

# MOJAVE RIVER WATERSHED

## Water Quality Management Plan

For:

### Tract 20500

APN: 3103-551-05, LOTS 1-210

Prepared for:

LEU, LIU & ASSOCIATES

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Prepared by:

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Final Approval Date: \_\_\_\_\_

## Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for Leu, Liu and Associates by Ludwig Engineering, Associates, Inc. The WQMP is intended to comply with the requirements of the City of Victorville and the Phase II Small MS4 General Permit for the Mojave River Watershed. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Hesperia and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the city/county/town shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

“I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors.”

Project Data			
Permit/Application Number(s):	PSUB21-00075	Grading Permit Number(s):	TBA
Tract/Parcel Map Number(s):	TRACT 20500	Building Permit Number(s):	TBA
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 3103-551-05, Lots 1-210
Owner's Signature			
<b>Owner Name:</b> David Liu			
Title			
Company	Leu, Liu and Associates		
Address	1803 Virginia Road San Marino, CA 91108		
Email	davidmcliu@gmail.com		
Telephone #	(626) 695-5222		
Signature			Date

### Preparer's Certification

Project Data			
Permit/Application Number(s):	PSUB21-00075	Grading Permit Number(s):	TBA
Tract/Parcel Map Number(s):	TRACT 20500	Building Permit Number(s):	TBA
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 3103-551-05, Lots 1-210

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of the California State Water Resources Control Board Order No. 2013-0001-DWQ.

<b>Engineer:</b> Jeff Ashbaker		PE Stamp Below
Title	Lead Engineer	
Company	Ludwig Engineering, Associates, Inc.	
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Telephone #	(909) 884-8217	
Signature		
Date		

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## Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: <http://cms.sbcounty.gov/dpw/Land/NPDES.aspx> to find pertinent arid region and Mojave River Watershed specific references and requirements.

## Section 1 Discretionary Permit(s)

<b>Form 1-1 Project Information</b>					
Project Name		TRACT 20500			
Project Owner Contact Name:		David Liu			
Mailing Address:	1803 Virginia Road, San Marino, CA, 91108	E-mail Address:	davidmcliu@gmail.com	Telephone:	(626) 695-5222
Permit/Application Number(s):		PSUB21-00075	Tract/Parcel Map Number(s):	TRACT 16681	
Additional Information/ Comments:		The entire tract will be draining to two infiltration basins to store the 2yr-24hr storm event and mitigate the difference between the Pre and Post 100yr volume runoff.			
Description of Project:		The Property is currently vacant and not in use. The project is bounded on the north by Seneca Road, on the east by Mesa Linda Drive, on the south by Begonia Road, and on the west by Cantina Drive. Propose land use is Residential (R-1) development.			
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.		Project requires WQMP due to a new development containing more than 5,000 square feet of impervious surfaces.			

## Section 2 Project Description

### 2.1 Project Information

The WQMP shall provide the information listed below. The information provided for Conceptual/Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

#### 2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

<b>Form 2.1-1 Description of Proposed Project</b>					
<b>1</b> Regulated Development Project Category (Select all that apply):					
<input checked="" type="checkbox"/> #1 New development involving the creation of 5,000 ft <sup>2</sup> or more of impervious surface collectively over entire site	<input type="checkbox"/> #2 Significant re-development involving the addition or replacement of 5,000 ft <sup>2</sup> or more of impervious surface on an already developed site	<input type="checkbox"/> #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	<input type="checkbox"/> #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface		
<input type="checkbox"/> Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) <i>Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.</i>					
<b>2</b> Project Area (ft <sup>2</sup> ):	2,377,155	<b>3</b> Number of Dwelling Units:	210	<b>4</b> SIC Code:	1521
<b>5</b> Is Project going to be phased? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.</i>					

## 2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

### Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

Owner (listed below) will be solely responsible for all BMP's Operation and Maintenance as specified in Section 5 of this report. Each individual homeowner will be responsible for management and maintenance of down-spouts, drainage swales, and all storm drain features within their property.

David Liu

Leu, Liu and Associates

1803 Virginia Road, San Marino, CA 91108

(626) 695-5222

No stormwater infrastructure on site is to be transferred to the City of Victorville.

## 2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 in the TGD for WQMP).

<b>Form 2.3-1 Pollutants of Concern</b>			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
	E <input type="checkbox"/>	N <input type="checkbox"/>	
Pathogens (Bacterial / Virus)	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources include animal waste.
Nutrients - Phosphorous	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources from urban runoff include fertilizers and eroded soils.
Nutrients - Nitrogen	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources from urban runoff include fertilizers and eroded soils.
Noxious Aquatic Plants	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources from urban runoff include fertilizers and eroded soils.
Sediment	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources include eroded soils.
Metals	E <input type="checkbox"/>	N <input checked="" type="checkbox"/>	Not expected per Table 3-3 in TGD for WQMP.
Oil and Grease	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources include petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.
Trash/Debris	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources include paper, plastic, polystyrene packing foam, and aluminum materials.
Pesticides / Herbicides	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources include fertilizers and pest sprays
Organic Compounds	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected per Table 3-3 in TGD for WQMP. Sources include solvents and cleaning compounds.
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	

## Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMPs through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed Drainage Management Areas (DMAs)) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet. A map presenting the DMAs must be included as an appendix to the WQMP document.***

Form 3-1 Site Location and Hydrologic Features			
Site coordinates <i>take GPS measurement at approximate center of site</i>	Latitude 34°31'4.4"	Longitude -117°23'13.9"	Thomas Bros Map page: 4385 C-1
<p><sup>1</sup> San Bernardino County climatic region: <input checked="" type="checkbox"/> Desert</p>			
<p><sup>2</sup> Does the site have more than one drainage area (DA): Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached</i></p>			
<pre> graph TD     DA_A[DA-A] --&gt; IB1[INFILTRATION BASIN 1]     IB1 --&gt; PD1[PARKWAY DRAIN 1]     PD1 --&gt; OF[OVERFLOW TO SENECA ROAD]     DA_B[DA-B] --&gt; IB2[INFILTRATION BASIN 2]     IB2 --&gt; PD2[PARKWAY DRAIN 2]     PD2 --&gt; OF             </pre>			
Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA		
	<i>Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property</i>		
DA-A to Outlet 1	DA-A street flows to Infiltration Basin 1 in Lot F, which overflows to Seneca Road		
DA-B to Outlet 2	DA-B street flows to Infiltration Basin 2 in Lot G, which overflows to Seneca Road		

<b>Form 3-2 Existing Hydrologic Characteristics</b>				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DA A	DA B	DMA C	DMA D
<b>1</b> DMA drainage area (ft <sup>2</sup> )	1,382,062	995,093		
<b>2</b> Existing site impervious area (ft <sup>2</sup> )	0	0		
<b>3</b> Antecedent moisture condition <i>For desert areas, use <a href="http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf">http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf</a></i>	2	2		
<b>4</b> Hydrologic soil group <i>Refer to County Hydrology Manual Addendum for Arid Regions – <a href="http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf">http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf</a></i>	A	A		
<b>5</b> Longest flowpath length (ft)	1736	1402		
<b>6</b> Longest flowpath slope (ft/ft)	0.0128	0.0126		
<b>7</b> Current land cover type(s) <i>Select from Fig C-3 of Hydrology Manual</i>	Undeveloped	Undeveloped		
<b>8</b> Pre-developed pervious area condition: <i>Based on the extent of wet season vegetated cover good &gt;75%; Fair 50-75%; Poor &lt;50% <b>Attach photos of site to support rating</b></i>	Fair	Fair		



<b>Form 3-3 Watershed Description for Drainage Area</b>	
<p>Receiving waters</p> <p>Refer to SWRCB site:</p> <p><a href="http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml">http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml</a></p>	<p>Mojave River (Upper Narrows to Lower Narrows to Below Lower Narrows)</p>
<p>Applicable TMDLs</p> <p><a href="http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml">http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml</a></p>	<p>Boron, Chloride, Disolved Oxygen, Fluoride, MTBE, Nitrate, Nitrite, Phosphate, Phosphorous, Sulfates, Total Dissolved Solids</p>
<p>303(d) listed impairments</p> <p><a href="http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml">http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml</a></p>	<p>Fluoride, Sulfates, Total Dissolved Solids</p>
<p>Environmentally Sensitive Areas (ESA)</p> <p>Refer to Watershed Mapping Tool –</p> <p><a href="http://sbcounty.permitrack.com/WAP">http://sbcounty.permitrack.com/WAP</a></p>	<p>Desert Tortoise Habitat, Mojave Ground Squirrel</p>
<p>Hydromodification Assessment</p>	<p><input checked="" type="checkbox"/> Yes Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal</p> <p><input type="checkbox"/> No</p>

## Section 4 Best Management Practices (BMP)

### 4.1 Source Control BMPs and Site Design BMP Measures

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

#### 4.1.1 Source Control BMPs

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

<b>Form 4.1-1 Non-Structural Source Control BMPs</b>				
Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Project conditions of approval will require that the POA periodically provide environmental awareness education materials, made available by the municipalities, to all members. Among other things, these materials will describe the use of chemicals (including household type) that should be limited to the property, with the discharge of wastes via hosing or other direct discharge to gutters, catch basins and storm drains. Educational materials available from the San Bernadino Stormwater Program and can be downloaded at: <a href="http://www.sbcountystormwater.org/gov_out.html">http://www.sbcountystormwater.org/gov_out.html</a>
N2	Activity Restrictions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The types of activities allowed within the project will be limited to those allowed by the City of Victorville codes, regulations, and zoning ordinances.
N3	Landscape Management BMPs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Landscape plans will be consistent with the County of Victorville requirements for water conservation vegetation and will conform to CASQA BMP SC-73
N4	BMP Maintenance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Maintenance of BMPs implemented at the project shall be performed at the frequency prescribed in this WQMP Form 5-1. Records of inspections and maintenance shall be maintained by the Owner and documented with the WQMP, and shall be available for review upon request.
N5	Title 22 CCR Compliance (How development will comply)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No hazardous materials to be allowed for this project
N6	Local Water Quality Ordinances	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No Ordinances apply
N7	Spill Contingency Plan	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Does not apply to this land use.
N8	Underground Storage Tank Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project does not feature underground storage tanks

**Form 4.1-1 Non-Structural Source Control BMPs**

N9	Hazardous Materials Disclosure Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This project does not feature hazardous materials
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<b>Form 4.1-1 Non-Structural Source Control BMPs</b>				
Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This project does not feature hazardous materials.
N11	Litter/Debris Control Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Property owner will implement a litter control program for common areas in conformance to CASQA BMP SC-60. Owner will contract with the City of Victorville or a local trash collector to empty dumpsters and trash bins on a weekly basis.
N12	Employee Training	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The owner will not be hiring employees
N13	Housekeeping of Loading Docks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	This project does not feature loading docks.
N14	Catch Basin Inspection Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Catch basins will be visually inspected per CASQA BMP SC-74 on a montly basis. The storm drain system will be inspected and cleaned prior to the start of the rainy season.
N15	Vacuum Sweeping of Private Streets and Parking Lots	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Private streets will be vacuum swept per CASQA BMP SC-70 as waste accumulates. The streets will be cleaned prior to the start fo the rainy season.
N16	Other Non-structural Measures for Public Agency Projects	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not a public agency project
N17	Comply with all other applicable NPDES permits	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No other NPDES permits applicable to this project.

<b>Form 4.1-2 Structural Source Control BMPs</b>				
Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Storm drain system stencilly and signage will be in conformance with CASQA BMP SD-13
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Outdoor material storage prohibited.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Public trash enclosures will be in conformance with CASQA BMP SD-32. Trash containers will be required to have a lid and be located away from storm drain inlets.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Irrigation systems will be designed to each landscaped area's specific water need in conformance with CASQA BMP SD-12. The irrigation system will be inspected for leaks and adjusted to prevent overwatering on a monthly basis.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1-2" will be provided between top of curb/sidewalk and finish grade in landscape areas
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Site contains no slopes or channels
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project does not include Dock Areas
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project does not include maintenace bays
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Vehicle washing prohibited
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Outdoor processing prohibited

<b>Form 4.1-2 Structural Source Control BMPs</b>				
Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Equipemnt washing prohibited.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project does not include fueling areas
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project does not include hillside landscaping
S14	Wash water control for food preparation areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No food preparation on site.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project does not include community car wash racks

### 4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

<b>Form 4.1-3 Site Design Practices Checklist</b>
<p>Site Design Practices <i>If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets</i></p>
<p>Minimize impervious areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>                      Explanation: A large amount of permeable landscaping is included in the site design. Sidewalks and streets area designed to minimum widths allowed under city ordinance.</p>
<p>Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>                      Explanation: Project is proposing infiltration basins BMPs onsite.</p>
<p>Preserve existing drainage patterns and time of concentration: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                      Explanation: Site will be completely regraded to suit project purposes</p>
<p>Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                      Explanation: Runoff wil flow through streets to infiltration basin BMPs.</p>
<p>Use of Porous Pavement.: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                      Explanation: Porous pavements will not be utilized</p>
<p>Protect existing vegetation and sensitive areas: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>                      Explanation: Existing vegetation will be removed during grading operations</p>
<p>Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>                      Explanation: Some areas will be re-vegetated using drought tolerant plants</p>



Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: Infiltration basin areas will be staked off after grading operations to prevent unnecessary compaction.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Explanation: Project does not include rock-lined drainage swales. Most runoff is carried by streets to infiltration area
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Explanation: Over-compaction will be avoided in landscaped areas
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Explanation: No provisions for rain barrels are made on a project-wide basis. Owner may implement at their discretion
Stream Setbacks. Includes a specified distance from an adjacent stream: : Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Explanation: Stream setbacks do not apply to this project

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

**San Bernardino County Special Districts:**

Guide to High Desert Landscaping -

<http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795>

Recommended High-Desert Plants -

<http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553>

**Mojave Water Agency:**

Desert Ranch: <http://www.mojavewater.org/files/desertranchgardenprototype.pdf>

Summertree: <http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf>

Thornless Garden: <http://www.mojavewater.org/files/thornlessgardenprototype.pdf>

Mediterranean Garden: <http://www.mojavewater.org/files/mediterraneangardenprototype.pdf>

Lush and Efficient Garden: <http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf>

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – <http://hdawac.org/save-outdoors.html>

## 4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evapotranspire, and/or bioretain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

### 4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection from hydromodification.

***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

***It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the  $P_6$  method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi<sup>2</sup>), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA-A)	
<b>1</b> Project area DA 1 (ft <sup>2</sup> ): <p style="text-align: center;">773,917</p>	<b>2</b> Imperviousness after applying preventative site design practices (Imp%): 52.2
<b>3</b> Runoff Coefficient (Rc): <u>  </u> 0.395 $R_c = 0.858(Imp\%)^{0.3} - 0.78(Imp\%)^{0.2} + 0.774(Imp\%) + 0.04$	
<b>4</b> Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in): 0.372 <a href="http://hdsc.nws.noaa.gov/hdsc/pfds/so/sca_pfds.html">http://hdsc.nws.noaa.gov/hdsc/pfds/so/sca_pfds.html</a>	
<b>5</b> Compute $P_6$ , Mean 6-hr Precipitation (inches): 0.46 <i><math>P_6 = \text{Item 4} * C_1</math>, where <math>C_1</math> is a function of site climatic region specified in Form 3-1 Item 1 ( Desert = 1.2371)</i>	
<b>6</b> Drawdown Rate Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.	24-hrs <input type="checkbox"/> 48-hrs <input checked="" type="checkbox"/>
<b>7</b> Compute design capture volume, DCV (ft <sup>3</sup> ): 21,988 $DCV = 1/12 * [\text{Item 1} * \text{Item 3} * \text{Item 5} * C_2]$ , where $C_2$ is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2	

Hydromodification for DA-A is handled by utilizing an infiltration/retarding basin. See drainage study for analysis of Basin 1

Form 4.2-2 Summary of Hydromodification Assessment (DA A)			
Is the change in post- and pre- condition flows captured on-site? : Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below ( <i>Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1</i> ) If "No," then proceed to Section 4.3 BMP Selection and Sizing			
Condition	Runoff Volume (ft <sup>3</sup> )	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	<i>Form 4.2-3 Item 12</i>	<i>Form 4.2-4 Item 13</i>	<i>Form 4.2-5 Item 10</i>
Post-developed	<i>Form 4.2-3 Item 13</i>	<i>Form 4.2-4 Item 14</i>	<i>Form 4.2-5 Item 14</i>
Difference	<i>Item 4 – Item 1</i>	<i>Item 2 – Item 5</i>	<i>Item 6 – Item 3</i>
Difference (as % of pre-developed)	<i>Item 7 / Item 1</i>	<i>Item 8 / Item 2</i>	<i>Item 9 / Item 3</i>

<b>Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA B)</b>	
<b>1</b> Project area DA 2 (ft <sup>2</sup> ):  1,603,238	<b>2</b> Imperviousness after applying preventative site design practices (Imp%):  52.2
<b>3</b> Runoff Coefficient (Rc): <u>  </u> 0.354 $R_c = 0.858(Imp\%)^{0.3} - 0.78(Imp\%)^{0.2} + 0.774(Imp\%) + 0.04$	
<b>4</b> Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in): 0.372 <a href="http://hdsc.nws.noaa.gov/hdsc/pfds/so/sca_pfds.html">http://hdsc.nws.noaa.gov/hdsc/pfds/so/sca_pfds.html</a>	
<b>5</b> Compute $P_6$ , Mean 6-hr Precipitation (inches): 0.46 <i><math>P_6 = \text{Item 4} * C_1</math>, where <math>C_1</math> is a function of site climatic region specified in Form 3-1 Item 1 ( Desert = 1.2371)</i>	
<b>6</b> Drawdown Rate  Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.	24-hrs <input type="checkbox"/> 48-hrs <input checked="" type="checkbox"/>
<b>7</b> Compute design capture volume, DCV (ft <sup>3</sup> ): 42,669 $DCV = 1/12 * [\text{Item 1} * \text{Item 3} * \text{Item 5} * C_2]$ , where $C_2$ is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2	

**SEE ATTACHED RATIONAL METHOD AND UNIT HYDROGRAPHS**

<b>Form 4.2-2 Summary of Hydromodification Assessment (DA B)</b>			
Is the change in post- and pre- condition flows captured on-site? : Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below ( <i>Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1</i> )			
If "No," then proceed to Section 4.3 BMP Selection and Sizing			
Condition	Runoff Volume (ft <sup>3</sup> )	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	<i>Form 4.2-3 Item 12</i>	<i>Form 4.2-4 Item 13</i>	<i>Form 4.2-5 Item 10</i>
Post-developed	<i>Form 4.2-3 Item 13</i>	<i>Form 4.2-4 Item 14</i>	<i>Form 4.2-5 Item 14</i>
Difference	<i>Item 4 – Item 1</i>	<i>Item 2 – Item 5</i>	<i>Item 6 – Item 3</i>
Difference (as % of pre-developed)	<i>Item 7 / Item 1</i>	<i>Item 8 / Item 2</i>	<i>Item 9 / Item 3</i>

## HYDROMODIFICATION

Most of the forms related to hydromodification are not used. Some of these forms serve the purpose of determining if hydromodification is needed for the project, and the some of the forms are for determining the type and size of the hydromodification BMPs if it is determined that hydromodification is needed.

The City of Victorville requires that post-development peak storm runoff does not exceed pre-development peak storm runoff for the 10-year and 100-year storm events. Therefore, there is no need to make a separate determination as to whether or not hydromodification is required.

As to determining the type and size of the facilities needed to retain the excess peak flows from the development, standard engineer methods were used, i.e., detention basins were determined to be the most economical way to attenuate the peak flows, and a basin routing analysis using San Bernardino County Hydrology Manual methodology was used to verify the basin design.

In place of the WQMP template hydromodification forms, some selected pages from the project drainage study is inserted following this page. The full drainage study is also available for reference.

Selected pages from the Drainage Study are as follows:

1. Section 4 of the Study
2. Pages from the computer analyses showing pre-development peak flow and post-development peak flow for the 100-year storm
3. Appendix , a conceptual basin design drawing.

- Rainfall data - NOAA Atlas 14, Volume 6, Version 2
- Antecedent Moisture Condition (AMC) – ADD-1.PDF (sbcouny.gov)
- Hydrologic Soil Group - NRCS Custom Soil Resource Report for San Bernardino County, California, Mojave River Area:

These sources are provided in Appendix A. Computer output files for pre-developed and post developed conditions are provided in Appendix B and C respectively.

#### 4.0 On-Site Runoff

##### 4.1 Pre-Developed Conditions

For pre-developed conditions, the property was divided into two drainage areas, “A” and “B”. Drainage area “A” encompasses approximately 32 acres in the West half of the property, and Drainage Area “B” encompasses the remaining 23 acres in the East half of the property. Both drainage areas surface flow from the Southern boundary to the Northern boundary of the property. Hydrographs for the 10-year and 100-year storms for each drainage area were developed using CivilD, and the peak runoff values are summarized in Table 1 below. The pre-developed Hydrology Map is provided in Appendix G.

**Table 1 – Pre-Developed Conditions Peak Runoff**

Drainage Area	10-Year Peak Runoff (CFS)	100-Year Peak Runoff (CFS)
A	15.86	39.23
B	14.07	28.57
Totals	29.93	67.80

##### 4.2 Post-Developed Conditions

For post-developed conditions, the property was also divided into two drainage areas, “A” and “B”.

Runoff from Drainage Area “A” terminates at Basin 1 in Lot F near the midpoint of the North property boundary. Runoff from Drainage Area “B” terminates at Basin 2 in Lot G near the Northeast corner of the Project. A hydrograph for the 10-year and 100-year storms for each drainage area was developed using CivilD, and the peak runoff values are summarized in Table 2 below. The post-developed Hydrology Map is provided in Appendix I.

**Table 2 – Post-Developed Conditions Peak Runoff**

Drainage Area	10-Year Peak Runoff (CFS)	100-Year Peak Runoff (CFS)
A	21.57	36.73
B	44.26	76.09
Totals	65.83	112.82

#### 4.2.1 Basin Design

Basins 1 and 2 serve as both retention and detention basins. The lower portion of the basins, below the outlets, retain runoff for infiltration purposes in accordance with the requirements of the WQMP. The upper portion of the basins, above the outlets, detain runoff, but allows runoff to drain slowly in order to attenuate peak flows.

The required retention water volume is based on the Design Capture Volume (DCV) as determined using procedures specified in the WQMP. For Basin 1, the DCV is 21,988 cubic feet, and for Basin 2, the DCV is 42,669 cubic feet. Both basins were designed such that the outlets are above the water levels corresponding to the DCV.

The CivilD basin routing routine was used to confirm that the basins will satisfactorily attenuate the peak 10-year and 100-yr peak runoff. The routing routine uses the hydraulic characteristics of the basin outlet, and water depth to calculate the discharge at various depth increments. A summary of the basin peak outflows is provided in Table 3 below:

**Table 3 – Basin Peak Outflows**

Basin	10-Year Peak Outflow (CFS)	100-Year Peak Outflow (CFS)
1	10.11	16.81
2	19.71	35.49
Totals	29.82	52.30

The post-development basin peak outflows are less than the pre-development peak runoff for both 10-year and 100-year storms. CivilD output files for the basin routing are provided in Appendix D and a conceptual basin design plan is provided in Appendix K.

It should be noted that the Westerly part of Basin 2 serves the dual purpose of a basin and a park.

pre-developed Subarea A

14+30	1.6731	2.51	Q	V		
14+35	1.6908	2.58	Q	V		
14+40	1.7090	2.64	Q	V		
14+45	1.7277	2.71	Q	V		
14+50	1.7470	2.79	Q	V		
14+55	1.7668	2.88	Q	V		
15+ 0	1.7872	2.97	Q	V		
15+ 5	1.8083	3.07	Q	V		
15+10	1.8302	3.18	Q	V		
15+15	1.8529	3.30	Q	V		
15+20	1.8766	3.43	Q	V		
15+25	1.9012	3.58	Q	V		
15+30	1.9267	3.71	Q	V		
15+35	1.9532	3.84	Q	V		
15+40	1.9802	3.92	Q	V		
15+45	2.0076	3.98	Q	V		
15+50	2.0362	4.15	Q	V		
15+55	2.0672	4.51	Q	V		
16+ 0	2.1034	5.26	Q	V		
16+ 5	2.1582	7.96	Q	V		
16+10	2.2496	13.27		Q	V	
16+15	2.3854	19.72			VQ	
16+20	2.6058	32.00			V	Q
<b>16+25</b>	<b>2.8760</b>	<b>39.23</b>			<b>v</b>	<b>Q</b>
16+30	3.0843	30.25				V Q
16+35	3.2392	22.49			Q	V
16+40	3.3578	17.22				V
16+45	3.4580	14.55		Q		V
16+50	3.5441	12.50		Q		V
16+55	3.6199	11.00		Q		V
17+ 0	3.6861	9.62		Q		V
17+ 5	3.7457	8.65		Q		V
17+10	3.7999	7.87		Q		V
17+15	3.8501	7.29		Q		V
17+20	3.8959	6.65		Q		V
17+25	3.9372	6.00		Q		V
17+30	3.9747	5.44		Q		V
17+35	4.0102	5.16		Q		V
17+40	4.0434	4.82	Q			V
17+45	4.0747	4.55	Q			V
17+50	4.1042	4.27	Q			V
17+55	4.1312	3.92	Q			V
18+ 0	4.1572	3.77	Q			V
18+ 5	4.1817	3.56	Q			V
18+10	4.2046	3.33	Q			V
18+15	4.2268	3.23	Q			V
18+20	4.2476	3.01	Q			V
18+25	4.2676	2.91	Q			V
18+30	4.2871	2.82	Q			V
18+35	4.3049	2.60	Q			V
18+40	4.3224	2.54	Q			V
18+45	4.3399	2.53	Q			V
18+50	4.3573	2.54	Q			V
18+55	4.3746	2.50	Q			V



pre-developed Subarea B

14+50	1.2812	2.06	Q		V			
14+55	1.2959	2.13	Q		V			
15+ 0	1.3110	2.20	Q		V			
15+ 5	1.3266	2.27	Q		V			
15+10	1.3429	2.36	Q		V			
15+15	1.3597	2.45	Q		V			
15+20	1.3773	2.55	Q		V			
15+25	1.3956	2.66	Q		V			
15+30	1.4147	2.76	Q		V			
15+35	1.4343	2.85	Q		V			
15+40	1.4542	2.88	Q		V			
15+45	1.4744	2.94	Q		V			
15+50	1.4957	3.10	Q		V			
15+55	1.5191	3.40	Q		V			
16+ 0	1.5469	4.03	Q		V			
16+ 5	1.5902	6.30		Q	V			
16+10	1.6659	10.98			Q	V		
16+15	1.7842	17.18				V	Q	
16+20	1.9791	28.30					V	Q
<b>16+25</b>	<b>2.1759</b>	<b>28.57</b>					<b>V</b>	<b>Q</b>
16+30	2.3169	20.47					V	Q
16+35	2.4194	14.89				Q	V	
16+40	2.5013	11.88						Q
16+45	2.5706	10.07				Q	V	
16+50	2.6304	8.68				Q	V	
16+55	2.6822	7.52				Q	V	
17+ 0	2.7280	6.66					Q	V
17+ 5	2.7697	6.05						Q
17+10	2.8079	5.54						Q
17+15	2.8422	4.98						Q
17+20	2.8725	4.40						Q
17+25	2.9007	4.10						Q
17+30	2.9271	3.83						Q
17+35	2.9517	3.57						Q
17+40	2.9747	3.34						Q
17+45	2.9957	3.05						Q
17+50	3.0158	2.92						Q
17+55	3.0345	2.70						Q
18+ 0	3.0520	2.54						Q
18+ 5	3.0686	2.41						Q
18+10	3.0837	2.20						Q
18+15	3.0983	2.12						Q
18+20	3.1119	1.96						Q
18+25	3.1250	1.91						Q
18+30	3.1382	1.92						Q
18+35	3.1515	1.93						Q
18+40	3.1646	1.90						Q
18+45	3.1775	1.87						Q
18+50	3.1901	1.83						Q
18+55	3.2020	1.72						Q
19+ 0	3.2130	1.61						Q
19+ 5	3.2239	1.57						Q
19+10	3.2338	1.45						Q
19+15	3.2431	1.34						Q

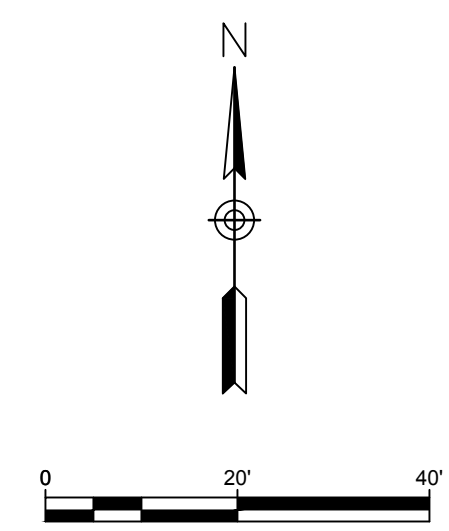
pos -developed Subarea A

15.833	3.50	3.04	0.536	OI					4.28
15.917	4.08	3.29	0.540	OI					4.30
16.000	5.34	3.77	0.548	OI					4.34
16.083	10.33	5.14	0.571	O	I				4.47
16.167	24.23	9.23	0.641		O		I		4.84
<b>16.250</b>	<b>36.73</b>	13.74	0.772			O		I	5.47
16.333	22.43	16.48	0.871				O	I	5.94
16.417	14.27	<b>16.81</b>	<b>0.883</b>			<b>I</b>	<b>O</b>		<b>5.99</b>
16.500	10.56	16.05	0.855			I	O		5.86
16.583	8.48	14.92	0.814		I		O		5.67
16.667	7.12	13.69	0.770		I		O		5.46
16.750	5.86	12.44	0.724		I		O		5.25
16.833	5.12	11.24	0.681		I		O		5.05
16.917	4.47	9.34	0.643		I		O		4.85
17.000	3.94	7.61	0.613		I	O			4.69
17.083	3.48	6.29	0.591		I	O			4.57
17.167	3.06	5.27	0.574		I	O			4.48
17.250	2.67	4.46	0.560		IO				4.41
17.333	2.48	3.82	0.549		IO				4.35
17.417	2.41	3.36	0.541		O				4.31
17.500	2.28	3.02	0.535		IO				4.28
17.583	2.03	2.73	0.530		IO				4.25
17.667	1.90	2.47	0.526		IO				4.23
17.750	1.56	2.22	0.522		O				4.20
17.833	1.49	1.99	0.518		O				4.18
17.917	1.44	1.81	0.515		O				4.17
18.000	1.39	1.68	0.512		O				4.15
18.083	1.35	1.57	0.511		O				4.14
18.167	1.35	1.50	0.509		O				4.14
18.250	1.39	1.45	0.509		O				4.13
18.333	1.39	1.43	0.508		O				4.13
18.417	1.38	1.42	0.508		O				4.13
18.500	1.37	1.40	0.508		O				4.13
18.583	1.35	1.39	0.508		O				4.13
18.667	1.33	1.37	0.507		O				4.13
18.750	1.31	1.36	0.507		O				4.12
18.833	1.29	1.34	0.507		O				4.12
18.917	1.27	1.32	0.506		O				4.12
19.000	1.26	1.30	0.506		O				4.12
19.083	1.24	1.28	0.506		O				4.12
19.167	1.22	1.26	0.505		O				4.12
19.250	1.20	1.25	0.505		O				4.11
19.333	1.18	1.23	0.505		O				4.11
19.417	1.17	1.21	0.505		O				4.11
19.500	1.15	1.19	0.504		O				4.11
19.583	1.14	1.18	0.504		IO				4.11
19.667	1.12	1.16	0.504		IO				4.11
19.750	1.11	1.15	0.503		O				4.10
19.833	1.09	1.13	0.503		O				4.10
19.917	1.08	1.12	0.503		O				4.10
20.000	1.07	1.10	0.503		O				4.10
20.083	1.06	1.09	0.502		O				4.10
20.167	1.04	1.08	0.502		O				4.10
20.250	1.03	1.06	0.502		O				4.10

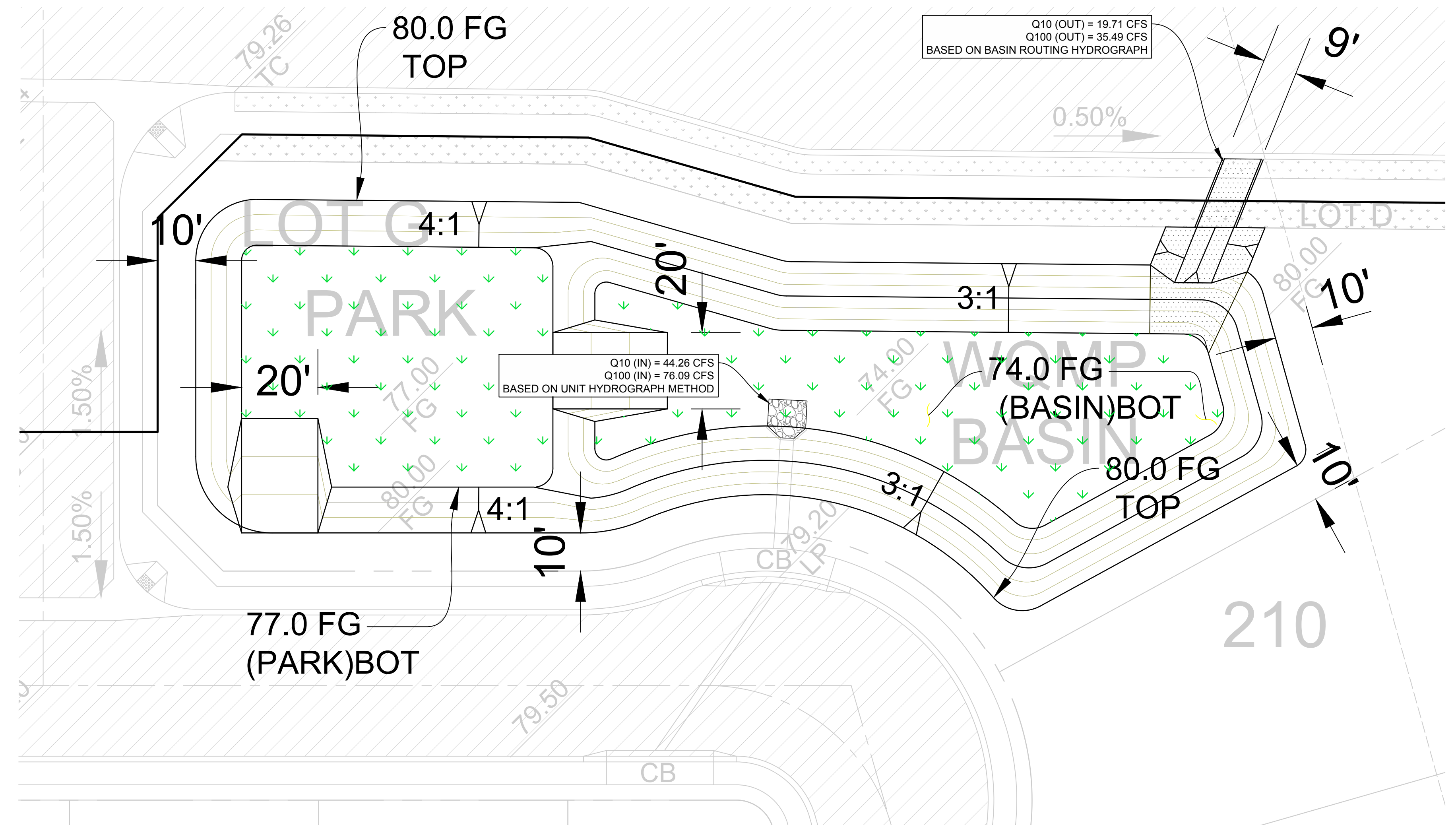
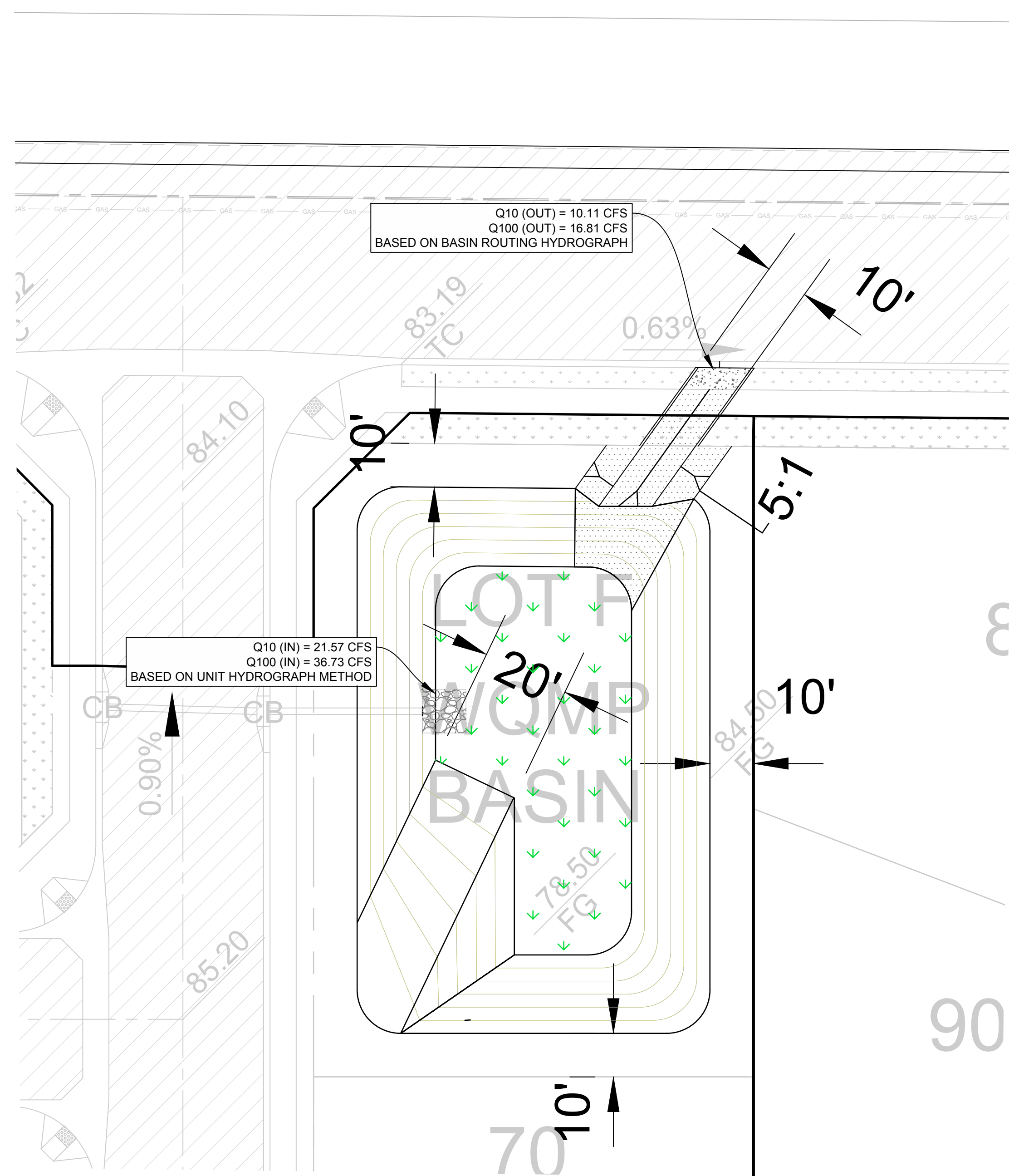
pos -developed Subarea B

16.000	11.11	7.38	1.116	OI				4.38
16.083	21.62	9.70	1.170	O	I			4.50
16.167	51.27	16.58	1.331	O		I		4.85
<b>16.250</b>	<b>76.09</b>	27.48	1.618		O		I	5.49
16.333	45.69	34.93	1.822		O	I		5.96
16.417	29.18	<b>35.49</b>	<b>1.837</b>		<b>I O</b>			<b>5.99</b>
16.500	21.56	33.23	1.775		I O			5.85
16.583	17.41	30.17	1.691		I	O		5.66
16.667	14.53	27.00	1.604		I	O		5.46
16.750	12.00	23.94	1.520		I	O		5.27
16.833	10.49	21.11	1.443		I O			5.10
16.917	9.11	18.44	1.374		I O			4.94
17.000	8.05	15.90	1.315		I O			4.81
17.083	7.10	13.76	1.265		I O			4.70
17.167	6.21	11.93	1.222		I O			4.61
17.250	5.42	10.36	1.186		I O			4.53
17.333	5.15	9.05	1.155		IO			4.46
17.417	4.97	8.02	1.131		IO			4.41
17.500	4.64	7.20	1.112		I O			4.37
17.583	4.10	6.47	1.095		IO			4.33
17.667	3.77	5.82	1.080		IO			4.30
17.750	3.20	5.22	1.066		IO			4.27
17.833	3.07	4.68	1.053		O			4.24
17.917	2.96	4.25	1.043		O			4.22
18.000	2.86	3.91	1.035		O			4.20
18.083	2.78	3.63	1.029		O			4.19
18.167	2.78	3.41	1.024		O			4.17
18.250	2.86	3.26	1.020		O			4.17
18.333	2.87	3.16	1.018		O			4.16
18.417	2.85	3.08	1.016		O			4.16
18.500	2.82	3.02	1.014		O			4.15
18.583	2.79	2.96	1.013		O			4.15
18.667	2.75	2.91	1.012		O			4.15
18.750	2.71	2.87	1.011		O			4.15
18.833	2.67	2.82	1.010		O			4.14
18.917	2.63	2.77	1.009		O			4.14
19.000	2.59	2.73	1.008		O			4.14
19.083	2.55	2.69	1.007		O			4.14
19.167	2.52	2.65	1.006		O			4.14
19.250	2.48	2.61	1.005		O			4.13
19.333	2.44	2.57	1.004		O			4.13
19.417	2.41	2.54	1.003		O			4.13
19.500	2.38	2.50	1.002		O			4.13
19.583	2.35	2.46	1.001		IO			4.13
19.667	2.32	2.43	1.001		IO			4.12
19.750	2.29	2.40	1.000		IO			4.12
19.833	2.26	2.37	0.999		O			4.12
19.917	2.23	2.33	0.998		O			4.12
20.000	2.20	2.30	0.998		O			4.12
20.083	2.18	2.28	0.997		O			4.12
20.167	2.15	2.25	0.996		O			4.11
20.250	2.13	2.22	0.996		O			4.11
20.333	2.11	2.19	0.995		O			4.11
20.417	2.08	2.17	0.995		O			4.11

INFILTRATION BASIN NO. 1 - STAGE STORAGE TABLE						
ELEV	AREA (sq. ft.)	DEPTH (ft)	AVG END INC. VOL. (cu. ft.)	AVG END TOTAL VOL. (cu. ft.)	AVG END INC. VOL. (ac. ft.)	AVG END TOTAL VOL. (ac. ft.)
78.500	3,216.41	N/A	N/A	0.00	N/A	0.0000
79.500	4,189.58	1.000	3702.99	3702.99	0.0850	0.0850
80.500	5,221.56	2.000	4705.57	8408.56	0.1080	0.1930
81.500	6,316.73	3.000	5769.15	14177.71	0.1324	0.3254
82.500	7,471.71	4.000	6894.22	21071.93	0.1583	0.4837
82.600	D.C.V.	4.100	D.C.V.	21,987.50		0.5048
83.500	8,707.22	5.000	8089.47	29161.40	0.1857	0.6694
84.500	10,025.90	6.000	9366.56	38527.96	0.2150	0.8845



BASIN NO. 2 - STAGE STORAGE TABLE						
ELEV	AREA (sq. ft.)	DEPTH (ft)	AVG END INC. VOL. (cu. ft.)	AVG END TOTAL VOL. (cu. ft.)	AVG END INC. VOL. (ac. ft.)	AVG END TOTAL VOL. (ac. ft.)
74.0	5,380.40	N/A	N/A	0.00	N/A	0.00
75.0	6,804.90	1	6092.65	6092.65	0.1399	0.1399
76.0	8,341.12	2	7573.01	13665.66	0.1738	0.3137
77.0	14,756.04	3	11548.58	25214.23	0.2652	0.5788
78.0	17,074.62	4	15915.33	41129.56	0.3654	0.9442
78.08	D.C.V.	4.08	D.C.V.	42,668.81		0.9795
79.0	19,510.48	5	18292.55	59422.11	0.4199	1.3641
80.0	22,028.54	6	20769.51	80191.63	0.4768	1.8409



PLOT STYLE: NCS US Standard.sbt PROJECT LOCATION & NAME: V:\client\TR\_16881 (David, Liu)\REVISED PROJECT-2021\CAD\civil\drainage maps pre and post developed.dwg PLOT TIME: Tuesday, February 8, 2023 8:09:56 AM LAYOUT: Basins



REV.	DESCRIPTION	DATE	BY

**Ludwig Engineering**  
ASSOCIATES, INC.  
Civil Engineering - Surveying - Planning  
109 East Third Street  
San Bernardino, CA 92410  
Phone: 909-884-8217  
Fax: 909-889-0153

5890 Hwy. 95, Ste. B  
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Fax: 928-768-7086

15352 Seneca Rd.  
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Fax: 760-241-4573

2126 MacAllister Blvd., Ste. 8  
Lake Havasu City, AZ 86403  
Phone: 928-680-6000  
Fax: 928-854-6530

**CITY OF VICTORVILLE**  
TRACT 20500  
BASIN CONCEPTUAL DESIGN

CLIENT:  
**LEU, LIU & ASSOCIATES**  
1803 VIRGINIA ROAD, SAN MARINO, CA 91108

DESIGNED BY: KH  
DRAWN BY: MR/LC  
CHECKED BY: JA

SCALE  
1" = 100'

SHEET  
1  
OF  
1

## 4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretenention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design Measures (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is “Yes,” provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Form 4.3-2 to determine the feasibility of applicable Site Design BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable Site Design BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

### **4.3.1 Exceptions to Requirements for Bioretention Facilities**

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

- 1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;
- 2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and
- 3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

<b>Form 4.3-1 Infiltration BMP Feasibility (DA A &amp; B)</b>	
Feasibility Criterion – Complete evaluation for each DA on the Project Site	
<p><sup>1</sup> Would infiltration BMP pose significant risk for groundwater related concerns? <i>Refer to Section 5.3.2.1 of the TGD for WQMP</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p><sup>2</sup> Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):</p> <ul style="list-style-type: none"> <li>• The location is less than 50 feet away from slopes steeper than 15 percent</li> <li>• The location is less than ten feet from building foundations or an alternative setback.</li> <li>• A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.</li> </ul>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p><sup>3</sup> Would infiltration of runoff on a Project site violate downstream water rights?</p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p><sup>4</sup> Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils?</p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p><sup>5</sup> Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)?</p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p><sup>6</sup> Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? <i>See Section 3.5 of the TGD for WQMP and WAP</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes, Provide basis: (attach)	
<p><sup>7</sup> Any answer from Item 1 through Item 3 is “Yes”: <i>If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.</i> <i>If no, then proceed to Item 8 below.</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<p><sup>8</sup> Any answer from Item 4 through Item 6 is “Yes”: <i>If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.</i> <i>If no, then proceed to Item 9, below.</i></p>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<p><sup>9</sup> All answers to Item 1 through Item 6 are “No”: <i>Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.</i> <i>Proceed to Form 4.3-2, Site Design BMPs.</i></p>	

### 4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive



with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

<b>Form 4.3-2 Site Design BMPs (DA A &amp; B)</b>			
<b>1</b> Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, complete Items 2-5; If no, proceed to Item 6	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
<b>2</b> Total impervious area draining to pervious area (ft <sup>2</sup> )			
<b>3</b> Ratio of pervious area receiving runoff to impervious area			
<b>4</b> Retention volume achieved from impervious area dispersion (ft <sup>3</sup> ) $V = \text{Item 2} * \text{Item 3} * (0.5/12)$ , assuming retention of 0.5 inches of runoff			
<b>5</b> Sum of retention volume achieved from impervious area dispersion (ft <sup>3</sup> ):		$V_{\text{retention}} = \text{Sum of Item 4 for all BMPs}$	
<b>6</b> Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
<b>7</b> Ponding surface area (ft <sup>2</sup> )			
<b>8</b> Ponding depth (ft) (min. 0.5 ft.)			
<b>9</b> Surface area of amended soil/gravel (ft <sup>2</sup> )			
<b>10</b> Average depth of amended soil/gravel (ft) (min. 1 ft.)			
<b>11</b> Average porosity of amended soil/gravel			
<b>12</b> Retention volume achieved from on-lot infiltration (ft <sup>3</sup> ) $V_{\text{retention}} = (\text{Item 7} * \text{Item 8}) + (\text{Item 9} * \text{Item 10} * \text{Item 11})$			
<b>13</b> Runoff volume retention from on-lot infiltration (ft <sup>3</sup> ):		$V_{\text{retention}} = \text{Sum of Item 12 for all BMPs}$	



**Form 4.3-2 cont. Site Design BMPs (DA A & B)**

<b>14</b> Implementation of Street Trees: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, complete Items 14-18. If no, proceed to Item 19</i>	DA    DMA BMP Type	DA    DMA BMP Type	DA    DMA BMP Type <i>(Use additional forms for more BMPs)</i>
<b>15</b> Number of Street Trees			
<b>16</b> Average canopy cover over impervious area (ft <sup>2</sup> )			
<b>17</b> Runoff volume retention from street trees (ft <sup>3</sup> ) <i>V<sub>retention</sub> = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches</i>			
<b>18</b> Runoff volume retention from street tree BMPs (ft <sup>3</sup> ): <span style="float: right;"><i>V<sub>retention</sub> = Sum of Item 17 for all BMPs</i></span>			
<b>19</b> Total Retention Volume from Site Design BMPs: <b>0</b> <span style="float: right;"><i>Sum of Items 5, 13 and 18</i></span>			

### 4.3.3 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix C of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

#### 4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

- 1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.
- 2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).
- 3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.
- 4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

### Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA A)

**1** Remaining LID DCV not met by site design BMP (ft<sup>3</sup>): 21,988  $V_{unmet} = \text{Form 4.2-1 Item 7} - \text{Form 4.3-2 Item 19}$

BMP Type <i>Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs</i>	DA 1 BMP Type Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
<b>2</b> Infiltration rate of underlying soils (in/hr) <i>See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods</i>	9.47		
<b>3</b> Infiltration safety factor <i>See TGD Section 5.4.2 and Appendix D</i>	5.0		
<b>4</b> Design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$	1.9		
<b>5</b> Ponded water drawdown time (hr) <i>Copy Item 6 in Form 4.2-1</i>	48		
<b>6</b> Maximum ponding depth (ft) <i>BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details</i>	5		
<b>7</b> Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$	4.5		
<b>8</b> Infiltrating surface area, $SA_{BMP}$ (ft <sup>2</sup> ) <i>the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP</i>	4,852		
<b>9</b> Amended soil depth, $d_{media}$ (ft) <i>Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details</i>	0		
<b>10</b> Amended soil porosity	0.3		
<b>11</b> Gravel depth, $d_{media}$ (ft) <i>Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details</i>	0		
<b>12</b> Gravel porosity	0.4		
<b>13</b> Duration of storm as basin is filling (hrs) <i>Typical ~ 3hrs</i>	3		
<b>14</b> Above Ground Retention Volume (ft <sup>3</sup> ) $V_{retention} = \text{Item 8} * [\text{Item 7} + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$	38,528*		
<b>15</b> Underground Retention Volume (ft <sup>3</sup> ) <i>Volume determined using manufacturer's specifications and calculations</i>			
<b>16</b> Total Retention Volume from LID Infiltration BMPs: 38,528* <i>(Sum of Items 14 and 15 for all infiltration BMP included in plan)</i>			
<b>17</b> Fraction of DCV achieved with infiltration BMP: 100% $\text{Retention\%} = \text{Item 16} / \text{Form 4.2-1 Item 7}$			

**18** Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes  No   
*If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*

**\*PER BASIN DESIGN VOLUME**

### Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA B)

**1** Remaining LID DCV not met by site design BMP (ft<sup>3</sup>): 42,669  $V_{unmet} = \text{Form 4.2-1 Item 7} - \text{Form 4.3-2 Item 19}$

BMP Type <i>Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs</i>	DA B BMP Type Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
<b>2</b> Infiltration rate of underlying soils (in/hr) <i>See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods</i>	3.97		
<b>3</b> Infiltration safety factor <i>See TGD Section 5.4.2 and Appendix D</i>	2		
<b>4</b> Design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$	2.0		
<b>5</b> Ponded water drawdown time (hr) <i>Copy Item 6 in Form 4.2-1</i>	48		
<b>6</b> Maximum ponding depth (ft) <i>BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details</i>	5		
<b>7</b> Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$	4.4		
<b>8</b> Infiltrating surface area, $SA_{BMP}$ (ft <sup>2</sup> ) <i>the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP</i>	6,773		
<b>9</b> Amended soil depth, $d_{media}$ (ft) <i>Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details</i>	0		
<b>10</b> Amended soil porosity	0.3		
<b>11</b> Gravel depth, $d_{media}$ (ft) <i>Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details</i>	0		
<b>12</b> Gravel porosity	0.4		
<b>13</b> Duration of storm as basin is filling (hrs) <i>Typical ~ 3hrs</i>	3		
<b>14</b> Above Ground Retention Volume (ft <sup>3</sup> ) $V_{retention} = \text{Item 8} * [\text{Item 7} + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$	80,192*		
<b>15</b> Underground Retention Volume (ft <sup>3</sup> ) <i>Volume determined using manufacturer's specifications and calculations</i>			
<b>16</b> Total Retention Volume from LID Infiltration BMPs: 80,192* <i>(Sum of Items 14 and 15 for all infiltration BMP included in plan)</i>			
<b>17</b> Fraction of DCV achieved with infiltration BMP: 100% $\text{Retention}\% = \text{Item 16} / \text{Form 4.2-1 Item 7}$			

**18** Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes  No   
*If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*

**\*PER BASIN DESIGN VOLUME**

### 4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

<b>Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA A &amp; B)</b>		
<b>1</b> Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft <sup>3</sup> ): <i>Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16</i>		List pollutants of concern <i>Copy from Form 2.3-1.</i>
<b>2</b> Biotreatment BMP Selected <i>(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)</i>	Volume-based biotreatment <i>Use Forms 4.3-5 and 4.3-6 to compute treated volume</i>	Flow-based biotreatment <i>Use Form 4.3-7 to compute treated flow</i>
	<input type="checkbox"/> Bioretention with underdrain <input type="checkbox"/> Planter box with underdrain <input type="checkbox"/> Constructed wetlands <input type="checkbox"/> Wet extended detention <input type="checkbox"/> Dry extended detention	<input type="checkbox"/> Vegetated swale <input type="checkbox"/> Vegetated filter strip <input type="checkbox"/> Proprietary biotreatment
<b>3</b> Volume biotreated in volume based biotreatment BMP (ft <sup>3</sup> ): <i>Form 4.3-5 Item 15 + Form 4.3-6 Item 13</i>	<b>4</b> Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft <sup>3</sup> ): <i>Item 1 – Item 3</i>	<b>5</b> Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % <i>Item 4 / Item 1</i>
<b>6</b> Flow-based biotreatment BMP capacity provided (cfs): <i>Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project’s precipitation zone (Form 3-1 Item 1)</i>		
<b>7</b> Metrics for MEP determination: <ul style="list-style-type: none"> <li>• Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: <input type="checkbox"/> <i>If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.</i></li> </ul>		

<b>Form 4.3-5 Volume Based Biotreatment (DA A &amp; B)</b>			
<b>– Bioretention and Planter Boxes with Underdrains</b>			
Biotreatment BMP Type <i>(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)</i>	DA    DMA BMP Type	DA    DMA BMP Type	DA    DMA BMP Type <i>(Use additional forms for more BMPs)</i>
<b>1</b> Pollutants addressed with BMP <i>List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP</i>			
<b>2</b> Amended soil infiltration rate <i>Typical ~ 5.0</i>			
<b>3</b> Amended soil infiltration safety factor <i>Typical ~ 2.0</i>			
<b>4</b> Amended soil design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$			
<b>5</b> Ponded water drawdown time (hr) <i>Copy Item 6 from Form 4.2-1</i>			
<b>6</b> Maximum ponding depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
<b>7</b> Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$			
<b>8</b> Amended soil surface area (ft <sup>2</sup> )			
<b>9</b> Amended soil depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
<b>10</b> Amended soil porosity, <i>n</i>			
<b>11</b> Gravel depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
<b>12</b> Gravel porosity, <i>n</i>			
<b>13</b> Duration of storm as basin is filling (hrs) <i>Typical ~ 3hrs</i>			
<b>14</b> Biotreated Volume (ft <sup>3</sup> ) $V_{biotreated} = \text{Item 8} * [(\text{Item 7}/2) + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$			
<b>15</b> Total biotreated volume from bioretention and/or planter box with underdrains BMP: <i>Sum of Item 14 for all volume-based BMPs included in this form</i>			

## Form 4.3-6 Volume Based Biotreatment (DA A & B) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type <i>Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (E.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.</i>	DA    DMA BMP Type		DA    DMA BMP Type <i>(Use additional forms for more BMPs)</i>	
	Forebay	Basin	Forebay	Basin
<b>1</b> Pollutants addressed with BMP forebay and basin <i>List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP</i>				
<b>2</b> Bottom width (ft)				
<b>3</b> Bottom length (ft)				
<b>4</b> Bottom area (ft <sup>2</sup> ) <i>A<sub>bottom</sub> = Item 2 * Item 3</i>				
<b>5</b> Side slope (ft/ft)				
<b>6</b> Depth of storage (ft)				
<b>7</b> Water surface area (ft <sup>2</sup> ) <i>A<sub>surface</sub> = (Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))</i>				
<b>8</b> Storage volume (ft <sup>3</sup> ) <i>For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details</i> <i>V = Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)<sup>0.5</sup>]</i>				
<b>9</b> Drawdown Time (hrs) <i>Copy Item 6 from Form 2.1</i>				
<b>10</b> Outflow rate (cfs) <i>Q<sub>BMP</sub> = (Item 8<sub>forebay</sub> + Item 8<sub>basin</sub>) / (Item 9 * 3600)</i>				
<b>11</b> Duration of design storm event (hrs)				
<b>12</b> Biotreated Volume (ft <sup>3</sup> ) <i>V<sub>biotreated</sub> = (Item 8<sub>forebay</sub> + Item 8<sub>basin</sub>) + (Item 10 * Item 11 * 3600)</i>				
<b>13</b> Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : <i>(Sum of Item 12 for all BMP included in plan)</i>				

<b>Form 4.3-7 Flow Based Biotreatment (DA A &amp; B)</b>			
Biotreatment BMP Type <i>Vegetated swale, vegetated filter strip, or other comparable proprietary BMP</i>	DA    DMA BMP Type	DA    DMA BMP Type	DA    DMA BMP Type <i>(Use additional forms for more BMPs)</i>
<b>1</b> Pollutants addressed with BMP <i>List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5</i>			
<b>2</b> Flow depth for water quality treatment (ft) <i>BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
<b>3</b> Bed slope (ft/ft) <i>BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
<b>4</b> Manning's roughness coefficient			
<b>5</b> Bottom width (ft) $b_w = (\text{Form 4.3-5 Item 6} * \text{Item 4}) / (1.49 * \text{Item 2}^{1.67} * \text{Item 3}^{0.5})$			
<b>6</b> Side Slope (ft/ft) <i>BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
<b>7</b> Cross sectional area (ft <sup>2</sup> ) $A = (\text{Item 5} * \text{Item 2}) + (\text{Item 6} * \text{Item 2}^2)$			
<b>8</b> Water quality flow velocity (ft/sec) $V = \text{Form 4.3-5 Item 6} / \text{Item 7}$			
<b>9</b> Hydraulic residence time (min) <i>Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
<b>10</b> Length of flow based BMP (ft) $L = \text{Item 8} * \text{Item 9} * 60$			
<b>11</b> Water surface area at water quality flow depth (ft <sup>2</sup> ) $SA_{top} = (\text{Item 5} + (2 * \text{Item 2} * \text{Item 6})) * \text{Item 10}$			



### 4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

<b>Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA A)</b>	
<b>1</b>	Total LID DCV for the Project DA-A (ft <sup>3</sup> ): 21,988 <i>Copy Item 7 in Form 4.2-1</i>
<b>2</b>	On-site retention with site design BMP (ft <sup>3</sup> ): 0 <i>Copy Item 18 in Form 4.3-2</i>
<b>3</b>	On-site retention with LID infiltration BMP (ft <sup>3</sup> ): 38,528 <i>Copy Item 16 in Form 4.3-3</i>
<b>4</b>	On-site biotreatment with volume based biotreatment BMP (ft <sup>3</sup> ): 0 <i>Copy Item 3 in Form 4.3-4</i>
<b>5</b>	Flow capacity provided by flow based biotreatment BMP (cfs): 0 <i>Copy Item 6 in Form 4.3-4</i>
<b>6</b>	<p>LID BMP performance criteria are achieved if answer to any of the following is "Yes":</p> <ul style="list-style-type: none"> <li>• Full retention of LID DCV with site design or infiltration BMP: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>If yes, sum of Items 2, 3, and 4 is greater than Item 1</i></li> <li>• Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3-5 Item 6 and Items 2, 3 and 4 are maximized</i></li> <li>▪ On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, Form 4.3-1 Items 7 and 8 were both checked yes</i></li> </ul>
<b>7</b>	<p>If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:</p> <ul style="list-style-type: none"> <li>• Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: <input type="checkbox"/> <i>Checked yes if Form 4.3-4 Item 7 is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, <math>V_{alt} = (Item\ 1 - Item\ 2 - Item\ 3 - Item\ 4 - Item\ 5) * (100 - Form\ 2.4-1\ Item\ 2)\%</math></i></li> <li>• Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated: <ul style="list-style-type: none"> <li>1) Equal or greater amount of runoff infiltrated or evapotranspired; <input type="checkbox"/></li> <li>2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; <input type="checkbox"/></li> <li>3) Equal or greater protection against shock loadings and spills; <input type="checkbox"/></li> <li>4) Equal or greater accessibility and ease of inspection and maintenance. <input type="checkbox"/></li> </ul> </li> </ul>

### 4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

<b>Form 4.3-9 Hydromodification Control BMPs (DA A)</b>	
<p><b>1</b> Volume reduction needed for hydromodification performance criteria (ft<sup>3</sup>): <i>(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1</i></p>	<p><b>2</b> On-site retention with site design and infiltration, BMP (ft<sup>3</sup>): <i>Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction</i></p>
<p><b>3</b> Remaining volume for hydromodification volume capture (ft<sup>3</sup>): <i>0 Item 1 – Item 2</i></p>	<p><b>4</b> Volume capture provided by incorporating additional on-site BMPs (ft<sup>3</sup>): 0</p>
<p><b>5</b> Is Form 4.2-2 Item 11 less than or equal to 5%: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p><i>If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:</i></p> <ul style="list-style-type: none"> <li>• Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP <input checked="" type="checkbox"/></li> <li>• Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities <input type="checkbox"/></li> </ul>	
<p><b>6</b> Form 4.2-2 Item 12 less than or equal to 5%: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p><i>If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:</i></p> <ul style="list-style-type: none"> <li>• Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs <input checked="" type="checkbox"/></li> </ul>	

### 4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

<b>Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA B)</b>	
<b>1</b>	Total LID DCV for the Project DA-B (ft <sup>3</sup> ): 42,669 <i>Copy Item 7 in Form 4.2-1</i>
<b>2</b>	On-site retention with site design BMP (ft <sup>3</sup> ): 0 <i>Copy Item 18 in Form 4.3-2</i>
<b>3</b>	On-site retention with LID infiltration BMP (ft <sup>3</sup> ): 80,192 <i>Copy Item 16 in Form 4.3-3</i>
<b>4</b>	On-site biotreatment with volume based biotreatment BMP (ft <sup>3</sup> ): 0 <i>Copy Item 3 in Form 4.3-4</i>
<b>5</b>	Flow capacity provided by flow based biotreatment BMP (cfs): 0 <i>Copy Item 6 in Form 4.3-4</i>
<b>6</b>	<p>LID BMP performance criteria are achieved if answer to any of the following is "Yes":</p> <ul style="list-style-type: none"> <li>• Full retention of LID DCV with site design or infiltration BMP: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>If yes, sum of Items 2, 3, and 4 is greater than Item 1</i></li> <li>• Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3-5 Item 6 and Items 2, 3 and 4 are maximized</i></li> <li>▪ On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, Form 4.3-1 Items 7 and 8 were both checked yes</i></li> </ul>
<b>7</b>	<p>If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:</p> <ul style="list-style-type: none"> <li>• Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: <input type="checkbox"/> <i>Checked yes if Form 4.3-4 Item 7 is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, <math>V_{alt} = (Item\ 1 - Item\ 2 - Item\ 3 - Item\ 4 - Item\ 5) * (100 - Form\ 2.4-1\ Item\ 2)\%</math></i></li> <li>• Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated: <ul style="list-style-type: none"> <li>1) Equal or greater amount of runoff infiltrated or evapotranspired; <input type="checkbox"/></li> <li>2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; <input type="checkbox"/></li> <li>3) Equal or greater protection against shock loadings and spills; <input type="checkbox"/></li> <li>4) Equal or greater accessibility and ease of inspection and maintenance. <input type="checkbox"/></li> </ul> </li> </ul>

### 4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

<b>Form 4.3-9 Hydromodification Control BMPs (DA B)</b>	
<p><b>1</b> Volume reduction needed for hydromodification performance criteria (ft<sup>3</sup>):</p> <p><i>(Form 4.2-2 Item 4 * 0.95) - Form 4.2-2 Item 1</i></p>	<p><b>2</b> On-site retention with site design and infiltration, BMP (ft<sup>3</sup>):</p> <p><i>Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction</i></p>
<p><b>3</b> Remaining volume for hydromodification volume capture (ft<sup>3</sup>): 0 <i>Item 1 - Item 2</i></p>	<p><b>4</b> Volume capture provided by incorporating additional on-site BMPs (ft<sup>3</sup>): 0</p>
<p><b>5</b> Is Form 4.2-2 Item 11 less than or equal to 5%: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p><i>If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:</i></p> <ul style="list-style-type: none"> <li>• Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP <input checked="" type="checkbox"/></li> <li>• Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities <input type="checkbox"/></li> </ul>	
<p><b>6</b> Form 4.2-2 Item 12 less than or equal to 5%: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p><i>If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:</i></p> <ul style="list-style-type: none"> <li>• Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs <input checked="" type="checkbox"/></li> </ul>	

## 4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance.

Alternative Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

- 1) Equal or greater amount of runoff infiltrated or evapotranspired;
- 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;
- 3) Equal or greater protection against shock loadings and spills;
- 4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

## Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Note that at time of Project construction completion, the Maintenance Agreement must be completed, signed, notarized and submitted to the County Stormwater Department

<b>Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)</b>			
BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Infiltration Basin	Owner	Maintain vegetation as needed	Ongoing, before annual storms and following rainfall events
Infiltration Basin	Owner	Remove debris and litter from entire basin to minimize clogging and improve aesthetics	Ongoing, before annual storms and following rainfall events
Infiltration Basin	Owner	Check for obvious problems & repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in basin bottom. There should be no long-term ponding water.	Ongoing, before annual storms and following rainfall events
Infiltration Basin	Owner	Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment integrity, as well as damage to any structural element.	Annually. If possible schedule these inspections within 72 hours after significant rainfall.

**MOJAVE RIVER WATERSHED Water Quality Management Plan (WQMP)**

Infiltration Basin	Owner	Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment.	Annually. If possible schedule these inspections within 72 hours after significant rainfall.
Infiltration Basin	Owner	Verify the basin bottom is allowing acceptable infiltration. Use disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis.	Annually. If possible schedule these inspections within 72 hours after significant rainfall.

## Section 6 WQMP Attachments

### 6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

### 6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

### 6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

### 6.4 Other Supporting Documentation

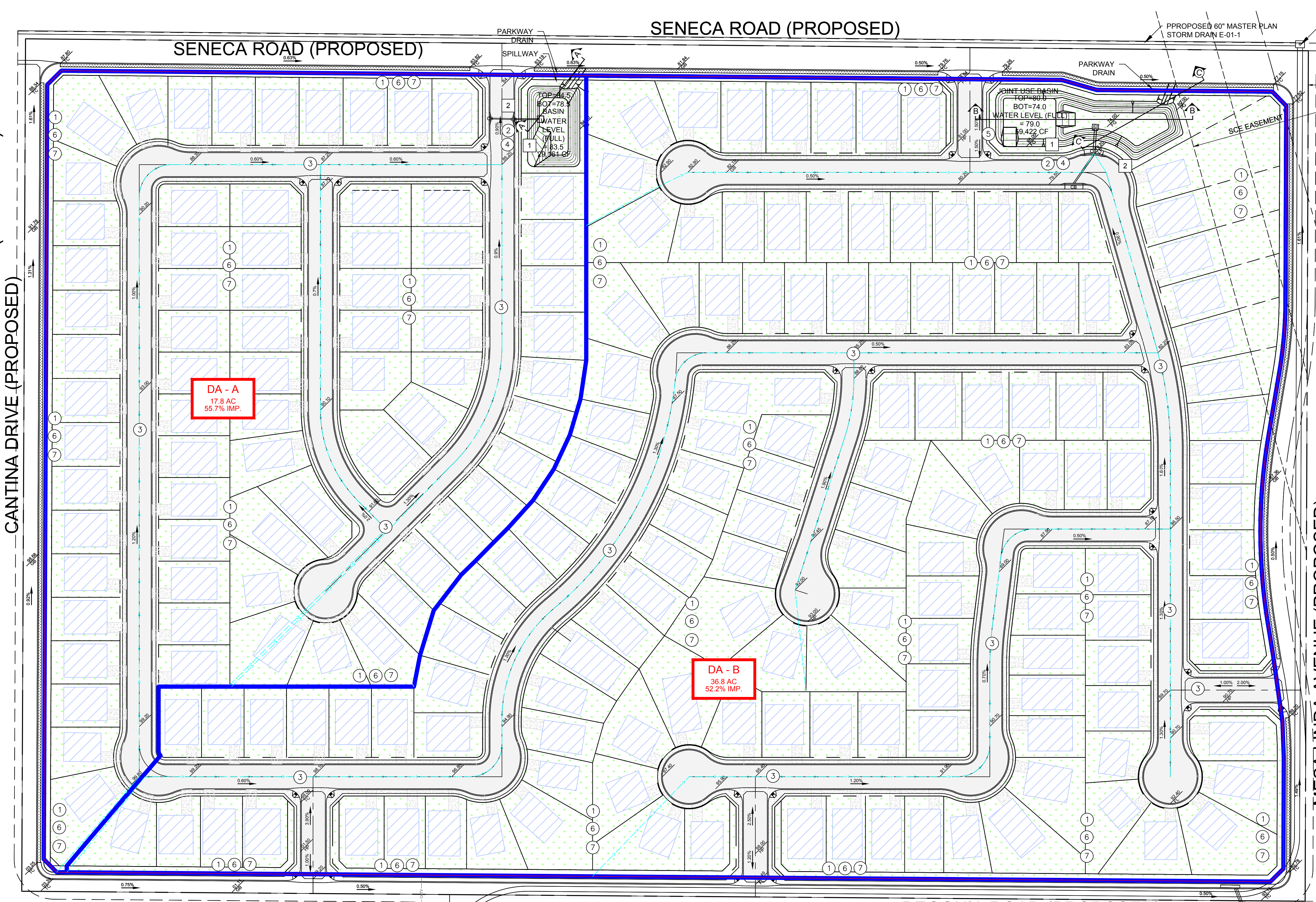
- BMP Educational Materials
- Activity Restriction – C,C&R's & Lease Agreements



# **Attachment 1 - Site Plan and Drainage Plan**



PLOT STYLE: MGS US Standard.ctb PROJECT LOCATION & NAME: V:\plans\18681 David Liu\REVISED PROJECT 2021\Engineering\WQMP\18681\_WQMP.dwg PLOT TIME: Tuesday, February 8, 2022 11:24:11 AM LAY-OUT: Wqmp



**SOIL GROUP A**

**LEGEND**

- DRAINAGE AREAS
- SITE BOUNDARY
- FLOW LINE
- PROPOSED CONCRETE PAVING AREAS
- PROPOSED A/C PAVING AREAS
- PROPOSED STRUCTURES
- PROPOSED LANDSCAPING AREAS

**DA - C**  
6.5 AC  
80% IMP

**DA - A COVER INFORMATION:**

COVER TYPE:	QTY.
ROOF:	242,005 SF.
CONCRETE:	73,978 SF.
ASPHALT:	114,965 SF.
LANDSCAPING:	342,999 SF.
TOTAL:	773,917 S.F.

**DA - B COVER INFORMATION:**

COVER TYPE:	QTY.
ROOF:	463,248 SF.
CONCRETE:	145,979 SF.
ASPHALT:	228,184 SF.
LANDSCAPING:	765,827 SF.
TOTAL:	1,603,238 S.F.

**%IMPERVIOUS:** 55.7%      **%IMPERVIOUS:** 52.2%

**DCV:** 21,988 CU.FT.      **DCV:** 42,669 CU.FT.

**HCOC:** 6,787 CU. FT.      **HCOC:** 9,878 CU. FT.

**TOTAL:** 28,775 CU. FT.      **TOTAL:** 52,547 CU. FT.

**BASIN VOL:** 29,161 CU. FT.      **BASIN VOL:** 59,422 CU. FT.

- FORM 4.1-1 NON-STRUCTURAL SOURCE CONTROL BMPs:**
- ① N1 - EDUCATION OF PROPERTY OWNERS, TENANTS AND OCCUPANTS ON STORMWATER BMPs
  - ② N2 - ACTIVITY RESTRICTIONS
  - ③ N3 - LANDSCAPE MANAGEMENT BMPs
  - ④ N4 - BMP MAINTENANCE
  - ⑤ N11 - LITTER/DEBRIS CONTROL PROGRAM
  - ⑥ N12 - EMPLOYEE TRAINING
  - ⑦ N14 - CATCH BASIN INSPECTION PROGRAM
  - ⑧ N15 - VACUUM SWEEPING OF PRIVATE STREETS AND PARKING LOTS

- FORM 4.1-2 NON-STRUCTURAL SOURCE CONTROL BMPs:**
- ④ S1 - PROVIDE STORM DRAIN SYSTEM STENCILING AND SIGNAGE (CASQA NEW DEVELOPMENT BMP HANDBOOK SD-13)
  - ⑤ S3 - DESIGN AND CONSTRUCT TRASH AND WASTE STORAGE AREAS TO REDUCE POLLUTION INTRODUCTION (CASQA NEW DEVELOPMENT BMP HANDBOOK SD-32)
  - ⑥ S4 - USE EFFICIENT IRRIGATION SYSTEM & LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLER AND SOURCE CONTROL (STATEWIDE MODEL LANDSCAPE ORDINANCE, CASQA NEW DEVELOPMENT BMP HANDBOOK SD-12)
  - ⑦ S5 - FINISH GRADE OF LANDSCAPE AREAS AT MINIMUM 1-2 INCHES BELOW TOP OF CURB, SIDEWALK, OR PAVEMENT

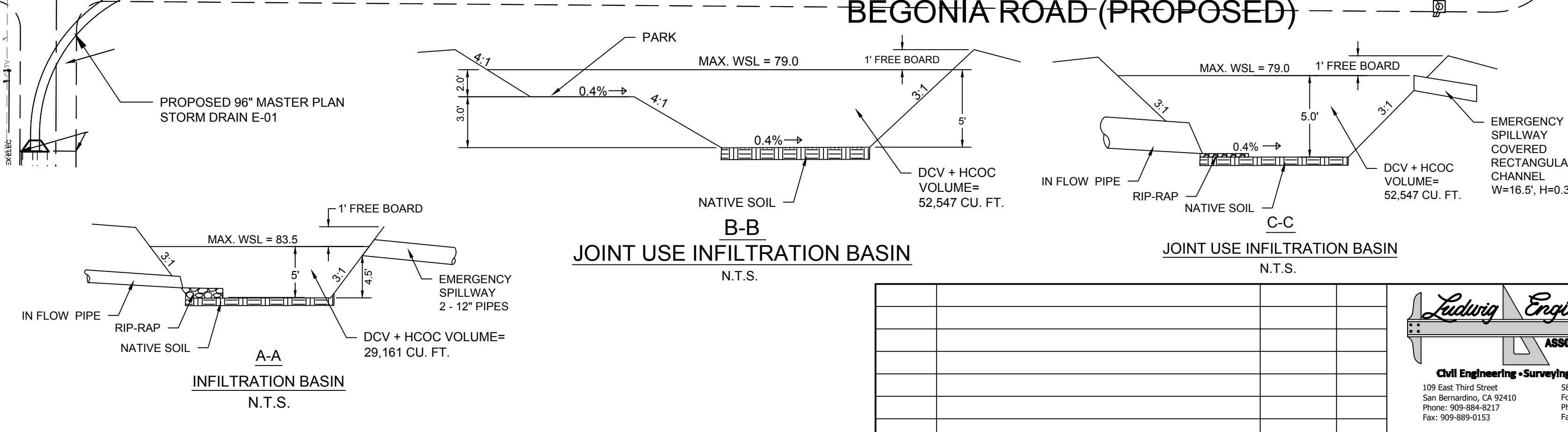
- PROPOSED TREATMENT CONTROL BMPs:**
- ① BMP 1 = INFILTRATION BASIN
  - ② PROVIDE LABELING AT STORM DRAIN INLETS AND CATCH BASIN WITH PROHIBITED LANGUAGE "NO DUMPING DRAINS TO STREAM PER CASQA SD-13"

**BASIN LOT F - DA-A (WEST AREA) STAGE STORAGE TABLE**

ELEV	AREA (sq. ft.)	DEPTH (ft)	AVG END INC. VOL. (cu. ft.)	AVG END TOTAL VOL. (cu. ft.)	AVG END INC. VOL. (ac. ft.)	AVG END TOTAL VOL. (ac. ft.)
78.5	3,216	N/A	N/A	0	N/A	N/A
79.5	4,190	1	3703	3703	0.085	0.085
80.5	5,222	2	4706	8409	0.108	0.193
81.5	6,317	3	5769	14178	0.132	0.325
82.5	7,472	4	6894	21072	0.158	0.484
82.6	D.C.V.	4.1	D.C.V.	21988		0.505
83.5	8,707	5	7173	29161	0.165	0.669
84.5	10,026	6	9367	38528	0.215	0.884

**BASIN LOT G - DA-B (EAST AREA) STAGE STORAGE TABLE**

ELEV	AREA (sq. ft.)	DEPTH (ft)	AVG END INC. VOL. (cu. ft.)	AVG END TOTAL VOL. (cu. ft.)	AVG END INC. VOL. (ac. ft.)	AVG END TOTAL VOL. (ac. ft.)
74	5,380	N/A	N/A	0	N/A	0.000
75	6,805	1	6093	6093	0.140	0.140
76	8,341	2	7573	13666	0.174	0.314
77	14,756	3	11548	25214	0.265	0.579
78	17,075	4	15916	41130	0.365	0.944
78.08	D.C.V.	4.08	D.C.V.	42669		0.980
79	19,510	5	18292	59422	0.420	1.364
80	22,029	6	20770	80192	0.477	1.841



**Ludwig Engineering ASSOCIATES, INC.**  
Civil Engineering • Surveying • Planning  
109 East Third Street, San Bernardino, CA 92410  
Phone: 909-884-8217 Fax: 909-889-0153

**CITY OF VICTORVILLE**  
TRACT 20500  
WQMP MAP

CLIENT: **LEU, LIU & ASSOCIATES**  
1803 VIRGINIA ROAD, SAN MARINO, CA 91108

DESIGNED BY: MR      DRAWN BY: MR      CHECKED BY: JA

SCALE: 1:80  
SHEET 1 OF 1

REV.	DESCRIPTION	DATE	BY

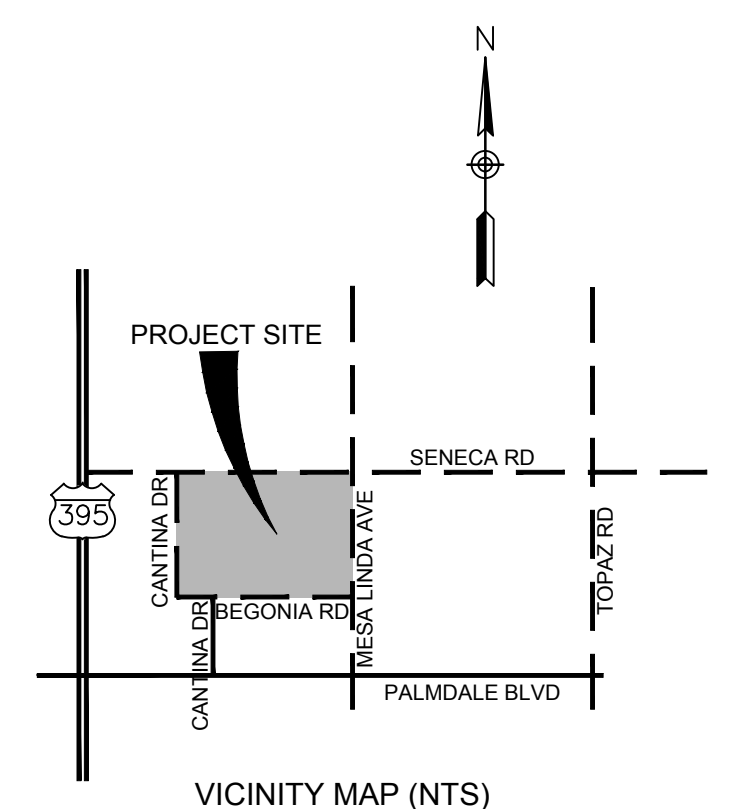
PLOT DATE: February 8, 2022



# IN THE CITY OF VICTORVILLE, COUNTY OF SAN BERNARDINO, CALIFORNIA TENTATIVE TRACT MAP NO. 20500

BEING A SUBDIVISION OF THE NORTH 1/2 OF THE NORTHWEST 1/4 OF SECTION 22 T5N. R5W. S.B.B. 4M.

LUDWIG ENGINEERING OCTOBER 2021



OWNER/DEVELOPER  
LEU, LIU & ASSOCIATES  
1803 VIRGINIA ROAD  
SAN MARINO, CA 91108  
(626) 695-5222

ENGINEER  
LUDWIG ENGINEERING ASSOCIATES, INC.  
109 E. THIRD STREET  
SAN BERNARDINO, CA 92410  
(909) 684-6217

ASSESSOR'S PARCEL NO.  
APN: 3103-551-05

ZONING & LAND USE  
R-1 (SINGLE-FAMILY RESIDENTIAL)

GENERAL PLAN DESIGNATION  
LOW DENSITY RESIDENTIAL

### SERVICES

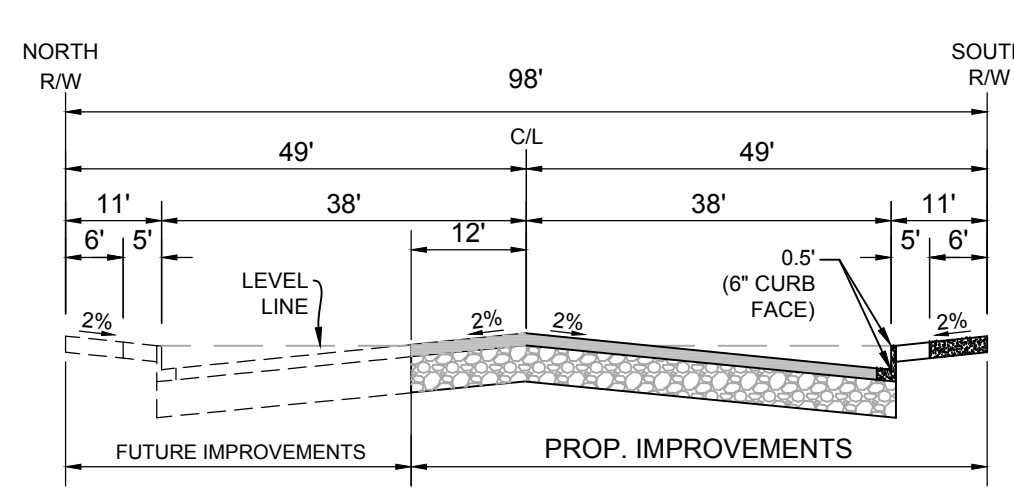
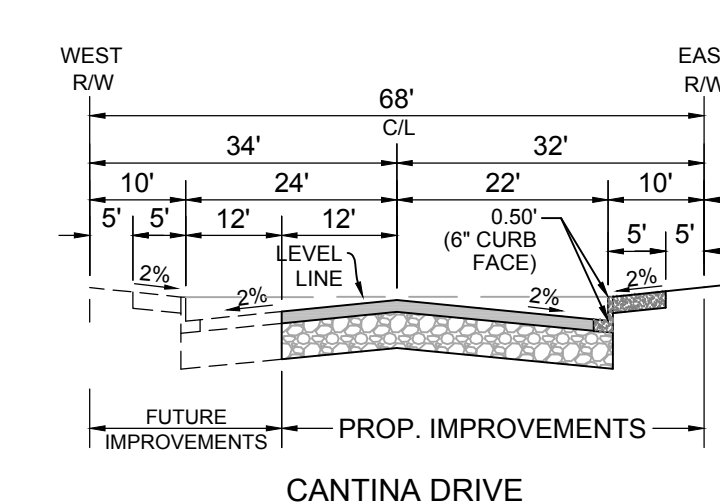
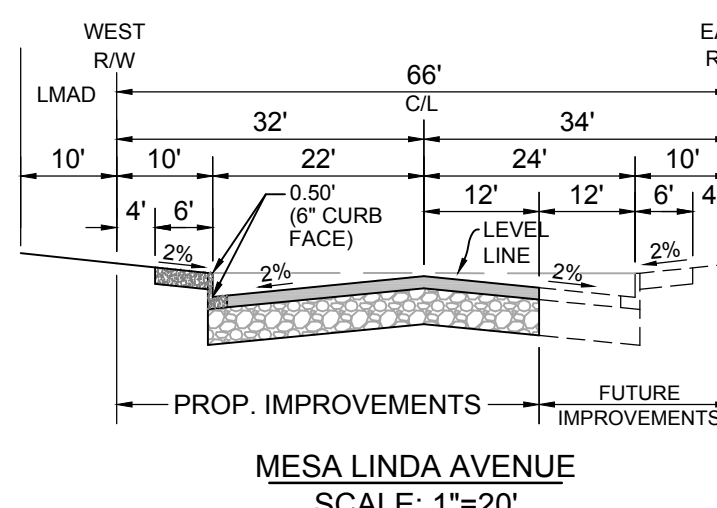
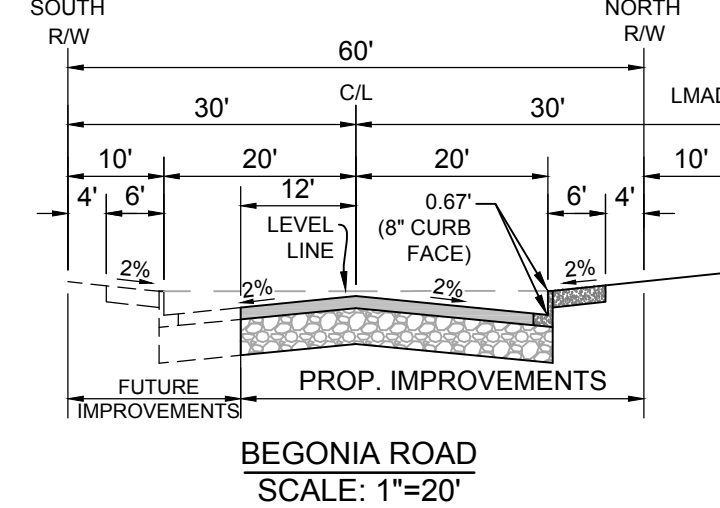
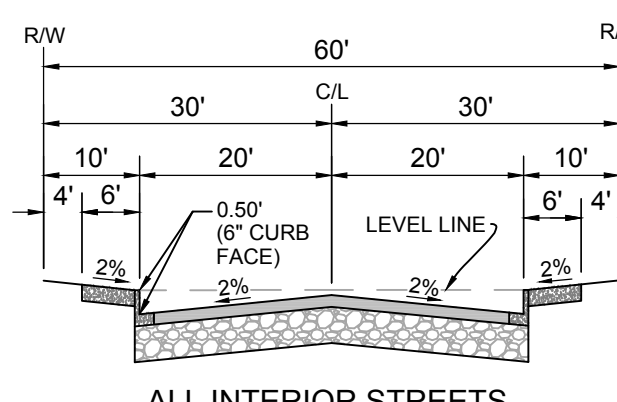
- ELECTRICITY SOUTH CALIFORNIA EDISON COMPANY 12551 HESPERIA ROAD VICTORVILLE, CA 92092
- WATER VICTORVILLE VALLEY WATER DISTRICT 1788 NUMA STREET VICTORVILLE, CA 92092-5887
- SEWER CITY OF VICTORVILLE 1450 CIVIC DRIVE VICTORVILLE, CA 92092
- GAS SOUTHWEST GAS COMPANY 14500 CIRCLE DRIVE VICTORVILLE, CA 92092
- TELEPHONE VERIZON 19071 MOJAVE DRIVE VICTORVILLE, CA 92092

### AREAS

TOTAL ACREAGE: APPROX. 55 AC  
TOTAL NUMBERED LOTS: 210  
UNITS PER ACRE: GROSS RES: 3.47  
MINIMUM LOT SIZE RES: 7,200 SF  
TOTAL LETTERED LOTS: 1 "LOT" "A" THROUGH "E" FOR LMAID. LOTS "F" AND "G" FOR WATER QUALITY BASINS)

### NOTES

- THIS TRACT CONTAINS 7,670 L.F. OF NEW STREETS.
- UNLESS OTHERWISE INDICATED PROPOSED SEWERS ARE 8" PVC.
- UNLESS OTHERWISE INDICATED PROPOSED WATER LINES ARE 8" PVC.
- UNLESS OTHERWISE INDICATED THE SURROUNDING LAND USE IS "VACANT".
- CONTOUR SOURCE: LUDWIG ENGINEERING GROUND SURVEY
- DEVELOPMENT OF SITE WILL HAVE MINIMAL EFFECT ON EXISTING DRAINAGE PATTERNS. STORM WATER RUNOFF WILL FOLLOW EXISTING AND NATURAL DRAINAGE COURSES OR BE CARRIED IN PROPOSED STREETS AND DRAINAGE FACILITIES AS INDICATED ON THE MAP AND OUTLINED IN ACCOMPANYING DRAINAGE STUDY.
- EARTHWORK WILL BE BALANCED ON SITE.
- ESTIMATED EARTHWORK QUANTITY: RAW CUT: 118,213 CY RAW FILL: 44,244 CY
- IMPROVEMENTS ARE PER TYPICAL SUBDIVISION AND ARE TO BE BUILT ACCORDING TO CITY OF VICTORVILLE STANDARDS.
- SETBACKS: 20'- FRONT & REAR  
10'- STREET SIDE YARD  
5'- SIDE YARD
- THIS IS A CALCULATED MAP. LOT CLOSURES ARE AVAILABLE. THE DEVELOPER REQUESTS REVIEW FOR COMPLIANCE WITH CURRENT CODES AND POLICIES WITH REGARD TO GEOMETRICS.
- SECONDARY ACCESS TO BE PROVIDED WHERE NECESSARY.
- (E23) INDICATES PAD ELEVATION.



### LEGEND AND ABBREVIATIONS

- TRACT BOUNDARY
- (E200) --- EXIST. CONTOURS
- EXIST. WATER
- EXIST. SEWER
- PROP. WATER
- PROP. SEWER
- PROP. GAS
- BLDG. SETBACK LINE
- (E200) EXIST. ELEVATIONS
- 80.0 PROP. ELEVATIONS
- EXIST. WATER
- EXIST. SEWER
- PROP. WATER
- PROP. SEWER
- PROP. GAS
- BLDG. SETBACK LINE
- FS FINISHED SURFACE
- FL FLOW LINE
- PE PAD ELEVATION
- GB GRADE BREAK
- HP HIGH POINT
- LP LOW POINT
- SF SQUARE FOOT

- AC PAVING
- LMAID



 Ludwig Engineering Associates, Inc. Civil Engineering - Surveying - Planning 100 East Third Street, Suite 100, Victorville, CA 92092 Phone: 951-949-0117 Fax: 951-949-0118 15255 Sanoma Rd., Suite 8, Victorville, CA 92092 Phone: 951-949-0117 Fax: 951-949-0118				<b>LOCATION</b> PROJECT_NAME DWG_NAME				<b>SCALE</b> DWGSCALE SHEET SHTNO OF SHTTOT MTR_SHT	
CLIENT: CLIENT_ADDRESS		DESIGNED BY: DESIGNER		DRAWN BY: DRAFTER		CHECKED BY: CHECKER			
REV.	DESCRIPTION	DATE	BY	DATE	BY	DATE	BY		



# VICINITY MAP (NTS)



## **Attachment 2 - Electronic Data Submittal**

This is a digital submittal. A separate electronic copy will not be provided.

## **Attachment 3 - Post Construction**

Maintenance Agreement will be signed and notarized when requested by the reviewing agency.

# **Attachment 4 - Other Supporting Documentation**



# Tract 20500

Looking North from Palmdale Road

Legend

Project Site

APN: 310356109-14,  
310356117-20,  
310356126-27

Palmdale Road





# Tract 20500

Looking East from US-395

Legend

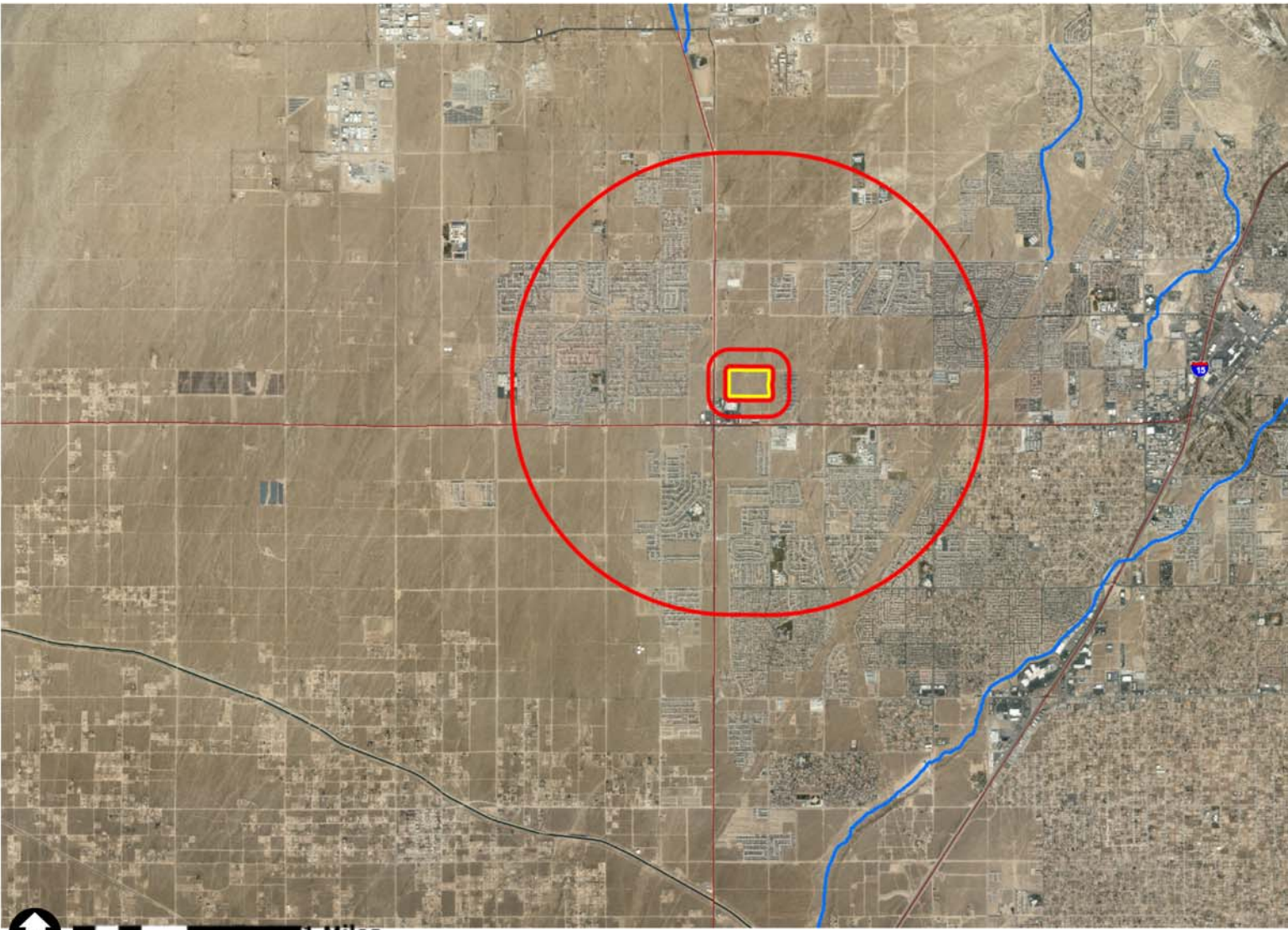
APN: 310355102-4

Project Site

US-395







1 Miles



Site Address: [permitrack.sbcounty.gov/wap](http://permitrack.sbcounty.gov/wap)



## WQMP Project Report

### County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Wednesday, September 01, 2021

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

<b>Project Site Parcel Number(s):</b>	310355105
<b>Project Site Acreage:</b>	55.081
<b>HCOG Exempt Area:</b>	No
<b>Closest Receiving Waters:</b> <small>(Applicant to verify based on local drainage facilities and topography.)</small>	<b>System Number</b> - See Note <b>Facility Name</b> - See Note <b>Owner</b> - See Note
<b>Closest channel segment's susceptibility to Hydromodification:</b>	See Note
<b>Highest downstream hydromodification susceptibility:</b>	See Note
<b>Is this drainage segment subject to TMDLs?</b>	See Note
<b>Are there downstream drainage segments subject to TMDLs?</b>	See Note
<b>Is this drainage segment a 303d listed stream?</b>	See Note
<b>Are there 303d listed streams downstream?</b>	See Note
<b>Are there unlined downstream waterbodies?</b>	See Note
<b>Project Site Onsite Soil Group(s):</b>	A, B
<b>Environmentally Sensitive Areas within 200':</b>	DESERT TORTOISE HABITAT CAT 3, MOJAVE GROUND SQUIRREL
<b>Groundwater Depth (FT):</b>	No data available
<b>Parcels with potential septic tanks within 1000':</b>	No
<b>Known Groundwater Contamination Plumes within 1000':</b>	No
<b>Studies and Reports Related to Project Site:</b>	

Note: No drainage facilities located within 2 miles of site.

**Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet**

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	3	0.75
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{TOT} = S_A \times S_B$				5.0	
Measured Infiltration Rate, inch/hr, $K_M$ (corrected for test-specific bias)				9.47	
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$				1.9	
<b>Supporting Data</b>					
Briefly describe infiltration test and provide reference to test forms:					
Infiltration rate was determined from a NRCS Custom Soil Resource Report by taking average infiltration rate from the provided capacity of the most limiting layer to transmit water, 112-Cajon Sand. <b>DRAINAGE AREA 1 (WEST SIDE)</b>					

**Note:** The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

**Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet**

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	3	0.75
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{TOT} = S_A \times S_B$				5.0* (2.0)	
Measured Infiltration Rate, inch/hr, $K_M$ (corrected for test-specific bias)				3.97	
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$				0.79* (2.0)	
<b>Supporting Data</b>					
Briefly describe infiltration test and provide reference to test forms:					
Infiltration rate was determined from a NRCS Custom Soil Resource Report by taking the average infiltration rate from the provided capacity of the most limiting layer to transmit water, 173-Wasco Sandy Loam.					
Combined Safety Factor has been reduced to 2 in order to test feasibility of infiltration BMPs.					
DRAINAGE AREA 2 (EAST AREA)					

**Note:** The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.





## 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.

## 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.

## Targeted Constituents

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



***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/>



## Objectives

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

## Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, re-use, and recycling; and preventing runoff and runoff.

## Approach

### *Pollution Prevention*

- Reduction in the amount of waste generated can be accomplished using the following source controls such as:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>





***Suggested Protocols****General*

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater runoff and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

*Controlling Litter*

- Post “No Littering” signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

*Waste Collection*

- Keep waste collection areas clean.
- Inspect solid waste containers for structural damage or leaks regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Place waste containers under cover if possible.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc. may not be

disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

## *Good Housekeeping*

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g. sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- Stencil storm drains on the facility's property with prohibitive message regarding waste disposal.

## *Chemical/Hazardous Wastes*

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers protected from vandalism, and in compliance with fire and hazardous waste codes.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

## *Runon/Runoff Prevention*

- Prevent stormwater runon from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent the waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

## *Inspection*

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.
- Repair leaking equipment including valves, lines, seals, or pumps promptly.

***Training***

- Train staff pollution prevention measures and proper disposal methods.
- Train employees and contractors proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
- Train employees and subcontractors in proper hazardous waste management.

***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.
- Vehicles transporting waste should have spill prevention equipment that can prevent spills during transport. The spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

***Other Considerations***

- Hazardous waste cannot be re-used or recycled; it must be disposed of by a licensed hazardous waste hauler.

**Requirements*****Costs***

- Capital and operation and maintenance costs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

***Maintenance***

- None except for maintaining equipment for material tracking program.



## Supplemental Information

### *Further Detail of the BMP*

#### *Land Treatment System*

- Minimize the runoff of polluted stormwater from land application of municipal waste on-site by:
  - Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, there is a closed drainage system.
  - Avoiding application of waste to the site when it is raining or when the ground is saturated with water.
  - Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site.
  - Maintaining adequate barriers between the land application site and the receiving waters. Planted strips are particularly good.
  - Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins.
  - Performing routine maintenance to ensure the erosion control or site stabilization measures are working.

## References and Resources

King County Stormwater Pollution Control Manual - <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Associations (BASMAA). On-line: <http://www.basmaa.org>





## Objectives

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

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>

## Description

Streets, roads, and highways are significant sources of pollutants in stormwater discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. Stormwater pollution from roadway and bridge maintenance should be addressed on a site-specific basis. Use of the procedures outlined below, that address street sweeping and repair, bridge and structure maintenance, and unpaved roads will reduce pollutants in stormwater.

## Approach

### *Pollution Prevention*

- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal)
- Recycle paint and other materials whenever possible.
- Enlist the help of citizens to keep yard waste, used oil, and other wastes out of the gutter.

### *Suggested Protocols*

#### *Street Sweeping and Cleaning*

- Maintain a consistent sweeping schedule. Provide minimum monthly sweeping of curbed streets.
- Perform street cleaning during dry weather if possible.



- Avoid wet cleaning or flushing of street, and utilize dry methods where possible.
- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc. For example:
  - Increase the sweeping frequency for streets with high pollutant loadings, especially in high traffic and industrial areas.
  - Increase the sweeping frequency just before the wet season to remove sediments accumulated during the summer.
  - Increase the sweeping frequency for streets in special problem areas such as special events, high litter or erosion zones.
- Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced with new technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.
- Operate sweepers at manufacturer requested optimal speed levels to increase effectiveness.
- To increase sweeping effectiveness consider the following:
  - Institute a parking policy to restrict parking in problematic areas during periods of street sweeping.
  - Post permanent street sweeping signs in problematic areas; use temporary signs if installation of permanent signs is not possible.
  - Develop and distribute flyers notifying residents of street sweeping schedules.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- If available use vacuum or regenerative air sweepers in the high sediment and trash areas (typically industrial/commercial).
- Keep accurate logs of the number of curb-miles swept and the amount of waste collected.
- Dispose of street sweeping debris and dirt at a landfill.
- Do not store swept material along the side of the street or near a storm drain inlet.
- Keep debris storage to a minimum during the wet season or make sure debris piles are contained (e.g. by berming the area) or covered (e.g. with tarps or permanent covers).

### *Street Repair and Maintenance*

#### *Pavement marking*

- Schedule pavement marking activities for dry weather.

- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.
- Provide drop cloths and drip pans in paint mixing areas.
- Properly maintain application equipment.
- Street sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.
- Paints containing lead or tributyltin are considered a hazardous waste and must be disposed of properly.
- Use water based paints whenever possible. If using water based paints, clean the application equipment in a sink that is connected to the sanitary sewer.
- Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

### *Concrete installation and repair*

- Schedule asphalt and concrete activities for dry weather.
- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place sand bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- When making saw cuts in pavement, use as little water as possible and perform during dry weather. Cover each storm drain inlet completely with filter fabric or plastic during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site. Alternatively, a small onsite vacuum may be used to pick up the slurry as this will prohibit slurry from reaching storm drain inlets.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.



*Patching, resurfacing, and surface sealing*

- Schedule patching, resurfacing and surface sealing for dry weather.
- Stockpile materials away from streets, gutter areas, storm drain inlets or watercourses. During wet weather, cover stockpiles with plastic tarps or berm around them if necessary to prevent transport of materials in runoff.
- Pre-heat, transfer or load hot bituminous material away from drainage systems or watercourses.
- Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and maintenance holes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from covered maintenance holes and storm drain inlets when the job is complete.
- Prevent excess material from exposed aggregate concrete or similar treatments from entering streets or storm drain inlets. Designate an area for clean up and proper disposal of excess materials.
- Use only as much water as necessary for dust control, to avoid runoff.
- Sweep, never hose down streets to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains.
- 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.

*Equipment cleaning maintenance and storage*

- Inspect equipment daily and repair any leaks. Place drip pans or absorbent materials under heavy equipment when not in use.
- Perform major equipment repairs at the corporation yard, when practical.
- If refueling or repairing vehicles and equipment must be done onsite, use a location away from storm drain inlets and watercourses.
- Clean equipment including sprayers, sprayer paint supply lines, patch and paving equipment, and mud jacking equipment at the end of each day. Clean in a sink or other area (e.g. vehicle wash area) that is connected to the sanitary sewer.

*Bridge and Structure Maintenance**Paint and Paint Removal*

- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Do not transfer or load paint near storm drain inlets or watercourses.

- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint container.
- Plug nearby storm drain inlets prior to starting painting where there is significant risk of a spill reaching storm drains. Remove plugs when job is completed.
- If sand blasting is used to remove paint, cover nearby storm drain inlets prior to starting work.
- Perform work on a maintenance traveler or platform, or use suspended netting or tarps to capture paint, rust, paint removing agents, or other materials, to prevent discharge of materials to surface waters if the bridge crosses a watercourse. If sanding, use a sander with a vacuum filter bag.
- Capture all clean-up water, and dispose of properly.
- Recycle paint when possible (e.g. paint may be used for graffiti removal activities). Dispose of unused paint at an appropriate household hazardous waste facility.

### *Graffiti Removal*

- Schedule graffiti removal activities for dry weather.
- Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.
- When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal above.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a landscaped or dirt area. If such an area is not available, filter runoff through an appropriate filtering device (e.g. filter fabric) to keep sand, particles, and debris out of storm drains.
- If a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound), plug nearby storm drains and vacuum/pump wash water to the sanitary sewer.
- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

### *Repair Work*

- Prevent concrete, steel, wood, metal parts, tools, or other work materials from entering storm drains or watercourses.
- Thoroughly clean up the job site when the repair work is completed.
- When cleaning guardrails or fences follow the appropriate surface cleaning methods (depending on the type of surface) outlined in SC-71 Plaza & Sidewalk Cleaning fact sheet.



- If painting is conducted, follow the painting and paint removal procedures above.
- If graffiti removal is conducted, follow the graffiti removal procedures above.
- If construction takes place, see the Construction Activity BMP Handbook.
- Recycle materials whenever possible.

#### *Unpaved Roads and Trails*

- Stabilize exposed soil areas to prevent soil from eroding during rain events. This is particularly important on steep slopes.
- For roadside areas with exposed soils, the most cost-effective choice is to vegetate the area, preferably with a mulch or binder that will hold the soils in place while the vegetation is establishing. Native vegetation should be used if possible.
- If vegetation cannot be established immediately, apply temporary erosion control mats/blankets; a comma straw, or gravel as appropriate.
- If sediment is already eroded and mobilized in roadside areas, temporary controls should be installed. These may include: sediment control fences, fabric-covered triangular dikes, gravel-filled burlap bags, biobags, or hay bales staked in place.

#### *Non-Stormwater Discharges*

Field crews should be aware of non-stormwater discharges as part of their ongoing street maintenance efforts.

- Refer to SC-10 Non-Stormwater Discharges
- Identify location, time and estimated quantity of discharges.
- Notify appropriate personnel.

#### ***Training***

- Train employees regarding proper street sweeping operation and street repair and maintenance.
- Instruct employees and subcontractors to ensure that measures to reduce the stormwater impacts of roadway/bridge maintenance are being followed.
- Require engineering staff and/or consulting A/E firms to address stormwater quality in new bridge designs or existing bridge retrofits.
- Use a training log or similar method to document training.
- Train employees on proper spill containment and clean up, and in identifying non-stormwater discharges.

## ***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations***

- Densely populated areas or heavily used streets may require parking regulations to clear streets for cleaning.
- No currently available conventional sweeper is effective at removing oil and grease. Mechanical sweepers are not effective at removing finer sediments.
- Limitations may arise in the location of new bridges. The availability and cost of land and other economic and political factors may dictate where the placement of a new bridge will occur. Better design of the bridge to control runoff is required if it is being placed near sensitive waters.

## **Requirements**

### ***Costs***

- The maintenance of local roads and bridges is already a consideration of most community public works or transportation departments. Therefore, the cost of pollutant reducing management practices will involve the training and equipment required to implement these new practices.
- The largest expenditures for street sweeping programs are in staffing and equipment. The capital cost for a conventional street sweeper is between \$60,000 and \$120,000. Newer technologies might have prices approaching \$180,000. The average useful life of a conventional sweeper is about four years, and programs must budget for equipment replacement. Sweeping frequencies will determine equipment life, so programs that sweep more often should expect to have a higher cost of replacement.
- A street sweeping program may require the following.
  - Sweeper operators, maintenance, supervisory, and administrative personnel are required.
  - Traffic control officers may be required to enforce parking restrictions.
  - Skillful design of cleaning routes is required for program to be productive.
  - Arrangements must be made for disposal of collected wastes.

- If investing in newer technologies, training for operators must be included in operation and maintenance budgets. Costs for public education are small, and mostly deal with the need to obey parking restrictions and litter control. Parking tickets are an effective reminder to obey parking rules, as well as being a source of revenue.

***Maintenance***

- Not applicable

**Supplemental Information*****Further Detail of the BMP******Street sweeping***

There are advantages and disadvantages to the two common types of sweepers. The best choice depends on your specific conditions. Many communities find it useful to have a compliment of both types in their fleet.

**Mechanical Broom Sweepers** - More effective at picking up large debris and cleaning wet streets. Less costly to purchase and operate. Create more airborne dust.

**Vacuum Sweepers** - More effective at removing fine particles and associated heavy metals. Ineffective at cleaning wet streets. Noisier than mechanical broom sweepers which may restrict areas or times of operation. May require an advance vehicle to remove large debris.

**Street Flushers** - Not affected by biggest interference to cleaning, parked cars. May remove finer sediments, moving them toward the gutter and stormwater inlets. For this reason, flushing fell out of favor and is now used primarily after sweeping. Flushing may be effective for combined sewer systems. Presently street flushing is not allowed under most NPDES permits.

***Cross-Media Transfer of Pollutants***

The California Air Resources Board (ARB) has established state ambient air quality standards including a standard for respirable particulate matter (less than or equal to 10 microns in diameter, symbolized as PM<sub>10</sub>). In the effort to sweep up finer sediments to remove attached heavy metals, municipalities should be aware that fine dust, that cannot be captured by the sweeping equipment and becomes airborne, could lead to issues of worker and public safety.

***Bridges***

Bridges that carry vehicular traffic generate some of the more direct discharges of runoff to surface waters. Bridge scupper drains cause a direct discharge of stormwater into receiving waters and have been shown to carry relatively high concentrations of pollutants. Bridge maintenance also generates wastes that may be either directly deposited to the water below or carried to the receiving water by stormwater. The following steps will help reduce the stormwater impacts of bridge maintenance:

- Site new bridges so that significant adverse impacts to wetlands, sensitive areas, critical habitat, and riparian vegetation are minimized.



- Design new bridges to avoid the use of scupper drains and route runoff to land for treatment control. Existing scupper drains should be cleaned on a regular basis to avoid sediment/debris accumulation.
- Reduce the discharge of pollutants to surface waters during maintenance by using suspended traps, vacuums, or booms in the water to capture paint, rust, and paint removing agents. Many of these wastes may be hazardous. Properly dispose of this waste by referring to CA21 (Hazardous Waste Management) in the Construction Handbook.
- Train employees and subcontractors to reduce the discharge of wastes during bridge maintenance.

## *De-icing*

- Do not over-apply deicing salt and sand, and routinely calibrate spreaders.
- Near reservoirs, restrict the application of deicing salt and redirect any runoff away from reservoirs.
- Consider using alternative deicing agents (less toxic, biodegradable, etc.).

## **References and Resources**

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](http://www.ocwatersheds.com/stormwater/swp_introduction.asp)

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

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

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Fresh Concrete and Mortar Application Best Management Practices for the Construction Industry. June.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Roadwork and Paving Best Management Practices for the Construction Industry. June.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Roadway and Bridge Maintenance. On-line [http://www.epa.gov/npdes/menuofbmeps/poll\\_13.htm](http://www.epa.gov/npdes/menuofbmeps/poll_13.htm)



## Objectives

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

## Description

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

## Approach

### *Pollution Prevention*

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).

### *Suggested Protocols*

#### *Surface Cleaning*

- Regularly broom (dry) sweep sidewalk, plaza and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



- Block the storm drain or contain runoff when washing parking areas, driveways or drive-throughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

#### *Graffiti Removal*

- Avoid graffiti abatement activities during rain events.
- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operation and Maintenance fact sheet when graffiti is removed by painting over.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.
- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

#### *Surface Removal and Repair*

- Schedule surface removal activities for dry weather if possible.
- Avoid creating excess dust when breaking asphalt or concrete.
- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.
- Designate an area for clean up and proper disposal of excess materials.
- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.
- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.
- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

#### *Concrete Installation and Repair*

- Schedule asphalt and concrete activities for dry weather.



- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place sand bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Protect applications of fresh concrete from rainfall and runoff until the material has dried.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

## *Controlling Litter*

- Post “No Littering” signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.
- Clean parking lots on a regular basis with a street sweeper.

## *Training*

- Provide regular training to field employees and/or contractors regarding surface cleaning and proper operation of equipment.
- Train employee and contractors in proper techniques for spill containment and cleanup.
- 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 known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

***Other Considerations***

- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.
- Surface cleaning activities that require discharges to the local sewerage agency will require coordination with the agency.
- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

**Requirements*****Costs***

- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

***Maintenance***

Not applicable

**Supplemental Information*****Further Detail of the BMP***

Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:

- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

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## Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	<input checked="" type="checkbox"/>

## 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.





- 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 known 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.

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Photo Credit: Geoff Brosseau

## Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

## Approach

### *Suggested Protocols*

#### *Catch Basins/Inlet Structures*

- Municipal staff should regularly inspect facilities to ensure 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 SC-75 Waste Handling and Disposal).
- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.

## Objectives

- Contain
- Educate
- Reduce/Minimize

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



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- 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.
- Record the amount of waste collected.
- 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 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 of. Do not dewater near a storm drain or stream.
- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

## *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 flushed effluent and pump to the sanitary sewer for treatment.

## *Pump Stations*

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.
- Conduct quarterly routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.
- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

## *Open Channel*

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to 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 stream 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*

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - 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 up gradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.
- Stencil 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*

- Regularly inspect and clean up hot spots and other storm drainage areas 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.

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- The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).
- The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

## ***Training***

- Train crews in proper maintenance activities, including record keeping and disposal.
- Only properly trained individuals are allowed to handle hazardous materials/wastes.
- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.
- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

## ***Spill Response and Prevention***

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

## ***Other Considerations***

- Cleanup 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 disposal of flushed effluent to sanitary sewer may be prohibited in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Private property access rights may be needed to track illegal discharges up gradient.



- Requirements of municipal ordinance authority for suspected source verification testing for illicit connections necessary for guaranteed rights of entry.

## Requirements

### *Costs*

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.
- 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. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from “environmental fees” or special assessment districts to fund their illicit connection elimination programs.

### *Maintenance*

- Two-person teams may be required to clean catch basins with vector trucks.
- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

## Supplemental Information

### *Further Detail of the BMP*

#### *Storm Drain flushing*

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents “plug flow” discharges of concentrated pollutant loadings and sediments. The 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, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect 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 re-collect 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 percent for organics and 55-65 percent 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 drain flushing.

#### *Flow Management*

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows were allowed to spread out.

#### *Stream Corridor Planning*

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for stream alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.



Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

Corridor reservation - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

Bank treatment - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

Geomorphic restoration – Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

Grade Control - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradation upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.

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When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to be reclaimed.

## ***Examples***

The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank and watershed instability and floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

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United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Illegal Dumping Control. On line:  
[http://www.epa.gov/npdes/menuofbmps/poll\\_7.htm](http://www.epa.gov/npdes/menuofbmps/poll_7.htm)

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:  
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## Objectives

- Cover
- Contain
- Educate
- Reduce/Reuse

## Description

It is important to control litter to eliminate trash and other materials in stormwater runoff. Waste reduction is a major component of waste management and should be encouraged through training and public outreach. Management of waste once it is collected may involve reuse, recycling, or proper disposal.

## Approach

### *Pollution Prevention*

- Reuse products when possible.
- Encourage recycling programs with recycling bins, used oil collection, etc.

### *Suggested Protocols*

#### *Solid Waste Collection*

- Implement procedures, where applicable, to collect, transport, and dispose of solid waste at appropriate disposal facilities in accordance with applicable federal, state, and local laws and regulations.
- Include properly designed trash storage areas. If feasible provide cover over trash storage areas.
- Regularly inspect solid waste containers for structural damage. Repair or replace damaged containers as necessary.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc. may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).
- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.
- Refer to SC-34 Waste Handling and Disposal for more information regarding solid waste facilities.

#### *Waste Reduction and Recycling*

- Recycle wastes whenever possible. Many types of waste can be recycled, recycling options for each waste type are limited. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should either be incinerated or disposed of at a properly permitted landfill.
- Recycling is always preferable to disposal of unwanted materials.
- Recycling bins for glass, metal, newspaper, plastic bottles and other recyclable household solid wastes should be provided at public facilities and/or for residential curbside collection.

#### *Controlling Litter*

- Post “No Littering” signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Clean out and cover litter receptacles frequently to prevent spillage.

#### *Illegal Dumping*

Substances illegally dumped on streets and into the storm drain system and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clipping, and pet wastes.

- Post “No Dumping” signs with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Landscaping and beautification efforts of hot spots might also discourage future dumping.
- See SC-74 Drainage System Maintenance, and SC-10 Non-Stormwater Discharges.



## Requirements

### *Costs*

- The costs for a solid waste source control program vary depending on the type of method. The cost of a community education program or a plan to increase the number of trash receptacles can be very minimal. Costs for structural controls such as trash racks, bar screens, and silt traps can be quite costly ranging from \$250,000 to \$900,000.
- A collection facility or curbside collection for used oil may result in significant costs. Commercial locations (automobile service stations, quick oil change centers, etc.) as collection points eliminate hauling and recycling costs.
- Collection and disposal of hazardous waste can be very expensive and requires trained operators; laboratory and detection equipment; and extensive record keeping including dates, types, and quantities.
- Use of volunteer work forces can lower storm drain stenciling program costs. Stenciling kits require procurement of durable/disposable items. The stenciling program can aid in the cataloging of the storm drain system. One municipality from the state of Washington has estimated that stenciling kits cost approximately \$50 each. Stencils may cost about \$8 each including the die cost on an order of 1,000. Re-orders cost about \$1/stencil. Stencil designs may be available from other communities. Stencil kits should be provided on a loan basis to volunteer groups free of charge with the understanding that kit remnants are to be returned.

### *Maintenance*

- The primary staff demand for stenciling programs is for program setup to provide marketing and training. Ongoing/follow-up staff time is minimal because of volunteer services.
- Staffing requirements are minimal for oil recycling programs if collection/recycling is contracted out to a used oil hauler/recycler or required at commercial locations.
- Staff requirements for maintaining good housekeeping BMPs at waste handling sites is minimal.

## Supplemental Information

### *Further Detail of the BMP*

#### *Waste Reduction*

An approach to reduce stormwater pollution from waste handling and disposal is to assess activities and reduce waste generation. The assessment is designed to find situations where waste can be eliminated or reduced and emissions and environmental damage can be minimized. The assessment involves collecting process specific information, setting pollution prevention targets, and developing, screening and selecting waste reduction options for further study. Starting a waste reduction program is economically beneficial because of reduced raw material purchases and lower waste disposal fees.



**References and Resources**

Best Management Practices Program for Pollution Prevention, City and County of San Francisco, Uribe & Associates, Oakland, California, 1990.

Harvard University. 2002. Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety.

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. (Revised February 2002 by the California Coastal Commission).

Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](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.

# Site Design & Landscape Planning SD-10



## Design Objectives

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

## Description

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

## Approach

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

## Suitable Applications

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

## Design Considerations

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





# **SD-10 Site Design & Landscape Planning**

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## ***Designing New Installations***

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

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

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

## ***Conserve Natural Areas during Landscape Planning***

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

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

## ***Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit***

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

# Site Design & Landscape Planning SD-10

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

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

## *Protection of Slopes and Channels during Landscape Design*

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

## ***Redeveloping Existing Installations***

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



# **SD-10 Site Design & Landscape Planning**

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

## **Other Resources**

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

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

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

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

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



## Design Objectives

- Maximize Infiltration
- Provide Retention
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- 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.

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## Design Objectives

- Maximize Infiltration
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- Prohibit Dumping of Improper Materials
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- Collect and Convey

## Description

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

## Approach

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

## Suitable Applications

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

## Design Considerations

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

## Designing New Installations

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

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





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

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

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

### ***Redeveloping Existing Installations***

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

### **Additional Information**

#### ***Maintenance Considerations***

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

#### ***Placement***

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

### **Supplemental Information**

#### ***Examples***

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

### **Other Resources**

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

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

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

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

## Description

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

## Approach

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

## Suitable Applications

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

## Design Considerations

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

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

## Designing New Installations

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

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

## Design Objectives

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





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

***Redeveloping Existing Installations***

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

**Additional Information*****Maintenance Considerations***

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

**Other Resources**

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

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

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.



## Design Considerations

- Soil for Infiltration
- Slope
- Aesthetics

## Targeted Constituents

<input checked="" type="checkbox"/>	Sediment	■
<input checked="" type="checkbox"/>	Nutrients	■
<input checked="" type="checkbox"/>	Trash	■
<input checked="" type="checkbox"/>	Metals	■
<input checked="" type="checkbox"/>	Bacteria	■
<input checked="" type="checkbox"/>	Oil and Grease	■
<input checked="" type="checkbox"/>	Organics	■

### Legend (Removal Effectiveness)

- Low
- High
- ▲ Medium

## Description

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins use the natural filtering ability of the soil to remove pollutants in stormwater runoff. Infiltration facilities store runoff until it gradually exfiltrates through the soil and eventually into the water table. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems. Infiltration basins can be challenging to apply on many sites, however, because of soils requirements. In addition, some studies have shown relatively high failure rates compared with other management practices.

## California Experience

Infiltration basins have a long history of use in California, especially in the Central Valley. Basins located in Fresno were among those initially evaluated in the National Urban Runoff Program and were found to be effective at reducing the volume of runoff, while posing little long-term threat to groundwater quality (EPA, 1983; Schroeder, 1995). Proper siting of these devices is crucial as underscored by the experience of Caltrans in siting two basins in Southern California. The basin with marginal separation from groundwater and soil permeability failed immediately and could never be rehabilitated.

## Advantages

- Provides 100% reduction in the load discharged to surface waters.
- The principal benefit of infiltration basins is the approximation of pre-development hydrology during which a





significant portion of the average annual rainfall runoff is infiltrated and evaporated rather than flushed directly to creeks.

- If the water quality volume is adequately sized, infiltration basins can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

**Limitations**

- May not be appropriate for industrial sites or locations where spills may occur.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration basins once clogged.

**Design and Sizing Guidelines**

- Water quality volume determined by local requirements or sized so that 85% of the annual runoff volume is captured.
- Basin sized so that the entire water quality volume is infiltrated within 48 hours.
- Vegetation establishment on the basin floor may help reduce the clogging rate.

**Construction/Inspection Considerations**

- Before construction begins, stabilize the entire area draining to the facility. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction or remove the top 2 inches of soil after the site is stabilized. Stabilize the entire contributing drainage area, including the side slopes, before allowing any runoff to enter once construction is complete.
- Place excavated material such that it can not be washed back into the basin if a storm occurs during construction of the facility.
- Build the basin without driving heavy equipment over the infiltration surface. Any equipment driven on the surface should have extra-wide ("low pressure") tires. Prior to any construction, rope off the infiltration area to stop entrance by unwanted equipment.
- After final grading, till the infiltration surface deeply.
- Use appropriate erosion control seed mix for the specific project and location.

## Performance

As water migrates through porous soil and rock, pollutant attenuation mechanisms include precipitation, sorption, physical filtration, and bacterial degradation. If functioning properly, this approach is presumed to have high removal efficiencies for particulate pollutants and moderate removal of soluble pollutants. Actual pollutant removal in the subsurface would be expected to vary depending upon site-specific soil types. This technology eliminates discharge to surface waters except for the very largest storms; consequently, complete removal of all stormwater constituents can be assumed.

There remain some concerns about the potential for groundwater contamination despite the findings of the NURP and Nightingale (1975; 1987a,b,c; 1989). For instance, a report by Pitt et al. (1994) highlighted the potential for groundwater contamination from intentional and unintentional stormwater infiltration. That report recommends that infiltration facilities not be sited in areas where high concentrations are present or where there is a potential for spills of toxic material. Conversely, Schroeder (1995) reported that there was no evidence of groundwater impacts from an infiltration basin serving a large industrial catchment in Fresno, CA.

## Siting Criteria

The key element in siting infiltration basins is identifying sites with appropriate soil and hydrogeologic properties, which is critical for long term performance. In one study conducted in Prince George's County, Maryland (Galli, 1992), all of the infiltration basins investigated clogged within 2 years. It is believed that these failures were for the most part due to allowing infiltration at sites with rates of less than 0.5 in/hr, basing siting on soil type rather than field infiltration tests, and poor construction practices that resulted in soil compaction of the basin invert.

A study of 23 infiltration basins in the Pacific Northwest showed better long-term performance in an area with highly permeable soils (Hilding, 1996). In this study, few of the infiltration basins had failed after 10 years. Consequently, the following guidelines for identifying appropriate soil and subsurface conditions should be rigorously adhered to.

- Determine soil type (consider RCS soil type 'A, B or C' only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30% clay or more than 40% of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.
- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.
- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15% should not be considered.
- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.



- Base flow should not be present in the tributary watershed.

### **Secondary Screening Based on Site Geotechnical Investigation**

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.
- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.
- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.
- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

### **Additional Design Guidelines**

- (1) Basin Sizing - The required water quality volume is determined by local regulations or sufficient to capture 85% of the annual runoff.
- (2) Provide pretreatment if sediment loading is a maintenance concern for the basin.
- (3) Include energy dissipation in the inlet design for the basins. Avoid designs that include a permanent pool to reduce opportunity for standing water and associated vector problems.
- (4) Basin invert area should be determined by the equation:

$$A = \frac{WQV}{kt}$$

where A = Basin invert area (m<sup>2</sup>)

WQV = water quality volume (m<sup>3</sup>)

k = 0.5 times the lowest field-measured hydraulic conductivity (m/hr)

t = drawdown time ( 48 hr)

- (5) The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).



## Maintenance

Regular maintenance is critical to the successful operation of infiltration basins. Recommended operation and maintenance guidelines include:

- Inspections and maintenance to ensure that water infiltrates into the subsurface completely (recommended infiltration rate of 72 hours or less) and that vegetation is carefully managed to prevent creating mosquito and other vector habitats.
- Observe drain time for the design storm after completion or modification of the facility to confirm that the desired drain time has been obtained.
- Schedule semiannual inspections for beginning and end of the wet season to identify potential problems such as erosion of the basin side slopes and invert, standing water, trash and debris, and sediment accumulation.
- Remove accumulated trash and debris in the basin at the start and end of the wet season.
- Inspect for standing water at the end of the wet season.
- Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin.
- If erosion is occurring within the basin, revegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established.
- To avoid reversing soil development, scarification or other disturbance should only be performed when there are actual signs of clogging, rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a very light tractor.

## Cost

Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them. One study estimated the total construction cost at about \$2 per ft (adjusted for inflation) of storage for a 0.25-acre basin (SWRPC, 1991). As with other BMPs, these published cost estimates may deviate greatly from what might be incurred at a specific site. For instance, Caltrans spent about \$18/ft<sup>3</sup> for the two infiltration basins constructed in southern California, each of which had a water quality volume of about 0.34 ac.-ft. Much of the higher cost can be attributed to changes in the storm drain system necessary to route the runoff to the basin locations.

Infiltration basins typically consume about 2 to 3% of the site draining to them, which is relatively small. Additional space may be required for buffer, landscaping, access road, and fencing. Maintenance costs are estimated at 5 to 10% of construction costs.

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly maintained, infiltration basins have a high failure rate. Thus, it may be necessary to replace the basin with a different technology after a relatively short period of time.

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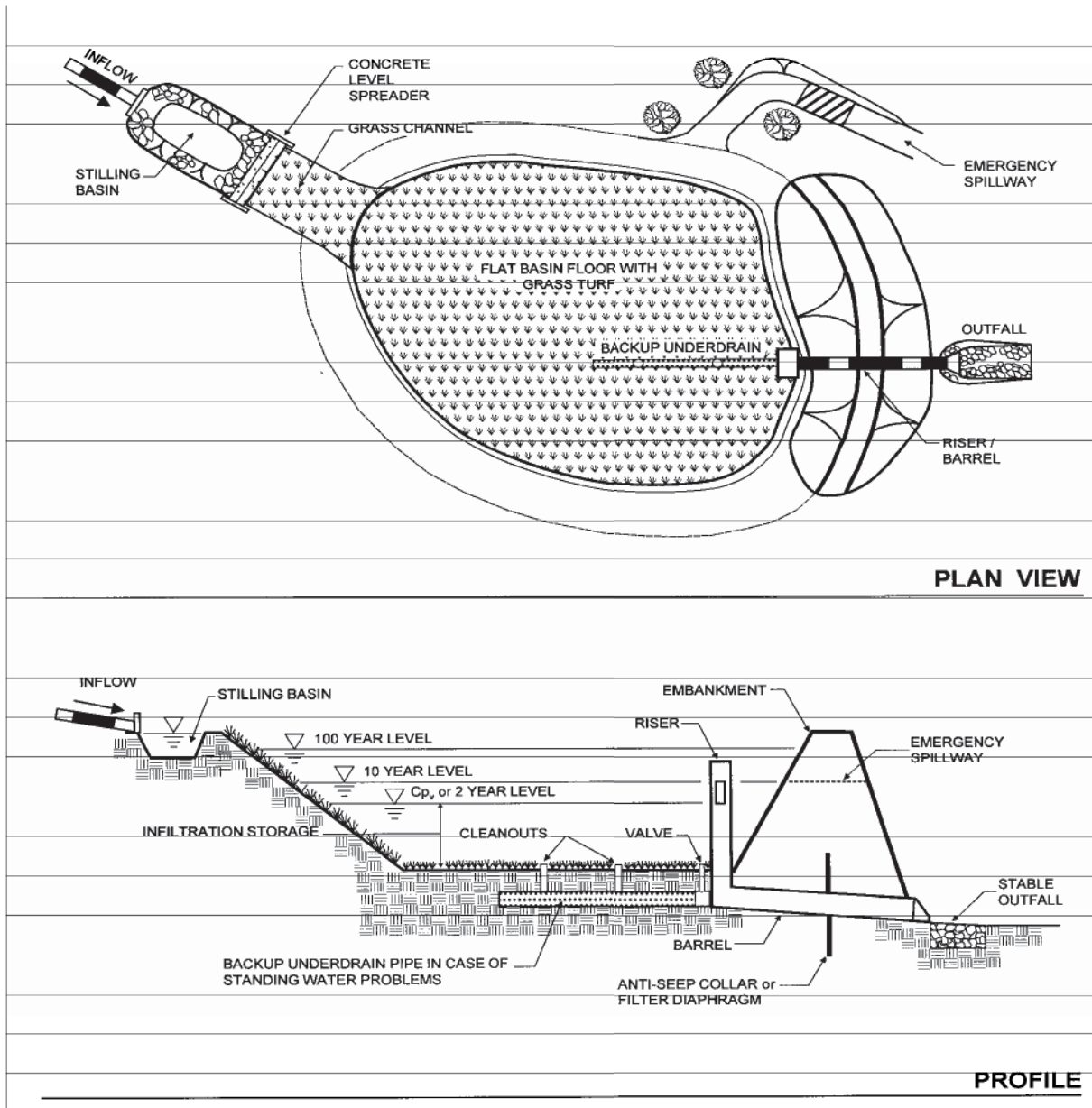
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# Stormwater Pollution Prevention

*Best Management Practices for Homeowner's Associations,  
Property Managers and Property Owners*



*Your Guide To Maintaining Water  
Friendly Standards In Your Community*

[sbcountystormwater.org](http://sbcountystormwater.org)

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# COMMERCIAL TRASH ENCLOSURES

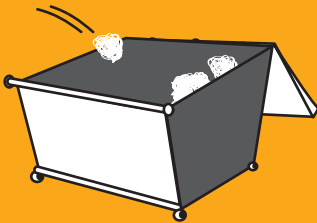
## FOLLOW THESE REQUIREMENTS TO KEEP OUR WATERWAYS CLEAN

Trash enclosures, such as those found in commercial and apartment complexes, typically contain materials that are intended to find their way to a landfill or a recycling facility.

**These materials are NOT meant to go into our local lakes and rivers.**

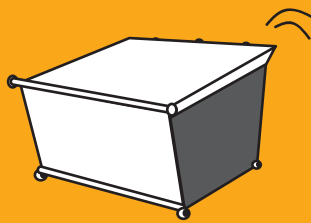
### PROTECT WATER QUALITY BY FOLLOWING THESE SIMPLE STEPS

#### PUT TRASH INSIDE



Place trash inside the bin  
(preferably in sealed bags)

#### CLOSE THE LID



Prevent rain from entering  
the bin in order to avoid  
leakage of polluted water  
runoff

#### KEEP TOXICS OUT



- Paint
- Grease, fats and used oils
- Batteries, electronics  
and fluorescent lights

### SOME ADDITIONAL GUIDELINES, INCLUDE

#### ✓ SWEEP FREQUENTLY

Sweep trash enclosure areas frequently, instead of hosing them down, to prevent polluted water from flowing into the streets and storm drains.

#### ✓ FIX LEAKS

Address trash bin leaks immediately by using dry clean up methods and report to your waste hauler to receive a replacement.

#### ✓ CONSTRUCT ROOF

Construct a solid cover roof over the existing trash enclosure structure to prevent rainwater from coming into contact with trash and garbage. Check with your local City/County for Building Codes.

In San Bernardino County, stormwater pollution is caused by food waste, landscape waste, chemicals and other debris that are washed into storm drains and end up in our waterways - untreated! You can be part of the solution by maintaining a water-friendly trash enclosure.

**THANK YOU FOR HELPING TO KEEP SAN BERNARDINO COUNTY CLEAN AND HEALTHY!**



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

[sbcountystormwater.org](http://sbcountystormwater.org)

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# HAZARDOUS WASTE

## CESQG PROGRAM

### Conditionally Exempt Small Quantity Generator

#### WHAT IS A CESQG?

Businesses that generate 27 gallons or 220 lbs. of hazardous waste, or 2.2 lbs. of extremely hazardous waste per month are called "Conditionally Exempt Small Quantity Generators," or CESQGs. San Bernardino County Household Hazardous Program provides waste management services to CESQG businesses. The most common CESQGs in San Bernardino County are painters, print shops, auto shops, builders, agricultural operators and property managers, but there are many others. When you call, be ready to describe the types and amounts of waste your business generates in a typical month. If you generate hazardous waste on a regular basis, you must:

- Register with San Bernardino County Fire Department (909) 386-8401 as a hazardous waste generator.
- To obtain an EPA ID# and application form from the State visit [www.dtsc.ca.gov](http://www.dtsc.ca.gov).
- Manage hazardous waste in accordance with all applicable local, state and federal laws and regulations.

#### HOW DO I GET SERVICE?

To arrange an appointment for the CESQG Program, call 1-800-OILY CAT or 909-382-5401. Be ready to describe the type and amount of hazardous waste your business is ready to dispose of, and the types and size(s) of containers that the waste is in.

#### Waste Type and Cost

There is a small handling fee involved in the collection of hazardous waste from your business. Disposal costs depend on the type of waste.

Aerosols	\$1.29/lb.
Automobile motor oil	\$.73/gal.
Anti-freeze	\$1.57/gal.
Contaminated oil	\$4.48/gal.
Car batteries	\$.62/ea.
Corrosive liquids, solids	\$2.80/lb.
Flammable solids, liquids	\$1.57/lb.
Latex Paint	\$.73/lb.
Mercury	\$10.08/lb.
NiCad/Alkaline Batteries	\$2.13/lb.
Oil Base Paints	\$1.00/lb.
Oil Filters	\$.56/ea.
Oxidizers	\$9.63/lb.
PCB Ballasts	\$5.94/lb.
Pesticides (most)	\$2.91/lb.
Photofixer, developer	\$4.31/gal.
Television & Monitors	\$11.20/ea.
Additional Handling	\$138.00/hr.

\*Rates subject to change without notice\*

#### WE CANNOT ACCEPT

- \* Radioactives
- \* Water reactives
- \* Explosives
- \* Compressed gas cylinders
- \* Medical or biohazardous waste
- \* Asbestos
- \* Remediation wastes



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

[sbcountystormwater.org](http://sbcountystormwater.org)

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# HAZARDOUS WASTE

## WHY IS THE FIRE DEPARTMENT COLLECTING HAZARDOUS WASTE?

Small Quantity Generators often have difficulty disposing of small quantities of hazardous waste. Hazardous waste companies usually have a minimum amount of waste that they will pick up, or charge a minimum fee for service. Typically, the minimum fee exceeds the cost of disposal for the hazardous waste. This leaves the small quantity generator in a difficult situation. Some respond by storing hazardous waste until it becomes economical for the hazardous waste transporter to pick it up, putting the business out of compliance by exceeding regulatory accumulation time limits. Other businesses simply store their hazardous wastes indefinitely, creating an unsafe work environment and exceeding accumulation time limits. Yet other businesses attempt to illegally dispose of their waste at household hazardous waste collection facilities. These facilities are not legally permitted to accept commercial wastes, nor are prepared to provide legal documentation for commercial hazardous waste disposal. In answer to the problems identified above, the San Bernardino County Fire Department Household Hazardous Program instituted the Conditionally Exempt Small Quantity Generator Program.

## PAYMENT FOR SERVICES

The CESQG Program will prepare an invoice for your business at the time of service. You can pay at the time of service with cash or a check, or you can mail your payment to the Fire Department within 30 days. Please note that we do not accept credit card payments. The preferred method of payment is to handle payment at time of service. Additional charges may apply for accounts not paid within 30 days.

## ARE THERE ANY OTHER WAYS THAT I CAN SAVE MONEY ON HAZARDOUS WASTE DISPOSAL?

Yes! First, start by reducing the amount of waste that you produce by changing processes or process chemicals, at your business. Next, examine if there is a way that you can recycle your waste back into your processes. Network with similar businesses or trade associations for waste minimization and pollution prevention solutions.

## WHAT IF YOUR BUSINESS DOES NOT QUALIFY?

Call the San Bernardino County Fire Department Field Services Division for assistance with hazardous waste management at 909-386-8401. If you reduce the amount of waste you generate each month to 27 gallons or less, you may qualify in the future.

## WHAT HAPPENS TO YOUR HAZARDOUS WASTE?

Hazardous waste collected by the CESQG Program is transported to a state permitted processing facility in San Bernardino. The waste is further processed at this point and packaged for off-site recycling (oil filters, oil, latex paint, antifreeze, and batteries) or destructive incineration (pesticides, corrosives, flammables, oil based paint).

San Bernardino County Fire Department  
CESQG Program  
2824 East "W" Street  
San Bernardino, CA 92415-0799  
Phone: 909-382-5401  
Fax: 909-382-5413  
[www.sbcfire.org/hazmat/hhw.asp](http://www.sbcfire.org/hazmat/hhw.asp)  
Email: [jschwab@sbcfire.org](mailto:jschwab@sbcfire.org)



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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## WHEN WORKING OUTDOORS USE THE 3Cs

CUANDO TRABAJE AL AIRE LIBRE UTILICE LAS 3Cs

### CONTROL | CONTROL



Locate the nearest storm drain and ensure nothing can enter or be discharged into it.

*Ubique el desagüe de aguas pluviales más cercano y asegúrese de que nada pueda ingresar a éste ni descargarse en él.*

### CONTAIN | CONTENER



Isolate your area to prevent material from potentially flowing or being blown away.

*Aísle su área para evitar que el material pueda discurrirse o ser llevado por el viento.*

### CAPTURE | CAPTURAR



Sweep up debris and place it in the trash. Clean up spills with an absorbent material (e.g. kitty litter) or vacuum with a Wet-Vac and dispose of properly.

*Recoja los restos y colóquelos en la basura. Limpie los derrames con un material absorbente (como la arena para gatos) o aspírelos con una Wet-Vac (aspiradora de humedad) y deséchelos correctamente.*



In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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# COMMERCIAL LANDSCAPE

DISCHARGE TO THE STORM DRAIN, ACCIDENTAL OR NOT, COULD LEAD TO ENFORCEMENT ACTIONS, WHICH COULD INCLUDE FINES.

Follow the best practices below to **prevent water pollution from landscaping activities.**

## RECYCLE YARD WASTE



- ✓ Recycle leaves, grass clippings and other yard waste.
- ✓ Do not blow, sweep, rake or hose yard waste into the street or catch basin.
- ✓ **Try grasscycling:** the natural recycling of grass by leaving clippings on the lawn when mowing.

For more information, please visit:  
[www.calrecycle.ca.gov/organics/grasscycling](http://www.calrecycle.ca.gov/organics/grasscycling)

## USE FERTILIZERS, HERBICIDES AND PESTICIDES SAFELY



- ✓ Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use natural and non-toxic alternatives as often as possible.
- ✓ If you must use chemical fertilizers, herbicides or pesticides:
  - Spot apply, rather than blanketing entire areas.
  - Avoid applying near curbs and driveways, and **never** before a rain.
  - Apply fertilizers as needed: when plants could best use it and when the potential runoff would be low.
  - Follow the manufacturer's instructions carefully—this will not only give the best results, but will save money.

## USE WATER WISELY



- ✓ Control the amount of water and direction of sprinklers. Sprinklers should only be on long enough to allow water to soak into the ground, but not so long as to cause runoff.
- ✓ Periodically inspect, fix leaks and realign sprinkler heads.
- ✓ Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.

## ! HOMEOWNERS

KEEP THESE TIPS IN MIND WHEN HIRING PROFESSIONAL LANDSCAPERS AND REMIND AS NECESSARY.



Leftover pesticides, fertilizers, and herbicides contaminate landfills and should be disposed of through a Hazardous Waste Facility.

For more information on proper disposal call,  
**(909) 382-5401 or 1-800-OILY CAT.**

\*FREE for San Bernardino County residents only. Businesses can call for cost inquiries and to schedule an appointment.



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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# SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

**Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. Fountain water containing chlorine and copperbased algaecides is toxic to aquatic life. Proper inspection, cleaning, and repair of pedestrian areas and HOA owned surfaces and structures can reduce pollutant runoff from these areas. Maintaining these areas may involve one or more of the following activities:**

- 1. Surface Cleaning**
- 2. Graffiti Cleaning**
- 3. Sidewalk Repair**
- 4. Controlling Litter**
- 5. Fountain Maintenance**

## **POLLUTION PREVENTION:**

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for sidewalk, plaza, and fountain maintenance and cleaning include:

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).
- Once per year, educate HOA staff and tenants on pollution prevention measures.

## **MODEL PROCEDURES:**

### 1. Surface Cleaning

**Discharges of wash water to the storm water drainage system from cleaning or hosing of impervious surfaces is prohibited.**

#### **Sidewalks, Plazas**

- ✓ Use dry methods (e.g. sweeping, backpack blowers, vacuuming) whenever practical to clean sidewalks and plazas rather than hosing, pressure washing, or steam cleaning. **DO NOT** sweep or blow material into curb; use devices that contain the materials.
- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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# SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

## **Parking Areas, Driveways, Drive-thru**

- ✓ Parking facilities should be swept/vacuumed on a regular basis. Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.
- ✓ Sweep all parking lots at least once before the onset of the wet season.
- ✓ Use absorbents to pick up oil; then dry sweep.
- ✓ Appropriately dispose of spilled materials and absorbents.

### OPTIONAL:

- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc.

## **Building Surfaces, Decks, etc., without loose paint**

- ✓ Use high-pressure water, no soap.
- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

## **Unpainted Building Surfaces, Wood Decks, etc.**

- ✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.
- ✓ Use biodegradable cleaning agents to remove deposits.
- ✓ Make sure pH is between 6.5 and 8.5 THEN discharge to landscaping (if cold water without a cleaning agent) otherwise dispose of properly.

## 2. Graffiti Cleaning

### **Graffiti Removal**

- ✓ Avoid graffiti abatement activities during rain events.
- ✓ When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal in the Roads, Streets, and Highway Operation and Maintenance procedure sheet.
- ✓ Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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# SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

- ✓ Note that care should be taken when disposing of waste since it may need to be disposed of as hazardous waste.

## OPTIONAL:

- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

## 3. Sidewalk Repair

### Surface Removal and Repair

- ✓ Schedule surface removal activities for dry weather if possible.
- ✓ Avoid creating excess dust when breaking asphalt or concrete.
- ✓ Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up material.
- ✓ Designate an area for clean up and proper disposal of excess materials.
- ✓ Remove and recycle as much of the broken pavement as possible.
- ✓ When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains shovel or vacuum the slurry, remove from site and dispose of properly.
- ✓ Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Discharge wash water to landscaping, pump to the sanitary sewer if permitted to do so or contain and dispose of properly.

### Concrete Installation and Repair

- ✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.
- ✓ Wash concrete trucks off-site or in designated areas on-site, such that there is no discharge of concrete wash water into storm drain inlets, open ditches, streets, or other storm water conveyance structures. (See Concrete Waste Management BMP WM – 8)



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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# SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

- ✓ Store dry and wet concrete materials under cover, protected from rainfall and runoff and away from drainage areas. After job is complete remove temporary stockpiles (asphalt materials, sand, etc.) and other materials as soon as possible.
- ✓ Return leftover materials to the transit mixer. Dispose of small amounts of excess concrete, grout, and mortar in the trash.
- ✓ When washing concrete to remove fine particles and expose the aggregate, contain the wash water for proper disposal.
- ✓ Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stock pile, or dispose in the trash.
- ✓ Protect applications of fresh concrete from rainfall and runoff until the material has hardened.

## 4. Litter Control

- ✓ Enforce anti-litter laws.
- ✓ Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- ✓ Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.

### OPTIONAL:

- Post "No Littering" signs.

## 5. Fountain Maintenance

- ✓ Do not use copper-based algaecides. Control algae with chlorine or other alternatives, such as sodium bromide.
- ✓ Allow chlorine to dissipate for a few days and then recycle/reuse water by draining it gradually onto a landscaped area. Water must be tested prior to discharge to ensure that chlorine is not present (concentration must be less than 0.1 ppm).
- ✓ Contact local agency for approval to drain into sewer or storm drain.
- ✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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# EQUIPMENT MAINTENANCE & REPAIR

Vehicle or equipment maintenance has the potential to be a significant source of stormwater pollution. Engine repair and service (parts cleaning, spilled fuel, oil, etc.), replacement of fluids, and outdoor equipment storage and parking (dripping engines) can all contaminate stormwater. Conducting the following activities in a controlled manner will reduce the potential for stormwater contamination:

1. General Maintenance and Repair
2. Vehicle and Machine Repair
3. Waste Handling/Disposal

Related vehicle maintenance activities are covered under the following program headings in this manual: “Vehicle and Equipment Cleaning”, “Vehicle and Equipment Storage”, and “Vehicle Fueling”.

## POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for equipment maintenance and repair include:

- Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Minimize use of solvents. Clean parts without using solvents whenever possible. Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- Once per year, educate HOA staff and tenants on pollution prevention measures.



In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

[sbcountystormwater.org](http://sbcountystormwater.org)

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# EQUIPMENT MAINTENANCE & REPAIR

## MODEL PROCEDURES:

### 1. General Maintenance and Repair

#### General Guidelines

→ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewerage agency.*

- ✓ Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- ✓ Regularly inspect vehicles and equipment for leaks.
- ✓ Move activity indoors or cover repair area with a permanent roof if feasible.
- ✓ Minimize contact of stormwater with outside operations through berming the local sewerage and drainage routing.
- ✓ Place curbs around the immediate boundaries of the process equipment.
- ✓ Clean yard storm drain inlets regularly and stencil them.

#### Good Housekeeping

- ✓ Avoid hosing down work areas. If work areas are washed and if discharge to the sanitary sewer is allowed, treat water with an appropriate treatment device (e.g. clarifier) before discharging. If discharge to the sanitary sewer is not permitted, pump water to a tank and dispose of properly.
- ✓ Collect leaking or dripping fluids in drip pans or container. Fluids are easier to recycle or dispose of properly if kept separate.
- ✓ Keep a drip pan under the vehicle while you unclip hoses, unscrew filters, any discharge of or remove other parts. Place a drip pan under any vehicle that might leak while you work on it to keep splatters or drips off the shop floor.
- ✓ Educate employees on proper handling and disposal of engine fluids.
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Do not pour liquid waste to floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- ✓ Post signs at sinks and stencil outdoor storm drain inlets.

### 2. Vehicle Repair

#### General Guidelines

- ✓ Perform vehicle fluid removal or changing inside of a building or in a contained covered area, where feasible, to prevent the run-on of stormwater and the runoff of spills.
- ✓ Regularly inspect vehicles and equipment for leaks, and repair as needed.



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# EQUIPMENT MAINTENANCE & REPAIR

- ✓ 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. Ensure that the drain pan or drip pan is large enough to contain drained fluids (e.g. larger pans are needed to contain antifreeze, which may gush from some vehicles).
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- ✓ Oil filters disposed of in trash cans or dumpsters can leak oil. 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 and dispose of properly at recycling facilities or at County hazardous waste disposal site.

## Vehicle Leak and Spill Control

- ✓ Use absorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- ✓ Place a stockpile of spill cleanup materials where it will be readily accessible.
- ✓ Sweep floor using dry absorbent material.

## 3. Machine Repair

- ✓ Keep equipment clean; don't allow excessive build-up of oil or grease.
- ✓ Minimize use of solvents.
- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Perform major equipment repairs at the corporation yard, when practical.
- ✓ Following good housekeeping measures in Vehicle Repair section.

## 4. Waste Handling/Disposal

### Waste Reduction

- ✓ Prevent spills and drips of solvents and cleansers to the shop floor.
- ✓ Do liquid cleaning at a centralized station so the solvents and residues stay in one area. Recycle liquid cleaners when feasible.



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# EQUIPMENT MAINTENANCE & REPAIR

- ✓ Locate drip pans, drain boards, and drying racks to direct drips back into a solvent sink or fluid holding tank for reuse.

## OPTIONAL:

- If possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous material:
  - Use non-caustic detergents instead of caustic cleaning for parts cleaning.
  - Use a water-based cleaning service and have tank cleaned. Use detergent-based or water-based cleaning systems in place of organic solvent degreasers.
  - Replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents.
  - Choose cleaning agents that can be recycled.

## Recycling

### OPTIONAL:

- Separate wastes for easier recycling. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents separate from non-chlorinated solvents.
- Label and track the recycling of waste material (e.g. used oil, spent solvents, batteries).
- Purchase recycled products to support the market for recycled materials.

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## LIMITATIONS:

Space and time limitations may preclude all work being conducted indoors. It may not be possible to contain and clean up spills from vehicles/equipment brought on-site after working hours. Dry floor cleaning methods may not be sufficient for some spills – see spill prevention and control procedures sheet. Identification of engine leaks may require some use of solvents.



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# POOL MAINTENANCE

***Pool chemicals and filter solids, when discharged to the City streets, gutters or storm drains, DO NOT GET TREATED before reaching the Santa Ana River. Chlorine, acid cleaning chemicals and metal-based algaecides used in pools can kill beneficial organisms in the food chain and pollute our drinking water.***

**When emptying your swimming pool, spa or fountain, please use one of the following best management practices to prevent water pollution:**

- Reuse the water as landscape irrigation
- Empty the water into the sewer between midnight and 6:00 am
- Remove solids and floating debris and dispose of in the trash, de-chlorinate the water to a chlorine residual = 0, wait 24 hours, then discharge the water to the street or storm drain
- Try not to use metal-based algaecides (i.e. copper sulfate) in your pool or spa. If you have, empty your pool or spa into the sewer. Prior to discharging pool water into the sanitary sewer system, contact your local agency.
- If the pool contains algae and mosquito larvae, discharge the water to the sewer

**When acid cleaning or other chemical cleaning:**

- Neutralize the pool water to pH of 6.5 to 8.5, then discharge to the sewer

**For swimming pool and spa filter backwash:**

- Dispose of solids into trash bag, then wash filter into a landscape area
- Settle, dispose of solids in trash and discharge water to the sewer, never to the storm drain



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## » For Residents

The following is a preview of the information we have available to residents. For more fact sheets, visit [sbcountystormwater.org](http://sbcountystormwater.org)

### Household Hazardous Waste Center Locations

# TOO TOXIC TO TRASH

Dispose of your **HOUSEHOLD HAZARDOUS WASTE (HHW)** at a **FREE** HHW Center near you. Examples of items collected: pesticides, fertilizers, paints, cleaners, antifreeze, batteries, motor oil, oil filters, and electronic waste.

SERVICE AREA	LOCATION	DAYS OPEN	HOURS
<b>Big Bear Lake</b> <small>(does not accept E-waste)</small>	42040 Garstin Dr. (cross: Big Bear Blvd.)	Saturdays	9 a.m. - 2 p.m.
<b>Chino</b>	5050 Schaefer Ave. (cross: 4th St.)	2 <sup>nd</sup> & 4 <sup>th</sup> Sat.	8 a.m. - 1 p.m.
<b>Fontana</b> <small>(Fontana residents only)</small>	16454 Orange Way (cross: Cypress Ave.) <small>Note: Provide a trash bill and a driver's license as proof of residency.</small>	Saturdays	8 a.m. - 12 p.m.
<b>Ontario</b>	1430 S. Cucamonga Ave. (cross: Belmont St.)	Fri. & Sat.	9 a.m. - 2 p.m.
<b>Rancho Cucamonga</b>	8794 Lion Street. (Off 9th St, between Vineyard and Hellman)	Saturdays	8 a.m. - 12 p.m.
<b>Redlands</b>	500 Kansas St. (cross: Park Ave.)	Saturdays	9:30 a.m. - 12:30 p.m.
<b>Rialto</b> <small>(does not accept E-waste)</small>	246 Willow Ave. (cross: Rialto Ave.)	2 <sup>nd</sup> & 4 <sup>th</sup> Fri. & Sat.	8 a.m. - 12 p.m.
<b>San Bernardino</b>	2824 East 'W' St., 302 (cross: Victoria Ave.)	Mon. - Fri.	9 a.m. - 4 p.m.
<b>Upland</b>	1370 N. Benson Ave. (cross: 14th St.)	Saturdays	9 a.m. - 2 p.m.



To report illegal dumping, call **(877) WASTE18**  
or visit [sbcountystormwater.org](http://sbcountystormwater.org)

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

**TAKE ONE**





## WE DID IT OURSELVES AND WE DID IT RIGHT



When painting your home,  
protect your family and community.

- **PAINTS** that are water-based are less toxic and should be used whenever possible.
- **BRUSHES** with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- **SAFELY** dispose of unwanted paint and paint thinner. The County of San Bernardino offers 9 HHW Centers that accept paint and other household hazardous waste from residents **FREE** of charge. For a list of acceptable materials, location information, and hours of operation call 1-800-OILY CAT.



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# VEHICLE MAINTENANCE

Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

## **Cleaning Auto Parts**

Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a sink, parking lot, driveway or street.

## **Storing Hazardous Waste**

Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

## **Preventing Leaks and Spills**

Conduct all vehicle maintenance inside of a garage. Place drip pans underneath vehicle to capture fluids. Use absorbent materials instead of water to clean work areas.

## **Cleaning Spills**

Use dry methods for spill cleanup (sweeping, absorbent materials). To report accidental spills into the street or storm drain call (877) WASTE18 or 911.

## **Proper Disposal of Hazardous Waste**

Dispose of household hazardous waste by taking it to your nearest household hazardous waste center. For more information, call 1-800-OILY CAT or check out [sbcountystormwater.org/Disposal.html](http://sbcountystormwater.org/Disposal.html)



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# PET WASTE DISPOSAL

## FREE DOGGIE WASTE BAGS

Remember to pick up after your pet **every time** to keep San Bernardino County clean and healthy!

To **RECEIVE** your  
**FREE CONTAINER**  
visit us online at  
[sbcountystormwater.org/dog](http://sbcountystormwater.org/dog)



In the event of a spill or discharge to a storm drain or waterway, contact San Bernardino County Stormwater immediately: (877) WASTE18 | [sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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## » Get In Touch With Us Online!

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» **YouTube**  
[youtube.com/sbcountystormwater](https://youtube.com/sbcountystormwater)

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» **Report Pollution Violations**  
[sbcountystormwater.org/report](http://sbcountystormwater.org/report)

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» **Email**  
[info@sbcountystormwater.org](mailto:info@sbcountystormwater.org)

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