Major Stormwater Management Plan
(Major SWMP)
for
Woodland & Watson Subdivision

Preparation/Revision Date: May 5, 2015

Prepared for:

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The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan have been prepared under the direction of the following Registered Civil Engineer and meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.

Larry Taylor, RCE, GE
RCE 58274 Expires 06.30.2016

REGISTERED PROFESSIONAL ENGINEER
LARRY R. TAYLOR
C 58274
CIVIL
STATE OF CALIFORNIA

May 5, 2015
Date

Major Stormwater Management Plan
(Major SWMP)
for Woodland & Watson Subdivision

PROJECT INFORMATION

Project Name:	Woodland and Watson Subdivision
Project Location/Address:	SE corner Woodland Drive and Watson Way
Permit Number (Land Development Projects):	
Work Authorization Number (**CIP only**):	
Applicant:	Paul D. Colucci
Applicant's Address:	2734 Loker Avenue, Suite E Carlsbad, CA 92101
Plan Prepared By:	Larry R. Taylor, RCE, GE
Preparer's Address:	Taylor Group, Inc. 301 Mission Avenue, Suite 201 Oceanside, CA 72054
Date:	October 6, 2014

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date	County Reviewer
	YES	NO		
Tentative Map				

PRIORITY DEVELOPMENT PROJECT DETERMINATION

TABLE 1: PROJECT CATEGORIES

Yes ☒	No ☐	A	Housing subdivisions of 10 or more dwelling units. Examples: single-family homes, multi-family homes, condominiums, and apartments.
Yes ☐	No ☒	B	Commercial—greater than one acre (total disturbed area). Any development other than heavy industry or residential. Examples: hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; airfields; and other light industrial facilities.
Yes ☐	No ☒	C	Heavy industry—greater than one acre (total disturbed area). Examples: manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas (bus, truck, etc.).
Yes ☐	No ☒	D	Automotive repair shops. A facility categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.
Yes ☐	No ☒	E	Restaurants. Any facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet shall meet all SUSMP requirements except for structural treatment BMP and numeric sizing criteria requirements and hydromodification requirements.
Yes ☐	No ☒	F	Hillside development greater than 5,000 square feet. Any development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions, where the development will grade on any natural slope that is twenty-five percent or greater.
Yes ☐	No ☒	G	Environmentally Sensitive Areas (ESAs). All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.
Yes ☐	No ☒	H	Parking lots 5,000 square feet or more or with 15 or more (paved) parking spaces and potentially exposed to urban runoff.
Yes ☒	No ☐	I	Street, roads, highways, and freeways. Any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes ☐	No ☒	J	Retail Gasoline Outlets (RGOs) that are: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

PROJECT STORMWATER QUALITY DETERMINATION

Total Project Site Area	3.51	Acres
Estimated amount of disturbed area:	4.23	Acres
(If >1 acre, you must also provide a WDID number from the SWRCB) WDID: (TBD)		
Total size of project site:	3.51	Acres
Total impervious area (including roof tops) before construction	0	Acres
Total impervious area (including roof tops) after construction	1.40	Acres
Percent impervious before construction: C/A =	0	%
Percent impervious after construction: C/A =	61	%

TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS

1.	Please provide a brief description of the project.

The proposed project consists of a village/suburban infill project that will entail subdividing an existing 3.5 acre site to create a new residential subdivision consisting of 18 lots for single-family residences and a new private street An easement of approx. 3,750 s.f.on proposed Lot 1 will be used for a common bioretention BMP for Lots 13, 14, 18 and the proposed private street.

The site is comprised of four contiguous parcels under common ownership. The land is currently undeveloped and has been used in the past (circa 1940s-1960s) for agricultural purposes.

The project will include offsite improvements including street widening and construction of curb, gutter and sidewalk along the Woodland Drive and Watson Way frontages and construction of new public sewer main in Woodland Drive.

The proposed residential lots will range from 6,000 sf to 10,650 s.f. (net), with an average lot size of 6,830 s.f. and a median lot size of 6,038 s.f. (net). Level building pads on the lots will be approximately 4,000 s.f.. Conceptual future improvements to the residential lots will consist of small 1- and 2-story single family residences with rooftop areas in the range of 1,800 to 2,000 square feet.

2.	Describe the current and proposed zoning and land use designation.

Current and future zoning is RS. The land is currently undeveloped and unused. The proposed land use is residential.

3.	Describe the pre-project and post-project topography of the project. (Show on Plan)

The existing site topography consists of mildly to moderately sloping terrain that slopes down to the northeast at about 10 to 25 percent, with an average slope of approximately 14 percent. There are no significant hydrologic features at the site. Existing site drainage is by overland sheet flow to the north and northeast to the Woodland Drive ROW and then via flow in an earthen swale and street flow along the south side to Woodland towards the southeast. The high point of the site is El. 570' at the SW corner and the low point is El. 502' at the SE corner.

The project proposes to create level building pads on most of the proposed parcels by performing cut and fill grading that will create cut and fill slopes with maximum slope ratios of 2:1 (26.6%). The maximum slope height will be approximately 20 feet, with most slopes less than 10 feet high. The average slope of the project site will remain at approximately 14%.

TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS

4.	**Describe the soil classification, permeability, erodibility, and depth to groundwater for LID and Treatment BMP consideration. (Show on Plan) If infiltration BMPs are proposed, a Geotechnical Engineer must certify infiltration BMPs in Attachment E.**

The site is underlain by Cretaceous-age batholitic rock (Green Valley Tonalite). The rock is weathered to a shallow soil cover of decomposed granite that is expected to be thicker at the lower elevations Soil is classified as soil group "D". The shallow bedrock is expected to haw low permeability and low erodibility. The shallow weathered soil cover is expected to have low to moderate permeability and is erodible.

Depth to groundwater is more than 50 feet.

Infiltration-based BMPs are not proposed.

5.	**Describe if contaminated or hazardous soils are within the project area. (Show on Plan)**

There are no known contaminated or hazardous soils at the project site or in the immediate vicinity of the project area.

6.	**Describe the existing site drainage and natural hydrologic features. (Show on Plan).**

There are no significant hydrologic features at the site. Existing site drainage is by overland sheet flow to the north and northeast to the Woodland Drive ROW and then via flow in an earthen swale along the southwest side to Woodland towards the south.

Drainage from the site enters the MS4 at a curb inlet at the SE corner of Woodland Dr. and Yettford Road located approximately 640' SE of the southeastern corner of the project site. Drainage is discharged from a RCP pipe to a natural drainage at a point about 650 feet east of the aforementioned curb inlet.

Drainage in Watson Way and Woodland Drive is by sheet flow to the easterly and southerly edges of the rights-of-way and then by flow in unimproved earthen gutters/ditches southerly along Woodland Drive to the aforementioned curb inlet at Yettford Road.

7.	**Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.**

The primary constraints at the site include relatively impermeable soil/bedrock conditions and the absence of adjacent public drainage infrastructure.

The site provides limited opportunities for LID features, but has adequate slope for implementation of flow-through bioretention facilities and is not above sensitive groundwater resources.

8.	**Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?***

~~YES~~	NO

9.	**Is this an emergency project? If yes, please provide a description below.**

~~YES~~	NO

TABLE 3: CHANNEL& DRAINAGE ANALYSIS

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?		✓		If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?				If YES go to 6.
3.	Will the project discharge to unlined channels?				If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?				If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?				If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.				Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.				Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.				Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.				Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.				Continue to 11.
11.	"Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.				Continue to 12.
12.	Provide other design principles that are comparable and equally effective.				Continue to 13.
13.	End	✓			

TEMPORARY CONSTRUCTION BMPS

Construction BMPs that may be implemented during construction of the project are indicated below. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- ☒ Silt Fence
- ☒ Fiber Rolls
- ☒ Street Sweeping and Vacuuming
- ☒ Storm Drain Inlet Protection
- ☒ Stockpile Management
- ☒ Solid Waste Management
- ☒ Stabilized Construction Entrance/Exit
- ☐ Dewatering Operations
- ☐ Vehicle and Equipment Maintenance
- ☒ Desilting Basin
- ☒ Gravel Bag Berm
- ☒ Sandbag Barrier
- ☒ Material Delivery and Storage
- ☒ Spill Prevention and Control
- ☒ Concrete Waste Management
- ☒ Water Conservation Practices
- ☒ Paving and Grinding Operations

☒ Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml		✓	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?			If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?			If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors kf greater than or equal to 0.4? http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm			If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	✓		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.		✓	Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

The proposed project will not pose an "exceptional threat to water quality," and therefore does not require Advanced Treatment Best Management Practices during the construction phase.

HYDROMODIFICATION DETERMINATION

TABLE 5: HYDROMODIFICATION DETERMINATION

	QUESTIONS	YES	NO	Information
1.	Will the project reduce the pre-project impervious area and are the unmitigated post-project outflows (outflows without detention routing) to each outlet location less as compared to the pre-project condition?		✓	If NO, continue to 2. If YES, go to 7.
2.	Would the project site discharge runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt reservoir, or a tidally-influenced area?		✓	If NO, continue to 3. If YES, go to 7.
3.	Would the project site discharge to a stabilized conveyance system, which has the capacity for the ultimate Q10, and extends to the Pacific Ocean, San Diego Bay, a tidally-influenced area, an exempt river reach or reservoir?		✓	If NO, continue to 4. If YES, go to 7.
4.	Does the contributing watershed area to which the project discharges have an impervious area percentage greater than 70 percent?		✓	If NO, continue to 5. If YES, go to 7.
5.	Is this an urban infill project which discharges to an existing hardened or rehabilitated conveyance system that extends beyond the "domain of analysis," where the potential for cumulative impacts in the watershed are low, and the ultimate receiving channel has a "Low" susceptibility to erosion as defined in the SCCWRP channel assessment tool?		✓	If NO, continue to 6. If YES, go to 7.
6.	Project is required to manage hydromodification impacts.	✓		Reference Appendix G "Hydromodification Management Plan" of the County SUSMP.
7.	Project is not required to manage hydromodification impacts.			Hydromodification Exempt. Keep on file.

Due to the lack of existing MS4 infrastructure adjacent to the project site, the topographic conditions and the underlying geologic conditions at the site, implementation of flow control for runoff from the portions of the public streets to be improved (Woodland Drive and Watson Way) presents a particular challenge for this project. Discharge from both the site and the surrounding streets concentrates at the topographic low at the extreme southeast corner of the property. Without a storm drain system to discharge to, flow control measures such as typical biofiltration or bioretention facilities with discharge controls must discharge back to the surface drainage downstream from the Site. The relatively low permeability of the granitic rock underlying the site make the use of infiltration systems impractical.

The project proposes to meet the hydromodification criteria by limiting discharge rates from onsite BMPs (bioretention basin and flow-through planters) to less than the allowable rates for those systems to offset the increased discharge from the new paved areas in the ROWs and by constructing a bioswale in the parkways along Woodland Drive and Watson Way. Calculations for flow control for the streets are included in Appendix D. The sizing calculations indicate that the allowable discharge rate for the street areas is 0.027 cfs. The onsite BMPs are designed to have combined discharge of 0.080 cfs less than the allowable discharge per the HMP sizing criteria. Therefore, combined discharge at the downstream project site point of concentration will be about 0.05 cfs less than that allowable per the HMP criteria.

This achieves the objective of limiting post-project runoff flows and durations to not exceed pre-project runoff flows and durations.

A vegetated bioswale BMP is proposed in the parkway along both Watson Way and Woodland Drive to address water quality criteria as discussed in the "DISCUSSION OF TREATMENT CONTROL BMP SELECTION" section of this Plan.

POLLUTANTS OF CONCERN DETERMINATION

WATERSHED

☐ San Juan 901	☐ Santa Margarita 902	☐ San Luis Rey 903	☒ Carlsbad 904
☐ San Dieguito 905	☐ Penasquitos 906	☐ San Diego 907	☐ Sweetwater 909
☐ Otay 910	☐ Tijuana 911	☐ Whitewater 719*	☐ Clark 720*
☐ West Salton 721*	☐ Anza Borrego 722*	☐ Imperial 723*	

*Projects located fully within these watersheds require only a Minor SWMP.

HYDROLOGIC SUB-AREA NAME AND BASIN NUMBERS

Basin Number	Sub-Area Name
904.32	Aqua Hedionda HA/Buena HSA

RECEIVING WATERS that each project discharge point proposes to discharge to.

RECEIVING WATERS (river, lake, reservoir, etc.)	Hydrologic Unit Basin Number	Impairment(s) listed [303(d) listed waters or waters with established TMDLs	Distance to Project
Buena Creek	904.32	Nutrients, Pesticides	0.8 miles
Agua Hedionda Creek	904.32	Heavy metals	2.1 miles
Agua Hedionda Lagoon	904.31	Bacteria, Sediment	8.7 miles
Pacific Ocean Shoreline		NA	10.6 miles

GROUND WATERS

Ground Waters	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH
Buena HSA	904.32	●	●	●			

+ Excepted from Municipal ● Existing Beneficial Use ○ Potential Beneficial Use

PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS

The following table identifies the pollutants that are anticipated to be generated from the proposed priority project categories.

TABLE 6: ANTICIPATED AND POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE

PDP categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development 1 acre or greater	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft^2	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

PROJECT POLLUTANTS OF CONCERN

The following table summarizes the identified project pollutants-of-concern and lists any surface water impairments identified. The pollutants that are anticipated to be generated by the project, which are also causing impairment of receiving waters, shall be considered the primary pollutants of concern. For projects where no primary pollutants of concern exist, those pollutants identified as anticipated shall be considered secondary pollutants of concern.

TABLE 7: PROJECT POLLUTANTS OF CONCERN

Pollutant Category	Anticipated (X)	Potential (P)	Surface Water Impairments
Sediments	X		X (Agua Hedionda Lagoon)
Nutrients	X		X (Buena Creek)
Heavy Metals	X		X (Agua Hedionda Creek)
Organic Compounds	X		
Trash & Debris	X		
Oxygen Demanding Substances	X		
Oil & Grease	X		
Bacteria & Viruses	X		X (Agua Hedionda Lagoon)
Pesticides	X		X (Buena Creek)

Based on the above comparison, the primary pollutants of concern are:

- Sediments
- Nutrients
- Heavy Metals
- Bacteria & Viruses
- Pesticides

LID AND SITE DESIGN STRATEGIES

TABLE 8: LID AND SITE DESIGN

1. Conserve natural Areas, Soils, and Vegetation
☐ Preserve well-draining soils (Type A or B)
☒ Preserve Significant Trees
☐ Preserve critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions
☐ Other. Description:
2. Minimize Disturbance to Natural Drainages
☐ Set-back development envelope from drainages
☒ Restrict heavy construction equipment access to planned green/ open space areas
☐ Other. Description:
3. Minimize and Disconnect Impervious Surfaces (see 5)
☐ Clustered Lot Design
☒ Items checked in 5
☐ Other. Description:
4. Minimize Soil Compaction
☐ Restrict heavy construction equipment access to planned green/ open space areas
☒ Re-till soils compacted by construction vehicles/equipment
☒ Collect & re-use upper soil layers of development site containing organic materials
☐ Other. Description:
5. Drain Runoff from Impervious Surfaces to Pervious Areas
<u>LID Street & Road Design</u> ☒ Curb-cuts to landscaping ☐ Rural Swales ☐ Concave Median ☐ Cul-de-sac Landscaping Design ☐ Other. Description: Discharge runoff from private street to bioretention facility. Flow-through planters on individual lots.
<u>LID Parking Lot Design</u> ☐ Permeable Pavements ☐ Curb-cuts to landscaping ☐ Other. Description:

TABLE 8: LID AND SITE DESIGN

LID Driveway, Sidewalk, Bike-path Design ☒ Permeable Pavements ☐ Pitch pavements toward landscaping ☐ Other. Description:
LID Building Design ☒ Cisterns & Rain Barrels ☒ Downspout to swale or landscaping ☐ Vegetated Roofs ☐ Other. Description:
LID Landscaping Design ☒ Soil Amendments ☒ Reuse of Native Soils ☒ Smart Irrigation Systems ☒ Street Trees ☐ Other. Description:
6. Minimize erosion from slopes
☐ Disturb existing slopes only when necessary
☒ Minimize cut and fill areas to reduce slope lengths
☒ Incorporate retaining walls to reduce steepness of slopes or to shorten slopes
☐ Provide benches or terraces on high cut and fill slopes to reduce concentration of flows
☒ Rounding and shaping slopes to reduce concentrated flow
☒ Collect concentrated flows in stabilized drains and channels
☐ Other. Description:

SOURCE CONTROL

The following table summarizes the Source Control BMPs that are applicable to the proposed project based on the potential sources of stormwater pollutants that apply to the site. These are identified on the Exhibit in Attachment B.

TABLE 9: PROJECT SOURCE CONTROL BMPS

Potential Source of Runoff Pollutants	Permanent source control BMPs	Operational source control BMPs
☒ On-site storm drain inlets	☒ Mark all inlets with the words "No Dumping! Flows to Bay" or similar where feasible.	☒ Maintain and periodically repaint or replace inlet markings. ☒Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☒ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks ☒ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☒ Need for future indoor & structural pest control	☒ Note building design features that discourage entry of pests	☒ Provide Integrated Pest Management information to owners, lessees, and operators
☒ Landscape/ Outdoor Pesticide Use	State that final landscape plans will accomplish all of the following: ☒ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ☒ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ☒ Where landscaped areas are used to retain or detain stormwater, specify plants	☒ Maintain landscaping using minimum or no pesticides. ☒ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks ☒ Provide IPM information to new owners, lessees and operators

TABLE 9: PROJECT SOURCE CONTROL BMPS

Potential Source of Runoff Pollutants	Permanent source control BMPs	Operational source control BMPs
	that are tolerant of saturated soil conditions. ☒ Consider using pest-resistant plants, especially adjacent to hardscape ☒ To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	
☒ Fire Sprinkler Test Water	☒ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☒ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks.

LID AND TREATMENT CONTROL SELECTION

Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? *(If yes, please document in Attachment D following the steps in Chapter 4 of the County*	
YES	NO
If this project is not utilizing the unified LID design procedure, please describe how the alternative treatment facilities will comply with applicable LID criteria, stormwater treatment criteria, and hydromodification management criteria.	

TABLE 10: GROUPING OF POTENTIAL POLLUTANTS OF CONCERN (POCs) BY FATE DURING STORMWATER TREATMENT

Pollutant	Check Project Specific POCs	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	X	
Nutrients	X		X	X
Heavy Metals	X		X	
Organic Compounds			X	
Trash & Debris		X		
Oxygen Demanding			X	
Bacteria	X		X	
Oil & Grease			X	
Pesticides	X			

TABLE 11: GROUPS OF POLLUTANTS AND RELATIVE EFFECTIVENESS OF TREATMENT FACILITIES

Pollutants of Concern	Bioretention Facilities (LID)	Settling Basins (Dry Ponds)	Wet Ponds and Constructed Wetlands	Infiltration Devices (LID)	Media Filters	Higher- rate biofilters	Higher- rate media filters	Trash Racks & Hydro -dynamic Devices	Vegetated Swales
Coarse Sediment and Trash	High ✓	High	High	High	High	High	High	High ✓	High ✓
Pollutants that tend to associate with fine particles during treatment	High ✓	High	High	High	High	Medium	Medium	Low ✓	Medium ✓
Pollutants that tend to be dissolved following treatment	Medium ✓	Low	Medium	High	Low	Low	Low	Low ✓	Low ✓

TABLE 12: PROJECT TCBMPS - BMPS DESIGNED TO TREAT STORMWATER (E.G., LID AND HYDROMOD) SHALL BE CONSIDERED TCBMPS.

TCBMP Type	Water Quality Treatment	Hydromodification Flow Control
Bioretention Facilities (LID)		
☒ Bioretention area	✓	✓
☒ Flow-through Planter	✓	✓
☐ Cistern with Bioretention		
Basins		
☐ Extended/dry detention basin with grass/vegetated lining		
☐ Extended/dry detention basin with impervious lining		
☐ Underground vault		
☐ Cistern		
Infiltration Devices (LID)		
☐ Infiltration basin		
☐ Infiltration trench		
☐ Other		
Wet Ponds and Constructed Wetlands		
☐ Wet pond/basin (permanent pool)		
☐ Constructed wetland		
☐ Infiltration basin		
☐ Infiltration trench		
☐ Other		
Wet Ponds and Constructed Wetlands		
☐ Wet pond/basin (permanent pool)		
☐ Constructed wetland		
Vegetated Swales (LID[1])		
☒ Vegetated Swale	✓	
Media Filters		
☐ Austin Sand Filter		
☐ Delaware Sand Filter		
☐ Multi-Chambered Treatment Train (MCTT)		
Higher-rate Biofilters		
☐ Tree-pit-style unit		
☐ Other		
Higher-rate Media Filters		
☐ Vault-based filtration unit with replaceable cartridges		
☐ Other		
Hydrodynamic Separator Systems		
☒ Swirl Concentrator	✓	
☐ Other		

TABLE 12: PROJECT TCBMPS - BMPS DESIGNED TO TREAT STORMWATER (E.G., LID AND HYDROMOD) SHALL BE CONSIDERED TCBMPS.

Trash Racks		
☐ Catch Basin Insert		
☐ Catch Basin Insert w/ Hydrocarbon boom		
☐ Other		
Self-Retaining Areas (LID)		
☐ Permeable Pavements		
☒ Self-Retaining	✓	✓
☐ Vegetated Roof		

(1) Must be designed per SUSMP "Vegetated Swales" design criteria for water quality treatment credit.

Sizing calculations are provided in Attachment D. Note that the proposed flow-through planters and bioretention basin are sized based on hydromodification requirements.

CONSTRUCTION PLAN SWMP CHECKLIST

Treatment Control BMPs[1]			
Description / Type	Sheet	Maintenance Category	Revisions
Flow-Through Planter – Lot 1		First	
Permeable Pavers – Lot 1		First	
Bioretention Basin – Lot 1 Easement		Second	
Flow-Through Planter – Lot 2		First	
Permeable Pavers – Lot 2		First	
Flow-Through Planter – Lot 3		First	
Permeable Pavers – Lot 3		First	
Flow-Through Planter – Lot 4		First	
Permeable Pavers – Lot 4		First	
Flow-Through Planter – Lot 5		First	
Permeable Pavers – Lot 5		First	
Flow-Through Planter – Lot 6		First	
Permeable Pavers – Lot 6		First	
Flow-Through Planter – Lot 7		First	
Permeable Pavers – Lot 7		First	
Flow-Through Planter – Lot 8		First	
Permeable Pavers – Lot 8		First	
Flow-Through Planter – Lot 9		First	
Permeable Pavers – Lot 9		First	
Flow-Through Planter – Lot 10		First	
Permeable Pavers – Lot 10		First	
Flow-Through Planter – Lot 11		First	
Permeable Pavers – Lot 11		First	
Flow-Through Planter – Lot 12		First	
Permeable Pavers – Lot 12		First	
Permeable Pavers – Lot 13		First	
Permeable Pavers – Lot 14		First	
Flow-Through Planter – Lot 15		First	
Permeable Pavers – Lot 15		First	
Flow-Through Planter – Lot 16		First	
Permeable Pavers – Lot 16		First	
Flow-Through Planter – Lot 17		First	
Permeable Pavers – Lot 17		First	
Permeable Pavers – Lot 18		First	
CDS Unit – Private Street		Second	
Vegetated Swale – Watson Way ROW		First	
Vegetated Swale – Woodland ROW		First	
[1] BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCBMPs.			

*BMP's approved as part of Stormwater Management Plan (SWMP) dated 05/05/2015 on file with DPW. Any changes to the above BMP's will require SWMP revision and Plan Change approvals.

DISCUSSION OF TREATMENT CONTROL BMP SELECTION

A. TREATMENT CONTROL BMPS FOR PRIVATE LOTS

Flow-through planters were selected as the treatment control BMP for most of the individual lots that are proposed for this project. This includes Lots 1 through 12 and Lots 15 through 17 (15 of the proposed 18 lots). This BMP was selected based on the following main factors:

- High and medium treatment efficiency for all of the PPCs
- Ease of maintenance by homeowners
- Site topography and proposed grading lends itself to gravity flow through flow-through planters

Lots 13 and 14 in the southernmost portion of the site are not planned to be graded as level pads due to constraints. Runoff from these lots will be directed to vegetated swales that will discharge to the private street. Runoff from the street will be directed to a curb inlet, routed through a CDS unit and then discharged at a bioretention basin located on Lot 1 as shown of the exhibits to this plan. Runoff from Lot 18 will be directed to vegetated swales that will discharge to a vegetated swale in a drainage easement and then to the bioretention facility of the remainder parcel. This BMP treatment train was selected for these lots based on the following main factors:

- High and medium treatment efficiency for all of the PPCs
- Site topography and proposed grading for these lots makes individual flow-through planters less feasible

B. TREATMENT CONTROL BMPS FOR PRIVATE STREET

Runoff from roughly 85% of the proposed private street will be directed to a curb inlet, routed through a CDS unit and then discharged at a bioretention basin located on the remainder parcel as shown of the exhibits to this plan. This BMP treatment train was selected for the private street based on the following main factors:

- High and medium treatment efficiency for all of the PPCs associated with the private street and the lots draining to it

It is noted that the site topography makes it infeasible to capture and treat runoff from the easternmost 100 feet of the street where it intersects Woodland Drive.

C. TREATMENT FOR PUBLIC STREET IMPROVEMENTS

There is currently no public storm drain system in wither Woodland drive or Watson Way. The nearest inlet to a storm drain system is located approximately 650 feet south of the southeastern project boundary at the intersection of Woodland Drive and Yettfford Road. Drainage entering this inlet is discharged to a modified natural drainage that crosses Woodland Drive 650 feet east if the curb inlet.

The project proposes to provide water quality treatment for the public street improvements by constructing a vegetated bioswale in the parkway adjacent to the streets as illustrated on the BMP Plan. The swales will run parallel to the streets. Gutter flow in the streets will enter the swales at multiple curb openings spaced about 100 feet apart. Erosion control at the openings will consist of stone energy dissipaters. The swales will be grass-lined and will act as biofilters for the runoff from the streets.

The swales have been modified from the previous submittal of this plan based on the requirements of PDS Land Development and Public Works. TGI has been informed that the Public Works Department is in the process of developing "green streets" design criteria for development projects. However, no specific guidelines and requirements have been adopted as of the date of this plan. Land Development staff provided TGI with a redlined version of a bioswale design standard from the District of Columbia Department of Transportation (DCDOT) Green Infrastructure Standards that the County is considering as a model for green streets criteria. Based on this guidance, TGI has incorporated a modified version of this bioswale design into the project's BMPs. It is noted that the geometric design in the DCDOT standard requires a minimum 12.5 foot wide parkway, whereas the project has a 10 foot wide parkway available. The proposed parkway design for this project is based on an 18" wide "step out zone" at the curb, a 4.5 foot wide bioswale and a 4 foot wide sidewalk. It is our understanding that this design concept may require processing of a design exception for the project.

The invert of the subdrain for the bioswale ant the southern end will be at approximately El. 500.5'. The perforated subdrain pipe can be connected to a solid 3" PVC pipe and extended approximately 100 feet to the south in the Woodland Drive ROW to discharge at a protected riser into the existing roadside drainage. If the discharge is fitted with an orifice, then the bioswale can also provide additional flow control.

Design information and sizing calculations for the bioswale are included in Appendix D. The bioswale is designed as a flow-based BMP using a rainfall intensity of 0.2 inch per hour for runoff from the roadway half-width. Street runoff will enter the swale via curb inlets spaced approximately 100 feet apart. The first flush of polluted street runoff will enter the bioswale via these inlets. For storms with runoff intensity exceeding the inlet capacity of the swale capacity, street runoff will bypass the swale as gutter flow.

OPERATION AND MAINTENANCE

A recorded maintenance agreement shall be included in the Maintenance Plan for this project (Attachment F).

TABLE 13: PROJECT BMP CATEGORY

CATEGORY	SELECTED		BMP Description
	YES	NO	
First[1]	✓		Flow-through planters on individual lots will be maintained by the homeowners. Bioswales in the parkway will be maintained by the homeowners of the adjacent parcels on the parkway frontage.
Second[2]	✓		Bioretention basin on the remainder parcel will serve the private street and Lots 13-18, which are also the lots that will utilize the private street. CDS unit in the private street will also be solely for this group of owners. Private maintenance agreement to address the street and the BMPs for the street and these lots. Maintenance to be performed by contractor.
Third[3]		✓	
Fourth[4]		✓	

Notes:

1. A maintenance notification will be required.
2. A recorded maintenance agreement and access easement will be required.
3. The project will be required to establish or be included in a watershed specific Community Facility District (CFD) for long-term maintenance.
4. Required to dedicate the BMP (and the property on which it is located and any necessary access) to the County.

TABLE 14: PROJECT SPECIFIC LID AND TCBMPS

Treatment Control BMPs (TCBMPs)[1,2] (List all from SWMP)		
Lot Number Or Location	**Description/Type**	**Sheet**
1	Flow-through planter	
1	Porous Pavement/Pavers	
1	Bioretention Basin (in easement)	
2	Flow-through planter	
2	Porous Pavement/Pavers	
3	Flow-through planter	
3	Porous Pavement/Pavers	
4	Flow-through planter	
4	Porous Pavement/Pavers	
5	Flow-through planter	
5	Porous Pavement/Pavers	
6	Flow-through planter	
6	Porous Pavement/Pavers	
7	Flow-through planter	
7	Porous Pavement/Pavers	
8	Flow-through planter	
8	Porous Pavement/Pavers	
9	Flow-through planter	
9	Porous Pavement/Pavers	
10	Flow-through planter	
10	Porous Pavement/Pavers	
11	Flow-through planter	
11	Porous Pavement/Pavers	
12	Flow-through planter	
12	Porous Pavement/Pavers	
13	Porous Pavement/Pavers	
14	Porous Pavement/Pavers	
15	Flow-through planter	
15	Porous Pavement/Pavers	
15	Vegetated Swale (in easement)	
16	Flow-through planter	

Treatment Control BMPs (TCBMPs)[1,2] (List all from SWMP)		
16	Porous Pavement/Pavers	
16	Vegetated Swale (in easement)	
17	Flow-through planter	
17	Porous Pavement/Pavers	
17	Vegetated Swale (in easement)	
18	Porous Pavement/Pavers	
Private Street	CDS Unit	
Public Streets	Vegetated swale in parkway	

1 All Priority Development Projects (PDPs) require a TCBMP.
2 BMPs designed to treat storm water (e.g. LID and hydromod) shall be considered TCBMPs.

* For location of BMP's, see approved Record Plan dated _XX/XX/XX_, plan (TYPE) sheet _(#)_

PARTY FOR THE CONSTRUCTION PHASE

The following table identifies the parties responsible for maintenance during the construction phase of the BMPs identified above and Source Controls specified in Attachment B.

Developer's Name: Anova, Inc.

Address: 2734 Loker Avenue, Suite E

City: Carlsbad State: CA Zip: 92010

Email Address: pauldcolucci@hotmail.com

Phone Number: (619) 922-1288

Engineer of Work: Larry Taylor, P.E., G.E. - TAYLOR GROUP, INC.

Engineer's Phone Number: (760) 721-9990

RESPONSIBLE PARTY FOR ONGOING MAINTENANCE:

The following table identifies the parties responsible for long-term maintenance of the BMPs identified above and Source Controls specified in Attachment B. Include the appropriate written agreement with the entities responsible for O&M in Attachment F. Please see Chapter 5 "Stormwater Facility Maintenance" of the County SUSMP for appropriate maintenance mechanisms.

Owner's Name: Vincenzo D. Collucci

Address: c/o Anova, Inc., 2734 Loker Avenue, Suite E

City : Carlsbad State: CA Zip: 92010

Email Address: pauldcolucci@hotmail.com

Phone Number: (619) 922-1288

Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.

FUNDING SOURCE:

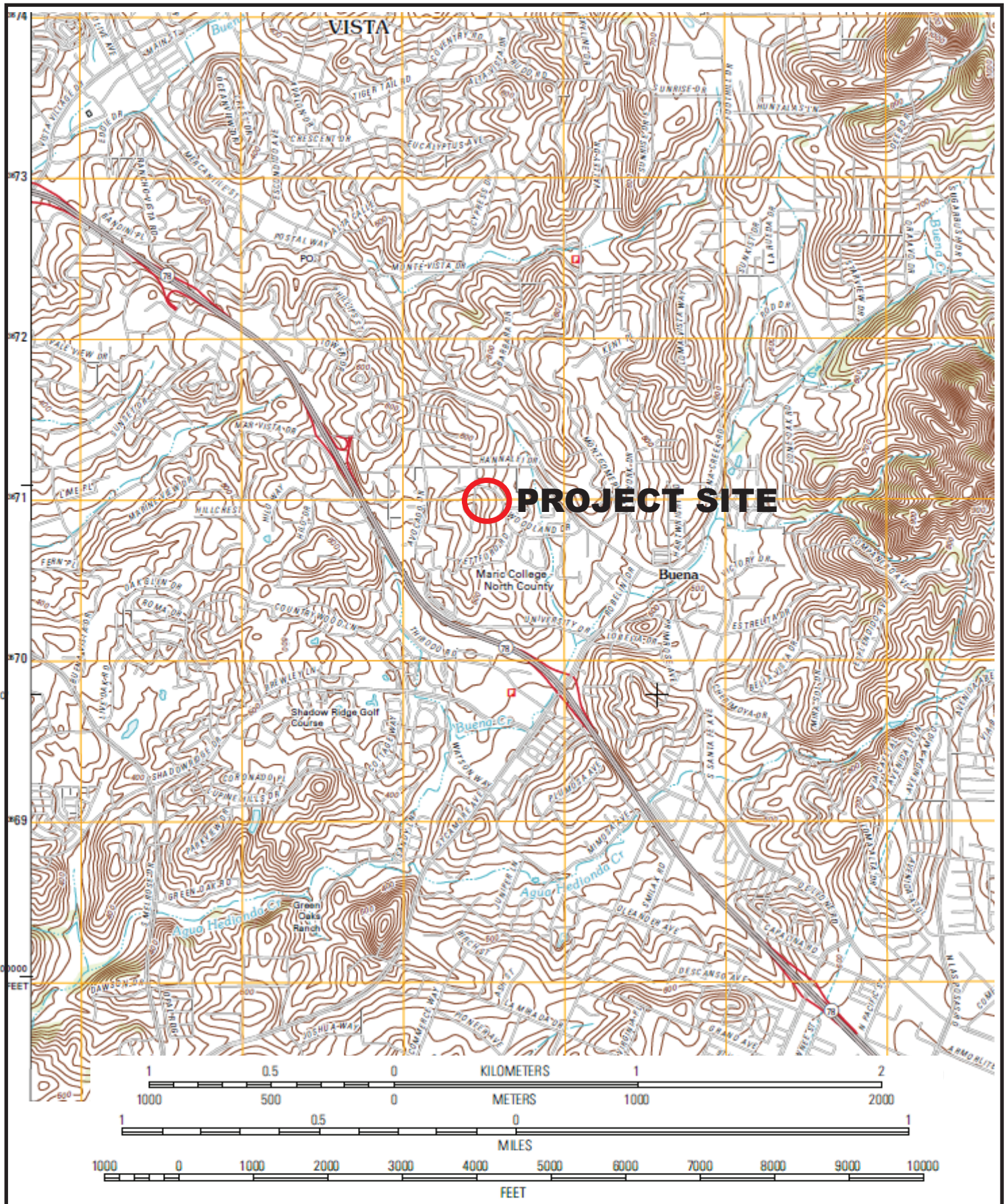
Provide the funding source or sources for long-term operation and maintenance of each BMP identified above. Please see Chapter 5 "Stormwater Facility Maintenance" of the County SUSMP for the appropriate funding source options. By certifying the Major SWMP the applicant is certifying that the funding responsibilities have been addressed and will be transferred to future owners.

A funding source is not necessary for any of the flow-through planter BMPs on private lots.

A security deposit will be necessary for the bioretention facility and for the CDS unit in the private street. Long term funding for the maintenance of these facilities will be addressed by a private maintenance agreement that will apply to the owners of Lots 13 through 18, inclusive (6 lots).

ATTACHMENT A

Project Location Map



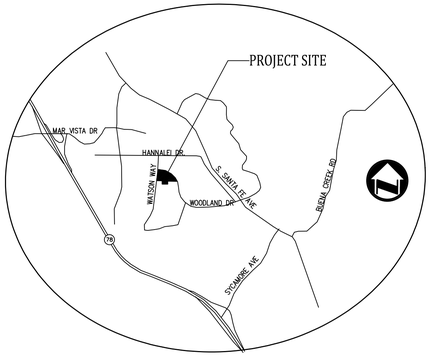
CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

TAYLOR GROUP, INC. GEOSCIENCE & ENGINEERING CONSULTANTS	TGI Project No. 14.00681	FIGURE 1. SITE LOCATION MAP
	Drawn by: LT / Checked by:	
	Date: October 2014	Woodland and Watson Subdivision

ATTACHMENT B

Source Control Exhibit

SWMP SOURCE CONTROL BMP EXHIBIT
WOODLAND & WATSON SUBDIVISION (TM _____)



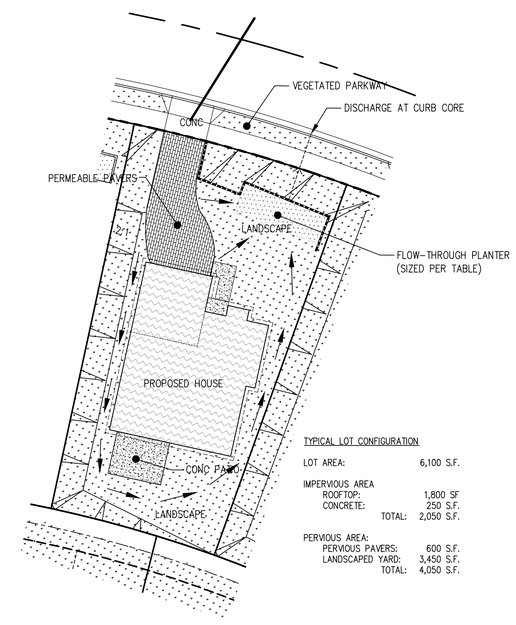
WATER QUALITY DISCHARGE DATA		
DISCHARGE POINT	TRIBUTARY AREA (ACRE)	Q_{WQ} (CFS)
A	0.138	0.013
B	0.138	0.013
C	0.138	0.013
D	0.138	0.013
E	0.139	0.013
F	0.138	0.013
G	0.138	0.013
H	0.152	0.013
I	0.135	0.013
J	0.118	0.013
K	0.119	0.013
L	0.126	0.013
M	0.178	0.013
N	0.210	0.013
O	0.220	0.013
P	1.286	0.072
TOTAL	3.512	0.267

SOURCE CONTROL BMP	FACT SHEET	SYMBOL
LABEL STORM DRAIN INLETS	CASQA SD-13	
INDOOR AND STRUCTURAL PEST CONTROL	CASQA SD-10	
PRESERVE EXISTING NATIVE VEGETATION	NA	
DROUGHT TOLERANT LANDSCAPE DESIGN	CASQA SD-10/SD-12	
USE PLANTS THAT TOLERATE SATURATED SOIL CONDITIONS	CASQA TC-32	

LID & SITE DESIGN BMP	FACT SHEET	SYMBOL
MINIMIZE AND DISCONNENT IMPERVIOUS SURFACES	CASQA SD-10	
CONVEY RUNOFF SAFELY FROM TOPS OF SLOPES	NA	
VEGETATE SLOPES WITH NATIVE AND DROUGHT TOLERANT VEGETATION	CASQA SD-10	
INSTALL RIPRAP ENERGY DISSIPATORS	SDRSD D-40	
ROOF RUNOFF CONTROLS	SD-11	
PERMEABLE PAVERS	SD-20	

DRAINAGE MANAGEMENT AREA TABULATION:

	AREA		AREAS ASSUMED FOR DESIGN (SQ.FT.)					
DMA	SQ. FT.	ACRE	ROOF	HARDSCAPE	TOTAL IMPERVIOUS	PERVIOUS PAVEMENT	LANDSCAPE	PERCENT IMPERVIOUS
DMA 1A	5,686	0.131	1,800	250	2,050	600	3,036	36%
DMA 1B	684	0.016	0	240	240	0	444	35%
DMA 2A	5,505	0.126	1,800	250	2,050	600	2,855	37%
DMA 2B	947	0.022	0	240	240	0	707	25%
DMA 3A	5,439	0.125	1,800	250	2,050	600	2,789	38%
DMA 3B	1,135	0.026	0	240	240	0	895	21%
DMA 4A	5,444	0.125	1,800	250	2,050	600	2,794	38%
DMA 4B	1,061	0.024	0	240	240	0	821	23%
DMA 5A	5,438	0.125	1,800	250	2,050	600	2,788	38%
DMA 5B	997	0.023	0	240	240	0	757	24%
DMA 6A	5,355	0.123	1,800	250	2,050	600	2,705	38%
DMA 6B	1,115	0.026	0	240	240	0	875	22%
DMA 7A	5,470	0.126	1,800	250	2,050	600	2,820	37%
DMA 7B	1,148	0.026	0	240	240	0	908	21%
DMA 8A	5,415	0.124	1,800	250	2,050	600	2,765	38%
DMA 8B	925	0.021	0	240	240	0	685	26%
DMA 9A	5,423	0.124	1,800	250	2,050	600	2,773	38%
DMA 9B	1,529	0.035	0	460	460	0	1,069	30%
DMA 10	5,191	0.119	1,800	250	2,050	600	2,541	39%
DMA 11	5,314	0.122	1,800	250	2,050	600	2,664	39%
DMA 12	4,754	0.109	1,800	250	2,050	600	2,104	43%
DMA 15	7,773	0.178	2,500	500	3,000	400	4,373	39%
DMA 16	9,134	0.210	2,400	900	3,300	400	5,434	36%
DMA 17	9,575	0.220	2,400	950	3,350	400	5,825	35%
DMA PMA	52,813	1.212	6,000	12,000	18,000	0	34,813	34%
DMA WDPW	1,163	0.027	0	290	290	0	873	25%
DMA WWPW	2,376	0.055	0	1,130	1,130	0	1,246	48%
DMA SI	6,971	0.160	0	6,971	6,971	0	0	100%
DMA PSNF	3,627	0.083	0	2,256	2,256	0	1,371	62%
DMA WDNF	1,000	0.023	0	1,000	1,000	0	0	100%
DMA WWNF	500	0.011	0	500	500	0	0	100%
TOTALS	168,907	3.878	34,900	31,877	66,777	8,400	93,730	40%



TYPICAL LOT CONFIGURATION

LOT AREA:	6,100 S.F.
IMPERVIOUS AREA	
ROOFTOP:	1,800 SF
CONCRETE:	250 S.F.
TOTAL:	2,050 S.F.
PERVIOUS AREA:	
PERVIOUS PAVERS:	600 S.F.
LANDSCAPED YARD:	3,450 S.F.
TOTAL:	4,050 S.F.

TYPICAL LOT SOURCE CONTROL BMPS, SITE DESIGN AND DRAINAGE

NO SCALE

ENGINEER OF WORK:

TAYLOR GROUP, INC.
301 MISSION AVENUE, SUITE 201
OCEANSIDE, CA 92054
TEL. 760.721.9990
FAX. 760.721.9991

BY: _____ DATE
LARRY R. TAYLOR, RCE, QE
R.C.E. 58274 EXPIRES 06.30.2016

REGISTERED PROFESSIONAL ENGINEER LARRY RUSSEL TAYLOR No. C 58274 Exp. 06/30/2016 CIVIL STATE OF CALIFORNIA

tgi TAYLOR GROUP, INC.
GEOSCIENCE & ENGINEERING CONSULTANTS
301 Mission Avenue, Suite 201
Oceanside, CA 92054
tel. 760.721.9990
fax. 760.721.9991
www.VisitTGI.com
Geotechnical Engineering
Civil Engineering
Environmental Science

COUNTY OF SAN DIEGO TM _____
TENTATIVE MAP

WOODLAND & WATSON SUBDIVISION

SOURCE CONTROL BMP EXHIBIT

SHEET 1 OF 2

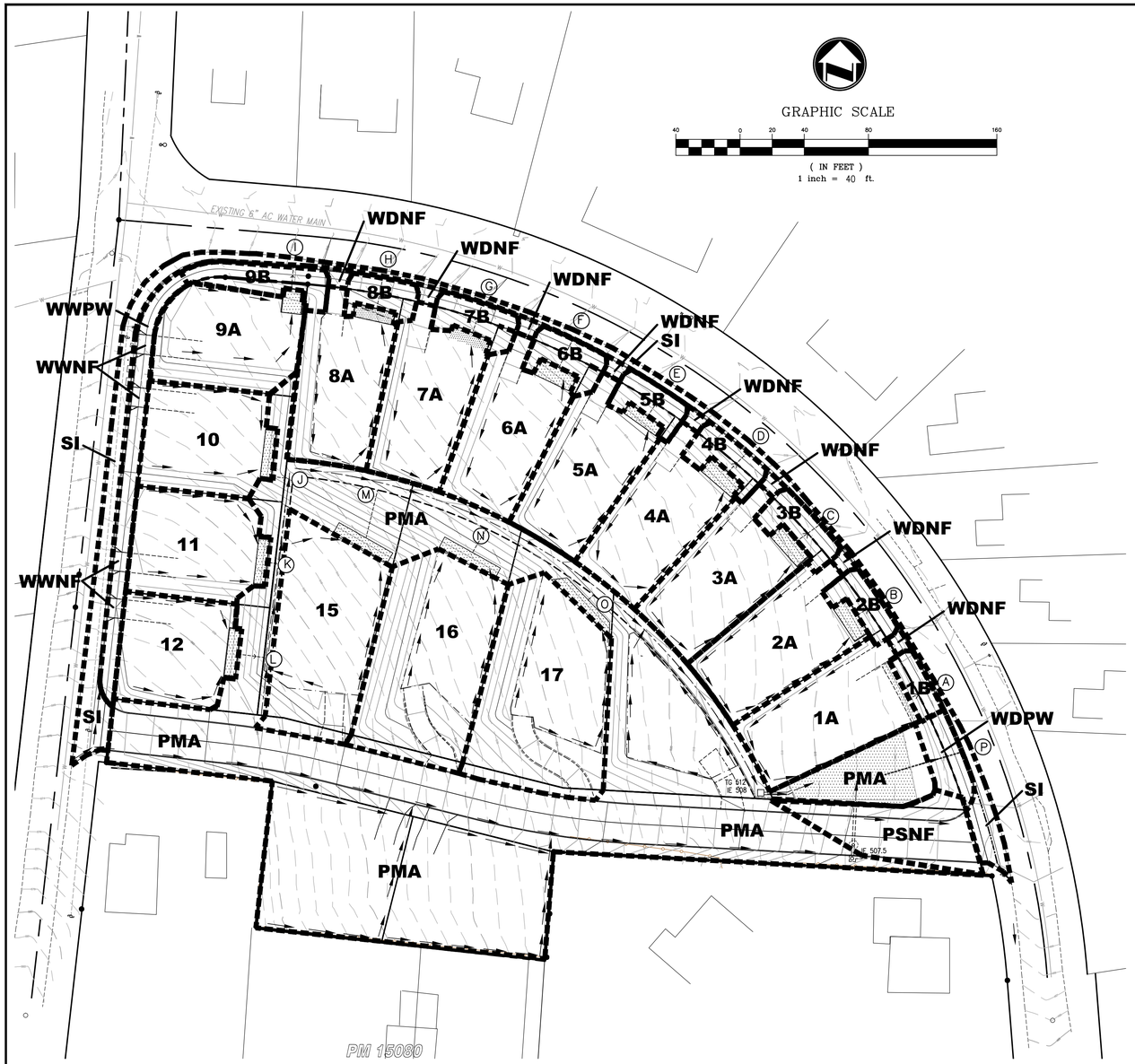
TAYLOR GROUP, INC.

ATTACHMENT C

Drainage Management Area (DMA) Exhibit

SWMP DMA EXHIBIT

WOODLAND & WATSON SUBDIVISION (TM _____)



AREAS DRAINING TO SELF RETAINING AREAS

DMA Name	Impervious Area (square feet)	Post-Development Surface	Runoff Factor	Area x Runoff Factor	Total Area x Runoff Factor	Receiving Self-retaining DMA	Receiving Self-retaining DMA Area (square feet)	Area Ratio
1B	240	Concrete (sidewalk)	1.0	240.0	261.2	1B	232	1.1
	212	Landscaped slope	0.1	21.2				
2B	240	Concrete (sidewalk)	1.0	240.0	287.5	2B	232	1.2
	475	Landscaped slope	0.1	47.5				
3B	240	Concrete (sidewalk)	1.0	240.0	306.3	3B	232	1.3
	663	Landscaped slope	0.1	66.3				
4B	240	Concrete (sidewalk)	1.0	240.0	298.9	4B	232	1.3
	589	Landscaped slope	0.1	58.9				
5B	240	Concrete (sidewalk)	1.0	240.0	292.5	5B	232	1.3
	525	Landscaped slope	0.1	52.5				
6B	240	Concrete (sidewalk)	1.0	240.0	304.3	6B	232	1.3
	643	Landscaped slope	0.1	64.3				
7B	240	Concrete (sidewalk)	1.0	240.0	307.6	7B	232	1.3
	676	Landscaped slope	0.1	67.6				
8B	240	Concrete (sidewalk)	1.0	240.0	285.3	8B	232	1.2
	453	Landscaped slope	0.1	45.3				
9B	460	Concrete (sidewalk)	1.0	460.0	522.4	9B	445	1.2
	624	Landscaped slope	0.1	62.4				
WDPW	290	Concrete (sidewalk)	1.0	290.0	348.3	9B	290	1.2
	583	Landscaped slope	0.1	58.3				
WWPW	1130	Concrete (sidewalk)	1.0	1130.0	1130.0	9B	1246	0.9
	0	Landscaped slope	0.1	0.0				

NOTE: Receiving self-retaining area consists of the landscaped portion of parkway adjacent to inperviuos sidewalk.

LEGEND:

- SUBDIVISION BOUNDARY
- EXISTING TOPOGRAPHIC CONTOUR
- PROPOSED TOTOGRAPHIC CONTOUR
- DIRECTION OF DRAINAGE
- DRAIANGE MANAGEMENT AREA (DMA) BOUNDARY
- PMA — DMA NUMBER (SEE TABLE THIS SHEET)
- (M) — WATER QUALITY OUTLET IDENTIFICATION (SEE TABLE THIS SHEET)
- FLOW–THROUGH PLANTER
- BIORETENTION BASIN
- CDS UNIT

DRAINAGE MANAGEMENT AREA TABULATION:

DMA	AREA		AREAS ASSUMED FOR DESIGN (SQ.FT.)					
	SQ. FT.	ACRE	ROOF	HARDSCAPE	TOTAL IMPERVIOUS	PERVIOUS PAVEMENT	LANDSCAPE	PERCENT IMPERVIOUS
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DMA 7B	1,148	0.026	0	240	240	0	908	21%
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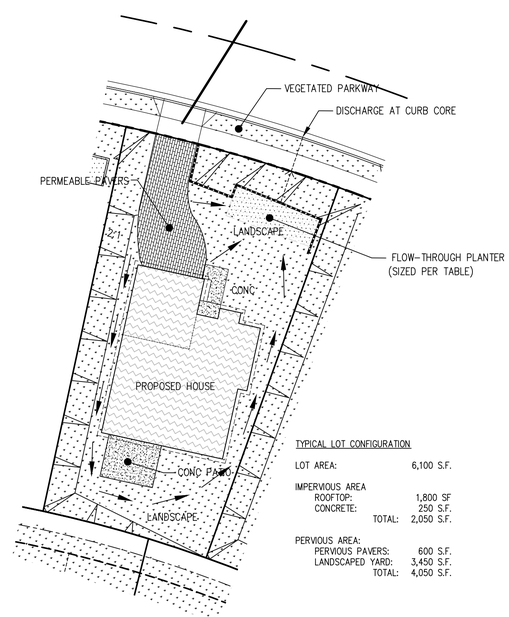
DMA 8B	925	0.021	0	240	240	0	685	26%
DMA 9A	5,423	0.124	1,800	250	2,050	600	2,773	38%
DMA 9B	1,529	0.035	0	460	460	0	1,069	30%
DMA 10	5,191	0.119	1,800	250	2,050	600	2,541	39%
DMA 11	5,314	0.122	1,800	250	2,050	600	2,664	39%
DMA 12	4,754	0.109	1,800	250	2,050	600	2,104	43%
DMA 15	7,773	0.178	2,500	500	3,000	400	4,373	39%
DMA 16	9,134	0.210	2,400	900	3,300	400	5,434	36%
DMA 17	9,575	0.220	2,400	950	3,350	400	5,825	35%
DMA PMA	52,813	1.212	6,000	12,000	18,000	0	34,813	34%
DMA WDPW	1,163	0.027	0	290	290	0	873	25%
DMA WWPW	2,376	0.055	0	1,130	1,130	0	1,246	48%
DMA SI	6,971	0.160	0	6,971	6,971	0	0	100%
DMA PSNF	3,627	0.083	0	2,256	2,256	0	1,371	62%
DMA WDNF	1,000	0.023	0	1,000	1,000	0	0	100%
DMA WWNF	500	0.011	0	500	500	0	0	100%
TOTALS	168,907	3.878	34,900	31,877	66,777	8,400	93,730	40%



TYPICAL LOT CONFIGURATION

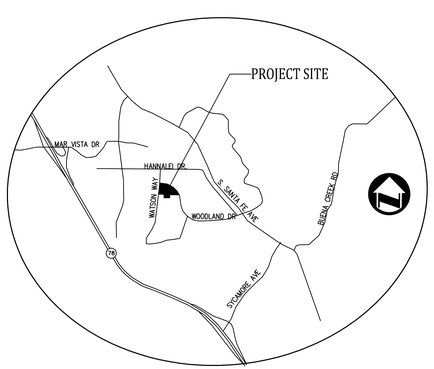
LOT AREA: 6,100 S.F.

IMPERVIOUS AREA
ROOFTOP: 1,800 SF
CONCRETE: 250 S.F.
TOTAL: 2,050 S.F.

PERVIOUS AREA:
PERVIOUS PAVERS: 600 S.F.
LANDSCAPED YARD: 3,450 S.F.
TOTAL: 4,050 S.F.

TYPICAL LOT DESIGN AND DRAINAGE

NO SCALE



WATER QUALITY DISCHARGE DATA

DISCHARGE POINT	TRIBUTARY AREA (ACRE)	Q_{WQ} (CFS)
A	0.138	0.013
B	0.138	0.013
C	0.138	0.013
D	0.138	0.013
E	0.139	0.013
F	0.138	0.013
G	0.138	0.013
H	0.152	0.013
I	0.135	0.013
J	0.118	0.013
K	0.119	0.013
L	0.126	0.013
M	0.178	0.013
N	0.210	0.013
O	0.220	0.013
P	1.286	0.072
TOTAL	3.512	0.267

SIZING OF BIORETENTION FACILITIES

DMA	AREA		STORAGE VOLUME (CF)		
	SQ. FT.	ACRE	SURFACE	SUBSURFACE	TOTAL
DMA 1A	5,686	0.131	153	300	453
DMA 2A	5,505	0.126	153	300	453
DMA 3A	5,439	0.125	153	300	453
DMA 4A	5,444	0.125	153	300	453
DMA 5A	5,438	0.125	153	300	453
DMA 6A	5,355	0.123	153	300	453
DMA 7A	5,470	0.126	153	300	453
DMA 8A	5,415	0.124	153	300	453
DMA 9A	5,423	0.124	153	300	453
DMA 10	5,191	0.119	153	300	453
DMA 11	5,314	0.122	153	300	453
DMA 12	4,754	0.109	153	300	453
DMA 15	7,773	0.178	238	420	658
DMA 16	9,134	0.210	238	420	658
DMA 17	9,575	0.220	242	428	670
DMA PMA	52,813	1.212	3200	3000	6200
TOTALS	143,729	3.300	5754	7868	13622

ENGINEER OF WORK:

TAYLOR GROUP, INC.
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BY: _____
LARRY R. TAYLOR, RCE, GE *DATE*
R.C.E. 58274 EXPIRES 06.30.2016

REGISTERED PROFESSIONAL ENGINEER
LARRY RUSSELL TAYLOR
No. C 58274
Exp. 06/30/2016
CIVIL
STATE OF CALIFORNIA

tgi TAYLOR GROUP, INC.
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Geotechnical Engineering
Civil Engineering
Environmental Science

COUNTY OF SAN DIEGO TM _____
TENTATIVE MAP

WOODLAND & WATSON SUBDIVISION

BMP DMA EXHIBIT

ATTACHMENT D

Sizing Design Calculations and TCBMP/LID Design Details

AREAS DRAINING TO SELF RETAINING AREAS

DMA Name	*Impervious Area (square feet)*	*Post-Development Surface*	*Runoff Factor*	*Area x Runoff Factor*	*Total Area x Runoff Factor*	*Receiving Self-retaining DMA*	*Receiving Self-retaining DMA Area (square feet)*	*Area Ratio*
1B	240	Concrete (sidewalk)	1.0	240.0	261.2	1B	232	1.1
	212	Landscaped slope	0.1	21.2				
2B	240	Concrete (sidewalk)	1.0	240.0	287.5	2B	232	1.2
	475	Landscaped slope	0.1	47.5				
3B	240	Concrete (sidewalk)	1.0	240.0	306.3	3B	232	1.3
	663	Landscaped slope	0.1	66.3				
4B	240	Concrete (sidewalk)	1.0	240.0	298.9	4B	232	1.3
	589	Landscaped slope	0.1	58.9				
5B	240	Concrete (sidewalk)	1.0	240.0	292.5	5B	232	1.3
	525	Landscaped slope	0.1	52.5				
6B	240	Concrete (sidewalk)	1.0	240.0	304.3	6B	232	1.3
	643	Landscaped slope	0.1	64.3				
7B	240	Concrete (sidewalk)	1.0	240.0	307.6	7B	232	1.3
	676	Landscaped slope	0.1	67.6				
8B	240	Concrete (sidewalk)	1.0	240.0	285.3	8B	232	1.2
	453	Landscaped slope	0.1	45.3				
9B	460	Concrete (sidewalk)	1.0	460.0	522.4	9B	445	1.2
	624	Landscaped slope	0.1	62.4				
WDPW	290	Concrete (sidewalk)	1.0	290.0	348.3	9B	290	1.2
	583	Landscaped slope	0.1	58.3				
WWPW	1130	Concrete (sidewalk)	1.0	1130.0	1130.0	9B	1246	0.9
	0	Landscaped slope	0.1	0.0				

NOTE: Receiving self-retaining area consists of the landscaped portion of parkway adjacent to inperviuos sidewalk.

BMP Sizing Spreadsheet V1.03			
Project Name:	Woodland & Watson Subdivision	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name:	Typical Lots 1-9 (< 6100 SF)	BMP Type:	Flow-Through Planter
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
DMA1.1	250	D	Moderate	Pavement	1.0	0.07	0.0583	0.042	18	15	11
DMA1.2	1800	D	Moderate	Roofs	1.0	0.07	0.0583	0.042	126	105	76
DMA1.3	3000	D	Moderate	Landscape	0.1	0.07	0.0583	0.042	21	17	13
DMA1.4	600	D	Moderate	Perm Pavers	0.1	0.07	0.0583	0.042	4	3	3
Total BMP Area	5650										

Minimum BMP Size	168.7	141	101
Proposed BMP Size*	200	153	300
Minimum Ponding Depth		1.23	in
Maximum Ponding Depth		260.53	in
Selected Ponding Depth		2.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V1.03			
Project Name:	odland & Watson Subdiv	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name	ypical Lots 1-9 (< 6100 S	BMP Type:	Flow-Through Planter

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DMA1.1	Oceanside	D	Scrub	Moderate	0.212	0.006	0.001	**0.01**
DMA1.2	Oceanside	D	Scrub	Moderate	0.212	0.041	0.004	**0.11**
DMA1.3	Oceanside	D	Scrub	Moderate	0.212	0.069	0.007	**0.18**
DMA1.4	Oceanside	d	Scrub	Moderate	0.212	0.014	0.001	**0.04**

0.014	**0.34**	**0.65**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.013	**0.31**	**0.63**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	0.7

If Drawdown time exceeds 96 Hrs project must implement a vector control program.

BMP Sizing Spreadsheet V1.03			
Project Name:	Woodland & Watson Subdivision	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name:	Typical Lots 10-12	BMP Type:	Flow-Through Planter
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
DMA1.1	250	D	Moderate	Pavement	1.0	0.07	0.0583	0.042	18	15	11
DMA1.2	1800	D	Moderate	Roofs	1.0	0.07	0.0583	0.042	126	105	76
DMA1.3	2540	D	Moderate	Landscape	0.1	0.07	0.0583	0.042	18	15	11
DMA1.4	600	D	Moderate	Perm Pavers	0.1	0.07	0.0583	0.042	4	3	3
Total BMP Area	5190										

Minimum BMP Size	165.48	138	99
Proposed BMP Size*	200	153	300
Minimum Ponding Depth		1.07	in
Maximum Ponding Depth		260.53	in
Selected Ponding Depth		2.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V1.03			
Project Name:	odland & Watson Subdiv	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name	Typical Lots 10-12	BMP Type:	Flow-Through Planter

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DMA1.1	Oceanside	D	Scrub	Moderate	0.212	0.006	0.001	**0.01**
DMA1.2	Oceanside	D	Scrub	Moderate	0.212	0.041	0.004	**0.11**
DMA1.3	Oceanside	D	Scrub	Moderate	0.212	0.058	0.006	**0.15**
DMA1.4	Oceanside	d	Scrub	Moderate	0.212	0.014	0.001	**0.04**

0.013	**0.31**	**0.63**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.013	**0.31**	**0.63**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	0.7

If Drawdown time exceeds 96 Hrs project must implement a vector control program.

BMP Sizing Spreadsheet V1.03			
Project Name:	Woodland & Watson Subdivision	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name:	FTP-15	BMP Type:	Flow-Through Planter
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
DMA15.1	500	D	Moderate	Pavement	1.0	0.07	0.0583	0.042	35	29	21
DMA15.2	2500	D	Moderate	Roofs	1.0	0.07	0.0583	0.042	175	146	105
DMA15.3	4373	D	Moderate	Landscape	0.1	0.07	0.0583	0.042	31	25	18
DMA15.4	400	D	Moderate	Perm Pavers	0.2	0.07	0.0583	0.042	6	5	3
Total BMP Area	7773										

Minimum BMP Size	246.211	205	148
Proposed BMP Size*	280	238	420
Minimum Ponding Depth		1.59	in
Maximum Ponding Depth		186.09	in
Selected Ponding Depth		3.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V1.03			
Project Name:	ɔdland & Watson Subdiv	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name	FTP-15	BMP Type:	Flow-Through Planter

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DMA15.1	Oceanside	D	Scrub	Moderate	0.212	0.011	0.001	**0.03**
DMA15.2	Oceanside	D	Scrub	Moderate	0.212	0.057	0.006	**0.15**
DMA15.3	Oceanside	D	Scrub	Moderate	0.212	0.100	0.011	**0.26**
DMA15.4	Oceanside	d	Scrub	Moderate	0.212	0.009	0.001	**0.02**

0.019	**0.46**	**0.77**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.013	**0.31**	**0.63**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	1.5

If Drawdown time exceeds 96 Hrs project must implement a vector control program.

BMP Sizing Spreadsheet V1.03			
Project Name:	Woodland & Watson Subdivision	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name:	FTP-16	BMP Type:	Flow-Through Planter
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
DMA16.1	900	D	Moderate	Pavement	1.0	0.07	0.0583	0.042	63	52	38
DMA16.2	2400	D	Moderate	Roofs	1.0	0.07	0.0583	0.042	168	140	101
DMA16.3	5434	D	Moderate	Landscape	0.1	0.07	0.0583	0.042	38	32	23
DMA16.4	400	D	Moderate	Perm Pavers	0.2	0.07	0.0583	0.042	6	5	3
Total BMP Area	9134										

Minimum BMP Size	274.638	229	165
Proposed BMP Size*	280	238	420
Minimum Ponding Depth		2.60	in
Maximum Ponding Depth		186.09	in
Selected Ponding Depth		3.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V1.03			
Project Name:	ɔdland & Watson Subdiv	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name	FTP-16	BMP Type:	Flow-Through Planter

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DMA16.1	Oceanside	D	Scrub	Moderate	0.212	0.021	0.002	**0.05**
DMA16.2	Oceanside	D	Scrub	Moderate	0.212	0.055	0.006	**0.14**
DMA16.3	Oceanside	D	Scrub	Moderate	0.212	0.125	0.013	**0.32**
DMA16.4	Oceanside	d	Scrub	Moderate	0.212	0.009	0.001	**0.02**

0.022	**0.54**	**0.83**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.013	**0.31**	**0.63**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	1.5

If Drawdown time exceeds 96 Hrs project must implement a vector control program.

BMP Sizing Spreadsheet V1.03			
Project Name:	Woodland & Watson Subdivision	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name:	FTP-17	BMP Type:	Flow-Through Planter
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
DMA17.1	950	D	Moderate	Pavement	1.0	0.07	0.0583	0.042	67	55	40
DMA17.2	2400	D	Moderate	Roofs	1.0	0.07	0.0583	0.042	168	140	101
DMA17.3	5826	D	Moderate	Landscape	0.1	0.07	0.0583	0.042	41	34	24
DMA17.4	400	D	Moderate	Perm Pavers	0.2	0.07	0.0583	0.042	6	5	3
Total BMP Area	9576										

Minimum BMP Size	280.882	234	169
Proposed BMP Size*	285	242	428
Minimum Ponding Depth		2.65	in
Maximum Ponding Depth		182.83	in
Selected Ponding Depth		3.00	in

Describe the BMP's in sufficient detail in your SWMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

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BMP Sizing Spreadsheet V1.03			
Project Name:	odland & Watson Subdiv	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name	FTP-17	BMP Type:	Flow-Through Planter

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DMA17.1	Oceanside	D	Scrub	Moderate	0.212	0.022	0.002	**0.06**
DMA17.2	Oceanside	D	Scrub	Moderate	0.212	0.055	0.006	**0.14**
DMA17.3	Oceanside	D	Scrub	Moderate	0.212	0.134	0.014	**0.35**
DMA17.4	Oceanside	d	Scrub	Moderate	0.212	0.009	0.001	**0.02**

0.023	**0.57**	**0.85**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.013	**0.31**	**0.63**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	1.6

If Drawdown time exceeds 96 Hrs project must implement a vector control program.

BMP Sizing Spreadsheet V1.03			
Project Name:	Woodland & Watson Subdivision	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name:	PMA	BMP Type:	Bioretention
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	0.024

Areas Draining to BMP						HMP Sizing Factors			Minimum BMP Size		
DMA Name	Area (sf)	Soil Type	Slope	Post Project Surface Type	Runoff Factor (Table 4-2)	Surface Area	Surface Volume	Subsurface Volume	Surface Area (sf)	Surface Volume (cf)	Subsurface Volume (cf)
DMA 20.1	12204	D	Moderate	Pavement	1.0	0.065	0.0542	0.039	793	661	476
DMA 20.2	11533	D	Moderate	Slopes	0.1	0.065	0.0542	0.039	75	63	45
DMA 20.3A	3000	D	Moderate	Lot 13 - Imperv	1.0	0.065	0.0542	0.039	195	163	117
DMA 20.3B	4266	D	Moderate	Lot 13 - Pervious	0.1	0.065	0.0542	0.039	28	23	17
DMA 20.4A	3000	D	Moderate	Lot 14-Imperv	1.0	0.065	0.0542	0.039	195	163	117
DMA 20.4B	4098	D	Moderate	Lot 14-Pervious	0.1	0.065	0.0542	0.039	27	22	16
DMA20.5A	2400	D	Moderate	Lot 18-Imperv	1.0	0.065	0.0542	0.039	156	130	94
DMA20.5B	3673	D	Moderate	Lot 18-Pervious	0.1	0.065	0.0542	0.039	24	20	14
DMA 20.6	4484	D	Moderate	Landscape Swales	0.1	0.065	0.0542	0.039	29	24	17
DMA 20.7	4172	D	Moderate	Landscape	0.1	0.065	0.0542	0.039	27	23	16
Total BMP Area	52830										

Minimum BMP Size	1548.729	1291	929
Proposed BMP Size*	2000	3200	3000
Minimum Ponding Depth		0.55	in
Maximum Ponding Depth		150.06	in
Selected Ponding Depth		12.00	in

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Project Name:	odland & Watson Subdiv	Hydrologic Unit:	Carlsbad
Project Applicant:	Paul Colucci	Rain Gauge:	Oceanside
Jurisdiction:	San Diego County	Total Project Area:	161172
Parcel (APN):	183-131-23 through 26	Low Flow Threshold:	0.5Q2
BMP Name	PMA	BMP Type:	Bioretention

DMA Name	Rain Gauge	Existing Condition			Q2 Sizing Factor (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	**Orifice Area (in2)**
		Soil Type	Cover	Slope				
DMA 20.1	Oceanside	D	Scrub	Moderate	0.212	0.280	0.030	**0.73**
DMA 20.2	Oceanside	D	Scrub	Moderate	0.212	0.265	0.028	**0.69**
DMA 20.3A	Oceanside	D	Scrub	Moderate	0.212	0.069	0.007	**0.18**
DMA 20.3B	Oceanside	D	Scrub	Moderate	0.212	0.098	0.010	**0.25**
DMA 20.4A	Oceanside	D	Scrub	Moderate	0.212	0.069	0.007	**0.18**
DMA 20.4B	Oceanside	D	Scrub	Moderate	0.212	0.094	0.010	**0.24**
DMA20.5A	Oceanside	D	Scrub	Moderate	0.212	0.055	0.006	**0.14**
DMA20.5B	Oceanside	D	Scrub	Moderate	0.212	0.084	0.009	**0.22**
DMA 20.6	Oceanside	D	Scrub	Moderate	0.212	0.103	0.011	**0.27**
DMA 20.7	Oceanside					0.096		

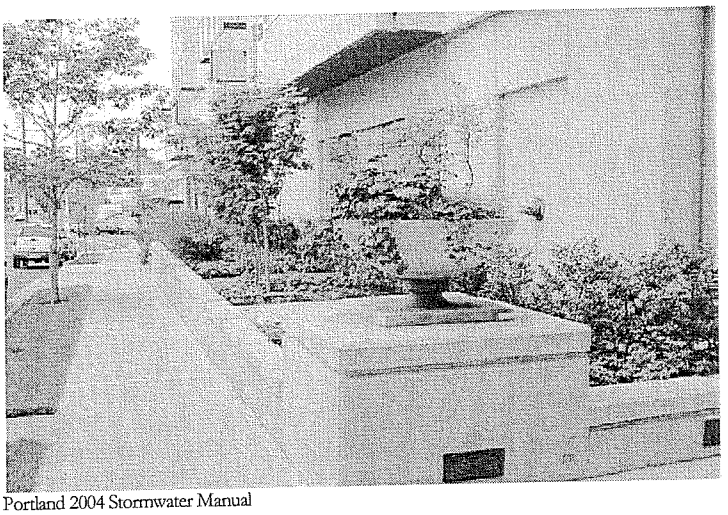
0.118	**2.89**	**1.92**
Tot. Allowable Orifice Flow (cfs)	**Tot. Allowable Orifice Area (in2)**	**Max Orifice Diameter (in)**

0.072	**1.77**	**1.50**
Actual Orifice Flow (cfs)	Actual Orifice Area (in2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	7.7

If Drawdown time exceeds 96 Hrs project must implement a vector control program.

Flow-through Planter



Portland 2004 Stormwater Manual

Best Uses

- Management of roof runoff
- Next to buildings
- Dense urban areas
- Where infiltration is not desired

Advantages

- Can be used next to structures
- Versatile
- Can be any shape
- Low maintenance

Limitations

- Can be used for flow-control only on sites with "C" and "D" soils
- Requires underdrain
- Requires 3-4 feet of head

Flow-through planters treat and detain runoff without allowing seepage into the underlying soil. They can be used next to buildings and on slopes where stability might be affected by adding soil moisture.

Flow-through planters typically receive runoff via downspouts leading from the roofs of adjacent buildings. However, they can also be set in-ground and receive sheet flow from adjacent paved areas.

Pollutants are removed as runoff passes through the soil layer and is collected in an underlying layer of gravel or drain rock. A perforated-pipe underdrain is typically connected to a storm drain or other discharge point. An overflow inlet conveys flows which exceed the capacity of the planter.

► CRITERIA

Treatment only. For development projects subject only to runoff treatment requirements, the following criteria apply:

Parameter	Criterion
Soil mix depth	18 inches minimum
Soil mix minimum percolation rate	5 inches per hour minimum sustained (10 inches per hour initial rate recommended)

Parameter	Criterion
Soil mix surface area	0.04 times tributary impervious area (or equivalent)
Surface reservoir depth	6" minimum; may be sloped to 4" where adjoining walkways.
Underdrain	Typically used. Perforated pipe embedded in gravel ("Class 2 permeable" recommended), connected to storm drain or other accepted discharge point.

▶ DETAILS

Configuration. The planter must be level. To avoid standing water in the subsurface layer, set the perforated pipe underdrain and orifice as nearly flush with the planter bottom as possible.

Inlets. Protect plantings from high-velocity flows by adding rocks or other energy-dissipating structures at downspouts and other inlets.

Soil mix. The required soil mix is similar to a loamy sand. It must maintain a minimum percolation rate of 5" per hour throughout the life of the facility, and it must be suitable for maintaining plant life. Typically, on-site soils will not be suitable due to clay content.

Gravel storage and drainage layer. "Class 2 permeable," Caltrans specification 68-1.025, is recommended. Open-graded crushed rock, washed, may be used, but requires 4"-6" of washed pea gravel be substituted at the top of the crushed rock layer. **Do not use filter fabric** to separate the soil mix from the gravel drainage layer.

Emergency overflow. The planter design and installation should anticipate extreme events and potential clogging of the overflow and route emergency overflows safely.

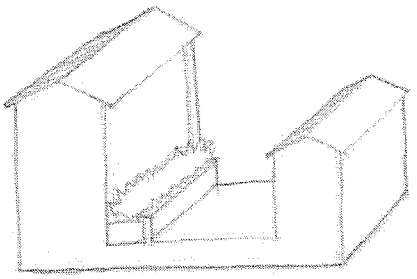
▶ APPLICATIONS

Adjacent to buildings. Flow-through planters may be located adjacent to buildings, where the planter vegetation can soften the visual effect of the building wall. A setback with a raised planter box may be appropriate even in some neo-traditional pedestrian-oriented urban streetscapes.

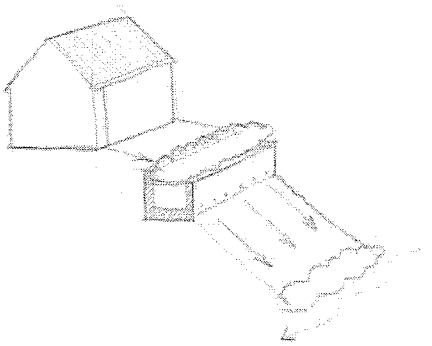
At plaza level. Flow-through planters have been successfully incorporated into podium-style developments, with the planters placed on the plaza level and receiving runoff from the tower roofs above. Runoff from the plaza level is typically managed separately by additional flow-through planters or bioretention facilities located at street level.

Steep slopes. Flow-through planters provide a means to detain and treat runoff on slopes that cannot accept infiltration from a bioretention facility. The planter can be built into the slope similar to a retaining wall. The design should consider the need to access the planter for periodic

maintenance. Flows from the planter underdrain and overflow must be directed in accordance with local requirements. It is sometimes possible to disperse these flows to the downgradient hillside.



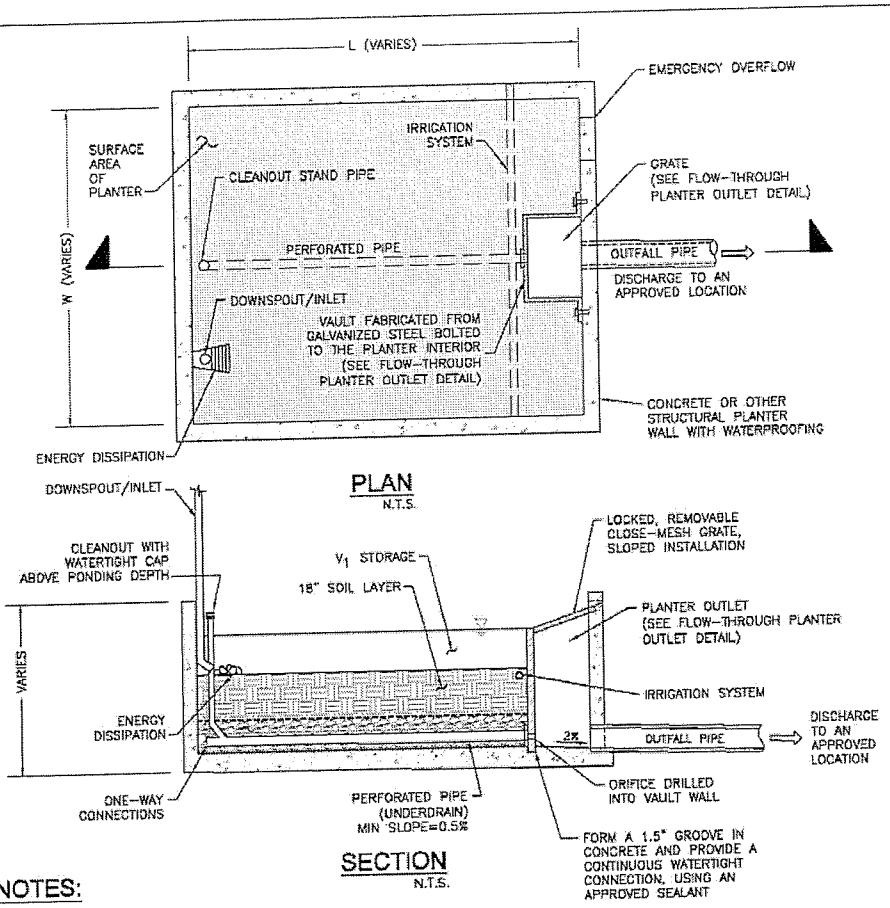
Flow-through planter on the plaza level of a podium-style development.



Flow-through planter built into a hillside. Flows from the underdrain and overflow must be directed in accordance with local requirements.

Design Checklist for Flow-through Planter

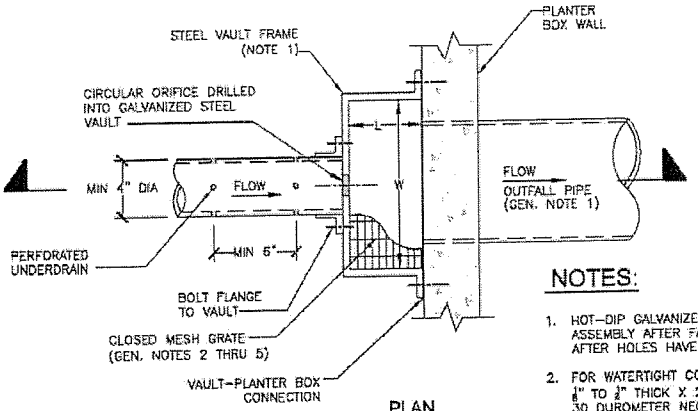
- ❒ Reservoir depth is 4-6" minimum.
- ❒ 18" depth "loamy sand" soil mix with minimum long-term infiltration rate of 5"/hour.
- ❒ Area of soil mix meets or exceeds minimum.
- ❒ "Class 2 perm" drainage layer.
- ❒ No filter fabric.
- ❒ Perforated pipe underdrain with outlet located flush or nearly flush with planter bottom. Connection with sufficient head to storm drain or discharge point.
- ❒ Underdrain has a clean-out port consisting of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 6 inches and a watertight cap.
- ❒ Overflow connected to a downstream storm drain or approved discharge point.
- ❒ Location and footprint of facility are shown on site plan and landscaping plan.
- ❒ Planter is set level.
- ❒ Emergency spillage will be safely conveyed overland.
- ❒ Plantings are suitable to the climate and a well-drained soil.
- ❒ Irrigation system with connection to water supply.



NOTES:

1. FLOW-THROUGH PLANTER SHALL BE SIZED TO MEET CCCWP CRITERIA FOR TREATMENT AND/OR FLOW CONTROL.
2. MINIMUM SURFACE AREA OF PLANTER IS 4% OF TRIBUTARY IMPERVIOUS AREA FOR TREATMENT ONLY DESIGN. FOR FLOW CONTROL AND TREATMENT, REFER TO CCCWP SIZING TOOL CRITERIA.
3. SHAPE OF PLANTER CAN VARY TO MEET PROJECT DESIGN REQUIREMENTS AND LOCATION.
4. CLASS 2 PERMEABLE MATERIAL
5. DOWNSPOUTS/INLET PIPES REQUIRE ENERGY DISSIPATION.
6. USE COUNTY APPROVED ADDITIVE MIXTURE FOR WATERPROOFING CONCRETE.
7. PLANTINGS: SEE CCCWP RECOMMENDED PLANT LIST AND GUIDELINES.
8. PLANTER DESIGN MAY REQUIRE STRUCTURAL ENGINEERING DESIGN.
9. AREA = W x L (ABOVE). EXCLUDES AREA OF VAULT

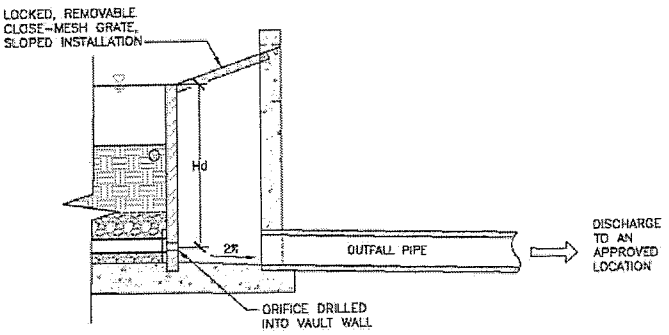
Flow-Through Planter Detail



PLAN
N.T.S.

NOTES:

1. HOT-DIP GALVANIZE ENTIRE FRAME ASSEMBLY AFTER FABRICATION AND AFTER HOLES HAVE BEEN DRILLED.
2. FOR WATERTIGHT CONNECTION, INSTALL $\frac{1}{8}$" TO $\frac{1}{2}$" THICK X 2" WIDE CONTINUOUS 30 DUROMETER NEOPRENE GASKET, ALL AROUND VAULT FRAME.



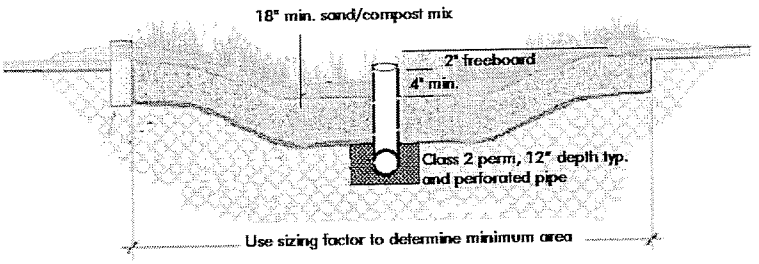
SECTION
N.T.S.

GENERAL OUTLET DETAIL NOTES:

1. OUTFALL PIPE SHALL BE SIZED TO CONVEY DESIGN STORM PER CCCWP DESIGN CRITERIA.
2. GRATE SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED AND LOCKABLE OR BOLTABLE ACCESS PANELS.
3. GRATE SHALL BE STAINLESS STEEL, ALUMINUM OR STEEL. STEEL GRATES SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER PAINTED AFTER GALVANIZING.
4. GRATE SHALL BE DESIGNED SUCH THAT THE DIAGONAL DIMENSION OF EACH OPENING IS SMALLER THAN THE DIAMETER OF THE OUTLET PIPE.
5. STRUCTURAL DESIGN OF GRATE SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF GRATE.

Flow-Through Planter Outlet Detail

Bioretention Facilities



Bioretention facility configured for treatment-only requirements. Bioretention facilities can rectangular, linear, or nearly any shape.

Bioretention detains runoff in a surface reservoir, filters it through plant roots and a biologically active soil mix, and then infiltrates it into the ground. Where native soils are less permeable, an underdrain conveys treated runoff to storm drain or surface drainage.

Bioretention facilities can be configured in nearly any shape. When configured as linear **swales**, they can convey high flows while percolating and treating lower flows.

Bioretention facilities can be configured as in-ground or above-ground planter boxes, with the bottom open to allow infiltration to native soils underneath. If infiltration cannot be allowed, use the sizing factors and criteria for the Flow-Through Planter.

► CRITERIA

For development projects subject only to runoff treatment requirements, the following criteria apply:

Parameter	Criterion
Soil mix depth	18 inches minimum
Soil mix minimum percolation rate	5 inches per hour minimum sustained (10 inches per hour initial rate recommended)
Soil mix surface area	0.04 times tributary impervious area (or equivalent)

Best Uses

- Commercial areas
- Residential subdivisions
- Industrial developments
- Roadways
- Parking lots
- Fit in setbacks, medians, and other landscaped areas

Advantages

- Can be any shape
- Low maintenance
- Can be landscaped

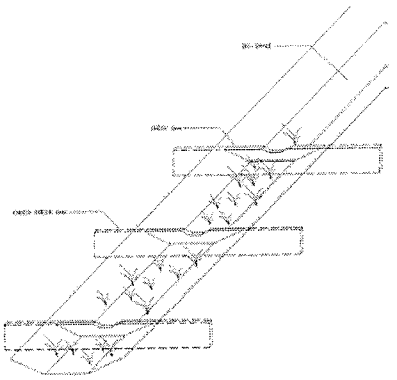
Limitations

- Require 4% of tributary impervious square footage
- Typically requires 3-4 feet of head
- Irrigation typically required

Parameter	Criterion
Surface reservoir depth	6 inches minimum; may be sloped to 4 inches where adjoining walkways.
Underdrain	Required in Group "C" and "D" soils. Perforated pipe embedded in gravel ("Class 2 permeable" recommended), connected to storm drain or other accepted discharge point.

▶ DETAILS

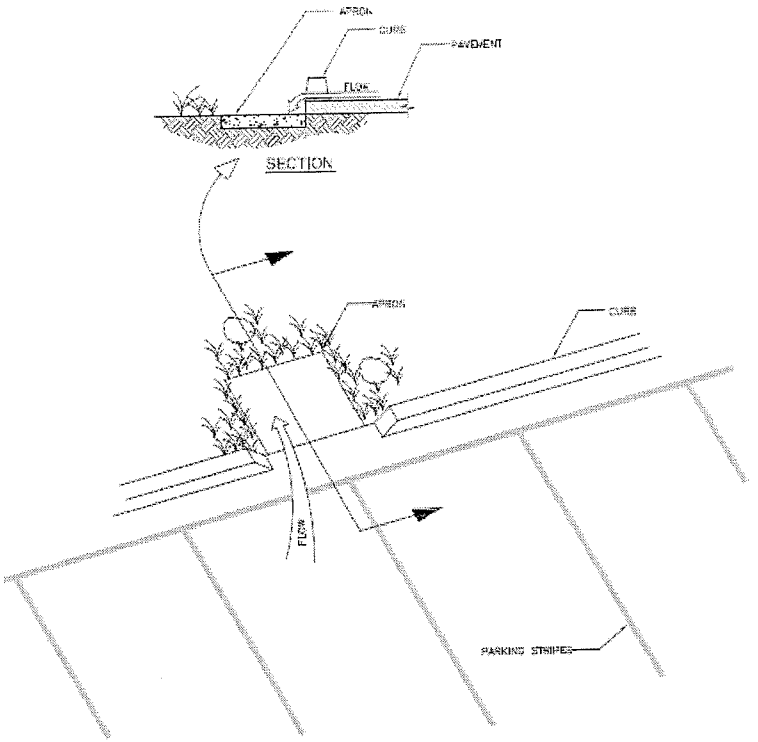
Plan. On the surface, a bioretention facility should be one level, shallow basin—or a series of basins. As runoff enters each basin, it should flood and fill throughout before runoff overflows to the outlet or to the next downstream basin. This will help prevent movement of surface mulch and soil mix.



Use check dams for linear bioretention facilities (swales) on a slope.

In a linear swale, check dams should be placed so that the lip of each dam is at least as high as the toe of the next upstream dam. A similar principle applies to bioretention facilities built as terraced roadway shoulders.

Inlets. Paved areas draining to the facility should be graded, and inlets should be placed, so that runoff remains as sheet flow or as dispersed as possible. Curb cuts should be wide (12" is recommended) to avoid clogging with leaves or debris. Allow for a minimum reveal of 4"-6" between the inlet and soil mix elevations to ensure turf or mulch buildup does not block the inlet. In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet.



Where runoff is collected in pipes or gutters and conveyed to the facility, protect the landscaping from high-velocity flows with energy-dissipating rocks. In larger installations, provide cobble-lined channels to better distribute flows throughout the facility.

Upturned pipe outlets can be used to dissipate energy when runoff is piped from roofs and upgradient paved areas.

Soil mix. The required soil mix is similar to a loamy sand. It must maintain a minimum percolation rate of 5" per hour throughout the life of the facility, and it must be suitable for maintaining plant life. Typically, on-site soils will not be suitable due to clay content.

Storage and drainage layer. "Class 2 permeable," Caltrans specification 68-1.025, is recommended. Open-graded crushed rock, washed, may be used, but requires 4"-6" washed pea gravel be substituted at the top of the crushed rock gravel layers. **Do not use filter fabric** to separate the soil mix from the gravel drainage layer or the gravel drainage layer from the native soil.

Underdrains. No underdrain is required where native soils beneath the facility are Hydrologic Soil Group A or B. For treatment-only facilities where native soils are Group C or D, a

perforated pipe must be bedded in the gravel layer and must terminate at a storm drain or other approved discharge point.

Outlets. In treatment-only facilities, outlets must be set high enough to ensure the surface reservoir fills and the entire surface area of soil mix is flooded before the outlet elevation is reached. In swales, this can be achieved with appropriately placed check dams.

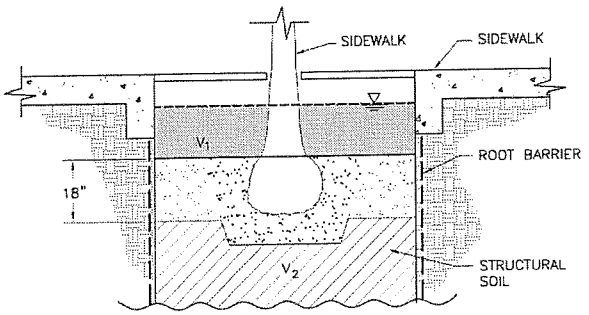
The outlet should be designed to exclude floating mulch and debris.

Vaults, utility boxes and light standards. It is best to locate utilities outside the bioretention facility—in adjacent walkways or in a separate area set aside for this purpose. If utility structures are to be placed within the facility, the locations should be anticipated and adjustments made to ensure the minimum bioretention surface area and volumes are achieved. Leaving the final locations to each individual utility can produce a haphazard, unaesthetic appearance and make the bioretention facility more difficult to maintain.

Emergency overflow. The site grading plan should anticipate extreme events and potential clogging of the overflow and route emergency overflows safely.

Trees. Bioretention areas can accommodate small or large trees. There is no need to subtract the area taken up by roots from the effective area of the facility. Extensive tree roots maintain soil permeability and help retain runoff. Normal maintenance of a bioretention facility should not affect tree lifespan.

The bioretention facility can be integrated with a tree pit of the required depth and filled with structural soil. If a root barrier is used, it can be located to allow tree roots to spread throughout the bioretention facility while protecting adjacent pavement. Locations and planting elevations should be selected to avoid blocking the facility's inlets and outlets.



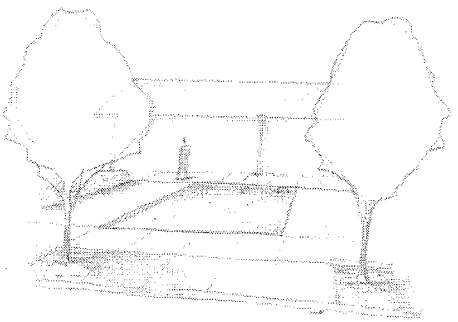
Bioretention facility configured as a tree well.
The root barrier is optional.

► APPLICATIONS

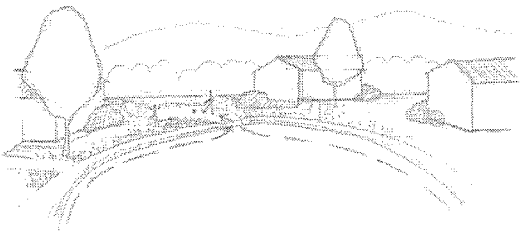
Multi-purpose landscaped areas. Bioretention facilities are easily adapted to serve multiple purposes. The loamy sand soil mix will support turf or a plant palette suitable to the location and a well-drained soil.

Example landscape treatments:

- Lawn with sloped transition to adjacent landscaping.
- Swale in setback area
- Swale in parking median
- Lawn with hardscaped edge treatment
- Decorative garden with formal or informal plantings
- Traffic island with low-maintenance landscaping
- Raised planter with seating
- Bioretention on a terraced slope



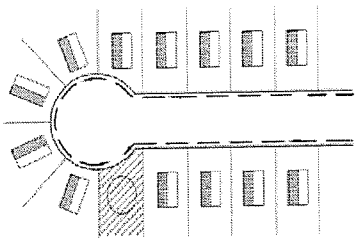
Bioretention facility configured as a recessed decorative lawn with hardscaped edge.



Bioretention facility configured and planted as a lawn/ play area.

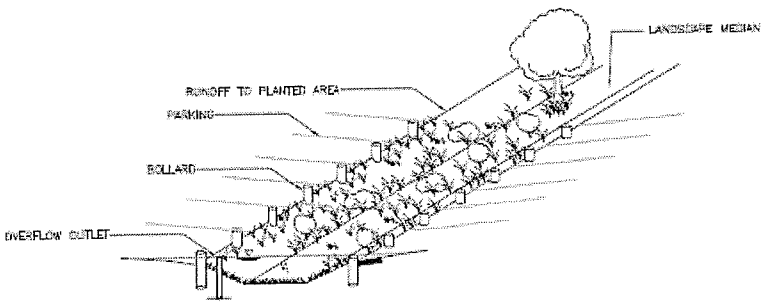
Residential subdivisions. Some subdivisions are designed to drain roofs and driveways to the streets (in the conventional manner) and then drain the streets to bioretention areas, with one bioretention area for each 1 to 6 lots, depending on subdivision layout and topography.

If allowed by the local jurisdiction, bioretention areas can be placed on a separate, dedicated parcel with joint ownership.



Bioretention facility receiving drainage from individual lots and the street in a residential subdivision.

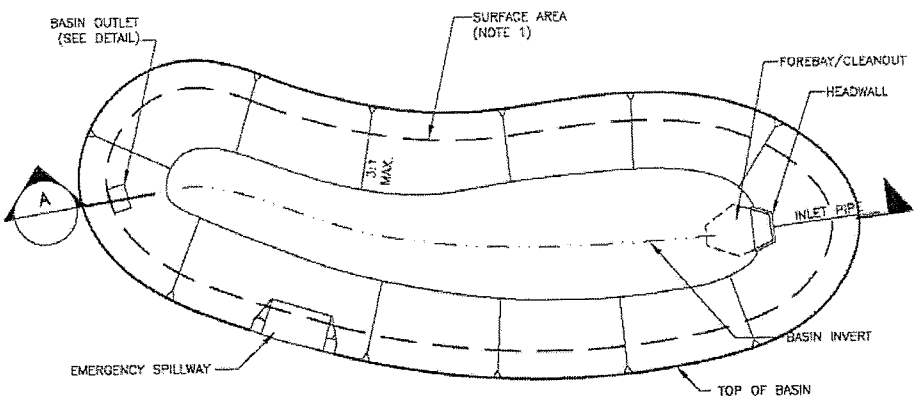
Sloped sites. Bioretention facilities must be constructed as a basin, or series of basins, with the circumference of each basin set level. It may be necessary to add curbs or low retaining walls.



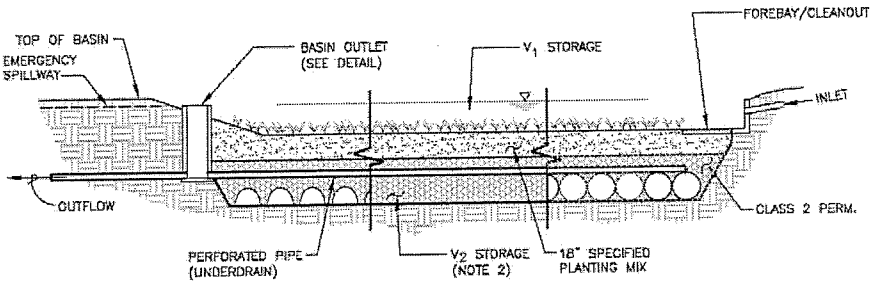
Bioretention facility configured as a parking median.
Note use of bollards in place of curbs, eliminating the need for curb cuts.

Design Checklist for Bioretention

- ☐ Volume or depth of surface reservoir meets or exceeds minimum.
- ☐ 18" depth "loamy sand" soil mix with minimum long-term percolation rate of 5"/hour.
- ☐ Area of soil mix meets or exceeds minimum.
- ☐ Perforated pipe underdrain bedded in "Class 2 perm" with connection and sufficient head to storm drain or discharge point (except in "A" or "B" soils).
- ☐ No filter fabric.
- ☐ Underdrain has a clean-out port consisting of a vertical, rigid, non-perforated PVC pipe, with a minimum diameter of 6 inches and a watertight cap.
- ☐ Location and footprint of facility are shown on site plan and landscaping plan.
- ☐ Bioretention area is designed as a basin (level edges) or a series of basins, and grading plan is consistent with these elevations. If facility is designed as a swale, check dams are set so the lip of each dam is at least as high as the toe of the next upstream dam.
- ☐ Inlets are 12" wide, have 4"-6" reveal and an apron or other provision to prevent blockage when vegetation grows in, and energy dissipation as needed.
- ☐ Overflow connected to a downstream storm drain or approved discharge point.
- ☐ Emergency spillage will be safely conveyed overland.
- ☐ Plantings are suitable to the climate and a well-drained soil.
- ☐ Irrigation system with connection to water supply.
- ☐ Vaults, utility boxes, and light standards are located outside the minimum soil mix surface area.
- ☐ When excavating, avoid smearing of the soils on bottom and side slopes. Minimize compaction of native soils and "rip" soils if clayey and/or compacted. Protect the area from construction site runoff.



PLAN VIEW
NOT TO SCALE

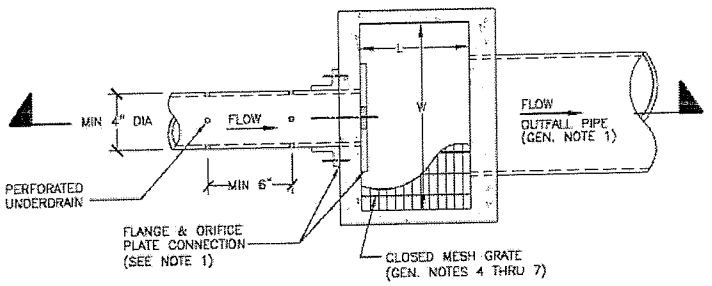


A SECTION
NOT TO SCALE

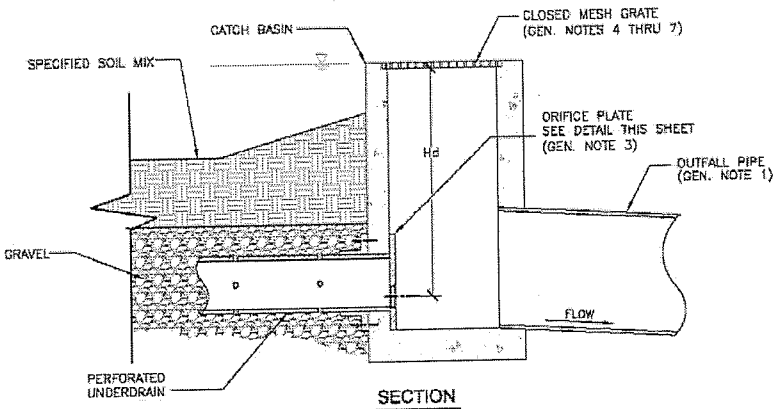
NOTE

1. SURFACE AREA LIMIT DETERMINED BY EXTENT OF SPECIFIED PLANTING MIX, WHICH IS GOVERNED BY THE OUTLET SPILL ELEVATION. FOR REQUIRED SURFACE AREA REFER TO THE FACTORS AND EQUATIONS IN THE STORMWATER C.3 GUIDEBOOK.
2. V_2 STORAGE ACCOMPLISHED WITH INFILTRATION ARCHES, PERFORATED PIPES, CLASS 2 PERM OR OTHER AT THE DESIGNERS DISCRETION.

Bioretention Facility



PLAN
N.T.S.



SECTION
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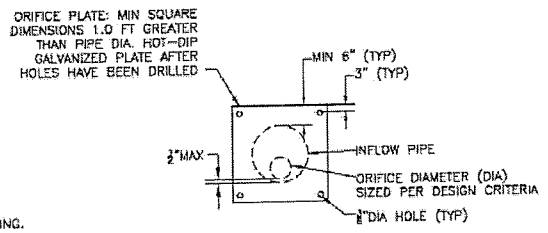


FLOW CONTROL ORIFICE PLATE

NOTE

1. ORIFICE PLATE & FLANGE CONNECTION TO CONCRETE SHALL BE FITTED WITH 30 DUROMETER NEOPRENE RING.

Bioretention Facility Outlet Detail - A

Self-Treating and Self-Retaining Areas

Best Uses

- Heavily landscaped sites

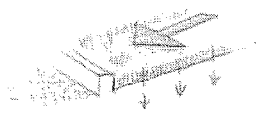
Advantages

- Complements site landscaping

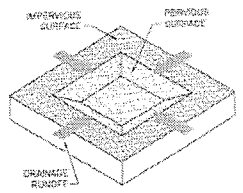
Limitations

- Requires substantial square footage
- Grading requirements must be coordinated with landscape design

▶ CRITERIA



Rainfall on self-treating areas infiltrates or—during intense storms— drains directly off-site or to the storm drain system.



Self-retaining areas are designed to retain the first one inch of rainfall without producing any runoff. During intense storms, runoff may drain off-site, to the storm drain system, or to IMPs.

LID design seeks to manage runoff from roofs and paving so effects on water quality and hydrology are minimized. Runoff from landscaping, however, does not need to be managed the same way.

Runoff from landscaping can be managed by creating self-treating and self-retaining areas.

Self-treating areas are natural, landscaped, or turf areas that drain directly off site or to the storm drain system. Examples include upslope undeveloped areas that are ditched and drained around a development and grassed slopes that drain offsite to a street or storm drain. Self-treating areas may not drain on to adjacent paved areas.

Where a landscaped area is upslope from or surrounded by paved areas, a **self-retaining area** (also called a zero-discharge area) may be created. Self-retaining areas are designed to retain the first one inch of rainfall without producing any runoff. The technique works best on flat, heavily landscaped sites. It may be used on mild slopes if there is a reasonable expectation that the first inch of rainfall would produce no runoff.

To create self-retaining turf and landscape areas in flat areas or on terraced slopes, berm the area or depress the grade into a concave cross-section so that these areas will retain the first inch of rainfall. Inlets of area drains, if any, should be set 3 inches above the low point to allow ponding.

Areas draining to self retaining areas. Drainage from roofs and paving can be directed to self-retaining areas and allowed to infiltrate into the soil. The maximum allowable ratio is 2 parts impervious: 1 part pervious for water quality treatment and a ratio of 1 part impervious: 1 part pervious for Hydromodification flow-control.

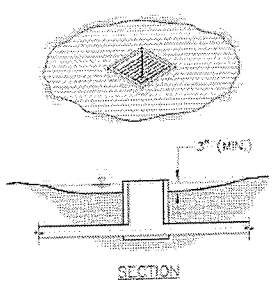
The self-retaining area must be bermed or depressed to retain an inch of rainfall including the flow from the tributary impervious area.

► DETAILS

Drainage from self-treating areas must flow to off-site streets or storm drains without flowing on to paved areas.

Pavement within a self-treating area cannot exceed 5% of the total area.

In self-retaining areas, overflows and area drain inlets should be set high enough to ensure ponding over the entire surface of the self-retaining area. The area drain inlets must have a grate elevation set so that 1" of rainfall from the entire area (both impervious and pervious areas) does not produce any runoff. If the self-retaining area itself was flat, and there was 2 parts impervious draining to the 1 part pervious (self-retaining area), then the grate elevation of the area drain would need to be 3" high. However, the total area draining to the self-retaining area and the slope of the self-retaining area will govern the height of the area drain inlet grate. The overall goal is to produce no runoff from 1" of rainfall over the entire tributary and self-retaining area itself.



Set overflows and area drain inlets high enough to ensure ponding (3" deep) over the surface of the self-retaining area.

Self–retaining areas should be designed to promote even distribution of ponded runoff over the area.

Leave enough reveal (from pavement down to landscaped surface) to accommodate buildup of turf or mulch.

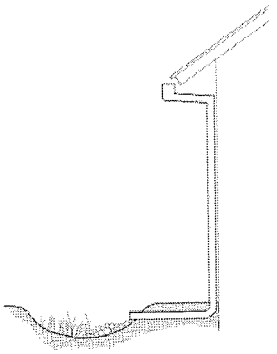
► APPLICATIONS

Lawn or landscaped areas adjacent to streets can be considered self-treating areas.

Self-retaining areas can be created by depressing lawn and landscape below surrounding sidewalks and plazas.

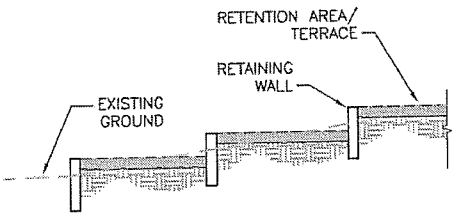
Runoff from walkways or driveways in parks and park-like areas can sheet-flow to self-retaining areas.

Roof leaders can be connected to self-retaining areas by piping beneath plazas and walkways. If necessary, a "bubble-up" can be used.



Connecting a roof leader to a self-retaining area. The head from the eave height makes it possible to route roof drainage some distance away from the building.

Self-retaining areas can be created by terracing mild slopes. The elevation difference promotes subsurface drainage.



Mild slopes can be terraced to create self-retaining areas.

► DESIGN CHECKLIST FOR SELF-TREATING AREAS

- ❒ The self-treating area is at least 95% lawn or landscaping (not more than 5% impervious).
- ❒ Re-graded or re-landscaped areas have amended soils, vegetation, and irrigation as may be required to maintain soil stability and permeability.
- ❒ Runoff from the self-treating area does not enter an IMP or another drainage management area, but goes directly to the storm drain system.

▶ DESIGN CHECKLIST FOR SELF-RETAINING AREAS

- ☐ Area is bermed all the way around or graded concave. Slopes do not exceed 4%.
- ☐ Entire area is lawn, landscaping, or pervious pavement (see criteria in Chapter 4).
- ☐ Area has amended soils, vegetation, and irrigation as may be required to maintain soil stability and permeability.
- ☐ Any area drain inlets are at least 3 inches above surrounding grade in order to retain 1" of runoff from the entire tributary area.
- ☐ Overflow in excess of 1" of rainfall must be safely conveyed towards and acceptable conveyance system.
- ☐ Infiltration rate is sufficient to ensure the self-retaining area will drain completely within 96 hours. Soil infiltration feasibility has been confirmed by a geotechnical engineer.
- ☐ Set back from structures 10' or as recommended by structural or geotechnical engineer.

▶ DESIGN CHECKLIST FOR AREAS DRAINING TO SELF-RETAINING AREAS

- ☐ Ratio of tributary impervious area to self-retaining area is not greater than 2:1 for water quality treatment and a ratio of 1:1 for hydromodification flow-control.
- ☐ Roof leaders collect runoff and route it to the self-retaining area.
- ☐ Paved areas are sloped so drainage is routed to the self-retaining area.
- ☐ Inlets are designed to protect against erosion and distribute runoff across the area.

Pervious Pavements

▶ CRITERIA

Impervious roadways, driveways, and parking lots account for much of the hydrologic impact of land development. In contrast, pervious pavements allow rainfall to collect in a gravel or sand base course and infiltrate into native soil.

Pervious pavements are designed to transmit rainfall through the surface to storage in a base course. For example, a 4-inch-deep base course provides approximately 1.6 inches of storage. Runoff stored in the base course infiltrates to native soils over time. Except in the case of solid pavers, the surface course provides additional storage.

Areas with the following pervious pavements may be regarded as "self-treating" and require no additional treatment or flow control if they drain off-site (not to an IMP).

- Pervious concrete
- Porous asphalt
- Crushed aggregate (gravel)
- Open pavers with grass or plantings
- Open pavers with gravel
- Artificial turf

Areas with these pervious pavements can also be **self-retaining areas** and may receive runoff from impervious areas if they are bermed or depressed to retain the first one inch of rainfall, including runoff from the tributary impervious area.

Solid unit pavers—such as bricks, stone blocks, or precast concrete shapes—are considered to reduce runoff compared to impervious pavement, when the unit pavers are set in sand or gravel with d" gaps between the pavers. Joints must be filled with an open-graded aggregate free of fines.

Best Uses

- Areas with permeable native soils
- Low-traffic areas
- Where aesthetic quality can justify higher cost

Advantages

- Variety of surface treatments can complement landscape design

Limitations

- Initial cost
- Placement requires specially trained crews
- Geotechnical concerns, especially in clay soils
- Concerns about pavement strength and surface integrity
- Some municipalities do not allow in public right of way

When draining pervious pavements to an IMP, use the runoff factors in Table 4-2.

▶ DETAILS

Permeable pavements can be used in clay soils; however, special design considerations, including an increased depth of base course, typically apply and will increase the cost of this option. Geotechnical fabric between the base course and underlying clay soil is recommended.

Pavement strength and durability typically determines the required depth of base course. If underdrains are used, the outlet elevation must be a minimum of 3 inches above the bottom elevation of the base course.

Pervious concrete and porous asphalt must be installed by crews with special training and tools. Industry associations maintain lists of qualified contractors.

Parking lots with crushed aggregate or unit pavers may require signs or bollards to organize parking.

▶ DESIGN CHECKLIST FOR PERVIOUS PAVEMENTS

- ❒ No erodible areas drain on to pavement.
- ❒ Subgrade is uniform. Compaction is minimal.
- ❒ Reservoir base course is of open-graded crushed stone. Base depth is adequate to retain rainfall and support design loads.
- ❒ If a subdrain is provided, outlet elevation is a minimum of 3 inches above bottom of base course.
- ❒ Subgrade is uniform and slopes are not so steep that subgrade is prone to erosion.
- ❒ Rigid edge is provided to retain granular pavements and unit pavers.
- ❒ Solid unit pavers are installed with open gaps filled with open-graded aggregate free of fines.
- ❒ Permeable pavements are installed by industry-certified professionals according to vendor's recommendations.
- ❒ Selection and location of pavements incorporates Americans with Disabilities Act requirements, site aesthetics, and uses.

Resources

- Southern California Concrete Producers www.concreteresources.net.
- California Asphalt Pavement Association http://www.californiapavements.org/stormwater.html
- Interlocking Concrete Pavement Institute http://www.icpi.org/
- *Start at the Source Design Manual for Water Quality Protection*, pp. 47-53. www.basmaa.org
- *Porous Pavements*, by Bruce K. Ferguson. 2005. ISBN 0-8493-2670-2.

ATTACHMENT F

Maintenance Plan

A Maintenance Plan will be prepared following the County's review of the initial SWMP submittal and will follow the outline below.

I. Inspection, Maintenance Log and Self-Verification Forms (Examples are attached for the anticipated BMPs)

II. Updates, Revisions and Errata

III. Introduction
   A. Overview describing the site; drainage areas, routing, and discharge points; and treatment facilities.

IV. Responsibility for Maintenance
   A. General
      1) Name and contact information for responsible individual(s).
      2) Organization chart or charts showing organization of the maintenance function and location within the overall organization.
      3) Insert a copy of the recorded maintenance agreement.
      4) Maintenance Funding
         a) Sources of funds for maintenance
         b) Budget category or line item
         c) Description of procedure and process for ensuring adequate funding for maintenance
   B. Staff Training Program
   C. Records
   D. Safety

V. Summary of Drainage Areas and Stormwater Facilities
   A. Drainage Areas
      1) Drawings showing pervious and impervious areas (from approved SWMP).
      2) Designation and description of each drainage area and how flow is routed to the corresponding facility.
   B. Treatment and Flow-Control Facilities
      1) Drawings showing location and type of each facility
      2) General description of each facility (Consider a table if more than two facilities)

         a) Area drained and routing of discharge.

         b) Facility type and size

VI. Facility Documentation

   A. "As-built" drawings of each facility (design drawings in the draft Plan)
   B. Manufacturer's data, manuals, and maintenance requirements for pumps, mechanical or electrical equipment, and proprietary facilities (include a "placeholder" in the draft plan for information not yet available).
   C. Specific operation and maintenance concerns and troubleshooting

VII. Maintenance Schedule or Matrix

A. Maintenance Schedule for each facility with specific requirements for:

1) Routine inspection and maintenance
2) Annual inspection and maintenance
3) Inspection and maintenance after major storms

B. Service Agreement Information

PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM

BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS

1. Transcribe the following information from your notification letter and make corrections as necessary:

Permit No.: _____

BMP Location: _____

Responsible Party: _____

Phone Number: ( ) _____ **Email:** _____

Responsible Party Address: _____
Number Street Name & Suffix City/Zip

☐ *Check here for Address or phone number change*

2. Using the Table below, please describe the inspections and maintenance activities that have been conducted during the fiscal year (July 1 – June 30), and date(s) maintenance was performed. Under "Results of Inspection," indicate whether maintenance was required based on each inspection, and if so, what type of maintenance. If maintenance was required, provide the date maintenance was conducted and a description of the maintenance. ***REFER TO THE BACK OF THIS SHEET FOR MORE INFORMATION DESCRIBING TYPICAL MAINTENANCE INDICATORS AND MAINTENANCE ACTIVITIES.*** *If no maintenance was required based on the inspection results, state "no maintenance required."*

What To Look For?	Date Inspected	Results of Inspection: Work needed? (Yes/No)	Date Maintenance Completed and Description of Maintenance Conducted
Accumulation of Sediment, Litter, Grease			
Standing Water Erosion Overgrown Vegetation			
Poor Vegetation Establishment			
Structural Damage			

3. Attach copies of available supporting documents (photographs, copies of maintenance contracts, and/or maintenance records).

4. Sign the bottom of the form and return to:

County of San Diego Watershed Protection Program
Treatment Control BMP Tracking
5201 Ruffin Road, Suite P, MS 0326
San Diego, CA 92123 ***OR***
Email: Watersheds@sdcounty.ca.gov

_____

Signature of Responsible Party Print Name Date

PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM

BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS-SIDE 2

This guide sheet provides general indicators for maintenance only and for a wide array of treatment control BMPs. Your developer prepared maintenance plans specifically for your treatment control BMP as an appendix to the Stormwater Management Plan. Also, if you have a manufactured structure, please refer to the manufacturer's maintenance instructions.

Biofilters include the following :
☐ **Vegetated Filter Strip/Swale** ☐ **Bioswale** ☐ **Bioretention Facility** ☐ **Planter Boxes**
☐ **Manufactered Higher-Flow-Rate Biofilters, such as Tree-Pit-Style Units.**
Routine maintenance is needed to ensure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active. Typical maintenance consists of the following:

Bioretention BMPs Inspection and Maintenance Checklist	
Typical Maintenance Indicators	**Typical Maintenance Actions**
Accumulation of sediment (over 2 inches deep or covers vegetation), litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation. Confirm that soil is not clogging and that the area drains after a storm event. Till or replace soil as necessary.
Poor vegetation establishment	Ensure vegetation is healthy and dense enough to provide filtering and to protect soils from erosion. Replenish mulch as necessary (if less than 3 inches deep), remove fallen leaves and debris, prune large shrubs or trees, and mow turf areas.
Overgrown vegetation—woody vegetation not part of design is present and grass excessively tall (greater than 10 inches)	Mow or trim as appropriate, but not less than the design height of the vegetation (typically 4-6 inches for grass). Confirm that irrigation is adequate and not excessive and that sprays do not directly enter overflow grates. Replace dead plants and remove noxious and invasive weeds.
Erosion due to concentrated irrigation flow	Repair/re-seed eroded areas and adjust the irrigation.
Erosion due to concentrated stormwater runoff flow	Repair/re-seed eroded areas and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or re-grading where necessary.Remove obstructions and sediment accumulations so water disperses.
Standing water (BMP not draining) . If mosquito larvae are present and persistent, contact the San Diego County Vector Control Program at (858) 694-2888. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.	Where there is an underdrain, such as in planter boxes and manufactured biofilters, check the underdrain piping to make sure it is intact and unobstructed. Abate any potential vectors by filling holes in the ground in and around the biofilter facility and by insuring that there are no areas where water stands longer than 96 hours following a storm .
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet, or outlet structures	Repair or replace as applicable.
Before the wet season and after rain events: remove sediment and debris from screens and overflow drains and downspouts; ensure pumps are functioning, where applicable; check integrity of mosquito screens; and; check that covers are properly seated and locked.	Where cisterns are part of the system
For manufactured high-flow-rate biofilters, see manufacturer's maintenance guidelines	

PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM
HYDRODYNAMIC SEPARATOR SYSTEMS

1. Transcribe the following information from your notification letter and make corrections as necessary:

Permit No.: _____

BMP Location: _____

Responsible Party: _____

Phone Number: ( ) _____ **Email:** _____

Responsible Party Address: _____
Number Street Name & Suffix City/Zip

☐ *Check here for Address Change*

2. Using the Table below, please describe the inspections and maintenance activities that have been conducted during the fiscal year (July 1 – June 30), and date(s) maintenance was performed. Under "Results of Inspection," indicate whether maintenance was required based on each inspection, and if so, what type of maintenance. If maintenance was required, provide the date maintenance was conducted and a description of the maintenance. ***REFER TO THE BACK OF THIS SHEET FOR MORE INFORMATION DESCRIBING TYPICAL MAINTENANCE INDICATORS AND MAINTENANCE ACTIVITIES.*** *If no maintenance was required based on the inspection results, state "no maintenance required."*

What To Look For?	Date Inspected	Results of Inspection: Work needed? (Yes/No)	Date Maintenance Completed and Description of Maintenance Conducted
Excessive Accumulation of Sediment, Litter, Grease Clogged Filter Media Structural Damage			

3. Attach copies of available supporting documents (photographs, copies of maintenance contracts, and/or maintenance records).

4. Sign the bottom of the form and return to:

County of San Diego Watershed Protection Program
Treatment Control BMP Tracking
5201 Ruffin Road, Suite P, MS 0326
San Diego, CA 92123 ***OR***
*Email:*Watersheds@sdcounty.ca.gov

_____

Signature of Responsible Party **Print Name** **Date**

PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM

HYDRODYNAMIC SEPARATORS – SIDE 2

The following list of typical maintenance indicators and maintenance activities for hydrodynamic separators is provided for your reference. **These are general indicators for maintenance only. These types of treatment control BMPs are proprietary so the best guidance is the manufacturer's instructions. Please refer to the manufacturer's maintenance instructions. If you have not been supplied the manufacturer's instructions by the developer or previous owner, these can frequently be found on in the internet or by contacting the manufacturer. The specific make and model of treatment control BMP can be found on the structure.**

Hydrodynamic Separator BMPs Inspection and Maintenance Checklist	
Typical Maintenance Indicators	**Typical Maintenance Actions**
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials generally by vactor truck.
Accumulation of floating oil and grease	Remove and properly dispose of oil and grease.
Spent or clogged sorbent material or media pack	Remove and properly dispose of sorbent material or media pack, and replace with fresh material. These materials/media are potentially hazardous and must be handled by a properly trained contractor.
Damage to components of the hydrodynamic separator	Repair or replace as applicable.
For offline systems – There is no accumulation of sediment, oil or grease in collection chambers after significant rainfall.or there are damaged or obstructed flow diversion components.	Inspect flow diversion devices for damage and obstructions. Remove obstructions. Repair damage.

Maintenance of hydrodynamic separators involves handling of potentially hazardous material (oil and/or oil sorbent material), which requires special disposal. Additionally, maintenance may involve entry into the hydrodynamic separator underground. Therefore the maintenance operator must be trained in handling and disposal of hazardous waste, and must also be certified for confined space entry if the maintenance will require entry into the hydrodynamic separator. Therefore it is recommended that private BMP owners obtain a maintenance contract with a qualified contractor to provide inspection and maintenance. There are several storm drain cleaning service providers who are able to inspect and/or maintain hydrodynamic separators. Contact the manufacturer of the hydrodynamic separator to find qualified service providers.