0		1
129	YES	799.45	806.592	7.142	0	799.65	0.75	0.75	0	0		0.171
130	NO	806.38	814.314	7.934	0	806.38	0	0	0	0		1
131	NO	813.96	822.712	8.752	0	813.96	0	0	0	0		1
132	NO	816.22	825	8.78	0	816.22	0	0	0	0		1
133	NO	818.77	828	9.23	0	818.77	0	0	0	0		1
137	NO	783.8	790.5	6.7	0	784.23	0	14.68	0	0		1
138	NO	783.95	791	7.05	0	784.44	0	14.68	0	0		1
139	NO	784.14	791.2	7.06	0	784.65	0	14.83	0	0		1
142	NO	783.8	790.5	6.7	0	784.23	0	15.03	0	0		1
143	NO	783.95	791	7.05	0	784.46	0	15.03	0	0		1
144	NO	784.14	791.2	7.06	0	784.65	0	15.18	0	0		1
69	NO	798.23	808.924	10.694	0	798.23	0	0	0	0		1
70	YES	785.66	801	15.34	0	785.75	0.17	0.17	0	0		0.038
71	NO	783.61	799.185	15.575	0	783.78	0	0.17	0	0		1
72	NO	783.09	793.562	10.472	0	783.27	0	0.17	0	0		1

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Table 7: Junctions 1D (continued...)

Name	Inflows	Invert Elev. (ft)	Rim Elev. (ft)	Depth (ft)	Surcharge Depth (ft)	Max. HGL (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Max. Surcharge (ft)	Total Flood Vol. (MG)	Description	Scale Factor
73	YES	782.64	790.823	8.183	0	782.9	0.19	0.36	0	0		0.044
74	NO	782.37	790.3	7.93	0	782.64	0	0.36	0	0		1
75	NO	782.27	790.213	7.943	0	782.52	0	0.36	0	0		1
76	YES	781.4	788.716	7.316	0	781.73	0.24	0.6	0	0		0.054
77	NO	780.53	787.219	6.689	0	780.87	0	0.6	0	0		1
78	NO	779.87	786.135	6.265	0	780.17	0	0.6	0	0		1
79	NO	779.21	785	5.79	0	779.52	0	0.6	0	0		1
80	YES	779.05	784.799	5.749	0	779.43	0.34	0.94	0	0		0.078
81	NO	778.74	784.1	5.36	0	779.05	0	0.94	0	0		1
82	YES	777.53	783.678	6.148	0	779.04	1.17	3.76	0	0		0.266
83	NO	779.83	783.143	3.313	0	779.95	0	1.66	0	0		1
84	NO	781.21	785.539	4.329	0	781.73	0	1.46	0	0		1
85	NO	782.58	789.954	7.374	0	783.04	0	1.46	0	0		1
86	NO	782.83	791	8.17	0	783.32	0	1.46	0	0		1
87	YES	783.89	793	9.11	0	784.37	0.43	1.47	0	0		0.098
88	NO	786.21	797.158	10.948	0	786.65	0	1.04	0	0		1
89	YES	787.6	799.681	12.081	0	788.04	0.29	1.04	0	0		0.065
90	NO	794.53	802.046	7.516	0	794.53	0	0	0	0		1
92	YES	775.4	781.023	5.623	0	775.98	0.12	3.02	0	0		0.027
93	NO	775.83	781.99	6.16	0	775.98	0	0.01	0	0		1
94	YES	776.61	783	6.39	0	779.04	0.08	3.58	0	0		0.019
J1	NO	870	871	1	0	870	0	0	0	0		1
J10	YES	799	799	0	0	799	0.48	0.48	0	0		0.109
J11	NO	793	794	1	0	793	0	0	0	0		1
J12	YES	793	794	1	0	793	0.5	0.5	0	0		0.114
J13	YES	790	791	1	0	790	0.75	0.75	0	0		0.17
J14	YES	787	792	5	0	787.46	3.46	3.46	0	0		0.784
J15	YES	799	804	5	0	799.53	5.58	5.58	0	0		1.266
J16	YES	795	800	5	0	795.48	4.74	4.74	0	0		1.074
J18	NO	806	807	1	0	806	0	0	0	0		1
J19	YES	829	830	1	0	829	0.52	0.52	0	0		0.118
J2	YES	794	812	18	5	794.34	30.21	30.21	0	0		1
J20	NO	802	803	1	0	802	0	0	0	0		1
J21	YES	801	802	1	0	801	1.04	1.04	0	0		0.236
J22	YES	793	798	5	0	793.06	0.07	0.07	0	0		0.022
J23	YES	794	803	9	0	794.62	15.96	15.96	0	0		3.618
J24	NO	794	795	1	0	794	0	0	0	0		1

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Table 7: Junctions 1D (continued...)

Name	Inflows	Invert Elev. (ft)	Rim Elev. (ft)	Depth (ft)	Surcharge Depth (ft)	Max. HGL (ft)	Max. Lat. Inflow (cfs)	Max. Total Inflow (cfs)	Max. Surcharge (ft)	Total Flood Vol. (MG)	Description	Scale Factor
J25	NO	833	834	1	0	833	0	0	0	0		1
J26	YES	788	793	5	0	788.72	6.17	6.17	0	0		1.4
J27	NO	795	796	1	0	795	0	0	0	0		1
J28	YES	786	793	7	0	786.76	6.92	6.99	0	0		1.57
J29	NO	792	793	1	0	792	0	0	0	0		1
J3	NO	793	812	19	0	793.48	0	30.24	0	0		1
J30	YES	780	785	5	0	780	0.22	0.22	0	0		0.07
J31	NO	805	806	1	0	805	0	0	0	0		1
J32	YES	786	791	5	0	786.32	2.06	2.06	0	0		0.468
J33	NO	799	800	1	0	799	0	0	0	0		1
J34	NO	792	793	1	0	792	0	0	0	0		1
J37	NO	787.5	788.5	1	0	787.5	0	0	0	0		1
J4	NO	777.5	795	17.5	0	787.26	0	104.65	0	0		1
J5	NO	800	801	1	0	800	0	0	0	0		1
J7	NO	792	793	1	0	792	0	0	0	0		1
J8	NO	803	804	1	0	803	0	0	0	0		1
J9	NO	845	846	1	0	845	0	0	0	0		1

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             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2011 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 18.0)
                 Release Date: 05/01/2011  License ID 1499

                           Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* District at Jurupa Valley                                             *
* Preliminary Hydrology 2 year 24 Hour Event                            *
* Kimley Horn May 26, 2022                                              *
 ************************************************************************

  FILE NAME: C:\aes2011\hydrosft\floodX\J2Y24H.fld
  TIME/DATE OF STUDY: 15:38 05/26/2022


**************************************************************************
  FLOW PROCESS FROM NODE   100.00 TO NODE   101.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERCOURSE LENGTH =    4582.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =    2749.200 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =      76.000 FEET
         BASIN FACTOR = 0.015
         WATERSHED AREA =     308.710 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.114 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         FOOTHILL S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.470
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.630
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.240
         USER-ENTERED RAINFALL =  1.95 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9994


         UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME = 219.682



==========================================================================
                      UNIT HYDROGRAPH DETERMINATION

--------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
--------------------------------------------------------------------------
        1               45.973               572.128
        2               93.932               596.848
        3               98.720                59.582
        4               99.526                10.027
```

5	99.810	3.542
6	99.953	1.771
7	100.000	0.590

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0039	0.0025	0.0014
2	0.0058	0.0037	0.0022
3	0.0058	0.0037	0.0022
4	0.0078	0.0049	0.0029
5	0.0058	0.0037	0.0022
6	0.0058	0.0037	0.0022
7	0.0058	0.0037	0.0022
8	0.0078	0.0049	0.0029
9	0.0078	0.0049	0.0029
10	0.0078	0.0049	0.0029
11	0.0097	0.0061	0.0036
12	0.0097	0.0061	0.0036
13	0.0097	0.0061	0.0036
14	0.0097	0.0061	0.0036
15	0.0097	0.0061	0.0036
16	0.0117	0.0074	0.0043
17	0.0117	0.0074	0.0043
18	0.0136	0.0086	0.0050
19	0.0136	0.0086	0.0050
20	0.0156	0.0098	0.0058
21	0.0117	0.0074	0.0043
22	0.0136	0.0086	0.0050
23	0.0156	0.0098	0.0058
24	0.0156	0.0098	0.0058
25	0.0175	0.0111	0.0065
26	0.0175	0.0111	0.0065
27	0.0195	0.0123	0.0072
28	0.0195	0.0123	0.0072
29	0.0195	0.0123	0.0072
30	0.0214	0.0135	0.0079
31	0.0234	0.0147	0.0087
32	0.0253	0.0160	0.0094
33	0.0292	0.0184	0.0108
34	0.0292	0.0184	0.0108
35	0.0312	0.0196	0.0115
36	0.0331	0.0209	0.0123
37	0.0370	0.0233	0.0137
38	0.0390	0.0246	0.0144
39	0.0409	0.0258	0.0151
40	0.0429	0.0270	0.0159
41	0.0292	0.0184	0.0108
42	0.0292	0.0184	0.0108
43	0.0390	0.0246	0.0144
44	0.0390	0.0246	0.0144
45	0.0370	0.0233	0.0137
46	0.0370	0.0233	0.0137
47	0.0331	0.0209	0.0123
48	0.0351	0.0221	0.0130
49	0.0487	0.0307	0.0180
50	0.0507	0.0319	0.0187
51	0.0546	0.0344	0.0202
52	0.0565	0.0356	0.0209
53	0.0663	0.0417	0.0245
54	0.0663	0.0417	0.0245
55	0.0448	0.0282	0.0166
56	0.0448	0.0282	0.0166
57	0.0526	0.0332	0.0195
58	0.0507	0.0319	0.0187
59	0.0507	0.0319	0.0187
60	0.0487	0.0307	0.0180
61	0.0468	0.0295	0.0173

62	0.0448	0.0282	0.0166
63	0.0370	0.0233	0.0137
64	0.0370	0.0233	0.0137
65	0.0078	0.0049	0.0029
66	0.0078	0.0049	0.0029
67	0.0058	0.0037	0.0022
68	0.0058	0.0037	0.0022
69	0.0097	0.0061	0.0036
70	0.0097	0.0061	0.0036
71	0.0097	0.0061	0.0036
72	0.0078	0.0049	0.0029
73	0.0078	0.0049	0.0029
74	0.0078	0.0049	0.0029
75	0.0058	0.0037	0.0022
76	0.0039	0.0025	0.0014
77	0.0058	0.0037	0.0022
78	0.0078	0.0049	0.0029
79	0.0058	0.0037	0.0022
80	0.0039	0.0025	0.0014
81	0.0058	0.0037	0.0022
82	0.0058	0.0037	0.0022
83	0.0058	0.0037	0.0022
84	0.0039	0.0025	0.0014
85	0.0058	0.0037	0.0022
86	0.0039	0.0025	0.0014
87	0.0058	0.0037	0.0022
88	0.0039	0.0025	0.0014
89	0.0058	0.0037	0.0022
90	0.0039	0.0025	0.0014
91	0.0039	0.0025	0.0014
92	0.0039	0.0025	0.0014
93	0.0039	0.0025	0.0014
94	0.0039	0.0025	0.0014
95	0.0039	0.0025	0.0014
96	0.0039	0.0025	0.0014

TOTAL STORM RAINFALL(INCHES) = 1.95
TOTAL SOIL-LOSS(INCHES) = 1.23
TOTAL EFFECTIVE RAINFALL(INCHES) = 0.72

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 31.5865
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 18.5412

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0. 10.0 20.0 30.0 40.0
0.083	0.0057	0.83	Q . . . .
0.167	0.0114	0.83	Q . . . .
0.250	0.0170	0.83	Q . . . .
0.333	0.0315	2.10	V Q . . . .
0.417	0.0460	2.10	V Q . . . .
0.500	0.0604	2.10	V Q . . . .
0.583	0.0784	2.61	V Q . . . .
0.667	0.0964	2.61	V Q . . . .
0.750	0.1144	2.61	V Q . . . .
0.833	0.1357	3.08	V Q . . . .
0.917	0.1569	3.08	V Q . . . .
1.000	0.1782	3.08	V Q . . . .
1.083	0.1996	3.11	V Q . . . .
1.167	0.2211	3.11	V Q . . . .
1.250	0.2425	3.11	V Q . . . .

1.333	0.2613	2.73	V Q	.	.	.	.
1.417	0.2802	2.73	V Q	.	.	.	.
1.500	0.2990	2.73	V Q	.	.	.	.
1.583	0.3176	2.70	V Q	.	.	.	.
1.667	0.3362	2.70	V Q	.	.	.	.
1.750	0.3547	2.70	V Q	.	.	.	.
1.833	0.3761	3.11	V Q	.	.	.	.
1.917	0.3975	3.11	V Q	.	.	.	.
2.000	0.4189	3.11	V Q	.	.	.	.
2.083	0.4433	3.54	V Q	.	.	.	.
2.167	0.4677	3.54	V Q	.	.	.	.
2.250	0.4920	3.54	V Q	.	.	.	.
2.333	0.5167	3.58	.V Q	.	.	.	.
2.417	0.5413	3.58	.V Q	.	.	.	.
2.500	0.5659	3.58	.V Q	.	.	.	.
2.583	0.5935	4.00	.V Q	.	.	.	.
2.667	0.6210	4.00	.V Q	.	.	.	.
2.750	0.6485	4.00	.V Q	.	.	.	.
2.833	0.6791	4.43	.V Q	.	.	.	.
2.917	0.7096	4.43	.V Q	.	.	.	.
3.000	0.7401	4.43	.V Q	.	.	.	.
3.083	0.7709	4.48	.V Q	.	.	.	.
3.167	0.8017	4.48	.V Q	.	.	.	.
3.250	0.8326	4.48	.V Q	.	.	.	.
3.333	0.8634	4.48	.V Q	.	.	.	.
3.417	0.8943	4.48	.V Q	.	.	.	.
3.500	0.9252	4.48	.V Q	.	.	.	.
3.583	0.9561	4.49	. V Q	.	.	.	.
3.667	0.9870	4.49	. V Q	.	.	.	.
3.750	1.0178	4.49	. V Q	.	.	.	.
3.833	1.0516	4.90	. V Q	.	.	.	.
3.917	1.0853	4.90	. V Q	.	.	.	.
4.000	1.1191	4.90	. V Q	.	.	.	.
4.083	1.1558	5.33	. V Q	.	.	.	.
4.167	1.1925	5.33	. V Q	.	.	.	.
4.250	1.2292	5.33	. V Q	.	.	.	.
4.333	1.2690	5.79	. V Q	.	.	.	.
4.417	1.3089	5.79	. V Q	.	.	.	.
4.500	1.3487	5.79	. V Q	.	.	.	.
4.583	1.3916	6.22	. V Q	.	.	.	.
4.667	1.4344	6.22	. V Q	.	.	.	.
4.750	1.4773	6.22	. V Q	.	.	.	.
4.833	1.5233	6.68	. V Q	.	.	.	.
4.917	1.5693	6.68	. V Q	.	.	.	.
5.000	1.6153	6.68	. V Q	.	.	.	.
5.083	1.6587	6.29	. V Q	.	.	.	.
5.167	1.7020	6.29	. V Q	.	.	.	.
5.250	1.7454	6.29	. V Q	.	.	.	.
5.333	1.7860	5.89	. V Q	.	.	.	.
5.417	1.8266	5.89	. V Q	.	.	.	.
5.500	1.8671	5.89	. VQ	.	.	.	.
5.583	1.9130	6.66	. V Q	.	.	.	.
5.667	1.9589	6.66	. V Q	.	.	.	.
5.750	2.0047	6.66	. V Q	.	.	.	.
5.833	2.0537	7.12	. V Q	.	.	.	.
5.917	2.1028	7.12	. V Q	.	.	.	.
6.000	2.1518	7.12	. V Q	.	.	.	.
6.083	2.2040	7.58	. V Q	.	.	.	.
6.167	2.2562	7.58	. V Q	.	.	.	.
6.250	2.3084	7.58	. V Q	.	.	.	.
6.333	2.3636	8.02	. V Q	.	.	.	.
6.417	2.4188	8.02	. V Q	.	.	.	.
6.500	2.4740	8.02	. V Q	.	.	.	.
6.583	2.5324	8.48	. V Q	.	.	.	.
6.667	2.5908	8.48	. V Q	.	.	.	.
6.750	2.6492	8.48	. V Q	.	.	.	.
6.833	2.7106	8.91	. V Q	.	.	.	.
6.917	2.7720	8.91	. V Q	.	.	.	.
7.000	2.8334	8.91	. V Q	.	.	.	.
7.083	2.8951	8.96	. V Q	.	.	.	.
7.167	2.9568	8.96	. V Q	.	.	.	.

```
 7.250      3.0185      8.96  .     V Q .          .          .          .
 7.333      3.0831      9.38  .     V  Q.          .          .          .
 7.417      3.1477      9.38  .     V  Q.          .          .          .
 7.500      3.2123      9.38  .     V  Q.          .          .          .
 7.583      3.2828     10.23  .      V  Q          .          .          .
 7.667      3.3532     10.23  .      V  Q          .          .          .
 7.750      3.4236     10.23  .      V  Q          .          .          .
 7.833      3.5002     11.11  .      V  .Q         .          .          .
 7.917      3.5767     11.11  .      V  .Q         .          .          .
 8.000      3.6533     11.11  .      V  .Q         .          .          .
 8.083      3.7388     12.42  .       V . Q        .          .          .
 8.167      3.8244     12.42  .       V . Q        .          .          .
 8.250      3.9099     12.42  .       V . Q        .          .          .
 8.333      4.0018     13.33  .       V .  Q       .          .          .
 8.417      4.0936     13.33  .       V .  Q       .          .          .
 8.500      4.1854     13.33  .        V.  Q       .          .          .
 8.583      4.2808     13.84  .        V.  Q       .          .          .
 8.667      4.3761     13.84  .        V.  Q       .          .          .
 8.750      4.4715     13.84  .        V.  Q       .          .          .
 8.833      4.5728     14.71  .        V.   Q      .          .          .
 8.917      4.6740     14.71  .         V   Q      .          .          .
 9.000      4.7753     14.71  .         V   Q      .          .          .
 9.083      4.8856     16.01  .         V     Q    .          .          .
 9.167      4.9958     16.01  .         V     Q    .          .          .
 9.250      5.1061     16.01  .          V    Q    .          .          .
 9.333      5.2255     17.34  .         .V     Q   .          .          .
 9.417      5.3449     17.34  .         .V     Q   .          .          .
 9.500      5.4643     17.34  .         .V     Q   .          .          .
 9.583      5.5902     18.28  .         . V     Q  .          .          .
 9.667      5.7161     18.28  .         . V     Q  .          .          .
 9.750      5.8420     18.28  .         . V     Q  .          .          .
 9.833      5.9741     19.18  .         . V      Q.          .          .
 9.917      6.1062     19.18  .         .  V     Q.          .          .
10.000      6.2383     19.18  .         .  V     Q.          .          .
10.083      6.3538     16.78  .         .  V  Q   .          .          .
10.167      6.4694     16.78  .         .  V  Q   .          .          .
10.250      6.5850     16.78  .         .   V Q   .          .          .
10.333      6.6802     13.82  .         .  QV     .          .          .
10.417      6.7754     13.82  .         .  QV     .          .          .
10.500      6.8706     13.82  .         .  QV     .          .          .
10.583      6.9780     15.60  .         .    Q    .          .          .
10.667      7.0854     15.60  .         .    Q    .          .          .
10.750      7.1929     15.60  .         .    Q    .          .          .
10.833      7.3148     17.70  .         .    V Q  .          .          .
10.917      7.4367     17.70  .         .     VQ  .          .          .
11.000      7.5586     17.70  .         .     VQ  .          .          .
11.083      7.6791     17.49  .         .     VQ  .          .          .
11.167      7.7995     17.49  .         .     VQ  .          .          .
11.250      7.9200     17.49  .         .      Q  .          .          .
11.333      8.0377     17.09  .         .      Q  .          .          .
11.417      8.1553     17.09  .         .      Q  .          .          .
11.500      8.2730     17.09  .         .      Q  .          .          .
11.583      8.3848     16.23  .         .     Q V .          .          .
11.667      8.4965     16.23  .         .     Q V .          .          .
11.750      8.6083     16.23  .         .     Q V .          .          .
11.833      8.7170     15.78  .         .    Q  V .          .          .
11.917      8.8257     15.78  .         .    Q   V.          .          .
12.000      8.9343     15.78  .         .    Q   V.          .          .
12.083      9.0653     19.01  .         .        Q.          .          .
12.167      9.1962     19.01  .         .        Q.          .          .
12.250      9.3271     19.01  .         .        QV          .          .
12.333      9.4818     22.46  .         .         V Q        .          .
12.417      9.6365     22.46  .         .         V Q        .          .
12.500      9.7912     22.46  .         .          VQ        .          .
12.583      9.9567     24.02  .         .         .V  Q      .          .
12.667     10.1221     24.02  .         .         .V  Q      .          .
12.750     10.2876     24.02  .         .         . V Q      .          .
12.833     10.4624     25.39  .         .         . V  Q     .          .
12.917     10.6373     25.39  .         .         . V  Q     .          .
13.000     10.8121     25.39  .         .         .  V Q     .          .
13.083     11.0049     27.99  .         .         .  V   Q   .          .
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13.167     11.1977     27.99  .         .         .   V  Q  .         .
13.250     11.3905     27.99  .         .         .   V  Q  .         .
13.333     11.5986     30.21  .         .         .    V    Q         .
13.417     11.8067     30.21  .         .         .    V    Q         .
13.500     12.0148     30.21  .         .         .    V    Q         .
13.583     12.1932     25.91  .         .         .    QV   .         .
13.667     12.3716     25.91  .         .         .    QV   .         .
13.750     12.5500     25.91  .         .         .    Q V  .         .
13.833     12.6962     21.22  .         .        .Q     V  .         .
13.917     12.8423     21.22  .         .        .Q     V  .         .
14.000     12.9884     21.22  .         .        .Q      V .         .
14.083     13.1427     22.41  .         .        . Q     V .         .
14.167     13.2970     22.41  .         .        . Q     V .         .
14.250     13.4513     22.41  .         .        . Q      V.         .
14.333     13.6142     23.64  .         .        .  Q     V.         .
14.417     13.7770     23.64  .         .        .  Q     V.         .
14.500     13.9399     23.64  .         .        .  Q      V         .
14.583     14.1007     23.36  .         .        .  Q      V         .
14.667     14.2616     23.36  .         .        .  Q      V         .
14.750     14.4225     23.36  .         .        .  Q       V        .
14.833     14.5803     22.92  .         .        . Q       .V        .
14.917     14.7382     22.92  .         .        . Q       .V        .
15.000     14.8960     22.92  .         .        . Q       . V       .
15.083     15.0480     22.07  .         .        . Q       . V       .
15.167     15.2001     22.07  .         .        . Q       . V       .
15.250     15.3521     22.07  .         .        . Q       .  V      .
15.333     15.4980     21.19  .         .        .Q        .  V      .
15.417     15.6440     21.19  .         .        .Q        .  V      .
15.500     15.7899     21.19  .         .        .Q        .   V     .
15.583     15.9212     19.06  .         .       Q.         .   V     .
15.667     16.0525     19.06  .         .       Q.         .   V     .
15.750     16.1837     19.06  .         .       Q.         .   V     .
15.833     16.3028     17.29  .         .     Q  .         .    V    .
15.917     16.4218     17.29  .         .     Q  .         .    V    .
16.000     16.5409     17.29  .         .     Q  .         .    V    .
16.083     16.6161     10.91  .        Q        .         .    V    .
16.167     16.6912     10.91  .        Q        .         .     V   .
16.250     16.7664     10.91  .        Q        .         .     V   .
16.333     16.7969      4.43  .   Q    .        .         .     V   .
16.417     16.8273      4.43  .   Q    .        .         .     V   .
16.500     16.8578      4.43  .   Q    .        .         .     V   .
16.583     16.8809      3.36  .  Q     .        .         .     V   .
16.667     16.9041      3.36  .  Q     .        .         .     V   .
16.750     16.9272      3.36  .  Q     .        .         .     V   .
16.833     16.9465      2.81  . Q      .        .         .     V   .
16.917     16.9659      2.81  . Q      .        .         .     V   .
17.000     16.9853      2.81  . Q      .        .         .     V   .
17.083     17.0098      3.55  .  Q     .        .         .     V   .
17.167     17.0342      3.55  .  Q     .        .         .     V   .
17.250     17.0587      3.55  .  Q     .        .         .     V   .
17.333     17.0889      4.39  .   Q    .        .         .     V   .
17.417     17.1192      4.39  .   Q    .        .         .     V   .
17.500     17.1494      4.39  .   Q    .        .         .     V   .
17.583     17.1802      4.47  .   Q    .        .         .      V  .
17.667     17.2109      4.47  .   Q    .        .         .      V  .
17.750     17.2417      4.47  .   Q    .        .         .      V  .
17.833     17.2697      4.07  .   Q    .        .         .      V  .
17.917     17.2977      4.07  .   Q    .        .         .      V  .
18.000     17.3257      4.07  .   Q    .        .         .      V  .
18.083     17.3508      3.64  .  Q     .        .         .      V  .
18.167     17.3758      3.64  .  Q     .        .         .      V  .
18.250     17.4009      3.64  .  Q     .        .         .      V  .
18.333     17.4257      3.60  .  Q     .        .         .      V  .
18.417     17.4505      3.60  .  Q     .        .         .      V  .
18.500     17.4753      3.60  .  Q     .        .         .      V  .
18.583     17.4972      3.18  .  Q     .        .         .      V  .
18.667     17.5191      3.18  .  Q     .        .         .      V  .
18.750     17.5410      3.18  .  Q     .        .         .      V  .
18.833     17.5571      2.34  . Q      .        .         .      V  .
18.917     17.5732      2.34  . Q      .        .         .      V  .
19.000     17.5893      2.34  . Q      .        .         .      V  .
```

```
19.083     17.6049      2.27  . Q       .         .         .      V  .
19.167     17.6206      2.27  . Q       .         .         .       V .
19.250     17.6363      2.27  . Q       .         .         .       V .
19.333     17.6574      3.07  .  Q      .         .         .       V .
19.417     17.6785      3.07  .  Q      .         .         .       V .
19.500     17.6996      3.07  .  Q      .         .         .       V .
19.583     17.7211      3.12  .  Q      .         .         .       V .
19.667     17.7425      3.12  .  Q      .         .         .       V .
19.750     17.7640      3.12  .  Q      .         .         .       V .
19.833     17.7800      2.32  . Q       .         .         .       V .
19.917     17.7960      2.32  . Q       .         .         .       V .
20.000     17.8120      2.32  . Q       .         .         .       V .
20.083     17.8276      2.27  . Q       .         .         .       V .
20.167     17.8432      2.27  . Q       .         .         .       V .
20.250     17.8588      2.27  . Q       .         .         .       V .
20.333     17.8771      2.65  . Q       .         .         .       V .
20.417     17.8953      2.65  . Q       .         .         .       V .
20.500     17.9136      2.65  . Q       .         .         .       V .
20.583     17.9321      2.69  . Q       .         .         .       V .
20.667     17.9506      2.69  . Q       .         .         .       V .
20.750     17.9691      2.69  . Q       .         .         .       V .
20.833     17.9848      2.28  . Q       .         .         .       V .
20.917     18.0005      2.28  . Q       .         .         .       V .
21.000     18.0161      2.28  . Q       .         .         .       V .
21.083     18.0317      2.26  . Q       .         .         .       V .
21.167     18.0473      2.26  . Q       .         .         .       V .
21.250     18.0628      2.26  . Q       .         .         .       V .
21.333     18.0782      2.24  . Q       .         .         .        V.
21.417     18.0936      2.24  . Q       .         .         .        V.
21.500     18.1090      2.24  . Q       .         .         .        V.
21.583     18.1246      2.25  . Q       .         .         .        V.
21.667     18.1401      2.25  . Q       .         .         .        V.
21.750     18.1556      2.25  . Q       .         .         .        V.
21.833     18.1710      2.23  . Q       .         .         .        V.
21.917     18.1864      2.23  . Q       .         .         .        V.
22.000     18.2018      2.23  . Q       .         .         .        V.
22.083     18.2173      2.25  . Q       .         .         .        V.
22.167     18.2328      2.25  . Q       .         .         .        V.
22.250     18.2483      2.25  . Q       .         .         .        V.
22.333     18.2637      2.23  . Q       .         .         .        V.
22.417     18.2791      2.23  . Q       .         .         .        V.
22.500     18.2945      2.23  . Q       .         .         .        V.
22.583     18.3072      1.84  .Q        .         .         .        V.
22.667     18.3198      1.84  .Q        .         .         .        V.
22.750     18.3325      1.84  .Q        .         .         .        V.
22.833     18.3449      1.80  .Q        .         .         .        V.
22.917     18.3574      1.80  .Q        .         .         .        V.
23.000     18.3698      1.80  .Q        .         .         .        V.
23.083     18.3822      1.80  .Q        .         .         .        V.
23.166     18.3945      1.80  .Q        .         .         .        V.
23.250     18.4069      1.80  .Q        .         .         .        V.
23.333     18.4193      1.80  .Q        .         .         .        V.
23.416     18.4317      1.80  .Q        .         .         .        V.
23.500     18.4440      1.80  .Q        .         .         .        V.
23.583     18.4564      1.80  .Q        .         .         .        V.
23.666     18.4688      1.80  .Q        .         .         .        V.
23.750     18.4811      1.80  .Q        .         .         .        V.
23.833     18.4935      1.79  .Q        .         .         .        V.
23.916     18.5058      1.79  .Q        .         .         .        V.
24.000     18.5182      1.79  .Q        .         .         .        V.
24.083     18.5249      0.97  Q         .         .         .        V.
24.166     18.5316      0.97  Q         .         .         .        V.
24.250     18.5382      0.97  Q         .         .         .        V.
24.333     18.5390      0.11  Q         .         .         .        V.
24.416     18.5397      0.11  Q         .         .         .        V.
24.500     18.5405      0.11  Q         .         .         .        V.
24.583     18.5406      0.02  Q         .         .         .        V.
24.666     18.5408      0.02  Q         .         .         .        V.
24.750     18.5410      0.02  Q         .         .         .        V.
24.833     18.5410      0.01  Q         .         .         .        V.
24.916     18.5411      0.01  Q         .         .         .        V.
```

```
  25.000     18.5411      0.01  Q         .         .         .        V.
--------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated               Duration
       Peak Flow Rate                    (minutes)
   ======================              =========
             0%                         1500.0
            10%                         1065.0
            20%                          690.0
            30%                          540.0
            40%                          480.0
            50%                          405.0
            60%                          255.0
            70%                          195.0
            80%                           60.0
            90%                           30.0


********************************************************************************
  FLOW PROCESS FROM NODE   104.00 TO NODE   105.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
================================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #2)

         WATERCOURSE LENGTH =    3781.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =    2268.600 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =      62.900 FEET
         BASIN FACTOR = 0.030
         WATERSHED AREA =     121.080 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.197 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         FOOTHILL S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.605
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.300
         USER-ENTERED RAINFALL =  1.95 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9998


         UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME = 127.183


================================================================================
                      UNIT HYDROGRAPH DETERMINATION

--------------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
--------------------------------------------------------------------------------
        1               23.805               116.193
        2               79.421               271.466
        3               93.967                70.998
        4               98.096                20.152
        5               98.840                 3.632
        6               99.426                 2.864
        7               99.771                 1.680
        8               99.943                 0.840
        9              100.000                 0.280
```

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0039	0.0035	0.0004
2	0.0058	0.0053	0.0006
3	0.0058	0.0053	0.0006
4	0.0078	0.0070	0.0008
5	0.0058	0.0053	0.0006
6	0.0058	0.0053	0.0006
7	0.0058	0.0053	0.0006
8	0.0078	0.0070	0.0008
9	0.0078	0.0070	0.0008
10	0.0078	0.0070	0.0008
11	0.0097	0.0088	0.0010
12	0.0097	0.0088	0.0010
13	0.0097	0.0088	0.0010
14	0.0097	0.0088	0.0010
15	0.0097	0.0088	0.0010
16	0.0117	0.0105	0.0012
17	0.0117	0.0105	0.0012
18	0.0136	0.0123	0.0014
19	0.0136	0.0123	0.0014
20	0.0156	0.0140	0.0016
21	0.0117	0.0105	0.0012
22	0.0136	0.0123	0.0014
23	0.0156	0.0140	0.0016
24	0.0156	0.0140	0.0016
25	0.0175	0.0158	0.0018
26	0.0175	0.0158	0.0018
27	0.0195	0.0175	0.0019
28	0.0195	0.0175	0.0019
29	0.0195	0.0175	0.0019
30	0.0214	0.0193	0.0021
31	0.0234	0.0211	0.0023
32	0.0253	0.0228	0.0025
33	0.0292	0.0263	0.0029
34	0.0292	0.0263	0.0029
35	0.0312	0.0281	0.0031
36	0.0331	0.0298	0.0033
37	0.0370	0.0333	0.0037
38	0.0390	0.0351	0.0039
39	0.0409	0.0368	0.0041
40	0.0429	0.0386	0.0043
41	0.0292	0.0263	0.0029
42	0.0292	0.0263	0.0029
43	0.0390	0.0351	0.0039
44	0.0390	0.0351	0.0039
45	0.0370	0.0333	0.0037
46	0.0370	0.0333	0.0037
47	0.0331	0.0298	0.0033
48	0.0351	0.0316	0.0035
49	0.0487	0.0439	0.0049
50	0.0507	0.0456	0.0051
51	0.0546	0.0491	0.0055
52	0.0565	0.0509	0.0057
53	0.0663	0.0597	0.0066
54	0.0663	0.0597	0.0066
55	0.0448	0.0404	0.0045
56	0.0448	0.0404	0.0045
57	0.0526	0.0474	0.0053
58	0.0507	0.0456	0.0051
59	0.0507	0.0456	0.0051
60	0.0487	0.0439	0.0049
61	0.0468	0.0421	0.0047
62	0.0448	0.0404	0.0045
63	0.0370	0.0333	0.0037
64	0.0370	0.0333	0.0037
65	0.0078	0.0070	0.0008
66	0.0078	0.0070	0.0008

67	0.0058	0.0053	0.0006
68	0.0058	0.0053	0.0006
69	0.0097	0.0088	0.0010
70	0.0097	0.0088	0.0010
71	0.0097	0.0088	0.0010
72	0.0078	0.0070	0.0008
73	0.0078	0.0070	0.0008
74	0.0078	0.0070	0.0008
75	0.0058	0.0053	0.0006
76	0.0039	0.0035	0.0004
77	0.0058	0.0053	0.0006
78	0.0078	0.0070	0.0008
79	0.0058	0.0053	0.0006
80	0.0039	0.0035	0.0004
81	0.0058	0.0053	0.0006
82	0.0058	0.0053	0.0006
83	0.0058	0.0053	0.0006
84	0.0039	0.0035	0.0004
85	0.0058	0.0053	0.0006
86	0.0039	0.0035	0.0004
87	0.0058	0.0053	0.0006
88	0.0039	0.0035	0.0004
89	0.0058	0.0053	0.0006
90	0.0039	0.0035	0.0004
91	0.0039	0.0035	0.0004
92	0.0039	0.0035	0.0004
93	0.0039	0.0035	0.0004
94	0.0039	0.0035	0.0004
95	0.0039	0.0035	0.0004
96	0.0039	0.0035	0.0004

TOTAL STORM RAINFALL(INCHES) = 1.95
TOTAL SOIL-LOSS(INCHES) = 1.75
TOTAL EFFECTIVE RAINFALL(INCHES) = 0.19

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 17.7041
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 1.9661

==========

2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0003	0.05	Q	.	.	.	.
0.167	0.0006	0.05	Q	.	.	.	.
0.250	0.0009	0.05	Q	.	.	.	.
0.333	0.0021	0.17	Q	.	.	.	.
0.417	0.0033	0.17	Q	.	.	.	.
0.500	0.0045	0.17	Q	.	.	.	.
0.583	0.0063	0.25	VQ	.	.	.	.
0.667	0.0080	0.25	VQ	.	.	.	.
0.750	0.0098	0.25	VQ	.	.	.	.
0.833	0.0118	0.30	VQ	.	.	.	.
0.917	0.0139	0.30	VQ	.	.	.	.
1.000	0.0160	0.30	VQ	.	.	.	.
1.083	0.0183	0.33	VQ	.	.	.	.
1.167	0.0206	0.33	VQ	.	.	.	.
1.250	0.0229	0.33	VQ	.	.	.	.
1.333	0.0249	0.30	VQ	.	.	.	.
1.417	0.0270	0.30	VQ	.	.	.	.
1.500	0.0290	0.30	VQ	.	.	.	.
1.583	0.0310	0.29	VQ	.	.	.	.
1.667	0.0330	0.29	VQ	.	.	.	.

```
1.750      0.0350      0.29  VQ        .         .         .         .
1.833      0.0371      0.31  VQ        .         .         .         .
1.917      0.0392      0.31  VQ        .         .         .         .
2.000      0.0413      0.31  VQ        .         .         .         .
2.083      0.0438      0.36  VQ        .         .         .         .
2.167      0.0463      0.36  VQ        .         .         .         .
2.250      0.0488      0.36  VQ        .         .         .         .
2.333      0.0514      0.38  .Q        .         .         .         .
2.417      0.0540      0.38  .Q        .         .         .         .
2.500      0.0566      0.38  .Q        .         .         .         .
2.583      0.0593      0.40  .Q        .         .         .         .
2.667      0.0621      0.40  .Q        .         .         .         .
2.750      0.0649      0.40  .Q        .         .         .         .
2.833      0.0680      0.46  .Q        .         .         .         .
2.917      0.0711      0.46  .Q        .         .         .         .
3.000      0.0743      0.46  .Q        .         .         .         .
3.083      0.0775      0.47  .Q        .         .         .         .
3.167      0.0807      0.47  .Q        .         .         .         .
3.250      0.0840      0.47  .Q        .         .         .         .
3.333      0.0872      0.47  .Q        .         .         .         .
3.417      0.0905      0.47  .Q        .         .         .         .
3.500      0.0938      0.47  .Q        .         .         .         .
3.583      0.0970      0.47  .Q        .         .         .         .
3.667      0.1003      0.47  .QV       .         .         .         .
3.750      0.1036      0.47  .QV       .         .         .         .
3.833      0.1070      0.50  .QV       .         .         .         .
3.917      0.1104      0.50  .QV       .         .         .         .
4.000      0.1138      0.50  .QV       .         .         .         .
4.083      0.1176      0.55  . Q       .         .         .         .
4.167      0.1214      0.55  . Q       .         .         .         .
4.250      0.1252      0.55  . Q       .         .         .         .
4.333      0.1293      0.59  . Q       .         .         .         .
4.417      0.1333      0.59  . Q       .         .         .         .
4.500      0.1374      0.59  . Q       .         .         .         .
4.583      0.1418      0.64  . Q       .         .         .         .
4.667      0.1463      0.64  . Q       .         .         .         .
4.750      0.1507      0.64  . QV      .         .         .         .
4.833      0.1554      0.68  . QV      .         .         .         .
4.917      0.1601      0.68  . QV      .         .         .         .
5.000      0.1648      0.68  . QV      .         .         .         .
5.083      0.1696      0.69  . QV      .         .         .         .
5.167      0.1743      0.69  . QV      .         .         .         .
5.250      0.1791      0.69  . QV      .         .         .         .
5.333      0.1834      0.63  . QV      .         .         .         .
5.417      0.1877      0.63  . QV      .         .         .         .
5.500      0.1921      0.63  . QV      .         .         .         .
5.583      0.1967      0.68  . Q V     .         .         .         .
5.667      0.2014      0.68  . Q V     .         .         .         .
5.750      0.2061      0.68  . Q V     .         .         .         .
5.833      0.2112      0.74  . Q V     .         .         .         .
5.917      0.2162      0.74  . Q V     .         .         .         .
6.000      0.2213      0.74  . Q V     .         .         .         .
6.083      0.2267      0.78  .  QV     .         .         .         .
6.167      0.2320      0.78  .  QV     .         .         .         .
6.250      0.2374      0.78  .  QV     .         .         .         .
6.333      0.2431      0.83  .  QV     .         .         .         .
6.417      0.2489      0.83  .  Q V    .         .         .         .
6.500      0.2546      0.83  .  Q V    .         .         .         .
6.583      0.2607      0.87  .  Q V    .         .         .         .
6.667      0.2667      0.87  .  Q V    .         .         .         .
6.750      0.2727      0.87  .  Q V    .         .         .         .
6.833      0.2791      0.93  .  Q V    .         .         .         .
6.917      0.2855      0.93  .  Q V    .         .         .         .
7.000      0.2919      0.93  .  Q V    .         .         .         .
7.083      0.2984      0.94  .  Q  V   .         .         .         .
7.167      0.3049      0.94  .  Q  V   .         .         .         .
7.250      0.3114      0.94  .  Q  V   .         .         .         .
7.333      0.3181      0.97  .  Q  V   .         .         .         .
7.417      0.3248      0.97  .  Q  V   .         .         .         .
7.500      0.3315      0.97  .  Q  V   .         .         .         .
7.583      0.3387      1.05  .   Q V   .         .         .         .
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 7.667      0.3459      1.05  .   Q  V  .         .         .         .
 7.750      0.3531      1.05  .   Q  V  .         .         .         .
 7.833      0.3610      1.14  .   Q  V  .         .         .         .
 7.917      0.3688      1.14  .   Q  V  .         .         .         .
 8.000      0.3767      1.14  .   Q  V  .         .         .         .
 8.083      0.3853      1.26  .    Q V  .         .         .         .
 8.167      0.3939      1.26  .    Q  V .         .         .         .
 8.250      0.4026      1.26  .    Q  V .         .         .         .
 8.333      0.4121      1.38  .    Q  V .         .         .         .
 8.417      0.4216      1.38  .    Q  V .         .         .         .
 8.500      0.4311      1.38  .    Q  V .         .         .         .
 8.583      0.4410      1.44  .    Q  V .         .         .         .
 8.667      0.4508      1.44  .    Q   V.         .         .         .
 8.750      0.4607      1.44  .    Q   V.         .         .         .
 8.833      0.4712      1.52  .     Q  V.         .         .         .
 8.917      0.4817      1.52  .     Q  V.         .         .         .
 9.000      0.4921      1.52  .     Q   V         .         .         .
 9.083      0.5034      1.63  .     Q   V         .         .         .
 9.167      0.5147      1.63  .     Q   V         .         .         .
 9.250      0.5259      1.63  .     Q   V         .         .         .
 9.333      0.5382      1.78  .      Q  V         .         .         .
 9.417      0.5505      1.78  .      Q   V        .         .         .
 9.500      0.5627      1.78  .      Q   V        .         .         .
 9.583      0.5758      1.89  .      Q  .V        .         .         .
 9.667      0.5888      1.89  .      Q  .V        .         .         .
 9.750      0.6018      1.89  .      Q  . V       .         .         .
 9.833      0.6155      1.99  .      Q  . V       .         .         .
 9.917      0.6292      1.99  .      Q  . V       .         .         .
10.000      0.6429      1.99  .      Q  .  V      .         .         .
10.083      0.6561      1.90  .      Q  .  V      .         .         .
10.167      0.6692      1.90  .      Q  .  V      .         .         .
10.250      0.6823      1.90  .      Q  .  V      .         .         .
10.333      0.6930      1.55  .     Q   .   V     .         .         .
10.417      0.7037      1.55  .     Q   .   V     .         .         .
10.500      0.7144      1.55  .     Q   .   V     .         .         .
10.583      0.7253      1.58  .     Q   .   V     .         .         .
10.667      0.7361      1.58  .     Q   .   V     .         .         .
10.750      0.7470      1.58  .     Q   .    V    .         .         .
10.833      0.7595      1.82  .      Q  .    V    .         .         .
10.917      0.7720      1.82  .      Q  .    V    .         .         .
11.000      0.7845      1.82  .      Q  .    V    .         .         .
11.083      0.7973      1.86  .      Q  .     V   .         .         .
11.167      0.8101      1.86  .      Q  .     V   .         .         .
11.250      0.8229      1.86  .      Q  .     V   .         .         .
11.333      0.8355      1.82  .      Q  .     V   .         .         .
11.417      0.8480      1.82  .      Q  .      V  .         .         .
11.500      0.8606      1.82  .      Q  .      V  .         .         .
11.583      0.8727      1.76  .      Q  .      V  .         .         .
11.667      0.8849      1.76  .      Q  .       V .         .         .
11.750      0.8970      1.76  .      Q  .       V .         .         .
11.833      0.9086      1.68  .     Q   .       V .         .         .
11.917      0.9201      1.68  .     Q   .       V .         .         .
12.000      0.9317      1.68  .     Q   .       V .         .         .
12.083      0.9445      1.86  .      Q  .        V.         .         .
12.167      0.9574      1.86  .      Q  .        V.         .         .
12.250      0.9702      1.86  .      Q  .        V.         .         .
12.333      0.9858      2.26  .        Q.         V         .         .
12.417      1.0014      2.26  .        Q.         V         .         .
12.500      1.0170      2.26  .        Q.         V         .         .
12.583      1.0339      2.46  .        Q.        .V         .         .
12.667      1.0509      2.46  .        Q.        .V         .         .
12.750      1.0678      2.46  .        Q.        .V         .         .
12.833      1.0859      2.63  .         Q        . V        .         .
12.917      1.1040      2.63  .         Q        . V        .         .
13.000      1.1221      2.63  .         Q        . V        .         .
13.083      1.1416      2.83  .         .Q       .  V       .         .
13.167      1.1611      2.83  .         .Q       .  V       .         .
13.250      1.1806      2.83  .         .Q       .   V      .         .
13.333      1.2021      3.12  .         . Q      .   V      .         .
13.417      1.2237      3.12  .         . Q      .   V      .         .
13.500      1.2452      3.12  .         . Q      .    V     .         .
```

Refer to J6 PC SWMM in Post Development

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13.583      1.2655      2.95  .         .Q        .    V    .         .
13.667      1.2858      2.95  .         .Q        .     V   .         .
13.750      1.3061      2.95  .         .Q        .     V   .         .
13.833      1.3226      2.39  .        Q.         .     V   .         .
13.917      1.3391      2.39  .        Q.         .      V  .         .
14.000      1.3556      2.39  .        Q.         .      V  .         .
14.083      1.3717      2.34  .        Q.         .      V  .         .
14.167      1.3877      2.34  .        Q.         .       V .         .
14.250      1.4038      2.34  .        Q.         .       V .         .
14.333      1.4210      2.49  .        Q.         .       V .         .
14.417      1.4381      2.49  .        Q.         .        V.         .
14.500      1.4552      2.49  .        Q.         .        V.         .
14.583      1.4723      2.48  .        Q.         .        V.         .
14.667      1.4894      2.48  .        Q.         .         V         .
14.750      1.5065      2.48  .        Q.         .         V         .
14.833      1.5234      2.46  .        Q.         .         V         .
14.917      1.5403      2.46  .        Q.         .          V        .
15.000      1.5572      2.46  .        Q.         .          V        .
15.083      1.5736      2.38  .        Q.         .         . V       .
15.167      1.5899      2.38  .        Q.         .         . V       .
15.250      1.6063      2.38  .        Q.         .         . V       .
15.333      1.6220      2.29  .        Q.         .         . V       .
15.417      1.6378      2.29  .        Q.         .         .  V      .
15.500      1.6535      2.29  .        Q.         .         .  V      .
15.583      1.6681      2.12  .       Q .         .         .  V      .
15.667      1.6828      2.12  .       Q .         .         .   V     .
15.750      1.6974      2.12  .       Q .         .         .   V     .
15.833      1.7105      1.90  .      Q  .         .         .   V     .
15.917      1.7235      1.90  .      Q  .         .         .    V    .
16.000      1.7366      1.90  .      Q  .         .         .    V    .
16.083      1.7469      1.49  .    Q    .         .         .    V    .
16.167      1.7572      1.49  .    Q    .         .         .    V    .
16.250      1.7674      1.49  .    Q    .         .         .    V    .
16.333      1.7722      0.68  . Q       .         .         .     V   .
16.417      1.7769      0.68  . Q       .         .         .     V   .
16.500      1.7816      0.68  . Q       .         .         .     V   .
16.583      1.7847      0.45  .Q        .         .         .     V   .
16.667      1.7878      0.45  .Q        .         .         .     V   .
16.750      1.7909      0.45  .Q        .         .         .     V   .
16.833      1.7932      0.33  .Q        .         .         .     V   .
16.917      1.7955      0.33  .Q        .         .         .     V   .
17.000      1.7978      0.33  .Q        .         .         .     V   .
17.083      1.8002      0.35  .Q        .         .         .     V   .
17.167      1.8026      0.35  .Q        .         .         .     V   .
17.250      1.8051      0.35  .Q        .         .         .     V   .
17.333      1.8082      0.45  .Q        .         .         .     V   .
17.417      1.8112      0.45  .Q        .         .         .     V   .
17.500      1.8143      0.45  .Q        .         .         .     V   .
17.583      1.8175      0.47  .Q        .         .         .     V   .
17.667      1.8208      0.47  .Q        .         .         .      V  .
17.750      1.8240      0.47  .Q        .         .         .      V  .
17.833      1.8271      0.45  .Q        .         .         .      V  .
17.917      1.8302      0.45  .Q        .         .         .      V  .
18.000      1.8333      0.45  .Q        .         .         .      V  .
18.083      1.8361      0.40  .Q        .         .         .      V  .
18.167      1.8388      0.40  .Q        .         .         .      V  .
18.250      1.8415      0.40  .Q        .         .         .      V  .
18.333      1.8442      0.39  .Q        .         .         .      V  .
18.417      1.8469      0.39  .Q        .         .         .      V  .
18.500      1.8495      0.39  .Q        .         .         .      V  .
18.583      1.8520      0.36  .Q        .         .         .      V  .
18.667      1.8545      0.36  .Q        .         .         .      V  .
18.750      1.8569      0.36  .Q        .         .         .      V  .
18.833      1.8589      0.28  .Q        .         .         .      V  .
18.917      1.8608      0.28  .Q        .         .         .      V  .
19.000      1.8628      0.28  .Q        .         .         .      V  .
19.083      1.8644      0.24  Q         .         .         .      V  .
19.167      1.8661      0.24  Q         .         .         .      V  .
19.250      1.8677      0.24  Q         .         .         .      V  .
19.333      1.8698      0.30  .Q        .         .         .       V .
19.417      1.8718      0.30  .Q        .         .         .       V .
```

19.500	1.8738	0.30	.Q	.	.	.	V .
19.583	1.8762	0.34	.Q	.	.	.	V .
19.667	1.8785	0.34	.Q	.	.	.	V .
19.750	1.8808	0.34	.Q	.	.	.	V .
19.833	1.8827	0.28	.Q	.	.	.	V .
19.917	1.8846	0.28	.Q	.	.	.	V .
20.000	1.8865	0.28	.Q	.	.	.	V .
20.083	1.8881	0.24	Q	.	.	.	V .
20.167	1.8897	0.24	Q	.	.	.	V .
20.250	1.8914	0.24	Q	.	.	.	V .
20.333	1.8932	0.27	.Q	.	.	.	V .
20.417	1.8951	0.27	.Q	.	.	.	V .
20.500	1.8970	0.27	.Q	.	.	.	V .
20.583	1.8989	0.28	.Q	.	.	.	V .
20.667	1.9009	0.28	.Q	.	.	.	V .
20.750	1.9028	0.28	.Q	.	.	.	V .
20.833	1.9046	0.26	.Q	.	.	.	V .
20.917	1.9064	0.26	.Q	.	.	.	V .
21.000	1.9082	0.26	.Q	.	.	.	V .
21.083	1.9098	0.23	Q	.	.	.	V .
21.167	1.9114	0.23	Q	.	.	.	V .
21.250	1.9130	0.23	Q	.	.	.	V .
21.333	1.9147	0.25	Q	.	.	.	V .
21.417	1.9165	0.25	Q	.	.	.	V .
21.500	1.9182	0.25	Q	.	.	.	V.
21.583	1.9197	0.23	Q	.	.	.	V.
21.667	1.9213	0.23	Q	.	.	.	V.
21.750	1.9229	0.23	Q	.	.	.	V.
21.833	1.9246	0.25	Q	.	.	.	V.
21.917	1.9263	0.25	Q	.	.	.	V.
22.000	1.9280	0.25	Q	.	.	.	V.
22.083	1.9296	0.23	Q	.	.	.	V.
22.167	1.9312	0.23	Q	.	.	.	V.
22.250	1.9327	0.23	Q	.	.	.	V.
22.333	1.9344	0.25	Q	.	.	.	V.
22.417	1.9361	0.25	Q	.	.	.	V.
22.500	1.9379	0.25	Q	.	.	.	V.
22.583	1.9393	0.21	Q	.	.	.	V.
22.667	1.9407	0.21	Q	.	.	.	V.
22.750	1.9421	0.21	Q	.	.	.	V.
22.833	1.9434	0.19	Q	.	.	.	V.
22.917	1.9448	0.19	Q	.	.	.	V.
23.000	1.9461	0.19	Q	.	.	.	V.
23.083	1.9474	0.19	Q	.	.	.	V.
23.166	1.9488	0.19	Q	.	.	.	V.
23.250	1.9501	0.19	Q	.	.	.	V.
23.333	1.9514	0.19	Q	.	.	.	V.
23.416	1.9527	0.19	Q	.	.	.	V.
23.500	1.9540	0.19	Q	.	.	.	V.
23.583	1.9553	0.19	Q	.	.	.	V.
23.666	1.9567	0.19	Q	.	.	.	V.
23.750	1.9580	0.19	Q	.	.	.	V.
23.833	1.9593	0.19	Q	.	.	.	V.
23.916	1.9606	0.19	Q	.	.	.	V.
24.000	1.9619	0.19	Q	.	.	.	V.
24.083	1.9629	0.15	Q	.	.	.	V.
24.166	1.9639	0.15	Q	.	.	.	V.
24.250	1.9649	0.15	Q	.	.	.	V.
24.333	1.9652	0.04	Q	.	.	.	V.
24.416	1.9654	0.04	Q	.	.	.	V.
24.500	1.9657	0.04	Q	.	.	.	V.
24.583	1.9658	0.01	Q	.	.	.	V.
24.666	1.9659	0.01	Q	.	.	.	V.
24.750	1.9659	0.01	Q	.	.	.	V.
24.833	1.9660	0.00	Q	.	.	.	V.
24.916	1.9660	0.00	Q	.	.	.	V.
25.000	1.9660	0.00	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1500.0
10%	1035.0
20%	720.0
30%	555.0
40%	495.0
50%	405.0
60%	270.0
70%	195.0
80%	60.0
90%	45.0

```
****************************************************************************
  FLOW PROCESS FROM NODE   106.00 TO NODE   103.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
============================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #3)

         WATERCOURSE LENGTH =    2948.000 FEET
         LENGTH FROM CONCENTRATION POINT TO CENTROID =    1768.800 FEET
         ELEVATION VARIATION ALONG WATERCOURSE =      14.700 FEET
         BASIN FACTOR = 0.030
         WATERSHED AREA =     136.170 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         WATERCOURSE "LAG" TIME =    0.205 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         FOOTHILL S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.565
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.900
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.280
         USER-ENTERED RAINFALL =  1.95 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 0.9998


         UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME = 122.223


============================================================================
                      UNIT HYDROGRAPH DETERMINATION

----------------------------------------------------------------------------
    INTERVAL          "S" GRAPH          UNIT HYDROGRAPH
     NUMBER          MEAN VALUES          ORDINATES(CFS)
----------------------------------------------------------------------------
        1                22.184               121.775
        2                78.029               306.553
        3                93.193                83.240
        4                97.884                25.752
        5                98.724                 4.612
        6                99.336                 3.357
        7                99.734                 2.188
        8                99.934                 1.094
        9               100.000                 0.365
```

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0039	0.0035	0.0004
2	0.0058	0.0053	0.0006
3	0.0058	0.0053	0.0006
4	0.0078	0.0070	0.0008
5	0.0058	0.0053	0.0006
6	0.0058	0.0053	0.0006
7	0.0058	0.0053	0.0006
8	0.0078	0.0070	0.0008
9	0.0078	0.0070	0.0008
10	0.0078	0.0070	0.0008
11	0.0097	0.0088	0.0010
12	0.0097	0.0088	0.0010
13	0.0097	0.0088	0.0010
14	0.0097	0.0088	0.0010
15	0.0097	0.0088	0.0010
16	0.0117	0.0105	0.0012
17	0.0117	0.0105	0.0012
18	0.0136	0.0123	0.0014
19	0.0136	0.0123	0.0014
20	0.0156	0.0140	0.0016
21	0.0117	0.0105	0.0012
22	0.0136	0.0123	0.0014
23	0.0156	0.0140	0.0016
24	0.0156	0.0140	0.0016
25	0.0175	0.0158	0.0018
26	0.0175	0.0158	0.0018
27	0.0195	0.0175	0.0019
28	0.0195	0.0175	0.0019
29	0.0195	0.0175	0.0019
30	0.0214	0.0193	0.0021
31	0.0234	0.0211	0.0023
32	0.0253	0.0228	0.0025
33	0.0292	0.0263	0.0029
34	0.0292	0.0263	0.0029
35	0.0312	0.0281	0.0031
36	0.0331	0.0298	0.0033
37	0.0370	0.0333	0.0037
38	0.0390	0.0351	0.0039
39	0.0409	0.0368	0.0041
40	0.0429	0.0386	0.0043
41	0.0292	0.0263	0.0029
42	0.0292	0.0263	0.0029
43	0.0390	0.0351	0.0039
44	0.0390	0.0351	0.0039
45	0.0370	0.0333	0.0037
46	0.0370	0.0333	0.0037
47	0.0331	0.0298	0.0033
48	0.0351	0.0316	0.0035
49	0.0487	0.0439	0.0049
50	0.0507	0.0456	0.0051
51	0.0546	0.0491	0.0055
52	0.0565	0.0509	0.0057
53	0.0663	0.0597	0.0066
54	0.0663	0.0597	0.0066
55	0.0448	0.0404	0.0045
56	0.0448	0.0404	0.0045
57	0.0526	0.0474	0.0053
58	0.0507	0.0456	0.0051
59	0.0507	0.0456	0.0051
60	0.0487	0.0439	0.0049
61	0.0468	0.0421	0.0047
62	0.0448	0.0404	0.0045
63	0.0370	0.0333	0.0037
64	0.0370	0.0333	0.0037
65	0.0078	0.0070	0.0008
66	0.0078	0.0070	0.0008

67	0.0058	0.0053	0.0006
68	0.0058	0.0053	0.0006
69	0.0097	0.0088	0.0010
70	0.0097	0.0088	0.0010
71	0.0097	0.0088	0.0010
72	0.0078	0.0070	0.0008
73	0.0078	0.0070	0.0008
74	0.0078	0.0070	0.0008
75	0.0058	0.0053	0.0006
76	0.0039	0.0035	0.0004
77	0.0058	0.0053	0.0006
78	0.0078	0.0070	0.0008
79	0.0058	0.0053	0.0006
80	0.0039	0.0035	0.0004
81	0.0058	0.0053	0.0006
82	0.0058	0.0053	0.0006
83	0.0058	0.0053	0.0006
84	0.0039	0.0035	0.0004
85	0.0058	0.0053	0.0006
86	0.0039	0.0035	0.0004
87	0.0058	0.0053	0.0006
88	0.0039	0.0035	0.0004
89	0.0058	0.0053	0.0006
90	0.0039	0.0035	0.0004
91	0.0039	0.0035	0.0004
92	0.0039	0.0035	0.0004
93	0.0039	0.0035	0.0004
94	0.0039	0.0035	0.0004
95	0.0039	0.0035	0.0004
96	0.0039	0.0035	0.0004

TOTAL STORM RAINFALL(INCHES) = 1.95
TOTAL SOIL-LOSS(INCHES) = 1.75
TOTAL EFFECTIVE RAINFALL(INCHES) = 0.19

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 19.9099
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 2.2111

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

==========

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0003	0.05	Q	.	.	.	.
0.167	0.0007	0.05	Q	.	.	.	.
0.250	0.0010	0.05	Q	.	.	.	.
0.333	0.0023	0.19	Q	.	.	.	.
0.417	0.0036	0.19	Q	.	.	.	.
0.500	0.0049	0.19	Q	.	.	.	.
0.583	0.0069	0.28	VQ	.	.	.	.
0.667	0.0088	0.28	VQ	.	.	.	.
0.750	0.0108	0.28	VQ	.	.	.	.
0.833	0.0131	0.33	VQ	.	.	.	.
0.917	0.0154	0.33	VQ	.	.	.	.
1.000	0.0176	0.33	VQ	.	.	.	.
1.083	0.0202	0.38	VQ	.	.	.	.
1.167	0.0228	0.38	VQ	.	.	.	.
1.250	0.0254	0.38	VQ	.	.	.	.
1.333	0.0277	0.33	VQ	.	.	.	.
1.417	0.0300	0.33	VQ	.	.	.	.
1.500	0.0323	0.33	VQ	.	.	.	.
1.583	0.0346	0.32	VQ	.	.	.	.
1.667	0.0368	0.32	VQ	.	.	.	.

1.750	0.0390	0.32	VQ	.	.	.	.
1.833	0.0414	0.35	VQ	.	.	.	.
1.917	0.0438	0.35	VQ	.	.	.	.
2.000	0.0462	0.35	VQ	.	.	.	.
2.083	0.0490	0.41	VQ	.	.	.	.
2.167	0.0517	0.41	VQ	.	.	.	.
2.250	0.0545	0.41	VQ	.	.	.	.
2.333	0.0574	0.42	.Q	.	.	.	.
2.417	0.0603	0.42	.Q	.	.	.	.
2.500	0.0632	0.42	.Q	.	.	.	.
2.583	0.0663	0.45	.Q	.	.	.	.
2.667	0.0694	0.45	.Q	.	.	.	.
2.750	0.0725	0.45	.Q	.	.	.	.
2.833	0.0760	0.51	.VQ	.	.	.	.
2.917	0.0796	0.51	.VQ	.	.	.	.
3.000	0.0831	0.51	.VQ	.	.	.	.
3.083	0.0867	0.53	.VQ	.	.	.	.
3.167	0.0903	0.53	.VQ	.	.	.	.
3.250	0.0940	0.53	.VQ	.	.	.	.
3.333	0.0976	0.53	.VQ	.	.	.	.
3.417	0.1013	0.53	.VQ	.	.	.	.
3.500	0.1050	0.53	.VQ	.	.	.	.
3.583	0.1086	0.53	.VQ	.	.	.	.
3.667	0.1123	0.53	. Q	.	.	.	.
3.750	0.1160	0.53	. Q	.	.	.	.
3.833	0.1198	0.56	. Q	.	.	.	.
3.917	0.1237	0.56	. Q	.	.	.	.
4.000	0.1275	0.56	. Q	.	.	.	.
4.083	0.1318	0.62	. Q	.	.	.	.
4.167	0.1360	0.62	. Q	.	.	.	.
4.250	0.1403	0.62	. Q	.	.	.	.
4.333	0.1448	0.66	. Q	.	.	.	.
4.417	0.1494	0.66	. Q	.	.	.	.
4.500	0.1539	0.66	. Q	.	.	.	.
4.583	0.1589	0.72	. Q	.	.	.	.
4.667	0.1639	0.72	. Q	.	.	.	.
4.750	0.1689	0.72	. QV	.	.	.	.
4.833	0.1741	0.76	. Q	.	.	.	.
4.917	0.1794	0.76	. Q	.	.	.	.
5.000	0.1846	0.76	. Q	.	.	.	.
5.083	0.1900	0.78	. Q	.	.	.	.
5.167	0.1954	0.78	. Q	.	.	.	.
5.250	0.2008	0.78	. Q	.	.	.	.
5.333	0.2056	0.70	. QV	.	.	.	.
5.417	0.2105	0.70	. QV	.	.	.	.
5.500	0.2153	0.70	. QV	.	.	.	.
5.583	0.2206	0.76	. Q	.	.	.	.
5.667	0.2258	0.76	. QV	.	.	.	.
5.750	0.2311	0.76	. QV	.	.	.	.
5.833	0.2368	0.83	. QV	.	.	.	.
5.917	0.2425	0.83	. QV	.	.	.	.
6.000	0.2482	0.83	. QV	.	.	.	.
6.083	0.2542	0.87	. QV	.	.	.	.
6.167	0.2602	0.87	. QV	.	.	.	.
6.250	0.2662	0.87	. QV	.	.	.	.
6.333	0.2727	0.94	. QV	.	.	.	.
6.417	0.2791	0.94	. Q V	.	.	.	.
6.500	0.2856	0.94	. Q V	.	.	.	.
6.583	0.2923	0.98	. Q V	.	.	.	.
6.667	0.2990	0.98	. Q V	.	.	.	.
6.750	0.3058	0.98	. Q V	.	.	.	.
6.833	0.3130	1.04	. QV	.	.	.	.
6.917	0.3201	1.04	. QV	.	.	.	.
7.000	0.3273	1.04	. QV	.	.	.	.
7.083	0.3346	1.06	. Q V	.	.	.	.
7.167	0.3419	1.06	. Q V	.	.	.	.
7.250	0.3493	1.06	. Q V	.	.	.	.
7.333	0.3568	1.09	. Q V	.	.	.	.
7.417	0.3643	1.09	. Q V	.	.	.	.
7.500	0.3718	1.09	. Q V	.	.	.	.
7.583	0.3799	1.18	. Q V	.	.	.	.

```
 7.667      0.3880      1.18  .   Q  V  .         .         .         .
 7.750      0.3961      1.18  .   Q  V  .         .         .         .
 7.833      0.4049      1.28  .    Q V  .         .         .         .
 7.917      0.4137      1.28  .    Q V  .         .         .         .
 8.000      0.4225      1.28  .    Q V  .         .         .         .
 8.083      0.4321      1.41  .    Q V  .         .         .         .
 8.167      0.4418      1.41  .    Q V  .         .         .         .
 8.250      0.4515      1.41  .    Q  V .         .         .         .
 8.333      0.4621      1.55  .     Q V .         .         .         .
 8.417      0.4728      1.55  .     Q V .         .         .         .
 8.500      0.4835      1.55  .     Q V .         .         .         .
 8.583      0.4945      1.61  .     Q V .         .         .         .
 8.667      0.5056      1.61  .     Q  V.         .         .         .
 8.750      0.5167      1.61  .     Q  V.         .         .         .
 8.833      0.5285      1.71  .     Q  V.         .         .         .
 8.917      0.5402      1.71  .     Q  V.         .         .         .
 9.000      0.5520      1.71  .     Q  V.         .         .         .
 9.083      0.5646      1.83  .      Q  V         .         .         .
 9.167      0.5772      1.83  .      Q  V         .         .         .
 9.250      0.5898      1.83  .      Q  V         .         .         .
 9.333      0.6036      2.00  .      Q  V         .         .         .
 9.417      0.6173      2.00  .      Q   V        .         .         .
 9.500      0.6311      2.00  .      Q   V        .         .         .
 9.583      0.6457      2.12  .       Q .V        .         .         .
 9.667      0.6603      2.12  .       Q .V        .         .         .
 9.750      0.6750      2.12  .       Q . V       .         .         .
 9.833      0.6903      2.23  .       Q . V       .         .         .
 9.917      0.7057      2.23  .       Q . V       .         .         .
10.000      0.7211      2.23  .       Q .  V      .         .         .
10.083      0.7359      2.15  .       Q .  V      .         .         .
10.167      0.7507      2.15  .       Q .  V      .         .         .
10.250      0.7655      2.15  .       Q .  V      .         .         .
10.333      0.7776      1.76  .      Q  .   V     .         .         .
10.417      0.7898      1.76  .      Q  .   V     .         .         .
10.500      0.8019      1.76  .      Q  .   V     .         .         .
10.583      0.8140      1.77  .      Q  .   V     .         .         .
10.667      0.8262      1.77  .      Q  .   V     .         .         .
10.750      0.8384      1.77  .      Q  .    V    .         .         .
10.833      0.8524      2.04  .       Q .    V    .         .         .
10.917      0.8665      2.04  .       Q .    V    .         .         .
11.000      0.8805      2.04  .       Q .    V    .         .         .
11.083      0.8949      2.09  .       Q .     V   .         .         .
11.167      0.9093      2.09  .       Q .     V   .         .         .
11.250      0.9236      2.09  .       Q .     V   .         .         .
11.333      0.9378      2.05  .       Q .     V   .         .         .
11.417      0.9519      2.05  .       Q .      V  .         .         .
11.500      0.9660      2.05  .       Q .      V  .         .         .
11.583      0.9797      1.99  .      Q  .      V  .         .         .
11.667      0.9934      1.99  .      Q  .      V  .         .         .
11.750      1.0071      1.99  .      Q  .       V .         .         .
11.833      1.0201      1.89  .      Q  .       V .         .         .
11.917      1.0331      1.89  .      Q  .       V .         .         .
12.000      1.0461      1.89  .      Q  .       V .         .         .
12.083      1.0605      2.08  .       Q .        V.         .         .
12.167      1.0748      2.08  .       Q .        V.         .         .
12.250      1.0892      2.08  .       Q .        V.         .         .
12.333      1.1066      2.53  .         Q         V         .         .
12.417      1.1240      2.53  .         Q         V         .         .
12.500      1.1415      2.53  .         Q         V         .         .
12.583      1.1605      2.76  .         .Q        V         .         .
12.667      1.1794      2.76  .         .Q         V        .         .
12.750      1.1984      2.76  .         .Q         V        .         .
12.833      1.2187      2.95  .         .Q        . V       .         .
12.917      1.2391      2.95  .         .Q        . V       .         .
13.000      1.2594      2.95  .         .Q        . V       .         .
13.083      1.2812      3.17  .         . Q       .  V      .         .
13.167      1.3031      3.17  .         . Q       .  V      .         .
13.250      1.3249      3.17  .         . Q       .  V      .         .
13.333      1.3490      3.50  .         .   Q     .   V     .         .
13.417      1.3732      3.50  .         .   Q     .   V     .         .
13.500      1.3973      3.50  .         .   Q     .    V    .         .
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Refer to OR10 plus OR11 in PC SWMM Post Development

13.583	1.4202	3.33	. . Q . V .
13.667	1.4432	3.33	. . Q . V .
13.750	1.4662	3.33	. . Q . V .
13.833	1.4848	2.71	. Q . V .
13.917	1.5034	2.71	. Q . V .
14.000	1.5220	2.71	. Q . V .
14.083	1.5401	2.63	. Q . V .
14.167	1.5582	2.63	. Q . V .
14.250	1.5763	2.63	. Q . V .
14.333	1.5956	2.79	. .Q . V .
14.417	1.6148	2.79	. .Q . V .
14.500	1.6340	2.79	. .Q . V .
14.583	1.6533	2.79	. .Q . V .
14.667	1.6725	2.79	. .Q . V .
14.750	1.6917	2.79	. .Q . V .
14.833	1.7107	2.76	. .Q . V .
14.917	1.7298	2.76	. .Q . V .
15.000	1.7488	2.76	. .Q . V .
15.083	1.7672	2.68	. Q . .V .
15.167	1.7857	2.68	. Q . . V .
15.250	1.8041	2.68	. Q . . V .
15.333	1.8218	2.57	. Q . . V .
15.417	1.8395	2.57	. Q . . V .
15.500	1.8573	2.57	. Q . . V .
15.583	1.8738	2.40	. Q. . . V .
15.667	1.8903	2.40	. Q. . . V .
15.750	1.9068	2.40	. Q. . . V .
15.833	1.9216	2.14	. Q . . . V .
15.917	1.9363	2.14	. Q . . . V .
16.000	1.9510	2.14	. Q . . . V .
16.083	1.9628	1.71	. Q . . . V .
16.167	1.9746	1.71	. Q . . . V .
16.250	1.9864	1.71	. Q . . . V .
16.333	1.9918	0.79	. Q . . . V .
16.417	1.9973	0.79	. Q . . . V .
16.500	2.0027	0.79	. Q . . . V .
16.583	2.0063	0.52	. Q . . . V .
16.667	2.0099	0.52	. Q . . . V .
16.750	2.0135	0.52	. Q . . . V .
16.833	2.0161	0.38	.Q . . . V .
16.917	2.0187	0.38	.Q . . . V .
17.000	2.0214	0.38	.Q . . . V .
17.083	2.0241	0.40	.Q . . . V .
17.167	2.0268	0.40	.Q . . . V .
17.250	2.0296	0.40	.Q . . . V .
17.333	2.0330	0.50	. Q . . . V .
17.417	2.0365	0.50	. Q . . . V .
17.500	2.0399	0.50	. Q . . . V .
17.583	2.0436	0.53	. Q . . . V .
17.667	2.0472	0.53	. Q . . . V .
17.750	2.0508	0.53	. Q . . . V .
17.833	2.0543	0.51	. Q . . . V .
17.917	2.0578	0.51	. Q . . . V .
18.000	2.0613	0.51	. Q . . . V .
18.083	2.0644	0.45	.Q . . . V .
18.167	2.0675	0.45	.Q . . . V .
18.250	2.0706	0.45	.Q . . . V .
18.333	2.0736	0.43	.Q . . . V .
18.417	2.0766	0.43	.Q . . . V .
18.500	2.0796	0.43	.Q . . . V .
18.583	2.0824	0.41	.Q . . . V .
18.667	2.0852	0.41	.Q . . . V .
18.750	2.0880	0.41	.Q . . . V .
18.833	2.0902	0.32	.Q . . . V .
18.917	2.0924	0.32	.Q . . . V .
19.000	2.0946	0.32	.Q . . . V .
19.083	2.0965	0.27	.Q . . . V .
19.167	2.0983	0.27	.Q . . . V .
19.250	2.1002	0.27	.Q . . . V .
19.333	2.1025	0.33	.Q . . . V .
19.417	2.1047	0.33	.Q . . . V .

19.500	2.1070	0.33	.Q	.	.	.	V .
19.583	2.1096	0.38	.Q	.	.	.	V .
19.667	2.1122	0.38	.Q	.	.	.	V .
19.750	2.1148	0.38	.Q	.	.	.	V .
19.833	2.1170	0.31	.Q	.	.	.	V .
19.917	2.1191	0.31	.Q	.	.	.	V .
20.000	2.1213	0.31	.Q	.	.	.	V .
20.083	2.1231	0.27	.Q	.	.	.	V .
20.167	2.1249	0.27	.Q	.	.	.	V .
20.250	2.1268	0.27	.Q	.	.	.	V .
20.333	2.1289	0.31	.Q	.	.	.	V .
20.417	2.1310	0.31	.Q	.	.	.	V .
20.500	2.1331	0.31	.Q	.	.	.	V .
20.583	2.1353	0.32	.Q	.	.	.	V .
20.667	2.1374	0.32	.Q	.	.	.	V .
20.750	2.1396	0.32	.Q	.	.	.	V .
20.833	2.1417	0.30	.Q	.	.	.	V .
20.917	2.1437	0.30	.Q	.	.	.	V .
21.000	2.1458	0.30	.Q	.	.	.	V .
21.083	2.1476	0.26	.Q	.	.	.	V .
21.167	2.1494	0.26	.Q	.	.	.	V .
21.250	2.1511	0.26	.Q	.	.	.	V .
21.333	2.1531	0.28	.Q	.	.	.	V .
21.417	2.1550	0.28	.Q	.	.	.	V .
21.500	2.1569	0.28	.Q	.	.	.	V.
21.583	2.1587	0.26	.Q	.	.	.	V.
21.667	2.1605	0.26	.Q	.	.	.	V.
21.750	2.1622	0.26	.Q	.	.	.	V.
21.833	2.1642	0.28	.Q	.	.	.	V.
21.917	2.1661	0.28	.Q	.	.	.	V.
22.000	2.1680	0.28	.Q	.	.	.	V.
22.083	2.1698	0.26	.Q	.	.	.	V.
22.167	2.1715	0.26	.Q	.	.	.	V.
22.250	2.1733	0.26	.Q	.	.	.	V.
22.333	2.1752	0.28	.Q	.	.	.	V.
22.417	2.1772	0.28	.Q	.	.	.	V.
22.500	2.1791	0.28	.Q	.	.	.	V.
22.583	2.1807	0.23	Q	.	.	.	V.
22.667	2.1823	0.23	Q	.	.	.	V.
22.750	2.1839	0.23	Q	.	.	.	V.
22.833	2.1854	0.22	Q	.	.	.	V.
22.917	2.1869	0.22	Q	.	.	.	V.
23.000	2.1884	0.22	Q	.	.	.	V.
23.083	2.1899	0.22	Q	.	.	.	V.
23.166	2.1914	0.22	Q	.	.	.	V.
23.250	2.1929	0.22	Q	.	.	.	V.
23.333	2.1943	0.21	Q	.	.	.	V.
23.416	2.1958	0.21	Q	.	.	.	V.
23.500	2.1973	0.21	Q	.	.	.	V.
23.583	2.1988	0.21	Q	.	.	.	V.
23.666	2.2003	0.21	Q	.	.	.	V.
23.750	2.2017	0.21	Q	.	.	.	V.
23.833	2.2032	0.21	Q	.	.	.	V.
23.916	2.2047	0.21	Q	.	.	.	V.
24.000	2.2062	0.21	Q	.	.	.	V.
24.083	2.2073	0.17	Q	.	.	.	V.
24.166	2.2085	0.17	Q	.	.	.	V.
24.250	2.2096	0.17	Q	.	.	.	V.
24.333	2.2099	0.05	Q	.	.	.	V.
24.416	2.2103	0.05	Q	.	.	.	V.
24.500	2.2106	0.05	Q	.	.	.	V.
24.583	2.2107	0.01	Q	.	.	.	V.
24.666	2.2108	0.01	Q	.	.	.	V.
24.750	2.2109	0.01	Q	.	.	.	V.
24.833	2.2109	0.00	Q	.	.	.	V.
24.916	2.2109	0.00	Q	.	.	.	V.
25.000	2.2110	0.00	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1500.0
10%	1035.0
20%	720.0
30%	555.0
40%	495.0
50%	420.0
60%	270.0
70%	195.0
80%	60.0
90%	45.0

****
FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 1

>>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========

(UNIT-HYDROGRAPH ADDED TO STREAM #4)

WATERSHED AREA = 20.000 ACRES
BASEFLOW = 0.000 CFS/SQUARE-MILE
*USER ENTERED "LAG" TIME = 0.100 HOURS
CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
FOOTHILL S-GRAPH SELECTED
UNIFORM MEAN SOIL-LOSS(INCH/HOUR) = 0.050
LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.180
MINIMUM SOIL-LOSS RATE(INCH/HOUR) = 0.030
USER-ENTERED RAINFALL = 1.95 INCHES
RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 1.0000

UNIT HYDROGRAPH TIME UNIT = 15.000 MINUTES
UNIT INTERVAL PERCENTAGE OF LAG-TIME = 250.000

==========
UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	50.960	41.086
2	95.823	36.171
3	99.089	2.633
4	99.636	0.441
5	99.909	0.220
6	100.000	0.073

****

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0039	0.0007	0.0032
2	0.0058	0.0011	0.0048
3	0.0058	0.0011	0.0048
4	0.0078	0.0014	0.0064
5	0.0058	0.0011	0.0048
6	0.0058	0.0011	0.0048
7	0.0058	0.0011	0.0048
8	0.0078	0.0014	0.0064

9	0.0078	0.0014	0.0064
10	0.0078	0.0014	0.0064
11	0.0097	0.0018	0.0080
12	0.0097	0.0018	0.0080
13	0.0097	0.0018	0.0080
14	0.0097	0.0018	0.0080
15	0.0097	0.0018	0.0080
16	0.0117	0.0021	0.0096
17	0.0117	0.0021	0.0096
18	0.0136	0.0025	0.0112
19	0.0136	0.0025	0.0112
20	0.0156	0.0028	0.0128
21	0.0117	0.0021	0.0096
22	0.0136	0.0025	0.0112
23	0.0156	0.0028	0.0128
24	0.0156	0.0028	0.0128
25	0.0175	0.0032	0.0144
26	0.0175	0.0032	0.0144
27	0.0195	0.0035	0.0160
28	0.0195	0.0035	0.0160
29	0.0195	0.0035	0.0160
30	0.0214	0.0039	0.0176
31	0.0234	0.0042	0.0192
32	0.0253	0.0046	0.0208
33	0.0292	0.0053	0.0240
34	0.0292	0.0053	0.0240
35	0.0312	0.0056	0.0256
36	0.0331	0.0060	0.0272
37	0.0370	0.0067	0.0304
38	0.0390	0.0070	0.0320
39	0.0409	0.0074	0.0336
40	0.0429	0.0077	0.0352
41	0.0292	0.0053	0.0240
42	0.0292	0.0053	0.0240
43	0.0390	0.0070	0.0320
44	0.0390	0.0070	0.0320
45	0.0370	0.0067	0.0304
46	0.0370	0.0067	0.0304
47	0.0331	0.0060	0.0272
48	0.0351	0.0063	0.0288
49	0.0487	0.0088	0.0400
50	0.0507	0.0091	0.0416
51	0.0546	0.0098	0.0448
52	0.0565	0.0102	0.0464
53	0.0663	0.0112	0.0551
54	0.0663	0.0111	0.0552
55	0.0448	0.0081	0.0368
56	0.0448	0.0081	0.0368
57	0.0526	0.0095	0.0432
58	0.0507	0.0091	0.0416
59	0.0507	0.0091	0.0416
60	0.0487	0.0088	0.0400
61	0.0468	0.0084	0.0384
62	0.0448	0.0081	0.0368
63	0.0370	0.0067	0.0304
64	0.0370	0.0067	0.0304
65	0.0078	0.0014	0.0064
66	0.0078	0.0014	0.0064
67	0.0058	0.0011	0.0048
68	0.0058	0.0011	0.0048
69	0.0097	0.0018	0.0080
70	0.0097	0.0018	0.0080
71	0.0097	0.0018	0.0080
72	0.0078	0.0014	0.0064
73	0.0078	0.0014	0.0064
74	0.0078	0.0014	0.0064
75	0.0058	0.0011	0.0048
76	0.0039	0.0007	0.0032
77	0.0058	0.0011	0.0048
78	0.0078	0.0014	0.0064
79	0.0058	0.0011	0.0048

80	0.0039	0.0007	0.0032
81	0.0058	0.0011	0.0048
82	0.0058	0.0011	0.0048
83	0.0058	0.0011	0.0048
84	0.0039	0.0007	0.0032
85	0.0058	0.0011	0.0048
86	0.0039	0.0007	0.0032
87	0.0058	0.0011	0.0048
88	0.0039	0.0007	0.0032
89	0.0058	0.0011	0.0048
90	0.0039	0.0007	0.0032
91	0.0039	0.0007	0.0032
92	0.0039	0.0007	0.0032
93	0.0039	0.0007	0.0032
94	0.0039	0.0007	0.0032
95	0.0039	0.0007	0.0032
96	0.0039	0.0007	0.0032

TOTAL STORM RAINFALL(INCHES) = 1.95
TOTAL SOIL-LOSS(INCHES) = 0.35
TOTAL EFFECTIVE RAINFALL(INCHES) = 1.60

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.5825
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 2.6661

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0009	0.13	Q	.	.	.	.
0.167	0.0018	0.13	Q	.	.	.	.
0.250	0.0027	0.13	Q	.	.	.	.
0.333	0.0049	0.31	VQ	.	.	.	.
0.417	0.0070	0.31	VQ	.	.	.	.
0.500	0.0092	0.31	VQ	.	.	.	.
0.583	0.0118	0.38	VQ	.	.	.	.
0.667	0.0144	0.38	VQ	.	.	.	.
0.750	0.0170	0.38	VQ	.	.	.	.
0.833	0.0201	0.45	VQ	.	.	.	.
0.917	0.0232	0.45	VQ	.	.	.	.
1.000	0.0263	0.45	VQ	.	.	.	.
1.083	0.0294	0.44	VQ	.	.	.	.
1.167	0.0324	0.44	VQ	.	.	.	.
1.250	0.0355	0.44	VQ	.	.	.	.
1.333	0.0382	0.39	VQ	.	.	.	.
1.417	0.0409	0.39	VQ	.	.	.	.
1.500	0.0436	0.39	VQ	.	.	.	.
1.583	0.0462	0.39	VQ	.	.	.	.
1.667	0.0489	0.39	VQ	.	.	.	.
1.750	0.0516	0.39	VQ	.	.	.	.
1.833	0.0547	0.45	VQ	.	.	.	.
1.917	0.0578	0.45	VQ	.	.	.	.
2.000	0.0609	0.45	VQ	.	.	.	.
2.083	0.0644	0.51	V Q	.	.	.	.
2.167	0.0679	0.51	VQ	.	.	.	.
2.250	0.0715	0.51	VQ	.	.	.	.
2.333	0.0750	0.51	.VQ	.	.	.	.
2.417	0.0785	0.51	.VQ	.	.	.	.
2.500	0.0821	0.51	.VQ	.	.	.	.
2.583	0.0861	0.58	.VQ	.	.	.	.
2.667	0.0901	0.58	.VQ	.	.	.	.
2.750	0.0941	0.58	.VQ	.	.	.	.

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2.833      0.0985      0.64  .VQ       .         .         .         .
2.917      0.1029      0.64  .VQ       .         .         .         .
3.000      0.1073      0.64  .VQ       .         .         .         .
3.083      0.1117      0.64  .VQ       .         .         .         .
3.167      0.1162      0.64  .VQ       .         .         .         .
3.250      0.1206      0.64  .VQ       .         .         .         .
3.333      0.1250      0.64  .VQ       .         .         .         .
3.417      0.1295      0.64  .VQ       .         .         .         .
3.500      0.1339      0.64  . Q       .         .         .         .
3.583      0.1383      0.64  . Q       .         .         .         .
3.667      0.1428      0.64  . Q       .         .         .         .
3.750      0.1472      0.64  . Q       .         .         .         .
3.833      0.1521      0.71  . Q       .         .         .         .
3.917      0.1570      0.71  . Q       .         .         .         .
4.000      0.1619      0.71  . Q       .         .         .         .
4.083      0.1672      0.77  . VQ      .         .         .         .
4.167      0.1725      0.77  . VQ      .         .         .         .
4.250      0.1778      0.77  . VQ      .         .         .         .
4.333      0.1835      0.84  . VQ      .         .         .         .
4.417      0.1893      0.84  . VQ      .         .         .         .
4.500      0.1951      0.84  . VQ      .         .         .         .
4.583      0.2012      0.90  .  Q      .         .         .         .
4.667      0.2074      0.90  .  Q      .         .         .         .
4.750      0.2136      0.90  .  Q      .         .         .         .
4.833      0.2203      0.97  .  Q      .         .         .         .
4.917      0.2269      0.97  .  Q      .         .         .         .
5.000      0.2336      0.97  .  Q      .         .         .         .
5.083      0.2397      0.89  .  Q      .         .         .         .
5.167      0.2459      0.89  .  Q      .         .         .         .
5.250      0.2520      0.89  .  Q      .         .         .         .
5.333      0.2579      0.85  .  Q      .         .         .         .
5.417      0.2637      0.85  .  Q      .         .         .         .
5.500      0.2696      0.85  .  QV     .         .         .         .
5.583      0.2762      0.96  .  QV     .         .         .         .
5.667      0.2829      0.96  .  QV     .         .         .         .
5.750      0.2895      0.96  .  QV     .         .         .         .
5.833      0.2966      1.03  .   Q     .         .         .         .
5.917      0.3036      1.03  .   Q     .         .         .         .
6.000      0.3107      1.03  .   Q     .         .         .         .
6.083      0.3182      1.10  .   Q     .         .         .         .
6.167      0.3258      1.10  .   Q     .         .         .         .
6.250      0.3333      1.10  .   QV    .         .         .         .
6.333      0.3413      1.15  .   QV    .         .         .         .
6.417      0.3492      1.15  .   QV    .         .         .         .
6.500      0.3572      1.15  .   QV    .         .         .         .
6.583      0.3656      1.22  .   QV    .         .         .         .
6.667      0.3741      1.22  .   QV    .         .         .         .
6.750      0.3825      1.22  .   QV    .         .         .         .
6.833      0.3913      1.28  .    Q    .         .         .         .
6.917      0.4002      1.28  .    QV   .         .         .         .
7.000      0.4090      1.28  .    QV   .         .         .         .
7.083      0.4179      1.29  .    QV   .         .         .         .
7.167      0.4267      1.29  .    QV   .         .         .         .
7.250      0.4356      1.29  .    QV   .         .         .         .
7.333      0.4449      1.35  .    QV   .         .         .         .
7.417      0.4543      1.35  .    QV   .         .         .         .
7.500      0.4636      1.35  .    QV   .         .         .         .
7.583      0.4738      1.48  .    Q V  .         .         .         .
7.667      0.4840      1.48  .    Q V  .         .         .         .
7.750      0.4941      1.48  .    Q V  .         .         .         .
7.833      0.5052      1.61  .     QV  .         .         .         .
7.917      0.5163      1.61  .     QV  .         .         .         .
8.000      0.5273      1.61  .     QV  .         .         .         .
8.083      0.5397      1.80  .      QV .         .         .         .
8.167      0.5521      1.80  .      QV .         .         .         .
8.250      0.5645      1.80  .      QV .         .         .         .
8.333      0.5777      1.92  .      QV .         .         .         .
8.417      0.5910      1.92  .      QV .         .         .         .
8.500      0.6042      1.92  .      Q V.         .         .         .
8.583      0.6180      2.00  .      Q V.         .         .         .
8.667      0.6317      2.00  .      Q V.         .         .         .
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 8.750      0.6455      2.00  .      Q V.          .          .          .
 8.833      0.6601      2.12  .       QV.          .          .          .
 8.917      0.6747      2.12  .       Q V          .          .          .
 9.000      0.6893      2.12  .       Q V          .          .          .
 9.083      0.7053      2.32  .        QV          .          .          .
 9.167      0.7212      2.32  .        QV          .          .          .
 9.250      0.7372      2.32  .        Q V         .          .          .
 9.333      0.7544      2.50  .         QV         .          .          .
 9.417      0.7716      2.50  .         QV         .          .          .
 9.500      0.7889      2.50  .         QV         .          .          .
 9.583      0.8070      2.64  .         Q V        .          .          .
 9.667      0.8252      2.64  .         Q V        .          .          .
 9.750      0.8433      2.64  .         Q V        .          .          .
 9.833      0.8624      2.77  .         .QV        .          .          .
 9.917      0.8814      2.77  .         .Q V       .          .          .
10.000      0.9005      2.77  .         .Q V       .          .          .
10.083      0.9168      2.37  .        Q.  V       .          .          .
10.167      0.9331      2.37  .        Q.  V       .          .          .
10.250      0.9494      2.37  .        Q.   V      .          .          .
10.333      0.9630      1.97  .      Q  .   V      .          .          .
10.417      0.9765      1.97  .      Q  .   V      .          .          .
10.500      0.9901      1.97  .      Q  .   V      .          .          .
10.583      1.0057      2.27  .        Q.    V     .          .          .
10.667      1.0214      2.27  .        Q.    V     .          .          .
10.750      1.0370      2.27  .        Q.    V     .          .          .
10.833      1.0546      2.55  .         Q    V     .          .          .
10.917      1.0722      2.55  .         Q     V    .          .          .
11.000      1.0898      2.55  .         Q     V    .          .          .
11.083      1.1070      2.51  .         Q     V    .          .          .
11.167      1.1243      2.51  .         Q     V    .          .          .
11.250      1.1416      2.51  .         Q      V   .          .          .
11.333      1.1585      2.45  .        Q.      V   .          .          .
11.417      1.1754      2.45  .        Q.      V   .          .          .
11.500      1.1922      2.45  .        Q.      V   .          .          .
11.583      1.2082      2.32  .        Q.       V  .          .          .
11.667      1.2242      2.32  .        Q.       V  .          .          .
11.750      1.2402      2.32  .        Q.       V  .          .          .
11.833      1.2558      2.27  .        Q.       V  .          .          .
11.917      1.2714      2.27  .        Q.        V.          .          .
12.000      1.2870      2.27  .        Q.        V.          .          .
12.083      1.3062      2.78  .         .Q       V.          .          .
12.167      1.3253      2.78  .         .Q       V.          .          .
12.250      1.3444      2.78  .         .Q        V          .          .
12.333      1.3668      3.25  .         .  Q      V          .          .
12.417      1.3892      3.25  .         .  Q      V          .          .
12.500      1.4116      3.25  .         .  Q       V         .          .
12.583      1.4355      3.47  .         .  Q      .V         .          .
12.667      1.4594      3.47  .         .  Q      .V         .          .
12.750      1.4832      3.47  .         .  Q      . V        .          .
12.833      1.5085      3.66  .         .   Q     . V        .          .
12.917      1.5337      3.66  .         .   Q     .  V       .          .
13.000      1.5589      3.66  .         .   Q     .  V       .          .
13.083      1.5870      4.09  .         .     Q   .  V       .          .
13.167      1.6152      4.09  .         .     Q   .   V      .          .
13.250      1.6433      4.09  .         .     Q   .   V      .          .
13.333      1.6737      4.41  .         .      Q  .    V     .          .
13.417      1.7041      4.41  .         .      Q  .    V     .          .
13.500      1.7345      4.41  .         .      Q  .     V    .          .
13.583      1.7599      3.69  .         .   Q     .     V    .          .
13.667      1.7852      3.69  .         .   Q     .     V    .          .
13.750      1.8106      3.69  .         .   Q     .      V   .          .
13.833      1.8314      3.02  .         . Q         .      V  .          .
13.917      1.8523      3.02  .         . Q         .      V  .          .
14.000      1.8731      3.02  .         . Q         .       V .          .
14.083      1.8954      3.24  .         . Q         .       V .          .
14.167      1.9177      3.24  .         . Q         .       V .          .
14.250      1.9401      3.24  .         . Q         .        V.          .
14.333      1.9635      3.40  .         .  Q        .        V.          .
14.417      1.9869      3.40  .         .  Q        .        V.          .
14.500      2.0103      3.40  .         .  Q        .         V          .
14.583      2.0334      3.35  .         .  Q        .         V          .
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14.667	2.0565	3.35	. . Q . V .
14.750	2.0796	3.35	. . Q . V .
14.833	2.1022	3.29	. . Q . .V .
14.917	2.1248	3.29	. . Q . .V .
15.000	2.1475	3.29	. . Q . . V .
15.083	2.1692	3.16	. . Q . . V .
15.167	2.1910	3.16	. . Q . . V .
15.250	2.2128	3.16	. . Q . . V .
15.333	2.2337	3.03	. . Q . . V .
15.417	2.2546	3.03	. . Q . . V .
15.500	2.2755	3.03	. . Q . . V .
15.583	2.2942	2.71	. Q . . V .
15.667	2.3128	2.71	. Q . . V .
15.750	2.3315	2.71	. Q . . V .
15.833	2.3485	2.47	. Q. . . V .
15.917	2.3655	2.47	. Q. . . V .
16.000	2.3826	2.47	. Q. . . V .
16.083	2.3927	1.47	. Q . . . V .
16.167	2.4028	1.47	. Q . . . V .
16.250	2.4129	1.47	. Q . . . V .
16.333	2.4170	0.60	. Q . . . V .
16.417	2.4212	0.60	. Q . . . V .
16.500	2.4253	0.60	. Q . . . V .
16.583	2.4285	0.47	.Q . . . V .
16.667	2.4317	0.47	.Q . . . V .
16.750	2.4350	0.47	.Q . . . V .
16.833	2.4377	0.40	.Q . . . V .
16.917	2.4405	0.40	.Q . . . V .
17.000	2.4432	0.40	.Q . . . V .
17.083	2.4468	0.52	. Q . . . V .
17.167	2.4504	0.52	. Q . . . V .
17.250	2.4540	0.52	. Q . . . V .
17.333	2.4583	0.63	. Q . . . V .
17.417	2.4627	0.63	. Q . . . V .
17.500	2.4671	0.63	. Q . . . V .
17.583	2.4715	0.64	. Q . . . V .
17.667	2.4759	0.64	. Q . . . V .
17.750	2.4804	0.64	. Q . . . V .
17.833	2.4843	0.58	. Q . . . V .
17.917	2.4883	0.58	. Q . . . V .
18.000	2.4923	0.58	. Q . . . V .
18.083	2.4959	0.52	. Q . . . V .
18.167	2.4995	0.52	. Q . . . V .
18.250	2.5031	0.52	. Q . . . V .
18.333	2.5066	0.52	. Q . . . V .
18.417	2.5102	0.52	. Q . . . V .
18.500	2.5137	0.52	. Q . . . V .
18.583	2.5168	0.45	.Q . . . V .
18.667	2.5199	0.45	.Q . . . V .
18.750	2.5230	0.45	.Q . . . V .
18.833	2.5253	0.33	.Q . . . V .
18.917	2.5275	0.33	.Q . . . V .
19.000	2.5298	0.33	.Q . . . V .
19.083	2.5321	0.33	.Q . . . V .
19.167	2.5343	0.33	.Q . . . V .
19.250	2.5366	0.33	.Q . . . V .
19.333	2.5397	0.45	.Q . . . V .
19.417	2.5428	0.45	.Q . . . V .
19.500	2.5459	0.45	.Q . . . V .
19.583	2.5489	0.44	.Q . . . V .
19.667	2.5520	0.44	.Q . . . V .
19.750	2.5550	0.44	.Q . . . V .
19.833	2.5573	0.32	.Q . . . V .
19.917	2.5595	0.32	.Q . . . V .
20.000	2.5618	0.32	.Q . . . V .
20.083	2.5640	0.33	.Q . . . V .
20.167	2.5663	0.33	.Q . . . V .
20.250	2.5686	0.33	.Q . . . V .
20.333	2.5712	0.38	.Q . . . V .
20.417	2.5738	0.38	.Q . . . V .
20.500	2.5765	0.38	.Q . . . V .

20.583	2.5791	0.39	.Q	.	.	.	V .
20.667	2.5818	0.39	.Q	.	.	.	V .
20.750	2.5845	0.39	.Q	.	.	.	V .
20.833	2.5867	0.32	.Q	.	.	.	V .
20.917	2.5889	0.32	.Q	.	.	.	V .
21.000	2.5911	0.32	.Q	.	.	.	V .
21.083	2.5933	0.33	.Q	.	.	.	V .
21.167	2.5956	0.33	.Q	.	.	.	V .
21.250	2.5979	0.33	.Q	.	.	.	V .
21.333	2.6001	0.32	.Q	.	.	.	V.
21.417	2.6022	0.32	.Q	.	.	.	V.
21.500	2.6044	0.32	.Q	.	.	.	V.
21.583	2.6067	0.33	.Q	.	.	.	V.
21.667	2.6089	0.33	.Q	.	.	.	V.
21.750	2.6112	0.33	.Q	.	.	.	V.
21.833	2.6134	0.32	.Q	.	.	.	V.
21.917	2.6156	0.32	.Q	.	.	.	V.
22.000	2.6177	0.32	.Q	.	.	.	V.
22.083	2.6200	0.33	.Q	.	.	.	V.
22.167	2.6223	0.33	.Q	.	.	.	V.
22.250	2.6245	0.33	.Q	.	.	.	V.
22.333	2.6267	0.32	.Q	.	.	.	V.
22.417	2.6289	0.32	.Q	.	.	.	V.
22.500	2.6311	0.32	.Q	.	.	.	V.
22.583	2.6329	0.26	.Q	.	.	.	V.
22.667	2.6347	0.26	.Q	.	.	.	V.
22.750	2.6365	0.26	.Q	.	.	.	V.
22.833	2.6383	0.26	.Q	.	.	.	V.
22.917	2.6400	0.26	.Q	.	.	.	V.
23.000	2.6418	0.26	.Q	.	.	.	V.
23.083	2.6436	0.26	.Q	.	.	.	V.
23.166	2.6454	0.26	.Q	.	.	.	V.
23.250	2.6472	0.26	.Q	.	.	.	V.
23.333	2.6489	0.26	.Q	.	.	.	V.
23.416	2.6507	0.26	.Q	.	.	.	V.
23.500	2.6525	0.26	.Q	.	.	.	V.
23.583	2.6543	0.26	.Q	.	.	.	V.
23.666	2.6560	0.26	.Q	.	.	.	V.
23.750	2.6578	0.26	.Q	.	.	.	V.
23.833	2.6596	0.26	.Q	.	.	.	V.
23.916	2.6614	0.26	.Q	.	.	.	V.
24.000	2.6631	0.26	.Q	.	.	.	V.
24.083	2.6640	0.13	Q	.	.	.	V.
24.166	2.6649	0.13	Q	.	.	.	V.
24.250	2.6658	0.13	Q	.	.	.	V.
24.333	2.6658	0.01	Q	.	.	.	V.
24.416	2.6659	0.01	Q	.	.	.	V.
24.500	2.6660	0.01	Q	.	.	.	V.
24.583	2.6660	0.00	Q	.	.	.	V.
24.666	2.6660	0.00	Q	.	.	.	V.
24.750	2.6660	0.00	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1485.0
10%	1065.0
20%	690.0
30%	540.0
40%	480.0
50%	405.0
60%	240.0
70%	165.0
80%	60.0
90%	30.0

==========

END OF FLOODSCx ROUTING ANALYSIS

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Appendix 9: O&M

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

Appendix 10: Educational Materials

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

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.

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.

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, 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.







After the Storm



For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

EPA United States Environmental Protection Agency

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January 2003

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THE YEAR OF CLEAN WATER
Celebration of Recommitment

A Citizen's Guide to Understanding Stormwater

WHEN IT RAINS IT DRAINS

Stormwater Pollution Solutions



Residential



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

Lawn care



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

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

Septic systems



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

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

Auto care



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

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

Pet waste



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

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



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

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



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

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



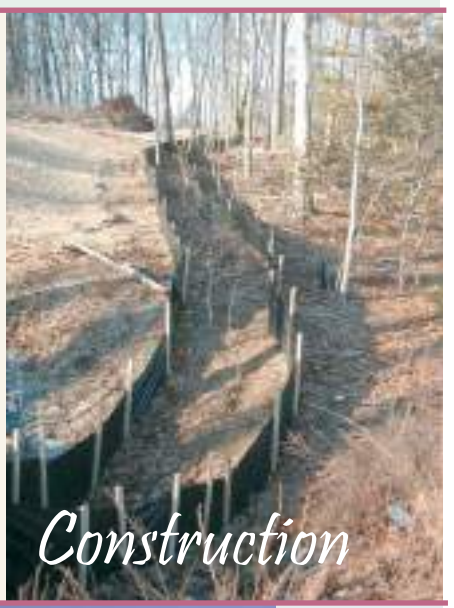
Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.



Commercial

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

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



Construction

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.



Agriculture

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



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



Forestry

Improperly managed logging operations can result in erosion and sedimentation.

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



Automotive Facilities

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

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

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities



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

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.



Landscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call
1-800-506-2555
"Only Rain Down the Storm Drain"

Important Links:

Riverside County Household Hazardous Waste Collection Information
1-800-304-2226 or www.rivcowm.org

Riverside County Backyard Composting Program
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions
www.ipm.ucdavis.edu

California Master Gardener Programs
www.mastergardeners.org
www.camastergardeners.ucdavis.edu

California Native Plant Society
www.cnps.org

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

...Only Rain Down ...the Storm Drain

What you should know for... Landscape and Gardening

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators



Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.



- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.
- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:
  - **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
  - **Biological Controls** - Use predatory insects to control harmful pests.
  - **Chemical Controls** - Check out www.ipm.ucdavis.edu before using chemicals. Remember, all chemicals should be used cautiously and in moderation.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

www.bewaterwise.com Great water conservation tips and drought tolerant garden designs.

www.ourwaterourworld.com Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
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City of Norco	(951) 270-5607
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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?

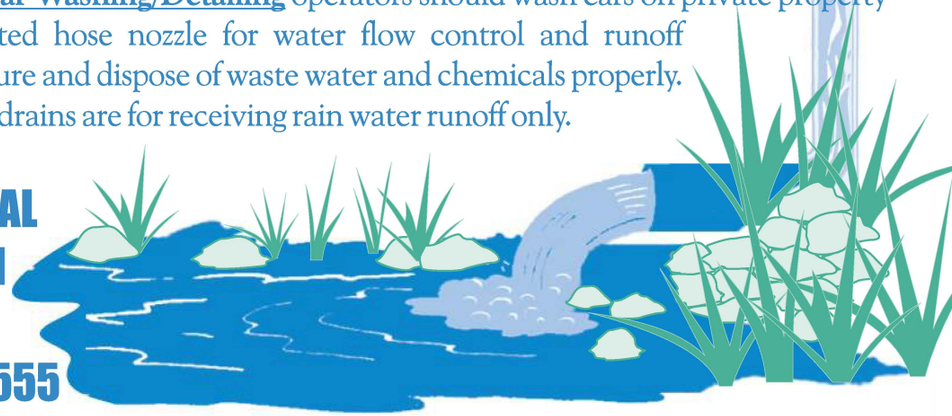
Storm drains are NOT connected to sanitary sewer systems and treatment plants!



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.

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- 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, 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.







After the Storm



For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

EPA United States Environmental Protection Agency

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January 2003

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THE YEAR OF CLEAN WATER
Celebration of Recommitment

A Citizen's Guide to Understanding Stormwater

WHEN IT RAINS IT DRAINS

Stormwater Pollution Solutions



Residential



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

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

Septic systems



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

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

Auto care



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

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

Pet waste



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

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



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

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



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

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



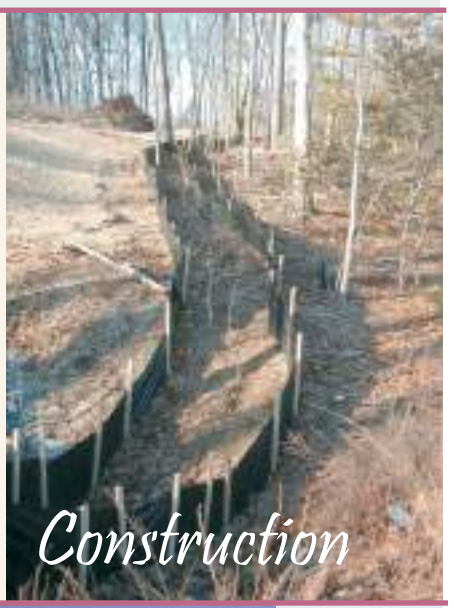
Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.



Commercial

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

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



Construction

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.



Agriculture

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



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



Forestry

Improperly managed logging operations can result in erosion and sedimentation.

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



Automotive Facilities

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

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

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities



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

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.



Landscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call
1-800-506-2555
"Only Rain Down the Storm Drain"

Important Links:

Riverside County Household Hazardous Waste Collection Information
1-800-304-2226 or www.rivcowm.org

Riverside County Backyard Composting Program
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions
www.ipm.ucdavis.edu

California Master Gardener Programs
www.mastergardeners.org
www.camastergardeners.ucdavis.edu

California Native Plant Society
www.cnps.org

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

...Only Rain Down ...the Storm Drain

What you should know for... Landscape and Gardening

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators



Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.



- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.
- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:
  - **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
  - **Biological Controls** - Use predatory insects to control harmful pests.
  - **Chemical Controls** - Check out www.ipm.ucdavis.edu before using chemicals. Remember, all chemicals should be used cautiously and in moderation.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

www.bewaterwise.com Great water conservation tips and drought tolerant garden designs.

www.ourwaterourworld.com Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
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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?

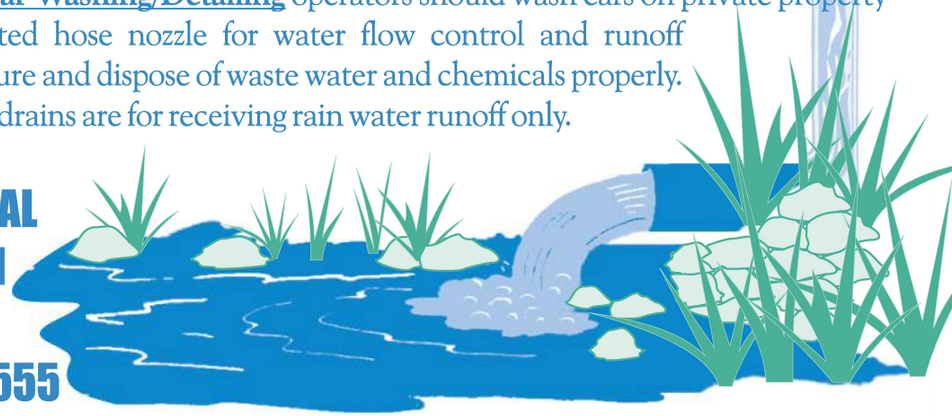
Storm drains are NOT connected to sanitary sewer systems and treatment plants!



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.

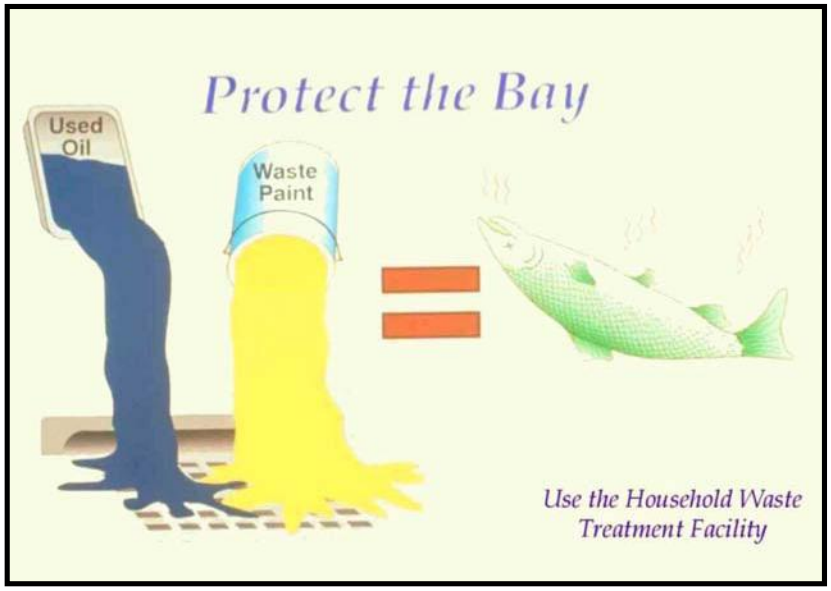
Drain Inlet Protection & Collection of Wash Water

- 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.

Non-Stormwater Discharges SC-10



Objectives

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

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

Targeted Constituents

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

Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

CASQA California Stormwater Quality Association

Pollution Prevention

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

Suggested Protocols

Recommended Complaint Investigation Equipment

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms
  - Educational materials

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.
- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled or demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

Illicit Connections

- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

Visual Inspection and Inventory

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping

- A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

Dye Testing

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Drainage System

- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Training

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.
- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.
- When a responsible party is identified, educate the party on the impacts of his or her actions.

Spill Response and Prevention

- See SC11 Spill Prevention Control and Cleanup.

Other Considerations

- Many facilities do not have accurate, up-to-date schematic drawings.

Requirements

Costs (including capital and operation & maintenance)

- The primary cost is for staff time and depends on how aggressively a program is implemented.
- Cost for containment and disposal is borne by the discharger.
- Illicit connections can be difficult to locate especially if there is groundwater infiltration.
- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

Maintenance (including administrative and staffing)

- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Further Detail of the BMP

Illegal Dumping

- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots

- Types and quantities (in some cases) of wastes
- Patterns in time of occurrence (time of day/night, month, or year)
- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

Performance Evaluation

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

References and Resources

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

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

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

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

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

Spill Prevention, Control & Cleanup SC-11



Objectives

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

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Targeted Constituents

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

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel

- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- If consistent illegal dumping is observed at the facility:
  - Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

- Routine maintenance:
  - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
  - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
  - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

  - Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).
- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.
- Clean up leaks and spills immediately.
- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to local agencies, such as the fire department; they can assist in cleanup.
- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

- Responsible parties

Training

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 6.67).

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from

tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

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

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

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

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The Stormwater Managers Resource Center http://www.stormwatercenter.net/

Contaminated or Erodible Areas SC-40

Description

Areas within an industrial site that are bare of vegetation or are subject to activities that promote the suppression of vegetation are often subject to erosion. In addition, they may or may not be contaminated from past or current activities. If the area is temporarily bare because of construction, see SC-42, Building Repair, Remodeling, and Construction. Sites with excessive erosion or the potential for excessive erosion should consider employing the soil erosion BMPs identified in the Construction BMP Handbook. Note that this fact sheet addresses soils that are not so contaminated as to exceed hazardous waste criteria (see Title 22 California Code of Regulations for Hazardous Waste Criteria).

Approach

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

Pollution Prevention

Preserve natural vegetation whenever possible. See also EC-2, Preservation of Existing Vegetation, in the Construction BMP Handbook.

Suggested Protocols

- Preserve natural vegetation.
- Analyze soil conditions.
- Re-vegetate when necessary.
- Remove contaminated soil.
- Utilize chemical stabilization when needed. See also EC-5, Soil Binders, and EC-13, Polyacrylamide, in the Construction BMP Handbook.
- Use geosynthetic membranes to control erosion if feasible. See also EC-7, Geotextiles and Mats, in the Construction BMP Handbook.

Training

Training is not a significant element of this best management practice.

Objectives

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

Targeted Constituents

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

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Other Considerations

- Disadvantages of preserving natural vegetation or revegetation include:
  - Requires substantial planning to preserve and maintain the existing vegetation
  - May not be cost-effective with high land costs
  - Lack of rainfall, inadequate irrigation and/or poor soils may limit the success of re-vegetated areas
- Disadvantages of chemical stabilization include:
  - Creation of impervious surfaces
  - May cause harmful effects on water quality
  - Is usually more expensive than vegetative cover

Requirements

Costs

Except for preservation of natural vegetation, each of the above solutions can be quite expensive depending upon the size of the area.

Maintenance

Maintenance should be minimal, except possibly if irrigation of vegetation is necessary.

Supplemental Information

Preserving Vegetation to Minimize Erosion

Preserving stabilized areas minimizes erosion potential, protects water quality, and provides aesthetic benefits. The most effective way to control erosion is to preserve existing vegetation. Preservation of natural vegetation provides a natural buffer zone and an opportunity for infiltration of stormwater and capture of pollutants in the soil matrix. This practice can be used as a permanent source control measure.

Vegetation preservation should be incorporated into the site. Preservation requires good site management to minimize the impact of construction when construction is underway and exposure of soils after construction. Proper maintenance is important to ensure healthy vegetation that can control erosion. Different species, soil types, and climatic conditions will require different maintenance activities such as mulching, fertilizing, liming, irrigation, pruning and weed and pest control. Maintenance should be performed regularly especially during construction phases.

The preferred approach is to leave as much native vegetation on-site as possible, thereby reducing or eliminating any erosion problem. However, assuming the site already has contaminated or erodible surface areas, there are four possible courses of action which can be taken:

- The area can be revegetated if it is not in use and therefore not subject to damage from site activities. In as much as the area is already devoid of vegetation, special measures are likely

necessary. Lack of vegetation may be due to the lack of water and/or poor soils. The latter can perhaps be solved with fertilization, or the ground may simply be too compacted from prior use. Improving soil conditions may be sufficient to support the recovery of vegetation. Use process wastewater for irrigation if possible. Finally, see the Construction BMP Handbook for further procedures on establishing vegetation.

- Chemical stabilization can be used as an alternate method in areas where temporary seeding practices cannot be used because of season or climate. It can provide immediate, effective, and inexpensive erosion control. Application rates and procedures recommended by the manufacturer should be followed as closely as possible to prevent the products from forming ponds and creating large areas where moisture cannot penetrate the soil. See also EC-5, Soil Binders, and EC-13, Polyacrylamide, in the Construction BMP Handbook for more information. Advantages of chemical stabilization include:

  - Applied easily to the surface
  - Stabilizes areas effectively
  - Provides immediate protection to soils that are in danger of erosion

- Contaminated soils can be removed, however this is a last resort and quite expensive. The level and extent of the contamination must be determined. This determination and removal must comply with State and Federal regulations, permits must be acquired and fees paid.

- Geosynthetics may be used. Geosynthetics include those materials that are designed as an impermeable barrier to contain or control large amounts of liquid or solid matter. Geosynthetics have been developed primarily for use in landfills and surface impoundments, and the technology is well established. There are two general types of geosynthetics: geomembranes (impermeable) and geotextiles (permeable). Geomembranes are composed of one of three types of impermeable materials: elastomers (rubbers), thermoplasics (plastics), or a combination of these two types of materials. See also EC-7, Geotextiles and Mats, in the Construction BMP Handbook for more information. The advantages of these materials include:

  - A variety of compounds are available
  - Sheeting is produced in a factory environment
  - Polymeric membranes are flexible
  - Installation is simple

  Disadvantages include:

  - Chemical resistance must be determined for each application
  - Seaming systems may be a weak link in the system
  - Many materials are subject to attack from biotic, mechanical, or environmental sources

Geotextiles are uncoated synthetic textile products that are not watertight. They are composed of a variety of materials, most commonly polypropylene and polyester. Geotextiles serve five basic functions:

- Filtration
- Drainage
- Separation
- Reinforcement
- Armoring

References and Resources

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

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

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

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

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

Building & Grounds Maintenance SC-41



Objectives

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

Targeted Constituents

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

Description

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

Approach

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

Pollution Prevention

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

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

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

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

Landscaping Activities

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

Building Repair, Remodeling, and Construction

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

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

Mowing, Trimming, and Planting

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

Fertilizer and Pesticide Management

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

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

Inspection

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

Training

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

Spill Response and Prevention

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

Other Considerations

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

Requirements

Costs

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

Maintenance

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

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

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

References and Resources

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

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

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

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

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

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

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

Building Repair and Construction SC-42



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Recycle

Targeted Constituents

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

Description

Modifications are common particularly at large industrial sites. The activity may vary from minor and normal building repair to major remodeling, or the construction of new facilities. These activities can generate pollutants including solvents, paints, paint and varnish removers, finishing residues, spent thinners, soap cleaners, kerosene, asphalt and concrete materials, adhesive residues, and old asbestos installation. Protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants to stormwater from building repair, remodeling, and construction by using soil erosion controls, enclosing or covering building material storage areas, using good housekeeping practices, using safer alternative products, and training employees.

Approach

Pollution Prevention

- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practical.
- Buy recycled products to the maximum extent practical.
- Inform on-site contractors of company policy on these matters and include appropriate provisions in their contract to ensure certain proper housekeeping and disposal practices are implemented.

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- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.

Suggested Protocols

Repair & Remodeling

- Follow BMPs identified in Construction BMP Handbook.
- Maintain good housekeeping practices while work is underway.
- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Cover materials of particular concern that must be left outside, particularly during the rainy season.
- Do not dump waste liquids down the storm drain.
- Dispose of wash water, sweepings, and sediments properly.
- Store materials properly that are normally used in repair and remodeling such as paints and solvents.
- Sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout if when repairing roofs, small particles have accumulated in the gutter. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is tight lined, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.
- Properly store and dispose waste materials generated from construction activities. See Construction BMP Handbook.
- Clean the storm drain system in the immediate vicinity of the construction activity after it is completed.

Painting

- Enclose painting operations consistent with local air quality regulations and OSHA.
- Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect water quality.
- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint containers.
- Mix paint indoors before using so that any spill will not be exposed to rain. Do so even during dry weather because cleanup of a spill will never be 100% effective.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.

- Do not transfer or load paint near storm drain inlets.
- Plug nearby storm drain inlets prior to starting painting and remove plugs when job is complete when there is significant risk of a spill reaching storm drains.
- Cover nearby storm drain inlets prior to starting work if sand blasting is used to remove paint.
- Use a ground cloth to collect the chips if painting requires scraping or sand blasting of the existing surface. Dispose the residue properly.
- Cover or enclose painting operations properly to avoid drift.
- Clean the application equipment in a sink that is connected to the sanitary sewer if using water based paints.
- Capture all cleanup-water and dispose of properly.
- Dispose of paints containing lead or tributyl tin and considered a hazardous waste properly.
- Store leftover paints if they are to be kept for the next job properly, or dispose properly.
- Recycle paint when possible. Dispose of paint at an appropriate household hazardous waste facility.

Training

Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employees can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Clean up spills immediately.
- Excavate and remove the contaminated (stained) soil if a spill occurs on dirt.

Limitations

- This BMP is for minor construction only. The State's General Construction Activity Stormwater Permit has more requirements for larger projects. The companion "Construction Best Management Practice Handbook" contains specific guidance and best management practices for larger-scale projects.
- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Be certain that actions to help stormwater quality are consistent with Cal- and Fed-OSHA and air quality regulations.

SC-42 Building Repair and Construction

Requirements

Costs

These BMPs are generally low to modest in cost.

Maintenance

N/A

Supplemental Information

Further Detail of the BMP

Soil/Erosion Control

If the work involves exposing large areas of soil, employ the appropriate soil erosion and control techniques. See the Construction Best Management Practice Handbook. If old buildings are being torn down and not replaced in the near future, stabilize the site using measures described in SC-40 Contaminated or Erodible Areas.

If a building is to be placed over an open area with a storm drainage system, make sure the storm inlets within the building are covered or removed, or the storm line is connected to the sanitary sewer. If because of the remodeling a new drainage system is to be installed or the existing system is to be modified, consider installing catch basins as they serve as effective "in-line" treatment devices. See Treatment Control Fact Sheet TC-20 Wet Pond/Basin in Section 5 of the New Development and Redevelopment Handbook regarding design criteria. Include in the catch basin a "turn-down" elbow or similar device to trap floatables.

References and Resources

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

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

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

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

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

Parking/Storage Area Maintenance SC-43



Objectives

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

Targeted Constituents

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

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)

- Keep accurate maintenance logs to evaluate BMP implementation.

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SC-43 Parking/Storage Area Maintenance

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

SC-43 Parking/Storage Area Maintenance

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

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

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

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

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Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

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

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

Drainage System Maintenance SC-44



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

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

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.

- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.

- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

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

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

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

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

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

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

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http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Landscape Maintenance SC-73



Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

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- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

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

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a know in location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.
- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.
- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

References and Resources

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. 1995. King County Surface Water Management. July. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Los Angeles County Stormwater Quality Model Programs. Public Agency Activities http://ladpw.org/wmd/npdes/model_links.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Landscaping and Lawn Care. Office of Water. Office of Wastewater Management. On-line: http://www.epa.gov/npdes/menuofbmps/poll_8.htm

Efficient Irrigation SD-12



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Maintenance Bays & Docks SD-31



Design Objectives

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

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

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

Design Considerations

Design requirements for vehicle maintenance and repair 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 requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.
- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.
- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.
- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.
- Other features may be 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.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

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.

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Maintenance Bays & Docks SD-31



Design Objectives

- Maximize Infiltration
- Provide Retention
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- Minimize Impervious Land Coverage
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- ☑ Contain Pollutants
- Collect and Convey

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

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

Design Considerations

Design requirements for vehicle maintenance and repair 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 requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.
- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.
- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.
- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.
- Other features may be 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.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

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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Trash Storage Areas SD-32

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.

Design Objectives

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

Suitable Applications

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

Design Considerations

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

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

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Other Resources

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

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

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Section 5
Monitoring, Reporting, and Program Evaluation

Conducting a monitoring program, reviewing the monitoring information, evaluating BMPs, and record keeping and reporting are all important elements of the implementation phase of the SWPPP. The success of the SWPPP depends upon the thorough implementation of the monitoring plan and evaluation of the effectiveness of the plan elements once they have been implemented.

Monitoring, Reporting, and Evaluation Elements

- Conduct monitoring program
- Conduct record keeping and reporting
- Conduct annual site evaluation
  - Review monitoring information
  - Evaluate BMPs
  - Review and revise the SWPPP as necessary

5.1 Conduct Monitoring Program

The General Permit requires that a monitoring program be a component of the SWPPP. The program has the following objectives:

- To monitor the quality of the stormwater discharge
- To aid in SWPPP implementation
- To measure the BMP effectiveness

To meet these objectives the monitoring effort has these elements:

- Training
- Visual observations
- Stormwater monitoring
- Authorized non-stormwater discharges

5.1.1 Training

Familiarity with the requirements of the stormwater monitoring plan and competence in the techniques and protocols specified in the plan are essential to ensure that stormwater samples are collected in a manner that meets the goals of the plan, while protecting the health and safety of the monitoring team members. It is recommended that all stormwater monitoring personnel receive training prior to conducting any stormwater monitoring activities. Stormwater monitoring training should include the following basic elements:

- Review of the Monitoring Plan and Health and Safety Plan

- Classroom training session
- Field training and sampling simulation (dry run)
- Annual refresher training

5.1.2 Visual Observations

Visual observations of both stormwater and non-stormwater discharges should be made at all facilities to document the presence of any discolorations, odors, floating and suspended material, oil and grease, etc., and to identify the source of any pollutants and non-stormwater flows. Visual observations should be made under the leadership of the SWPPP Leader, with appropriate members of the Pollution Prevention Team, according to the following schedule:

- All drainage areas within the facility should be checked for the presence of unauthorized non-stormwater discharges on a quarterly basis, during daylight hours, on days with no stormwater discharges.
- All authorized non-stormwater discharges and their sources should be observed quarterly during daylight hours, on days with no stormwater discharges.
- One storm event per month during the wet season (October 1-May 30) should be visually observed during the first hour of discharge at all discharge locations. These observations are only required of stormwater discharges that occur during daylight hours that are preceded by at least three working days without stormwater discharges and that occur during scheduled facility operating hours.

The results of the visual observations should be recorded and include: the date of the observation, locations observed, observations, response taken to eliminate unauthorized non-stormwater discharges, and actions taken to reduce or prevent pollutants from contacting non-stormwater or stormwater discharges. Results are included in the Annual Report.

5.1.3 Stormwater Monitoring

Each facility should either conduct an individual monitoring plan or participate in a group-sampling program. A group-monitoring program may be developed either by an entity representing a group of similar facilities or by a local stormwater agency that holds its own NPDES permit. According to the General Permit, the monitoring plan is to contain the rationale and description of the visual observation methods, location, and frequency; and the analytical methods and corresponding method detection limits used to detect constituents.

Selection of sites for industrial stormwater monitoring will depend on many factors including the following:

Representativeness

It is important to select sites that are representative of typical site operations.

- Runoff from the facility should combine to form a definable runoff stream.

- The runoff stream should represent the full range of activities at the facility.
- Runoff from the facility should not combine with runoff from other sources.
- Adequate flow volume must be available for sample collection.

Personal Safety

Development of a health and safety plan is recommended. Site selection should insure monitoring personnel from the following potential hazards:

- Traffic
- Uneven or slippery footing surface
- Poor night visibility (lighting)

Site Access

Ease of monitoring site access for monitoring personnel and vehicles parking is essential. Also, for sites that require installation of sample collection or flow metering equipment, adequate equipment access for maintenance and monitoring activities must be available.

Equipment Security

Permanently installed monitoring equipment must be located at a site that will minimize potential vandalism and other possible damage.

Adequate Flow Volume

Monitoring sites should be configured such that adequate flow volume is present for sample collection. Hydraulic conditions should be well mixed and free flowing.

Utility Access

If automated monitoring equipment is required, electrical power should be readily available at selected monitoring sites. Additionally, telephone service may be required for off-site station controlling and data transfer.

Stormwater samples should be collected during the first hour of discharge from (1) the first storm event of the wet season, and (2) at least one other storm event in the wet season. If the first event is missed, sampling of two events during the wet season is still required. Furthermore, a justification for failing to sample the first event should be provided in the Annual Report. Sample collection is only required of stormwater discharges that occur during scheduled facility operating hours and that are preceded by at least three working days without stormwater discharge. Sample collection is not required if dangerous weather conditions are present (e.g., flooding, electrical storm, etc.), when stormwater discharges begin after scheduled facility operating hours or when stormwater discharges are not preceded by three working days without discharge. When the required samples are not collected due to these exceptions, an explanation must be provided in the Annual Report. Visual observations and sample collection may be conducted more than one hour after discharge begins if it is determined that the

monitoring objectives will be better satisfied. If this occurs, an explanation should be provided in the Annual Report.

Specific sampling and analysis requirements include the following:

- All sampling and sample preservation should be in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater".
- All monitoring instruments and equipment should be calibrated and maintained in accordance with manufacturers' specifications to ensure accurate measurements.
- All laboratory analyses should be conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified by the RWQCB.
- Analyze samples for total suspended solids (TSS), pH, specific conductance, and total organic carbon (TOC). Oil and grease (O&G) may be substituted for TOC.
- Analyze toxic chemicals and other pollutants that are likely to be present in stormwater discharges. Any of these pollutants that are not detected in significant quantities after two consecutive sampling events may be eliminated from future sampling analysis until the pollutant is likely to be present again. (According to the definitions section of the General Permit, "significant quantities" is defined as the volume, concentration, or mass of a pollutant that can cause or threaten to cause pollution, contamination, or nuisance; adversely impact human health or the environment; and/or cause or contribute to a violation of any applicable water quality standards for the receiving water.)
- Other analytical parameters should be included based on the facility's standard industrial classification (see Table D of the General Permit).

Rules to Follow to Reduce Potential Sample Contamination

1. No smoking.
2. Never sample near a running vehicle. Do not park vehicles in immediate sample collection area (even non-running vehicles)
3. Always wear clean, powder-free nitrile gloves when handling composite bottles, lids, sterile grab sample bottles, tubing, or strainers.
4. Never touch the inside surface of a sample bottle or lid, even with gloved hands.
5. Never touch the exposed end of a sampling tube.
6. Never allow the inner surface of a sample bottle, lid, or sampling tube to be contacted by any material other than the sample water.
7. Never allow any object or material to fall into or contact the collected sample water.
8. Avoid allowing rain water to drip from rain gear or other surfaces into sample bottles.
9. Do not eat or drink during sample collection.
10. Do not breathe, sneeze or cough in the direction of an open sample bottle.

In addition to the requirements above, which are outlined in the General Permit, the following procedures are recommended to maximize the ability of sampling personnel to collect samples reliably and with minimal sample contamination.

- Before stormwater samples are collected, personnel must ensure the safety of such activities at each sampling location.

- Select the appropriate sample bottles and equipment for each parameter to be measured. As general guidelines, all sampling equipment and sample bottles used for trace metals determination should be nonmetallic and free from any material that may contain metals. Only high-density plastic or Teflon containers should be used for metals analytical sample storage bottles. All sampling equipment and sample bottles used for trace organics determination should be glass or Teflon. Nutrients and most "conventional" parameters may be sampled using plastic or glass bottles.

- Employ "clean" sampling techniques to minimize potential sources of sample contamination, particularly from trace pollutants. Experience has shown that when clean sampling techniques are used, detected concentrations of constituents tend to be lower.

5.2 Conduct Record Keeping and Reporting

Records of all stormwater monitoring information, inspections and visual observations, certifications, corrective actions and follow-up activities, and copies of all reports should be retained for a period of at least five years. These records should include:

- The date, place, and time of site inspections, sampling, visual observations, and measurements

- The individual(s) who performed the site inspections, sampling, visual observations, and measurements

- Flow measurements or estimates (as required by Section B.6 of the General Permit)

- The date and approximate time of analyses

- The individual who performed the analyses

- Analytical results, method detection limits, and the analytical techniques or methods used

- Quality assurance and quality control records and results

- Non-stormwater discharge inspections and visual observations and stormwater discharge visual observation records

- Visual observations and sample collection exception records

- All calibration and maintenance records of onsite instruments used

- All sampling and analysis exemption and reduction certifications and supporting documentation

- The records of any corrective actions and follow-up activities that resulted from the visual observations

It is also recommended that information regarding the rain event be collected. A nearby recording gage should be identified and used to document the start and stop times and date of precipitation event. Some industries may want to consider installing a recording gage at the monitoring site.

Photographs can be useful. Also keep a record of maintenance activities or any other BMPs that are of an "action" nature. It is easy to demonstrate that a BMP that involves a physical change, such as berming or covering, has been accomplished. But actions that relate to good housekeeping can only be demonstrated by record keeping. Keeping a record of catch basin cleaning, for example, also provides insight into how soon it takes for the catch basin sump to refill.

An Annual Report including the items listed below should be submitted by July 1 of each year to the Executive Officer of the appropriate RWQCB.

- Summary of visual observations and sampling results

- Evaluation of the visual observations and sampling and analysis results

- Documentation that the BMPs in the SWPPP are being implemented and properly maintained as necessary

- Laboratory reports (including detection limits for each analytical parameter)

- The Annual Comprehensive Site Compliance Evaluation Report (as described below)

- Documentation, including the justification, of any deviations from the General Permit requirements (if not already included in the Evaluation Report)

- Records

- Detection limits for each analytical parameter

5.3 Conduct Annual Site Evaluation

All facilities should conduct an annual comprehensive site compliance evaluation. It may be helpful to involve the Pollution Prevention Team (PPT) in this effort (see Section 2). The SWPPP should be revised within 90 days of the evaluation based on the evaluation and the revisions implemented. Evaluations should include the following:

- A review of the results of visual inspections of potential pollutant sources for evidence of, or the potential for, pollutants entering the drainage system

- A review of visual observation records, inspection records, and sampling and analysis results
- A review and evaluation of each BMP to determine whether it is adequate, properly implemented, and maintained
- A review of site activities to ascertain if change has occurred, and if so, whether new or modified BMPs are needed
- A review of the list of significant materials to ascertain if the list has changed, and if so, whether new or modified BMPs are needed
- A review of spills that have occurred over the past 12 months, with a determination of cause(s) and possible solutions, including modified or new BMPs
- A determination of whether each BMP must be modified, replaced, and whether additional BMPs are needed
- An evaluation report