Major Stormwater Management Plan
(Major SWMP)
For
LONE OAK RANCH

Preparation/Revision Date:
February 2, 2015

Prepared for:

Marker Development Company
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Prepared by:

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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.

Alisa S. Vialpando, RCE# 47945

2/2/15
Date

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	Lone Oak Ranch
Project Location/ Address:	Lone Oak Road at Buena Creek Road, San Diego County, CA 92084
Permit Number (Land Development Projects):	
Work Authorization Number (**CIP only**):	
Applicant:	Marker Development Company
Applicant's Address:	427 South Cedros Ave, Suite 201 Solana Beach, CA 92075
Plan Prepared By *(Leave blank if same as applicant)*:	Hunsaker & Associates San Diego, Inc.
Preparer's Address:	9707 Waples Street San Diego, CA 92121
Date:	October 8, 2014

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9926) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date	County Reviewer
	YES	NO		
Rough Grading	X			

Instructions for a Major SWMP can be downloaded at
http://www. sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

STEP 1

PRIORITY DEVELOPMENT PROJECT DETERMINATION

TABLE 1: IS THE PROJECT IN ANY OF THESE 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.

To use the table, review each definition A through K. If any of the definitions match, the project is a Priority Development Project. Note some thresholds are defined by square footage of impervious area created; others by the total area of the development. Please see special requirements for previously developed sites and project exemptions on page 6 of the County SUSMP.

STEP 2
PROJECT STORMWATER QUALITY DETERMINATION

Total Project Site Area 14.15 (Acres or ft^2)

Estimated amount of disturbed area: 8.36 (Acres or ft^2)
(If>1 acre, you must also provide a WDID number from the SWRCB) WDID: TBD

Complete A through C and the calculations below to determine the amount of impervious surface on your project before and after construction.

A. Total size of project site: 8.36 (Acres or ft^2)

B. Total impervious area (including roof tops) before construction 0.27 (Acres or ft^2)

C. Total impervious area (including roof tops) after construction 1.64 (Acres or ft^2)

Calculate percent impervious before construction: B/A = 3.23 %
Calculate percent impervious after construction: C/A = 19.62 %

Please provide detailed descriptions regarding the following questions:

TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS

1.	Please provide a brief description of the project.

The project site currently consists of two (2) individual legal parcels. The northerly parcel (APN 181-162-06) is currently vacant. This parcel abuts Buena Creek Road and is bordered by an RPO Wetland and Oak Woodland which extends from Lone Oak Road to the Cleveland Trail. The southerly parcel (APN 184-080-01) forms the southerly half of the project site and currently has two structures on it. One structure is a single family residence and the other structure is a large storage building. Both structures will be removed as part of this project.

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

The property is located within the Village Residential plan designation with a density of 2 dwelling units per acre. The northerly parcel is currently zoned A70 (Limited Agriculture) and the southerly parcel is zoned RR (Rural Residential).
This project proposes a Vesting Tentative Map and Major Use Permit (PRD Site Plan) with the development of a total 26 residential lots (approx. average lot size of 10,500 sf). The project is further divided into one private drive lot, one Cleveland Trail lot, two water quality/detention basin lots, one HOA open space lot and one HOA open space wetland/woodland lot. The open space wetland/woodland lot includes an undisturbed 50' Oak Root buffer which will include a non-intrusive walking trail for the residents of the project. Residential structures will be required to be setback an additional 50' from this Oak Root buffer. All grading for the project will occur outside the existing 100 year floodway.

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

The existing northern portion of the site slopes to the west towards Buena Creek with an average grade of approximately 5.2%. After entering Buena Creek, runoff is directed towards the southwest along the east side of Buena Creek Road. An existing 72" storm drain concrete culvert conveys the channel flows underneath Lone Oak Road before continuing downstream.
The southern half of the site drains towards the west to existing Lone Oak Road where it continues in a southwesterly direction then confluences with flows from a tributary of Buena Creek. Runoff from the southern half reaches Buena Creek approximately 0.23 miles west of Lone Oak Road. An existing natural drainage channel conveys offsite runoff along the sites southern boundary. The offsite upstream area includes approximately 40 acres of undeveloped hilly land and a few residential homes.

Onsite runoff will drain along the street gutter towards the proposed inlets located at the proposed entrance to the site. This runoff will then be directed towards the proposed basin. This basin will serve three purposes: water quality, hydromodification, and peak flow attenuation. Please refer to the Tentative Map Drainage Study for Lone Oak Ranch (October 2014) for hydrologic calculations as well as preliminary inlet and basin calculations. This onsite runoff will tie in to the existing 72" culvert at the intersection of Lone Oak Road and Buena Creek Road. This onsite analysis of the site will require that flows towards the 72" culvert address HMP requirements.

Approximately 38 acres of upstream offsite runoff will be directed around the site along the

southern boundary and into the existing natural drainage channel that eventually crosses Lone Oak Road. This offsite area will not increase the amount of imperviousness and will not increase the unmitigated peak flow compared to the existing condition at the downstream project boundary and therefore is exempt from addressing hydromodification per the City's SUSMP HMP requirements.	
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.
Per the NRCS Web Soil Survey website, the site consists of Huerhuero loam with a soil Type D classification. Type D soils are classified as having very slow infiltration rates when thoroughly wet and slow rate of water transmission. Per the NRCS Web Survey website, the site has an erodibility rating of 0.43. Groundwater was not encountered in the geotechnical engineer's exploratory excavation. No Infiltration BMPs are proposed for this site.	
5.	Describe if contaminated or hazardous soils are within the project area. (Show on Plan)
No contaminants have been detected on the site.	
6.	Describe the existing site drainage and natural hydrologic features. (Show on Plan)
See Item #3 above within Table 2.	
7.	Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.
Site constraints for the site include impermeable soils, perimeter conditions, right-of-way restrictions, and existing easements. Site features which will provide opportunities include adequate hydraulic head and an adequate downstream drainage infrastructure after peak flow detention.	
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

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

TABLE 3: PROJECT SPECIFIC STORMWATER 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

Please check the construction BMPs that may be implemented during construction of the project. 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

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices during the construction phase.

TABLE 4: 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/2010/state_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 k_f 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.

Exemption potentially available for projects that require advanced treatment: Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that demonstrates (to the County official's satisfaction) that advanced treatment is not required

STEP 3

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management plan (HMP) issues. If the project is exempt from the HMP criteria, please provide the supporting documentation is Attachment H. please reference the full descriptions of the HMP exemptions located in Figure 1-1 of the County SUSMP.

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 Q_{10} 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.

STEP 4

POLLUTANTS OF CONCERN DETERMINATION

WATERSHED

Please check the watershed(s) for the project.

☐ 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*	

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml
*Projects located fully within these watersheds require only a Minor SWMP.

HYDROLOGIC SUB-AREA NAME AND NUMBER(S)

Basin Number	Sub-Area Name
904.32	Buena

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

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]. List the impairments identified in **Table 7.**	Distance to Project
Agua Hedionda Creek	904.3	Manganese, selenium, sulfates, TDS	2.5 miles

http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/ 303dlists2006/epa/r9_06_ 303d reqtmdls.pdf

GROUND WATERS

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

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml
+ Excepted from Municipal • Existing Beneficial Use ◦Potential Beneficial Use

PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS

Using Table 6, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

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

	General Pollutant categories								
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 SUMMARY TABLE

Please summarize the identified project pollutants of concern by checking the appropriate boxes in the table below and list any surface water impairments identified. Pollutants 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 (determined by your receiving waters impairments on page 10)
Sediments	**X**		Sediment
Nutrients	**X**	**P**	
Heavy Metals	**X**		
Organic Compounds	**X**		
Trash & Debris	**X**		
Oxygen Demanding Substances	**X**	**P**	
Oil & Grease	**X**	**X**	
Bacteria & Viruses	**X**		Bacteria
Pesticides	**X**		

STEP 5

LID AND SITE DESIGN STRATEGIES

Each numbered item below is a Low Impact Development (LID) requirement of the WPO. Please check the box(s) under each number that best describes the LID BMP(s) and Site Design Strategies selected for this project. LID BMPs selected on this table will be typically represented as a self-retaining area, self-treating area, pervious pavement and greenroof, which, should be delineated in the Drainage Management Area map in Attachment C.

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
LID Street & Road Design
☐ Curb-cuts to landscaping
☐ Rural Swales
☐ Concave Median
☐ Cul-de-sac Landscaping Design
☐ Other. Description:

LID Parking Lot Design
☐ Permeable Pavements
☐ Curb-cuts to landscaping
☐ Other. Description:
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:

STEP 6

SOURCE CONTROL

Please complete the checklist on the following pages to determine Source Control BMPs. Below is instruction on how to use the checklist. (Also see instructions on page 60 of the *SUSMP)*

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies and list in Table 9.

2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your Source Control Exhibit in Attachment B.

3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs into Table 9.

4. Use the format in Table 9 below to summarize the project Source Control BMPs. Incorporate all identified Source Control BMPs in your Source Control 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 at www.cabmphandbooks.com
Landscape/Outdoor Pesticide Use	-Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. -Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. -Where landscaped areas are used to retain or detain stormwater, specify plants	

	that are tolerant of saturated soil conditions.	
Roofing, gutters, and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Plazas, sidewalks and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris.

Describe your specific Source Control BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting Source Control BMPs or substituting alternatives.

Source Control BMPs proposed for this site include marking inlets and educating new owners on stormwater pollution prevention, Preservation of existing native planting wherever possible, avoiding construction which includes unprotected metals that could leach into runoff, and general maintenance and cleanup of sidewalks and streets.

IF THESE SOURCES WILL BE ON THE PROJECT SITE…	…THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls – Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls – List in Table 9 and Narrative**	**4** **Operational BMPs – Include in Table 9 and Narrative**
☒ **A.** On-site storm drain inlets	☒ Location of 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 at www.cabmphandbooks.com ☐ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☐ **B**. Interior floor drains and elevator shaft sump pumps		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ **C.** Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

IF THESE SOURCES WILL BE ON THE PROJECT SITE…	…THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls – Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls – List in Table 9 and Narrative**	**4** **Operational BMPs – Include in Table 9 and Narrative**
☐ **D1.** Need for future indoor & structural pest control		☐ Note building design features that discourage entry of pests.	☐ Provide Integrated Pest Management information to owners, lessees, and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE…	…THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls – Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls – List in Table 9 and Narrative**	**4** **Operational BMPs – Include in Table 9 and Narrative**
☒ **D2.** Landscape/ Outdoor Pesticide Use Note: Should be consistent with project landscape plan (if applicable).	☐ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ☐ Show self-retaining landscape areas, if any. ☒ Show stormwater treatment facilities	State that final landscape plans will accomplish all of the following: ☒ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ☒ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ☒ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ☐ Consider using pest-resistant plants, especially adjacent to hardscape. ☐ To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	☒ Maintain landscaping using minimum or no pesticides. ☐ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com. ☒ Provide IPM information to new owners, lessees and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE…	…THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls – Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls – List in Table 9 and Narrative**	**4** **Operational BMPs – Include in Table 9 and Narrative**
☐ **E.** Pools, spas, ponds decorative fountains, and other water features.	☐ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	☐ If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☐ See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
☐ **F**. Food service	☐ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☐ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☐ Describe the location and features of the designated cleaning area. ☐ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	☐

IF THESE SOURCES WILL BE ON THE PROJECT SITE…	…THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls – Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls – List in Table 9 and Narrative**	**4** **Operational BMPs – Include in Table 9 and Narrative**
☐ **G.** Refuse areas	☐ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☐ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ☐ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☐ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☐ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☐ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on- site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
☐ **H**. Industrial processes.	☐ Show process area.	☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE…	…THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCES CONTROL BMPs		
1 **Potential Sources of Runoff Pollutants – List in Table 9**	**2** **Permanent Controls – Show on Source Control Exhibit, Attachment B**	**3** **Permanent Controls – List in Table 9 and Narrative**	**4** **Operational BMPs – Include in Table 9 and Narrative**
☐ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ☐ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ☐ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	☐ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 Underground Storage Tank	☐ See Fact Sheet SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

☐ **J.** Vehicle and Equipment Cleaning	☐ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shutoff to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	☐ If a car wash area is not provided, describe measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ☐ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. ☐ Car dealerships and similar may rinse cars with water only. ☐ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

☐ **K.** Vehicle/Equipment Repair and Maintenance	☐ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ☐ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ☐ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	☐ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ☐ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ☐ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the SUSMP report, note that all of the following restrictions apply to use the site: ☐ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ☐ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ☐ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

☐ **L.** Fuel Dispensing Area	☐ Fueling areas[1] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable ☐ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		☐ The property owner shall sweep the fueling area routinely. ☐ See the Business Guide Sheet, "Automotive Service - Service, Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.

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

☐ **M.** Loading Docks	☐ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. ☐ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ☐ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		☐ Move loaded and unloaded items indoors as soon as possible ☐ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
☐ **N**. Fire Sprinkler Test Water		☐ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☒ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

☒ **O.** Miscellaneous Drain or Wash Water ☐ Boiler drain lines ☐ Condensate drain lines ☐ Rooftop equipment ☐ Drainage sumps ☒ Roofing, gutters, and trim		☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☐ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm dram system. ☐ Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ☐ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
☒ **P**. Plazas, sidewalks and parking lots.			☐ Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

STEP 7

LID AND TREATMENT CONTROL SELECTION

A treatment control BMP and/or LID IMP facility must be selected to treat the project pollutants of concern identified in Table 7 "Project Pollutants of Concern". A treatment control facility with a high or medium pollutant removal efficiency for the project's most significant pollutant of concern shall be selected. It is recommended to use the design procedure in Chapter 4 of the SUSMP to meet NPDES permit LID requirements, treatment requirements, and flow control requirements. If your project does not utilize this approach, the project will need to demonstrate compliance with LID, treatment and hydromodification flow control requirements. Review Chapter 2 "Selection of Stormwater Treatment Facilities" in the SUSMP to assist in determining the appropriate treatment facility for your project.

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 SUSMP)*	
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.

This project does not propose infiltration bioretention or the similar BMPs listed in Chapter 4 of the Countywide SUSMP that use the unified LID design procedure but instead proposes to use bioretention areas as treatment control BMPs.

The bioretention areas were sized to treat the runoff volume from an 85th percentile event. The BMP surface area, which is the bottom area of the bioretention area, was sized to ensure that the entire water quality runoff would filter through the amended soil layer. Darcy's Law equation was used to determine the flowrate through the bioretention medium. The volume filtered through the BMP area can then be subtracted from the total water quality volume to determine a ponded depth in the bioretention area.

According to Table F-4 of the County of San Diego Treatment BMP Design Guidelines, the existing project soil most likely has a hydraulic conductivity of less than 0.05 in/hr. Since this value is very low, the proposed bioretention area will use engineered soil with an infiltration rate of 5.0 in/hr, Calculations for the bioretention area is included in Attachment D.

TABLE F-4: TYPICAL INFILTRATION RATES FOR NRCS TYPE AND HSG CLASSIFICATIONS

NRCS Soil Type	HSG Classification	Infiltration Rate	
		cm/hr	(in/hr)
Sand	A	2.0	(8.0)
Loamy sand	A	5.1	(2.0)
Sandy loam	B	2.5	(1.0)
Loam	B	1.3*	(0.5)*
Silt loam	C	0.6	(0.25)
Sandy clay loam	C	0.4	(0.15)
Clay loam & silty clay loam	D	<0.2	(<0.09)
Clays	D	<0.1	(<0.05)

* Minimum rate for infiltration basins. Silt loams may also be acceptable (HSG C) if geotechnical investigations demonstrate adequate infiltration rates.

► Indicate the project pollutants of concern (POCs) from Table 7 in Column 2 below.

TABLE 10: GROUPING OF POTENTIAL POLLUTANTS of Concern (POCs) by fate during stormwater treatment

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

► Indicate the treatment facility(s) chosen for this project in the following table.

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
Course 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

► Please check the box(s) that best describes the Treatment Control BMP(s) and / or LID IMP selected for this project. Please check if the treatment facility is designed for water quality or hydromodification flow control. Check both boxes if the facility is designed for both water quality and hydromodification flow control.

TABLE 12: PROJECT TCBMPS – BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCMPBs.

TCMBP Type	Water Quality Treatment	Hydromodification Flow Control
Bioretention Facilities (LID)		
☐ Bioretention area		
☐ Flow-through Planter		
☒ Cistern with Bioretention Facility	✓	✓
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		

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_____		
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 designated per SUSMP "Vegetated Swales" design criteria for water quality treatment credit (p. 102-103).

For design guidelines and calculations refer to Chapter 4 "Low Impact Development Design Guide" in the SUSMP. Please show all calculations and design sheets for all treatment control BMPs proposed in Attachment D.

► Create a Construction Plan SWMP Checklist for your project.

Instructions on how to fill out table

1. Number and list each measure or BMP you have specified in your SWMP in Columns 1 and Maintenance Category in Column 3 of the table. Leave Column 2 blank.

2. When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 2, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. **This table must be shown on the front sheet of the grading and improvement plans.**

Treatment Control BMPs[1]			
Description / Type	Sheet	Maintenance Category	Revisions
1. Cistern w/ Bioretention Basin		Category 2	
[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 xx/xx/xx on file with DPW. Any changes to the above BMP's will require SWMP revision and Plan Change approvals.

► Please describe why the chosen treatment control BMP(s) was selected for this project. For project utilizing a low performing BMP, please provide a **feasibility analysis** that demonstrates utilization of a treatment control BMP with a high or medium removal efficiency ranking is infeasible.

The BMP which is proposed for this site was chosen for its effectiveness at removing the Pollutants of Concern. In addition, utilizing a regional approach with a single basin could combine it use for water quality, hydromodifcation flow control, and peak flow attenuation.

Please provide the sizing design calculations for each Drainage Management Area in Attachment D. Guidelines for design calculations are located in Chapter 4 of the County SUSMP. To assist in these calculations a BMP sizing calculator is available for use at the following location: http://www.projectcleanwater.org/html/wg_susmp.html.

STEP 8

OPERATION AND MAINTENANCE

► Please check the box that best describes the maintenance mechanism(s) for this project. The 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]		✓	Cistern with Bioretention Facility.
Second[2]	✓		
Third[3]		✓	
Fourth[4]		✓	

Note:

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. The developer would be required to dedicate the BMP (and the property on which it is located and any necessary access) to the County.

► Please list all individual LID and Treatment Control BMPs (TCBMPs) incorporated into the project. Please attach the record plan sheets upon completion of project and amend the Major SWMP where appropriate. For each type of LID or TCBMP provide an inspection sheet in Attachment F "Maintenance Plan". Replicate Table 14 in Attachment G once the TCBMP has been constructed.

TABLE 14: PROJECT SPECIFIC LID AND TCBMPS

Treatment Control BMPs (TCBMPs) [1,2] (List all from SWMP)		
Lot Number or Location	**Description/Type**	**Sheet**
Located at Entrance to Lone Oak Ranch off Lone Oak Road	Cistern with Bioretention Facility	

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

*For location of BMPs, see approved Record Plan dated XX/XX/XX, plan (TYPE) sheet (#).

►Responsible Party for the Construction Phase:

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

Developer's Name: Marker Development Company

Address: 427 South Cedros Avenue, Suite 201

City: Solana Beach State : CA Zip: 92075

Email Address: marc@markercompany.com

Phone Number: (858) 755-3350

Engineer of Work: Alisa S. Vialpando

Engineer's Phone Number: (858) 558- 4500

►Responsible Party for Ongoing Maintenance

Identify 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: Marker Development Company

Address: 427 South Cedros Avenue, Suite 201

City: Solana Beach State: CA Zip: 92075

Email Address: marc@markercompany.com

Phone Number: (858) 755-3350

* 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.

No funding will be required to the County of San Diego. The proposed BMPs will be maintained by the owner until a Homeowners Association for Lone Oak Ranch can be established.

ATTACHMENTS

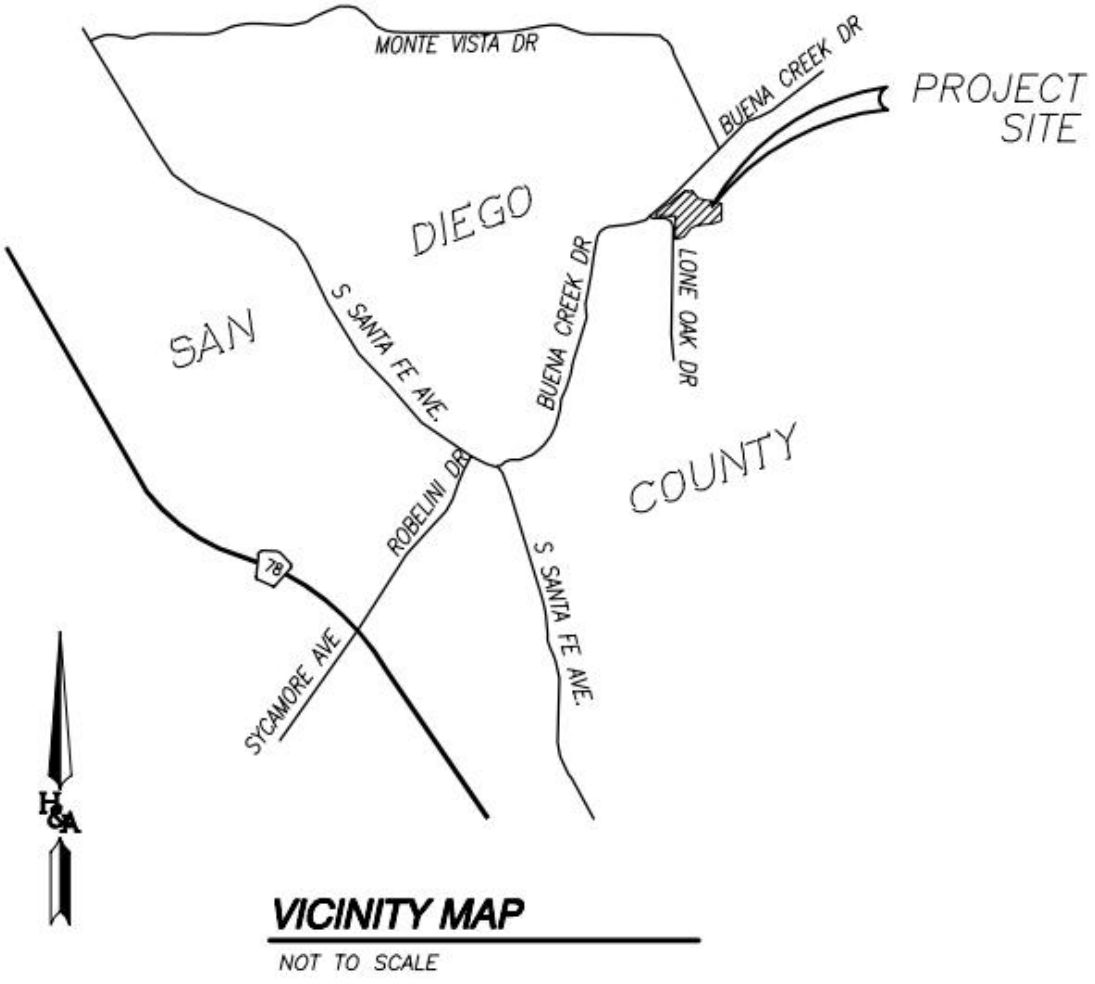
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	☒	☐
B	Source Control Exhibit	☒	☐
C	Drainage Management Area (DMA)Exhibit	☒	☐
D	BMP Sizing Design Calculations (Water Quality and Hydromodification) and TCBMP/IMP Design Details	☒	☐
E	Geotechnical Certification Sheet	☐	☒
F	Maintenance Plan	☒	☐
G	Treatment Control BMP Certification (due at project completion)	☐	☐
H	HMP Study	☒	☐
I	Geomorphic Assessment	☐	☒
J	HMP Exemption Documentation	☐	☒
K	Addendum	☐	☐

Note: Attachments B and C may be combined.

ATTACHMENT A

Project Location Map



ATTACHMENT B

Source Control Exhibit

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 at www.cabmphandbooks.com
Landscape/Outdoor Pesticide Use	-Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. -Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. -Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.	Maintain landscaping using minimum or no pesticides.
Roofing, gutters, and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Plazas, sidewalks and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris.

ATTACHMENT C

Drainage Management Area (DMA) Exhibit

BUENA CREEK

FLOODWAY

180 YEAR FLOOD ZONE (FLOOD ZONE AE)

FLOODWAY

DAM INUNDATION LINE

DAM INUNDATION LINE

SANGIS DAM INUNDATION LINE

24" PUBLIC UTILITY EASEMENT

EXISTING CLEVELAND TRAIL

PVT. DR. "A"

PVT. DR. "B"

PVT. DR. "A"

LONE OAK ROAD

EXISTING LONE OAK ROAD

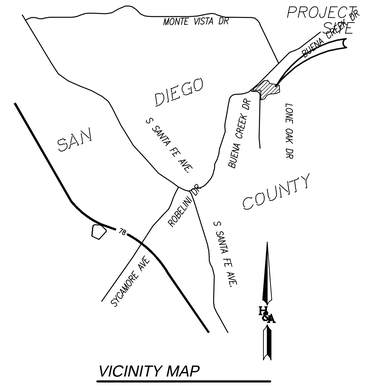
DUAL PURPOSE WATER QUALITY & DETENTION BASIN (PRIVATELY OWNED & MAINTAINED)
TOP OF BASIN ELEVATION: 529.0 MIN.
WATER SURFACE ELEVATION: 528.0
BOTTOM OF BASIN: 523.8
VOLUME 0.95 AC. FT.@ ELEV. 528.0

PROPOSED BROW DITCH

PUBLIC SEWER MAIN (TYP.)

EXISTING NATURAL DRAINAGE CHANNEL

EXIST. WATER ESMT. TO BE ABANDONED



VICINITY MAP

NOT TO SCALE

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 at www.cabmphandbooks.com
Landscape/Outdoor Pesticide Use	-Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. -Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. -Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.	Maintain landscaping using minimum or no pesticides.
Roofing, gutters, and trim	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Plazas, sidewalks and parking lots.		Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris.

LEGEND

PROJECT BOUNDARY

DMA BOUNDARY

FLOW DIRECTION

SUBAREA ACREAGE X ACRES

ROOF

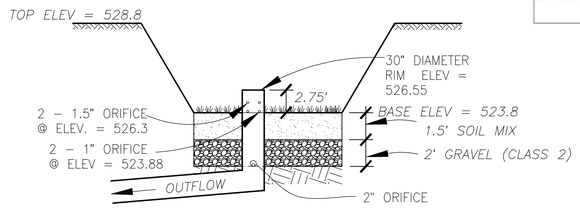
OFFSITE PERVIOUS AREA

ONSITE PERVIOUS AREA

IMPERVIOUS AREA

TREATMENT CONTROL BMPS:
CISTERN WITH BIORETENTION FACILITY

SITE DESIGN / LID BMPS:
UTILIZE EXISTING TOPOGRAPHY
MINIMIZE IMPERVIOUS FOOTPRINT
DISPERSE RUNOFF TO ADJACENT LANDSCAPING
MINIMIZE SOIL COMPACTION AND IMPLEMENT SOIL AMENDMENTS
STABILIZE THE SITE
INSTALL ENERGY DISSIPATERS



TREATMENT CONTROL BMP: BIORETENTION FACILITY

NTS

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

DRAINAGE MANAGEMENT AREA MAP

LONE OAK RANCH

CITY OF VISTA, CALIFORNIA

SHEET 1 OF 1

W.O.# 2414-3d

40 0 40 80 120

SCALE 1"= 40'

ATTACHMENT D

Sizing Design Calculations and TCBMP/LID Design Details

(Provide BMP Sixing Calculator results and/or continuous simulation modeling results, if applicable)

See Attachment H for HMP Study.

PROJECT NAME: Lone Oak Ranch
PROJECT LOCATION: County of San Diego

85TH PERCENTILE
PRECIPITATION DEPTH (IN): 0.75

LONE OAK RANCH, BIORETENTION							
TOTAL DRAINAGE AREA :	AREA (SQ FT)	AREA (AC)					
	340,204	7.81					
			SELF-TREATING VEGETATED/LANDSCAPED AREAS				
DMA NAME	SURFACE TYPE	DMA AREA (SQ FT)	DMA AREA (AC)	DMA RUNOFF FACTOR	85TH PERCENTILE PRECIPITATION DEPTH (IN)	85TH PERCENTILE VOLUME (CU FT)	85TH PERCENTILE FLOW (CFS)
PERVIOUS	VEGETATED	172,062	3.95	0.1	0.75	1,075.39	0.079
			ROOFS, SIDEWALKS, AND STREETS DRAINING TO IMPS (PLANTER AREA)				
DMA NAME	SURFACE TYPE	DMA AREA (SQ FT)	DMA AREA (AC)	DMA RUNOFF FACTOR	85TH PERCENTILE PRECIPITATION DEPTH (IN)	85TH PERCENTILE VOLUME (CU FT)	85TH PERCENTILE FLOW (CFS)
IMPERVIOUS	IMPERVIOUS	168,142	3.86	1	0.75	10508.88	0.77
					Column Total	11,584.26	0.851

4% Surface Area =	0.17	acres
Surface Area Provided =	0.18	acres

Hydrologic Soil Group—San Diego County Area, California
(Lone Oak Ranch)

Map Scale: 1:2,030 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 7, Nov 15, 2013

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

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GrB	Greenfield sandy loam, 2 to 5 percent slopes	A	0.0	0.0%
HrC2	Huerhuero loam, 5 to 9 percent slopes, eroded	D	9.8	100.0%
Totals for Area of Interest			**9.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

K Factor, Whole Soil—San Diego County Area, California
(Lone Oak Ranch)

Map Scale: 1:2,030 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Soil Rating Lines
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Soil Rating Points
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 7, Nov 15, 2013

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

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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

K Factor, Whole Soil

K Factor, Whole Soil— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
GrB	Greenfield sandy loam, 2 to 5 percent slopes	.20	0.0	0.0%
HrC2	Huerhuero loam, 5 to 9 percent slopes, eroded	.43	9.8	100.0%
Totals for Area of Interest			**9.8**	**100.0%**

Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Rating Options

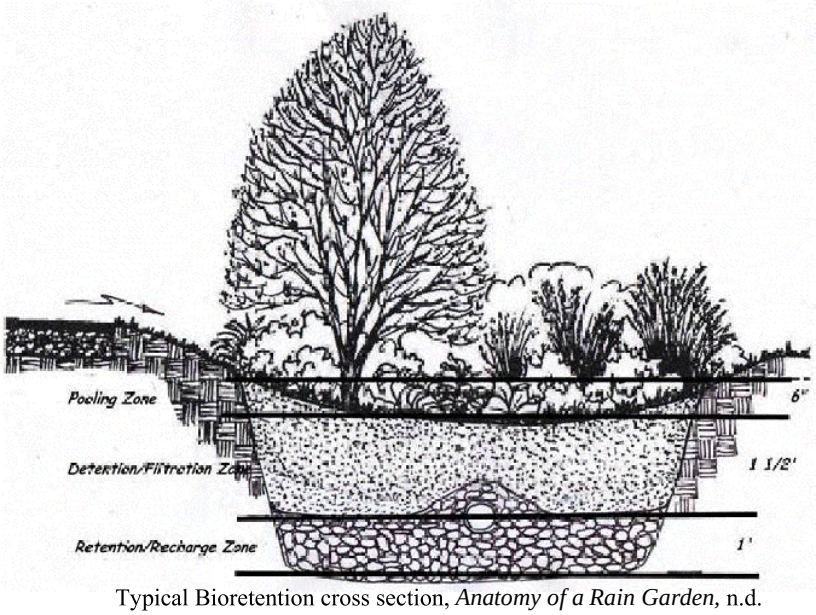
Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Fact Sheet 7. Bioretention Systems



Typical Bioretention cross section, *Anatomy of a Rain Garden,* n.d.

Bioretention systems are essentially a surface and sub-surface water filtration system. In function they are similar to sand filters. Bioretention systems incorporate both plants and underlying filter soils for removal of contaminants. These facilities normally consist of a treatment train approach: filter strip, sand bed, ponding area, organic layer, planting soil, and plants.

CHARACTERISICS

- Effective in removing sediments and attached pollutants by filtration through surface vegetation, ground cover and underlying filter media layer
- Delay runoff peaks by providing retention capacity and reducing flow velocities.
- Vegetation increases aesthetic value while also enhancing filtration capacity and helping to maintain the porosity of the filter media.
- Can be constructed as either large or small scale devices, with native or amended soils.
- Small scale units are usually located in a residential planter box that filters collected stormwater through the filter media and to an outlet.
- Larger scale devices work on the same methodology, however are generally located along the streetscapes and retarding basins over large open areas.
- In addition, there are two main types of bioretention system: Non-conveyance systems, which generally pond runoff volume, and Conveyance, which generally convey minor storm events along longitudinal channels. Such conveyance systems generally include an amended soil layer under the surface for additional storage and filtration

APPLICATION

- Effective in removing medium to fine size sediments and attached pollutants (such as nutrients, free oils/grease and metals), but typically have higher pollutant

removal efficiencies for a wider range of contaminants due to enhanced filtration/biological processes associated with the surface vegetation.
- Best suited to small residential, commercial, and industrial developments with high percentages of impervious areas, including parking lots, high density residential housing, and roadways.
- Aesthetic benefits due to the surface vegetation make bioretention systems appealing for incorporation into streetscape and general landscape features.

DESIGN
- Provide a gentle slope for overland flow and adequate water storage. No water should be allowed to pond in the bioretention system for longer than 72 hours.
- Usually designed in conjunction with swales and other devices upstream so as to reduce filter clogging and provide water treatment (treatment train).
- Filter media employed is usually the plant growing material, which may comprise soil, sand and peat mixtures.
- "Planting box" type systems should be restricted to very small catchment areas.
- A subdrain system should be included in urban areas along with associated cleanout to facilitate maintenance.
- For more precise design techniques, see: CASQA (2003, January) California Stormwater BMP Handbook: New Development and Redevelopment

MAINTENANCE
- Generally, only routine periodic maintenance typical of any landscaped area (mulching, plant replacement, pruning, weeding) is necessary.
- Regular inspections and maintenance are particularly important during the vegetation establishment period.
- Routine maintenance should include a biannual health evaluation of the trees and shrubs and subsequent removal of any dead or diseased vegetation.
- Other potential tasks include soil pH regulation, erosion repair at inflow points, mulch replenishment, unclogging the under-drain, and repairing overflow structures.

LIMITATIONS
- Adequate sunlight is required for vegetation growth.
- The use of irrigation may not meet State water conservation goals. Appropriate drought-tolerant plants should be considered.
- Placement may be limited by the need for upstream pre-treatment so as to avoid filter clogging (treatment train).
- Contributing drainage area should be less than 1 acre for small-scale, on-lot devices
- Bioretention (a BMP with incidental infiltration) is not an appropriate BMP when:
    - the seasonal high groundwater table is within 6 feet of the ground surface (US EPA 1999)
    - at locations where or where surrounding soil stratum is unstable
- exceptions to the 6 foot separation can be made when:
    - the BMP is designed with an under-drain and approved by a qualified licensed professional, or when:

  - written approval of a separation in the interval of 4-6 feet has been obtained by the Regional Water Quality Control Board and the Department of Environmental Health.
- Site must contain sufficient elevation relief so that subdrain system may discharge to receiving swale, curb or storm drain system.

ECONOMICS

- Construction cost estimates for a bioretention area are slightly greater than those for the required landscaping for a new development (EPA, 1999).
- The operation and maintenance costs for a bioretention facility will be comparable to those of typical landscaping required for a site. (CASQA, 2003)
- Maintenance costs are projected at 5-7% of the construction cost annually.

REFERENCES

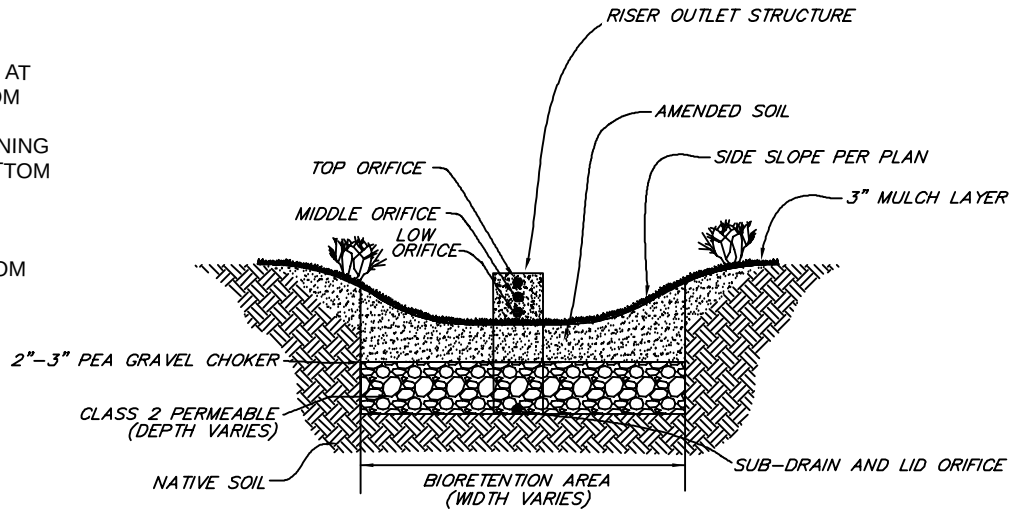
- California Stormwater Quality Association. (2003, January) California Stormwater BMP Handbook: New Development and Redevelopment.
- URS Australia Pty Ltd, (2004, May), Water Sensitive Urban Design: Technical Guidelines for Western Sydney, Upper Parramatta River Catchment Trust.
- US EPA (1999, September) BMP Fact Sheet 832-F-99-012. http://www.epa.gov/owm/mtb/biortn.pdf
- US EPA (1999, August) Preliminary Studies: Preliminary Data Summary of Urban Stormwater Best Management Practices. EPA-821-R-99-012 Part D.
- For additional information pertaining to Bioretention Systems, see the works cited in the San Diego County LID Literature Index.

NOTES:
LOW ORIFICE: 2- 1" DIA. OPENING AT ELEV 0.08 FT FROM BASIN BOTTOM

MIDDLE ORIFICE: 2- 1.5" DIA. OPENING AT ELEV 2.50 FT FROM BASIN BOTTOM

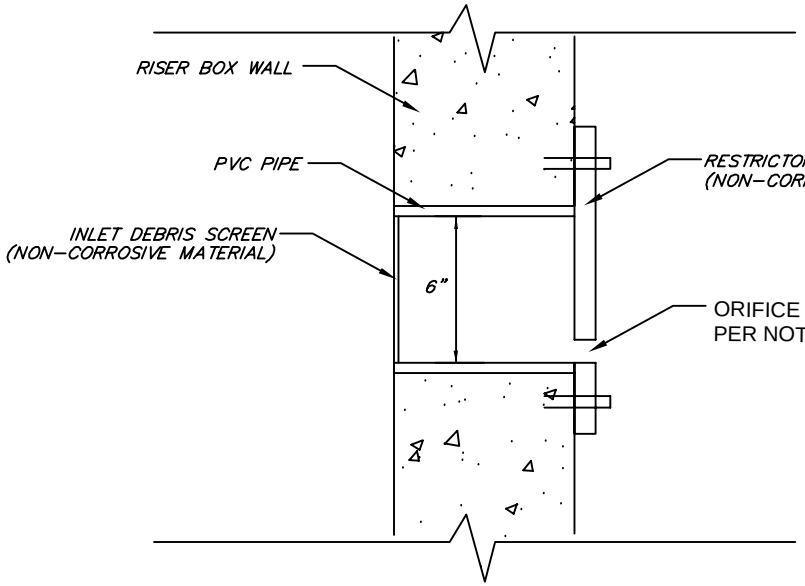
TOP ORIFICE: N/A

30" DIA. RISER W/ RIM AT 2.75' FROM BASIN BOTTOM



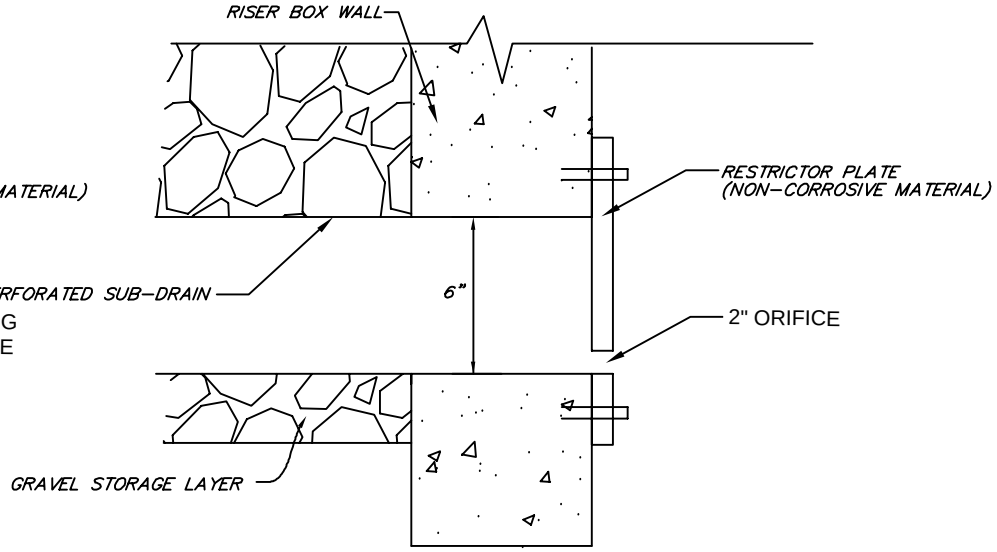
TYPICAL BIORETENTION BASIN CROSS SECTION

NOT TO SCALE



RISER ORIFICE DETAIL

NOT TO SCALE



LID ORIFICE DETAIL

NOT TO SCALE

ATTACHMENT E

Geotechnical Certification Sheet
(If applicable)

The design of stormwater treatment and other control measures proposed in this plan requiring specific soil infiltration characteristics and / or geological conditions has been reviewed and approved by a registered Civil Engineer, Geotechnical Engineer, or Geologist in the State of California.

_____ _____

Name and registration # Date

THIS ATTACHMENT E IS NOT APPLICABLE TO THE LONE OAK RANCH PROJECT

ATTACHMENT F

Maintenance Plan

(Use Chapter 5 of the SUSMP as guidance in developing your Maintenance Plan)

The following is a general outline to create your project specific Maintenance Plan. A Maintenance Plan is a living document and field conditions may require modifications to the Maintenance Plan.

I. Inspection, Maintenance Log and Self-Verification Forms (Examples are provided in Appendix F of the San Diego County SUSMP)

II. Updates, Revisions and Errata

III. Introduction

- A. Narrative 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
    - (1) Sources of funds for maintenance
    - (2) Budget category or line item
    - (3) 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 (copied or adapted from initial 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)

(1) Area drained and routing of discharge.

(2) 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

Assemble and make copies of your maintenance plan. One copy must be submitted to the County, and at least one copy kept on-site. Here are some suggestions for formatting the maintenance plan:

- Format plans to 8½ x 11" to facilitate duplication, filing, and handling.
- Include the revision date in the footer on each page.
- Scan graphics and incorporate with text into a single electronic file. Keep the electronic file backed-up so that copies of the maintenance plan can be made if the hard copy is lost or damaged.

Operations and Maintenance Plan

Maintenance Program for Inlet Stenciling

Inspection Frequency/Indications:	Regular Maintenance Inspections ❑ Before wet season begins (September); ❑ After wet season (April).
Maintenance Indications	**Maintenance Activities**
❑ Inlet stenciling/signage begins to weather or fade	❑ Re-stamp signage
❑ Broken or damaged structure	❑ Repair or replace signage structure

Maintenance Program for Planter Areas/ Cistern with Bioretention Area

Inspection Frequency/Indications:	Regular Inspections ❑ Before wet season begins (September); ❑ Every 60 days during wet season (September-April); ❑ After wet season (April). Performance Inspections ❑ After rainfall events greater than 0.5 inch
Maintenance Indications Connections	**Maintenance Activities Connections**
❑ Damage to inlet/outlet, sideslopes, headwall, or other structures	❑ Repair inlet/outlet structures, side slopes, fences, or other structural elements as needed to maintain performance of the facility.
❑ Over-grown vegetation, emergent woody vegetation and/or weeds	❑ Trim vegetation to average height of 12 inches and remove trimmings. ❑ Remove emergent trees and other vegetation that are not part of bioretention basin plan and weeds ❑ Re-seed and re-plan barren areas prior to rainy season ❑ Install erosion blanket on barren spots if re-vegetation is not successful
❑ Sediment accumulation over 3 inches	❑ Remove sediment accumulation at or near plant height
❑ Trash, debris, and vegetative litter	❑ Remove trash, debris, and vegetative litter
❑ Rodents or other vectors	❑ Abate and control rodents as necessary to maintain performance of the facility ❑ Drain standing water
Waste Disposal	Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations.

ATTACHMENT G

Treatment Control BMP Certification for DPW Permitted Land Development Projects

After TCBMP construction, complete a TCBMP Certification form to verify with County staff that all constructed TCBMPs on the record plans match the approved TCBMPs in the most current SWMP. TCBMP Certification must be completed and verified for permit closure.

County of San Diego

DEPARTMENT OF PUBLIC WORKS

Treatment Control BMP Certification for DPW Permitted Land Development Projects

Permit Number (e.g. L-grading) _____ HSU Watershed _____

Project Name _____

Location / Address _____

Maintenance Notification/Agreement No.: _____

Responsible Party for Construction Phase

Developer's Name: _____

Address: _____

City _____ State _____ Zip _____

Email Address: _____

Phone Number: _____

Engineer of Work: _____

Engineer's Phone Number: _____

Responsible Party for Perpetual Maintenance

Owner's Name(s)*_____

Address: _____

City _____ State _____ Zip _____

Email Address: _____

Phone Number: _____

*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.

Treatment Control BMPs (TCBMPs) [1,2] (List all from SWMP)		
Lot Number or Location	**Description/Type**	**Sheet**

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

(Add sheet for all additional BMPs)

For Applicant to submit to PDCI:

- ☐ Copy of the final accepted SWMP and any accepted addendum.
- ☐ Copy of the most current plan showing the Stormwater TCBMP Table, plans/cross-section sheets of the TCBMPs and the location of each verified as-built TCBMP.
- ☐ Photograph of each TCBMP.
- ☐ Copy of the approved TCBMP maintenance agreement associated security

By signing below, I certify that the treatment control BMP(s) for this project have been constructed and all BMPs are in substantial conformance with the approved plans and applicable regulations. I understand the County reserves the right to inspect the above BMPs to verify compliance with the approved plans and Watershed Protection Ordinance. Should it be determined that the BMPs were not constructed to plan or code, corrective actions may be necessary before permits can be closed.

Please sign your name and seal.

Professional Engineer's Printed Name:

_____

Professional Engineer's Signed Name:

_____

Date: _____

[SEAL]

COUNTY – OFFICIAL USE ONLY:

For PDCI:

PDCI Inspector:_____

Date Project has/expects to close:_____

Date Certification received from EOW:_____

By signing below, PDCI Inspector concurs that every noted TCBMP has been installed per plan.

PDCI Inspector's Signature:_____ Date:_____

FOR WPP:

Date Received from PDCI:_____

WPP Submittal Reviewer:_____

WPP Reviewer concurs that the provided for the following TCBMPs is acceptable to enter into the TCBMP Maintenance verification inventory.

List **acceptable** TCBMPs:

WPP Reviewer's Signature: _____Date:_____

☐ Provide a copy of the certification sheet to DPLU.

ATTACHMENT H

HMP Study

(Contact County staff to determine if this should be a separate report from the Major SWMP)

Hydromodification Management Plan

INTRODUCTION

This report summarizes the approach used to model the proposed Lone Oak Ranch project site within San Diego County, CA using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post developed conditions at the site in order to determine if the proposed bioretention and detention basin facility has sufficient footprint to meet the current Hydromodification Management Plan (HMP) requirements from the Regional Water Quality Control Board (RWQCB).

SWMM MODEL DEVELOPMENT

Two (2) SWMM model were prepared for this study, one for the point of compliance (POC1) in existing conditions and one for the POC1 in the proposed condition. There is one onsite drainage area in existing and proposed conditions. For all SWMM models, flow duration curves were prepared to demonstrate that the proposed bioretention & detention basin footprint will be sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Oceanside Rain Gage from the Project Clean Water website was used for this study, since it is the most representative of the project site precipitation.

Evaporation for the site was modeled using average monthly values from the San Diego County hourly dataset. The site was modeled with hydrologic soil group D soils as determined from both the San Diego County Hydrology Manual soil map and the USGS Survey web-based Soil Survey Map. Other SWMM inputs for the subareas are discussed in the attachment to this document where the selection of the parameters is explained in detail.

BIORETENTION MODELING

Developed storm water runoff is routed through one (1) bioretention basin located near the southwesterly project boundary. The basin was modeled using the bioretention LID module within SWMM. The bioretention module can model the underground gravel storage layer, underdrain with an orifice plate, amended soil layer, and a surface storage pond up to the elevation of the invert of the bottom orifice. A separate diversion and detention basin were used to model the portion of the storage pond between the base orifice invert elevations and the spillway elevation from the bioretention basin, according to the assumptions explained in the appendix. Once runoff has been routed through the respective basin outlet structure, it is conveyed via a storm drain pipe to each POC.

Basin Discussion:

Flow control in the basin is achieved using multiple orifices on a concrete riser box. The size, number and location of the orifices are presented in the Basin Table below. The basin also contains an emergency overflow riser that is only utilized in storm events equal to or larger than the 100 year storm. Sizing and further peak flow discussion is in the Tentative Map Drainage Study for Lone Oak Ranch (October 2014).

Basin Table

	Basin
Spillway Height (ft)*	2.75
Spillway Length (ft)	4.91
Amended Soil Depth (in)	18
Class 2 Perm. Depth (in)	24
Top Orifice	
No. of Orifices	2
Diameter (in)	1.5
Invert Height (ft)*	2.5
Bottom Orifice	
No. of Orifices	2
Diameter (in)	1
Invert Height (ft)*	0.08
Sub-Drain Orifice	
No. of Orifices	1
Diameter (in)	2

*From finish grade

FLOW DURATION CURVE COMPARISON

The Flow Duration Curves (FDC) for the site were compared at POC 1 by exporting the hourly runoff time series results from SWMM to a spreadsheet. The FDC was compared between 10% of the existing condition Q_2 (based on accepting an assumption of high susceptibility for downstream channel erosion as required if no soils tests are completed) up to the existing condition Q_{10}. The Q_2 and Q_{10} were determined using a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model is a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate.

The FDC comparison at POC 1 is illustrated in Figure 1 in both normal and logarithmic scale. POC 1 corresponds with the point located downstream of the discharge of Basin #1. Attachment 10 of this HMP Study provides detailed drainage exhibit for the post-developed condition.

As can be seen in Figure 1 the FDC for the proposed condition with the basin is within 110% of the curve for the existing condition. The additional runoff volume generated from developing the site will be released to the downstream storm drain at a flow rate below the 10% Q_2 lower threshold. Additionally, the project will not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the graphic and also in the attached table.

SUMMARY & CONCLUSION

A summary of existing and proposed areas draining to the point of compliance (POC) is shown in the table below. The increase in area draining to the POC is attributed to grading and development of the property. The bioretention basin is proposed to mitigate increased flow frequencies as a result of development.

Area Summary

	Existing (AC)	Proposed (AC)
POC 1	6.90	7.81
Bypass	0.0	2.69
TOTAL	6.90	10.5

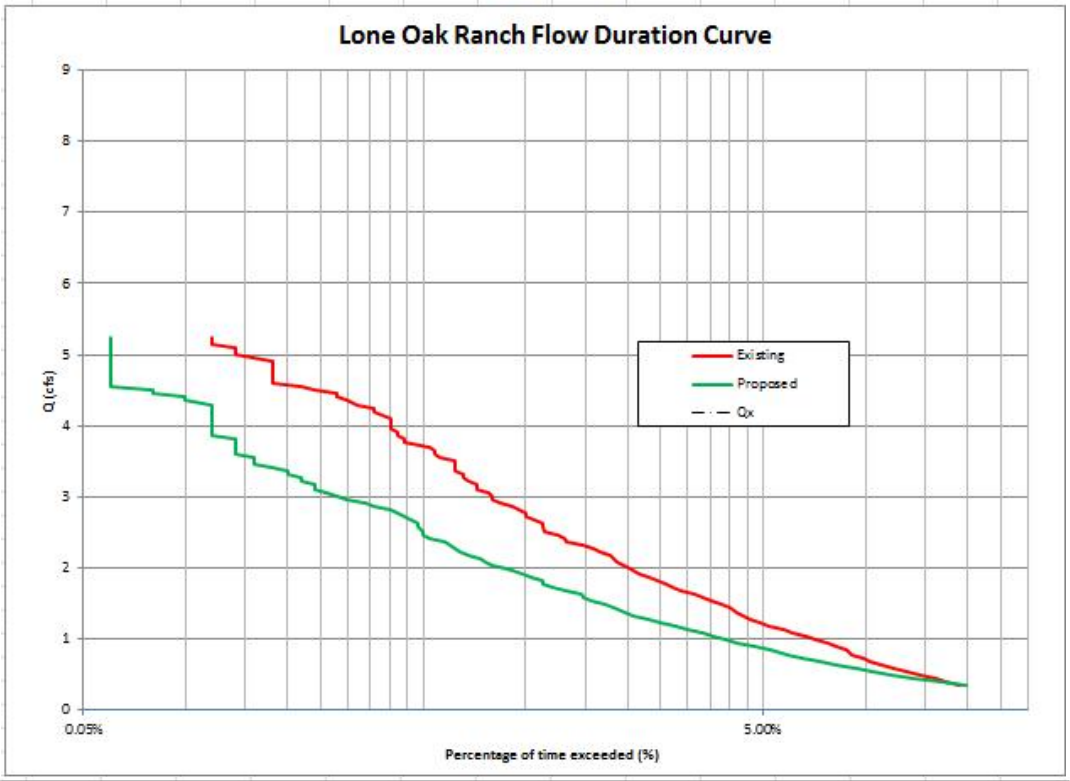
This study has demonstrated that the proposed bioretention footprint at the Lone Oak Ranch site is sufficient to meet the current HMP criteria if the bioretention cross-section area and volume recommended within this attachment are incorporated within the proposed project site.

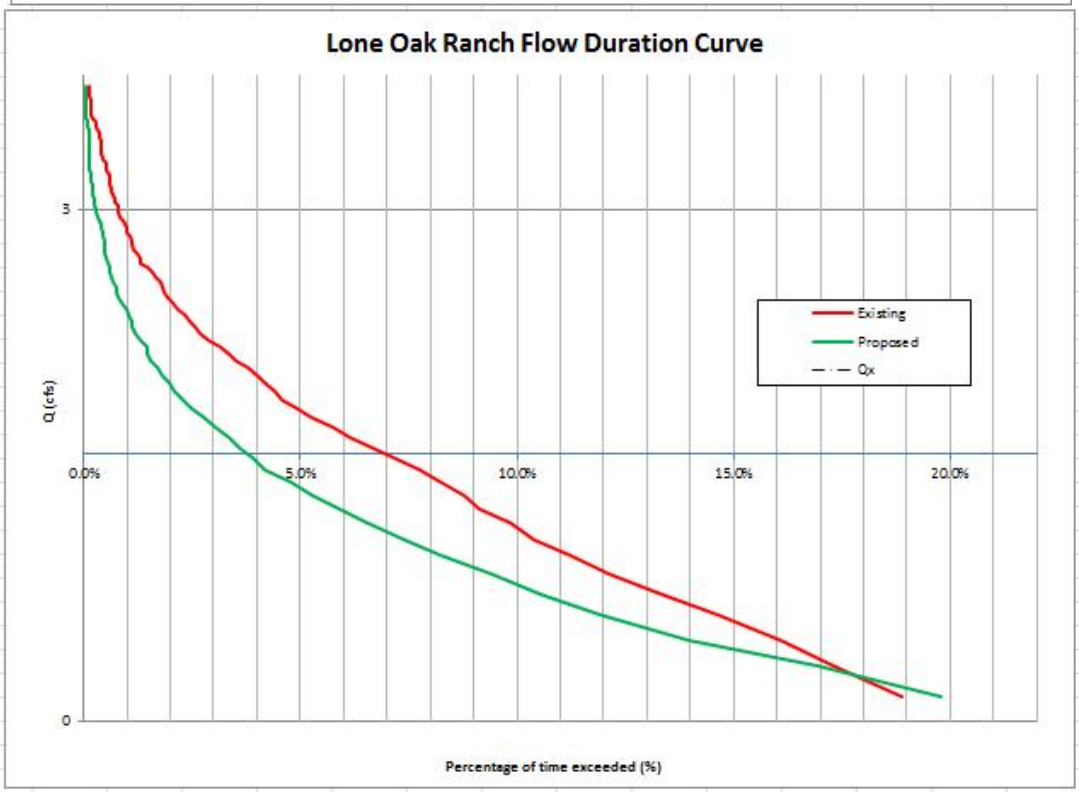
KEY ASSUMPTIONS

1. D Soils are representative of the existing conditions for the site.

ATTACHMENTS

1. Q_2 to Q_{10} Summary Table
2. Flow Duration Curve Analysis, Plots (log and natural "x" scale) and Tables.
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Elevation vs. Area Curves and Elevations vs. Discharge Curves to be used in SWMM
5. Bioretention Details
6. SWMM Input Data (Existing and Proposed Models)
7. SWMM Screenshots and Explanation of Significant Variables
8. Drying Time of the Surface Layer of Bio-retention cells
9. USGS Soil Map of Project Site
10. Hydromodification Watershed Maps





Figures 1a and 1b. – POC 1 Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1 – Q_2 to Q_{10} Summary Table

BASIN 1 – Q_2 to Q_{10} Summary Tables

Return Period	Pre-dev. Q	Post-Dev. Q	Reduction
10	5.241	3.778	1.463
9	5.150	3.630	1.520
8	5.032	3.486	1.546
7	4.934	3.216	1.718
6	4.553	3.042	1.511
5	4.451	2.921	1.530
4	4.286	2.853	1.433
3	3.787	2.226	1.561
2	3.340	1.870	1.470

ATTACHMENT 2 - Flow Duration Curve Analysis, Plot & Table

Flow duration curve shall not exceed the existing conditions by more than 10% neither in peak flow nor duration.

The figure on the following page illustrates that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval 0.10Q 2 – Q 10 is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

Consequently, the design passes the hydromodification test.

It is important to note that the flow duration curve can be expressed in the "x" axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same and compliance can be observed regardless of the variable selected. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented for reference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by H&A, not only the range of analysis is clearly depicted (10% of Q 2 to Q 10) but also all intermediate flows are shown (30% of Q 2 , 50% of Q 2 , Q 2 , Q 3 , Q 4 , Q 5 , Q 6 , Q 7 , Q 8 and Q 9) in order to demonstrate compliance at any range Q x – Q x+1 . It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q i from i = 2 to 10). H&A performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) from the "n" largest independent peak flows obtained from the continuous time series.

The largest "n" peak flows are attached in this appendix, as well as the values of Q_i with a return period "i", from i=2 to 10. The Q i values are also added into the flow-duration plot.

Flow Duration Curve Data for Lone Oak Ranch

Q2 =	3.34	cfs	Fraction Q2=	10 %
Q10 =	5.24	cfs		
Step =	0.0496	cfs		
Count =	499678	hours		
	57.00	years		

	Existing Condition			Detention Basin Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.334	944	1.89E-01	988	1.98E-01	105%	Pass
2	0.384	865	1.73E-01	847	1.70E-01	98%	Pass
3	0.433	805	1.61E-01	698	1.40E-01	87%	Pass
4	0.483	732	1.46E-01	596	1.19E-01	81%	Pass
5	0.532	667	1.33E-01	527	1.05E-01	79%	Pass
6	0.582	605	1.21E-01	471	9.43E-02	78%	Pass
7	0.631	561	1.12E-01	412	8.25E-02	73%	Pass
8	0.681	519	1.04E-01	370	7.40E-02	71%	Pass
9	0.730	491	9.83E-02	327	6.54E-02	67%	Pass
10	0.780	457	9.15E-02	296	5.92E-02	65%	Pass
11	0.830	438	8.77E-02	263	5.26E-02	60%	Pass
12	0.879	412	8.25E-02	238	4.76E-02	58%	Pass
13	0.929	388	7.77E-02	209	4.18E-02	54%	Pass
14	0.978	359	7.18E-02	196	3.92E-02	55%	Pass
15	1.028	333	6.66E-02	179	3.58E-02	54%	Pass
16	1.077	307	6.14E-02	167	3.34E-02	54%	Pass
17	1.127	288	5.76E-02	151	3.02E-02	52%	Pass
18	1.177	261	5.22E-02	138	2.76E-02	53%	Pass
19	1.226	246	4.92E-02	125	2.50E-02	51%	Pass
20	1.276	229	4.58E-02	115	2.30E-02	50%	Pass
21	1.325	220	4.40E-02	104	2.08E-02	47%	Pass
22	1.375	209	4.18E-02	98	1.96E-02	47%	Pass
23	1.424	201	4.02E-02	91	1.82E-02	45%	Pass
24	1.474	189	3.78E-02	86	1.72E-02	46%	Pass
25	1.523	176	3.52E-02	78	1.56E-02	44%	Pass
26	1.573	167	3.34E-02	74	1.48E-02	44%	Pass
27	1.623	158	3.16E-02	73	1.46E-02	46%	Pass
28	1.672	144	2.88E-02	66	1.32E-02	46%	Pass
29	1.722	135	2.70E-02	60	1.20E-02	44%	Pass
30	1.771	129	2.58E-02	56	1.12E-02	43%	Pass
31	1.821	122	2.44E-02	56	1.12E-02	46%	Pass
32	1.870	116	2.32E-02	52	1.04E-02	45%	Pass
33	1.920	108	2.16E-02	49	9.81E-03	45%	Pass
34	1.970	102	2.04E-02	44	8.81E-03	43%	Pass
35	2.019	97	1.94E-02	40	8.01E-03	41%	Pass
36	2.069	93	1.86E-02	38	7.60E-03	41%	Pass

Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	2.118	91	1.82E-02	37	7.40E-03	41%	Pass
38	2.168	89	1.78E-02	34	6.80E-03	38%	Pass
39	2.217	83	1.66E-02	32	6.40E-03	39%	Pass
40	2.267	79	1.58E-02	31	6.20E-03	39%	Pass
41	2.316	74	1.48E-02	30	6.00E-03	41%	Pass
42	2.366	66	1.32E-02	29	5.80E-03	44%	Pass
43	2.416	65	1.30E-02	26	5.20E-03	40%	Pass
44	2.465	62	1.24E-02	25	5.00E-03	40%	Pass
45	2.515	57	1.14E-02	25	5.00E-03	44%	Pass
46	2.564	56	1.12E-02	24	4.80E-03	43%	Pass
47	2.614	56	1.12E-02	24	4.80E-03	43%	Pass
48	2.663	53	1.06E-02	23	4.60E-03	43%	Pass
49	2.713	50	1.00E-02	22	4.40E-03	44%	Pass
50	2.763	50	1.00E-02	21	4.20E-03	42%	Pass
51	2.812	48	9.61E-03	20	4.00E-03	42%	Pass
52	2.862	46	9.21E-03	18	3.60E-03	39%	Pass
53	2.911	42	8.41E-03	17	3.40E-03	40%	Pass
54	2.961	40	8.01E-03	15	3.00E-03	38%	Pass
55	3.010	40	8.01E-03	14	2.80E-03	35%	Pass
56	3.060	39	7.81E-03	13	2.60E-03	33%	Pass
57	3.109	36	7.20E-03	12	2.40E-03	33%	Pass
58	3.159	36	7.20E-03	12	2.40E-03	33%	Pass
59	3.209	34	6.80E-03	11	2.20E-03	32%	Pass
60	3.258	33	6.60E-03	11	2.20E-03	33%	Pass
61	3.308	33	6.60E-03	10	2.00E-03	30%	Pass
62	3.357	31	6.20E-03	10	2.00E-03	32%	Pass
63	3.407	31	6.20E-03	9	1.80E-03	29%	Pass
64	3.456	31	6.20E-03	8	1.60E-03	26%	Pass
65	3.506	31	6.20E-03	8	1.60E-03	26%	Pass
66	3.556	28	5.60E-03	8	1.60E-03	29%	Pass
67	3.605	27	5.40E-03	7	1.40E-03	26%	Pass
68	3.655	27	5.40E-03	7	1.40E-03	26%	Pass
69	3.704	26	5.20E-03	7	1.40E-03	27%	Pass
70	3.754	22	4.40E-03	7	1.40E-03	32%	Pass
71	3.803	22	4.40E-03	7	1.40E-03	32%	Pass
72	3.853	21	4.20E-03	6	1.20E-03	29%	Pass
73	3.902	21	4.20E-03	6	1.20E-03	29%	Pass
74	3.952	20	4.00E-03	6	1.20E-03	30%	Pass
75	4.002	20	4.00E-03	6	1.20E-03	30%	Pass
76	4.051	20	4.00E-03	6	1.20E-03	30%	Pass
77	4.101	20	4.00E-03	6	1.20E-03	30%	Pass
78	4.150	19	3.80E-03	6	1.20E-03	32%	Pass
79	4.200	18	3.60E-03	6	1.20E-03	33%	Pass
80	4.249	18	3.60E-03	6	1.20E-03	33%	Pass
81	4.299	16	3.20E-03	6	1.20E-03	38%	Pass

Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	4.349	15	3.00E-03	5	1.00E-03	33%	Pass
83	4.398	14	2.80E-03	5	1.00E-03	36%	Pass
84	4.448	14	2.80E-03	4	8.01E-04	29%	Pass
85	4.497	12	2.40E-03	4	8.01E-04	33%	Pass
86	4.547	11	2.20E-03	3	6.00E-04	27%	Pass
87	4.596	9	1.80E-03	3	6.00E-04	33%	Pass
88	4.646	9	1.80E-03	3	6.00E-04	33%	Pass
89	4.695	9	1.80E-03	3	6.00E-04	33%	Pass
90	4.745	9	1.80E-03	3	6.00E-04	33%	Pass
91	4.795	9	1.80E-03	3	6.00E-04	33%	Pass
92	4.844	9	1.80E-03	3	6.00E-04	33%	Pass
93	4.894	9	1.80E-03	3	6.00E-04	33%	Pass
94	4.943	8	1.60E-03	3	6.00E-04	38%	Pass
95	4.993	7	1.40E-03	3	6.00E-04	43%	Pass
96	5.042	7	1.40E-03	3	6.00E-04	43%	Pass
97	5.092	7	1.40E-03	3	6.00E-04	43%	Pass
98	5.141	6	1.20E-03	3	6.00E-04	50%	Pass
99	5.191	6	1.20E-03	3	6.00E-04	50%	Pass
100	5.241	6	1.20E-03	3	6.00E-04	50%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period	Pre-dev. Q	Post-Dev. Q	Reduction
10	5.241	3.778	1.462
9	5.150	3.630	1.521
8	5.032	3.486	1.546
7	4.934	3.216	1.718
6	4.553	3.042	1.510
5	4.451	2.921	1.530
4	4.286	2.853	1.433
3	3.787	2.226	1.561
2	3.340	1.870	1.470

ATTACHMENT 3 - List of Peak Events and Determination of Q2 & Q10

List of Peak events and Determination of P2 and P10 (Pre-Development)

T	Cunnane	Weibull				Period of Return	
10	5.24	5.43	Peaks	Date	Position	Weibull	Cunnane
9	5.15	5.19	2.42	3/16/1954	57	1.02	1.01
8	5.03	5.08	2.45	2/11/1959	56	1.04	1.03
7	4.93	4.95	2.45	12/2/1961	55	1.05	1.05
6	4.55	4.65	2.48	1/21/1964	54	1.07	1.07
5	4.45	4.45	2.49	11/16/1965	53	1.09	1.09
4	4.29	4.29	2.51	11/17/1972	52	1.12	1.11
3	3.79	3.80	2.51	3/20/1973	51	1.14	1.13
2	3.34	3.34	2.56	1/6/1977	50	1.16	1.15
			2.62	1/14/1978	49	1.18	1.18
			2.66	3/11/1978	48	1.21	1.20
			2.69	11/25/1985	47	1.23	1.23
			2.69	1/18/1952	46	1.26	1.25
			2.69	12/18/1967	45	1.29	1.28
			2.77	1/14/1969	44	1.32	1.31
			2.8	2/6/1969	43	1.35	1.34
			2.83	2/17/1971	42	1.38	1.38
			2.86	2/8/1976	41	1.41	1.41
			2.87	12/31/1976	40	1.45	1.44
			2.89	5/8/1977	39	1.49	1.48
			2.91	1/6/1979	38	1.53	1.52
			2.94	3/1/1981	37	1.57	1.56
			3.04	3/17/1982	36	1.61	1.61
			3.08	3/24/1983	35	1.66	1.65
			3.09	11/25/1983	34	1.71	1.70
			3.09	1/18/1993	33	1.76	1.75
			3.17	3/11/1995	32	1.81	1.81
			3.17	12/28/2004	31	1.87	1.87
			3.25	2/21/2005	30	1.93	1.93
			3.34	2/21/2005	29	2.00	2.00
			3.34	2/3/1958	28	2.07	2.07
			3.54	3/6/1975	27	2.15	2.15
			3.55	2/25/1981	26	2.23	2.23
			3.55	3/1/1983	25	2.32	2.33
			3.56	11/17/1986	24	2.42	2.42
			3.72	12/4/1987	23	2.52	2.53
			3.73	4/21/1988	22	2.64	2.65
			3.73	1/31/1993	21	2.76	2.78
			3.74	2/14/1995	20	2.90	2.92
			3.83	12/23/1995	19	3.05	3.08
			4.11	1/12/1960	18	3.22	3.25
			4.19	3/8/1968	17	3.41	3.45
			4.25	12/4/1974	16	3.63	3.67
			4.28	3/16/1986	15	3.87	3.92
			4.3	11/5/1987	14	4.14	4.21
			4.36	1/10/1955	13	4.46	4.54
			4.45	1/10/1978	12	4.83	4.93
			4.46	1/25/1995	11	5.27	5.40
			4.53	10/27/2004	10	5.80	5.96
			4.91	11/21/1967	9	6.44	6.65
			4.97	2/28/1970	8	7.25	7.53
			5.12	11/16/1972	7	8.29	8.67
			5.26	1/31/1979	6	9.67	10.21
			6.27	2/24/1998	5	11.60	12.43
			6.49	12/29/2004	4	14.50	15.89
			6.86	2/20/1980	3	19.33	22.00
			6.94	3/7/1952	2	29.00	35.75
			7.65	12/10/1965	1	58.00	95.33

Note:
Cunnane is the preferred method by the HMP permit.

List of Peak events and Determination of P2 and P10 (Post-Development)

T	Cunnane	Weibull				Period of Return	
10	3.78	3.89	Peaks	Date	Position	Weibull	Cunnane
9	3.63	3.70	1.39	1/13/1952	57	1.02	1.01
8	3.49	3.54	1.41	1/18/1952	56	1.04	1.03
7	3.22	3.31	1.42	1/18/1952	55	1.05	1.05
6	3.04	3.05	1.42	12/20/1952	54	1.07	1.07
5	2.92	2.92	1.43	1/10/1955	53	1.09	1.09
4	2.85	2.85	1.43	1/7/1957	52	1.12	1.11
3	2.23	2.23	1.46	1/20/1962	51	1.14	1.13
2	1.87	1.87	1.49	4/8/1965	50	1.16	1.15
			1.5	3/22/1954	49	1.18	1.18
			1.5	12/5/1957	48	1.21	1.20
			1.51	1/12/1960	47	1.23	1.23
			1.51	12/2/1961	46	1.26	1.25
			1.55	11/20/1963	45	1.29	1.28
			1.57	12/5/1966	44	1.32	1.31
			1.57	1/14/1969	43	1.35	1.34
			1.59	12/21/2002	42	1.38	1.38
			1.63	2/14/2003	41	1.41	1.41
			1.65	2/22/2004	40	1.45	1.44
			1.65	3/7/1952	39	1.49	1.48
			1.66	3/16/1958	38	1.53	1.52
			1.66	3/1/1981	37	1.57	1.56
			1.7	3/17/1982	36	1.61	1.61
			1.7	2/2/1983	35	1.66	1.65
			1.7	3/1/1983	34	1.71	1.70
			1.72	11/25/1985	33	1.76	1.75
			1.73	3/1/1991	32	1.81	1.81
			1.73	2/19/1993	31	1.87	1.87
			1.85	3/11/1995	30	1.93	1.93
			1.87	3/11/1995	29	2.00	2.00
			1.9	2/3/1998	28	2.07	2.07
			1.95	2/8/1998	27	2.15	2.15
			1.96	2/12/2003	26	2.23	2.23
			1.97	3/5/2005	25	2.32	2.33
			1.99	12/30/1951	24	2.42	2.42
			2.02	3/16/1952	23	2.52	2.53
			2.03	3/16/1986	22	2.64	2.65
			2.14	1/14/1990	21	2.76	2.78
			2.2	1/15/1993	20	2.90	2.92
			2.25	1/25/1995	19	3.05	3.08
			2.41	1/25/1995	18	3.22	3.25
			2.62	11/22/1996	17	3.41	3.45
			2.73	10/27/2004	16	3.63	3.67
			2.85	12/29/2004	15	3.87	3.92
			2.86	1/3/2005	14	4.14	4.21
			2.87	3/6/1975	13	4.46	4.54
			2.92	1/10/1978	12	4.83	4.93
			2.93	1/14/1978	11	5.27	5.40
			3.04	1/11/2001	10	5.80	5.96
			3.08	3/2/1983	9	6.44	6.65
			3.42	11/5/1987	8	7.25	7.53
			3.58	11/21/1967	7	8.29	8.67
			3.81	2/28/1970	6	9.67	10.21
			4.3	11/16/1972	5	11.60	12.43
			4.44	1/31/1979	4	14.50	15.89
			4.52	1/4/1995	3	19.33	22.00
			5.33	2/21/2005	2	29.00	35.75
			9.31	12/10/1965	1	58.00	95.33

Note:
Cunnane is the preferred method by the HMP permit.

ATTACHMENT 4 - Elevation vs. Area Curves vs. Discharge Curves to be used in SWMM

Elevation vs. Area

For the portion of the flow diverted in the LID Control to the receiving detention basin, a pond is used to route the hydrographs. The elevation vs area curve in the model is calculated in Excel and imported into the model at a 0.5 ft interval range.

Elevation vs Discharge

The total discharge peak flow is imported from an Excel spreadsheet that calculated the elevation vs discharge of the multiple outlet system.

The orifices have been selected to maximize their size while still restricting flows to conform to the required 10% of the Q2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While we acknowledge that these orifices are small, to increase the size of these outlets would impact the basins' ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conformance with HMP requirements.

In order to prevent blockage of the orifices, a debris screen will be fitted to the base invert of the lower orifices located within the detention basin. Regular maintenance of the riser and orifices will be performed to ensure potential blockages are minimized. A detail of the orifice and riser structure is provided in Attachment 5 of this attachment. The stage-storage and stage-discharge calculations have been provided on the following pages.

	Basin Bottom:		523.8	Areas
		North Basin	South Basin	Combined
Stage	Elev			
0	523.8	5182	2533	7715
0.5	524.3	5474	2738	8212
1	524.8	5774	2952	8726
1.5	525.3	6082	3173	9255
2	525.8	6398	3402	9800
2.5	526.3	6722	3640	10362
3	526.8	7054	3885	10939
3.5	527.3	7394	4138	11532
4	527.8	7742	4400	12142
4.5	528.3	8097	4669	12766
5	528.8	8461	4946	13407

Basin #1 Discharge

Discharge vs Elevation Table

Low orifice:	1 "	Top orifice:	2 "
Number:	2	Number:	0
Cg-low:	0.61	Cg-low:	0.61
invert elev:	0.08 ft	invert elev:	1.50 ft
Middle orifice:	1.5 "	Emergency inlet:	
number of orif:	2	Invert:	2.75 ft
Cg-middle:	0.61	Area (SF=2)	4.91 sq ft
invert elev:	2.50 ft		

h (ft)	H/D-low -	H/D-mid -	H/D-top -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qemerg (cfs)	Qtot (cfs)
0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.1	0.30	0.00	0.00	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
0.2	1.50	0.00	0.00	0.015	0.019	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015
0.3	2.70	0.00	0.00	0.023	0.028	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023
0.4	3.90	0.00	0.00	0.028	0.042	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.028
0.5	5.10	0.00	0.00	0.033	0.220	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.033
0.6	6.30	0.00	0.00	0.037	0.958	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037
0.7	7.50	0.00	0.00	0.041	2.994	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.041
0.8	8.70	0.00	0.00	0.044	7.495	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.044
0.9	9.90	0.00	0.00	0.047	16.157	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047
1.0	11.10	0.00	0.00	0.050	31.300	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.050
1.1	12.30	0.00	0.00	0.053	55.965	0.053	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.053
1.2	13.50	0.00	0.00	0.056	94.008	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.056
1.3	14.70	0.00	0.00	0.058	150.198	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.058
1.4	15.90	0.00	0.00	0.060	230.310	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060
1.5	17.10	0.00	0.00	0.063	341.223	0.063	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.063
1.6	18.30	0.00	0.60	0.065	491.015	0.065	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.065
1.7	19.50	0.00	1.20	0.067	689.061	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.067
1.8	20.70	0.00	1.80	0.069	946.125	0.069	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.069
1.9	21.90	0.00	2.40	0.071	1274.459	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.071
2.0	23.10	0.00	3.00	0.073	1687.897	0.073	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.073
2.1	24.30	0.00	3.60	0.075	2201.951	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075
2.2	25.50	0.00	4.20	0.077	2833.911	0.077	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.077
2.3	26.70	0.00	4.80	0.079	3602.932	0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.079
2.4	27.90	0.00	5.40	0.081	4530.140	0.081	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.081
2.5	29.10	0.00	6.00	0.082	5638.720	0.082	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.082
2.6	30.30	0.80	6.60	0.084	6954.016	0.084	0.023	0.020	0.020	0.000	0.000	0.000	0.000	0.104
2.7	31.50	1.60	7.20	0.086	8503.625	0.086	0.045	0.056	0.045	0.000	0.000	0.000	0.000	0.130
2.8	32.70	2.40	7.80	0.087	10317.496	0.087	0.059	0.076	0.059	0.000	0.000	0.000	0.087	0.233
2.9	33.90	3.20	8.40	0.089	12428.019	0.089	0.070	0.079	0.070	0.000	0.000	0.000	0.450	0.609
3.0	35.10	4.00	9.00	0.091	14870.130	0.091	0.079	0.130	0.079	0.000	0.000	0.000	0.969	1.139
3.1	36.30	4.80	9.60	0.092	17681.400	0.092	0.088	0.395	0.088	0.000	0.000	0.000	1.605	1.785
3.2	37.50	5.60	10.20	0.094	20902.132	0.094	0.096	1.173	0.096	0.000	0.000	0.000	2.340	2.529
3.3	38.70	6.40	10.80	0.095	24575.460	0.095	0.103	2.936	0.103	0.000	0.000	0.000	3.162	3.360
3.4	39.90	7.20	11.40	0.097	28747.441	0.097	0.110	6.361	0.110	0.000	0.000	0.000	4.062	4.269
3.5	41.10	8.00	12.00	0.098	33467.154	0.098	0.116	12.361	0.116	0.000	0.000	0.000	5.034	5.249
3.6	42.30	8.80	12.60	0.100	38786.794	0.100	0.122	22.129	0.122	0.000	0.000	0.000	6.074	6.296
3.7	43.50	9.60	13.20	0.101	44761.767	0.101	0.128	37.163	0.128	0.000	0.000	0.000	7.177	7.406
3.8	44.70	10.40	13.80	0.102	51450.789	0.102	0.134	59.307	0.134	0.000	0.000	0.000	8.340	8.576
3.9	45.90	11.20	14.40	0.104	58915.980	0.104	0.139	90.784	0.139	0.000	0.000	0.000	9.559	9.802
4.0	47.10	12.00	15.00	0.105	67222.957	0.105	0.144	134.229	0.144	0.000	0.000	0.000	10.832	11.082
4.1	48.30	12.80	15.60	0.107	76440.937	0.107	0.149	192.729	0.149	0.000	0.000	0.000	12.158	12.413
4.2	49.50	13.60	16.20	0.108	86642.825	0.108	0.154	269.850	0.154	0.000	0.000	0.000	13.533	13.795
4.3	50.70	14.40	16.80	0.109	97905.316	0.109	0.158	369.679	0.158	0.000	0.000	0.000	14.957	15.225
4.4	51.90	15.20	17.40	0.111	110308.987	0.111	0.163	496.854	0.163	0.000	0.000	0.000	16.428	16.701
4.5	53.10	16.00	18.00	0.112	123938.394	0.112	0.167	656.603	0.167	0.000	0.000	0.000	17.944	18.223
4.6	54.30	16.80	18.60	0.113	138882.168	0.113	0.171	854.773	0.171	0.000	0.000	0.000	19.504	19.788
4.7	55.50	17.60	19.20	0.114	155233.112	0.114	0.176	1097.872	0.176	0.000	0.000	0.000	21.106	21.396
4.8	56.70	18.40	19.80	0.116	173088.294	0.116	0.180	1393.096	0.180	0.000	0.000	0.000	22.750	23.046
4.9	57.90	19.20	20.40	0.117	192549.146	0.117	0.184	1748.371	0.184	0.000	0.000	0.000	24.435	24.736
5.0	59.10	20.00	21.00	0.118	213721.558	0.118	0.188	2172.383	0.188	0.000	0.000	0.000	26.160	26.465

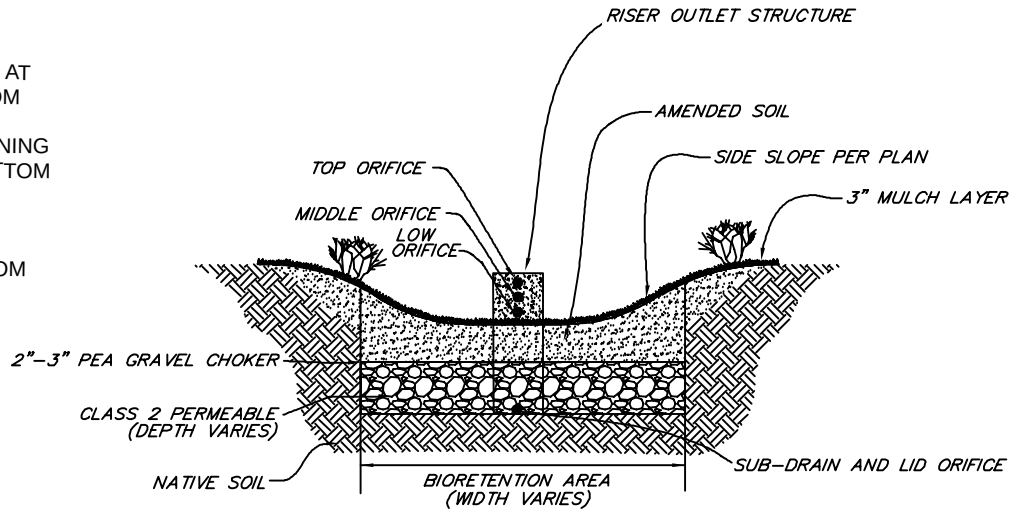
ATTACHMENT 5 - Bio Retention Details

NOTES:
LOW ORIFICE: 2- 1" DIA. OPENING AT ELEV 0.08 FT FROM BASIN BOTTOM

MIDDLE ORIFICE: 2- 1.5" DIA. OPENING AT ELEV 2.50 FT FROM BASIN BOTTOM

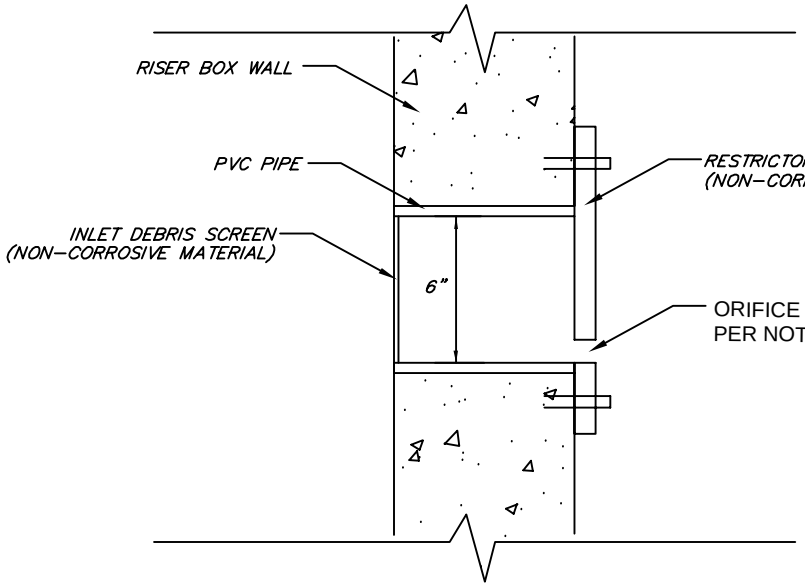
TOP ORIFICE: N/A

30" DIA. RISER W/ RIM AT 2.75' FROM BASIN BOTTOM



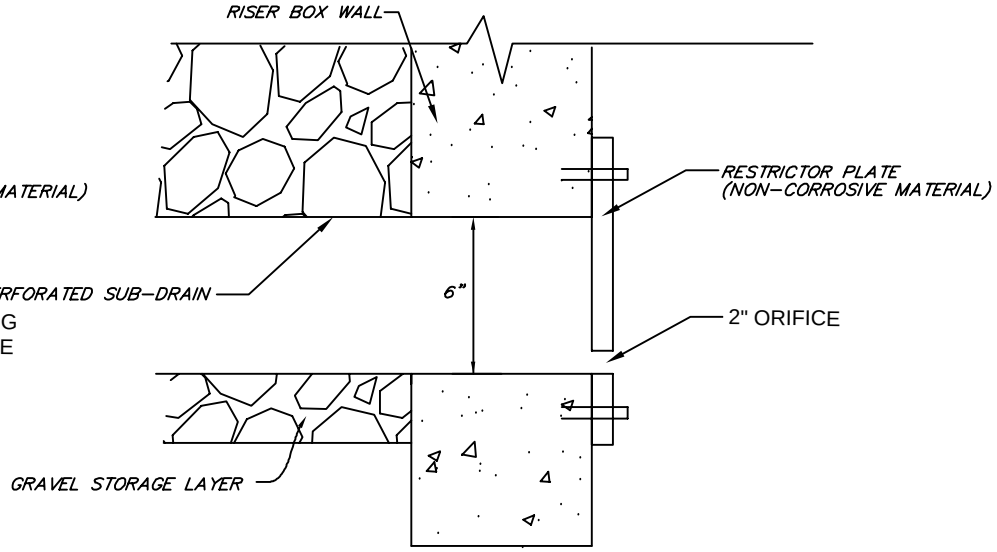
TYPICAL BIORETENTION BASIN CROSS SECTION

NOT TO SCALE



RISER ORIFICE DETAIL

NOT TO SCALE



LID ORIFICE DETAIL

NOT TO SCALE

ATTACHMENT 6 - SWMM Input Data (Existing and Proposed Models)

Lone Oak Ranch POC 1 DMA Calculations					
Pre-Developed Condition					
POC	Neighborhood	% Imperviousness	Total Area	Pervious Area	Impervious Area
1	Natural	0%	6.52	6.52	0.00
1	Residential Roofs	100%	0.18	0.00	0.18
1	Roadway	100%	0.20	0.00	0.20
1	Total	6%	6.90	6.52	0.38

Lone Oak Ranch POC 1 DMA Calculations					
Post-Developed Condition					
POC*	Neighborhood	% Imperviousness	Total Area	Pervious Area	Impervious Area
1-Direct	Natural	0%	2.49	2.49	0.00
1-Direct	Residential	55%	0.00	0.00	0.00
1-Direct	Roadway	100%	0.20	0.00	0.20
1-Direct	1-Direct-SubTotal	7%	2.69	2.49	0.20
1-Basin	Slope - Developed	0%	0.28	0.28	0.00
1-Basin	Basin	0%	0.17	0.17	0.00
1-Basin	Roadway - Developed	52%	7.36	3.50	3.86
1-Basin	1-Basin-SubTotal	49%	7.81	3.95	3.86
1-Total	1-Total-Total	39%	10.50	6.44	4.06

* - 'Direct' indicates those areas draining to POC whereas 'Basin' indicate areas which drain to basin before being routed to POC.

Lone Oak POC1 Watershed Parameters		
Watershed #1-EX		
L=	1116	ft
A=	6.90	ac
% Impervious	6%	
W=	269	ft
US Elev=	570	ft
DS Elev=	513	ft
S=	5.1%	
Watershed #1 (Basin)-PR		
L=	1167	ft
A=	7.64	ac
% Impervious	50%	
W=	285	ft
US Elev=	567	ft
DS Elev=	530	ft
S=	3.2%	
Basin #1		
L=	100	ft
A=	0.17	ac
W=	74	
US Elev=	523.80	ft
DS Elev=	523.70	ft
S=	0.1%	
Watershed #1 (Non-Basin)-PR		
L=	789	ft
A=	2.69	ac
% Impervious	7%	
W=	149	ft
US Elev=	562	ft
DS Elev=	513	ft
S=	6.2%	

Required Bio Retention Basin Area (Flow Based)		
Basin #1 (4%/0.4% WQ Area)=	0.17	ac
Required Bio Retention Basin Volume (Volume Based)		
Basin #1 (85th WQ Volume)=	0.27	ac-ft
Adjusted Required Volume Below 1st Orifice/Riser		
Basin bottom area provided	7715	sf
Basin #1 Infiltration Capacity=	3215	cf/hr
Basin #1 WQ Flow=	3087	cf/hr
Deficiency=	-128	cf/hr
Volume (0.75"/0.2"/hr=3.75 hours)=	-0.01	ac-ft
Deficiency depth	-0.062	ft
Lowest orifice on riser set at depth=	0.08	
VOLUME req. per 2013 Permit (Vol x 1.5)	-0.016	
Defeciency depth	-0.093	
Lowest orifice on riser set at depth=	0.08	

LID Outlet #1			
ABMP=	7715	sq-ft	(Area above engineered fill/bio-retention section)
			(It can also be area of infiltration at the bottom)
Cg=	0.61		(coefficient of discharge of the bottom orifice)
Dorif=	2	in	(diameter in inches of the bottom orifice)
Aorifice=	0.02182	sq-ft	(area of orifice in sq-ft)
$C_{SWMM=}$	0.1726		C coefficient to be inserted into SWMM
H-gravel=	2	ft	Depth of the gravel layer where water is ponding
	24	in	(In this case: superior bottom - mulch - ammended soil - invert of French drain)
	22	in	
H-design=	1.833	ft	H-gravel minus radius of the discharge
$Q_{orif\text{-}classic}$=	0.14460	cfs	
$Q_{orif\text{-}SWMM}$=	0.14460	cfs	
$Q_{diversion}$=	0.14605	cfs	1% additional to the Qorifice.

ATTACHMENT 7 - SWMM Screens and Explanation of Significant Variables

Attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, LID controls for the bio-retention cells, ponding on top of the bio-retention (modeled as a storage unit), weir as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their SWMM calibration. Currently, no recommended values have been established by the San Diego County HMP Permit for the SWMM Model.

Soil characteristics of the existing soils were determined from the USGS sources.

Some values incorporated within the SWMM model have been determined from the professional experience of H&A using conservative assumption that have a tendency to increase the size of the needed BMP and also generate a long-term runoff as a percentage of rainfall similar to those measured in gage stations in Southern California by the USGS.

Description of model parameters and assumptions:

N-Imperv – Manning's N for impervious surfaces
    0.012 (typical)

N-Perv – Manning's N for pervious surfaces
    0.05 (typical)

Dstore-Imperv – Depth of depression storage on impervious area (in)
    0.02 (typical)

Dstore-Perv – Depth of depression storage on pervious area (in)
    0.1 (typical)

%Zero-Imperv – Percentage of impervious area with no depression storage (%)
    25 (typical)

Suction Head – Soil capillary suction head (in)

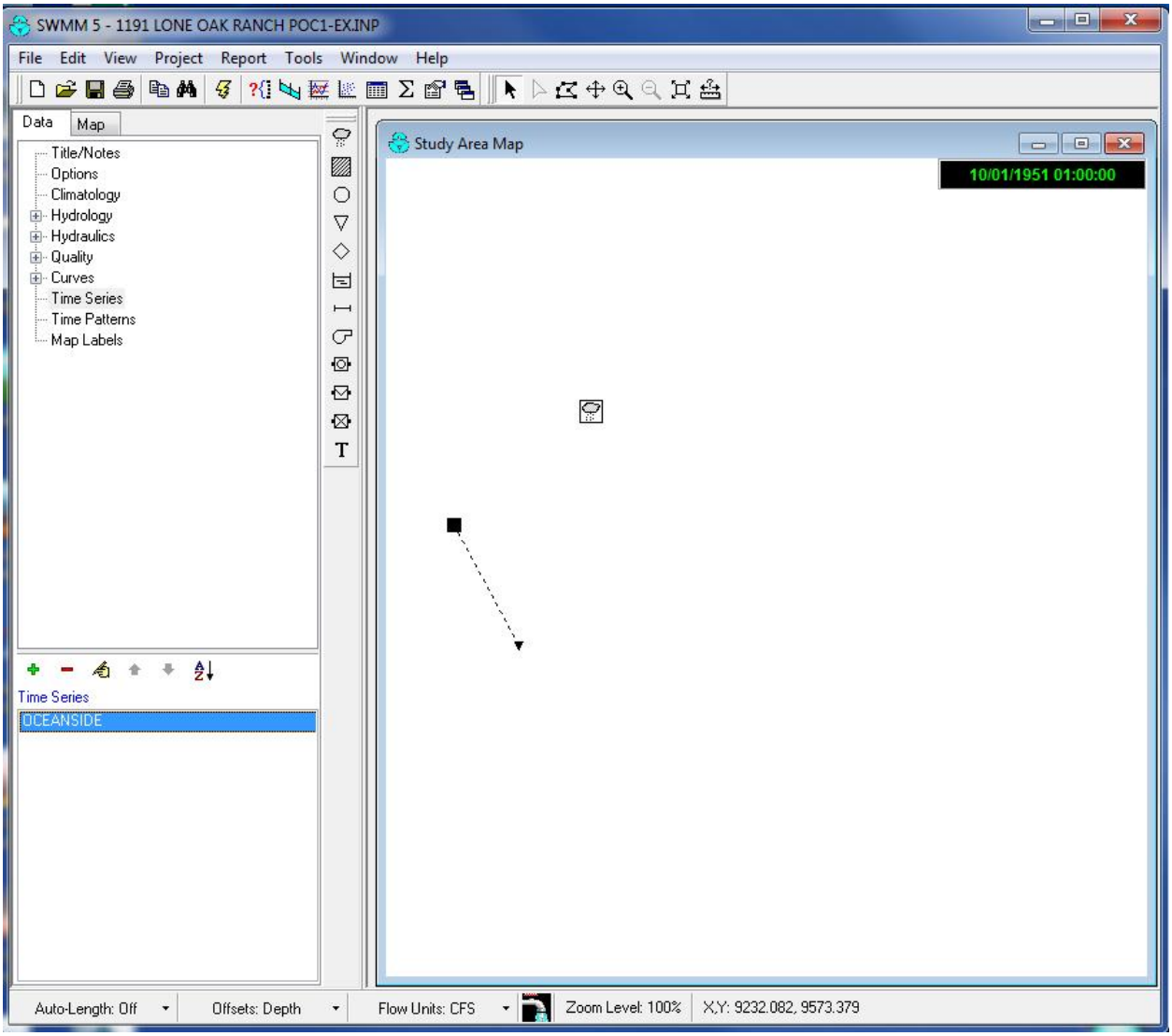
Conductivity – Soil saturated hydraulic conductivity (in/hr)
    -75% of these values if subcatchment is graded/compacted

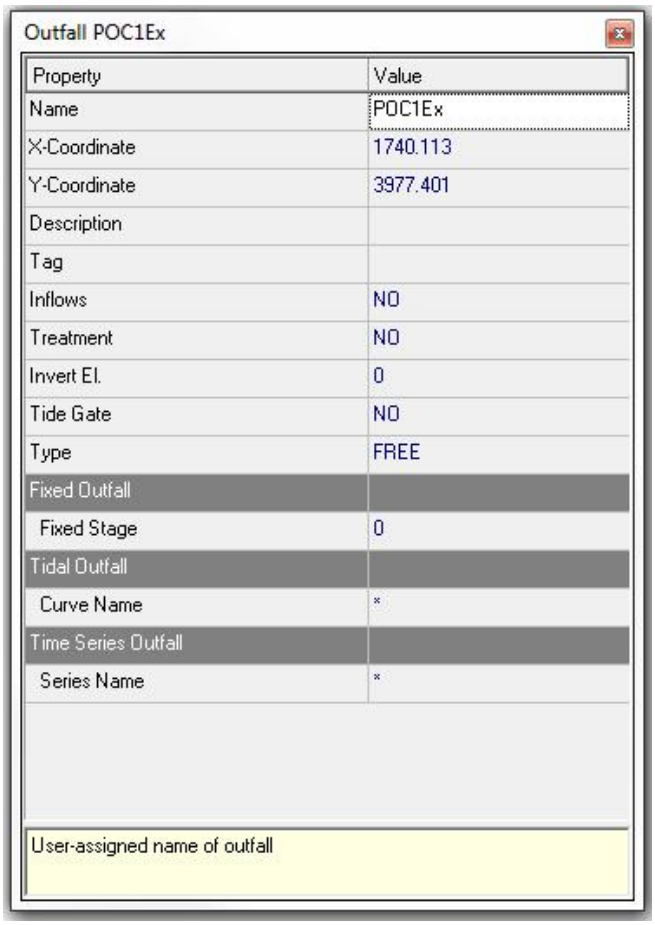
Initial Deficit – Initial moisture deficit (fraction)

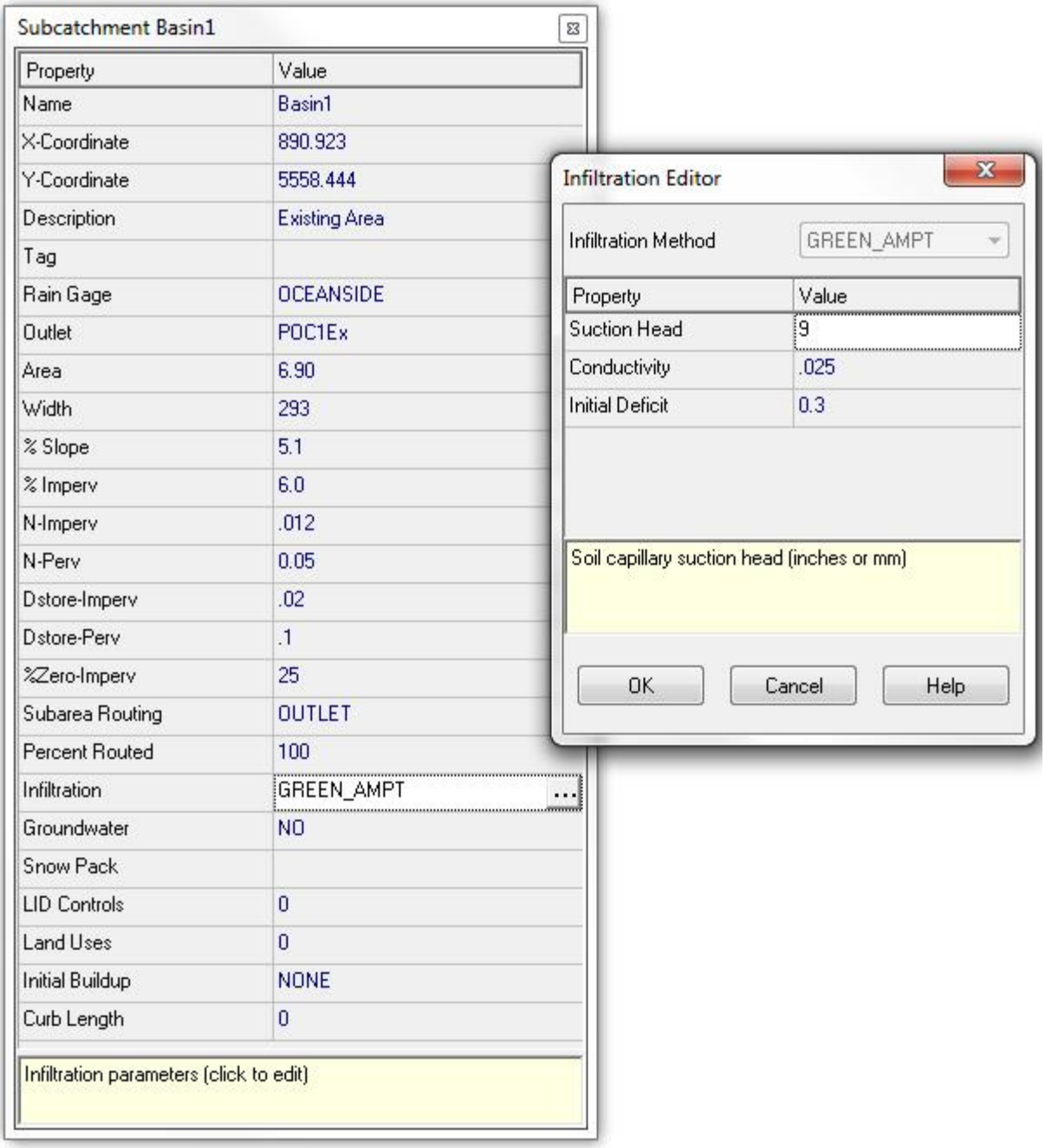
Soil Type	Suction Head	Conductivity	Initial Deficit
A	1.5	0.3	0.33
B	3	0.2	0.32
C	6	0.1	0.31
D	9	0.025	0.30

NOTE : These values are based on Maidment's Handbook of Hydrology, Orange County calibrations for SWMM and recommended values form the EPA SWMM program.

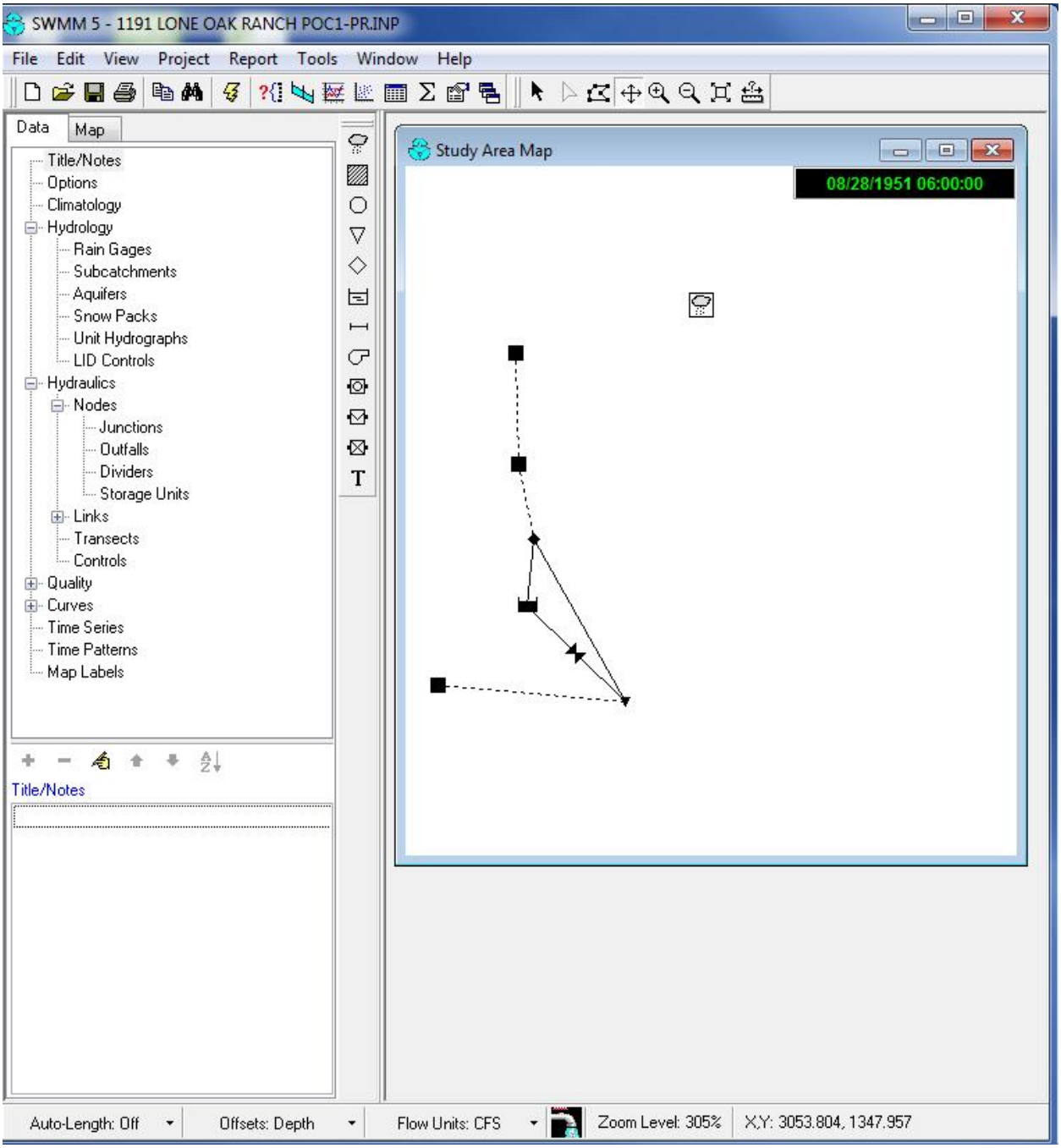
POC 1 – Pre-Developed Condition

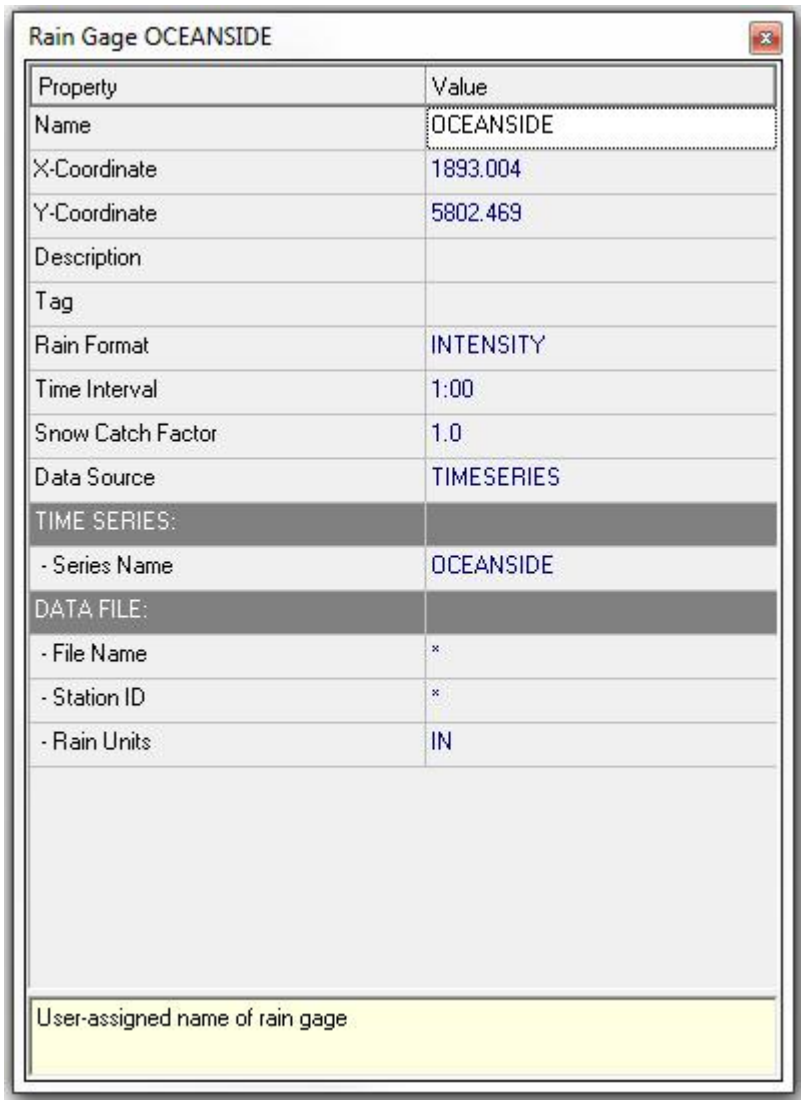



Outfall POC1Ex
Property
Value
Name
POC1Ex
X-Coordinate
1740.113
Y-Coordinate
3977.401
Description
Tag
Inflows
NO
Treatment
NO
Invert El.
0
Tide Gate
NO
Type
FREE
Fixed Outfall
Fixed Stage
0
Tidal Outfall
Curve Name
*
Time Series Outfall
Series Name
*
User-assigned name of outfall


Subcatchment Basin1
Property
Value
Name
Basin1
X-Coordinate
890.923
Y-Coordinate
5558.444
Description
Existing Area
Tag
Rain Gage
OCEANSIDE
Outlet
POC1Ex
Area
6.90
Width
293
% Slope
5.1
% Imperv
6.0
N-Imperv
.012
N-Perv
0.05
Dstore-Imperv
.02
Dstore-Perv
.1
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
Groundwater
NO
Snow Pack
LID Controls
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration parameters (click to edit)
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
9
Conductivity
.025
Initial Deficit
0.3
Soil capillary suction head (inches or mm)
OK
Cancel
Help

POC 1 – Developed Condition




Rain Gage OCEANSIDE
Property
Value
Name
OCEANSIDE
X-Coordinate
1893.004
Y-Coordinate
5802.469
Description
Tag
Rain Format
INTENSITY
Time Interval
1:00
Snow Catch Factor
1.0
Data Source
TIMESERIES
TIME SERIES:
- Series Name
OCEANSIDE
DATA FILE:
- File Name
*
- Station ID
*
- Rain Units
IN
User-assigned name of rain gage

Rain Gage OCEANSIDE

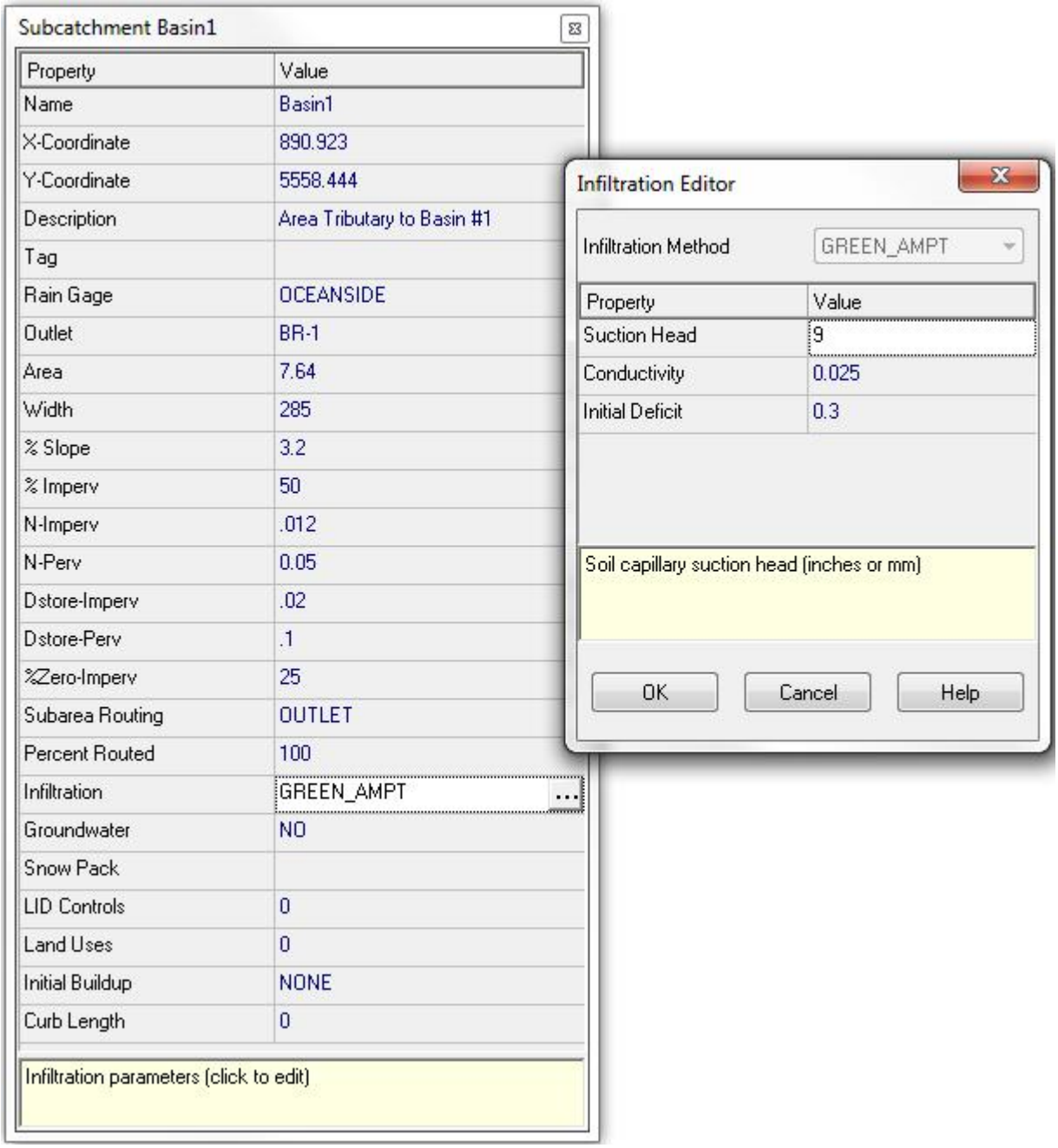
Property	Value
Name	OCEANSIDE
X-Coordinate	1893.004
Y-Coordinate	5802.469
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	OCEANSIDE
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

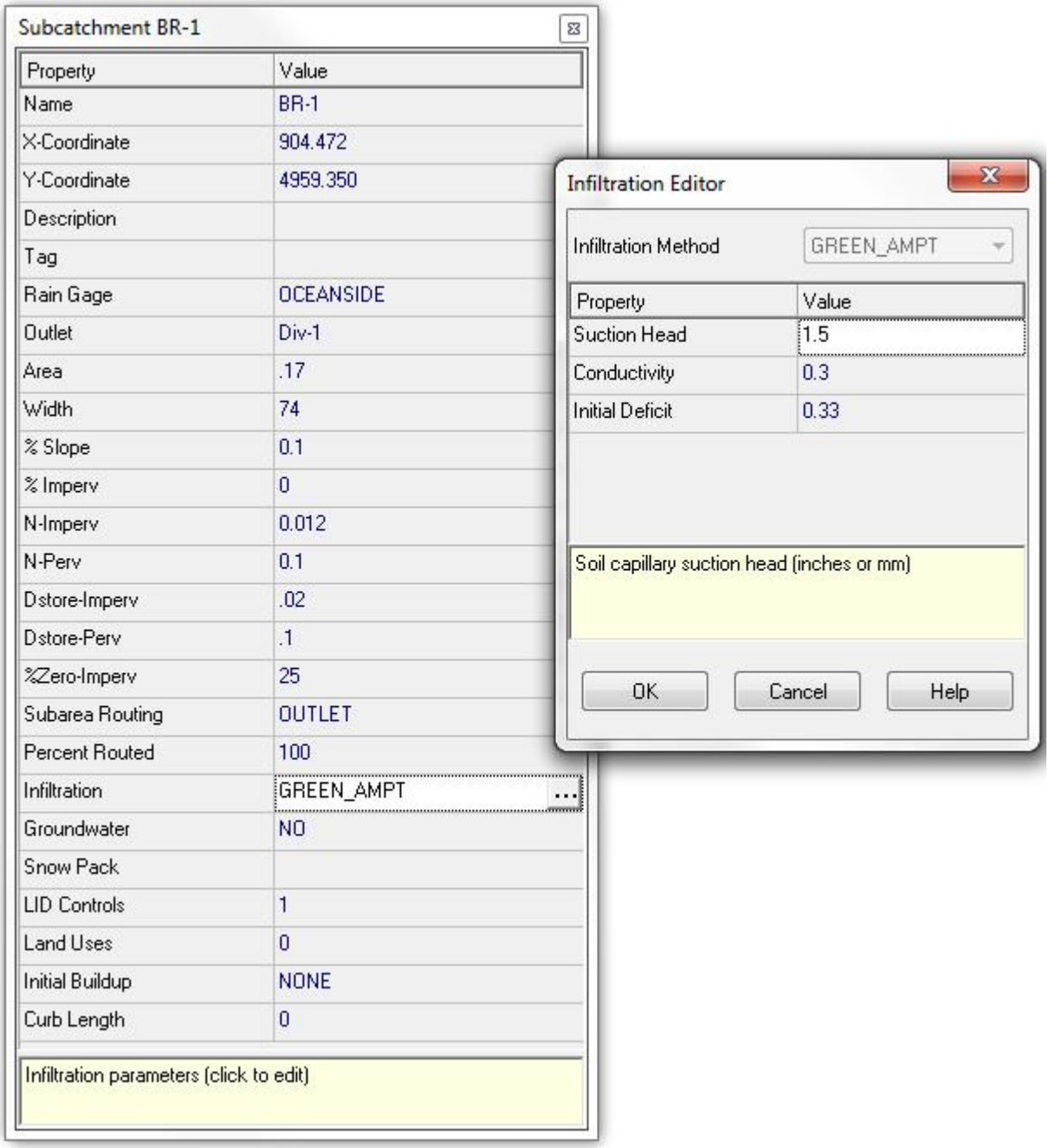
User-assigned name of rain gage

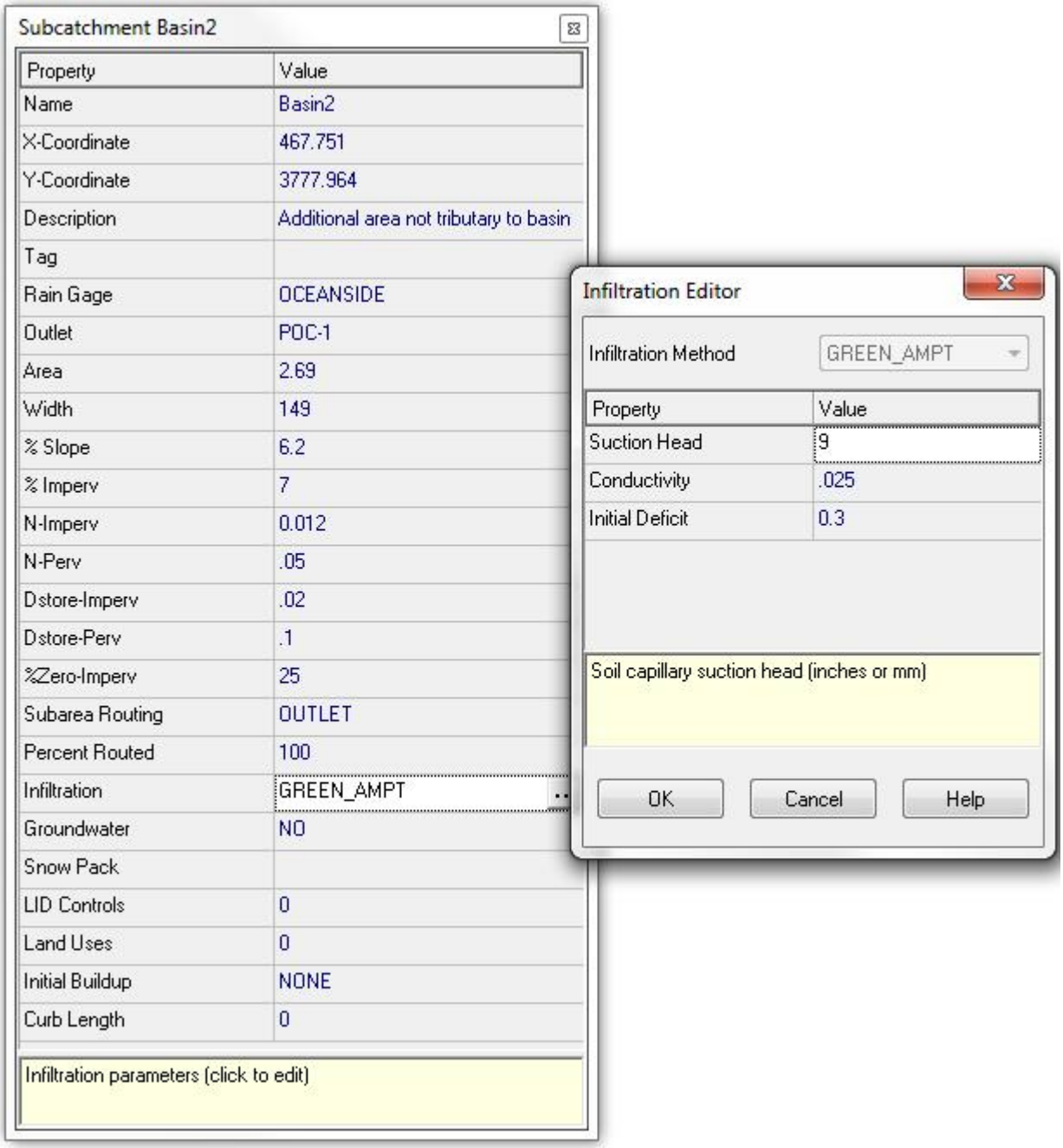
Outfall POC-1

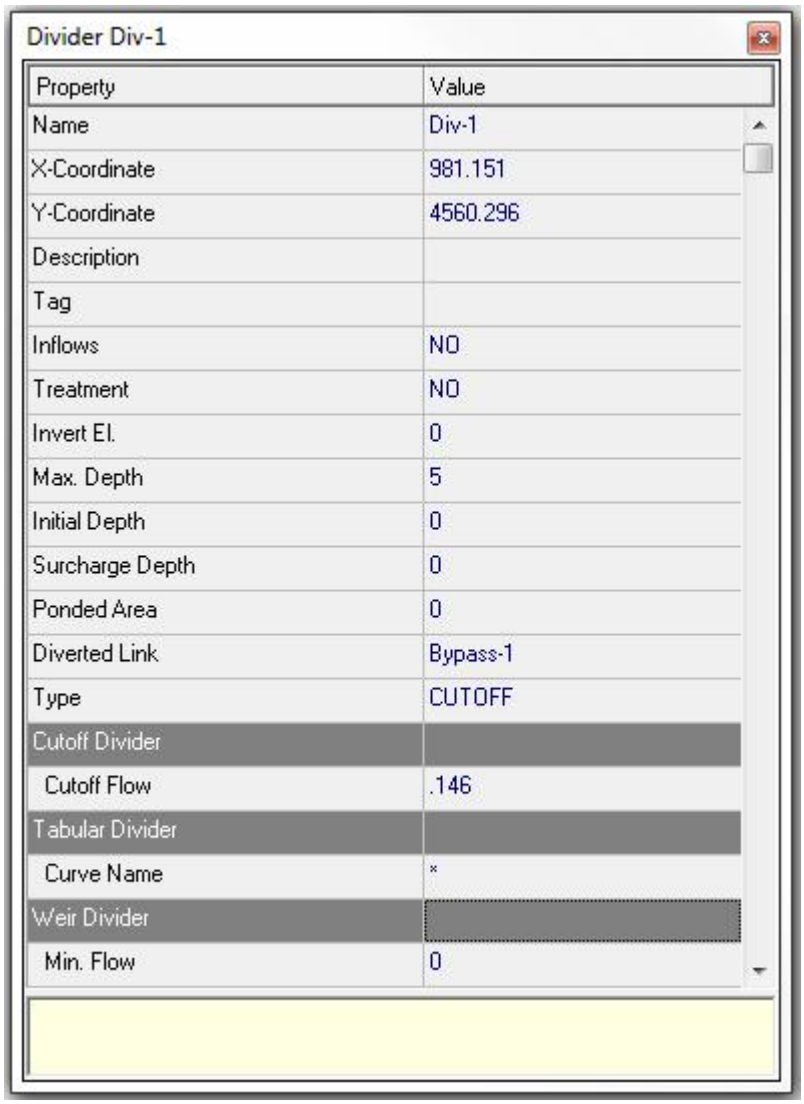
Property	Value
Name	POC-1
X-Coordinate	1477.152
Y-Coordinate	3687.566
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

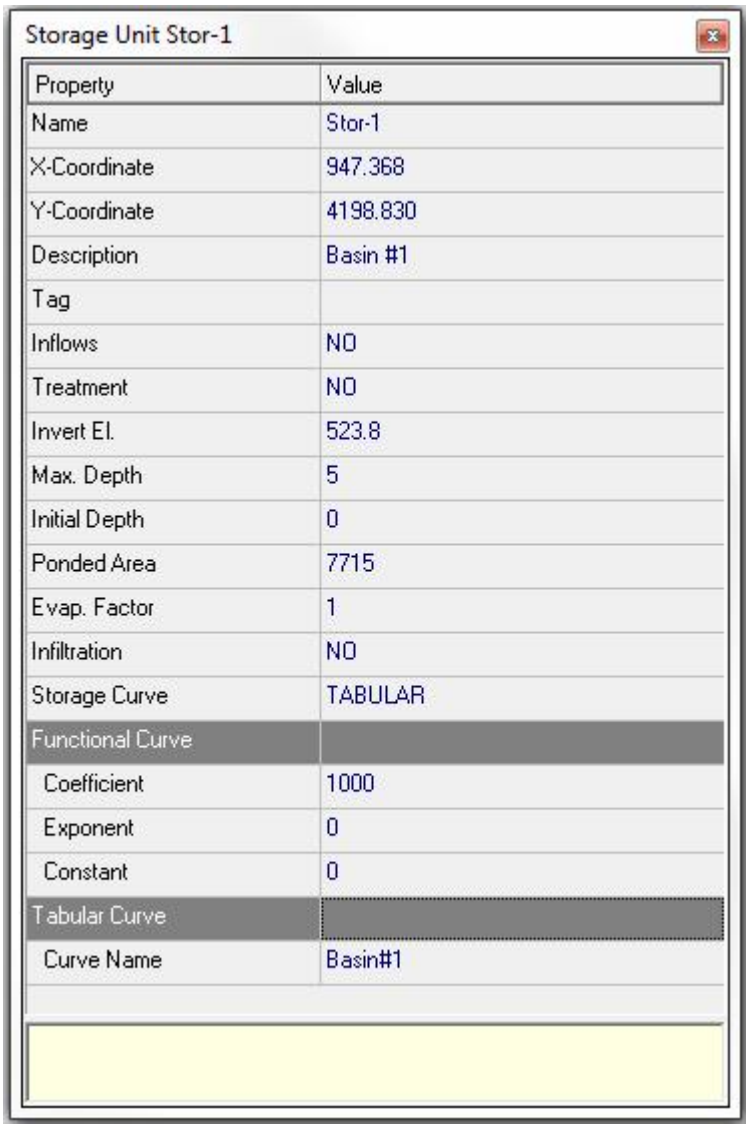
User-assigned name of outfall

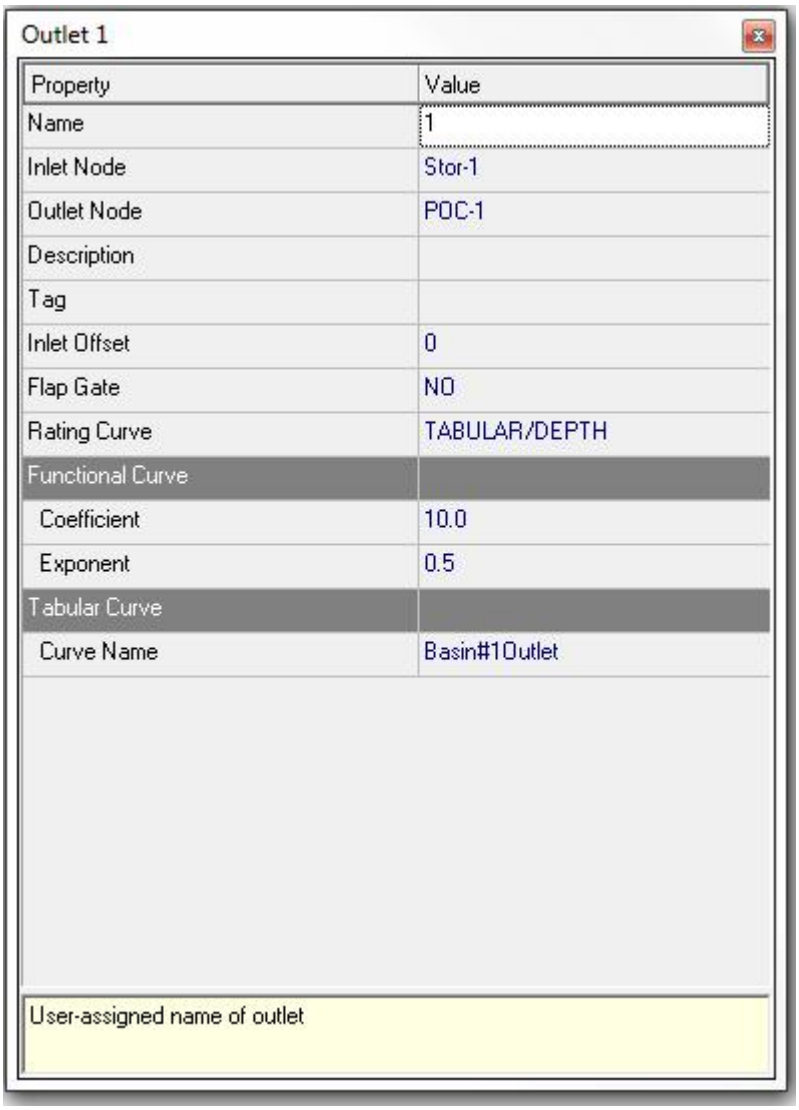

Subcatchment Basin1
Property
Value
Name
Basin1
X-Coordinate
890.923
Y-Coordinate
5558.444
Description
Area Tributary to Basin #1
Tag
Rain Gage
OCEANSIDE
Outlet
BR-1
Area
7.64
Width
285
% Slope
3.2
% Imperv
50
N-Imperv
.012
N-Perv
0.05
Dstore-Imperv
.02
Dstore-Perv
.1
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
Groundwater
NO
Snow Pack
LID Controls
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration parameters (click to edit)
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
9
Conductivity
0.025
Initial Deficit
0.3
Soil capillary suction head (inches or mm)
OK
Cancel
Help


Subcatchment BR-1
Property
Value
Name
BR-1
X-Coordinate
904.472
Y-Coordinate
4959.350
Description
Tag
Rain Gage
OCEANSIDE
Outlet
Div-1
Area
.17
Width
74
% Slope
0.1
% Imperv
0
N-Imperv
0.012
N-Perv
0.1
Dstore-Imperv
.02
Dstore-Perv
.1
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
...
Groundwater
NO
Snow Pack
LID Controls
1
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration parameters (click to edit)
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
1.5
Conductivity
0.3
Initial Deficit
0.33
Soil capillary suction head (inches or mm)
OK
Cancel
Help


Subcatchment Basin2
Property
Value
Name
Basin2
X-Coordinate
467.751
Y-Coordinate
3777.964
Description
Additional area not tributary to basin
Tag
Rain Gage
OCEANSIDE
Outlet
POC-1
Area
2.69
Width
149
% Slope
6.2
% Imperv
7
N-Imperv
0.012
N-Perv
.05
Dstore-Imperv
.02
Dstore-Perv
.1
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
Groundwater
NO
Snow Pack
LID Controls
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration parameters (click to edit)
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
9
Conductivity
.025
Initial Deficit
0.3
Soil capillary suction head (inches or mm)
OK
Cancel
Help


Divider Div-1
Property
Value
Name
Div-1
X-Coordinate
981.151
Y-Coordinate
4560.296
Description
Tag
Inflows
NO
Treatment
NO
Invert El.
0
Max. Depth
5
Initial Depth
0
Surcharge Depth
0
Ponded Area
0
Diverted Link
Bypass-1
Type
CUTOFF
Cutoff Divider
Cutoff Flow
.146
Tabular Divider
Curve Name
*
Weir Divider
Min. Flow
0


Storage Unit Stor-1
Property
Value
Name
Stor-1
X-Coordinate
947.368
Y-Coordinate
4198.830
Description
Basin #1
Tag
Inflows
NO
Treatment
NO
Invert El.
523.8
Max. Depth
5
Initial Depth
0
Ponded Area
7715
Evap. Factor
1
Infiltration
NO
Storage Curve
TABULAR
Functional Curve
Coefficient
1000
Exponent
0
Constant
0
Tabular Curve
Curve Name
Basin#1


Outlet 1
Property
Value
Name
1
Inlet Node
Stor-1
Outlet Node
POC-1
Description
Tag
Inlet Offset
0
Flap Gate
NO
Rating Curve
TABULAR/DEPTH
Functional Curve
Coefficient
10.0
Exponent
0.5
Tabular Curve
Curve Name
Basin#1Outlet
User-assigned name of outlet

EXPLANATION OF SELECTED VARIABLES

Parameters for the pre- and post-developed models include soil types B & D in accordance with the San Diego County Hydrology Manual and the USGS Soil Survey Map (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for the soil types, according to sources consulted, professional experience, and approximate values obtained by the interim Orange County modeling approach.

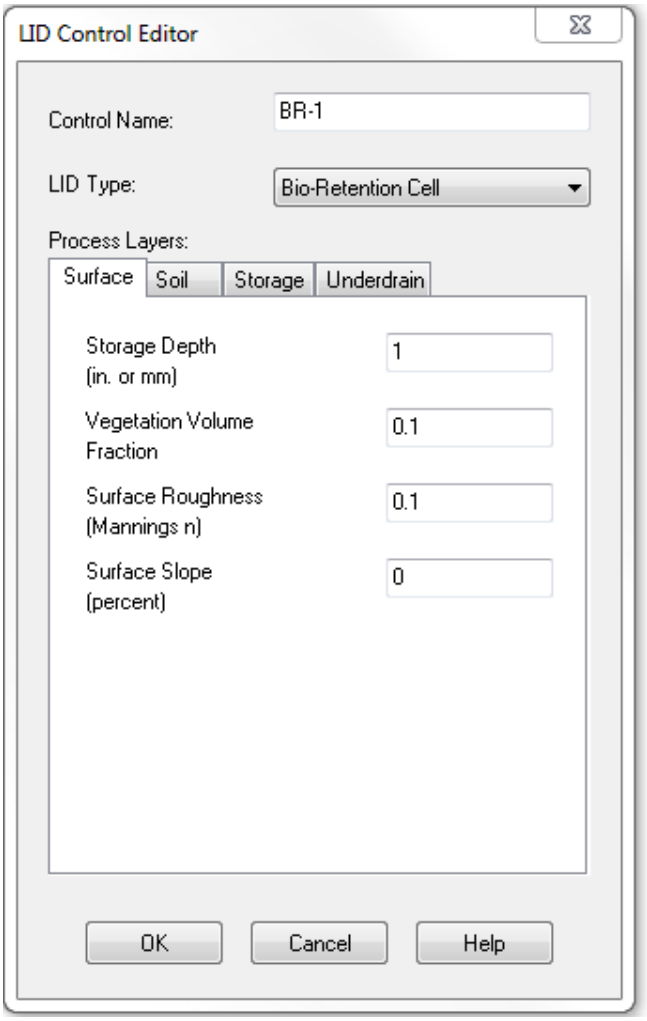
H&A selected infiltration values, such that the percentage of total precipitation that becomes runoff, is realistic for soil type D and slightly smaller than measured values for Southern California watersheds.

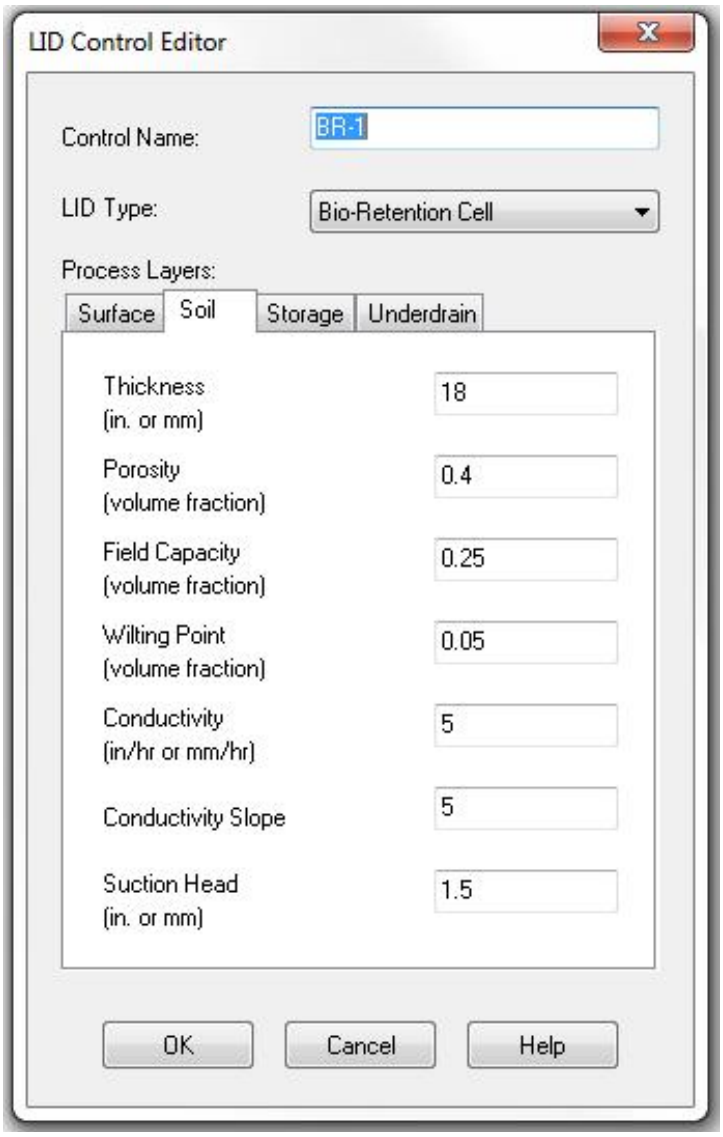
Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant than the precise routing in a system where the time of concentration is much smaller than 1 hour.

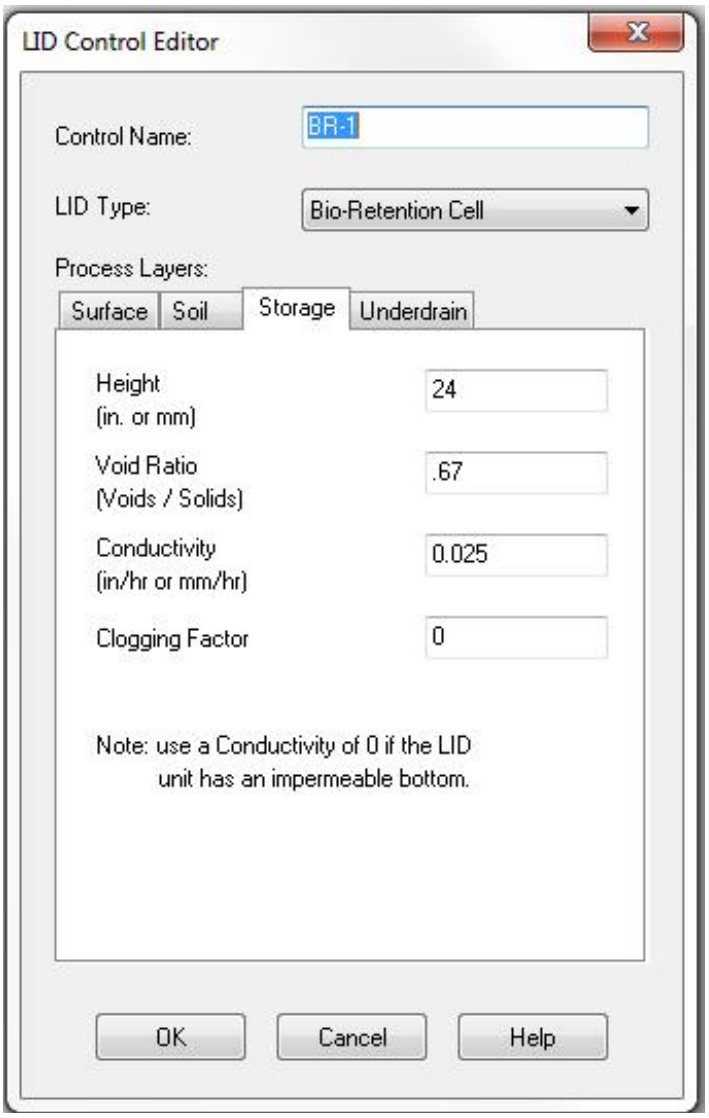
Sub-catchments BR-1

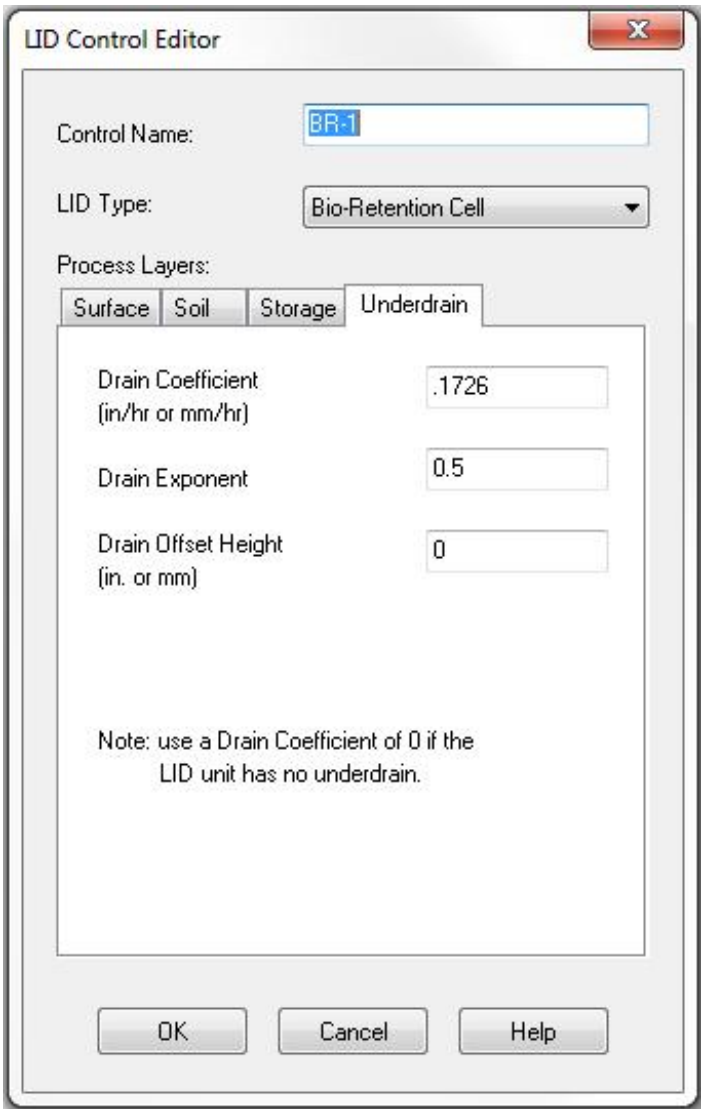
The area of Prop-X + BR-X must be equal to the area of the development tributary to that particular bio-retention facility. Five (5) decimal places were given regarding the areas of the bio-retention to insure that the area used by the program for the LID subroutine corresponds exactly with these tributaries.

BIORETENTION 1




LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Thickness
(in. or mm)
18
Porosity
(volume fraction)
0.4
Field Capacity
(volume fraction)
0.25
Wilting Point
(volume fraction)
0.05
Conductivity
(in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head
(in. or mm)
1.5
OK
Cancel
Help


LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Height
(in. or mm)
24
Void Ratio
(Voids / Solids)
.67
Conductivity
(in/hr or mm/hr)
0.025
Clogging Factor
0
Note: use a Conductivity of 0 if the LID
unit has an impermeable bottom.
OK
Cancel
Help


LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Drain Coefficient
(in/hr or mm/hr)
.1726
Drain Exponent
0.5
Drain Offset Height
(in. or mm)
0
Note: use a Drain Coefficient of 0 if the
LID unit has no underdrain.
OK
Cancel
Help

LID Control Editor: Explanation of Significant Variables

Storage Depth:
The storage depth variable within the SWMM model is representative of the storage volume provided beneath the engineered soil and mulch components of the bioretention facility. This storage volume is comprised of a gravel located bed beneath a layer of engineered soil and a 0.25 foot (3-inch) layer of landscaping mulch.

Porosity:
A porosity value of 0.4 has been selected for the model. The amended soil is to be highly sandy in content in order to have a saturated hydraulic conductivity of approximately 5 in/hr.

H&A considers such a value to be slightly high; however, in order to comply with the HMP Permit, the value recommended by the Copermittees for the porosity of amended soil is 0.4, per Appendix A of the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011.

Void Ratio:
The ratio of the void volume divided by the soil volume is directly related to porosity as n/(1-n). As the underdrain layer is composed of gravel, a porosity value of 0.4 has been selected, which results in a void ratio of 0.4/(1-0.4) = 0.67 for the gravel detention layer.

Clogging factor:
A clogging factor was not used (0 indicates that there is not clogging assumed within the model). The reason for this is related to the fairness of a comparison with the SDHM model and the HMP sizing tables: a clogging factor was not considered, and instead, a conservative value of infiltration was recommended.

Drain (Flow) coefficient:
The flow coefficient in the SWMM Model is the coefficient needed to transform the orifice equation into a general power law equation of the form:

$$q = C(H - H_D)^n \qquad (1)$$

where q is the peak flow in in/hr, n is the exponent (typically 0.5 for orifice equation), H D is the elevation of the centroid of the orifice in inches (assumed equal to the invert of the orifice for small orifices and in our design equal to 0) and H is the depth of the water in inches.

The general orifice equation can be expressed as:

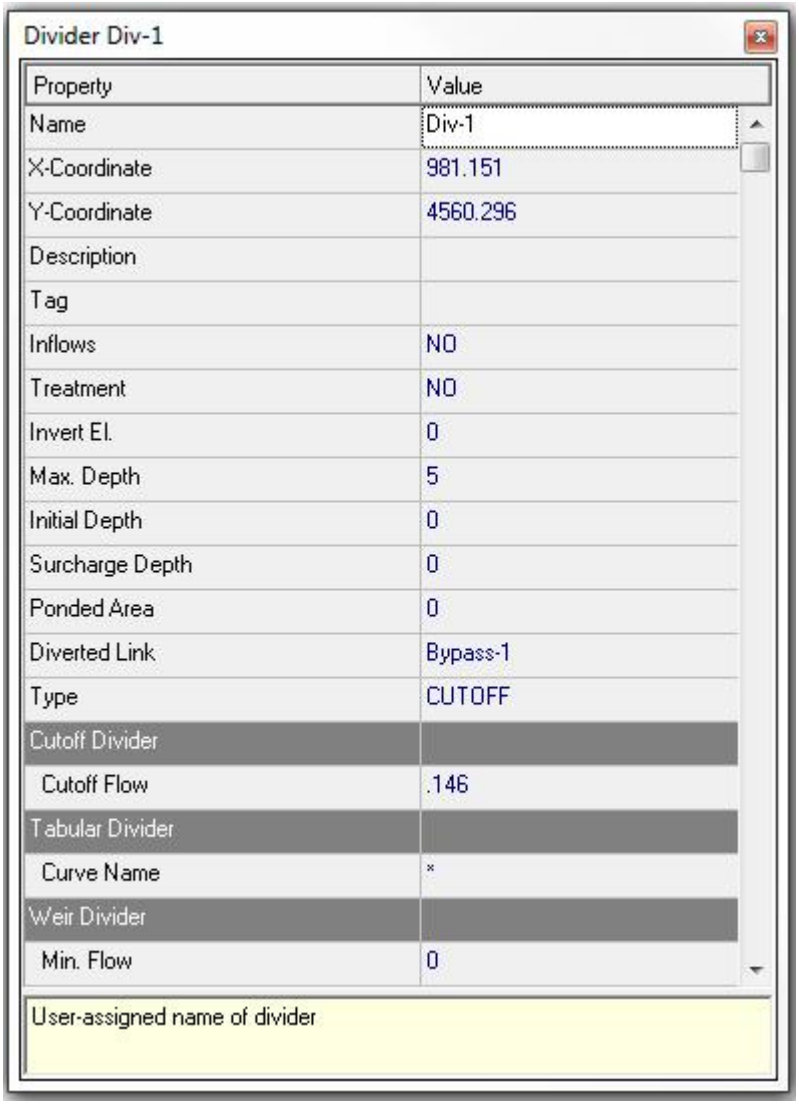
$$Q = \frac{\pi}{4} c_g \frac{D^2}{144} \sqrt{2g \frac{(H - H_D)}{12}} \qquad (2)$$

LID Outlet #1			
ABMP=	7715	sq-ft	(Area above engineered fill/bio-retention section)
			(It can also be area of infiltration at the bottom)
Cg=	0.61		(coefficient of discharge of the bottom orifice)
Dorif=	2	in	(diameter in inches of the bottom orifice)
Aorifice=	0.02182	sq-ft	(area of orifice in sq-ft)
$C_{SWMM=}$	0.1726		C coefficient to be inserted into SWMM
H-gravel=	2	ft	Depth of the gravel layer where water is ponding
	24	in	(In this case: superior bottom - mulch - ammended soil - invert of French drain)
	22	in	
H-design=	1.833	ft	H-gravel minus radius of the discharge
$Q_{orif\text{-}classic}$=	0.14460	cfs	
$Q_{orif\text{-}SWMM}$=	0.14460	cfs	
$Q_{diversion}$=	0.14605	cfs	1% additional to the Qorifice.

where Q is the peak flow in cfs, D is the diameter in inches, c g is the typical discharge coefficient for orifices (0.61-0.63 for thin walls and around 0.75-0.8 for thick walls), g is the acceleration of gravity in ft/s^2, and H and H D are defined above and are also used in inches in Equation (2).

Cutoff Flow:

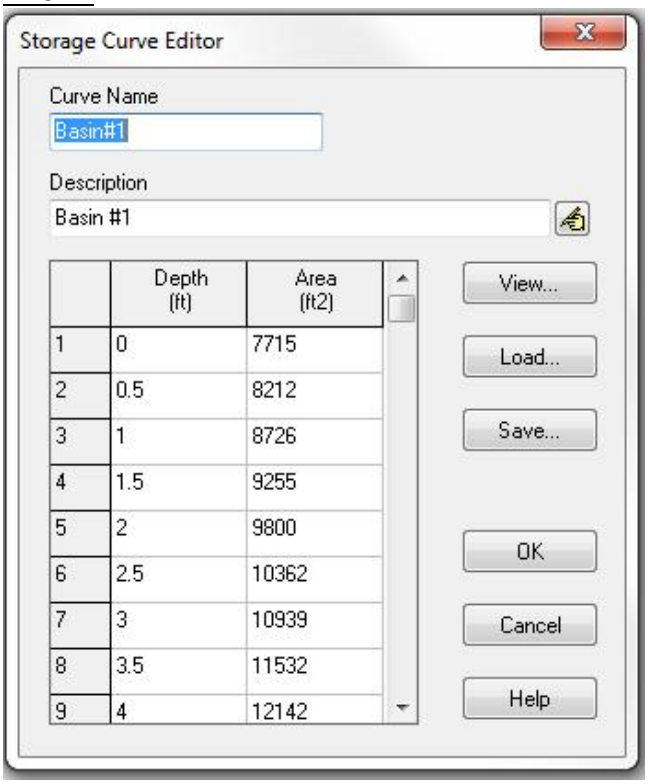
This is the only significant variable in the diversion, as the type of diversion is defined by this value. Any excess of flow over this value will be diverted into a pond subroutine (the surface stage of the bio-retention basin) and routed there. The determination of this value equates to the value obtained with equation (2) above, plus 1%, when H = depth of gravel layer and H_D=0 (orifice situated at the datum). Thus, once flows exceed the maximum discharge the LID orifice experiences a head of the storage depth, ponding occurs within the bioretention basin, routing these additional flows via the pond riser.

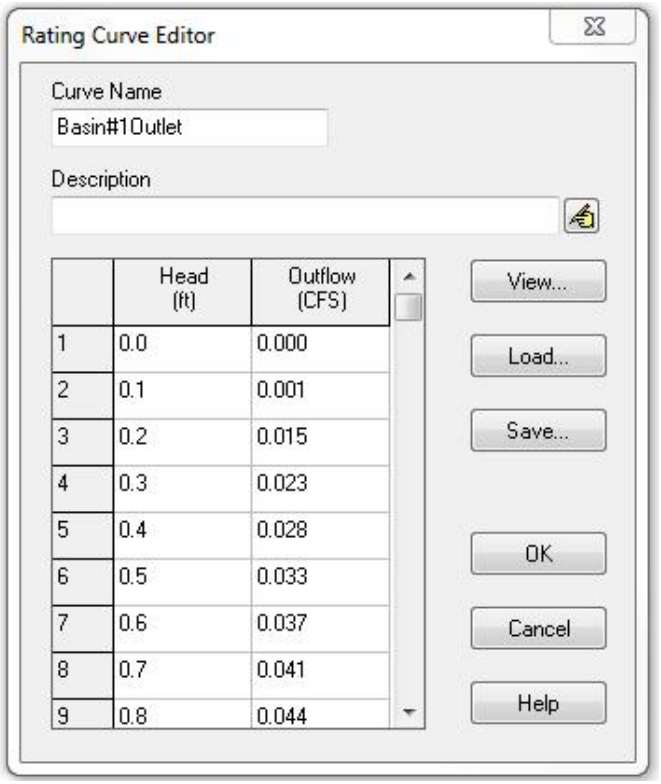


Note:

The complete storage and rating curves and the respective explanation is shown at the end of this appendix. A variable area vs. elevation storage curve was used for the final model, and a discharge that is a function of the outlet structure in the surface was used also.

BASIN:




Rating Curve Editor
Curve Name
Basin#1Outlet
Description
Head (ft)
Outflow (CFS)
1 0.0 0.000
2 0.1 0.001
3 0.2 0.015
4 0.3 0.023
5 0.4 0.028
6 0.5 0.033
7 0.6 0.037
8 0.7 0.041
9 0.8 0.044
View...
Load...
Save...
OK
Cancel
Help

ATTACHMENT 8 - Drying Time of the Surface Layer of Bio-retention cells

The LID subroutine of the SWMM Model does not increase the discharge of the lower LID orifice once the storage layer is full (in other words, it does not consider the influence of the pressure in the amended soil layer). The discharge of the lower LID orifice when the surface layer is full is considered constant by the model and equal to the discharge of the lower orifice when the storage layer is full (equal to the cutoff flows).

The drying time interval between an elevation yi and another elevation $yi - \Delta y$ can be obtained by:

$$\Delta t_i(hours) = \frac{(Q(yi)+Q(yi-\Delta y))}{7200\ (V(yi)-V(yi-\Delta y))} = \frac{Q_{ave}}{3600\ \Delta V}$$

$$t = \sum_{i=1}^{n} \Delta t_i\ (hours)$$

Q_{ave} represents the average discharge between elevation y_i and y_{i+1} obtained by $\frac{Q(yi)+Q(yi-\Delta y)}{2}$ where ΔV represents the fraction of the volume that must be discharged at a peak flow $Q_{ave}(V(yi) - V(yi - \Delta y))$.

The volume and the discharge change as the elevation changes; the calculation takes into account this change.

Basin #1		$Q_{Sub\ Drain}$=	0.15	cfs
Elevation	Q_{AVG} (CFS)	DV (CF)	DT (HR)	Total T
523.9	0.15	775	1.39	33.27
524.0	0.17	782	1.32	31.88
524.1	0.17	789	1.28	30.56
524.2	0.18	796	1.25	29.29
524.3	0.18	803	1.23	28.03
524.4	0.19	811	1.22	26.80
524.5	0.19	818	1.21	25.59
524.6	0.19	825	1.20	24.38
524.7	0.19	832	1.19	23.19
524.8	0.20	840	1.18	22.00
524.9	0.20	847	1.17	20.82
525.0	0.20	854	1.17	19.64
525.1	0.21	862	1.17	18.47
525.2	0.21	869	1.16	17.31
525.3	0.21	877	1.16	16.14
525.4	0.21	884	1.16	14.98
525.5	0.21	892	1.16	13.83
525.6	0.22	899	1.15	12.67
525.7	0.22	907	1.15	11.52
525.8	0.22	915	1.15	10.36
525.9	0.22	922	1.15	9.21
526.0	0.22	930	1.15	8.06
526.1	0.23	938	1.15	6.90
526.2	0.23	945	1.15	5.75
526.3	0.24	953	1.11	4.60
526.4	0.26	961	1.01	3.49
526.5	0.33	969	0.82	2.47
526.6	0.57	977	0.48	1.65
526.7	1.02	985	0.27	1.17
526.8	1.61	993	0.17	0.91
526.9	2.30	1001	0.12	0.73
527.0	3.09	1009	0.09	0.61
527.1	3.96	1017	0.07	0.52
527.2	4.90	1025	0.06	0.45
527.3	5.92	1033	0.05	0.39
527.4	7.00	1041	0.04	0.35
527.5	8.14	1049	0.04	0.30
527.6	9.33	1058	0.03	0.27
527.7	10.59	1066	0.03	0.24
527.8	11.89	1074	0.03	0.21
527.9	13.25	1082	0.02	0.18
528.0	14.66	1091	0.02	0.16
528.1	16.11	1099	0.02	0.14
528.2	17.61	1107	0.02	0.12
528.3	19.15	1116	0.02	0.10
528.4	20.74	1124	0.02	0.09
528.5	22.37	1133	0.01	0.07
528.6	24.04	1141	0.01	0.06
528.7	25.75	1150	0.01	0.05
528.8	27.50	1159	0.01	0.03
528.9	29.28	1167	0.01	0.02
529.0	31.11	1176	0.01	0.01

ATTACHMENT 9 – Hydromodification Watershed Maps

LEGEND

PROJECT BOUNDARY

SUBAREA BOUNDARY

FLOW DIRECTION

POC # (X)

SUBAREA ACREAGE — X ACRES

EXISTING RESIDENTIAL TO POC 1

EXISTING NATURAL GROUND TO POC 1

EXISTING BUENA CREEK ROAD

EXISTING CLEVELAND TRAIL

6.90 ACRES

44.92 ACRES

POC 1

EXISTING LONE OAK ROAD

EXISTING LONE OAK CANE

EXISTING AC CONCRETE CULVERT UNDER ROADWAY (TO REMAIN IN PLACE)

SOUTH WATERSHED
TOTAL AREA = 44.92 AC
Pre-Developed Impervious < Post-Developed Impervious,
Pre-Developed flow < Post Developed Flow
EXEMPT FROM HYDROMODIFICATION REQUIREMENTS

100 0 100 200 300

SCALE 1"=100'

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

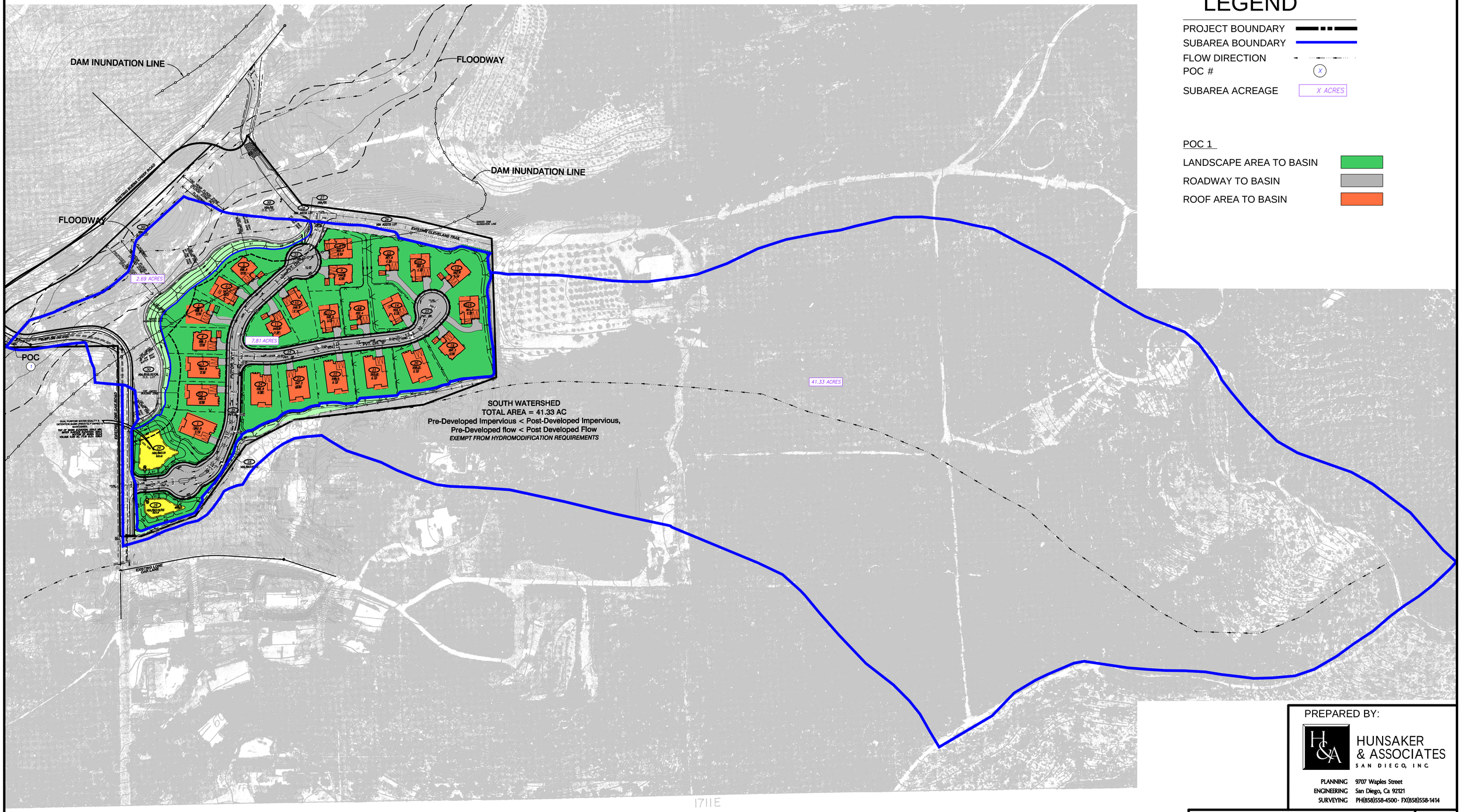
EXISTING CONDITION HYDROMOD EXHIBIT FOR:

LONE OAK RANCH

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 1 OF 2

W.O.# 2414-34T



LEGEND

PROJECT BOUNDARY

SUBAREA BOUNDARY

FLOW DIRECTION

POC # (X)

SUBAREA ACREAGE — X ACRES

POC 1

LANDSCAPE AREA TO BASIN

ROADWAY TO BASIN

ROOF AREA TO BASIN

1711E

100 0 100 200 300

SCALE 1"=100'

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

PROPOSED CONDITION HYDROMOD EXHIBIT FOR:

LONE OAK RANCH

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 2 OF 2

W.O.# 2414-541

ATTACHMENT I

Geomorphic Assessment

(Contact County staff immediately if you are planning to conduct a Geomorphic Assessment. A Geomorphic Assessment must be performed if the project is using a "Medium" low flow threshold of $0.3.Q_2$ or a "High" low flow threshold of $0.5Q_2$.)

THIS ATTACHMENT I IS NOT APPLICABLE TO THE LONE OAK RANCH PROJECT

ATTACHMENT J

HMP Exemption Documentation
(If applicable)

ATTACHMENT K

Addendum