County of San Diego
PRIORITY DEVELOPMENT PROJECT (PDP) SWQMP

COUNTY OF SAN DIEGO TM 5443 RPL3
PDS2016-TM-5443TE; PDS2016-ER-05-08-019A, PDS2017-LDGRMJ-30120

1505 YORK DRIVE
VISTA, CA 92084

ASSESSOR'S PARCEL NUMBER(S):
184-012-12

ENGINEER OF WORK:

RONALD HOLLOWAY R.C.E. 29271- EXP. 3-31-2019

REGISTERED PROFESSIONAL ENGINEER
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DATE OF SWQMP:
AUGUST 29, 2018

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SWQMP APPROVED BY:

APPROVAL DATE:

SDC PDS RCVD 10-05-18
TM5443TE

THE NOBLEST MOTIVE IS THE PUBLIC GOOD
COUNTY OF SAN DIEGO
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Attachments

Attachment 1: Backup for PDP Pollutant Control BMPs
- Attachment 1a: Storm Water Pollutant Control Worksheet Calculations
- Attachment 1b: DMA Exhibit
- Attachment 1c: Individual Structural BMP DMA Mapbook

Attachment 2: Backup for PDP Hydromodification Control Measures
- Attachment 2a: Flow Control Facility Design
- Attachment 2b: Hydromodification Management Exhibit
- Attachment 2c: Management of Critical Coarse Sediment Yield Areas
- Attachment 2d: Geomorphic Assessment of Receiving Channels (optional)
- Attachment 2e: Vector Control Plan (if applicable)

Attachment 3: Structural BMP Maintenance Plan
- Attachment 3a: Structural BMP Maintenance Thresholds and Actions
- Attachment 3b: Draft Maintenance Agreements / Notifications(when applicable)

Attachment 4: County of San Diego PDP Structural BMP Verification for DPW Permitted Land Development Projects

Attachment 5: Copy of Plan Sheets Showing Permanent Storm Water BMPs

Attachment 6: Copy of Project's Drainage Report

Attachment 7: Copy of Project's Geotechnical and Groundwater Investigation Report

Acronyms

ACP	Alternative Compliance Project
APN	Assessor's Parcel Number
BMP	Best Management Practice
BMP DM	Best Management Practice Design Manual
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDCI	Private Development Construction Inspection Section
PDP	Priority Development Project
PDS	Planning and Development Services
PE	Professional Engineer
RPO	Resource Protection Ordinance
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWQMP	Storm Water Quality Management Plan
WMAA	Watershed Management Area Analysis
WPO	Watershed Protection Ordinance
WQIP	Water Quality Improvement Plan

PDP SWQMP Preparer's Certification Page

Project Name: TM 5443 RPL 3
Permit Application Number: PDS2016-TM-5443TE; PDS2016-ER-05-08-019A, PDS2017-LDGRMJ-30120

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with local County of San Diego Watershed Protection Ordinance (Sections 67.801 et seq.) and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100) requirements for storm water management.

I have read and understand that the County of San Diego has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by County staff is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

RCE29271, EXP 3-31-19
Engineer of Work's Signature, PE Number & Expiration Date

REGISTERED PROFESSIONAL ENGINEER
RONALD L. HOLLOWAY
No. 29271
CIVIL
STATE OF CALIFORNIA

Ronald Holloway
Print Name

bHA, Inc
land planning, civil engineering, surveying
Company

5, 2018
September 20, 2017
Date

Engineer's Seal:

Template Date: March 16, 2016
LUEG:SW **PDP SWQMP**

Preparation Date: September 20, 2017

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Submittal Record

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Preliminary Design / Planning / CEQA

Submittal Number	Date	Summary of Changes
1	January 24, 2017	Initial Submittal
2	July 18, 2018	2nd Submittal
3		
4		

Final Design

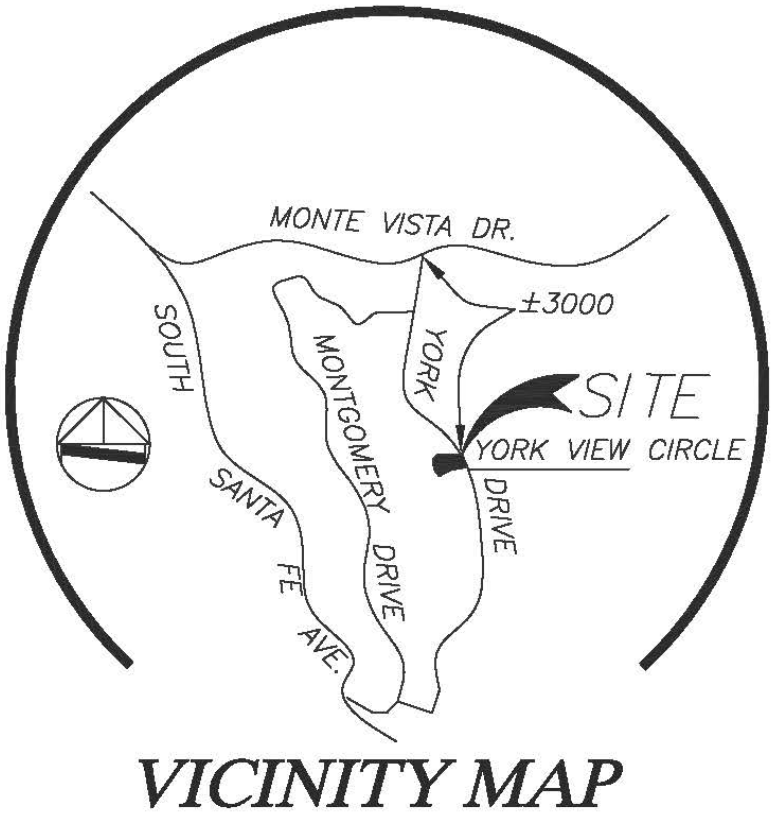
Submittal Number	Date	Summary of Changes
1	September 20, 2017	Initial Submittal
2	May 18, 2018	2nd
3		
4		

Plan Changes

Submittal Number	Date	Summary of Changes
1		Initial Submittal
2		
3		
4		

Project Vicinity Map

Project Name: TM 5443 RPL3
Record ID: PDS2016-TM-5443TE; PDS2016-ER-05-08-019A, PDS2017-LDGRMJ-30120



VICINITY MAP

Step 1: Project type determination (Standard or Priority Development Project)

Is the project part of another Priority Development Project (PDP)? If so, a PDP SWQMP is required. Go to Step 2.			(☐ Yes ☒ No
The project is (select one): ☒ New Development ☐ Redevelopment[1]			
The total proposed newly created or replaced impervious area is:			36,976 ft^2
The total existing (pre-project) impervious area is:			7,916 ft^2
The total area disturbed by the project is:			122,938 ft^2
If the total area disturbed by the project is 1 acre (43,560 sq. ft.) or more OR the project is part of a larger common plan of development disturbing 1 acre or more, a Waste Discharger Identification (WDID) number must be obtained from the State Water Resources Control Board. WDID: _(To be obtained)__			
Is the project in any of the following categories, (a) through (f)?[2]			
Yes ☒	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces [3](collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

[1] Redevelopment is defined as: The creation and/or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include routine maintenance activities, such as trenching and resurfacing associated with utility work; pavement grinding; resurfacing existing roadways; new sidewalks construction; pedestrian ramps; or bike lanes on existing roads; and routine replacement of damaged pavement, such as pothole repair.

[2] Applicants should note that any development project that will create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site) is considered a new development.

[3] For solar energy farm projects, the area of the solar panels does not count toward the total impervious area of the site.

Project type determination (continued)

Yes ☐	No ☒	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). *Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See BMP Design Manual Section 1.4.2 for additional guidance.*
Yes ☐	No ☒	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.
Yes ☒	No ☐	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See BMP Design Manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the Priority Development Project categories (a) through (f) listed above?

☐ No – the project is not a Priority Development Project (Standard Project).

☒ Yes – the project is a Priority Development Project (PDP).

Further guidance may be found in Chapter 1 and Table 1-2 of the BMP Design Manual.

The following is for **redevelopment PDPs only**:

The area of existing (pre-project) impervious area at the project site is: ft² (A)
The total proposed newly created or replaced impervious area is ft² (B)
Percent impervious surface created or replaced (B/A)*100: %
The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – **only newly created or replaced impervious areas are considered a PDP and subject to stormwater requirements**

OR

☐ greater than fifty percent (50%) – **the entire project site is considered a PDP and subject to stormwater requirements**

Step 1.1: Storm Water Quality Management Plan requirements

Step	Answer	Progression
Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, complete Step 1 Project Type Determination Checklist on Pages 1 and 2, and see PDP exemption information below. For further guidance, see Section 1.4 of the BMP Design Manual *in its entirety*.	☐ Standard Project	Standard Project requirements apply, including Standard Project SWQMP. **Complete Standard Project SWQMP.**
	☒ PDP	Standard and PDP requirements apply, including PDP SWQMP. **Complete PDP SWQMP.**
	☐ PDP with ACP	If participating in offsite alternative compliance, **complete Step 6.3 and an ACP SWQMP.**
	☐ PDP Exemption	**Go to Step 1.2 below.**

Step 1.2: Exemption to PDP definitions

Is the project exempt from PDP definitions based on either of the following:	If so:
☐ Projects that are only new or retrofit paved sidewalks, bicycle lanes, or trails that meet the following criteria: (i) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR (ii) Designed and constructed to be hydraulically disconnected from paved streets or roads [i.e., runoff from the new improvement does not drain directly onto paved streets or roads]; OR (iii) Designed and constructed with permeable pavements or surfaces in accordance with County of San Diego Guidance on Green Infrastructure;	Standard Project requirements apply, AND any additional requirements specific to the type of project. County concurrence with the exemption is required. *Provide discussion and list any additional requirements below in this form.* **Complete Standard Project SWQMP**
☐ Projects that are only retrofitting or redeveloping existing paved alleys, streets or roads that are designed and constructed in accordance with the County of San Diego Guidance on Green Infrastructure.	**Complete Green Streets PDP Exempt SWQMP.**
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:	

Step 2: Construction Storm Water BMP Checklist

Minimum Required Standard Construction Storm Water BMPs		
If you answer "Yes" to any of the questions below, your project is subject to Table 1 on the following page (Minimum Required Standard Construction Stormwater BMPs). As noted in Table 1, please select at least the minimum number of required BMPs, or as many as are feasible for your project. If no BMP is selected, an explanation must be given in the box provided. The following questions are intended to aid in determining construction BMP requirements for your project. **Note: All selected BMPs below must be included on the BMP plan incorporated into the construction plan sets.**		
1. Will there be soil disturbing activities that will result in exposed soil areas? (This includes minor grading and trenching.) **Reference Table 1 Items A, B, D, and E** Note: Soil disturbances NOT considered significant include, but are not limited to, change in use, mechanical/electrical/plumbing activities, signs, temporary trailers, interior remodeling, and minor tenant improvement.	☒Yes	☐No
2. Will there be asphalt paving, including patching? **Reference Table 1 Items D and F**	☒Yes	☐No
3. Will there be slurries from mortar mixing, coring, or concrete saw cutting? **Reference Table 1 Items D and F**	☒Yes	☐No
4. Will there be solid wastes from concrete demolition and removal, wall construction, or form work? **Reference Table 1 Items D and F**	☒Yes	☐No
5. Will there be stockpiling (soil, compost, asphalt, concrete, solid waste) for over 24 hours? **Reference Table 1 Items D and F**	☒Yes	☐No
6. Will there be dewatering operations? **Reference Table 1 Items C and D**	☒Yes	☐No
7. Will there be temporary on-site storage of construction materials, including mortar mix, raw landscaping and soil stabilization materials, treated lumber, rebar, and plated metal fencing materials? **Reference Table 1 Items E and F**	☒Yes	☐No
8. Will trash or solid waste product be generated from this project? **Reference Table 1 Item F**	☒Yes	☐No
9. Will construction equipment be stored on site (e.g.: fuels, oils, trucks, etc.?) **Reference Table 1 Item F**	☒Yes	☐No
10. Will Portable Sanitary Services ("Porta-potty") be used on the site? **Reference Table 1 Item F**	☒Yes	☐No

Table 1. Construction Storm Water BMP Checklist

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook[4] Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
A. Select Erosion Control Method for Disturbed Slopes (choose at least one for the appropriate season)			
Vegetation Stabilization Planting[5] (Summer)	SS-2, SS-4	☒	Sheet 8, PDS2017-LDGRMJ-30120
Hydraulic Stabilization Hydroseeding[2] (Summer)	SS-4	☒	
Bonded Fiber Matrix or Stabilized Fiber Matrix[6] (Winter)	SS-3	☒	
Physical Stabilization Erosion Control Blanket[3] (Winter)	SS-7	☒	
B. Select erosion control method for disturbed flat areas (slope < 5%) (choose at least one)			
County Standard Lot Perimeter Protection Detail	PDS 659[7], SC-2	☐	Sheet 8, PDS2017-LDGRMJ-30120
Will use erosion control measures from Item A on flat areas also	SS-3, 4, 7	☒	
County Standard Desilting Basin (must treat all site runoff)	PDS 660[8], SC-2	☐	
Mulch, straw, wood chips, soil application	SS-6, SS-8	☐	

4 State of California Department of Transportation (Caltrans). 2003. Storm Water Quality Handbooks, Construction Site Best Management Practices (BMPs) Manual. March. Available online at: http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm.

5 If Vegetation Stabilization (Planting or Hydroseeding) is proposed for erosion control it may be installed between May 1st and August 15th. Slope irrigation is in place and needs to be operable for slopes >3 feet. Vegetation must be watered and established prior to October 1st. The owner must implement a contingency physical BMP by August 15th if vegetation establishment does not occur by that date. If landscaping is proposed, erosion control measures must also be used while landscaping is being established. Established vegetation must have a subsurface mat of intertwined mature roots with a uniform vegetative coverage of 70 percent of the natural vegetative coverage or more on all disturbed areas.

6 All slopes over three feet must have established vegetative cover prior to final permit approval.

7 County of San Diego, Planning & Development Services. 2012. Standard Lot Perimeter Protection Design System. Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds659.pdf.

8 County of San Diego, Planning & Development Services. 2012. County Standard Desilting Basin for Disturbed Areas of 1 Acre or Less Building Division. PDS 659. Available online at http://www.sandiegocounty.gov/pds/docs/pds660.pdf.

Table 1. Construction Storm Water BMP Checklist (continued)

Minimum Required Best Management Practices (BMPs)	CALTRANS SW Handbook Detail or County Std. Detail	✔ BMP Selected	Reference sheet No.'s where each selected BMP is shown on the plans. If no BMP is selected, an explanation must be provided.
C. If runoff or dewatering operation is concentrated, velocity must be controlled using an energy dissipater			
Energy Dissipater Outlet Protection[9]	SS-10	☒	Sheet 8, PDS2017-LDGRMJ-30120
D. Select sediment control method for all disturbed areas (choose at least one)			
Silt Fence	SC-1	☒	Sheet 8, PDS2017-LDGRMJ-30120
Fiber Rolls (Straw Wattles)	SC-5	☒	
Gravel & Sand Bags	SC-6 & 8	☒	
Dewatering Filtration	NS-2	☐	
Storm Drain Inlet Protection	SC-10	☒	
Engineered Desilting Basin (sized for 10-year flow)	SC-2	☐	
E. Select method for preventing offsite tracking of sediment (choose at least one)			
Stabilized Construction Entrance	TC-1	☒	Sheet 8, PDS2017-LDGRMJ-30120
Construction Road Stabilization	TC-2	☐	
Entrance/Exit Tire Wash	TC-3	☒	
Entrance/Exit Inspection & Cleaning Facility	TC-1	☒	
Street Sweeping and Vacuuming	SC-7	☒	
F. Select the general site management BMPs			
F.1 Materials Management			
Material Delivery & Storage	WM-1	☒	Sheet 8, PDS2017-LDGRMJ-30120
Spill Prevention and Control	WM-4	☒	
F.2 Waste Management[10]			
Waste Management Concrete Waste Management	WM-8	☒	Sheet 8, PDS2017-LDGRMJ-30120
Solid Waste Management	WM-5	☒	
Sanitary Waste Management	WM-9	☒	
Hazardous Waste Management	WM-6	☒	

Note: The Construction General Permit (Order No. 2009-0009-DWQ) also requires all projects not subject to the BMP Design Manual to comply with runoff reduction requirements through the implementation of post-construction BMPs as described in Section XIII of the order.

[9] Regional Standard Drawing D-40 – Rip Rap Energy Dissipater is also acceptable for velocity reduction.

[10] Not all projects will have every waste identified. The applicant is responsible for identifying wastes that will be onsite and applying the appropriate BMP. For example, if concrete will be used, BMP WM-8 must be selected.

Step 3: County of San Diego PDP SWQMP Site Information Checklist

Step 3.1: Description of Existing Site Condition

Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	904 Carlsbad HU; 904.3 Agua Hedionda HA, & 904.32 Buena HSA

Current Status of the Site (select all that apply):

- ☒ Existing development
- ☐ Previously graded but not built out
- ☐ Demolition completed without new construction
- ☐ Agricultural or other non-impervious use
- ☐ Vacant, undeveloped/natural

Description / Additional Information:
The project is located on the western side of York Drive, near York View Circle and approximately 3,000 feet south of Monte Vista Drive. Currently, two single family residences occupy the site. The project is surrounded by single family residences. Site terrain continues to support native grass with few scattered shrubs.

Existing Land Cover Includes (select all that apply and provide each area on site):

- ☒ Vegetative Cover 2.64 Acres (115,022 Square Feet)
- ☐ Non-Vegetated Pervious Areas _____ Acres (_____ Square Feet)
- ☒ Impervious Areas 0.18 Acres (7,916 Square Feet)

Description / Additional Information:
The majority of the property is covered by small vegetative growth. The site also includes impervious residential structures and driveway areas as described above.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

- ☒ NRCS Type A
- ☒ NRCS Type B
- ☐ NRCS Type C
- ☐ NRCS Type D

Approximate Depth to Groundwater (GW) (or N/A if no infiltration is used):

- ☐ GW Depth < 5 feet
- ☐ 5 feet < GW Depth < 10 feet
- ☐ 10 feet < GW Depth < 20 feet
- ☒ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):
☒ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☐ None
☐ Other

Description / Additional Information:
Upstream runoff is intercepted by an existing 18-inch storm drain crossing York Drive along the easterly boundary and by a shallow intermittent natural swale near the northwesterly property corner. The 18-inch storm drain discharges the runoff on-site, where it drains westerly to the shallow intermittent natural drainage swale to the westerly boundary, where it confluences with the runoff from the north.

Step 3.2: Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

(1) Whether existing drainage conveyance is natural or urban;
(2) Is runoff from offsite conveyed through the site? if yes, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site;
(3) Provide details regarding existing project site drainage conveyance network, including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels; and
(4) Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Describe existing site drainage patterns:
The 2.82-acre project site is located in the unincorporated Vista area of the San Diego County, California. Currently, two single family residences occupy the site. The remaining site is vacant with native grass and few scattered shrubs. The project is surrounded by single family residences. Hydrologic group soils A & B were located on the project site via the USGS web soil survey data for the project site (See References).

The project site receives upstream runoff from the north and northeast. Upstream runoff from the northeast is intercepted by an existing 18-inch storm drain crossing York Drive along the easterly boundary and by a shallow intermittent natural swale near the northwesterly property corner. The 18-inch storm drain discharges the runoff on-site, where it drains westerly to the shallow drainage swale and confluences with the runoff from the north. The shallow natural drainage swale serves as the project's Point of Compliance (POC).

Infiltration testing was performed by Vinje & Middleton Engineering to evaluate the general infiltration rate of the project site. An analysis of the field test data is included in the *Percolation Data* by Vinje & Middleton Engineering, December 15, 2016 (Attachment 7).

According to the *Percolation Data*, infiltration rates are considered high and within the range for Type A hydrologic soils. Therefore the entire project site will be modeled with existing Type A soils.

Please refer to Step 3.8- Other Site Requirements and Constraints for a full discussion of infiltration testing.

Step 3.3: Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:
This project proposes to subdivide the existing property into 5 lots. Proposed development includes the grading of 4 pads for single family residences, a private road, the improvement of York Drive, and storm drain infrastructure. One of the existing homes will be demolished and removed, while the other existing home, on the lot nearest to York Drive, will remain. Drainage patterns reflected on the DMA Exhibit will respect the existing drainage basin and will discharge to the POC previously identified in the existing condition analysis. POC-1 includes new impervious contributing area and is subject to Hydromodification Plan (HMP) compliance.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):
The proposed impervious features of the project include 4 single-family residences with driveways, the paved private cul-de-sac, and the improvement of York Drive.

List/describe proposed pervious features of the project (e.g., landscape areas):
The proposed pervious features of the project include landscape areas surrounding the proposed residences and the proposed biofiltration basins.

Does the project include grading and changes to site topography?

☒ Yes

☐ No

Description / Additional Information:
Project grading will occur on approximately 2.63 acres of the project, which comprises approximately 93 percent of the total parcel area. The proposed site topography will continue to direct flow southwesterly. The site will be flattened, as compared to existing conditions, in order to facilitate construction of residential pads and drive aisles. Grading on the site has been minimized to the maximum extent possible.

Grading has also been limited to avoid the existing 100-year inundation in the western portion of the project. Storm drain pipes and minor concrete drainage channels are proposed to carry runoff safely to the existing discharge location. Biofiltration basins are proposed for flow control and to mitigate peak flow rates to predevelopment conditions. Post-development site flow will mimic existing drainage conditions, and will discharge from the site at below historical flow rates. Impervious surfaces have been minimized where feasible.

Insert acreage or square feet for the different land cover types in the table below:

Change in Land Cover Type Summary			
Land Cover Type	Existing (acres or ft^2)	Proposed (acres or ft^2)	Percent Change

Vegetation	2.64 acres	1.78 acres	32.6%
Pervious (non-vegetated)			
Impervious	0.18 acres	0.85 acres	372.2%

Step 3.4: Description of Proposed Site Drainage Patterns

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☒Yes

☐No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre- and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Describe proposed site drainage patterns:
Storm water runoff from the project site is routed to one (1) Point of Compliance (POC), located at the discharge location to the westerly boundary of the project site.

The developed hydrology for this project respects the existing drainage basin. The upstream runoff intercepted by the existing 18-inch storm drain at York Drive will be conveyed by a proposed storm drain system to the cul-de-sac of Happy Daze Lane. Flow is then conveyed by two 24-inch storm drains underneath the cul-de-sac and northerly lot line of Lot 4, and outlets to the shallow intermittent natural drainage swale near the westerly boundary, where it confluences with the runoff from the north.

Prior to discharging from the project site, developed site runoff is drained to five (5) onsite receiving biofiltration BMPs. Once flows are routed via the proposed HMP-BMPs, developed flows are then discharged to the existing point of drainage from the project site.

The developed hydrology for this project respects the existing drainage basin. The upstream runoff intercepted by the existing 18-inch storm drain at York Drive will be conveyed by a proposed 30”-dia storm drain system to the cul-de-sac of Happy Daze Lane. Flow is then conveyed by two 24”-dia storm drains underneath the cul-de-sac and northerly lot line of Lot 4 and outlets to the shallow intermittent natural drainage swale near the westerly boundary, where it confluences with the runoff from the north. Two 24”-dia storm drains are used instead of a 30-inch pipe to maintain the minimum cover of 2 feet over the storm drain crossing at Lot 4 and to daylight the storm drain into the shallow intermittent natural drainage swale.

The two vegetated areas (SM-1 & SM-2) that lie along the westerly slopes of Lots 3 and 4 are unable to drain to the receiving biofiltration basins and bypass these facilities, draining directly to POC-1.

A third landscape area (SM-3) along the southerly project boundary is also unable to drain to the receiving biofiltration basins and bypasses these facilities, draining directly to POC-1.

Runoff from the impervious surfaces on Lots 1-4 are routed to pervious dispersion areas before draining to yard swales and the proposed biofiltration basins. These areas have been designed with the site design BMP SD-5 Impervious Area Dispersion per Appendix E.3 of the County of San Diego BMP Design Manual.

The proposed basins will be designed as a biofiltration BMPs (BF-2) for hydromodification and storm water pollutant control. Flows will discharge from the basins via the outlet structure or infiltrate through the base of the facilities to the receiving soil media and low flow orifice. An underdrain pipe will also be provided within the basin to carry away filtered runoff. Below the underdrain pipe, the basins are lined to prevent storm water infiltration. The underdrain pipe will direct flow to the proposed storm drain system, which will outlet at the existing point of discharge at POC-1.

There are two (2) De Minimis areas (DM-1 and DM-2), asphalt driveways that are infeasible to treat, DM-1 is located on Lot 5, north of Happy Daze Lane and contains 192 square feet. DM-2 is located south of Happy Daze Lane, near Lot 4 driveway entrance and contains 339 square feet. The total area of the two de minimis areas are less than 2% of the total added or replaced impervious area for the project.

Step 3.5: Potential Pollutant Source Areas

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply). Select "Other" if the project is a phased development and provide a description:

- ☒ On-site storm drain inlets
- ☐ Interior floor drains and elevator shaft sump pumps
- ☐ Interior parking garages
- ☒ Need for future indoor & structural pest control
- ☒ Landscape/Outdoor Pesticide Use
- ☐ Pools, spas, ponds, decorative fountains, and other water features
- ☐ Food service
- ☐ Refuse areas
- ☐ Industrial processes
- ☐ Outdoor storage of equipment or materials
- ☐ Vehicle and Equipment Cleaning
- ☐ Vehicle/Equipment Repair and Maintenance
- ☐ Fuel Dispensing Areas
- ☐ Loading Docks
- ☐ Fire Sprinkler Test Water
- ☐ Miscellaneous Drain or Wash Water
- ☐ Plazas, sidewalks, and parking lots
- ☐ Other (provide description)

Description / Additional Information:
An Operation and Maintenance (O&M) Plan will be provided to future occupants that will acknowledge the potential pollutant sources and provide educational materials to prevent illicit discharges to the storm drain system. The following will discuss how source control requirements will be applied to the project:

• Storm drain inlets and catch basins will be labeled with "No Dumping Drains to Waterways". See DMA Exhibit for structural BMP label.

• Pest-resistant or well-adapted plant varieties such as drought tolerant and/or native plants will be planted in landscape areas. Integrated Pest Management (IPM) educational materials will be distributed to future occupants as a component of the O&M Plan that address physical pest elimination techniques such as relying on natural enemies to consume pests, weeding, pruning, and etc.

• Irrigation systems will be designed for the specific water requirements of each landscape area. Landscaping will be designed to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. Flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines will be used. Water conservation educational materials will also be provided for future occupants as a component of the O&M Plan.

Step 3.6: Identification and Narrative of Receiving Water and Pollutants of Concern

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable):
Biofiltration basins will be located on each lot. As such, all project site runoff is disconnected prior to discharging from the project site.

All biofiltration basins will consist of an 18 to 21-inch rock section (42-percent voids), an 18-inch soil matrix layer (40-percent voids), and 12 inches of available surface ponding (100-percent voids) below the invert of lowest riser opening. The basins will not be allowed to infiltrate into sub-grade soils due to site-specific geotechnical concerns. The basins will be fitted with perforated sub-drains and impermeable liners that will prevent the potential for migration of flow. The sub-drains will connect to the proposed storm drain system or outlet at the existing natural drainage channel along the westerly project boundary.

Runoff discharged from the site drains conveys southerly into a tributary of the Buena Creek, then to Agua Hedionda Creek. Aqua Hedionda Creek flows to the Agua Hedionda Lagoon and eventually to the Pacific Ocean.

List any 303(d) impaired water bodies[11] within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
Agua Hedionda Creek 904.31	*Enterococcus* *Fecal Coliform* *Manganese* *Phosphorus* *Selenium* *Sulfates* *Total Dissolved Solids (TDS)* *Total Nitrogen as N* *Toxicity*	*n/a*
Agua Hedionda Lagoon 904.31	*Indicator Bacteria* *Invasive Species* *Sedimentation/Siltation*	*n/a*
Buena Creek 904.32	*Dichlorodiphenyltrichloroe-thane (DDT)* *Nitrate and Nitrite*	*n/a*

Identification of Project Site Pollutants*

*Identification of project site pollutants below is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs. Note the project must also participate in an alternative compliance program (unless prior lawful approval to meet earlier PDP requirements is demonstrated).

[11] The current list of Section 303(d) impaired water bodies can be found at http://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/#impaired

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix B.6):			
Pollutant	**Not Applicable to the Project Site**	**Anticipated from the Project Site**	**Also a Receiving Water Pollutant of Concern**
Sediment	☐	☒	☒
Nutrients	☐	☒	☒
Heavy Metals	☐	☒	☒
Organic Compounds	☐	☒	☒
Trash & Debris	☐	☒	☒
Oxygen Demanding Substances	☐	☒	☒
Oil & Grease	☐	☒	☒
Bacteria & Viruses	☐	☒	☒
Pesticides	☐	☐	☒

Step 3.7: Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

☒ Yes, hydromodification management requirements for flow control and preservation of critical coarse sediment yield areas are applicable.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA[12] for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

[12] The Watershed Management Area Analysis (WMAA) is an optional element for inclusion in the Water Quality Improvement Plans (WQIPs) described in the 2013 MS4 Permit [Provision B.3.b.(4)]. It is available online at the Project Clean Water website: http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=248

Step 3.7.1: Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**

Projects must satisfy critical coarse sediment yield area (CCSYA) requirements by characterizing the project as one of the scenario-types presented below and satisfying associated criteria. Projects must appropriately satisfy all requirements for identification, avoidance, and bypass, OR may alternatively elect to demonstrate no net impact.

☐ **Scenario 1**: Project is subject to and in compliance with RPO requirements *(without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3) that result in impacts to more than 15% of the project-scale CCSYAs)*.

- ☐ Identify: Project has identified both onsite and upstream CCSYAs as areas that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,*
- ☐ Avoid: Project has avoided onsite CCSYAs per existing RPO steep slope encroachment criteria. AND,
- ☐ Bypass: Project has demonstrated that both onsite and upstream CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR,
- ☐ No Net Impact: Project does not satisfy all Scenario 1 criteria above and must alternatively demonstrate no net impact to the receiving water.

☒ **Scenario 2**: Project is entirely exempt/not subject to RPO requirements without utilization of RPO exemptions 86.604(e)(2)(cc) or 86.604(e)(3).

- ☒ Identify: Project has identified upstream CCSYAs that are coarse, ≥25% slope, and ≥50' tall. *(Optional refinement methods may be performed per guidance in Section H.1.2). AND,*
- ☒ Avoid: Project is not required to avoid onsite CCSYAs as none were identified in the previous step. AND,
- ☒ Bypass: Project has demonstrated that upstream CCSYAs are bypassed through or around the project site with a 2 year peak storm velocity of 3 feet per second or greater. OR,
- ☐ No Net Impact: Project does not satisfy all Scenario 2 criteria above and must alternatively demonstrate no net impact to the receiving water. *(Skip to next row).*

☐ **Scenario 3**: Project utilizes exemption(s) via RPO Section 86.604(e)(2)(cc) or 86.604(e)(3) and impacts more than 15% of the project-scale CCSYAs.

- ☐ No Net Impact: Project is not eligible for traditional methods of identification, avoidance, and bypass. Project must demonstrate no net impact to the receiving water.

Critical Coarse Sediment Yield Areas Continued
Demonstrate No Net Impact
If the project elects to satisfy CCSYA criteria through demonstration of no net impact to the receiving water. Applicants must identify the methods utilized from the list below and provide supporting documentation in Attachment 2c of the SWQMP. Check all that are applicable. ☐ N/A, the project appropriately identifies, avoids, and bypasses CCSYAs. ☐ Project has performed additional analysis to demonstrate that impacts to CCSYAs satisfy the no net impact standard of Ep/Sp≤1.1. ☐ Project has provided alternate mapping of CCSYAs. ☐ Project has implemented additional onsite hydromodification flow control measures. ☐ Project has implemented an offsite stream rehabilitation project to offset impacts. ☐ Project has implemented other applicant-proposed mitigation measures.

Step 3.7.2: Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply
List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit. One (1) Point of Compliance (POC) has been identified for flow control for hydromodificaiton management at the shallow intermittent natural drainage swale near the westerly boundary. POC-1 will receive treated runoff from the biofiltration basins. POC-1 has been modeled using the SWMM Version 5.1.
Has a geomorphic assessment been performed for the receiving channel(s)? ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is the low flow threshold is 0.1Q2 ☐ Yes, the result is the low flow threshold is 0.3Q2 ☐ Yes, the result is the low flow threshold is 0.5Q2 *If a geomorphic assessment has been performed, provide title, date, and preparer:* *Discussion / Additional Information: (optional)*

Step 3.8: Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

Several factors are considered while assessing the feasibility and desirability of infiltration related to geotechnical conditions. A review of the soil survey maps indicate Type-A and Type-B soils at the location of the project site. According to the NRCS web survey, Type-A and Type-B soils are generally rated for high-infiltration capacity.

Additional field and laboratory investigations were performed by Vinje & Middleton Engineering to further assess the geological impacts of storm water infiltration. The purpose of the study was to evaluate the general infiltration rate of earth materials in the location of anticipated infiltration basins. Infiltration testing was performed using the borehole percolation test method, in general conformance with County of San Diego BMP Design Manual Guidelines. An analysis of the field test data is included in the *Percolation Data* by Vinje & Middleton Engineering, December 15, 2016 (Attachment 7).

According to the *Percolation Data*, infiltration rates are considered high and within the range for Type A hydrologic soils. However, concentrated stormwater infiltration is not recommended in the location of the proposed biofiltration basins due to potential geotechnical issues discussed in Worksheet C.4-1 (Form I-8). Therefore the feasibility screening category for the biofiltration basins is “No Infiltration”.

A feasibility analysis was conducted to move the biofiltration basins away from the top of cut slopes in order to propose partial infiltration. But due to site constraints and minimum BMP sizing, it was not possible to meet the minimum setback requirements from cut slopes and building footprints.

Since the tested infiltration rates are within the range for Type A hydrologic soils, the site will be modeled with existing Type A soils.

Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed. Because the slope of the developed pads and streets is less than the existing topography, the time of concentration is prolonged in the developed condition and the rainfall intensity is reduced, resulting in minimum increase in developed runoff. Based on this conclusion, runoff released from the proposed project site will be unlikely to cause any adverse impact to downstream water bodies or existing habitat integrity. Erosion and sediment will likely be reduced upon site development.

Step 4: Source Control BMP Checklist

Source Control BMPs			
All development projects must implement source control BMPs 4.2.1 through 4.2.6 where applicable and feasible. See Chapter 4.2 and Appendix E of the County BMP Design Manual for information to implement source control BMPs shown in this checklist. Answer each category below pursuant to the following: • "Yes" means the project will implement the source control BMP as described in Chapter 4.2 and/or Appendix E of the County BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification must be provided.			
Source Control Requirement	**Applied?**		
4.2.1 Prevention of Illicit Discharges into the MS4	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.1 not implemented: Acknowledge that an illicit discharge is any discharge to the MS4 that is not composed entirely of wash water. Provide educational materials to prevent illicit discharges as a component of the Operation and Maintenance Plan (O&M Plan).			
4.2.2 Storm Drain Stenciling or Signage	☒Yes	☐No	☐N/A
Discussion / justification if 4.2.2 not implemented: Prohibitive dumping placards and/or signage will be provided at storm drain inlets and catch basins.			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☒N/A
Discussion / justification if 4.2.3 not implemented: No outdoor materials storage areas proposed.			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☒N/A
Discussion / justification if 4.2.4 not implemented: No materials will be stored in outdoor work areas.			

Source Control Requirement	Applied?		
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐Yes	☐No	☒N/A
Discussion / justification if 4.2.5 not implemented: No trash storage areas proposed.			
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below):			
☒ A. On-site storm drain inlets	☒Yes	☐No	☐N/A
☐ B. Interior floor drains and elevator shaft sump pumps	☐Yes	☐No	☒N/A
☐ C. Interior parking garages	☐Yes	☐No	☒N/A
☒ D. Need for future indoor & structural pest control	☒Yes	☐No	☐N/A
☒ E. Landscape/outdoor pesticide use	☒Yes	☐No	☐N/A
☐ F. Pools, spas, ponds, fountains, and other water features	☐Yes	☐No	☒N/A
☐ G. Food service	☐Yes	☐No	☒N/A
☐ H. Refuse areas	☐Yes	☐No	☐N/A
☐ I. Industrial processes	☐Yes	☐No	☒N/A
☐ J. Outdoor storage of equipment or materials	☐Yes	☐No	☒N/A
☐ K. Vehicle and equipment cleaning	☐Yes	☐No	☒N/A
☐ L. Vehicle/equipment repair and maintenance	☐Yes	☐No	☒N/A
☐ M. Fuel dispensing areas	☐Yes	☐No	☒N/A
☐ N. Loading docks	☐Yes	☐No	☒N/A
☐ O. Fire sprinkler test water	☐Yes	☐No	☒N/A
☐ P. Miscellaneous drain or wash water	☐Yes	☐No	☒N/A
☐ Q. Plazas, sidewalks, and parking lots	☐Yes	☐No	☒N/A

Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.

• Storm drain inlets and catch basins will be labeled with “No Dumping Drains to Waterways”. See DMA Exhibit.

• Pest-resistant or well-adapted plant varieties such as drought tolerant and/or native plants will be planted in landscape areas. Integrated Pest Management (IPM) educational materials will be distributed to future occupants as a component of the O&M Plan that address physical pest elimination techniques such as relying on natural enemies to consume pests, weeding, pruning, and etc.

• Irrigation systems will be designed for the specific water requirements of each landscape area. Landscaping will be designed to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. Flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines will be used. Water conservation educational materials will also be provided for future occupants.

Note: Show all source control measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 5: Site Design BMP Checklist

Site Design BMPs
All development projects must implement site design BMPs SD-A through SD-H where applicable and feasible. See Chapter 4.3 and Appendix E of the County BMP Design Manual for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following: • "Yes" means the project will implement the site design BMP as described in Chapter 4.3 and/or Appendix E of the County BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification must be provided.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☒Yes	☒No	☐N/A
Discussion / justification if 4.3.1 not implemented: The shallow intermittent natural drainage swales located to the west of the project site will be maintained. A proposed storm drain pipe underneath Happy Daze Lane will be constructed to maintain the upstream existing drainage basin. An existing and developed 100-year flood inundation analysis has been done for the ditch/swale at the project outlet using the "Hydrologic Engineering Centers River Analysis System" (HEC-RAS). The development of this project will not significantly affect the existing 100 year flood inundation line and channel velocities. Disturbances to the shallow intermittent natural drainage swale has been minimized. The water surface elevations will remain the same, and the change in velocities are negligible. See the "Drainage Study for for 1505 York Lane, TM 5443, ER 87-08-036A" by BHA dated May 2018 for comparison of existing and developed 100-year flood inundation cross sections (HEC-RAS).			
4.3.2 Conserve Natural Areas, Soils, and Vegetation	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.2 not implemented: Natural areas located within the existing 100-year flood inundation will be preserved. See the DMA Exhibit for location of undisturbed areas. Soil disturbance is minimized where feasible.			
4.3.3 Minimize Impervious Area	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.3 not implemented: The cul-de-sac street has been constructed to the minimum width necessary. Sidewalks are not proposed along the cul-de-sac.			
4.3.4 Minimize Soil Compaction	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.4 not implemented: Soil compaction will be minimized in natural landscape areas. Disturbed slope soils will also be amended and aerated.			

Site Design Requirement	Applied?		
4.3.5 Impervious Area Dispersion	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.5 not implemented: Landscape areas will effectively receive and infiltrate, retain and treat runoff from impervious areas as much as possible. Roof drains will be directed to landscape dispersion areas prior to discharging to storm water facilities.			
4.3.6 Runoff Collection	☐Yes	☒No	☐N/A
Discussion / justification if 4.3.6 not implemented: Although landscape areas will effectively receive and infiltrate runoff as much as possible into native soils, the landscape areas are not designed to retain runoff in a way that can be credited towards reducing the overall DCV.			
4.3.7 Landscaping with Native or Drought Tolerant Species	☒Yes	☐No	☐N/A
Discussion / justification if 4.3.7 not implemented: Slope soils will be amended, aerated, and planted with native or drought tolerant non-native plants. Other landscape or pervious areas will incorporate native or drought tolerant landscape design.			
4.3.8 Harvesting and Using Precipitation	☐Yes	☐No	☒N/A
Discussion / justification if 4.3.8 not implemented: No rain-water harvesting strategies proposed. Harvest and use is considered to be infeasible for this project per Worksheet B.3-1 and Form I-8 in Attachment 1.			

Note: Show all site design measures described above that are included in design capture volume calculations in the plan sheets of Attachment 5.

Step 6: PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the County at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the County must confirm the maintenance (see Section 7 of the BMP Design Manual).

Use this section to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (Step 6.2) for each structural BMP within the project (copy the BMP summary information sheet [Step 6.2] as many times as needed to provide summary information for each individual structural BMP).

Step 6.1: Description of structural BMP strategy

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate. At the end of this discussion provide a summary of all the structural BMPs within the project including the type and number.

For the purpose of this SWQMP, the proposed site condition has been divided into five (5) Drainage Management Areas (DMAs) draining to Biofiltration IMPs and three (3) Self-Mitigating DMAs. The DMAs have been delineated based on onsite drainage patters and BMP locations.

The type of structural BMP chosen for the project was based on the flow chart presented in Figures 5-1 and 5-2 of the BMP DM. Using Worksheet B.3.1 to gauge the feasibility of implementing capture and use techniques of the project site, the feasibility was determined to be Category 3, encouraging the use of retention BMPs. The negative impacts associated with retention were then identified by the geotechnical engineer and substantiated through completion of Form I-8.

Infiltration testing for the design of the planned storm water treatment facilities at the subject site was provided by Vinje & Middleton Engineering under separate document tilted *Percolation Data* dated December 15, 2016. The study provided the results of infiltration testing using the borehole percolation test method, analysis of field test data, and preparation of Worksheets D.4.1 and C.4.1. Based on conclusions from the study, the geotechnical engineer has recommended that concentrated infiltration within close proximity to engineered slopes both cut and fill is not feasible. See Attachment 7 for geotechnical references.

Since infiltration is considered infeasible, biofiltration basins were chosen as the type of structural BMP for DMAs draining to IMPs.

The type of structural BMP chosen was also based on downstream receiving waters and treatment goals. Since the project is located upstream from a receiving water that is 303(d) listed for a nutrient pollutant, Nutrient Sensitive Media Design (BF-2) was selected for the biofiltration IMPs to minimize the potential for export of nutrients from the media.

Five (5) biofiltration basins with no infiltration are located within the project site and is responsible for handling hydromodification requirements for POC-1. In developed conditions, the basins will have a total surface depth of 30 inches and an internal outlet structure (see dimensions in Table 2). Flows will then discharge from the basin via the outlet structure or infiltrate through the base of the facilities to the receiving amended soil and low flow orifice. The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain system.

(Continue on following page as necessary.)

Description of structural BMP strategy continued
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)

(Continued from previous page)

Beneath the basin's invert lies the proposed LID biofiltration portion of the drainage facility. This portion of the basin is comprised of a 3-inch layer of mulch, an 18-inch layer of amended soil (a highly sandy, organic rich composite with an infiltration capacity of at least 5 inches/hr) and 18 to 21-inch reservoir layer of gravel. An underdrain pipe with low flow orifice will be provided at the bottom of the basin to carry way filtered runoff. The underdrain pipe will be located 3 inches above the gravel layer invert. The bottom of the basins will be lined with an impermeable liner to prevent infiltration into native soils. A riser structure will be constructed within the BMPs with an emergency overflow weir, such that peak flows can be safely discharged to the receiving storm drain system (see dimensions in Table 3).

TABLE 2 – Summary of Developed Dual Purpose BMPs: Biofiltration with Surface Ponding

BMP	BMP DIMENSIONS						
	Tributary Area (ac)	BMP Area[1] (ft^2)	Underdrain Orifice, D (in)[2]	Gravel Depth (in)[3]	Depth Riser Invert[4] (in)	Total Surface Depth[5] (ft)	Total Sub-Surface Depth[6] (ft)
1	0.52	643	0.37"-dia	21	2.00	1.6	3.83
2	0.49	509	0.35"-dia	12	1.25	1.3	3.08
3	0.37	382	0.81"-dia	12	2.00	1.6	3.08
4	0.27	186	0.25"-dia	12	2.00	1.5	3.08
5	0.58	580	0.81"-dia	21	2.00	2.0	3.83

Notes:

(1): BMP Area = Gravel Area = Amended Soil Area. Amended soil depth equal to 18 inches for the BMPs.

(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q_2).

(3): Total depth of gravel layer including 3 inches of saturated storage below underdrain pipe.

(4): Depth from top of amended soil layer to invert of emergency overflow weir.

(5): The total surface ponding depth from the top of amended soil layer.

(6): The total sub-surface depth from the invert of the gravel layer to top of amended soil layer.

TABLE 3 – Summary of Riser Dimensions

BMP	Lower Orifice Dimensions			Upper Orifice Dimensions			Emergency Weir	
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions Length x Height[3]	Outlet Type[1]	Invert Elev, HU[2] (in)	Dimensions [3]	Riser Invert Elev, Htop[4] (in)	Weir Perimeter Length[5] (ft)
1	Slot	12	(1) 3" x 6"	Vertical Notch	15	2" Wide x 9" High	24	12
2	Slot	12	(1) 3" x 3"	N/A	N/A	N/A	15	12
3	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
4	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
5	Slot	12	(1) 3" x 12	Vertical Notch	15	2" Wide x 9" High	24	12

Notes:

(1): Shape of orifice opening in riser structure.

(2): Depth from top of amended soil layer to invert of lower orifice or weir.

(3): Number of orifices - (#) .

(4): Depth from bottom of pond to invert of emergency overflow weir.

(5): Overflow length, the internal perimeter of the riser is 12 ft (3 ft x 3 ft internal dimensions).

Biofiltration basins are proposed for each lot so that increases in the drainage discharge rate and velocity will be mitigated up the 100-year runoff in accordance with hydromodification management requirements. The flow control facilities have been designed using continuous simulation hydrologic modeling presented in Appendix G of the 2016 County of San Diego BMP Design Manual. In this case, SWMM models were prepared for pre-development and post-project conditions, and post-project (with hydromodification flow control BMPs) runoff rates and durations were compared to the pre-development condition and until compliance with the flow control performance standards were demonstrated.

It is anticipated that the biofiltration basins may also fulfill water quality requirements. Therefore, the basins will be dual purpose to achieve the flow-duration requirements set forth in the County HMP, as well as address the storm water quality requirements set forth in the MS4 permit as

regional post-construction treatment BMPs for the developed area. See Attachment 1a for project pollutant control compliance as presented in Appendix B of the BMP Design Manual.

The SWMM model can model the underground gravel storage layer, underdrain with an orifice plate, amended soil layer, surface storage pond, and discharge opening in a basin riser structure. Based on the selected basin outlet configurations and basin stage-storage and stage-discharge relationships, flow duration curves are generated to analyze the difference between pre-developed and post-project peak flow frequencies and flow durations.

Since a geomorphic channel assessment analysis has not been performed for the receiving water body, the receiving water body is assumed to have a high susceptibility to erosion. Therefore, the default $0.1Q_2$ low-flow threshold was selected.

As the flow duration curve (FDC) comparison demonstrates, the proposed flow control facilities mitigate post-project peak flow frequencies and durations at or below 110% of the pre-developed condition; therefore, the additional storm water generated by site development will be detained and released at a rate that will not exceed the pre-developed peak flow frequencies and durations for the geomorphically significant range of flows.

The SWMM model has demonstrated that the proposed biofiltration basins flow control facility designs comply with the County of San Diego hydromodification management performance standards. Basin areas, storage volumes, and detailed outlet structure specifications are shown in Attachment 2 of this report.

Step 6.2: Structural BMP Checklist

(Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BMP 1	
Construction Plan Sheet No. 3	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☒ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms (See Section 1.12 of the BMP Design Manual)	Ronald Holloway, RCE 29271 5115 Avenida Encinas, Suite L Carlsbad, CA 92008 (760) 931-8700
Who will be the final owner of this BMP?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
Who will maintain this BMP into perpetuity?	☐ HOA ☒ Property Owner ☐ County ☐ Other (describe)
What Category (1-4) is the Structural BMP? Refer to the Category definitions in Section 7.3 of the BMP DM. Attach the appropriate maintenance agreement in Attachment 3.	Category 1
Discussion (as needed): *(Continue on subsequent pages as necessary)*	

Step 6.3: Offsite Alternative Compliance Participation Form

PDP INFORMATION	
Record ID:	PDS2016-TM-5443TE; PDS2016-ER-05-08-019A
Assessor's Parcel Number(s) [APN(s)]	184-012-12
What are your PDP Pollutant Control Debits? *See Attachment 1 of the PDP SWQMP	N/A
What are your PDP HMP Debits? (if applicable) *See Attachment 2 of the PDP SWQMP	N/A
ACP Information	
Record ID:	N/A
Assessor's Parcel Number(s) [APN(s)]	
Project Owner/Address	
What are your ACP Pollutant Control Credits? *See Attachment 1 of the ACP SWQMP	
What are your ACP HMP Debits? (if applicable) *See Attachment 2 of the ACP SWQMP	
Is your ACP in the same watershed as your PDP? ☐ Yes ☐ No	Will your ACP project be completed prior to the completion of the PDP? ☐ Yes ☐ No
Does your ACP account for all Deficits generated by the PDP? ☐ Yes ☐ No (PDP and/or ACP must be redesigned to account for all deficits generated by the PDP.	What is the difference between your PDP debits and ACP Credits? *(ACP Credits -Total PDP Debits = Total Earned Credits)

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	Storm Water Pollutant Control Worksheet Calculations -Worksheet B.3-1 (Required) -Worksheet B.1-1 (Required) -Worksheet B.4-1 (if applicable) -Worksheet B.4-2 (if applicable) -Worksheet B.5-1 (if applicable) -Worksheet B.5-2 (if applicable) -Worksheet B.5-3 (if applicable) -Worksheet B.6-1 (if applicable) -Summary Worksheet (optional)	☒ Included
Attachment 1b	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1c	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒ Included
Attachment 1d	Individual Structural BMP DMA Mapbook (Required) -Place each map on 8.5”x11” paper. -Show at a minimum the DMA, Structural BMP, and any existing hydrologic features within the DMA.	☒ Included

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography and impervious areas
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed demolition
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☒ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Step 3.5)
☒ Structural BMPs (identify location, structural BMP ID#, type of BMP, and size/detail)

Attachment 1a

Storm Water Pollutant Control Worksheet Calculations

Automated Worksheet B.3-1: Project-Scale BMP Feasibility Analysis (V1.3)

Category	#	Description	Value	Units
Capture & Use Inputs	0	Design Capture Volume for Entire Project Site	2,872	cubic-feet
	1	Proposed Development Type	Residential	unitless
	2	Number of Residents or Employees at Proposed Development	16	#
	3	Total Planted Area within Development	50,732	sq-ft
	4	Water Use Category for Proposed Planted Areas	Low	unitless
Infiltration Inputs	5	Is Average Site Design Infiltration Rate ≤0.500 Inches per Hour?	No	yes/no
	6	Is Average Site Design Infiltration Rate ≤0.010 Inches per Hour?	No	yes/no
	7	Is Infiltration of the Full DCV Anticipated to Produce Negative Impacts?	Yes	yes/no
	8	Is Infiltration of Any Volume Anticipated to Produce Negative Impacts?	Yes	yes/no
Calculations	9	36-Hour Toilet Use Per Resident or Employee	1.86	cubic-feet
	10	Subtotal: Anticipated 36 Hour Toilet Use	30	cubic-feet
	11	Anticipated 1 Acre Landscape Use Over 36 Hours	52.14	cubic-feet
	12	Subtotal: Anticipated Landscape Use Over 36 Hours	61	cubic-feet
	13	Total Anticipated Use Over 36 Hours	91	cubic-feet
	14	Total Anticipated Use / Design Capture Volume	0.03	cubic-feet
	15	Are Full Capture and Use Techniques Feasible for this Project?	No	unitless
	16	Is Full Retention Feasible for this Project?	No	yes/no
	17	Is Partial Retention Feasible for this Project?	No	yes/no
Result	18	Feasibility Category	5	1, 2, 3, 4, 5

Worksheet B.3-1 General Notes:

A. Applicants may use this worksheet to determine the types of structural BMPs that are acceptable for implementation at their project site (as required in Section 5 of the BMPDM). User input should be provided for yellow shaded cells, values for all other cells will be automatically generated. Projects demonstrating feasibility or potential feasibility via this worksheet are encouraged to incorporate capture and use features in their project.

B. Negative impacts associated with retention may include geotechnical, groundwater, water balance, or other issues identified by a geotechnical engineer and substantiated through completion of Form I-8.

C. Feasibility Category 1: Applicant must implement capture & use, retention, and/or infiltration elements for the entire DCV.

D. Feasibility Category 2: Applicant must implement capture & use elements for the entire DCV.

E. Feasibility Category 3: Applicant must implement retention and/or infiltration elements for all DMAs with Design Infiltration Rates greater than 0.50 in/hr.

F. Feasibility Category 4: Applicant must implement standard unlined biofiltration BMPs sized at ≥3% of the effective impervious tributary area for all DMAs with Design Infiltration Rates of 0.011 to 0.50 in/hr. Applicants may be permitted to implement lined BMPs, reduced size BMPs, and/or specialized biofiltration BMPs provided additional criteria identified in "Supplemental Retention Criteria for Non-Standard Biofiltration BMPs" are satisfied.

G. Feasibility Category 5: Applicant must implement standard lined biofiltration BMPs sized at ≥3% of the effective impervious tributary area for all DMAs with Design Infiltration Rates of 0.010 in/hr or less. Applicants may also be permitted to implement reduced size and/or specialized biofiltration BMPs provided additional criteria identified in "Supplemental Retention Criteria for Non-Standard Biofiltration BMPs" are satisfied.

H. PDPs participating in an offsite alternative compliance program are not held to the feasibility categories presented herein.

Automated Worksheet B.1-1: Calculation of Design Capture Volume (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	0	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	DMA-4	DMA-5						unitless
	1	Basin Drains to the Following BMP Type	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration						unitless
	2	85th Percentile 24-hr Storm Depth	0.70	0.70	0.70	0.70	0.70						inches
	3	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	0.000	0.000	0.000						in/hr
	4	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	4,828	4,491	7,792	4,517	16,932						sq-ft
	5	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)	9,266	10,615	8,468	7,109							sq-ft
	6	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)	8,527	6,747									sq-ft
	8	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	9	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	10	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)					8,340						sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	11	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	Yes	Yes	Yes	No	No	No	No	No	No	No	yes/no
	12	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	13	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	14	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	16	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	17	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	18	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	19	Number of Tree Wells Proposed per SD-A											#
	20	Average Mature Tree Canopy Diameter											ft
	21	Number of Rain Barrels Proposed per SD-E											#
	22	Average Rain Barrel Size											gal
Treatment Train Inputs & Calculations	23	Does BMP Overflow to Stormwater Features in Downstream Drainage?	No	No	No	No	No	No	No	No	No	No	unitless
	24	Identify Downstream Drainage Basin Providing Treatment in Series											unitless
	25	Percent of Upstream Flows Directed to Downstream Dispersion Areas											percent
	26	Upstream Impervious Surfaces Directed to Dispersion Area (Ci=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
	27	Upstream Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	0	0	0	0	0	0	0	0	0	0	cubic-feet
Initial Runoff Factor Calculation	28	Total Tributary Area	22,621	21,853	16,260	11,626	25,272	0	0	0	0	0	sq-ft
	29	Initial Runoff Factor for Standard Drainage Areas	0.35	0.36	0.59	0.53	0.70	0.00	0.00	0.00	0.00	0.00	unitless
	30	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	31	Initial Weighted Runoff Factor	0.35	0.36	0.59	0.53	0.70	0.00	0.00	0.00	0.00	0.00	unitless
	32	Initial Design Capture Volume	462	459	560	359	1,032	0	0	0	0	0	cubic-feet
Dispersion Area Adjustments	33	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	34	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	35	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	36	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	37	Runoff Factor After Dispersion Techniques	0.35	0.36	0.59	0.53	0.70	n/a	n/a	n/a	n/a	n/a	unitless
	38	Design Capture Volume After Dispersion Techniques	462	459	560	359	1,032	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	39	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	40	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	41	Final Adjusted Runoff Factor	0.35	0.36	0.59	0.53	0.70	0.00	0.00	0.00	0.00	0.00	unitless
	42	Final Effective Tributary Area	7,917	7,867	9,593	6,162	17,690	0	0	0	0	0	sq-ft
	43	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	44	Final Design Capture Volume Tributary to BMP	462	459	560	359	1,032	0	0	0	0	0	cubic-feet

Worksheet B.1-1 General Notes:

A. Applicants may use this worksheet to calculate design capture volumes for up to 10 drainage areas User input must be provided for yellow shaded cells, values for all other cells will be automatically generated, errors/notifications will be highlighted in red and summarized below. Upon completion of this worksheet, proceed to the appropriate BMP Sizing worksheet(s).

Automated Worksheet B.5-1: Sizing Lined or Unlined Biofiltration BMPs (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	0	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	DMA-4	DMA-5	-	-	-	-	-	sq-ft
	1	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	in/hr
	2	Effective Tributary Area	7,917	7,867	9,593	6,162	17,690	-	-	-	-	-	sq-ft
	3	Minimum Biofiltration Footprint Sizing Factor	0.030	0.030	0.030	0.030	0.030	-	-	-	-	-	ratio
	4	Design Capture Volume Tributary to BMP	462	459	560	359	1,032	-	-	-	-	-	cubic-feet
	5	Is Biofiltration Basin Impermeably Lined or Unlined?	Lined	Lined	Lined	Lined	Lined						unitless
	6	Provided Biofiltration BMP Surface Area	643	509	382	186	580						sq-ft
	7	Provided Surface Ponding Depth	12	12	12	12	12						inches
	8	Provided Soil Media Thickness	18	18	18	18	18						inches
	9	Provided Depth of Gravel Above Underdrain Invert	21	12	12	12	21						inches
	10	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	0.37	0.35	0.81	0.25	0.81						inches
	11	Provided Depth of Gravel Below the Underdrain	3	3	3	3	3						inches
Retention Calculations	12	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	13	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	14	Gravel Pore Space Available for Retention	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	15	Effective Retention Depth	0.90	0.90	0.90	0.90	0.90	0.00	0.00	0.00	0.00	0.00	inches
	16	Calculated Retention Storage Drawdown (Including 6 Hr Storm)	120	120	120	120	120	0	0	0	0	0	hours
	17	Volume Retained by BMP	48	38	29	14	44	0	0	0	0	0	cubic-feet
	18	Fraction of DCV Retained	0.10	0.08	0.05	0.04	0.04	0.00	0.00	0.00	0.00	0.00	ratio
	19	Portion of Retention Performance Standard Satisfied	0.12	0.10	0.06	0.05	0.05	0.00	0.00	0.00	0.00	0.00	ratio
	20	Fraction of DCV Retained (normalized to 36-hr drawdown)	0.06	0.05	0.03	0.02	0.02	0.00	0.00	0.00	0.00	0.00	ratio
	21	Design Capture Volume Remaining for Biofiltration	434	436	543	352	1,011	0	0	0	0	0	cubic-feet
Biofiltration Calculations	22	Max Hydromod Flow Rate through Underdrain	0.0074	0.0060	0.0321	0.0031	0.0354	n/a	n/a	n/a	n/a	n/a	CFS
	23	Max Soil Filtration Rate Allowed by Underdrain Orifice	0.50	0.51	3.63	0.71	2.64	n/a	n/a	n/a	n/a	n/a	in/hr
	24	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	25	Soil Media Filtration Rate to be used for Sizing	0.50	0.51	3.63	0.71	2.64	5.00	5.00	5.00	5.00	5.00	in/hr
	26	Depth Biofiltered Over 6 Hour Storm	2.98	3.06	21.77	4.27	15.81	30.00	30.00	30.00	30.00	30.00	inches
	27	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	28	Effective Depth of Biofiltration Storage	24.00	20.40	20.40	20.40	24.00	0.00	0.00	0.00	0.00	0.00	inches
	29	Drawdown Time for Surface Ponding	24	24	3	17	5	0	0	0	0	0	hours
	30	Drawdown Time for Effective Biofiltration Depth	48	40	6	29	9	0	0	0	0	0	hours
	31	Total Depth Biofiltered	26.98	23.46	42.17	24.67	39.81	30.00	30.00	30.00	30.00	30.00	inches
	32	Option 1 - Biofilter 1.50 DCV: Target Volume	651	654	815	528	1,517	0	0	0	0	0	cubic-feet
	33	Option 1 - Provided Biofiltration Volume	651	654	815	382	1,517	0	0	0	0	0	cubic-feet
	34	Option 2 - Store 0.75 DCV: Target Volume	326	327	407	264	758	0	0	0	0	0	cubic-feet
	35	Option 2 - Provided Storage Volume	326	327	407	264	758	0	0	0	0	0	cubic-feet
	36	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	37	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	Yes	Yes	Yes	-	-	-	-	-	yes/no
	38	Overall Portion of Performance Standard Satisfied	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	ratio
	39	This BMP Overflows to the Following Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	40	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**0**	**0**	**0**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

Worksheet B.5-1 General Notes:

A. Applicants may use this worksheet to size Lined or Unlined Biofiltration BMPs (BF-1, PR-1) for up to 10 basins. User input must be provided for yellow shaded cells, values for blue cells are automatically populated based on user inputs from previous worksheets, values for all other cells will be automatically generated, errors/notifications will be highlighted in red/orange and summarized below. BMPs fully satisfying the pollutant control performance standards will have a deficit treated volume of zero and be highlighted in green.

Summary of Stormwater Pollutant Control Calculations (V1.3)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
General Info	0	Drainage Basin ID or Name	DMA-1	DMA-2	DMA-3	DMA-4	DMA-5	-	-	-	-	-	unitless
	1	85th Percentile Storm Depth	0.70	0.70	0.70	0.70	0.70	-	-	-	-	-	inches
	2	Design Infiltration Rate Recommended by Geotechnical Engineer	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	in/hr
	3	Total Tributary Area	22,621	21,853	16,260	11,626	25,272	-	-	-	-	-	sq-ft
	4	85th Percentile Storm Volume (Rainfall Volume)	1,320	1,275	949	678	1,474	-	-	-	-	-	cubic-feet
Initial DCV	5	Initial Weighted Runoff Factor	0.35	0.36	0.59	0.53	0.70	-	-	-	-	-	unitless
	6	Initial Design Capture Volume	462	459	560	359	1,032	-	-	-	-	-	cubic-feet
Site Design Volume Reductions	7	Dispersion Area Reductions	0	0	0	0	0	-	-	-	-	-	cubic-feet
	8	Tree Well and Rain Barrel Reductions	0	0	0	0	0	-	-	-	-	-	cubic-feet
BMP Volume Reductions	9	Effective Area Tributary to BMP	7,917	7,867	9,593	6,162	17,690	-	-	-	-	-	square feet
	10	Final Design Capture Volume Tributary to BMP	462	459	560	359	1,032	-	-	-	-	-	cubic-feet
	11	Basin Drains to the Following BMP Type	Biofiltration	Biofiltration	Biofiltration	Biofiltration	Biofiltration	-	-	-	-	-	unitless
	12	Volume Retained by BMP (normalized to 36 hour drawdown)	28	23	17	7	21	-	-	-	-	-	cubic-feet
Total Volume Reductions	13	Total Fraction of Initial DCV Retained within DMA	0.06	0.05	0.03	0.02	0.02	-	-	-	-	-	fraction
	14	Percent of Average Annual Runoff Retention Provided	9.1%	7.6%	4.6%	3.0%	3.0%	-	-	-	-	-	%
	15	Percent of Average Annual Runoff Retention Required	1.5%	1.5%	1.5%	1.5%	1.5%	-	-	-	-	-	%
Performance Standard	16	Percent of Pollution Control Standard Satisfied	100.0%	100.0%	100.0%	100.0%	100.0%	-	-	-	-	-	%
Treatment Train	17	Discharges to Secondary Treatment in Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	18	Impervious Surface Area Still Requiring Treatment	0	0	0	0	0	-	-	-	-	-	square feet
	19	Impervious Surfaces Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
	20	Impervious Surfaces Not Directed to Downstream Dispersion Area	-	-	-	-	-	-	-	-	-	-	square feet
Result	21	Deficit of Effectively Treated Stormwater	0	0	0	0	0	-	-	-	-	-	cubic-feet

Summary Notes:

All fields in this summary worksheet are populated based on previous user inputs. If applicable, drainage basin elements that require revisions and/or supplemental information outside the scope of these worksheets are highlighted in orange and summairzed in the red text below. If all drainage basins achieve full compliance without a need for supplemental information, a green message will appear below.

-Congratulations, all specified drainage basins and BMPs are in compliance with stormwater pollutant control requirements. Include 11x17 color prints of this summary sheet and supporting worksheet calculations as part of the SWQMP submittal package.

False

Biofiltration Criteria Checklist

The applicant must provide documentation of compliance with each criterion in this checklist as part of the project submittal. The right column of this checklist identifies the submittal information that is recommended to document compliance with each criterion. Biofiltration BMPs that substantially meet all aspects of Fact Sheets PR-1 or BF-1 should still use this checklist; however additional documentation (beyond what is already required for project submittal) should not be required.

1. Biofiltration BMPs must be allowed to be used only as described in the BMP selection process based on a documented feasibility analysis.

Intent: This manual defines a specific prioritization of pollutant treatment BMPs, where BMPs that retain water (retained includes evapotranspired, infiltrated, and/or harvested and used) must be used before considering BMPs that have a biofiltered discharge to the MS4 or surface waters. Use of a biofiltration BMP in a manner in conflict with this prioritization (i.e., without a feasibility analysis justifying its use) is not permitted, regardless of the adequacy of the sizing and design of the system.

[X]	The project applicant has demonstrated that it is not technically feasible to retain the full DCV onsite.	Document feasibility analysis and findings in the SWQMP per Appendix C.

2. Biofiltration BMPs must be sized using acceptable sizing methods.

Intent: The MS4 Permit and this manual defines specific sizing methods that must be used to size biofiltration BMPs. Sizing of biofiltration BMPs is a fundamental factor in the amount of storm water that can be treated and also influences volume and pollutant retention processes.

[X]	The project applicant has demonstrated that biofiltration BMPs are sized to meet one of the biofiltration sizing options available (Appendix B).	Submit sizing worksheets (Appendix B) or other equivalent documentation with the SWQMP.

3. Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.

Intent: Various decisions about BMP placement and design influence how much water is retained via infiltration and evapotranspiration. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention (evapotranspiration and infiltration) of storm water volume.

☒	The biofiltration BMP is sited to allow for maximum infiltration of runoff volume based on the feasibility factors considered in site planning efforts. It is also designed to maximize evapotranspiration through the use of amended media and plants (biofiltration designs without amended media and plants may be permissible; see Item 5).	Document site planning and feasibility analyses in the SWQMP per Section 5.4.
☐	For biofiltration BMPs categorized as "Partial Infiltration Condition," the infiltration storage depth in the biofiltration design has been selected to drain in 36 hours or an alternative value shown to maximize infiltration on the site.	Included documentation of estimated infiltration rate per Appendix D; provide calculations using Appendix B.4 and B.5 to show that the infiltration storage depth meets this criterion. Note, depths that are too shallow or too deep may not be acceptable.
☐	For biofiltration BMP locations categorized as "Partial Infiltration Condition," the infiltration storage is over the entire bottom of the biofiltration BMP footprint.	Document on plans that the infiltration storage covers the entire bottom of the BMP (i.e., not just underdrain trenches); or an equivalent footprint elsewhere on the site.
☐	For biofiltration BMP locations categorized as "Partial Infiltration Condition," the sizing factor used for the infiltration storage area is not less than the minimum biofiltration BMP sizing factors calculated using Worksheet B.5.3.	Provide a table that compares the minimum sizing factor from Appendix B.5 to the provided sizing factor. Note: The infiltration storage area could be a separate storage feature located downstream of the biofiltration BMP, not necessarily within the same footprint.
☒	An impermeable liner or other hydraulic restriction layer is only used when needed to avoid geotechnical and/or subsurface contamination issues in locations identified as "No Infiltration Condition."	If using an impermeable liner or hydraulic restriction layer, provide documentation of feasibility findings per Appendix C that recommend the use of this feature.
	The use of "compact" biofiltration BMP design is permitted only in conditions identified as "No Infiltration Condition" and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible.	Provide documentation of feasibility findings that recommend no infiltration is feasible. Provide site-specific information to demonstrate that a larger footprint biofiltration BMP would not be feasible.

4. Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control processes, and minimize potential for pollutant washout.

Intent: Various decisions about biofiltration BMP design influence the degree to which pollutants are retained. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention of storm water pollutants.

☒	Media selected for the biofiltration BMP meets minimum quality and material specifications per 2016 City Storm Water Standards or County LID Manual, including the maximum allowable design filtration rate and minimum thickness of media. **OR**	Provide documentation that media meets the specifications in 2016 City Storm Water Standards or County LID Manual.
☐	Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in the 2016 City Storm Water Standards or County LID Manual, field scale testing data are provided to demonstrate that proposed media meets the pollutant treatment performance criteria in Section F.1 below.	Provide documentation of performance information as described in Section F.1.
☒	To the extent practicable, filtration rates are outlet controlled (e.g., via an underdrain and orifice/weir) instead of controlled by the infiltration rate of the media.	Include outlet control in designs or provide documentation of why outlet control is not practicable.
☒	The water surface drains to at least 12 inches below the media surface within 24 hours from the end of storm event flow to preserve plant health and promote healthy soil structure.	Include calculations to demonstrate that drawdown rate is adequate. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of County staff if certified by a landscape architect or agronomist.
☒	If nutrients are a pollutant of concern, design of the biofiltration BMP follows nutrient-sensitive design criteria.	Follow specifications for nutrient sensitive design in Fact Sheet BF-2. Or provide alternative documentation that nutrient treatment is addressed and potential for nutrient release is minimized.
☒	Media gradation calculations or geotextile selection calculations demonstrate that migration of media between layers will be prevented and permeability will be preserved.	Follow specification for choking layer or geotextile in Fact Sheet PR-1 or BF-1. Or include calculations to demonstrate that choking layer is appropriately specified.

5. Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.

Intent: Biological processes are an important element of biofiltration performance and longevity.

☒	Plants have been selected to be tolerant of project climate, design ponding depths and the treatment media composition.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.20.
☒	Plants have been selected to minimize irrigation requirements.	Provide documentation describing irrigation requirements for establishment and long term operation.
☒	Plant location and growth will not impede expected long-term media filtration rates and will enhance long term infiltration rates to the extent possible.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.20.
☒	If plants are not part of the biofiltration design, other biological processes are supported as needed to sustain treatment processes (e.g., biofilm in a subsurface flow wetland).	For biofiltration designs without plants, describe the biological processes that will support effective treatment and how they will be sustained.
	6. Biofiltration BMPs must be designed with a hydraulic loading rate to prevent erosion, scour, and channeling within the BMP. Intent: Erosion, scour, and/or channeling can disrupt treatment processes and reduce biofiltration effectiveness.	
☒	Scour protection has been provided for both sheet flow and pipe inflows to the BMP, where needed.	Provide documentation of scour protection as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☒	Where scour protection has not been provided, flows into and within the BMP are kept to non-erosive velocities.	Provide documentation of design checks for erosive velocities as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☐	For proprietary BMPs, the BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification[19] (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).	Provide copy of manufacturer recommendations and conditions of third-party certification.

[19] Certifications or verifications issued by the Washington Technology Acceptance Protocol-Ecology program and the New Jersey Corporation for Advanced Technology programs are typically accompanied by a set of guidelines regarding appropriate design and maintenance conditions that would be consistent with the certification/verification

7. Biofiltration BMP must include operations and maintenance design features and planning considerations for continued effectiveness of pollutant and flow control functions.

Intent: Biofiltration BMPs require regular maintenance in order provide ongoing function as intended. Additionally, it is not possible to foresee and avoid potential issues as part of design; therefore plans must be in place to correct issues if they arise.

☒	The biofiltration BMP maintenance plan describes specific inspection activities, regular/periodic maintenance activities and specific corrective actions relating to scour, erosion, channeling, media clogging, vegetation health, and inflow and outflow structures.	Include maintenance plan with the SWQMP as described in Chapter 7.
☒	Adequate site area and features have been provided for BMP inspection and maintenance access.	Illustrate maintenance access routes, setbacks, maintenance features as needed on project water quality plans.
☐	For proprietary biofiltration BMPs, the BMP maintenance plan is consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies).	Provide copy of manufacturer recommendations and conditions of third-party certification.

If These Sources Will Be on the Project Site …	… Then Your SWQMP Must Consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
☒ **A.** Onsite storm drain inlets ❑ Not Applicable	☒ Locations of inlets.	☒ Mark all inlets with the words "No Dumping! Flows to Bay" or similar. See stencil template provided in Appendix I-4	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide storm water 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 Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook. ☒ 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."

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **B.** Interior floor drains and elevator shaft sump pumps ☒ Not Applicable		❑ 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 ☒ Not Applicable		❑ State that parking garage floor drains will be plumbed to the sanitary sewer.	❑ Inspect and maintain drains to prevent blockages and overflow.
☒ **D1.** Need for future indoor & structural pest control ❑ Not Applicable		☒ 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 SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
☒ **D2.** Landscape/ Outdoor Pesticide Use ❑ Not Applicable	☒ Show locations of existing trees or areas of shrubs and ground cover to be undisturbed and retained. ☒ Show self-retaining landscape areas, if any. ☒ Show storm water treatment facilities.	State that final landscape plans will accomplish all of the following. ☒ Preserve existing drought tolerant 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 storm water pollution. ☒ Where landscaped areas are used to retain or detain storm water, specify plants that are tolerant of periodic saturated soil conditions. ☒ Consider using pest-resistant plants, especially adjacent to hardscape. ☒ To ensure 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 Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook. ☒ Provide IPM information to new owners, lessees and operators.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features. ☒ Not Applicable	❑ 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 Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook.
❑ **F.** Food service ☒ Not Applicable	❑ 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 ensure that the largest items can be accommodated.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **G.** Refuse areas ☒ Not Applicable	❑ 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. Also show how the designated area will be protected from wind dispersal. ❑ Any drains from dumpsters, compactors, and tallow bin areas must 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 Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative Table and Narrative**
❑ **H.** Industrial processes. ☒ Not Applicable	❑ Show process area.	❑ If industrial processes are to be located onsite, 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-Storm Water Discharges" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks.
❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.) ☒ Not Applicable	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or runoff from area and protected from wind dispersal. ❑ Storage of non-hazardous liquids must 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 Prevention Program ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **J.** Vehicle and Equipment Cleaning ☒ Not Applicable	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs must 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 must have a paved, bermed, and covered car wash area (unless car washing is prohibited onsite and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment must 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 must be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility must discharge to the sanitary sewer, or a wastewater reclamation system must be installed.	❑ If a car wash area is not provided, describe measures taken to discourage onsite 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 must 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 Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **K.** Vehicle/Equipment Repair and Maintenance ☒ Not Applicable	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to protect from rainfall, run-on runoff, and wind dispersal. ❑ 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 must 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 report, note that all of the following restrictions apply to use the site: ❑ No person must 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 must 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 must be contained or drained from the vehicle immediately. ❑ No person must leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **L.** Fuel Dispensing Areas ☒ Not Applicable	❑ Fueling areas[16] must have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are (1) graded at the minimum slope necessary to prevent ponding; and (2) separated from the rest of the site by a grade break that prevents run-on of storm water to the MEP. ❑ Fueling areas must 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 area1.] The canopy [or cover] must not drain onto the fueling area.		❑ The property owner must dry sweep the fueling area routinely. ❑ See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Storm Water Quality Handbooks at https://www.casqa.org/resources/bmp-handbooks.

[16] The fueling area must 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.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in**	**4** **Operational BMPs—Include in Table and Narrative**
M. Loading Docks ☒ Not Applicable	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks must be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts must be positioned to direct storm water 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 must be equipped with a spill control valve or equivalent device, which must 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 Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook.

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
❑ **N.** Fire Sprinkler Test Water ☒ Not Applicable		❑ 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 Storm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook
O. Miscellaneous Drain or Wash Water ❑ Boiler drain lines ❑ Condensate drain lines ❑ Rooftop equipment ❑ Drainage sumps ❑ Roofing, gutters, and trim ☒ Not Applicable		❑ Boiler drain lines must 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 drain system. ❑ Rooftop mounted equipment with potential to produce pollutants must be roofed and/or have secondary containment. ❑ Any drainage sumps onsite must 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.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP must consider These Source Control BMPs		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on Drawings**	**3** **Permanent Controls—List in Table and Narrative**	**4** **Operational BMPs—Include in Table and Narrative**
☒ **P.** Plazas, sidewalks, and parking lots. ☐ Not Applicable			☒ Plazas, sidewalks, and parking lots must be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing must be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser must be collected and discharged to the sanitary sewer and not discharged to a storm drain.

Attachment 1b

Form I-8, Categorization of Infiltration Feasibility Condition

See *Percolation Data* by Vinje & Middleton Engineering dated December 15, 2016. for Form I-8 and percolation testing results.

JOB # 16-236-S
Test Site Location:
1505 York Drive,
Vista

Storm Water BMP
Percolation Data

12/15/2016

Infiltration BMP Type	Infiltration Basin
Test Method	Shallow Percolation Testing (Option 2)
Factor of Safety	FS=3
Drill Date	12/6/2016
Test Date	12/7/2016
Equipment Type	B-31 Mobile Drill Using Solid Stem Auger
Test Bore Diameter	8" inch
Observation Bore Diameter	6" inch
Groundwater Conditions	No Groundwater Encountered
Weather Conditions	Dry, Partley Sunny, 68° F

Test No.	Depth (*ft*)	Percolation Rate (*mpi*)	Infiltration Rate (in/hr)	
A	3'	5.0	0.86	**BAISN A**
B	3'	3.1	1.51	
C	3'	2.6	1.74	
D	5'	3.1	0.77	**BASIN B**
E	5'	2.1	1.16	
F	5'	2.1	1.16	
G	3'	8.6	0.45	**BASIN C**
H	3'	5.6	0.75	
I	3'	4.7	0.89	

Site Average = 4.1 mpi Site Average = 1.03 in/hr

Infiltration Rates Vary Slightly Due to Actual Depth of Hole In Inches

Depth (ft)	Observation Boring 1	12/6/2016
0 - 3'	Reddish Brown Loamy Sand	
3 - 15'	Brown Clayey Sand	
15 - 19'	Grey Silty Sand (D.G.)	
	End @ 19'	

Depth (ft)	Observation Boring 2	12/6/2016
0 - 3'	Reddish Brown Loamy Sand	
3 - 10'	Brown Clayey Sand	
10 - 19'	Grey Silty Sand (D.G.)	
	End @ 19'	

note: See Geotechnical Report For USCS Soil Classifications

REGISTERED PROFESSIONAL ENGINEER
RALPH MALCOLM VINJE
No. 863
Exp. 12-31-17
GEOTECHNICAL
OF CALIFORNIA

Ralph M. Vinje GE # 863

Vinje & Middleton
Engineering, Inc.

2450 Auto Park Way
Escondido, CA 92029-1229
(760) 743-1214

JOB #16-236-S BASINS #1 & #2

1505 YORK DRIVE, VISTA

Categorization of Infiltration Feasibility Condition		Form I-5	
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: SEE ATTACHED INFILTRATION RATE RESULTS WITH MAXIMUM INFILTRATION RATE = 1.74 INCHES/HOUR AND MINIMUM INFILTRATION RATE = 0.45 INCHES/HOUR AND SITE AVERAGE = 1.03 IN/HR. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X
Provide basis: HAZARD POTENTIAL IS BASED ON PROPOSED INFILTRATION BASINS WITHIN CLOSE PROXIMITY TO ENGINEERED SLOPES BOTH CUT AND FILL. INFILTRATION RATES INDICATE RAPID WATER MOVEMENT THRU THE SOIL PROFILE. THE RATE AT WHICH WATER IS INFILTRATING THE SOIL WILL ALLOW WATER TO EXIT THE SLOPE FACE. THIS WILL CAUSE SOIL STABILITY ISSUES AS WELL AS SOIL EROSION. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Form I-5			
Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: SHALLOW GROUNDWATER CONDIDTIONS WERE NOT SEEN AT OBSERVATION BORINGS #1 & #2. BASED ON GROUNDWATER CONDITIONS BEING DEEPER THAN 19' FEET, STORMWATER CONTAMINANTS WILL HAVE ADEQUATED TIME FOR BIOREMEIDIATION WITHIN THE SOIL PROFILE BEFORE THEY ENCOUNTER NATIVE GROUNDWATER. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonally or ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: PROPOSED INFILTRATION OR BIOFILTRATION BASINS WILL INTERCEPT STORMWATER AND PROVIDE CONTAMINATE TREATMENT TO STORMWATER THAT WOULD OTHERWISE SHEET FLOW DIRECTLEY TO THE SEASONAL FLOWLINE ALONG THE SOUTH-WESTERN PROPERTY LINE UNTREATED. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	"NO"	

Form I-5

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	

Provide basis:

SEE ATTACHED INFILTRATION RATE RESULTS WITH MAXIMUM INFILTRATION RATE = 1.74 INCHES/HOUR AND MINIMUM INFILTRATION RATE = 0.45 INCHES/HOUR AND SITE AVERAGE = 1.03 IN/HR AT 3' TO 5' FOOT DEPTH.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X

Provide basis:

HAZARD POTENTIAL IS BASED ON PROPOSED INFILTRATION BASINS WITHIN CLOSE PROXIMITY TO ENGINEERED SLOPES BOTH CUT AND FILL. INFILTRATION RATES INDICATE RAPID WATER MOVEMENT THRU THE SOIL PROFILE. THE RATE AT WHICH WATER IS INFILTRATING THE SOIL WILL ALLOW WATER TO EXIT THE SLOPE FACE. THIS WILL CAUSE SOIL STABILITY ISSUES AS WELL AS SOIL EROSION.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Form I-5			
Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: SHALLOW GROUNDWATER CONDIDTIONS WERE NOT SEEN AT OBSERVATION BORINGS #1 & #2. BASED ON GROUNDWATER CONDITIONS BEING DEEPER THAN 19' FEET, STORMWATER CONTAMINANTS WILL HAVE ADEQUATED TIME FOR BIOREMEIDIATION WITHIN THE SOIL PROFILE BEFORE THEY ENCOUNTER NATIVE GROUNDWATER. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: DOWNSTREAM WATER RIGHTS VIOLATIONS ARE EXPECTED TO REMAIN UNCHANGED AND NON-EXISTING. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 5-8 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	NO INFILTRATION	

Form I-5 Certification

The Geotechnical Engineer certifies they completed Form I-5 except Criteria 4 & 8 (see Appendix C.4.3).

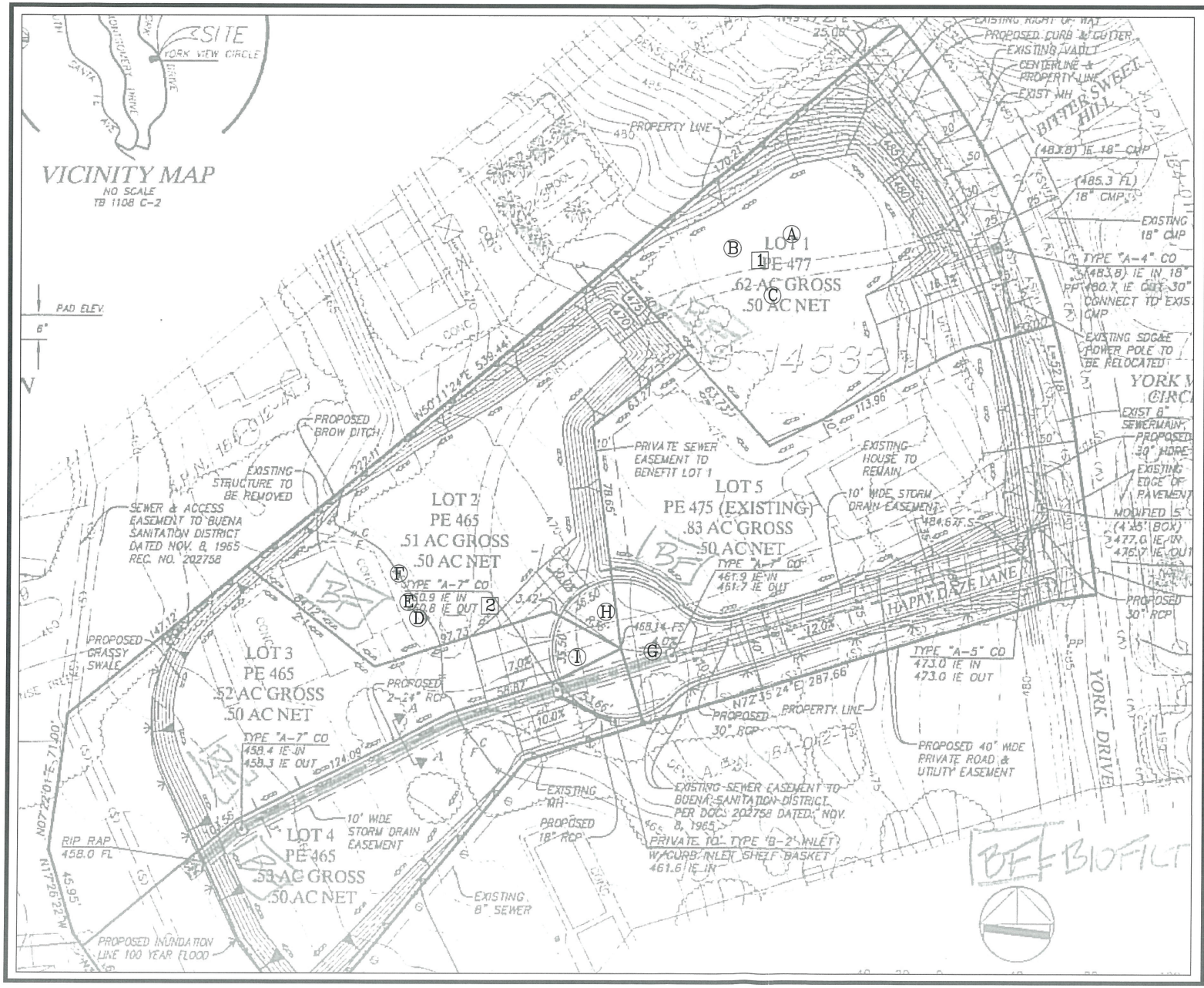
Professional Geotechnical Engineer's Printed Name:

RALPH MALCOLM VINJE

Professional Geotechnical Engineer's Signed Name:

Date: 12-20-16

[SEAL]



VINJE & MIDDLETON ENGINEERING, INC.
2450 Auto Park Way
Escondido, CA 92029-1229
760-743-1214

Ralph M. Vinje GE #863

LOT INFORMATION

DATE: 12/16/2016
JOB No. 16-236-S
APN 184-012-12
ACRES 2.77

Owners Address	Site Location
Gary Van Eik 841 Quails Trail Vista, CA 92081 c. 858-453-1331	1505 York Drive, Vista

c/o: Bruce Rice @ 760-931-8700 ext. 236
brice@bhaincsd.com

LEGEND

Ⓐ ← PERC TEST LOCATION
Ⓑ ← OBSERVATION BORING
475 ~ CONTOUR LINE W/ 1' INTERVAL

LOT #1 = BASIN A
LOT #2 = BASIN B
LOT #5 = BASIN C

SCALE 1" = 50'

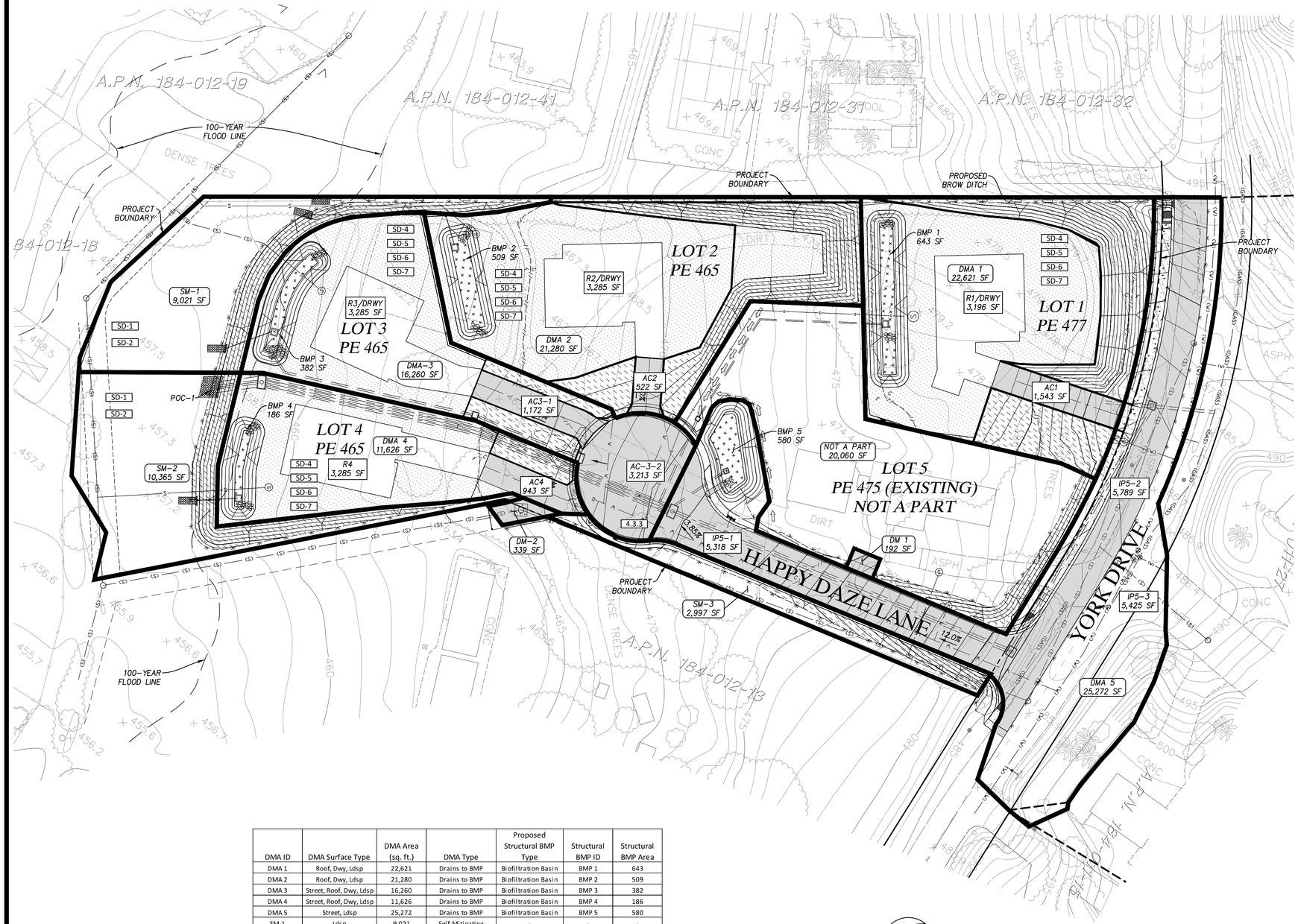
FIGURE 1

Infiltration Test Boring Location Map

Attachment 1c

DMA Exhibit

POST-DEVELOPMENT DRAINAGE MANAGEMENT AREA EXHIBIT
1505 YORK DRIVE
TM 5443 RPL3



DMA ID	DMA Surface Type	DMA Area (sq. ft.)	DMA Type	Proposed Structural BMP Type	Structural BMP ID	Structural BMP Area
DMA 1	Roof, Dwy, Ldsp	22,621	Drains to BMP	Biofiltration Basin	BMP 1	643
DMA 2	Roof, Dwy, Ldsp	21,280	Drains to BMP	Biofiltration Basin	BMP 2	509
DMA 3	Street, Roof, Dwy, Ldsp	16,260	Drains to BMP	Biofiltration Basin	BMP 3	382
DMA 4	Street, Roof, Dwy, Ldsp	11,626	Drains to BMP	Biofiltration Basin	BMP 4	186
DMA 5	Street, Ldsp	25,272	Drains to BMP	Biofiltration Basin	BMP 5	580
SM-1	Ldsp	9,021	Self-Mitigating	-	-	-
SM-2	Ldsp	10,365	Self-Mitigating	-	-	-
SM-3	Ldsp	2,997	Self-Mitigating	-	-	-
DM-1	Dwy	192	De Minimis	-	-	-
DM-2	Dwy	339	De Minimis	-	-	-

30' 15' 0' 30' 60' 90'

SCALE: 1" = 30'

PROJECT CHARACTERISTICS	
PROJECT AREA	2.82 ACRES
DISTURBED AREA	2.63 ACRES
PROPOSED IMPERVIOUS AREA	0.85 ACRES
PROPOSED PERVIOUS AREA	1.78 ACRES
SOIL TYPE	A
DEPTH TO GROUNDWATER	> 20 FEET

HYDROLOGIC UNIT CONTRIBUTION (WATERSHED)			
WATERSHED	HYDROLOGIC AREA	HYDROLOGIC SUB-AREA	DOWNSTREAM WATERBODIES
904 CARLSBAD	904.3 AGUA HEDIONDA	904.32 BUENA	AGUA HEDIONDA CREEK, AGUA HEDIONDA LAGOON

IMPAIRED WATER BODIES	
IMPAIRED WATERBODY	CONSTITUENTS OF CONCERN
AGUA HEDIONDA CREEK	ENTEROCOCCUS, FECAL COLIFORM, MANGANESE, PHOSPHORUS, SELENIUM, SULFATES, TOTAL DISSOLVED SOLIDS, TOTAL NITROGEN AS N, TOXICITY
AGUA HEDIONDA LAGOON	INDICATOR BACTERIA, INVASIVE SPECIES, SEDIMENTATION/SILTATION

LEGEND

DMA NAME	DMA-1
AREA (SQUARE FEET)	22,621 SF
SELF-MITIGATING DMA	SM-1
DMA POINT OF COMPLIANCE (POC)	POC-1
DMA BOUNDARY	
PROJECT BOUNDARY	
BIOFILTRATION BASIN	
VEGETATED SLOPES	
IMPERVIOUS AREA DISPERSION	
CONCRETE	
ASPHALT	
FLOW DIRECTION	
BROW DITCH	
RIP RAP ENERGY DISSIPATER	

POLLUTANTS OF CONCERN			
POLLUTANT CATEGORY	ANTICIPATED/ POTENTIAL	DOWNSTREAM IMPAIRMENT	PRIMARY POLLUTANT OF CONCERN
SEDIMENT	X	X	X
NUTRIENTS	X	X	X
HEAVY METALS	X	X	X
ORGANIC COMPOUNDS	X	X	X
TRASH & DEBRIS	X		X
OXYGEN DEMANDING SUBSTANCES	X	X	X
OIL & GREASE	X		X
BACTERIA & VIRUSES	X	X	X
PESTICIDES	X		X

CRITICAL COARSE SEDIMENT YIELD AREAS:

PRIORITY DEVELOPMENT PROJECTS (PDPS) MUST SATISFY CRITICAL COURSE SEDIMENT YIELD AREA (CCSYA) REQUIREMENTS AS ADDRESSED IN APPENDIX H OF THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL.

REGIONAL-LEVEL MAPPING OF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS WAS PREPARED USING REGIONAL DATA SETS INCLUDED IN THE "SAN DIEGO COUNTY REGIONAL WMAA".

PDPS ARE REQUIRED TO CHECK THE MAP INCLUDED IN THE WMAA FOR THE WATERSHED IN WHICH THE PROJECT RESIDES TO DETERMINE IF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS EXIST WITHIN THE PROJECT DRAINAGE BOUNDARIES.

ACCORDING TO THE REGIONAL WMAA, NO PCCSYAS EXIST WITHIN THE PROJECT DRAINAGE BOUNDARIES. THEREFORE THE PROJECT IS (A) ENTIRELY EXEMPT/NOT SUBJECT TO RPO REQUIREMENTS WITHOUT UTILIZATION OF RPO EXEMPTIONS AND (B) AS THERE ARE NO AREAS UPSTREAM OF THE PROJECT TO PROTECT, THEN THE PROJECT IS NOT REQUIRED TO AVOID ONSITE CCSYAS AS NONE WERE IDENTIFIED (IN OTHER WORDS, NO AREAS IDENTIFIED ON THE DMA EXHIBIT ARE PCCSYAS THAT BECOME NON-CCSYAS.

REFER TO THE SWQMP FOR 1505 YORK DRIVE DATED SEPTEMBER 2017 BY BHA, INC. FOR CCSYA EXEMPTION METHODOLOGY.

SELF-MITIGATING DMAS:

VEGETATION IN THE NATURAL OR LANDSCAPE AREA IS NATIVE OR NON-NATIVE DROUGHT TOLERANT SPECIES.

SOILS ARE UNDISTURBED NATIVE TOPSOIL, OR DISTURBED SOILS HAVE BEEN AMENDED AND AERATED TO PROMOTE WATER RETENTION CHARACTERISTICS EQUIVALENT TO UNDISTURBED NATIVE TOPSOIL.

INCIDENTAL IMPERVIOUS AREAS ARE LESS THAN 5 PERCENT OF THE SELF-MITIGATING AREA.

IMPERVIOUS AREAS CALCULATED WITHIN THE SELF-MITIGATED AREA SHOULD NOT BE HYDRAULICALLY CONNECTED TO OTHER IMPERVIOUS AREAS UNLESS IT IS A STORM WATER CONVEYANCE SYSTEM (SUCH AS BROW DITCHES).

THE SELF-MITIGATING AREA IS HYDRAULICALLY SEPARATE FROM DMAS THAT CONTAIN PERMANENT STORM WATER POLLUTION CONTROL BMPS.

SOURCE CONTROL BMPS:

- SC-1 PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
- SC-2 STORM DRAIN STENCILING AND SIGNAGE
- SC-6 ADDITIONAL BMPS BASED ON POTENTIAL RUNOFF POLLUTANTS:
  - A ON-SITE STORM DRAIN INLETS
  - D NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
  - E LANDSCAPE/OUTDOOR PESTICIDE USE

NO DUMPING DRAINS TO WATERWAYS

SIGNAGE DETAIL
NOT TO SCALE

LID AND SITE DESIGN:

- SD-1 MAINTAIN NATURAL DRAINAGE PATHWAYS AND HYDROLOGIC FEATURES
- SD-2 CONSERVE NATURAL AREAS, SOILS, AND VEGETATION
- SD-3 MINIMIZE IMPERVIOUS AREA
- SD-4 MINIMIZE SOIL COMPACTION
- SD-5 IMPERVIOUS AREA DISPERSION
- SD-6 RUNOFF COLLECTION
- SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES

COUNTY APPROVED CHANGES

NO.	DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	SHEETS
1		2

POST-DEVELOPMENT DRAINAGE MANAGEMENT AREA EXHIBIT FOR:

TM 5443 RPL3

CALIFORNIA COORDINATE INDEX 370-1701

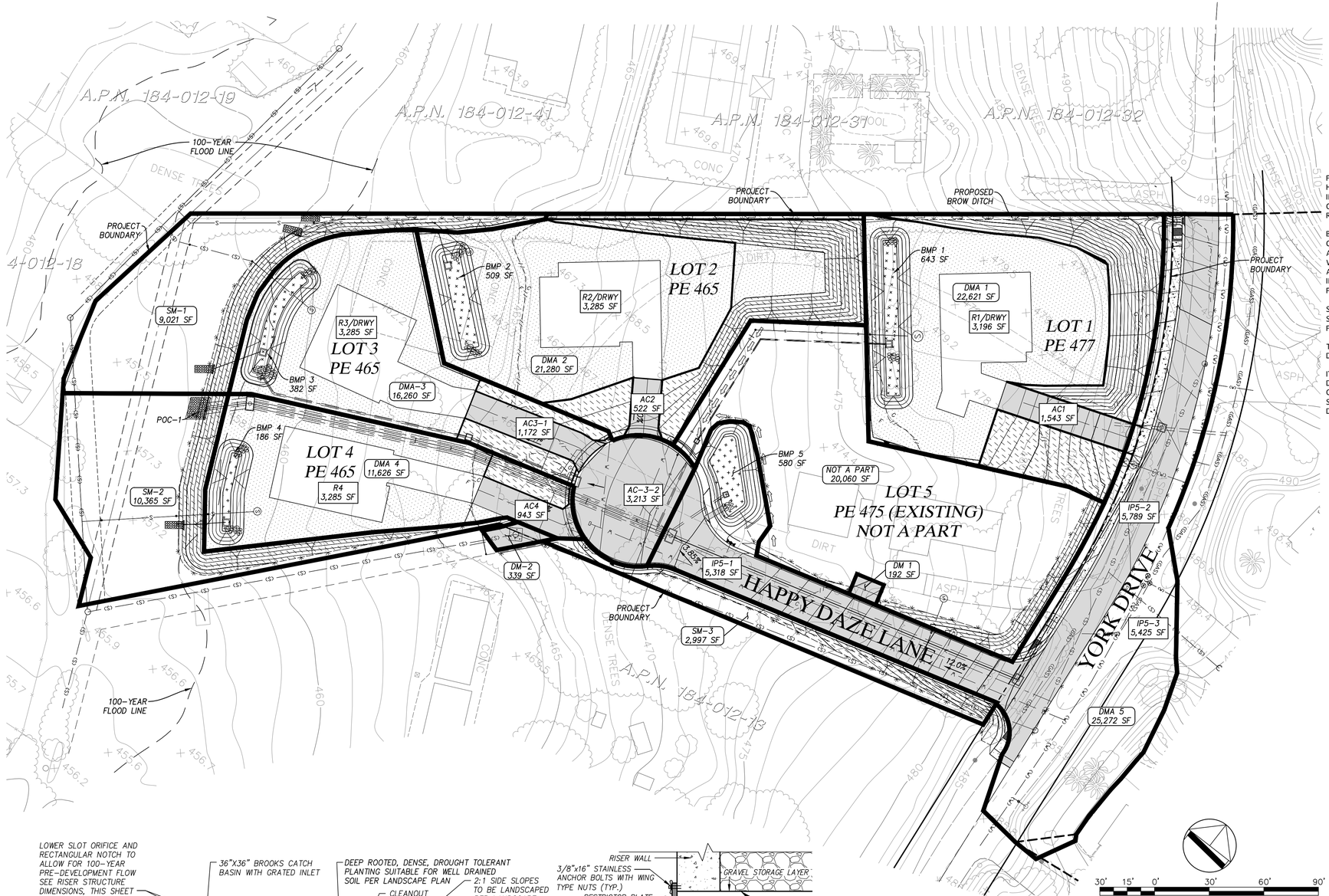
APPROVED FOR WILLIAM P. MORGAN COUNTY ENGINEER
BY:
BY: DATE

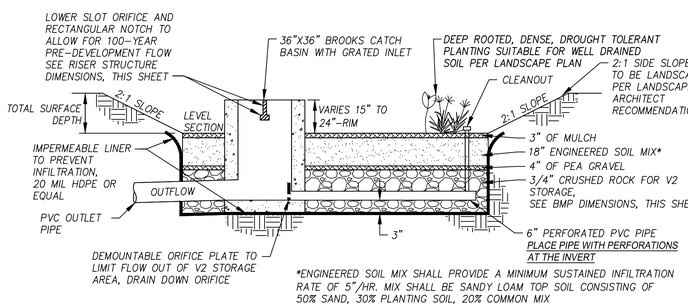
ENGINEER OF WORK
RONALD L. HOLLOWAY R.C.E. 29271
DATE

PDS2017-LDGRMJ-30120
GRADING PERMIT NO:

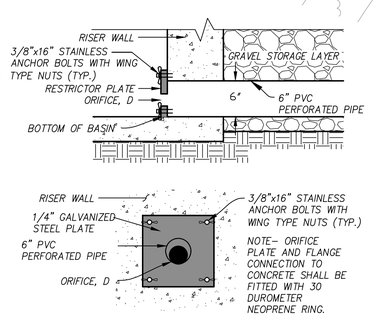
bha inc. 5145 AVENIDA ENCINAS SUITE L CARLSBAD, CA 92008 (760) 931-8700

POST-DEVELOPMENT DRAINAGE MANAGEMENT AREA EXHIBIT
1505 YORK DRIVE
TM 5443 RPL3

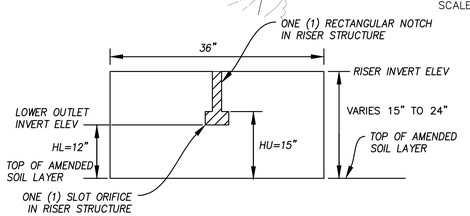




TYPICAL BIOFILTRATION BASIN DETAIL, TYP



RESTRICTOR PLATE DETAIL
NOT TO SCALE



TYPICAL OUTLET STRUCTURE DETAIL
NOT TO SCALE

TREATMENT CONTROL BMPS

DEVELOPED CONDITIONS

STORM WATER RUNOFF FROM THE PROPOSED PROJECT SITE IS ROUTED TO ONE (1) POC, LOCATED AT THE WESTERLY BOUNDARY OF THE PROJECT SITE. RUNOFF FROM THE DEVELOPED PROJECT SITE IS DRAINED TO FIVE (5) ONSITE RECEIVING BIOFILTRATION BMPS. ONCE FLOWS ARE ROUTED VIA THE PROPOSED BIOFILTRATION BMPS, DEVELOPED FLOWS ARE THEN DISCHARGED TO THE EXISTING POINT OF DRAINAGE FROM THE PROJECT SITE.

3 SMALL VEGETATION AREAS (SM-1, SM-2, AND SM-3) ARE UNABLE TO DRAIN TO THE RECEIVING BIOFILTRATION BASINS AND BYPASS THESE FACILITIES, DRAINING DIRECTLY TO POC-1.

TABLE 1 - SUMMARY OF DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious
1	DMA-1	22,621	21%
	DMA-2	21,280	18%
	DMA-3	16,260	47%
	DMA-4	11,626	36%
	DMA-5	25,272	65%
	SM-1	9,021	0%
	SM-2	10,365	0%
	SM-3	2,997	0%
	DM-1	192	100%
	DM-2	339	100%

FIVE (5) BIOFILTRATION BASINS WITH NO INFILTRATION ARE LOCATED WITHIN THE PROJECT SITE AND IS RESPONSIBLE FOR HANDLING HYDROMODIFICATION REQUIREMENTS FOR POC-1. IN DEVELOPED CONDITIONS, THE BASINS WILL HAVE A TOTAL DEPTH OF FROM 17 TO 24 INCHES AND AN INTERNAL OUTLET STRUCTURE (SEE DIMENSIONS IN TABLE 2). FLOWS WILL THEN DISCHARGE FROM THE BASIN VIA THE OUTLET STRUCTURE OR INFILTRATE THROUGH THE BASE OF THE FACILITIES TO THE RECEIVING AMENDED SOIL AND LOW FLOW ORIFICE. THE RISER STRUCTURE WILL ACT AS A SPILLWAY SUCH THAT PEAK FLOWS CAN BE SAFELY DISCHARGED TO THE RECEIVING STORM DRAIN SYSTEM.

BENEATH THE BASIN'S INVERT LIES THE PROPOSED LID BIOFILTRATION PORTION OF THE DRAINAGE FACILITY. THIS PORTION OF THE BASIN IS COMPRISED OF A 3-INCH LAYER OF MULCH, AN 18 TO 21-INCH LAYER OF AMENDED SOIL (A HIGHLY SANDY, ORGANIC RICH COMPOSITE WITH AN INFILTRATION CAPACITY OF AT LEAST 5 INCHES/HR) AND A RESERVOIR LAYER OF GRAVEL. AN UNDERDRAIN PIPE WITH LOW FLOW ORIFICE WILL BE PROVIDED AT THE BOTTOM OF THE BASIN TO CARRY WAY FILTERED RUNOFF. THE UNDERDRAIN PIPE WILL BE LOCATED 3 INCHES ABOVE THE GRAVEL LAYER INVERT. THE BOTTOM OF THE BASINS WILL BE LINED WITH AN IMPERMEABLE LINER TO PREVENT INFILTRATION INTO NATIVE SOILS. A RISER STRUCTURE WILL BE CONSTRUCTED WITHIN THE BMPS WITH AN EMERGENCY OVERFLOW WEIR, SUCH THAT PEAK FLOWS CAN BE SAFELY DISCHARGED TO THE RECEIVING STORM DRAIN SYSTEM (SEE DIMENSIONS IN TABLE 3).

SINCE THE PROJECT IS LOCATED UPSTREAM FROM A RECEIVING WATER THAT IS 303d LISTED FOR A NUTRIENT POLLUTANT, NUTRIENT SENSITIVE MEDIA DESIGN (BF-2) WAS SELECTED FOR THE BIOFILTRATION BMPS TO MINIMIZE THE POTENTIAL FOR EXPORT OF NUTRIENTS FROM THE MEDIA.

THE BIOFILTRATION FACILITIES HAVE BEEN MODELED USING SWMM 5.1. THE SWMM USES CONTINUOUS SIMULATION MODELING TO DETERMINE THE MINIMUM REQUIRED HYDROMODIFICATION MANAGEMENT VOLUMES FOR EACH PROPOSED BIOFILTRATION BASIN.

IT IS ANTICIPATED THAT THE BIOFILTRATION BASINS MAY ALSO FULFILL WATER QUALITY REQUIREMENTS. THEREFORE, THE BASINS WILL BE DUAL PURPOSE TO ACHIEVE THE FLOW-DURATION REQUIREMENTS SET FORTH IN THE COUNTY HMP, AS WELL AS ADDRESS THE STORM WATER QUALITY REQUIREMENTS SET FORTH IN THE MS4 PERMIT AS REGIONAL POST-CONSTRUCTION TREATMENT BMPS FOR THE DEVELOPED AREA. SEE ATTACHMENT 1 OF THE "PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR 1505 YORK DRIVE" FOR POLLUTANT CONTROL COMPLIANCE AS PRESENTED IN APPENDIX B OF THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL.

BMP MODELING FOR WATER QUALITY PURPOSES

MODELING OF DUAL PURPOSE WATER QUALITY/HMP BMPS

FIVE (5) BMPS ARE PROPOSED FOR WATER QUALITY TREATMENT FOR THE PROJECT SITE. TABLE 2 ILLUSTRATES THE DIMENSIONS REQUIRED FOR POLLUTANT CONTROL COMPLIANCE.

TABLE 2 - SUMMARY OF DEVELOPED DUAL PURPOSE BMPS: BIOFILTRATION WITH SURFACE PONDING

BMP	BMP DIMENSIONS						
	Tributary Area (ac)	BMP Area[1] (ft^2)	Underdrain Orifice, D (in)[2]	Gravel Depth (in)[3]	Depth Riser Invert[4] (in)	Total Surface Depth[5] (ft)	Total Sub-Surface Depth[6] (ft)
1	0.52	643	0.37"-dia	21	2.00	1.6	3.83
2	0.49	509	0.35"-dia	12	1.25	1.3	3.08
3	0.37	382	0.81"-dia	12	2.00	1.6	3.08
4	0.27	186	0.25"-dia	12	2.00	1.5	3.08
5	0.58	580	0.81"-dia	21	2.00	2.0	3.83

Notes: (1): BMP Area = Gravel Area = Amended Soil Area. Amended soil depth equal to 18 inches for the BMPs.
(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q_2).
(3): Total depth of gravel layer including 3 inches of saturated storage below underdrain pipe.
(4): Depth from top of amended soil layer to invert of emergency overflow weir.
(5): The total surface ponding depth from the top of amended soil layer.
(6): The total sub-surface depth from the invert of the gravel layer to top of amended soil layer.

TABLE 3 - SUMMARY OF RISER DIMENSIONS

BMP	Lower Orifice Dimensions			Upper Orifice Dimensions			Emergency Weir	
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions Length x Height[3]	Outlet Type[1]	Invert Elev, HU[2] (in)	Dimensions[3]	Riser Invert Elev, Htop[4] (in)	Weir Perimeter Length[5] (ft)
1	Slot	12	(1) 3" x 6"	Vertical Notch	15	2" Wide x 9" High	24	12
2	Slot	12	(1) 3" x 3"	N/A	N/A	N/A	15	12
3	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
4	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
5	Slot	12	(1) 3" x 12	Vertical Notch	15	2" Wide x 9" High	24	12

Notes: (1): Shape of orifice opening in riser structure.
(2): Depth from top of amended soil layer to invert of lower orifice or weir.
(3): Number of orifices - (#) .
(4): Depth from bottom of pond to invert of emergency overflow weir.
(5): Overflow length, the internal perimeter of the riser is 12 ft (3 ft x 3 ft internal dimensions).

COUNTY APPROVED CHANGES

Htop DESCRIPTION:	APPROVED BY:	DATE:

PRIVATE CONTRACT

SHEET 2	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	2 SHEETS

POST-DEVELOPMENT DRAINAGE MANAGEMENT AREA EXHIBIT FOR:

TM 5443 RPL3

CALIFORNIA COORDINATE INDEX 370-1701

APPROVED FOR WILLIAM P. MORGAN COUNTY ENGINEER
BY: _____ DATE: _____

ENGINEER OF WORK
RONALD L. HOLLOWAY R.C.E. 29271
DATE

PDS2017-LDGRMJ-30120
GRADING PERMIT NO:

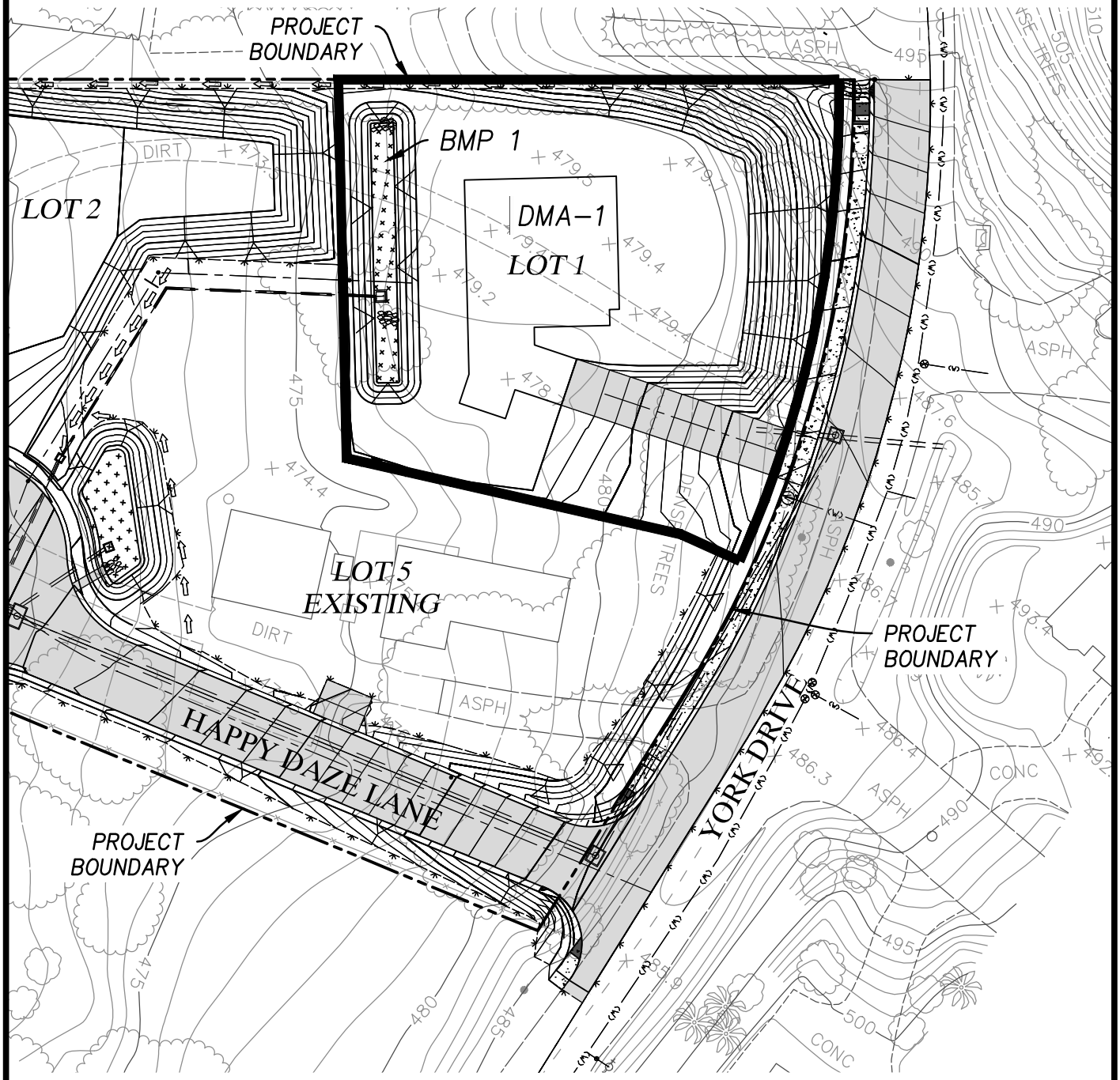
bha, inc. 5115 AVENIDA ENCINAS SUITE L CARLSBAD, CA. 92008 (760) 931-8700

K:\Civil 3D\1019\DWG\HYDRO-SWMP\757-1019-DMA EXHIBIT-W-DISPERSION BR.dwg, 9/4/2018 9:22:10 AM

Attachment 1d

Individual Structural BMP DMA Mapbook

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
ATTACHMENT 1D
1505 YORK DRIVE TM 5443 RPL3



SCALE: 1" = 50'

LEGEND

DMA BOUNDARY

BMP

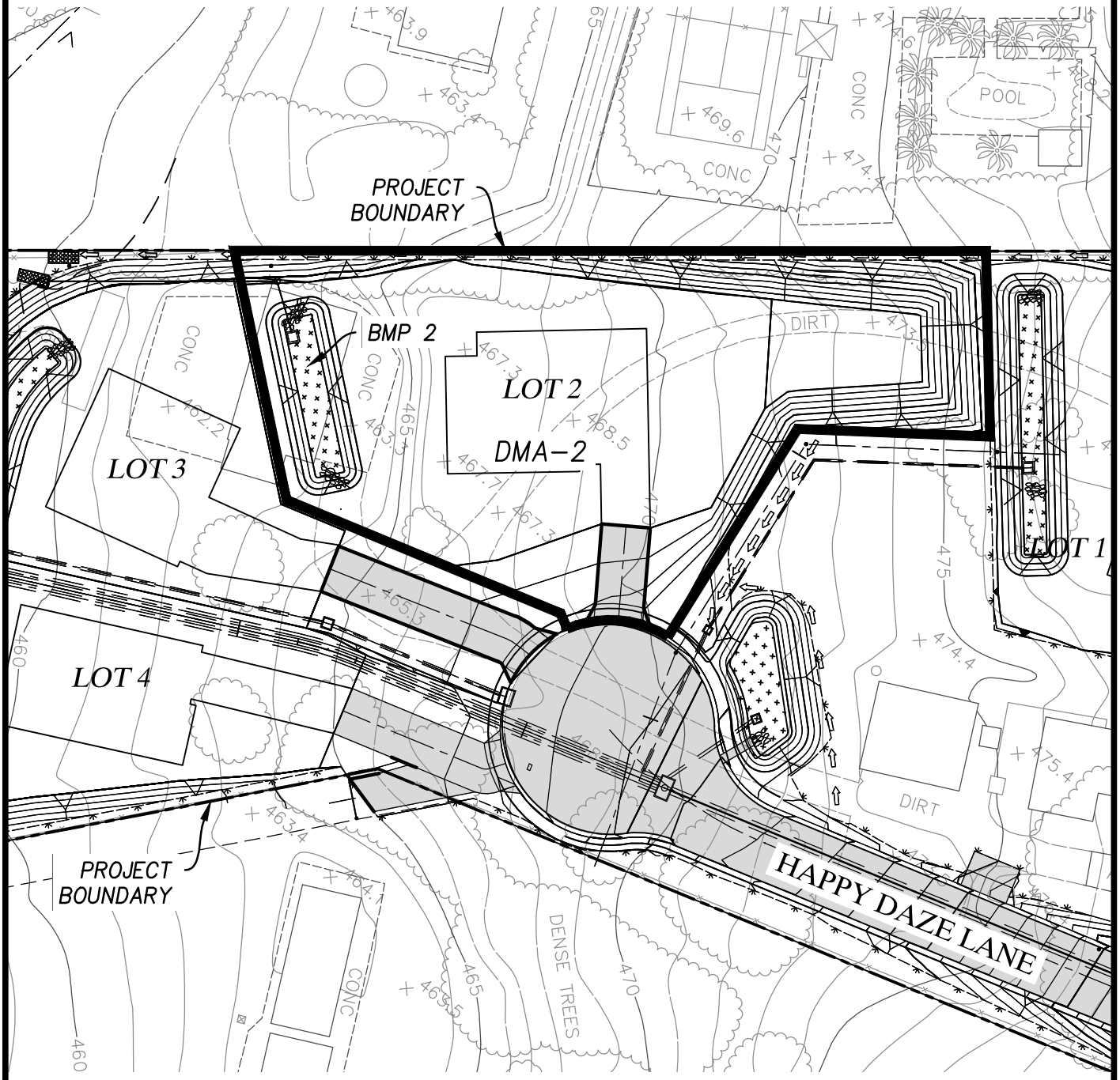
ATTACHMENT 1D

1505 YORK DIRVE
TM 5443 RPL3

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
SHEET 1 OF 5

bHA, Inc. 5115 AVENIDA ENCINAS SUITE L CARLSBAD, CA. 92008 (760) 931-8700

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
ATTACHMENT 1D
1505 YORK DRIVE TM 5443 RPL3



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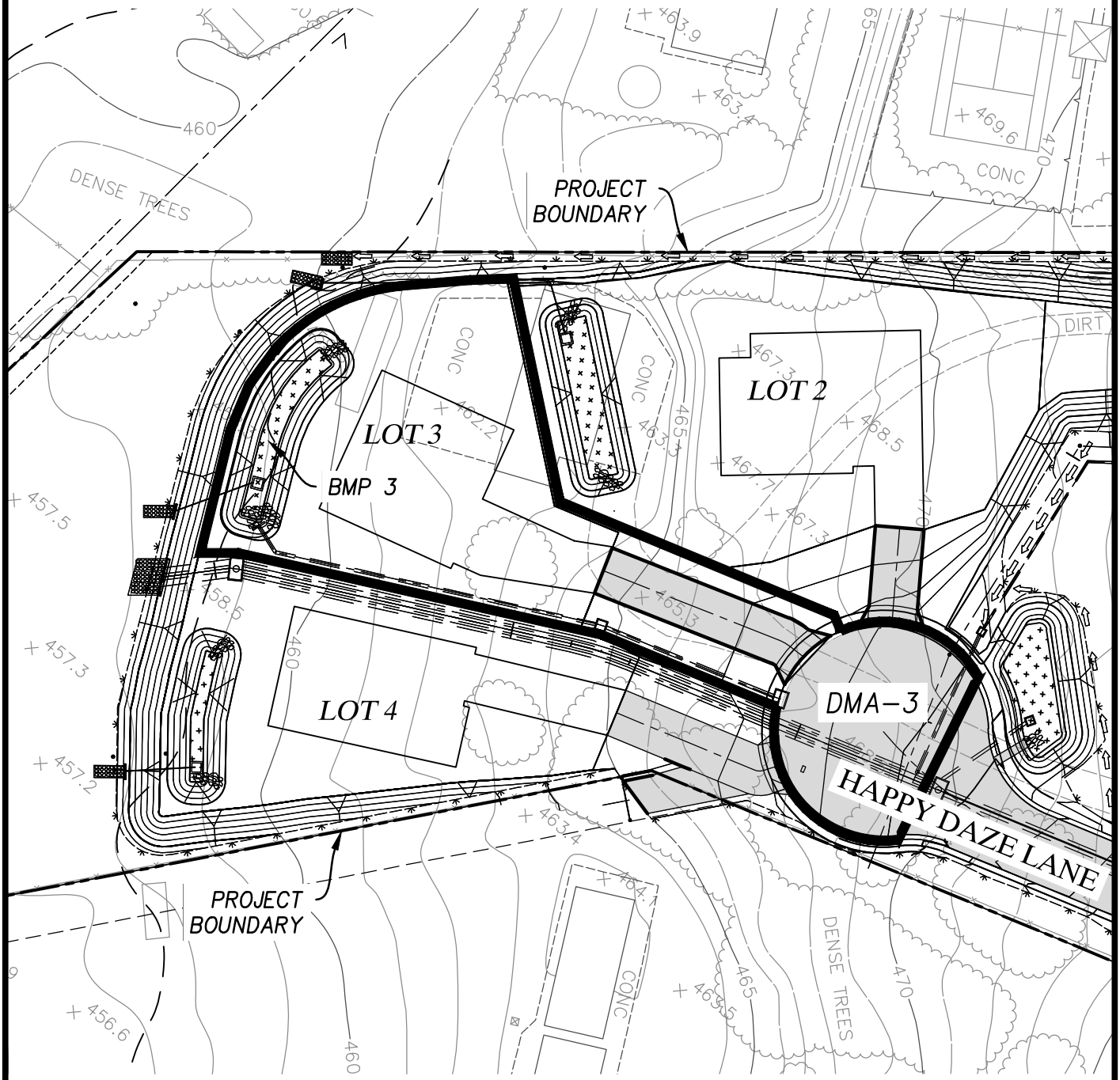
LEGEND
DMA BOUNDARY
BMP

ATTACHMENT 1D
1505 YORK DIRVE
TM 5443 RPL3

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
SHEET 2 OF 5

bHA, Inc 5115 AVENIDA ENCINAS SUITE L CARLSBAD, CA. 92008 (760) 931-8700

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
ATTACHMENT 1D
1505 YORK DRIVE TM 5443 RPL3



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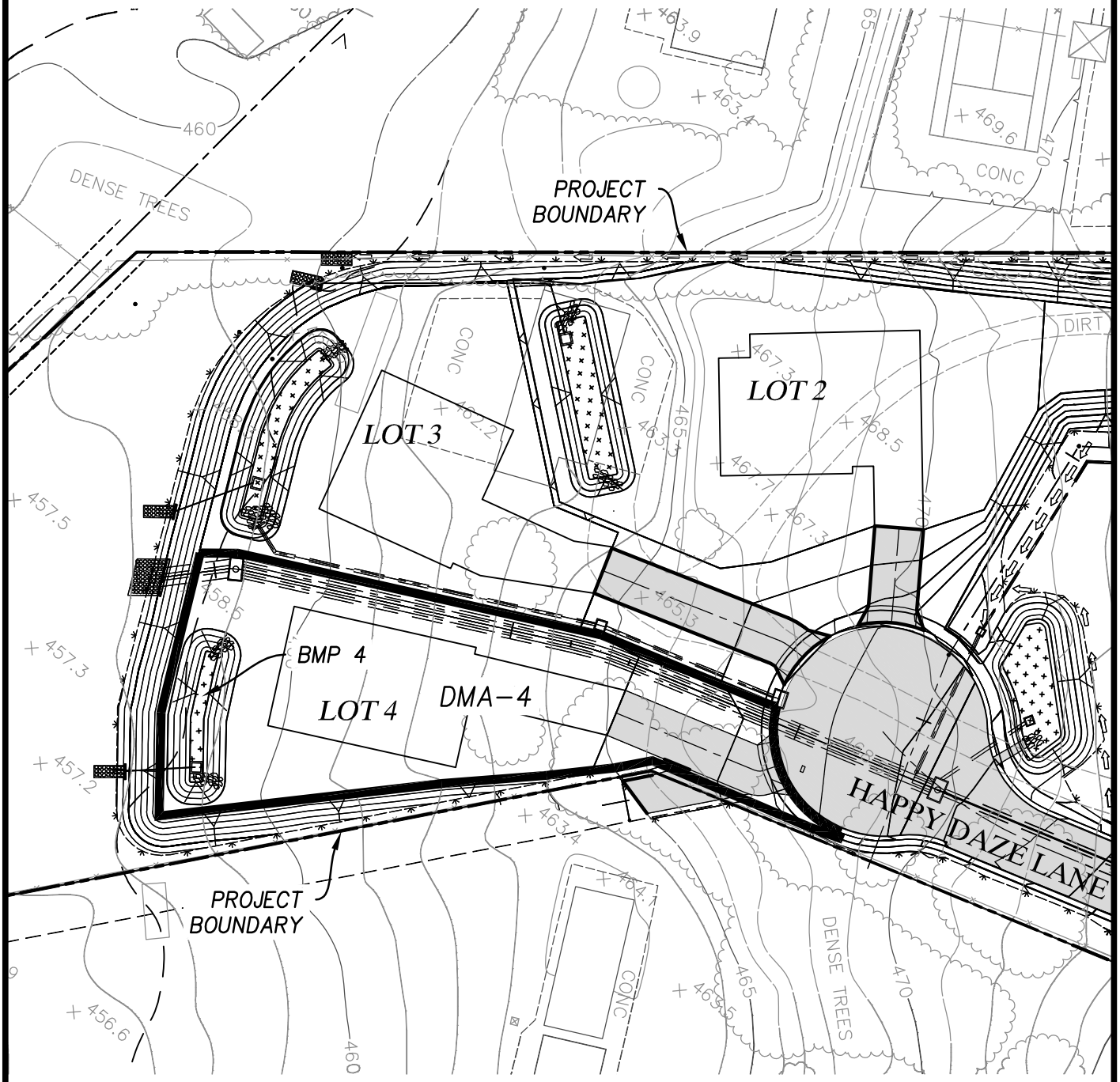
LEGEND
DMA BOUNDARY
BMP

ATTACHMENT 1D
1505 YORK DIRVE
TM 5443 RPL3

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
SHEET 3 OF 5

bHA, Inc. 5115 AVENIDA ENCINAS SUITE L CARLSBAD, CA. 92008 (760) 931-8700

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
ATTACHMENT 1D
1505 YORK DRIVE TM 5443 RPL3



SCALE: 1" = 50'

LEGEND

DMA BOUNDARY

BMP

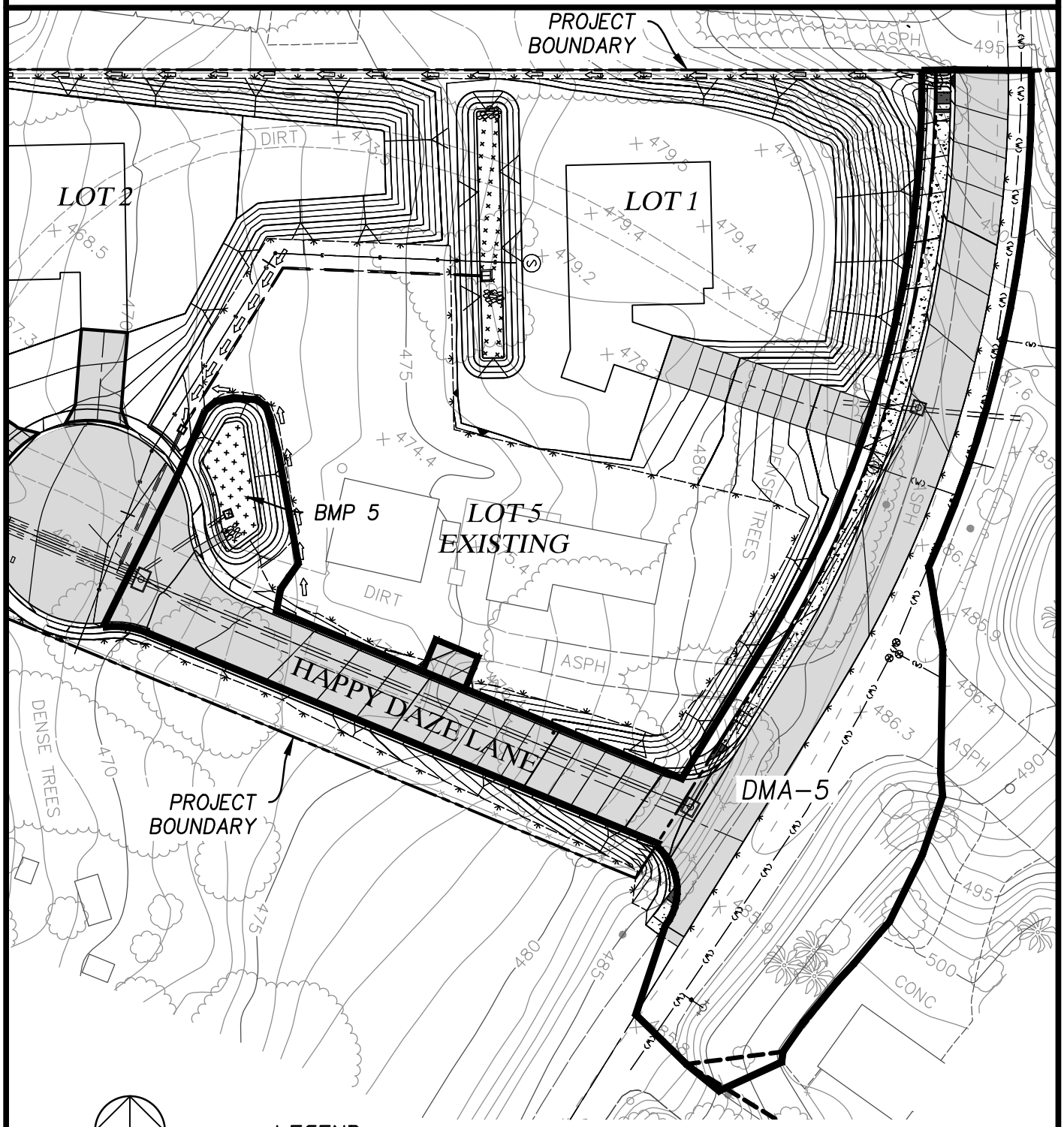
ATTACHMENT 1D

1505 YORK DIRVE
TM 5443 RPL3

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
SHEET 4 OF 5

bHA, inc. 5115 AVENIDA ENCINAS SUITE L CARLSBAD, CA. 92008 (760) 931-8700

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
ATTACHMENT 1D
1505 YORK DRIVE TM 5443 RPL3



SCALE: 1" = 50'

LEGEND
DMA BOUNDARY
BMP

ATTACHMENT 1D
1505 YORK DIRVE
TM 5443 RPL3

INDIVIDUAL STRUCTURAL BMP DMA MAPBOOK
SHEET 5 OF 5

bHA, Inc. 5115 AVENIDA ENCINAS SUITE L CARLSBAD, CA. 92008 (760) 931-8700

ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2b	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2c	Management of Critical Coarse Sediment Yield Areas See Section 6.2 and Appendix H of the BMP Design Manual.	☒ Exhibit depicting onsite and/or upstream sources of critical coarse sediment as mapped by Regional or Jurisdictional approaches outlined in Appendix H.1 AND, ☒ Demonstration that the project effectively avoids and bypasses sources of mapped critical coarse sediment per approaches outlined in Appendix H.2 and H.3. OR, ☐ Demonstration that project does not generate a net impact on the receiving water per approaches outlined in Appendix H.4.
Attachment 2d	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ Not required because BMPs will drain in less than 96 hours

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Point(s) of Compliance (POC) for Hydromodification Management
☒ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☒ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

HYDROMODIFICATION MANAGEMENT PLAN (HMP)

SWMM Modeling for Hydromodification Compliance of:

1505 York Drive Project
TM 5443 RPL3

Prepared For:

Gary Van Elk
841 Quails Trail
Vista, CA 92081

August 29, 2018

Prepared By:

Ronald Holloway, R.C.E. 29271

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HYDROMODIFICATION MANAGEMENT PLAN (HMP)

SWMM Modeling for Hydromodification Compliance of: 1505 York Drive Project, TM 5443 RPL3, County of San Diego, CA

INTRODUCTION

This document summarizes the approach used to model the proposed Olive Avenue project site in the City of Vista using the Environmental Protection Agency (EPA) Storm Water Management Model 5.1 (SWMM). SWMM simulations were prepared for the pre and post-development conditions at the site in order to determine if the proposed LID biofiltration facilities have sufficient volume to meet the current Hydromodification Management Plan (HMP) requirements from the San Diego Regional Water Quality Control Board (SDRWQCB), as established in the Model BMP Design Manual San Diego Region (BMPDM) for the County of San Diego Copermittees, which includes the City of Vista.

SWMM MODEL DEVELOPMENT

This project proposes to subdivide the existing property into 5 lots. Proposed development includes the grading of 4 pads for single family residences, a private road, the improvement of York Drive, and storm drain infrastructure. One of the existing homes will be demolished and removed, while the other existing home, on the lot nearest to York Drive, will remain. Drainage patterns reflected on the DMA Exhibit will respect the existing drainage basin and will discharge to the POC previously identified in the existing condition analysis. POC-1 includes new impervious contributing area and is subject to Hydromodification Plan (HMP) compliance.

Project grading will occur on approximately 2.40 acres of the project, which comprises approximately 85 percent of the total parcel area. The proposed site topography will continue to direct flow southwesterly. The site will be flattened, as compared to existing conditions, in order to facilitate construction of residential pads and drive aisles. Grading on the site has been minimized to the maximum extent possible.

The POC include impervious contributing area and require SWMM continuous simulation analysis to prove compliance with HMP requirements.

TABLE 1 – CONTRIBUTING AREA – PRE-DEVELOPMENT VS. POST-DEVELOPMENT

POC ID	Pre-Dev Area (Ac)	Post-Dev Area (Ac)
1	1,068,220	1,068,220

The SWMM was used since we have found it to be more comparable to San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM) and also because it is a non-proprietary model

approved by the HMP document. For both SWMM simulations, flow duration curves were prepared to determine if the proposed HMP facilities are sufficient to meet the current HMP requirements.

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

Per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 4 Evapotranspiration Area. Thus evapotranspiration values for the site were modeled using Zone 4 monthly values from Table G.1-1 from the County of San Diego BMP Design Manual.

The on-site soil classification is Type A and Type **B** from USDA Web Soil Survey and ArcGIS BMP Sizing Calculator is Type B (see References). Additional field and laboratory investigations were performed by Christian Wheeler Engineering to further assess the geological impacts of storm water infiltration. The purpose of the study was to evaluate the general infiltration rate of earth materials in the location of anticipated infiltration basins. Infiltration testing was performed using the falling head test method, in general conformance with County of San Diego BMP Design Manual Guidelines. An analysis of the field test data is included in the Report of Geotechnical Infiltration Study, 1505 York Drive, County of San Diego, California, December 15, 2016 (Attachment 5).

According to the percolation data, infiltration rates are considered high and within the range of Type A soils. However the site is proposing infiltration basins within close proximity to engineering slopes cut and fill. Infiltration rates indicate rapid water movement thru the soil profile that will cause soil stability issues as well as soil erosion. Also see Worksheet C.4.-1 (Form I-8). Biofiltration Basins will be lined with an impermeable liner to prevent potential of geologic hazard near top of slopes.

Onsite soil areas have been assumed to be compacted in the existing condition to represent the current condition of the site and fully compacted in the post development conditions. Other SWMM inputs for subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

HMP MODELING

POC-1

Storm water runoff from the project site is routed to one (1) Point of Compliance (POC), located at the discharge location to the westerly boundary of the project site. The current site contains impervious structures and driveways, the portion of site that is to remain undisturbed having both impervious and pervious areas will be modeled as such. The remaining site that is to be grading will be modeled as entirely pervious, as required by RWQCB Order No. R9-2013-0001.

Runoff from the impervious surfaces on Lots 1-4 are routed to pervious dispersion areas before draining to yard swales and the proposed biofiltration basins. These areas have been designed with the site design BMP SD-5 Impervious Area Dispersion per Appendix E.3 of the County of San Diego BMP Design Manual.

Once runoff is routed via the proposed BMP, the flow is then conveyed via storm drain to the aforementioned POC1. Tables 2.1 and 2.2 summarize data for the POC-1 DMAs.

TABLE 2.1 – SUMMARY OF EXISTING CONDITIONS FOR POC-1

DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
DMA-1	1,068,220	25.0%

TABLE 2.2 – SUMMARY OF DEVELOPED CONDITIONS FOR POC-1

DMA	Tributary Area, A (ac)	Impervious Percentage, Ip
DMA-1A	0.3215	34%
DMA-1B	0.1274	0%
DMA-1C	0.0556	0%
Basin 1	0.0148	0%
DMA-2A	0.2989	0%
DMA-2B	0.1598	0%
DMA-2C	0.0181	0%
Basin 2	0.0117	0%
DMA-3A	0.2595	32%
DMA-3B	0.0738	100%
Basin 3	0.0088	0%
DMA-4A	0.2476	36%
Basin 4	0.0043	0%
DMA-5A	0.5669	65%
Basin 5	0.0133	0%
Total	2.1819	

The BMP biofiltration basins are responsible for handling hydromodification requirements for POC-1. In developed conditions, the basins will have a total depth from 1.25 feet to 2 feet. The BMP is comprised of an 18-inch layer of amended soil (a highly sandy, organic rich compost with an infiltration capacity of at least 5 in/hr), and 18 to 21-inches reservoir layer of gravel for additional detention, and to accommodate the French drain system. Below the reservoir layer, the basin will include 3 inches of saturated storage. Flows will discharge from the basin via a low-flow orifice outlet within the gravel layer to the receiving storm drain system or discharged to a rip rap energy dissipater. A riser structure will also be constructed within the BMP with multiple low-flow orifices and an emergency overflow, such that peak flows can be safely discharged to the storm drain system (see dimensions in Table 2 and 3).

General Considerations

The biofiltration basins were modeled using the biofiltration LID module within SWMM. The biofiltration module can model the underground gravel storage layer, underdrain with orifice plate, amended soil layer, and a surface storage pond up to the elevation of the invert of the lowest surface discharge opening in the basin riser structure. Ponding above the invert of the lowest surface discharge opening in the basin riser structure is modeled as a detention basin: elevation vs. area, and elevation vs. discharge tables, are needed by SWMM for Modified Puls routing purposes. Detailed outlet structure location and elevations should be shown on the construction plans based on the recommendations of this study.

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP IMP

HMP-BMP biofiltration basins are proposed for hydromodification conformance and flood control for the project site. Tables 3 and 4 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project. Flood control is discussed within the Drainage Report prepared by BHA for this project.

TABLE 3 – SUMMARY OF DUAL PURPOSE BMP: Biofiltration with Surface Ponding

BMP	BMP DIMENSIONS						
	Tributary Area (ac)	BMP Area[(1)] (ft^2)	Underdrain Orifice, D (in)[(2)]	Gravel Depth (in)[(3)]	Depth Riser Invert[(4)] (in)	Total Surface Depth[(5)] (ft)	Total Sub-Surface Depth[(6)] (ft)
1	0.52	643	0.37"-dia	21	2.00	3.5	3.83
2	0.49	509	0.35"-dia	12	1.33	2.9	3.08
3	0.37	382	0.81"-dia	12	2.00	3.4	3.08
4	0.27	186	0.25"-dia	12	2.00	3.7	3.08
5	0.58	580	0.81"-dia	21	2.00	2.7	3.83

Notes: (1): BMP Area = Gravel Area = Amended Soil Area. Amended soil depth equal to 18 inches for the BMPs.

(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q_2).

(3): Total depth of gravel layer including 3 inches of saturated storage below underdrain pipe.

(4): Depth from top of amended soil layer to invert of emergency overflow weir.

(5): The total surface ponding depth from the top of amended soil layer.

(6): The total sub-surface depth from the invert of the gravel layer to top of amended soil layer.

TABLE 4 – SUMMARY HMP RISER SURFACE DISCHARGE STRUCTURES

BMP	Lower Orifice Dimensions			Upper Orifice Dimensions			Emergency Weir	
	Outlet Type[(1)]	Invert Elev, HL[(2)] (in)	Dimensions Length x Height[(3)]	Outlet Type[(1)]	Invert Elev, HU[(2)] (in)	Dimensions[(3)]	Riser Invert Elev, Htop[(4)] (in)	Weir Perimeter Length[(5)] (ft)
1	Slot	12	(1) 3" x 6"	Vertical Notch	15	2" Wide x 9" High	24	12
2	Slot	12	(1) 3" x 12"	Vertical Notch	15	2" Wide x 9" High	24	12
3	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
4	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
5	Slot	12	(1) 3" x 12	Vertical Notch	15	2" Wide x 9" High	24	12

Notes: (1): Shape of orifice opening in riser structure.

(2): Depth from top of amended soil layer to invert of lower orifice or weir.

(3): Number of orifices - (#) .

(4): Depth from bottom of pond to invert of emergency overflow weir.

(5): Overflow length, the internal perimeter of the riser is 12 ft (3 ft x 3 ft internal dimensions).

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at POC-1 by exporting the hourly runoff time series results from SWMM to a spreadsheet. At both POCs, the FDC was compared between 10% of the existing condition Q_2 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 Weibull plotting position method.

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 (Qi with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at POC-1 and POC-2 is illustrated in Figure 1 and Figure 2, respectively, in both normal and logarithmic scale.

As can be seen in Figure 1 and Figure 2, the FDCs for the proposed condition with the HMP facilities is within 110% of the curve for the existing condition in both peak and duration. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold. Additionally, the project will also not increase peak flow rates between the pre-development Q_2 and the Q_{10}, as shown in the graphic and also in the peak flow tables listed in Attachment 1.

Discussion of the Manning's coefficient (Pervious Areas) for Pre and Post-Development Conditions

Typically the Manning's coefficient is selected as n = 0.15 for pervious areas and n = 0.012 for impervious areas (as consistent with the BMP Design Manual). However, due to the impact that n has in the continuous simulation a more accurate value of the Manning's coefficient has been chosen for pervious areas. Taken into consideration the study prepared by Tory R. Walker Engineering (Reference [6]) a value of n = 0.08 has been selected (see Table 1 of Reference [6] included in Attachment 7). The existing condition site includes paved driveways and impervious accessory buildings. Existing impervious areas are assumed to be pervious areas consisting of the bare soil underlying the impervious surfaces. Therefore the existing condition site is primarily a mix of bare dirt and shrubs. Based on these existing site observations, the N value was conservatively selected as 0.08, which is consistent per the reference cited. The BMP Design Manual default value of n = 0.10 was used for the developed portions of the project, as the developed site is assumed to include dense landscaping.

DRAWDOWN TIME

To ensure compliance with the 24 hour and 96 hour drawdown requirements (per Section 6.3.7 of the BMP Design Manual); drawdown calculations are provided in Attachment 10 of this report.

SUMMARY

This study has demonstrated that the proposed biofiltration basins provided for the Olive Avenue project site are sufficient to meet current HMP criteria if the cross-section areas and volumes recommended within this document, and the respective orifice and outlet structures are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. According to the percolation data, infiltration rates are considered low and within the range of Type D soils.
2. The biofiltration basins will be lined with an impermeable liner (no infiltration).

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural “x” scale) and Flow Duration Table
3. List of the “n” largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge & Stage- Storage Curves to be used in SWMM
5. Basin Outlet Structure Details
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model
10. Drawdown calculations

REFERENCES

[1] – "*County of San Diego BMP Design Manual*", May 2018, County off San Diego.

[2] – "*Final Hydromodification Management Plan (HMP) prepared for the County of San Diego*", March 2011, Brown and Caldwell.

[3] – Order R9-2013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

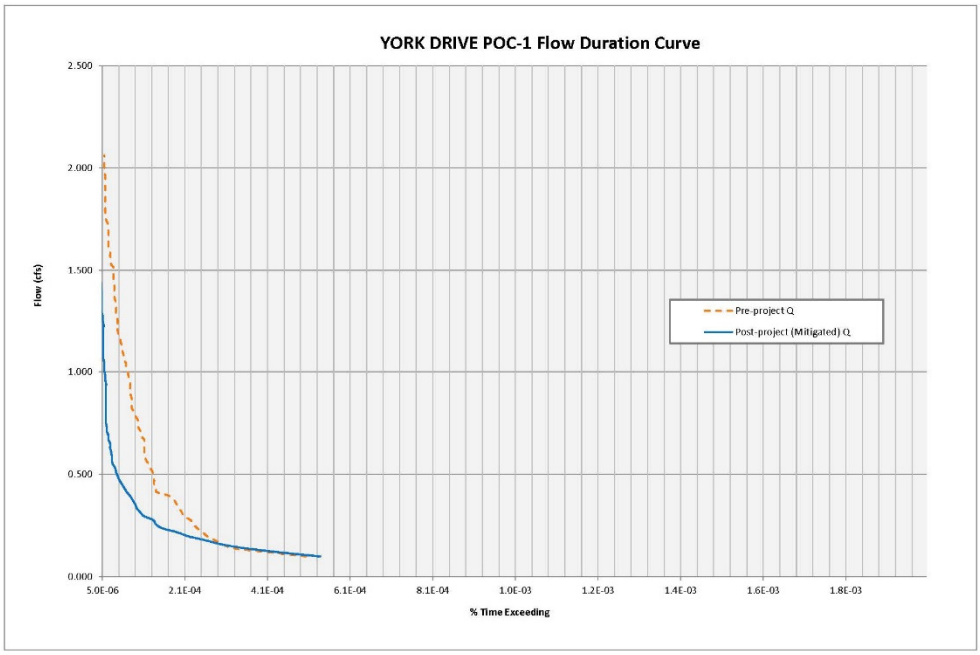
[4] – "*Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista*", May 2012, Tory R. Walker Engineering.

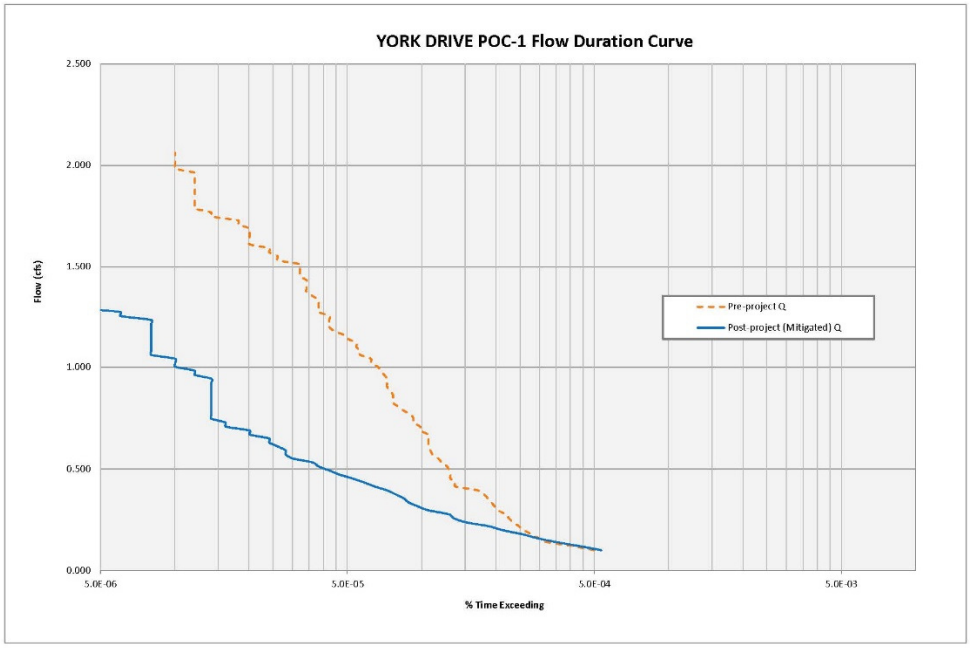
[5] – "*San Diego County Hydraulic Design Manual*", September 2014, County of San Diego Department of Public Works Flood Control Section.

[6] – "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Value in the San Diego Region*", Tory R. Walker Engineering, 2016.

[7] – *"Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for 1505 York Drive*", August 29, 2018, BHA, Inc.

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


YORK DRIVE POC-1 Flow Duration Curve
2.500
2.000
1.500
1.000
0.500
0.000
Flow (cfs)
5.0E-06
2.1E-04
4.1E-04
6.1E-04
8.1E-04
1.0E-03
1.2E-03
1.4E-03
1.6E-03
1.8E-03
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q


YORK DRIVE POC-1 Flow Duration Curve
2.500
2.000
1.500
1.000
0.500
0.000
Flow (cfs)
5.0E-06
5.0E-05
5.0E-04
5.0E-03
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

ATTACHMENT 1

Q_2 to Q_{10} Comparison Tables

Peak Flow Frequency Summary – POC-1

Q_2 to Q_{10} Comparison Table - POC-1			
Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
LF = 0.1xQ_2	0.099	0.040	0.059
2-year	0.992	0.401	0.591
3-year	1.256	0.472	0.784
4-year	1.477	0.538	0.939
5-year	1.540	0.577	0.963
6-year	1.595	0.626	0.968
7-year	1.697	0.677	1.020
8-year	1.762	0.702	1.060
9-year	1.871	0.724	1.147
10-year	2.061	0.783	1.278

ATTACHMENT 2

FDC Plots (log and natural “x” scale) and Flow Duration Table

Flow Duration Curve Analysis

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

The figures on the following pages illustrate 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 $0.1Q_2 – Q_{10}$ is divided into 100 sub intervals, the post development divided by pre-development durations is never larger than 110% (the permit allows up to 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. However, in order to satisfy the County of San Diego HMP example, % of time exceeded is the variable of choice in the flow duration curve. 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 just to prove the difference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by BHA, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (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). BHA performed the analysis using the Weibull Plotting positon Method 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 POC-1,

Low Flow Threshold:	10%	
0.1xQ2 (Pre):	0.099	cfs
Q10 (Pre):	2.061	cfs
# of Ordinates:	100	
Incremental Q (Pre):	0.01962	cfs
Total Hourly Data:	497370	hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.099	248	4.99E-04	265	5.33E-04	107%	Pass
1	0.119	205	4.12E-04	217	4.36E-04	106%	Pass
2	0.138	161	3.24E-04	176	3.54E-04	109%	Pass
3	0.158	148	2.98E-04	146	2.94E-04	99%	Pass
4	0.178	138	2.77E-04	127	2.55E-04	92%	Pass
5	0.197	129	2.59E-04	106	2.13E-04	82%	Pass
6	0.217	123	2.47E-04	93	1.87E-04	76%	Pass
7	0.237	117	2.35E-04	75	1.51E-04	64%	Pass
8	0.256	112	2.25E-04	67	1.35E-04	60%	Pass
9	0.276	109	2.19E-04	64	1.29E-04	59%	Pass
10	0.295	101	2.03E-04	53	1.07E-04	52%	Pass
11	0.315	98	1.97E-04	48	9.65E-05	49%	Pass
12	0.335	95	1.91E-04	44	8.85E-05	46%	Pass
13	0.354	92	1.85E-04	42	8.44E-05	46%	Pass
14	0.374	89	1.79E-04	39	7.84E-05	44%	Pass
15	0.393	84	1.69E-04	36	7.24E-05	43%	Pass
16	0.413	68	1.37E-04	32	6.43E-05	47%	Pass
17	0.433	68	1.37E-04	29	5.83E-05	43%	Pass
18	0.452	65	1.31E-04	26	5.23E-05	40%	Pass
19	0.472	65	1.31E-04	23	4.62E-05	35%	Pass
20	0.492	64	1.29E-04	21	4.22E-05	33%	Pass
21	0.511	63	1.27E-04	19	3.82E-05	30%	Pass
22	0.531	60	1.21E-04	18	3.62E-05	30%	Pass
23	0.550	58	1.17E-04	15	3.02E-05	26%	Pass
24	0.570	55	1.11E-04	14	2.81E-05	25%	Pass
25	0.590	54	1.09E-04	14	2.81E-05	26%	Pass
26	0.609	53	1.07E-04	13	2.61E-05	25%	Pass
27	0.629	53	1.07E-04	12	2.41E-05	23%	Pass

28	0.649	53	1.07E-04	12	2.41E-05	23%	Pass
29	0.668	53	1.07E-04	10	2.01E-05	19%	Pass
30	0.688	49	9.85E-05	10	2.01E-05	20%	Pass
31	0.707	49	9.85E-05	8	1.61E-05	16%	Pass
32	0.727	46	9.25E-05	8	1.61E-05	17%	Pass
33	0.747	46	9.25E-05	7	1.41E-05	15%	Pass
34	0.766	45	9.05E-05	7	1.41E-05	16%	Pass
35	0.786	42	8.44E-05	7	1.41E-05	17%	Pass
36	0.805	40	8.04E-05	7	1.41E-05	18%	Pass
37	0.825	38	7.64E-05	7	1.41E-05	18%	Pass
38	0.845	38	7.64E-05	7	1.41E-05	18%	Pass
39	0.864	38	7.64E-05	7	1.41E-05	18%	Pass
40	0.884	37	7.44E-05	7	1.41E-05	19%	Pass
41	0.904	36	7.24E-05	7	1.41E-05	19%	Pass
42	0.923	36	7.24E-05	7	1.41E-05	19%	Pass
43	0.943	36	7.24E-05	7	1.41E-05	19%	Pass
44	0.962	35	7.04E-05	6	1.21E-05	17%	Pass
45	0.982	34	6.84E-05	6	1.21E-05	18%	Pass
46	1.002	33	6.63E-05	5	1.01E-05	15%	Pass
47	1.021	31	6.23E-05	5	1.01E-05	16%	Pass
48	1.041	31	6.23E-05	5	1.01E-05	16%	Pass
49	1.061	28	5.63E-05	4	8.04E-06	14%	Pass
50	1.080	28	5.63E-05	4	8.04E-06	14%	Pass
51	1.100	27	5.43E-05	4	8.04E-06	15%	Pass
52	1.119	27	5.43E-05	4	8.04E-06	15%	Pass
53	1.139	25	5.03E-05	4	8.04E-06	16%	Pass
54	1.159	24	4.83E-05	4	8.04E-06	17%	Pass
55	1.178	22	4.42E-05	4	8.04E-06	18%	Pass
56	1.198	21	4.22E-05	4	8.04E-06	19%	Pass
57	1.217	21	4.22E-05	4	8.04E-06	19%	Pass
58	1.237	21	4.22E-05	4	8.04E-06	19%	Pass
59	1.257	21	4.22E-05	3	6.03E-06	14%	Pass
60	1.276	19	3.82E-05	3	6.03E-06	16%	Pass
61	1.296	19	3.82E-05	2	4.02E-06	11%	Pass
62	1.316	19	3.82E-05	2	4.02E-06	11%	Pass
63	1.335	19	3.82E-05	2	4.02E-06	11%	Pass
64	1.355	18	3.62E-05	2	4.02E-06	11%	Pass
65	1.374	17	3.42E-05	2	4.02E-06	12%	Pass
66	1.394	17	3.42E-05	2	4.02E-06	12%	Pass
67	1.414	17	3.42E-05	1	2.01E-06	6%	Pass
68	1.433	17	3.42E-05	1	2.01E-06	6%	Pass
69	1.453	16	3.22E-05	0	0.00E+00	0%	Pass
70	1.473	16	3.22E-05	0	0.00E+00	0%	Pass

71	1.492	16	3.22E-05	0	0.00E+00	0%	Pass
72	1.512	16	3.22E-05	0	0.00E+00	0%	Pass
73	1.531	13	2.61E-05	0	0.00E+00	0%	Pass
74	1.551	13	2.61E-05	0	0.00E+00	0%	Pass
75	1.571	12	2.41E-05	0	0.00E+00	0%	Pass
76	1.590	12	2.41E-05	0	0.00E+00	0%	Pass
77	1.610	10	2.01E-05	0	0.00E+00	0%	Pass
78	1.629	10	2.01E-05	0	0.00E+00	0%	Pass
79	1.649	10	2.01E-05	0	0.00E+00	0%	Pass
80	1.669	10	2.01E-05	0	0.00E+00	0%	Pass
81	1.688	10	2.01E-05	0	0.00E+00	0%	Pass
82	1.708	9	1.81E-05	0	0.00E+00	0%	Pass
83	1.728	9	1.81E-05	0	0.00E+00	0%	Pass
84	1.747	7	1.41E-05	0	0.00E+00	0%	Pass
85	1.767	7	1.41E-05	0	0.00E+00	0%	Pass
86	1.786	6	1.21E-05	0	0.00E+00	0%	Pass
87	1.806	6	1.21E-05	0	0.00E+00	0%	Pass
88	1.826	6	1.21E-05	0	0.00E+00	0%	Pass
89	1.845	6	1.21E-05	0	0.00E+00	0%	Pass
90	1.865	6	1.21E-05	0	0.00E+00	0%	Pass
91	1.884	6	1.21E-05	0	0.00E+00	0%	Pass
92	1.904	6	1.21E-05	0	0.00E+00	0%	Pass
93	1.924	6	1.21E-05	0	0.00E+00	0%	Pass
94	1.943	6	1.21E-05	0	0.00E+00	0%	Pass
95	1.963	6	1.21E-05	0	0.00E+00	0%	Pass
96	1.983	5	1.01E-05	0	0.00E+00	0%	Pass
97	2.002	5	1.01E-05	0	0.00E+00	0%	Pass
98	2.022	5	1.01E-05	0	0.00E+00	0%	Pass
99	2.041	5	1.01E-05	0	0.00E+00	0%	Pass
100	2.061	5	1.01E-05	0	0.00E+00	0%	Pass

Peak flows calculated with the Weibull Plotting Position

Return Period (years)	Pre-Dev. Peak Flows (cfs)	Post-Dev. Peak Flows (cfs)	Reduction (cfs)
LF = 0.1xQ2	0.633	0.592	0.041
2-year	6.326	5.915	0.411
3-year	8.061	7.454	0.607
4-year	9.316	8.574	0.742
5-year	10.119	9.129	0.989
6-year	10.234	9.455	0.779
7-year	11.074	10.297	0.777
8-year	11.424	10.646	0.778
9-year	12.208	11.371	0.836
10-year	13.884	12.945	0.938

ATTACHMENT 3

List of the “n” largest Peaks: Pre-Development and Post-Development Conditions

List of the "n" Largest Peaks: Pre & Post-Developed Conditions

- Basic Probabilistic Equation: $R = \frac{1}{P}$

  where,

  R = Return period in years; and

  P = Probability of a flow to be equaled or exceeded any given year (dimensionless).

- Weibull Equation: $P = \frac{i}{n+1}$

  where,

  i = Position of the peak whose probability is desired (sorted from large to small); and

  n = number of years analyzed.

Explanation of Variables for the Tables in this Attachment

- Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.
- Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.
- Date: Date of the occurrence of the peak at the outlet form the continuous simulation.
- Note: All peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt=0, and the peak is the largest value in 25 hours (12 hours before the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

ATTACHMENT 4

Elevation vs. Area Curves and Elevation vs. Discharge Curves to be used in SWMM

Elevation vs. Area

The elevation vs. area curves in the model are calculated in Excel and imported into the model. The summary of elevation vs. area for each BMP has been provided on the following pages.

The LID surface storage depth beneath the lowest surface discharge structure is accounted for in the LID module as illustrated in Attachment 7.

Elevation vs. Discharge

The total elevation vs. discharge curve is imported from an Excel spreadsheet that calculates the elevation vs. discharge of the outlet system. Elevation vs. discharge relationships are provided in the surface discharge of the biofiltration basin as this is where a Modified Puls routing procedure will be applied in the continuous simulation model.

The low-flow orifice size has been selected to maximum its size while still restricting flows to conform with the required 10% of the Q_2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While BHA acknowledges that this orifice is small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conforming with HMP requirements.

In order to further reduce the risk of blockage of the orifice, regular maintenance of the riser and orifice must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structures are provided in Attachment 5 of this memorandum.

Discharge Equations

The following equations are based on the *San Diego County Hydraulic Design Manual* (September 2014):

- Weir:
  $Q_W = C_W * L * H^{3/2}$ (1)

- Slot:

  As an orifice: $Q_S = B_S * h_S * c_g * \sqrt{2g(H - \frac{h_S}{2})}$ (2.a)

  As a weir: $Q_S = C_W * B_S * H^{3/2}$ (2.b)

  For $H > h_S$ slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

- Vertical Orifices:

  As an orifice: $Q_O = 0.25 * \pi D^2 * c_g * \sqrt{2g(H - \frac{D}{2})}$ (3.a)

  As a weir: Critical depth and geometric family of circular sector must be solved to determine Q as a function of H:

  $\frac{Q_o^2}{g} = \frac{A_{cr}^3}{T_{cr}}; H = y_{cr} + \frac{A_{cr}}{2*T_{cr}}; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}; A_{cr} = \frac{D^2}{8}[a_{cr} - \sin(a_{cr})];$
  $y_{cr} = \frac{D}{2}[1 - \sin(0.5 * a_{cr})]$ (3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)

  There is a value of H (approximately H=110%D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type of discharge.

The following are the variables used above:

Q_W, Q_s, Q_o : Discharge of weir, slot or orifice (cfs)

C_W, c_g: Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s: Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

$A_{cr}, T_{cr}, y_{cr}, a_{cr}$: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Elevation vs. Area Tables

SURFACE STORAGE BASIN 1

Depth (ft)	Area (ft^2)	Volume (ft^3)	
0.00	643	0	Bottom of Basin
0.25	713	170	
0.50	783	357	
0.75	853	561	
1.00	923	783	Lower Slot Orifice
1.25	993	1,023	
1.50	1063	1,280	
1.75	1133	1,554	
2.00	1203	1,846	
2.25	1273	2,156	
2.50	1343	2,483	

SUB SURFACE STORAGE BASIN A

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	643	193	Amended Soil Base (0.2 voids)
-3.25	643	450	Gravel Base (0.4 voids)
Gravel & Amended Soil	TOTAL =	643	(ft^3)
Surface Total	TOTAL =	643	(ft^3)
BMP	**TOTAL =**	**1286**	**(ft^3)**

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	14.61 in

Outlet Structure for Discharge of Basin 1

Elevation vs. Discharge Table

Lower orifice			Lower slot			Emergency Weir		
No. of orif:	0		No. of slots:	0		Invert:	1.00	ft
Dia:	0	"	Invert:	0	ft	B:	12.0	ft
Invert:	0	ft	B:	0.250	ft			
Cg-low:	0.62		h_{slot}:	0.250	ft			
Upper orifice			Lower notch			Upper notch		
No. of orif:	0		No. of slots:	1		No. of slots:	1	
Dia:	0	"	Invert:	0.25	ft	Invert:	0.25	ft
Invert:	0	ft	B:	0.600	ft	B:	0.167	ft
Cg-low:	0.620		h_{slot}:	0.250	ft	h_{slot}:	0.750	ft

***Note: h = head above the invert of the lowest surface discharge opening.**

H (ft)	h* (ft)	$Q_{orifice-low}$ (cfs)	$Q_{orifice-upper}$ (cfs)	$Q_{slot-low}$ (cfs)	$Q_{slot-notch}$ (cfs)	Q_{emerg} (cfs)	Q_{tot} (cfs)
1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.083	0.083	0.000	0.000	0.000	0.045	0.000	0.045
1.167	0.167	0.000	0.000	0.000	0.127	0.000	0.127
1.250	0.250	0.000	0.000	0.000	0.233	0.000	0.233
1.333	0.333	0.000	0.000	0.000	0.354	0.000	0.354
1.417	0.417	0.000	0.000	0.000	0.441	0.000	0.441
1.500	0.500	0.000	0.000	0.000	0.526	0.000	0.526
1.583	0.583	0.000	0.000	0.000	0.612	0.000	0.612
1.667	0.667	0.000	0.000	0.000	0.698	0.000	0.698
1.750	0.750	0.000	0.000	0.000	0.786	0.000	0.786
1.833	0.833	0.000	0.000	0.000	0.875	0.000	0.875
1.917	0.917	0.000	0.000	0.000	0.965	0.000	0.965
2.000	1.000	0.000	0.000	0.000	1.057	0.000	1.057
2.083	1.083	0.000	0.000	0.000	0.730	0.895	1.625
2.167	1.167	0.000	0.000	0.000	0.761	2.531	3.293
2.250	1.250	0.000	0.000	0.000	0.791	4.650	5.441
2.333	1.333	0.000	0.000	0.000	0.820	7.159	7.979
2.417	1.417	0.000	0.000	0.000	0.848	10.005	10.853
2.500	1.500	0.000	0.000	0.000	0.875	13.152	14.027

SWMM Model Flow Coefficient Calculation - Basin 1

York Drive

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	21	in
TOTAL		4.25	ft
		51	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	0.37	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.007	ft^3/s
Ponding Depth Surface Area	A_{PD}	923	ft^2
	A_S, A_G	643	ft^2
Bioretention Surface Area	A_S, A_G	0.0148	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	1.243	in/hr
Effective Ponding Depth	PD_{eff}	14.61	in
Flow Coefficient	C	0.0703	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	12	in
Cutoff Flow	Q_{cutoff}	0.0074	cfs

SURFACE STORAGE BASIN 2

Depth (ft)	Area (ft^2)	Volume (ft^3)	
0.00	509	0	Bottom of Basin
0.25	567	135	
0.50	625	284	
0.75	683	447	
1.00	741	625	Lower Slot Orifice
1.25	799	818	
1.50	857	1,025	
1.75	915	1,246	
2.00	973	1,482	
2.25	1031	1,733	
2.50	1089	1,998	

SUB SURFACE STORAGE BASIN A

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	509	153	Amended Soil Base (0.2 voids)
-2.50	509	204	Gravel Base (0.4 voids)
Gravel & Amended Soil	TOTAL =	356	(ft^3)
Surface Total	TOTAL =	643	(ft^3)
BMP	**TOTAL =**	**999**	**(ft^3)**

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	14.61 in

Outlet Structure for Discharge of Basin 2

Elevation vs. Discharge Table

Lower orifice		Lower slot		Emergency Weir	
No. of orif:	0	No. of slots:	0	Invert:	1.00 ft
Dia:	0 "	Invert:	0 ft	B:	12.0 ft
Invert:	0 ft	B:	2.00		
Cg-low:	0.62	h_{slot}:	0.250 ft		
Upper orifice		**Lower notch**		**Upper notch**	
No. of orif:	0	No. of slots:	1	No. of slots:	1
Dia:	0 "	Invert:	0.25 ft	Invert:	0.25 ft
Invert:	0 ft	B:	1.000	B:	0.167 ft
Cg-low:	0.620	h_{slot}:	0.250 ft	h_{slot}:	0.750 ft

***Note: h = head above the invert of the lowest surface discharge opening.**

H (ft)	h* (ft)	$Q_{orifice-low}$ (cfs)	$Q_{orifice-upper}$ (cfs)	$Q_{slot-low}$ (cfs)	$Q_{slot-notch}$ (cfs)	Q_{emerg} (cfs)	Q_{tot} (cfs)
1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.083	0.083	0.000	0.000	0.000	0.075	0.000	0.075
1.167	0.167	0.000	0.000	0.000	0.211	0.000	0.211
1.250	0.250	0.000	0.000	0.000	0.440	0.000	0.440
1.333	0.333	0.000	0.000	0.000	0.587	0.895	1.482
1.417	0.417	0.000	0.000	0.000	0.728	2.531	3.259
1.500	0.500	0.000	0.000	0.000	0.865	4.650	5.515
1.583	0.583	0.000	0.000	0.000	1.002	7.159	8.161
1.667	0.667	0.000	0.000	0.000	1.138	10.005	11.144
1.750	0.750	0.000	0.000	0.000	1.277	13.152	14.429
1.833	0.833	0.000	0.000	0.000	1.416	16.574	17.990
1.917	0.917	0.000	0.000	0.000	1.558	20.249	21.808
2.000	1.000	0.000	0.000	0.000	1.703	24.162	25.865
2.083	1.083	0.000	0.000	0.000	1.217	28.299	29.516
2.167	1.167	0.000	0.000	0.000	1.269	32.648	33.917
2.250	1.250	0.000	0.000	0.000	1.319	37.200	38.519
2.333	1.333	0.000	0.000	0.000	1.367	41.946	43.312
2.417	1.417	0.000	0.000	0.000	1.413	46.877	48.290
2.500	1.500	0.000	0.000	0.000	1.458	51.989	53.447

SWMM Model Flow Coefficient Calculation - Basin 2

York Drive

PARAMETER	ABBREV.	Bio-Retention Cell LID BMP	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	0.35	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.006	ft^3/s
Ponding Depth Surface Area	A_{PD}	741	ft^2
Bioretention Surface Area	A_S, A_G	509	ft^2
	A_S, A_G	0.0117	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	1.274	in/hr
Effective Ponding Depth	PD_{eff}	14.73	in
Flow Coefficient	C	0.0795	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	12	in
Cutoff Flow	Q_{cutoff}	0.00601	cfs

Stage Area for Basin 3

SURFACE STORAGE BASIN 3

Depth (ft)	Area (ft^2)	Volume (ft^3)	
0.00	382	0	Bottom of Basin
0.25	440	103	
0.50	498	220	
0.75	556	352	
1.00	614	498	Lower Slot Orifice
1.25	672	659	
1.50	730	834	
1.75	788	1,024	
2.00	846	1,228	
2.25	904	1,447	
2.50	962	1,680	

SUB SURFACE STORAGE BASIN A

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	382	115	Amended Soil Base (0.2 voids)
-2.50	382	153	Gravel Base (0.4 voids)
Gravel & Amended Soil	TOTAL =	267	(ft^3)
Surface Total	TOTAL =	643	(ft^3)
BMP	**TOTAL =**	**910**	**(ft^3)**

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	14.61 in

Outlet Structure for Discharge of Basin 3

Elevation vs. Discharge Table

Lower orifice		Lower slot		Emergency Weir	
No. of orif:	0	No. of slots:	0	Invert:	1.00 ft
Dia:	0 "	Invert:	0 ft	B:	12.0 ft
Invert:	0 ft	B:	0.250 ft		
Cg-low:	0.62	h_{slot}:	0.250 ft		
Upper orifice		**Lower notch**		**Upper notch**	
No. of orif:	0	No. of slots:	1	No. of slots:	1
Dia:	0 "	Invert:	0.25 ft	Invert:	0.25 ft
Invert:	0 ft	B:	0.750 ft	B:	0.167 ft
Cg-low:	0.620	h_{slot}:	0.250 ft	h_{slot}:	0.750 ft

***Note: h = head above the invert of the lowest surface discharge opening.**

H (ft)	h* (ft)	$Q_{orifice-low}$ (cfs)	$Q_{orifice-upper}$ (cfs)	$Q_{slot-low}$ (cfs)	$Q_{slot-notch}$ (cfs)	Q_{emerg} (cfs)	Q_{tot} (cfs)
1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.083	0.083	0.000	0.000	0.000	0.056	0.000	0.056
1.167	0.167	0.000	0.000	0.000	0.158	0.000	0.158
1.250	0.250	0.000	0.000	0.000	0.330	0.000	0.330
1.333	0.333	0.000	0.000	0.000	0.446	0.000	0.446
1.417	0.417	0.000	0.000	0.000	0.560	0.000	0.560
1.500	0.500	0.000	0.000	0.000	0.675	0.000	0.675
1.583	0.583	0.000	0.000	0.000	0.791	0.000	0.791
1.667	0.667	0.000	0.000	0.000	0.910	0.000	0.910
1.750	0.750	0.000	0.000	0.000	1.031	0.000	1.031
1.833	0.833	0.000	0.000	0.000	1.155	0.000	1.155
1.917	0.917	0.000	0.000	0.000	1.282	0.000	1.282
2.000	1.000	0.000	0.000	0.000	1.412	0.000	1.412
2.083	1.083	0.000	0.000	0.000	0.913	0.895	1.808
2.167	1.167	0.000	0.000	0.000	0.952	2.531	3.483
2.250	1.250	0.000	0.000	0.000	0.989	4.650	5.639
2.333	1.333	0.000	0.000	0.000	1.025	7.159	8.184
2.417	1.417	0.000	0.000	0.000	1.060	10.005	11.065
2.500	1.500	0.000	0.000	0.000	1.093	13.152	14.246

SWMM Model Flow Coefficient Calculation - Basin 3

York Drive			
PARAMETER	**ABBREV.**	**Bio-Retention Cell LID BMP**	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	0.81	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.032	ft^3/s
Ponding Depth Surface Area	A_{PD}	614	ft^2
	A_S, A_G	382	ft^2
Bioretention Surface Area	A_S, A_G	0.0088	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	9.069	in/hr
Effective Ponding Depth	PD_{eff}	15.64	in
Flow Coefficient	C	0.5672	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	12	in
Cutoff Flow	Q_{cutoff}	0.03208	cfs

SURFACE STORAGE BASIN 4

Depth (ft)	Area (ft^2)	Volume (ft^3)	
0.00	186	0	Bottom of Basin
0.25	239	53	
0.50	292	120	
0.75	345	199	
1.00	398	292	Lower Slot Orifice
1.25	451	398	
1.50	504	518	
1.75	557	650	
2.00	610	796	
2.25	663	955	
2.50	716	1,128	

SUB SURFACE STORAGE BASIN A

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	186	56	Amended Soil Base (0.2 voids)
-2.50	186	74	Gravel Base (0.4 voids)
Gravel & Amended Soil	TOTAL =	130	(ft^3)
Surface Total	TOTAL =	643	(ft^3)
BMP	**TOTAL =**	**773**	**(ft^3)**

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	14.61 in

Outlet Structure for Discharge of Basin 4

Elevation vs. Discharge Table

Lower orifice			Lower slot			Emergency Weir		
No. of orif:	0		No. of slots:	0		Invert:	1.00	ft
Dia:	0	"	Invert:	0	ft	B:	12.0	ft
Invert:	0	ft	B:	2.000	ft			
Cg-low:	0.62		h_{slot}:	0.167	ft			
Upper orifice			Lower notch			Upper notch		
No. of orif:	0		No. of slots:	1		No. of slots:	1	
Dia:	0	"	Invert:	0.25	ft	Invert:	0.25	ft
Invert:	0	ft	B:	0.750	ft	B:	0.167	ft
Cg-low:	0.620		h_{slot}:	0.250	ft	h_{slot}:	0.750	ft

***Note: h = head above the invert of the lowest surface discharge opening.**

H (ft)	h* (ft)	$Q_{orifice-low}$ (cfs)	$Q_{orifice-upper}$ (cfs)	$Q_{slot-low}$ (cfs)	$Q_{slot-notch}$ (cfs)	Q_{emerg} (cfs)	Q_{tot} (cfs)
1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.083	0.083	0.000	0.000	0.000	0.056	0.000	0.056
1.167	0.167	0.000	0.000	0.000	0.158	0.000	0.158
1.250	0.250	0.000	0.000	0.000	0.330	0.000	0.330
1.333	0.333	0.000	0.000	0.000	0.446	0.000	0.446
1.417	0.417	0.000	0.000	0.000	0.560	0.000	0.560
1.500	0.500	0.000	0.000	0.000	0.675	0.000	0.675
1.583	0.583	0.000	0.000	0.000	0.791	0.000	0.791
1.667	0.667	0.000	0.000	0.000	0.910	0.000	0.910
1.750	0.750	0.000	0.000	0.000	1.031	0.000	1.031
1.833	0.833	0.000	0.000	0.000	1.155	0.000	1.155
1.917	0.917	0.000	0.000	0.000	1.282	0.000	1.282
2.000	1.000	0.000	0.000	0.000	1.412	0.000	1.412
2.083	1.083	0.000	0.000	0.000	0.913	0.895	1.808
2.167	1.167	0.000	0.000	0.000	0.952	2.531	3.483
2.250	1.250	0.000	0.000	0.000	0.989	4.650	5.639
2.333	1.333	0.000	0.000	0.000	1.025	7.159	8.184
2.417	1.417	0.000	0.000	0.000	1.060	10.005	11.065
2.500	1.500	0.000	0.000	0.000	1.093	13.152	14.246

SWMM Model Flow Coefficient Calculation - Basin 4

York Drive			
PARAMETER	**ABBREV.**	**Bio-Retention Cell LID BMP**	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	12	in
TOTAL		3.5	ft
		42	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	0.25	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.003	ft^3/s
Ponding Depth Surface Area	A_{PD}	398	ft^2
	A_S, A_G	186	ft^2
Bioretention Surface Area	A_S, A_G	0.0043	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	1.780	in/hr
Effective Ponding Depth	PD_{eff}	18.84	in
Flow Coefficient	C	0.1110	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	12	in
Cutoff Flow	Q_{cutoff}	0.00307	cfs

SURFACE STORAGE BASIN 5

Depth (ft)	Area (ft^2)	Volume (ft^3)	
0.00	580	0	Bottom of Basin
0.25	637	152	
0.50	693	318	
0.75	750	499	
1.00	806	693	Lower Slot Orifice
1.25	863	902	
1.50	919	1,124	
1.75	976	1,361	
2.00	1032	1,612	
2.25	1089	1,877	
2.50	1145	2,156	

SUB SURFACE STORAGE BASIN A

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	580	174	Amended Soil Base (0.2 voids)
-3.25	580	406	Gravel Base (0.4 voids)
Gravel & Amended Soil	TOTAL =	580	(ft^3)
Surface Total	TOTAL =	643	(ft^3)
BMP	**TOTAL =**	**1223**	**(ft^3)**

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)

(2): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	14.61 in

Outlet Structure for Discharge of Basin 5

Elevation vs. Discharge Table

Lower orifice		Lower slot		Emergency Weir	
No. of orif:	0	No. of slots:	0	Invert:	1.00 ft
Dia:	0 "	Invert:	0 ft	B:	12.0 ft
Invert:	0 ft	B:	1.00 ft		
Cg-low:	0.62	h_{slot}:	0.250 ft		
Upper orifice		Lower notch		Upper notch	
No. of orif:	0	No. of slots:	1	No. of slots:	1
Dia:	0 "	Invert:	0.25 ft	Invert:	0.25 ft
Invert:	0 ft	B:	1.000 ft	B:	0.167 ft
Cg-low:	0.620	h_{slot}:	0.250 ft	h_{slot}:	0.750 ft

***Note: h = head above the invert of the lowest surface discharge opening.**

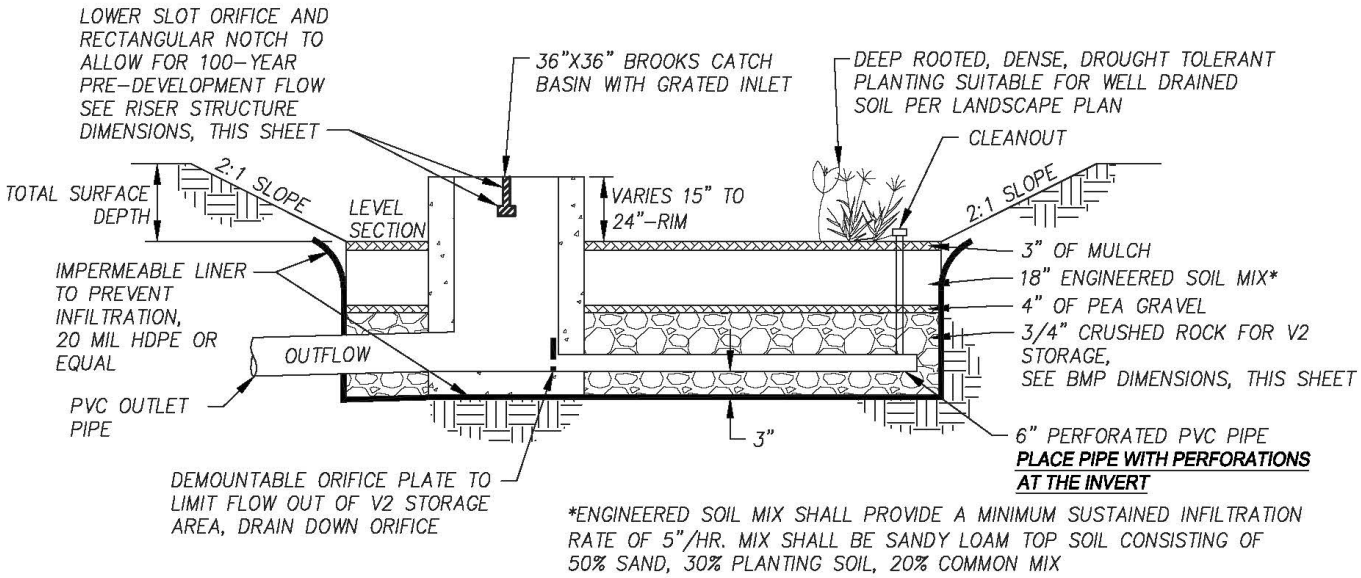
H (ft)	h* (ft)	$Q_{orifice-low}$ (cfs)	$Q_{orifice-upper}$ (cfs)	$Q_{slot-low}$ (cfs)	$Q_{slot-notch}$ (cfs)	Q_{emerg} (cfs)	Q_{tot} (cfs)
1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.083	0.083	0.000	0.000	0.000	0.075	0.000	0.075
1.167	0.167	0.000	0.000	0.000	0.211	0.000	0.211
1.250	0.250	0.000	0.000	0.000	0.388	0.000	0.388
1.333	0.333	0.000	0.000	0.000	0.581	0.000	0.581
1.417	0.417	0.000	0.000	0.000	0.709	0.000	0.709
1.500	0.500	0.000	0.000	0.000	0.831	0.000	0.831
1.583	0.583	0.000	0.000	0.000	0.948	0.000	0.948
1.667	0.667	0.000	0.000	0.000	1.064	0.000	1.064
1.750	0.750	0.000	0.000	0.000	1.179	0.000	1.179
1.833	0.833	0.000	0.000	0.000	1.293	0.000	1.293
1.917	0.917	0.000	0.000	0.000	1.408	0.000	1.408
2.000	1.000	0.000	0.000	0.000	1.523	0.000	1.523
2.083	1.083	0.000	0.000	0.000	1.217	0.895	2.112
2.167	1.167	0.000	0.000	0.000	1.269	2.531	3.800
2.250	1.250	0.000	0.000	0.000	1.319	4.650	5.969
2.333	1.333	0.000	0.000	0.000	1.367	7.159	8.526
2.417	1.417	0.000	0.000	0.000	1.413	10.005	11.418
2.500	1.500	0.000	0.000	0.000	1.458	13.152	14.610

SWMM Model Flow Coefficient Calculation - Basin 5

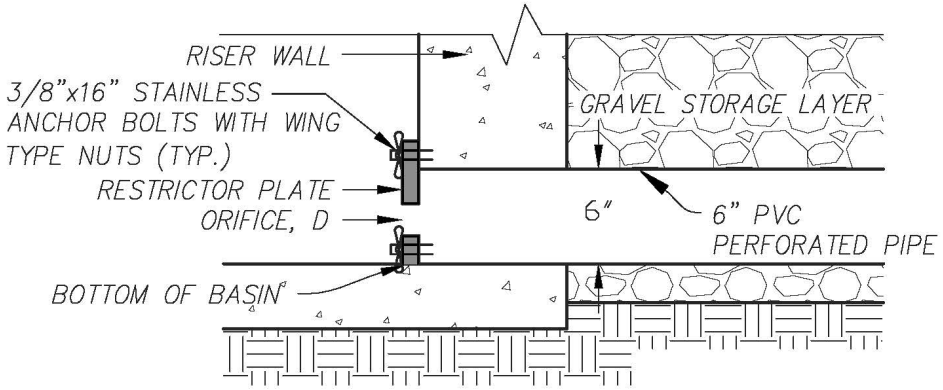
York Drive			
PARAMETER	**ABBREV.**	**Bio-Retention Cell LID BMP**	
Ponding Depth	PD	12	in
Bioretention Soil Layer	S	18	in
Gravel Layer	G	21	in
TOTAL		4.25	ft
		51	in
Orifice Coefficient	Cg	0.6	--
Low Flow Orifice Diameter	D	0.81	in
Drain exponent	n	0.5	--
Flow Rate (volumetric)	Q	0.035	ft^3/s
Ponding Depth Surface Area	A_{PD}	806	ft^2
	A_S, A_G	580	ft^2
Bioretention Surface Area	A_S, A_G	0.0133	ac
Porosity of Bioretention Soil	η	0.40	--
Flow Rate (per unit area)	q	6.588	in/hr
Effective Ponding Depth	PD_{eff}	14.34	in
Flow Coefficient	C	0.3736	--
Ponding Depth @ $V_{WQ,\ required}$	$PD_{orificeFL}$	12	in
Cutoff Flow	Q_{cutoff}	0.03538	cfs

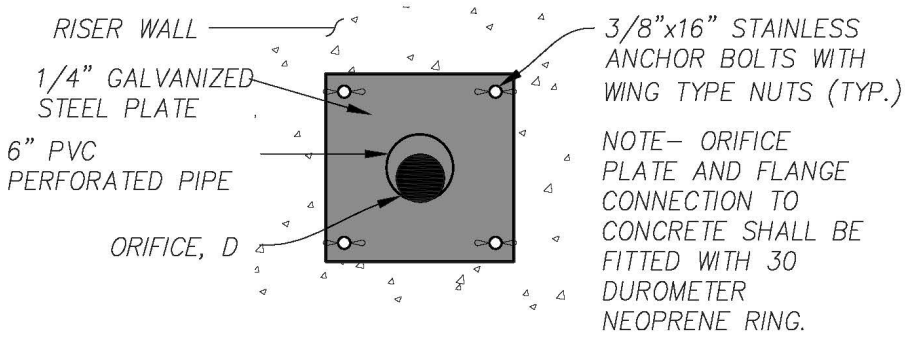
ATTACHMENT 5

Basin Outlet Details



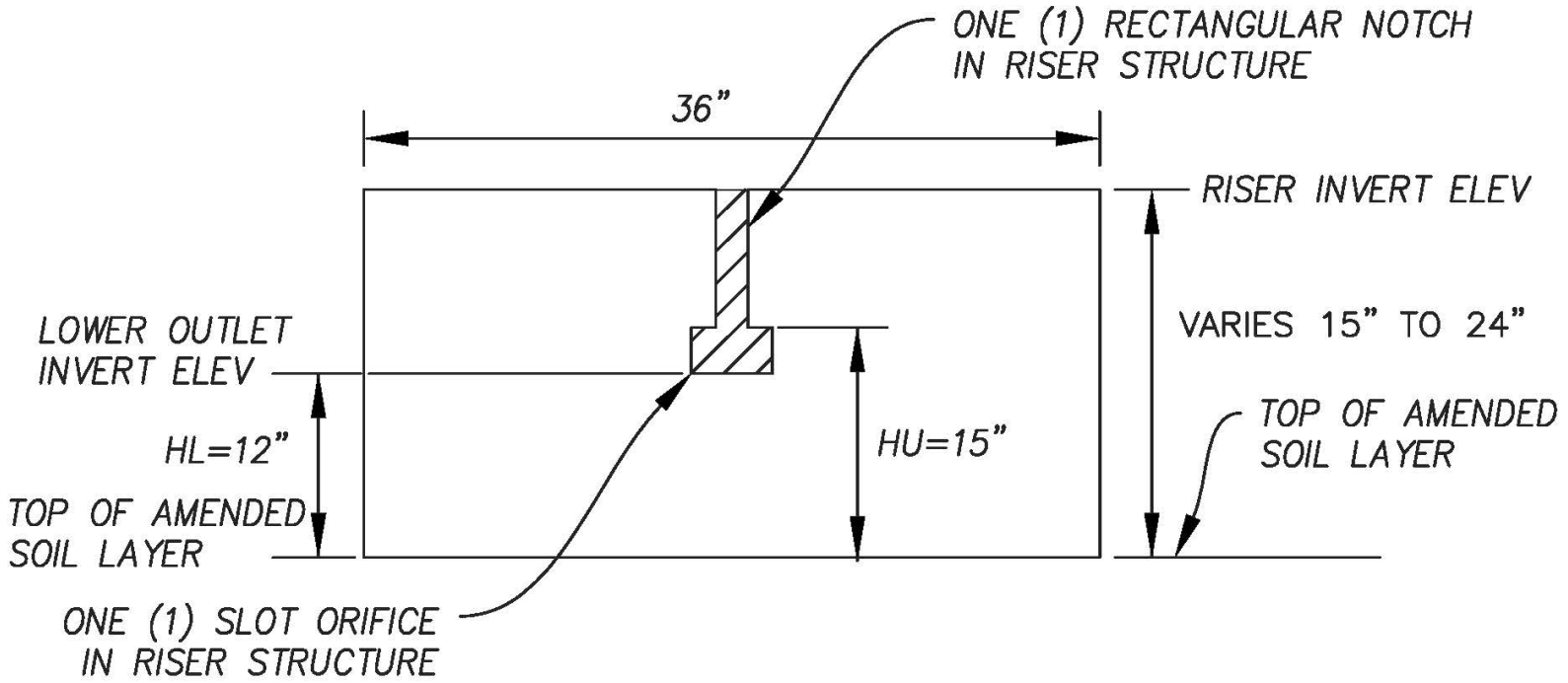
TYPICAL BIOFILTRATION BASIN DETAIL, TYP





RESTRICTOR PLATE DETAIL

NOT TO SCALE



TYPICAL OUTLET STRUCTURE DETAIL

NOT TO SCALE

ATTACHMENT 6

SWMM Input Data in Input Format
(Existing and Proposed Models)

POC-1

PRE-DEVELOPED RUNOFF CONDITION INPUT FILE

```
[TITLE]
;;Project Title/Notes
Olive Avenue, Pre-Developed Runoff Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
```

```
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          .060   .08    .11    .15    .17    .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
OCEANSIDE        INTENSITY 1:00     1.0      TIMESERIES OCEANSIDE

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
DMA-1            OCEANSIDE        POC-1            3.2284   10.1     251      7.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      .08        0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
DMA-1            3          0.2        0.31

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Oceanside Rain Data.dat"

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL
```

```
[TAGS]

[MAP]
DIMENSIONS 2182.681359 6021.851375 2183.279716 6040.229030
Units      Degrees

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2182.708557        6022.686723

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            2182.692422        6035.392805

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OCEANSIDE        2182.692422        6037.800628
```

POC-1

POST-DEVELOPED RUNOFF CONDITION INPUT FILE

```
[TITLE]
;;Project Title/Notes
York Drive, Lots 1 and 5 Post-Developed Runoff Condition

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           08/28/1951
START_TIME           05:00:00
REPORT_START_DATE    08/28/1951
REPORT_START_TIME    05:00:00
END_DATE             05/23/2008
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           0
HEAD_TOLERANCE       0
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
```

```
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.06   .08    .11    .15    .17    .19    .19    .18    .15    .11    .08    .06
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
OCEANSIDE        INTENSITY 1:00     1.0      TIMESERIES OCEANSIDE

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
BASIN-1          OCEANSIDE        DIV-1            0.0148   0        8.6      0        0
DMA-1A           OCEANSIDE        BASIN-1          0.3215   33.8     147      1.0      0
DMA-1B           OCEANSIDE        BASIN-1          0.0556   0        93       20       0
DMA-1C           OCEANSIDE        BASIN-1          0.1274   0        30       20       0
BYPASS           OCEANSIDE        POC-1            1.0001   3.6      193      6.4      0
DMA-5A           OCEANSIDE        BASIN-5          0.5669   65       50       5.88     0
BASIN-5          OCEANSIDE        DIV-5            0.0133   0        15       0        0
DMA-2A           OCEANSIDE        BASIN-2          0.2989   29.6     99       1        0
DMA-2B           OCEANSIDE        BASIN-2          0.1598   0        298      50       0
DMA-2C           OCEANSIDE        BASIN-2          0.0181   0        32       50       0
BASIN-2          OCEANSIDE        DIV-2            0.0117   0        6        0        0
DMA-3A           OCEANSIDE        BASIN-3          0.2595   32       180      1        0
DMA-3B           OCEANSIDE        BASIN-3          0.0738   100      62       4        0
BASIN-3          OCEANSIDE        DIV-3            0.0088   0        4        0        0
DMA-4A           OCEANSIDE        BASIN-4          0.2476   37       65       1.6      0
BASIN-4          OCEANSIDE        DIV-4            0.0043   0        50       0        0
DMA-3C           OCEANSIDE        BASIN-3          0.0124   0        25       7        0
DMA-3D           OCEANSIDE        BASIN-3          0.01892  0        15       7        0
DMA-4B           OCEANSIDE        BASIN-4          0.015    0        15       10       0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
BASIN-1          0.012      0.10       0.05       .1         25         OUTLET
DMA-1A           0.012      .10        0.05       0.10       25         PERVIOUS   25
DMA-1B           0.012      0.10       0.05       .1         25         OUTLET
DMA-1C           0.012      0.10       0.05       .1         25         OUTLET
BYPASS           0.012      0.08       0.05       .1         25         OUTLET
```

```
DMA-5A           0.012      0.1        0.05       .1         25         OUTLET
BASIN-5          0.012      0.10       0.05       .1         25         OUTLET
DMA-2A           0.012      0.1        0.05       .1         25         PERVIOUS   25
DMA-2B           0.012      0.10       0.05       .1         25         OUTLET
DMA-2C           0.012      0.1        0.05       .1         25         OUTLET
BASIN-2          0.012      0.10       0.05       .1         25         OUTLET
DMA-3A           0.012      0.1        0.05       .1         25         PERVIOUS   25
DMA-3B           0.012      0.10       0.05       .1         25         OUTLET
BASIN-3          0.012      0.10       0.05       .1         25         OUTLET
DMA-4A           0.012      0.1        0.05       .1         25         PERVIOUS   25
BASIN-4          0.012      0.1        0.05       .1         25         OUTLET
DMA-3C           0.012      0.1        0.05       .1         30         OUTLET
DMA-3D           0.012      0.1        0.05       .1         30         OUTLET
DMA-4B           0.010      0.010      0.05       .1         25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
BASIN-1          3          0.2        0.31
DMA-1A           3          0.15       0.31
DMA-1B           3          0.2        0.31
DMA-1C           3          0.2        0.31
BYPASS           3          0.2        0.31
DMA-5A           3          0.2        0.31
BASIN-5          3          0.2        0.31
DMA-2A           3          0.15       0.31
DMA-2B           3          0.2        0.31
DMA-2C           3          0.2        0.31
BASIN-2          3          0.2        0.31
DMA-3A           9          0.019      0.33
DMA-3B           9          0.019      0.33
BASIN-3          3          0.2        0.31
DMA-4A           9          0.019      0.33
BASIN-4          3          0.2        0.31
DMA-3C           3          0.2        0.31
DMA-3D           3          0.2        0.31
DMA-4B           3          0.2        0.31

[LID_CONTROLS]
;;Name           Type/Layer Parameters
;;-------------- ---------- ----------
BASIN-1          BC
BASIN-1          SURFACE    14.61      0.05       0          0          5
BASIN-1          SOIL       18         0.4        0.2        0.1        5          5          1.5
BASIN-1          STORAGE    21         0.67       0          0
```

```
BASIN-1          DRAIN      0.0703     0.5        3          6

BASIN-5          BC
BASIN-5          SURFACE    14.34      0.05       0          0          5
BASIN-5          SOIL       18         0.4        0.2        0.1        5          5          1.5
BASIN-5          STORAGE    21         0.67       0          0
BASIN-5          DRAIN      0.3736     0.5        3          6

BASIN-2          BC
BASIN-2          SURFACE    14.73      0.05       0.         0          5
BASIN-2          SOIL       18         0.4        0.2        0.1        5          5          1.5
BASIN-2          STORAGE    12         0.67       0          0
BASIN-2          DRAIN      0.0795     0.5        3          6

BASIN-3          BC
BASIN-3          SURFACE    15.64      0.05       0          0          5
BASIN-3          SOIL       18         0.4        0.2        0.1        5          5          1.5
BASIN-3          STORAGE    12         0.67       0          0
BASIN-3          DRAIN      0.5672     0.5        3          6

BASIN-4          BC
BASIN-4          SURFACE    18.84      0.05       0          0          5
BASIN-4          SOIL       18         0.4        0.2        0.1        5          5          1.5
BASIN-4          STORAGE    12         0.67       0          0
BASIN-4          DRAIN      0.1110     0.5        3          6

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile
DrainTo
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ----------------------
-- ----------------
BASIN-1          BASIN-1          1       644.69     0          0          0          0
BASIN-5          BASIN-5          1       579.35     0          0          0          0
BASIN-2          BASIN-2          1       509.65     0          0          0          0
BASIN-3          BASIN-3          1       383.33     0          0          0          0
BASIN-4          BASIN-4          1       187.31     0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
```

```
DIV-1            0          BYPASS-1         CUTOFF     0.0074     0          0          0          0
DIV-5            0          BYPASS-5         CUTOFF     0.03538    0          0          0          0
DIV-2            0          BYPASS-2         CUTOFF     0.00601    0          0          0          0
DIV-3            0          BYPASS-3         CUTOFF     0.03208    0          0          0          0
DIV-4            0          BYPASS-4         CUTOFF     0.00307    0          0          0          0

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat
IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------          ---
----- --------
STOR-1           0        1.5        0          TABULAR    STOR-1                       0        1
STOR-5           0        1.5        0          TABULAR    STOR-5                       0        1
STOR-2           0        1.5        0          TABULAR    STOR-2                       0        1
STOR-3           0        1.5        0          TABULAR    STOR-3                       0        1
STOR-4           0        1.5        0          TABULAR    STOR-4                       0        1

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
BYPASS-1         DIV-1            STOR-1           400        0.01       0          0          0          0
DRAIN-1          DIV-1            POC-1            400        .011       0          0          0          0
DRAIN-5          DIV-5            POC-1            400        0.011      0          0          0          0
BYPASS-5         DIV-5            STOR-5           400        0.01       0          0          0          0
BYPASS-2         STOR-2           DIV-2            400        0.01       0          0          0          0
DRAIN-2          DIV-2            POC-1            400        0.01       0          0          0          0
BYPASS-3         DIV-3            STOR-3           400        0.01       0          0          0          0
DRAIN-3          DIV-3            POC-1            400        0.01       0          0          0          0
BYPASS-4         STOR-4           DIV-4            400        0.01       0          0          0          0
3                DIV-4            POC-1            400        0.01       0          0          0          0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
MID-FLOW-1       STOR-1           POC-1            0          TABULAR/DEPTH   MID-FLOW-1                  NO
MID-FLOW-5       STOR-5           POC-1            0          TABULAR/DEPTH   MID-FLOW-5                  NO
MID-FLOW-2       STOR-2           POC-1            0          TABULAR/DEPTH   MID-FLOW-2                  NO
MID-FLOW-3       STOR-3           POC-1            0          TABULAR/DEPTH   MID-FLOW-3                  NO
MID-FLOW-4       STOR-4           POC-1            0          TABULAR/HEAD    MID-FLOW-4                  NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
BYPASS-1         DUMMY        0                0          0          0          1
DRAIN-1          CIRCULAR     1                0          0          0          1
```

```
DRAIN-5          CIRCULAR     1                0          0          0          1
BYPASS-5         CIRCULAR     1                0          0          0          1
BYPASS-2         CIRCULAR     1                0          0          0          1
DRAIN-2          CIRCULAR     1                0          0          0          1
BYPASS-3         CIRCULAR     1                0          0          0          1
DRAIN-3          CIRCULAR     1                0          0          0          1
BYPASS-4         CIRCULAR     1                0          0          0          1
3                CIRCULAR     1                0          0          0          1

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUTLET-1         Rating     0.000      0.000
OUTLET-1                    0.042      0.026
OUTLET-1                    0.083      0.075
OUTLET-1                    0.125      0.137
OUTLET-1                    0.167      0.211
OUTLET-1                    0.208      0.295
OUTLET-1                    0.250      0.388
OUTLET-1                    0.292      0.488
OUTLET-1                    0.333      0.597
OUTLET-1                    0.375      0.707
OUTLET-1                    0.417      0.816
OUTLET-1                    0.458      0.881
OUTLET-1                    0.500      0.942
OUTLET-1                    0.542      0.999
OUTLET-1                    0.583      1.053
OUTLET-1                    0.625      1.105
OUTLET-1                    0.667      1.154
OUTLET-1                    0.708      1.201
OUTLET-1                    0.750      1.246
OUTLET-1                    0.792      1.290
OUTLET-1                    0.833      1.332
OUTLET-1                    0.875      1.373
OUTLET-1                    0.917      1.413
OUTLET-1                    0.958      1.452
OUTLET-1                    1.000      1.490
OUTLET-1                    1.042      1.843
OUTLET-1                    1.083      2.457
OUTLET-1                    1.125      3.241
OUTLET-1                    1.167      4.163
OUTLET-1                    1.208      5.203
OUTLET-1                    1.250      6.348
OUTLET-1                    1.292      7.590
OUTLET-1                    1.333      8.922
```

```
OUTLET-1                    1.375      10.336
OUTLET-1                    1.417      11.830
OUTLET-1                    1.458      13.397
OUTLET-1                    1.500      15.036
OUTLET-1                    1.542      16.743
OUTLET-1                    1.583      18.516
OUTLET-1                    1.625      20.351
OUTLET-1                    1.667      22.248
OUTLET-1                    1.708      24.203
OUTLET-1                    1.750      26.215
OUTLET-1                    1.792      28.283
OUTLET-1                    1.833      30.406
OUTLET-1                    1.875      32.581
OUTLET-1                    1.917      34.807
OUTLET-1                    1.958      37.084
OUTLET-1                    2.000      39.409
;
MID-FLOW          Rating    0.000      0.000
MID-FLOW                    0.042      0.026
MID-FLOW                    0.083      0.075
MID-FLOW                    0.125      0.137
MID-FLOW                    0.167      0.211
MID-FLOW                    0.208      0.295
MID-FLOW                    0.250      0.388
MID-FLOW                    0.292      0.488
MID-FLOW                    0.333      0.597
MID-FLOW                    0.375      0.707
MID-FLOW                    0.417      0.816
MID-FLOW                    0.458      0.881
MID-FLOW                    0.500      0.942
MID-FLOW                    0.542      0.999
MID-FLOW                    0.583      1.053
MID-FLOW                    0.625      1.105
MID-FLOW                    0.667      1.154
MID-FLOW                    0.708      1.201
MID-FLOW                    0.750      1.246
MID-FLOW                    0.792      1.290
MID-FLOW                    0.833      1.332
MID-FLOW                    0.875      1.373
MID-FLOW                    0.917      1.413
MID-FLOW                    0.958      1.452
MID-FLOW                    1.000      1.490
MID-FLOW                    1.042      1.843
MID-FLOW                    1.083      2.457
MID-FLOW                    1.125      3.241
```

```
MID-FLOW                    1.167      4.163
MID-FLOW                    1.208      5.203
MID-FLOW                    1.250      6.348
MID-FLOW                    1.292      7.590
MID-FLOW                    1.333      8.922
MID-FLOW                    1.375      10.336
MID-FLOW                    1.417      11.830
MID-FLOW                    1.458      13.397
MID-FLOW                    1.500      15.036
MID-FLOW                    1.542      16.743
MID-FLOW                    1.583      18.516
MID-FLOW                    1.625      20.351
MID-FLOW                    1.667      22.248
MID-FLOW                    1.708      24.203
MID-FLOW                    1.750      26.215
MID-FLOW                    1.792      28.283
MID-FLOW                    1.833      30.406
MID-FLOW                    1.875      32.581
MID-FLOW                    1.917      34.807
MID-FLOW                    1.958      37.084
MID-FLOW                    2.000      39.409
;
MID-FLOW-1        Rating    0.000      0.000
MID-FLOW-1                  0.083      0.045
MID-FLOW-1                  0.167      0.127
MID-FLOW-1                  0.250      0.233
MID-FLOW-1                  0.333      0.354
MID-FLOW-1                  0.417      0.441
MID-FLOW-1                  0.500      0.526
MID-FLOW-1                  0.583      0.612
MID-FLOW-1                  0.667      0.698
MID-FLOW-1                  0.750      0.786
MID-FLOW-1                  0.833      0.875
MID-FLOW-1                  0.917      0.965
MID-FLOW-1                  1.000      1.057
MID-FLOW-1                  1.083      1.625
MID-FLOW-1                  1.167      3.293
MID-FLOW-1                  1.250      5.441
MID-FLOW-1                  1.333      7.979
MID-FLOW-1                  1.417      10.853
MID-FLOW-1                  1.500      14.027
;
MID-FLOW-4        Rating    0.000      0.000
MID-FLOW-4                  0.083      0.056
MID-FLOW-4                  0.167      0.158
```

```
MID-FLOW-4                0.250      0.330
MID-FLOW-4                0.333      0.446
MID-FLOW-4                0.417      0.560
MID-FLOW-4                0.500      0.675
MID-FLOW-4                0.583      0.791
MID-FLOW-4                0.667      0.910
MID-FLOW-4                0.750      1.031
MID-FLOW-4                0.833      1.155
MID-FLOW-4                0.917      1.282
MID-FLOW-4                1.000      1.412
MID-FLOW-4                1.083      1.808
MID-FLOW-4                1.167      3.483
MID-FLOW-4                1.250      5.639
MID-FLOW-4                1.333      8.184
MID-FLOW-4                1.417      11.065
MID-FLOW-4                1.500      14.246
;
MID-FLOW-5       Rating   0.000      0.000
MID-FLOW-5                0.083      0.075
MID-FLOW-5                0.167      0.211
MID-FLOW-5                0.250      0.388
MID-FLOW-5                0.333      0.581
MID-FLOW-5                0.417      0.709
MID-FLOW-5                0.500      0.831
MID-FLOW-5                0.583      0.948
MID-FLOW-5                0.667      1.064
MID-FLOW-5                0.750      1.179
MID-FLOW-5                0.833      1.293
MID-FLOW-5                0.917      1.408
MID-FLOW-5                1.000      1.523
MID-FLOW-5                1.083      2.112
MID-FLOW-5                1.167      3.800
MID-FLOW-5                1.250      5.969
MID-FLOW-5                1.333      8.526
MID-FLOW-5                1.417      11.418
MID-FLOW-5                1.500      14.610
;
MID-FLOW-2       Rating   0.000      0.000
MID-FLOW-2                0.083      0.075
MID-FLOW-2                0.167      0.211
MID-FLOW-2                0.250      0.440
MID-FLOW-2                0.333      1.482
MID-FLOW-2                0.417      3.259
MID-FLOW-2                0.500      5.515
MID-FLOW-2                0.583      8.161
```

```
MID-FLOW-2                0.667      11.144
MID-FLOW-2                0.750      14.429
MID-FLOW-2                0.833      17.990
MID-FLOW-2                0.917      21.808
MID-FLOW-2                1.000      25.865
MID-FLOW-2                1.083      29.516
MID-FLOW-2                1.167      33.917
MID-FLOW-2                1.250      38.519
MID-FLOW-2                1.333      43.312
MID-FLOW-2                1.417      48.290
MID-FLOW-2                1.500      53.447
;
MID-FLOW-3       Rating   0.000      0.000
MID-FLOW-3                0.083      0.056
MID-FLOW-3                0.167      0.158
MID-FLOW-3                0.250      0.330
MID-FLOW-3                0.333      0.446
MID-FLOW-3                0.417      0.560
MID-FLOW-3                0.500      0.675
MID-FLOW-3                0.583      0.791
MID-FLOW-3                0.667      0.910
MID-FLOW-3                0.750      1.031
MID-FLOW-3                0.833      1.155
MID-FLOW-3                0.917      1.282
MID-FLOW-3                1.000      1.412
MID-FLOW-3                1.083      1.808
MID-FLOW-3                1.167      3.483
MID-FLOW-3                1.250      5.639
MID-FLOW-3                1.333      8.184
MID-FLOW-3                1.417      11.065
MID-FLOW-3                1.500      14.246
;
STOR-2           Storage  0.00       741
STOR-2                    0.25       799
STOR-2                    0.50       857
STOR-2                    0.75       915
STOR-2                    1.00       973
STOR-2                    1.25       1031
STOR-2                    1.50       1089
;
STOR-4           Storage  0.00       398
STOR-4                    0.25       451
STOR-4                    0.50       504
STOR-4                    0.75       557
STOR-4                    1.00       610
```

```
STOR-4                     1.25       663
STOR-4                     1.50       716
;
STOR-5           Storage   0.00       806
STOR-5                     0.25       863
STOR-5                     0.50       919
STOR-5                     0.75       976
STOR-5                     1.00       1032
STOR-5                     1.25       1089
STOR-5                     1.50       1145
;
STOR-3           Storage   0.00       614
STOR-3                     0.25       672
STOR-3                     0.50       730
STOR-3                     0.75       788
STOR-3                     1.00       846
STOR-3                     1.25       904
STOR-3                     1.50       962
;
STOR-1           Storage   0.00       923
STOR-1                     0.25       993
STOR-1                     0.50       1063
STOR-1                     0.75       1133
STOR-1                     1.00       1203
STOR-1                     1.25       1273
STOR-1                     1.50       1343

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "K:\Library\Stormwater\SWMM\RAIN GAGES\Oceanside Rain Data.dat"

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 2182.681359 6021.851375 2183.279716 6040.229030
Units      Degrees
```

```
[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2182.666926        6022.708581
DIV-1            2183.032806        6026.179219
DIV-5            2186.336184        6021.245059
DIV-2            2180.273022        6025.970144
DIV-3            2179.469276        6022.179914
DIV-4            2181.402024        6020.032426
STOR-1           2184.500344        6026.050839
STOR-5           2185.416256        6019.886074
STOR-2           2181.912785        6026.286653
STOR-3           2179.394909        6023.837583
STOR-4           2180.241661        6020.617835

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
BASIN-1          2183.785475        6028.290872
DMA-1A           2182.886454        6030.381618
DMA-1B           2181.502112        6030.290723
DMA-1C           2180.480856        6029.270428
BYPASS           2188.323303        6023.544879
BYPASS           2188.363298        6023.544879
DMA-5A           2191.098641        6019.900674
DMA-5A           2191.001916        6019.900674
BASIN-5          2188.636005        6020.847817
DMA-2A           2177.764980        6029.962184
DMA-2B           2175.875880        6028.935499
DMA-2C           2174.397454        6027.066933
BASIN-2          2178.537703        6027.161869
DMA-3A           2174.417988        6023.986879
DMA-3B           2173.473438        6022.446852
BASIN-3          2177.743219        6022.081357
DMA-4A           2178.642240        6016.749955
BASIN-4          2180.461189        6018.088033
DMA-3C           2173.719842        6020.906825
DMA-3D           2174.664392        6019.469467
DMA-4B           2180.352225        6016.204609
DMA-4B           2180.352225        6016.204609
```

```
DMA-4B           2180.331691        6016.204609

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OCEANSIDE        2173.021808        6028.550520
```

ATTACHMENT 7

SWMM Screens and Explanation of Significant Variables

EPA SWMM Figures and Explanations

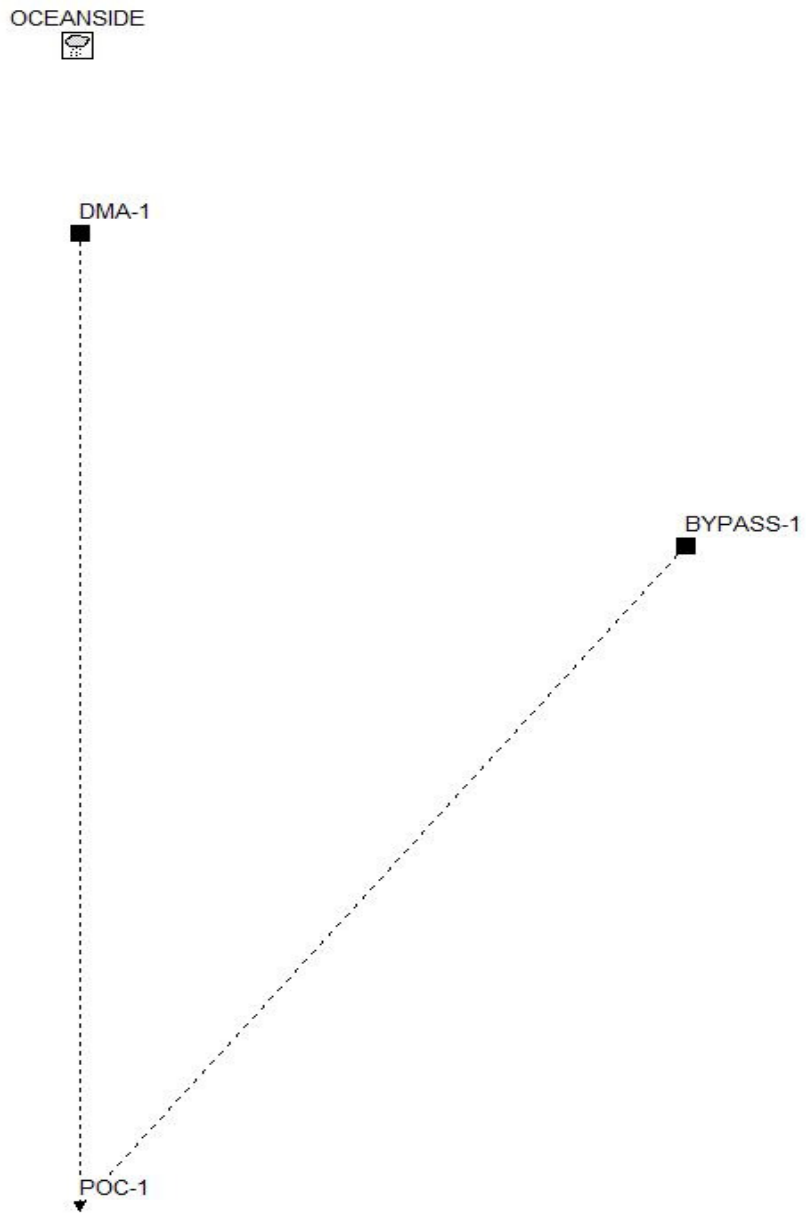
Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, storage units, weirs and orifices as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model and the Model BMP Design Manual San Diego Region.

Soil characteristics of the existing soils were determined from the site specific NRCS Web Soil Survey.

Some values incorporated within the SWMM model have been determined from the professional experience of BHA using conservative assumptions 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.

PRE-DEVELOPED CONDITION (POC-1)



Rain Gage OCEANSIDE

Property	Value
Name	OCEANSIDE
X-Coordinate	2182.692
Y-Coordinate	6037.801
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	2182.709
Y-Coordinate	6022.687
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Route To	
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	2182.692
Y-Coordinate	6035.393
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	POC-1
Area	3.2284
Width	251
% Slope	7.5
% Imperv	10.1
N-Imperv	0.012
N-Perv	.08
Dstore-Imperv	0.05
Dstore-Perv	0.10
%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

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

OK Cancel Help

POST-DEVELOPED CONDITION (POC-1)

DMA 1

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	2182.667
Y-Coordinate	6022.709
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Route To	
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage OCEANSIDE

Property	Value
Name	OCEANSIDE
X-Coordinate	2173.022
Y-Coordinate	6028.551
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

Subcatchment DMA-1A

Property	Value
Name	DMA-1A
X-Coordinate	2182.886
Y-Coordinate	6030.382
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-1
Area	0.3215
Width	147
% Slope	1.0
% Imperv	33.8
N-Imperv	0.012
N-Perv	.10
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	PERVIOUS
Percent Routed	25
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.15
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Subcatchment DMA-1B

Property	Value
Name	DMA-1B
X-Coordinate	2181.502
Y-Coordinate	6030.291
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-1
Area	0.0556
Width	93
% Slope	20
% Imperv	0
N-Imperv	0.012
N-Perv	0.10
Dstore-Imperv	0.05
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	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Subcatchment DMA-1C

Property	Value
Name	DMA-1C
X-Coordinate	2180.481
Y-Coordinate	6029.270
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-1
Area	0.1274
Width	30
% Slope	20
% Imperv	0
N-Imperv	0.012
N-Perv	0.10
Dstore-Imperv	0.05
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	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Storage Unit STOR-1

Property	Value
Name	STOR-1
X-Coordinate	2184.500
Y-Coordinate	6026.051
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	1.5
Initial Depth	0
Ponded Area	0
Evap. Factor	1
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	STOR-1

Storage Curve Editor

Curve Name: STOR-1

Description:

	Depth (ft)	Area (ft2)
1	0.00	923
2	0.25	993
3	0.50	1063
4	0.75	1133
5	1.00	1203
6	1.25	1273
7	1.50	1343
8		
9		
10		
11		

View... Load... Save... OK Cancel Help

Outlet MID-FLOW-1

Property	Value
Name	MID-FLOW-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	MID-FLOW-1

Rating Curve Editor

Curve Name: MID-FLOW-1

Description:

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	0.083	0.045
3	0.167	0.127
4	0.250	0.233
5	0.333	0.354
6	0.417	0.441
7	0.500	0.526
8	0.583	0.612
9	0.667	0.698
10	0.750	0.786
11	0.833	0.875

View...
Load...
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OK
Cancel
Help

Divider DIV-1

Property	Value
Name	DIV-1
X-Coordinate	2183.033
Y-Coordinate	6026.179
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	BYPASS-1
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	0.0074
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

DMA 2

Subcatchment DMA-2A

Property	Value
Name	DMA-2A
X-Coordinate	2177.765
Y-Coordinate	6029.962
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-2
Area	0.2989
Width	99
% Slope	1
% Imperv	29.6
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	PERVIOUS
Percent Routed	25
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.15
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Subcatchment DMA-2B

Property	Value
Name	DMA-2B
X-Coordinate	2177.681
Y-Coordinate	6027.911
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-2
Area	0.1368
Width	298
% Slope	50
% Imperv	0
N-Imperv	0.012
N-Perv	0.10
Dstore-Imperv	0.05
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	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Subcatchment DMA-2C

Property	Value
Name	DMA-2C
X-Coordinate	2174.397
Y-Coordinate	6027.067
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-2
Area	0.0181
Width	32
% Slope	50
% Imperv	0
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Storage Unit STOR-1

Property	Value
Name	STOR-1
X-Coordinate	2184.500
Y-Coordinate	6026.051
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	1.5
Initial Depth	0
Ponded Area	0
Evap. Factor	1
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	STOR-1

Storage Curve Editor

Curve Name: STOR-1

Description:

	Depth (ft)	Area (ft2)
1	0.00	923
2	0.25	993
3	0.50	1063
4	0.75	1133
5	1.00	1203
6	1.25	1273
7	1.50	1343
8		
9		
10		
11		

View... Load... Save... OK Cancel Help

Outlet MID-FLOW-2

Property	Value
Name	MID-FLOW-2
Inlet Node	STOR-2
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	MID-FLOW-2

Rating Curve Editor

Curve Name: MID-FLOW-2

Description:

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	0.083	0.075
3	0.167	0.211
4	0.250	0.388
5	0.333	0.400
6	0.417	1.295
7	0.500	2.931
8	0.583	5.050
9	0.667	7.559
10	0.750	10.405
11	0.833	13.552

View... Load... Save... OK Cancel Help

Divider DIV-2

Property	Value
Name	DIV-2
X-Coordinate	2180.273
Y-Coordinate	6025.970
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	BYPASS-2
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	0.00601
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

DMA 3

Subcatchment DMA-3A

Property	Value
Name	DMA-3A
X-Coordinate	2173.482
Y-Coordinate	6023.931
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-3
Area	0.2885
Width	180
% Slope	1
% Imperv	35
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	PERVIOUS
Percent Routed	25
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.019
Initial Deficit	0.33

Soil capillary suction head (inches or mm)

OK Cancel Help

Subcatchment DMA-3B

Property	Value
Name	DMA-3B
X-Coordinate	2173.473
Y-Coordinate	6022.447
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-3
Area	0.0738
Width	62
% Slope	4
% Imperv	100
N-Imperv	0.012
N-Perv	0.10
Dstore-Imperv	0.05
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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Subcatchment DMA-3C

Property	Value
Name	DMA-3C
X-Coordinate	2173.720
Y-Coordinate	6020.907
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-3
Area	0.0124
Width	25
% Slope	7
% Imperv	0
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	.1
%Zero-Imperv	30
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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Subcatchment DMA-3D

Property	Value
Name	DMA-3D
X-Coordinate	2174.664
Y-Coordinate	6019.469
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-3
Area	0.01892
Width	15
% Slope	7
% Imperv	0
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	.1
%Zero-Imperv	30
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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Storage Unit STOR-3

Property	Value
Name	STOR-3
X-Coordinate	2179.321
Y-Coordinate	6023.871
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	1.5
Initial Depth	0
Ponded Area	0
Evap. Factor	1
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	STOR-3

Storage Curve Editor

Curve Name

STOR-3

Description

	Depth (ft)	Area (ft2)
1	0.00	614
2	0.25	672
3	0.50	730
4	0.75	788
5	1.00	846
6	1.25	904
7	1.50	962
8		
9		
10		
11		

View...

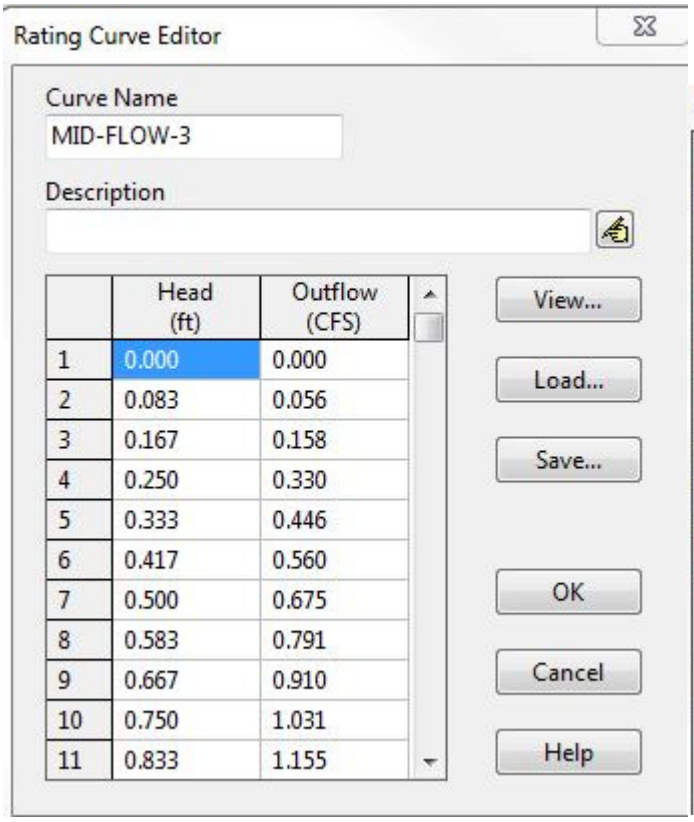
Load...

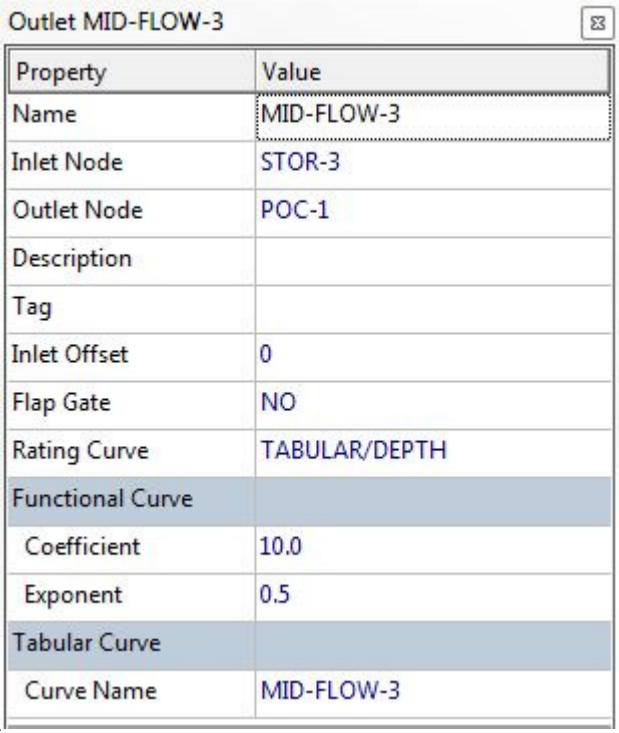
Save...

OK

Cancel

Help


Rating Curve Editor
Curve Name
MID-FLOW-3
Description
Head (ft)
Outflow (CFS)
1 0.000 0.000
2 0.083 0.056
3 0.167 0.158
4 0.250 0.330
5 0.333 0.446
6 0.417 0.560
7 0.500 0.675
8 0.583 0.791
9 0.667 0.910
10 0.750 1.031
11 0.833 1.155
View...
Load...
Save...
OK
Cancel
Help


Outlet MID-FLOW-3
Property
Value
Name MID-FLOW-3
Inlet Node STOR-3
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 MID-FLOW-3

Divider DIV-3

Property	Value
Name	DIV-3
X-Coordinate	2179.469
Y-Coordinate	6022.180
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	BYPASS-3
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	0.03208
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

DMA 4

Subcatchment DMA-4A

Property	Value
Name	DMA-4A
X-Coordinate	2178.600
Y-Coordinate	6016.771
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-4
Area	0.2476
Width	65
% Slope	1.6
% Imperv	37
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	PERVIOUS
Percent Routed	25
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.019
Initial Deficit	0.33

Soil capillary suction head (inches or mm)

Subcatchment DMA-4B

Property	Value
Name	DMA-4B
X-Coordinate	2180.345
Y-Coordinate	6016.205
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-4
Area	0.015
Width	15
% Slope	10
% Imperv	0
N-Imperv	0.010
N-Perv	0.010
Dstore-Imperv	0.05
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	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Storage Unit STOR-4

Property	Value
Name	STOR-4
X-Coordinate	2180.242
Y-Coordinate	6020.618
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	1.5
Initial Depth	0
Ponded Area	0
Evap. Factor	1
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	STOR-4

Storage Curve Editor

Curve Name

STOR-4

Description

	Depth (ft)	Area (ft2)
1	0.00	398
2	0.25	451
3	0.50	504
4	0.75	557
5	1.00	610
6	1.25	663
7	1.50	716
8		
9		
10		
11		

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OK

Cancel

Help

Outlet MID-FLOW-4

Property	Value
Name	MID-FLOW-4
Inlet Node	STOR-4
Outlet Node	POC-1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	MID-FLOW-4

Rating Curve Editor

Curve Name: MID-FLOW-4

Description:

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	0.083	0.056
3	0.167	0.158
4	0.250	0.330
5	0.333	0.446
6	0.417	0.560
7	0.500	0.675
8	0.583	0.791
9	0.667	0.910
10	0.750	1.031
11	0.833	1.155

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Divider DIV-4

Property	Value
Name	DIV-4
X-Coordinate	2181.402
Y-Coordinate	6020.032
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	BYPASS-4
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	0.00307
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

DMA 5

Subcatchment DMA-5A

Property	Value
Name	DMA-5A
X-Coordinate	2191.050
Y-Coordinate	6019.901
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BASIN-5
Area	0.5669
Width	50
% Slope	5.88
% Imperv	65
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
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 Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3
Conductivity	0.2
Initial Deficit	0.31

Soil capillary suction head (inches or mm)

Storage Unit STOR-5

Property	Value
Name	STOR-5
X-Coordinate	2185.416
Y-Coordinate	6019.886
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	1.5
Initial Depth	0
Ponded Area	0
Evap. Factor	1
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	STOR-5

Storage Curve Editor

Curve Name

STOR-5

Description

	Depth (ft)	Area (ft2)
1	0.00	806
2	0.25	863
3	0.50	919
4	0.75	976
5	1.00	1032
6	1.25	1089
7	1.50	1145
8		
9		
10		
11		

View...

Load...

Save...

OK

Cancel

Help

Outlet MID-FLOW-5

Property	Value
Name	MID-FLOW-5
Inlet Node	STOR-5
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	MID-FLOW-5

Rating Curve Editor

Curve Name

MID-FLOW-5

Description

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	0.083	0.075
3	0.167	0.211
4	0.250	0.388
5	0.333	0.400
6	0.417	0.435
7	0.500	0.500
8	0.583	0.600
9	0.667	0.739
10	0.750	0.922
11	0.833	1.152

View...

Load...

Save...

OK

Cancel

Help

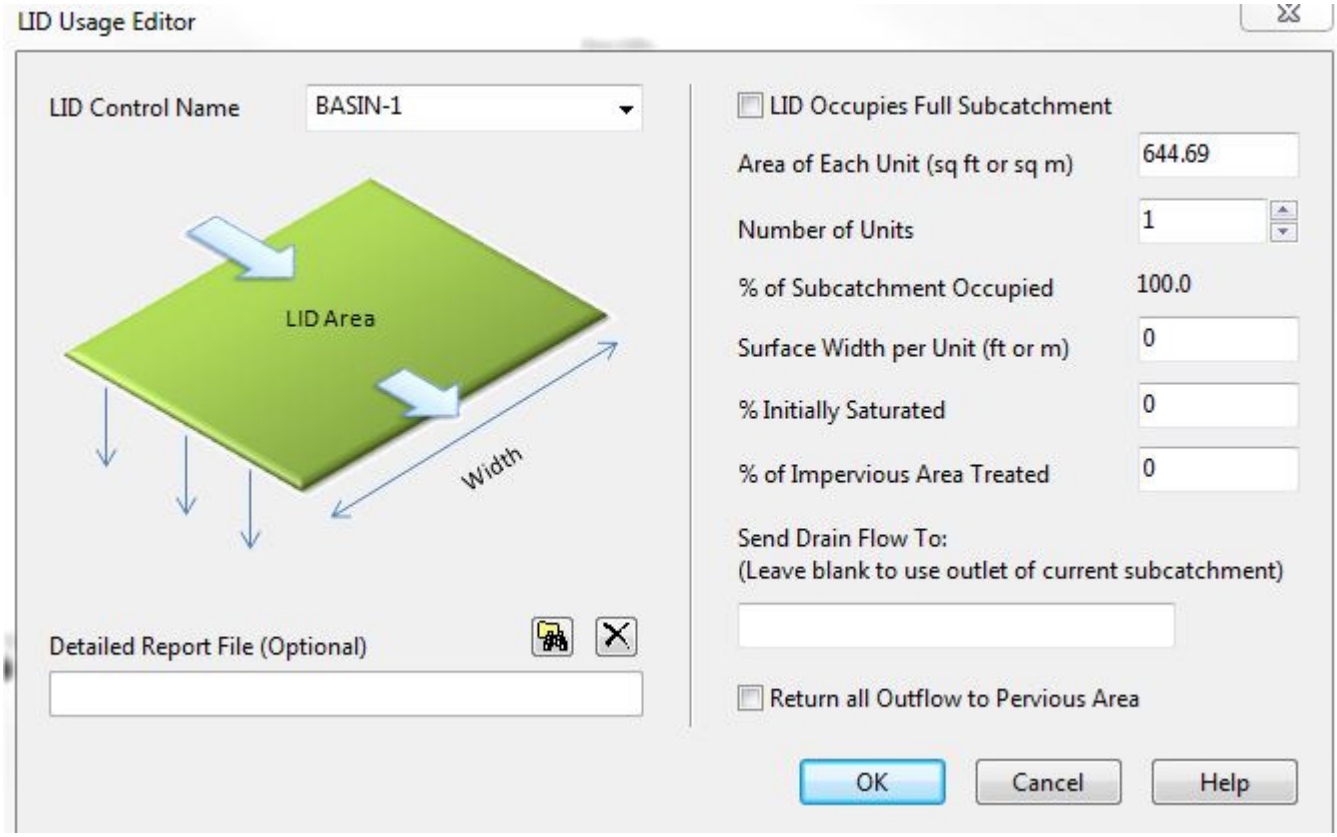
Explanation of Selected Variables

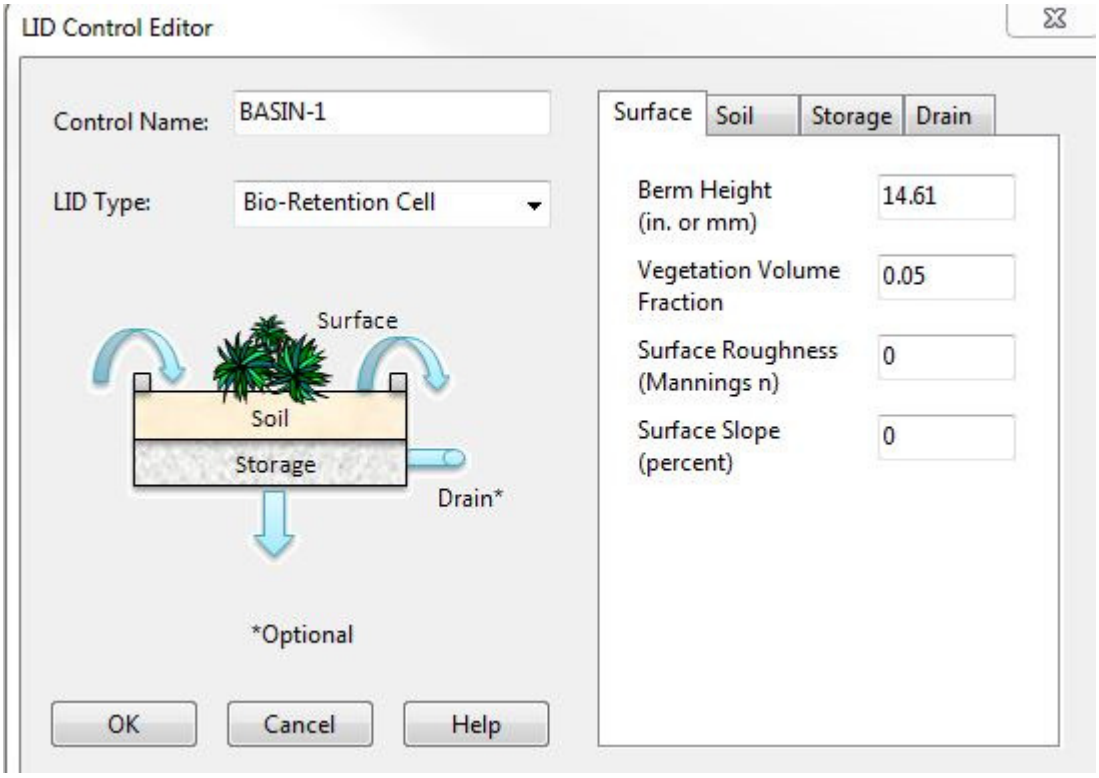
- Sub Catchment Areas: Please refer to the attached diagram that indicates the DMA and biofiltration BMP sub-areas modeled within the project site at both the pre and post-developed conditions draining to the project's POCs.

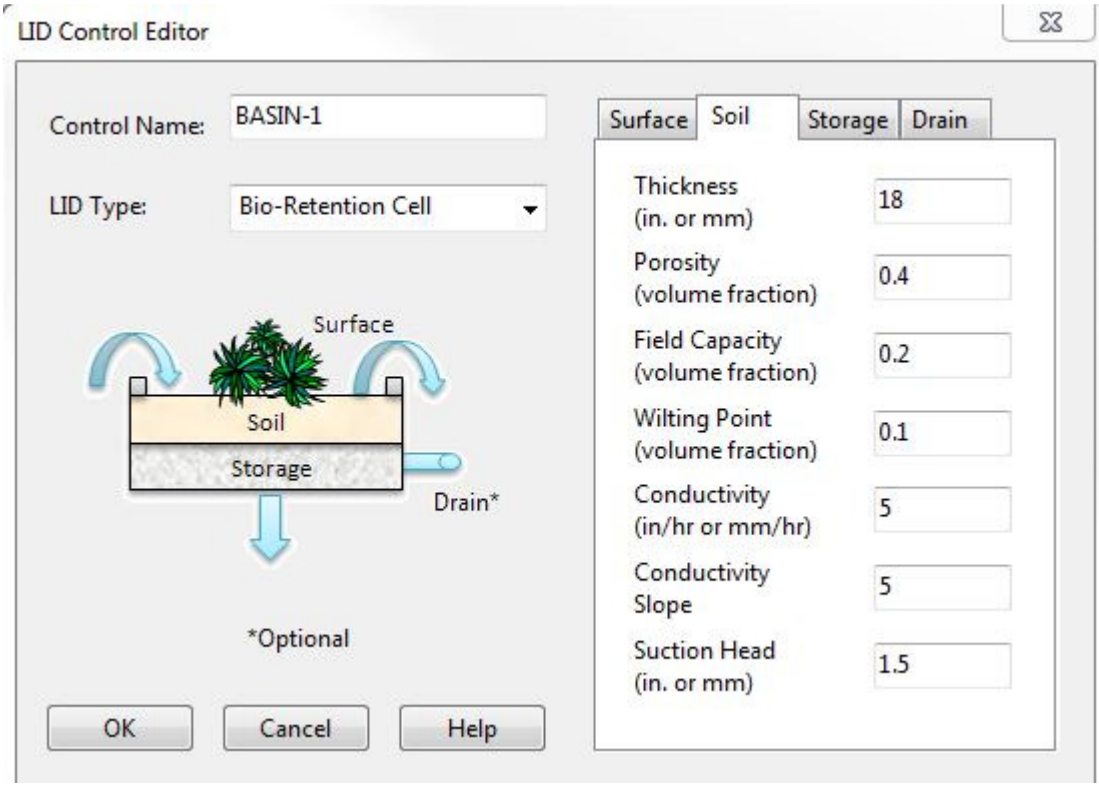
  Parameters for the pre-developed model include soils Type A as determined from the NRCS Web Soils Survey and ArcGIS BMP Sizing Calculator (see Attachment 8). For the purpose of this report, the entire project site will be modeled with Type A soils in cut and Type D soils in fill. Suction head, conductivity and initial deficit correspond to average values expected for each soil type, according to the BMP Design Manual (BMPDM).

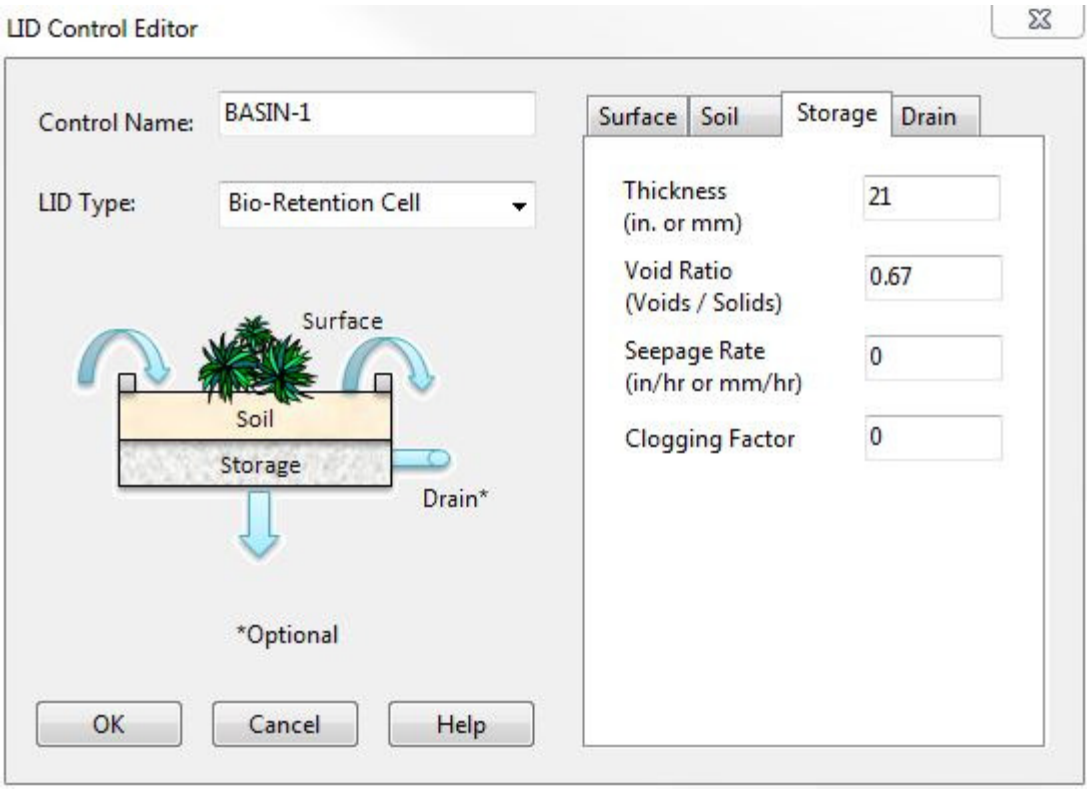
- Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system,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

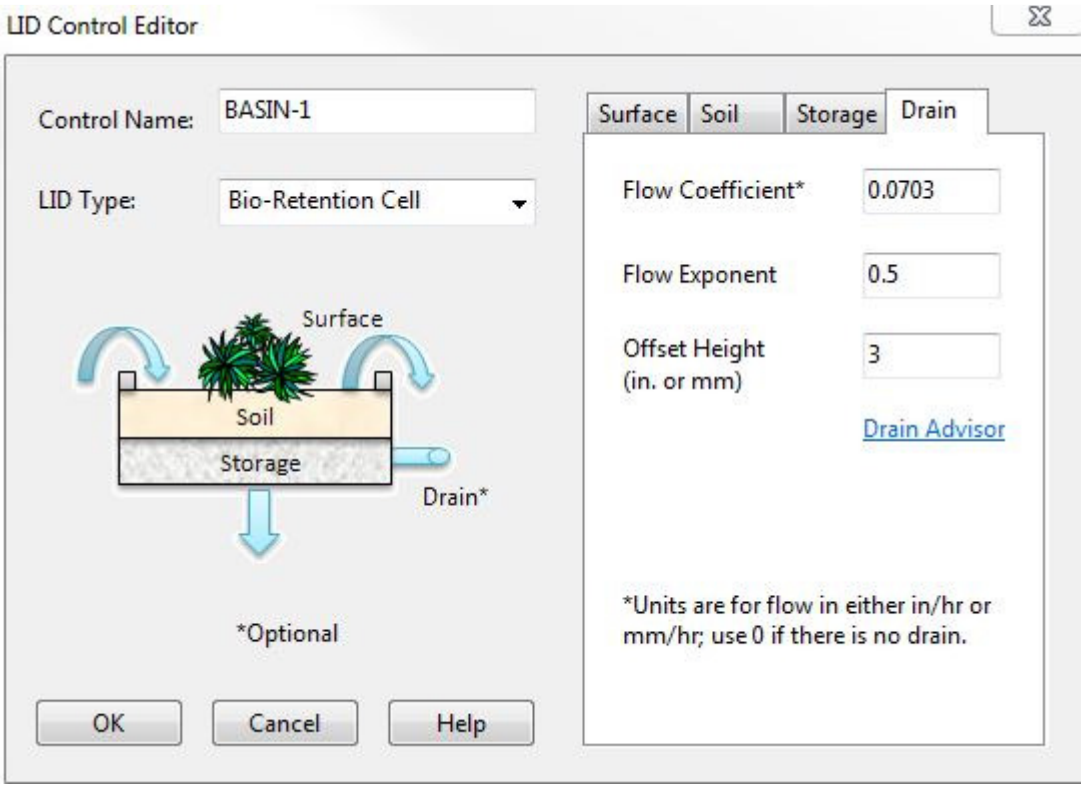
- Sub Catchment BMP: The subcatchment BMP is assigned the area of biofiltration, which is equal to the area of amended soil. At least four (4) decimal places were given regarding the area of the biofiltration to insure that the area used by the program for the LID subroutine corresponds exactly with the actual biofiltration area.

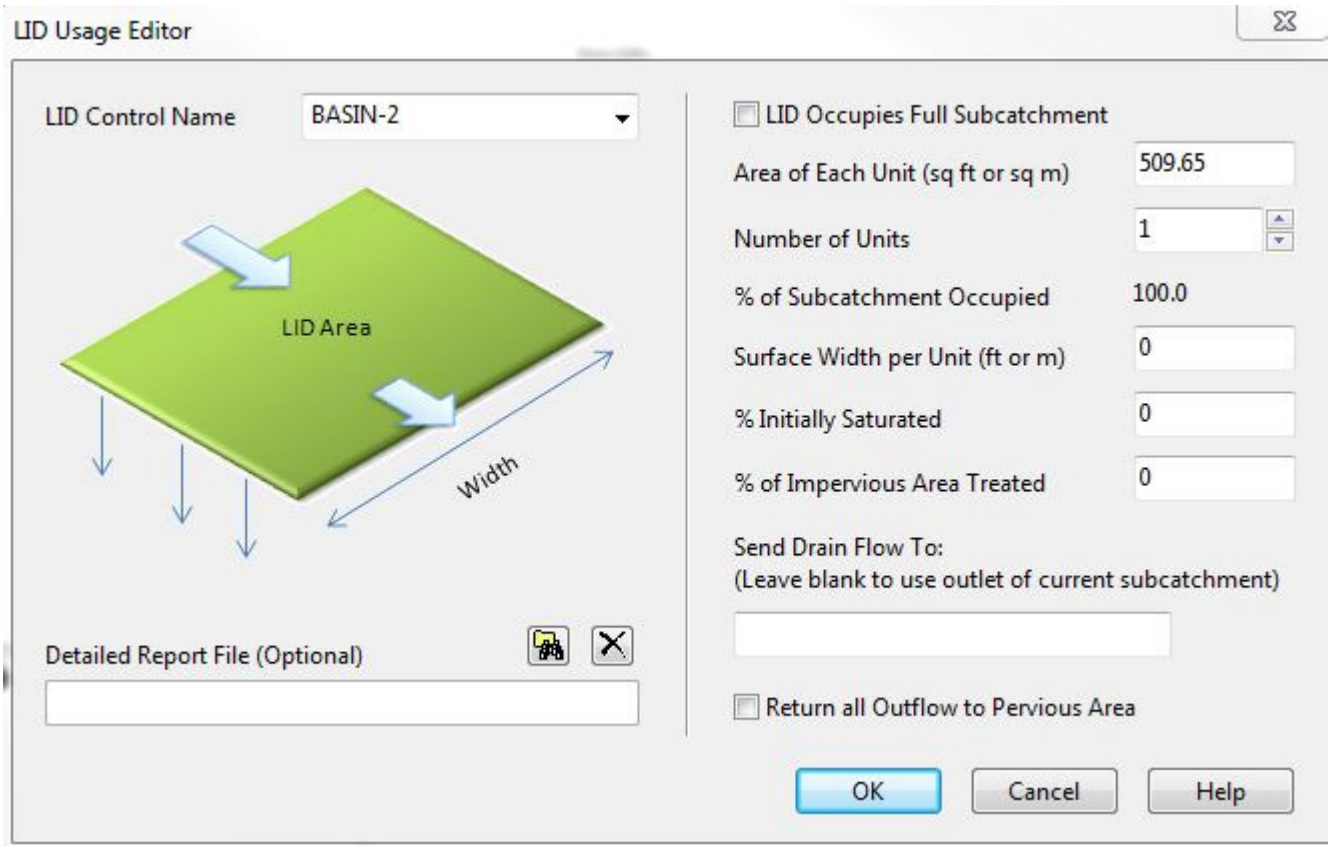

LID Usage Editor
LID Control Name
BASIN-1
LID Area
Width
Detailed Report File (Optional)
LID Occupies Full Subcatchment
Area of Each Unit (sq ft or sq m)
644.69
Number of Units
1
% of Subcatchment Occupied
100.0
Surface Width per Unit (ft or m)
0
% Initially Saturated
0
% of Impervious Area Treated
0
Send Drain Flow To:
(Leave blank to use outlet of current subcatchment)
Return all Outflow to Pervious Area
OK
Cancel
Help

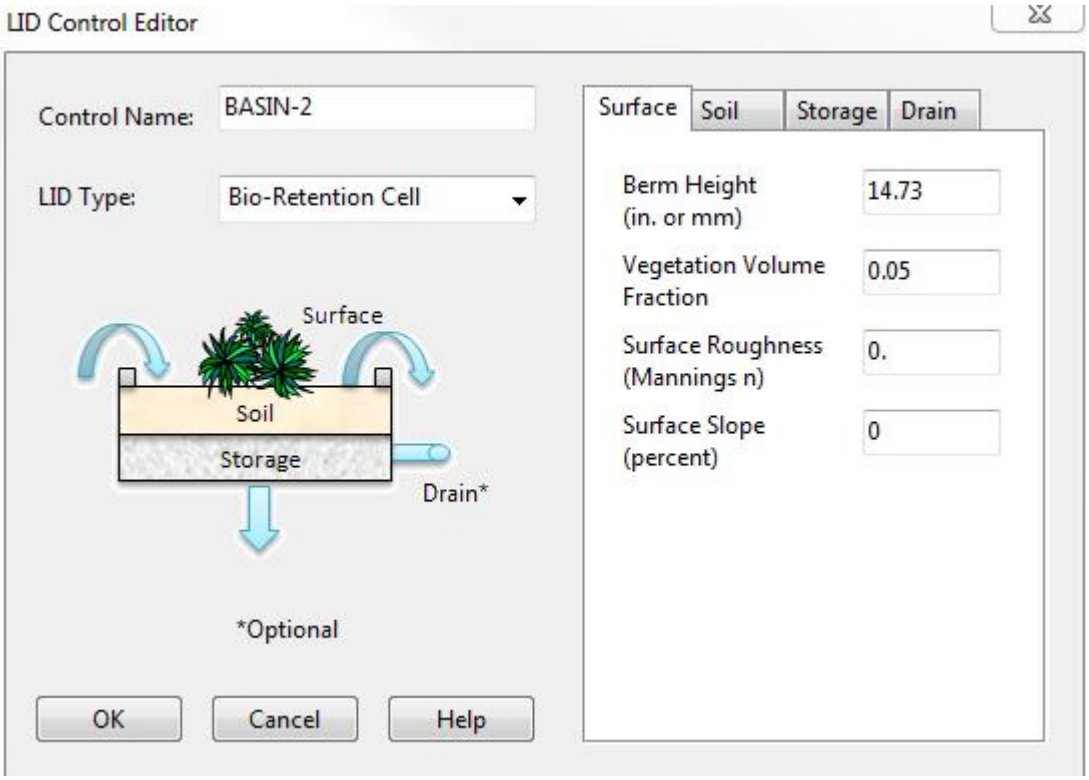

LID Control Editor
Control Name:
BASIN-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
14.61
Vegetation Volume Fraction
0.05
Surface Roughness (Mannings n)
0
Surface Slope (percent)
0

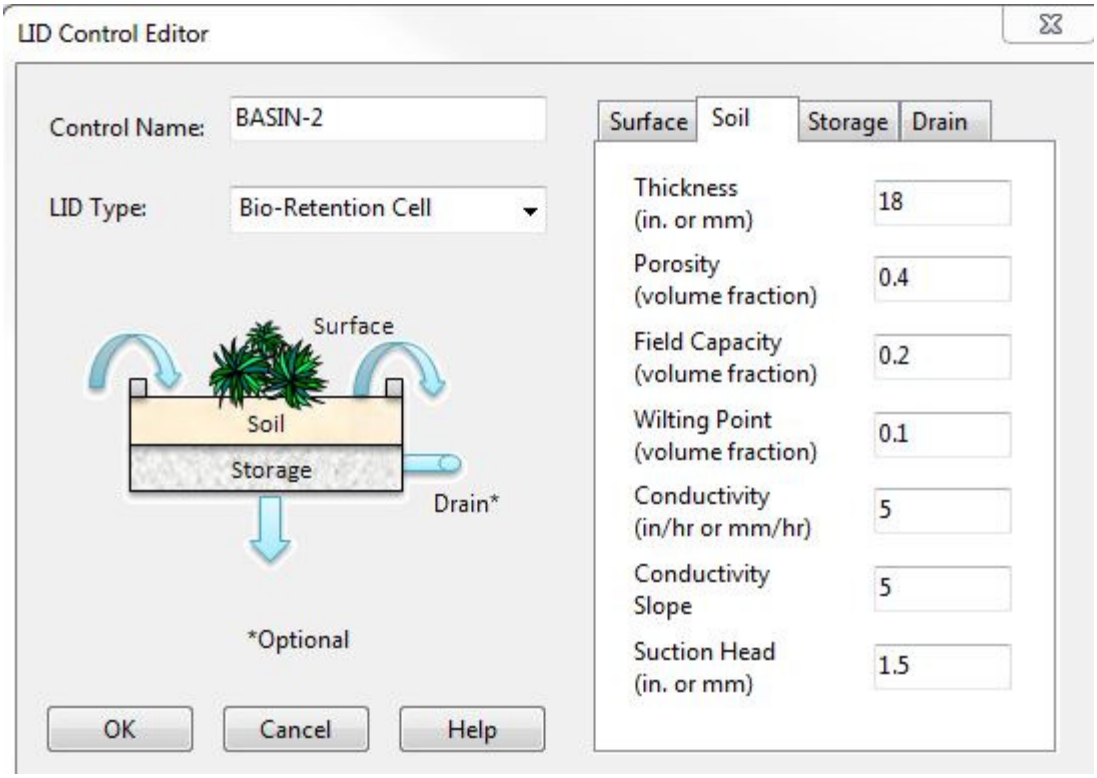

LID Control Editor
Control Name:
BASIN-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
18
Porosity (volume fraction)
0.4
Field Capacity (volume fraction)
0.2
Wilting Point (volume fraction)
0.1
Conductivity (in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head (in. or mm)
1.5

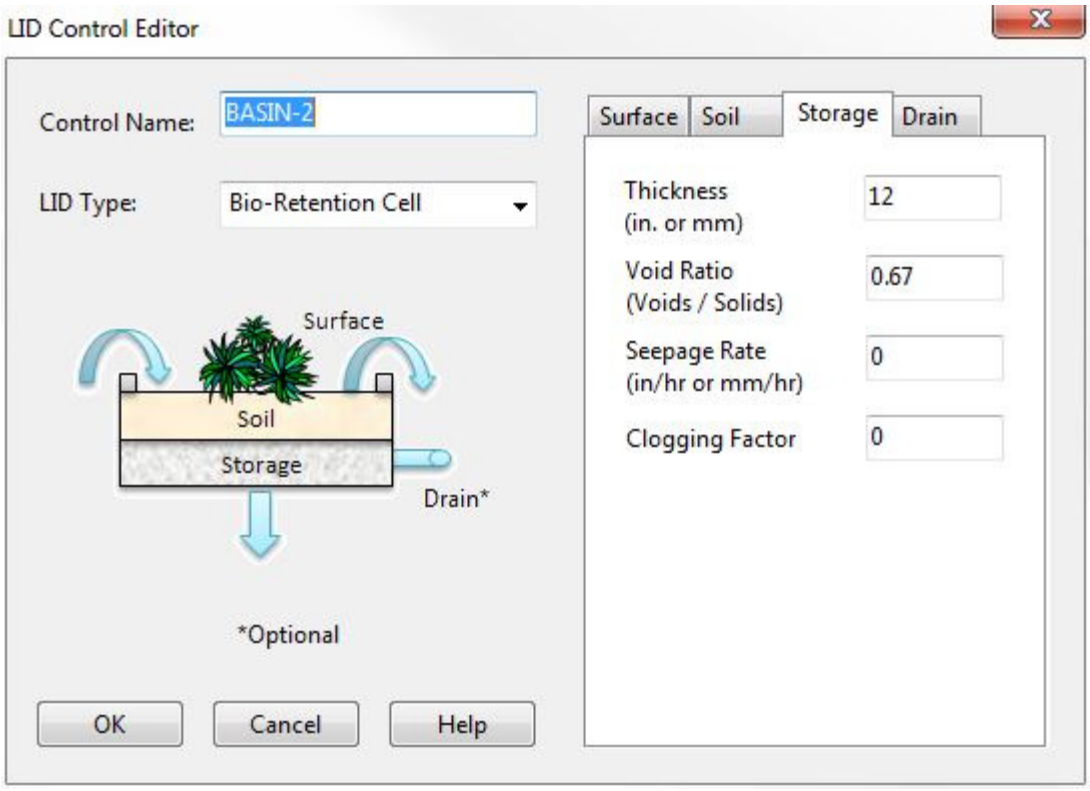

LID Control Editor
Control Name:
BASIN-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
21
Void Ratio
(Voids / Solids)
0.67
Seepage Rate
(in/hr or mm/hr)
0
Clogging Factor
0

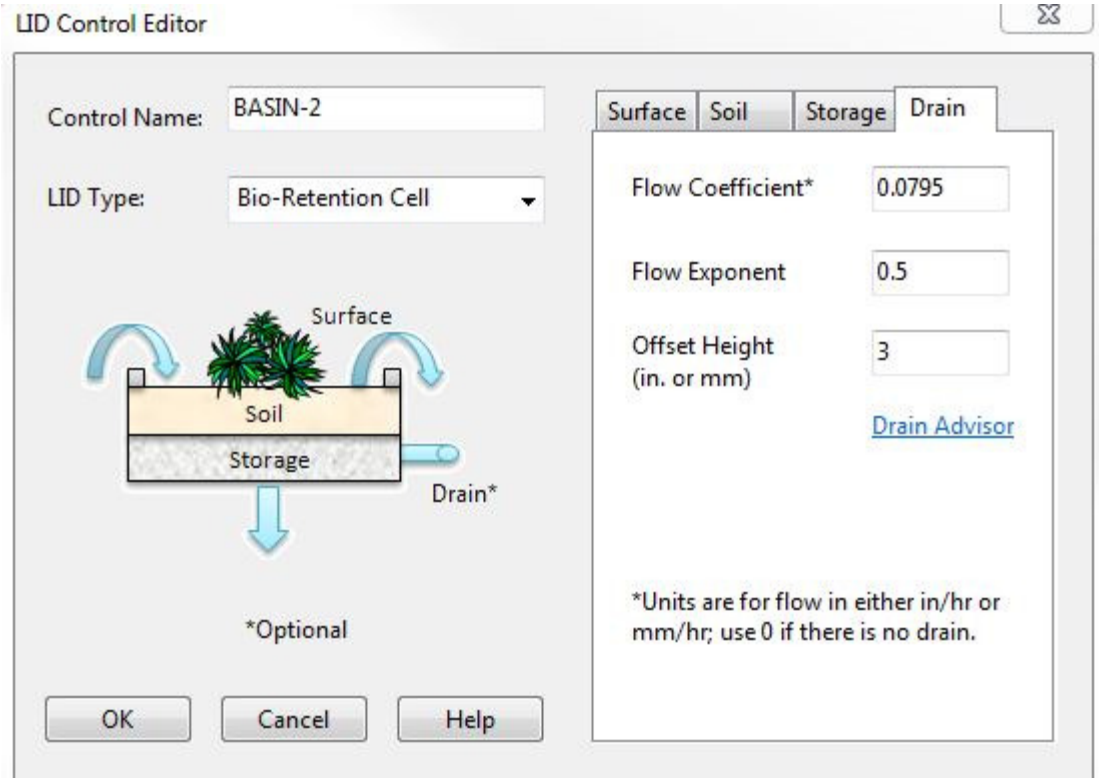

LID Control Editor
Control Name:
BASIN-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.0703
Flow Exponent
0.5
Offset Height
(in. or mm)
3
Drain Advisor
*Units are for flow in either in/hr or
mm/hr; use 0 if there is no drain.

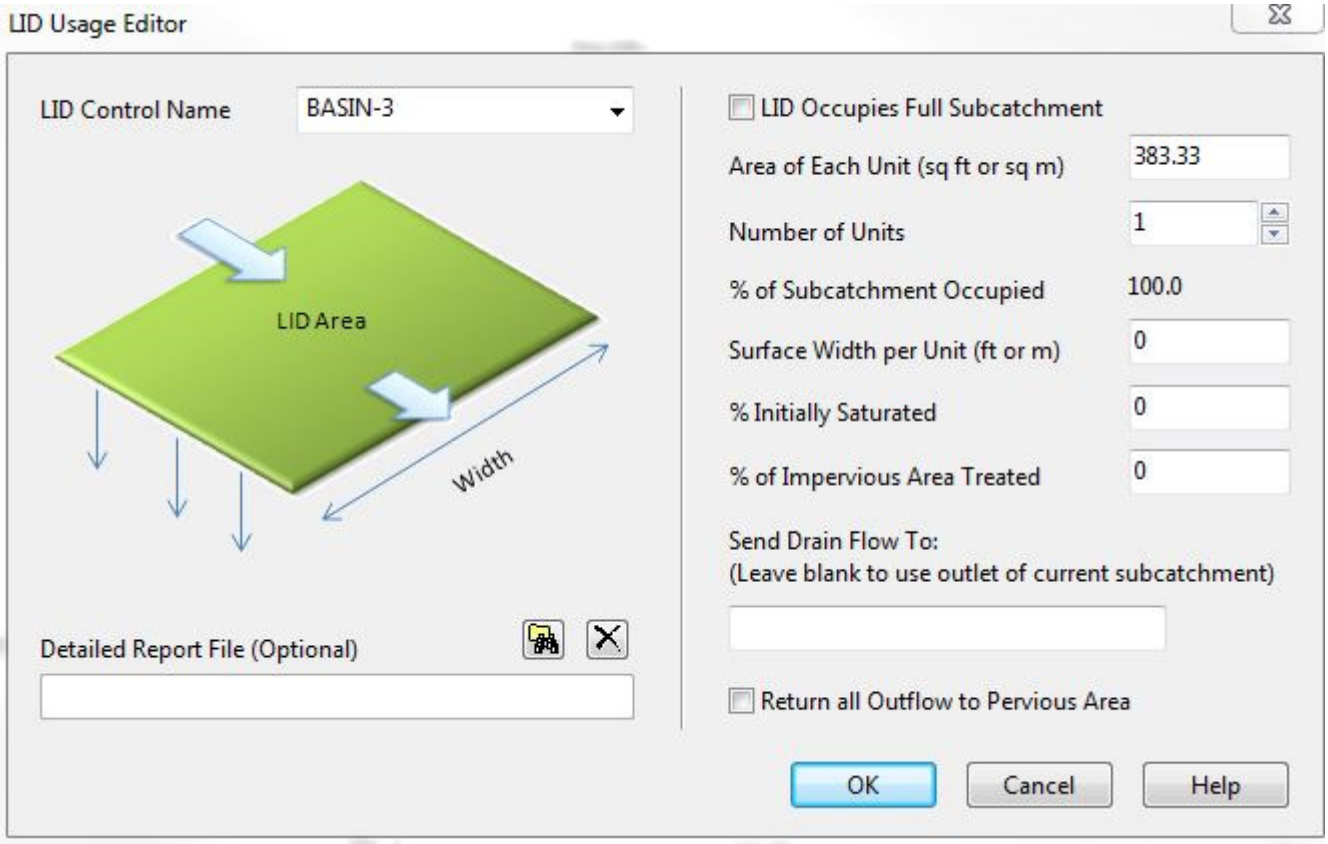

LID Usage Editor
LID Control Name
BASIN-2
LID Area
Width
Detailed Report File (Optional)
LID Occupies Full Subcatchment
Area of Each Unit (sq ft or sq m)
509.65
Number of Units
1
% of Subcatchment Occupied
100.0
Surface Width per Unit (ft or m)
0
% Initially Saturated
0
% of Impervious Area Treated
0
Send Drain Flow To:
(Leave blank to use outlet of current subcatchment)
Return all Outflow to Pervious Area
OK
Cancel
Help

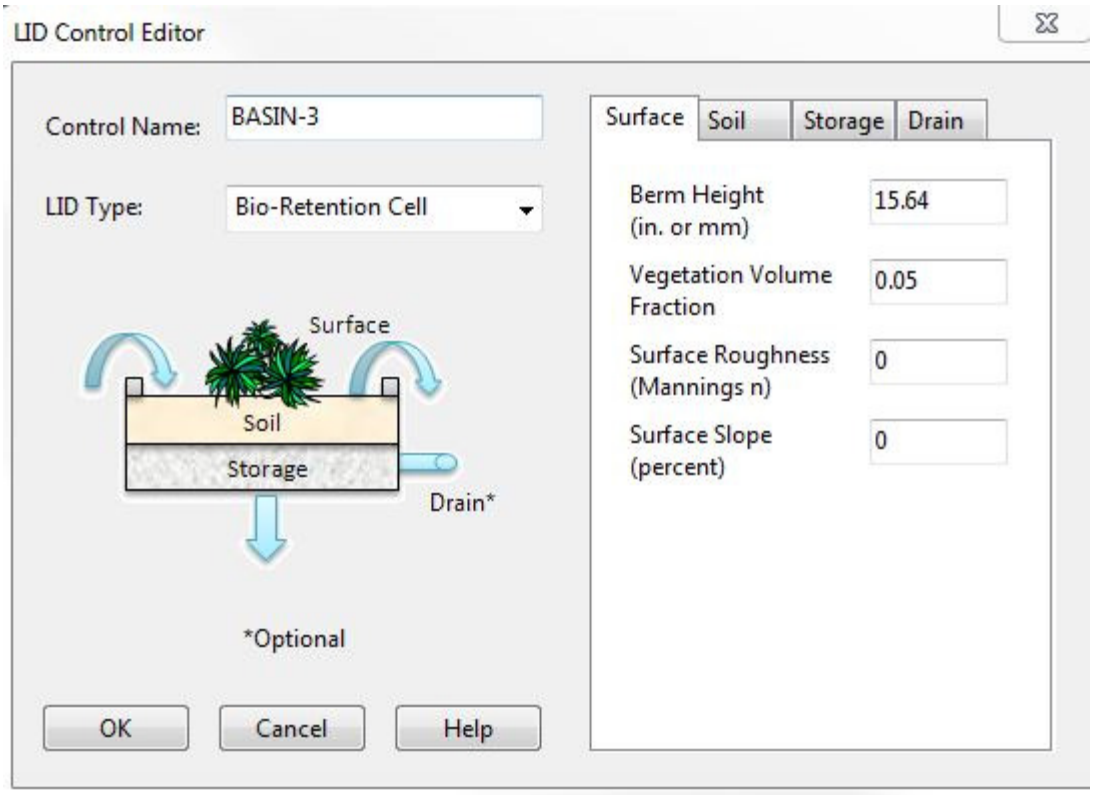

LID Control Editor
Control Name:
BASIN-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
14.73
Vegetation Volume Fraction
0.05
Surface Roughness (Mannings n)
0.
Surface Slope (percent)
0

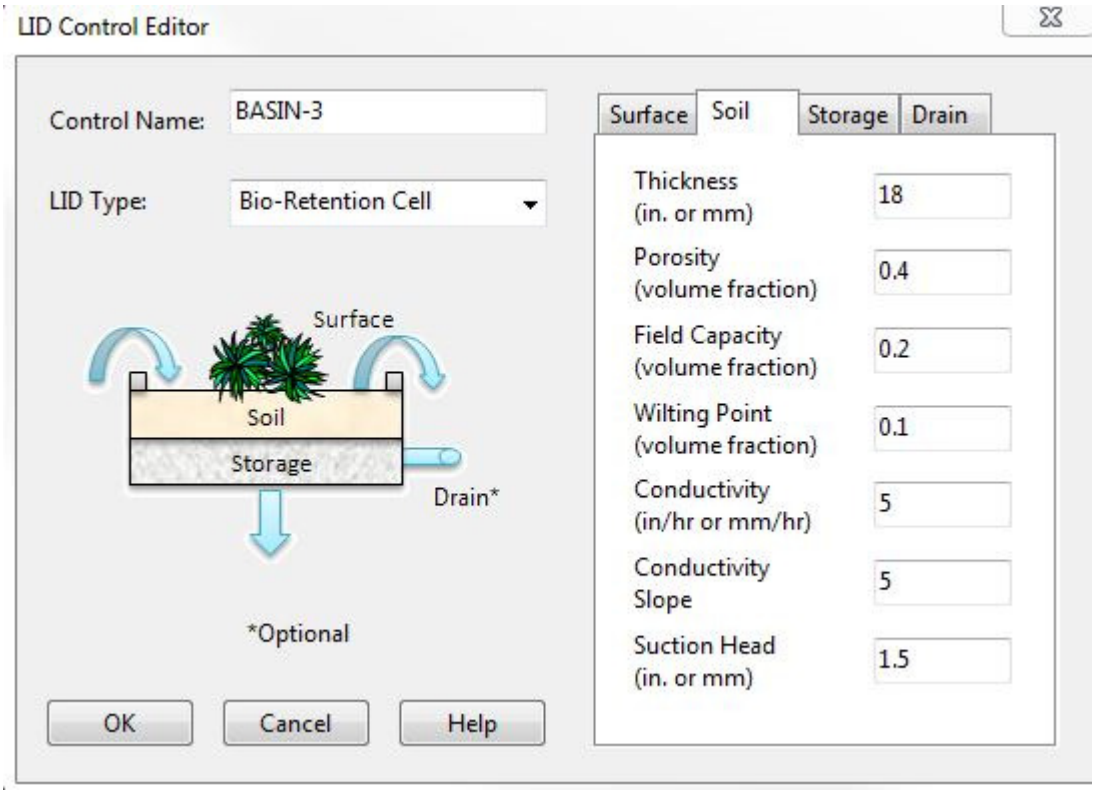

LID Control Editor
Control Name:
BASIN-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
18
Porosity (volume fraction)
0.4
Field Capacity (volume fraction)
0.2
Wilting Point (volume fraction)
0.1
Conductivity (in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head (in. or mm)
1.5

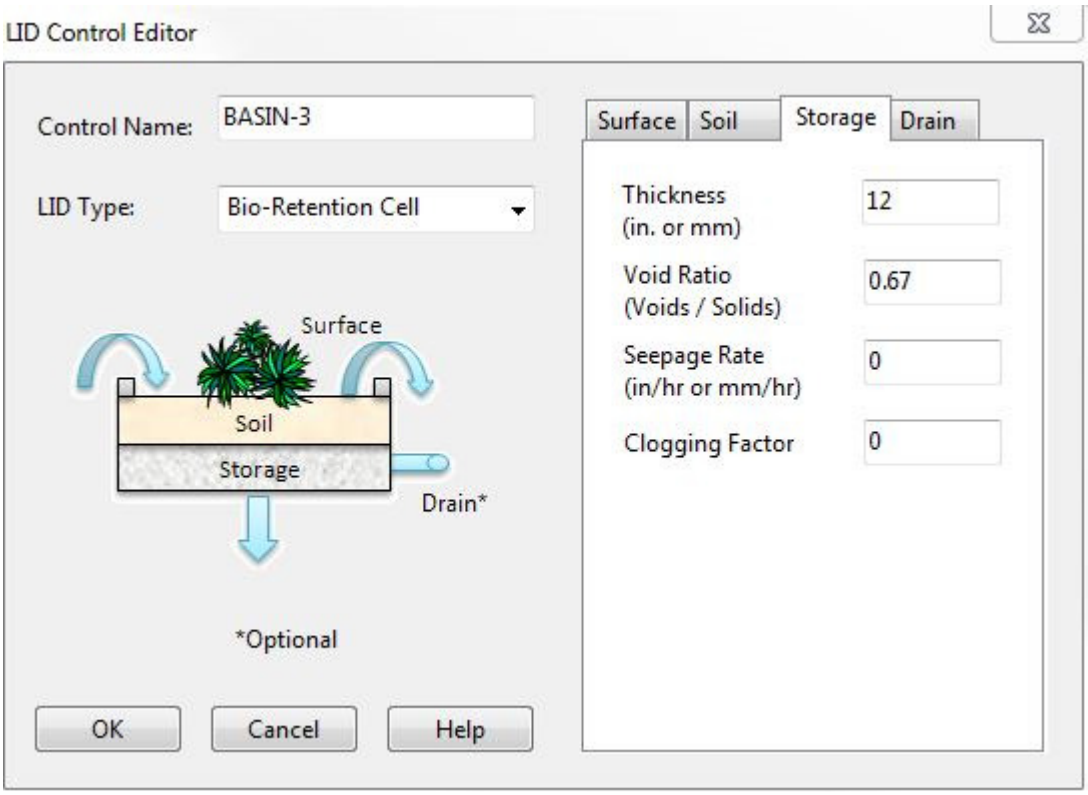

LID Control Editor
Control Name:
BASIN-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
12
Void Ratio
(Voids / Solids)
0.67
Seepage Rate
(in/hr or mm/hr)
0
Clogging Factor
0

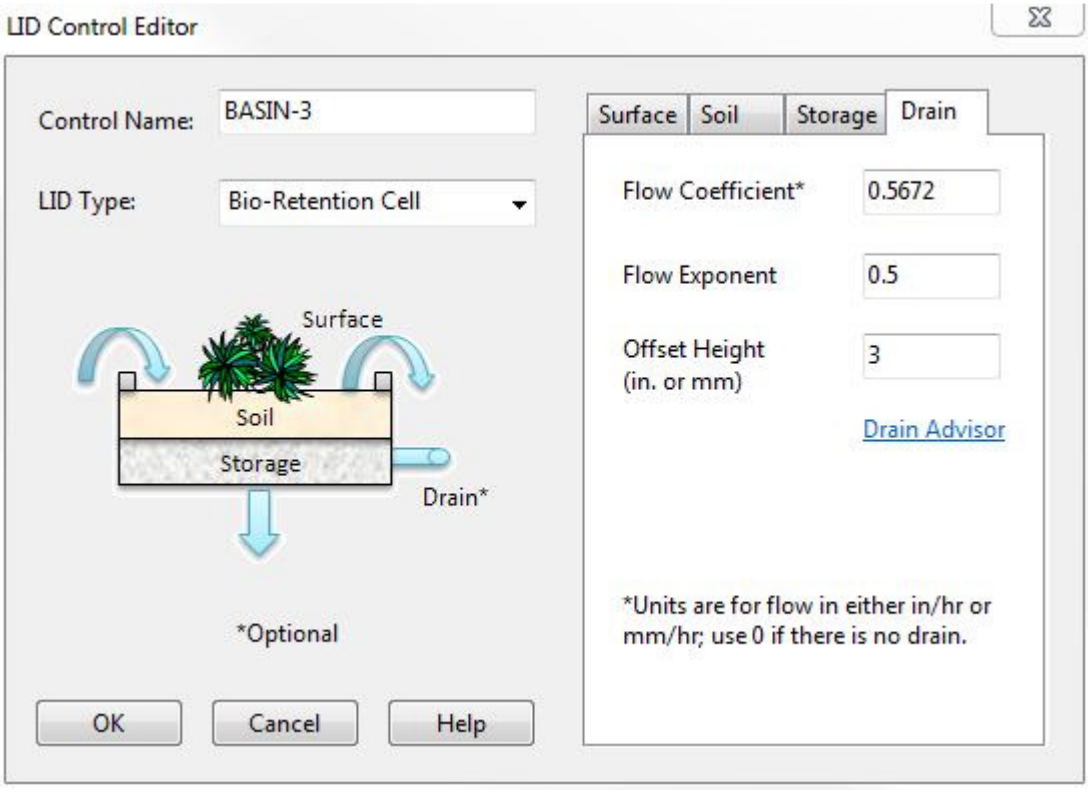

LID Control Editor
Control Name:
BASIN-2
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.0795
Flow Exponent
0.5
Offset Height
(in. or mm)
3
Drain Advisor
*Units are for flow in either in/hr or
mm/hr; use 0 if there is no drain.

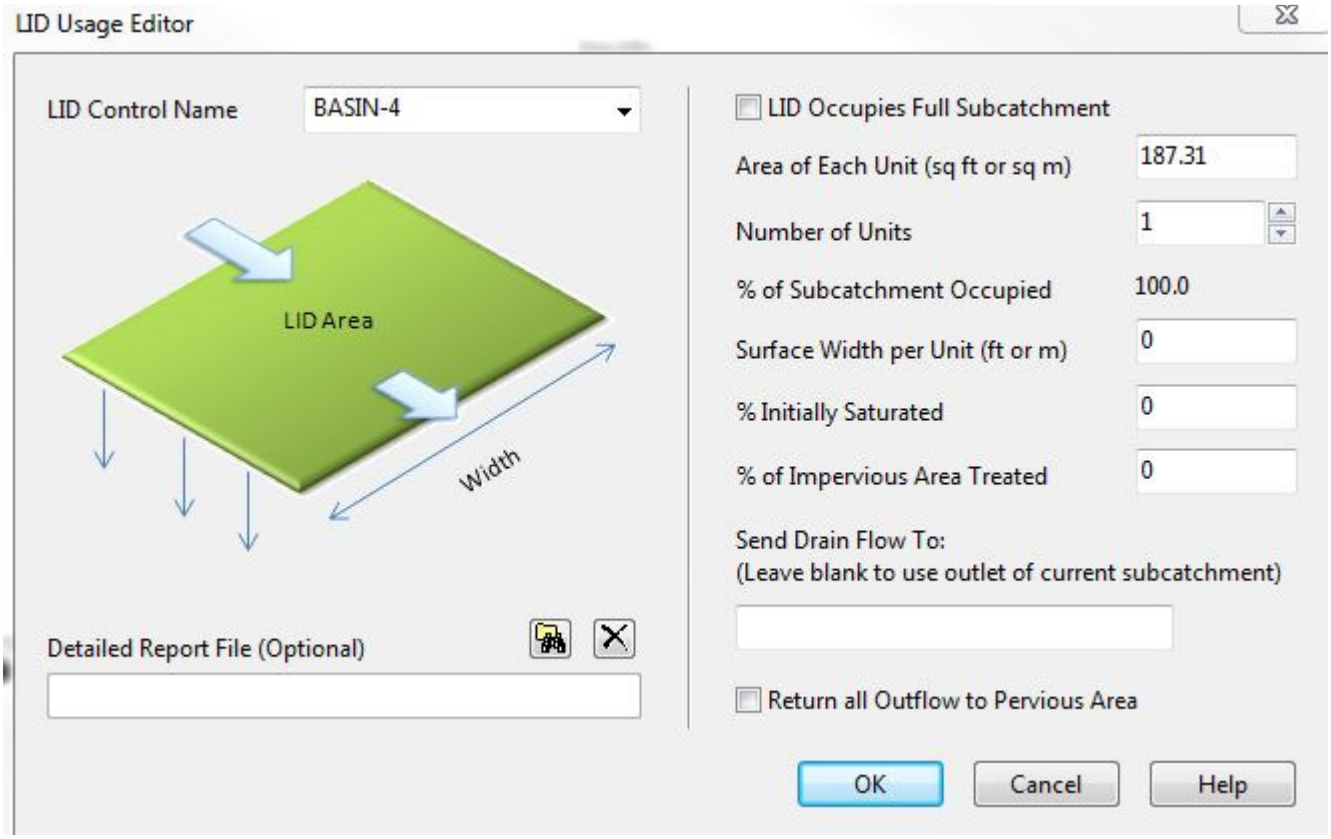

LID Usage Editor
LID Control Name
BASIN-3
LID Occupies Full Subcatchment
Area of Each Unit (sq ft or sq m)
383.33
Number of Units
1
% of Subcatchment Occupied
100.0
Surface Width per Unit (ft or m)
0
% Initially Saturated
0
% of Impervious Area Treated
0
LID Area
Width
Send Drain Flow To:
(Leave blank to use outlet of current subcatchment)
Detailed Report File (Optional)
Return all Outflow to Pervious Area
OK
Cancel
Help

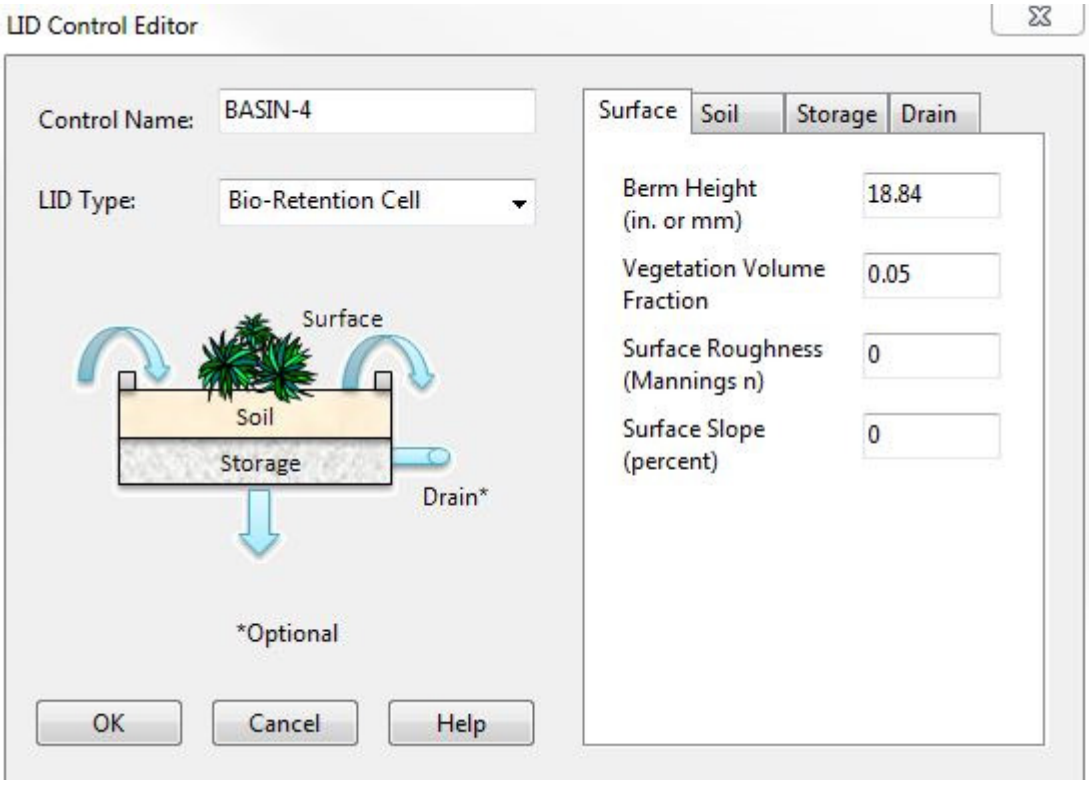

LID Control Editor
Control Name:
BASIN-3
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
15.64
Vegetation Volume Fraction
0.05
Surface Roughness (Mannings n)
0
Surface Slope (percent)
0

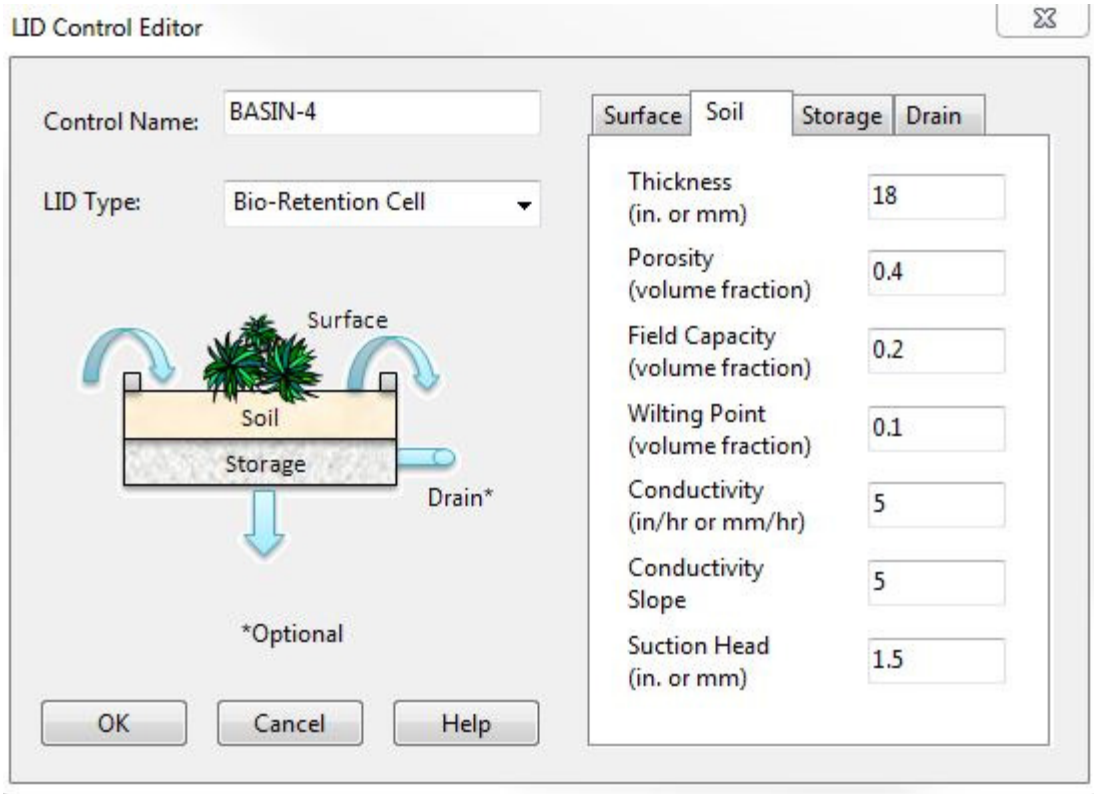

LID Control Editor
Control Name:
BASIN-3
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
18
Porosity (volume fraction)
0.4
Field Capacity (volume fraction)
0.2
Wilting Point (volume fraction)
0.1
Conductivity (in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head (in. or mm)
1.5

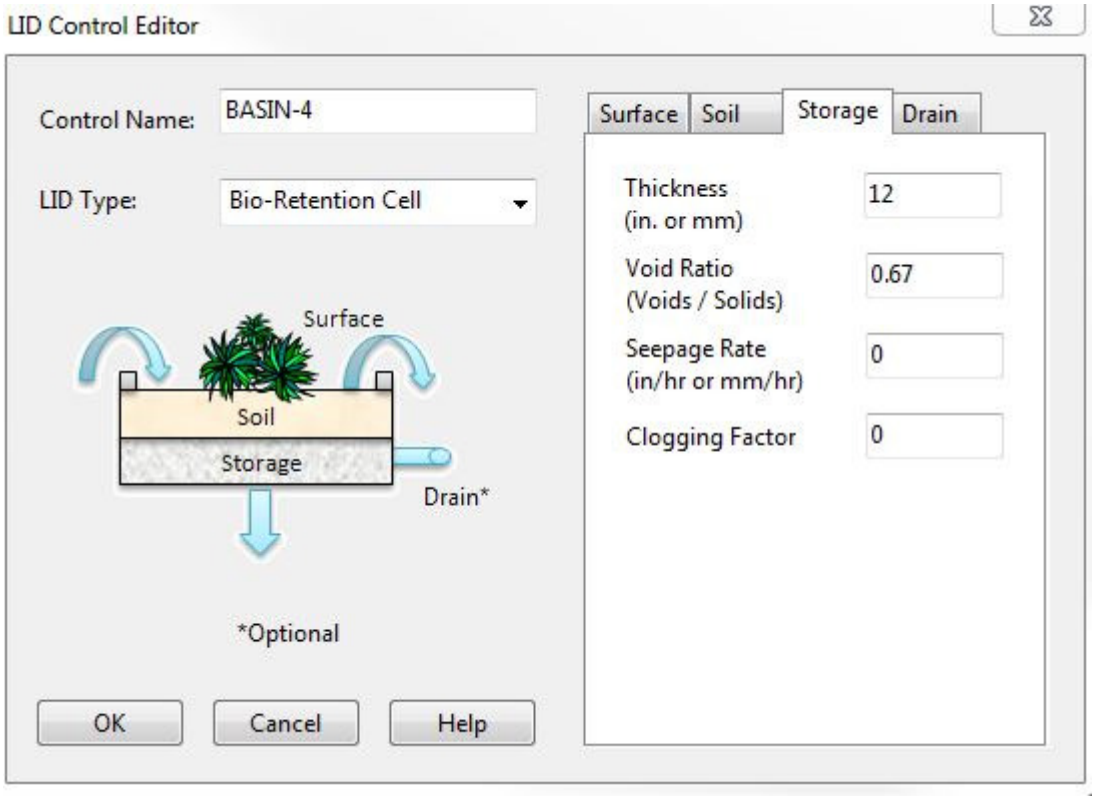

LID Control Editor
Control Name:
BASIN-3
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
12
Void Ratio
(Voids / Solids)
0.67
Seepage Rate
(in/hr or mm/hr)
0
Clogging Factor
0

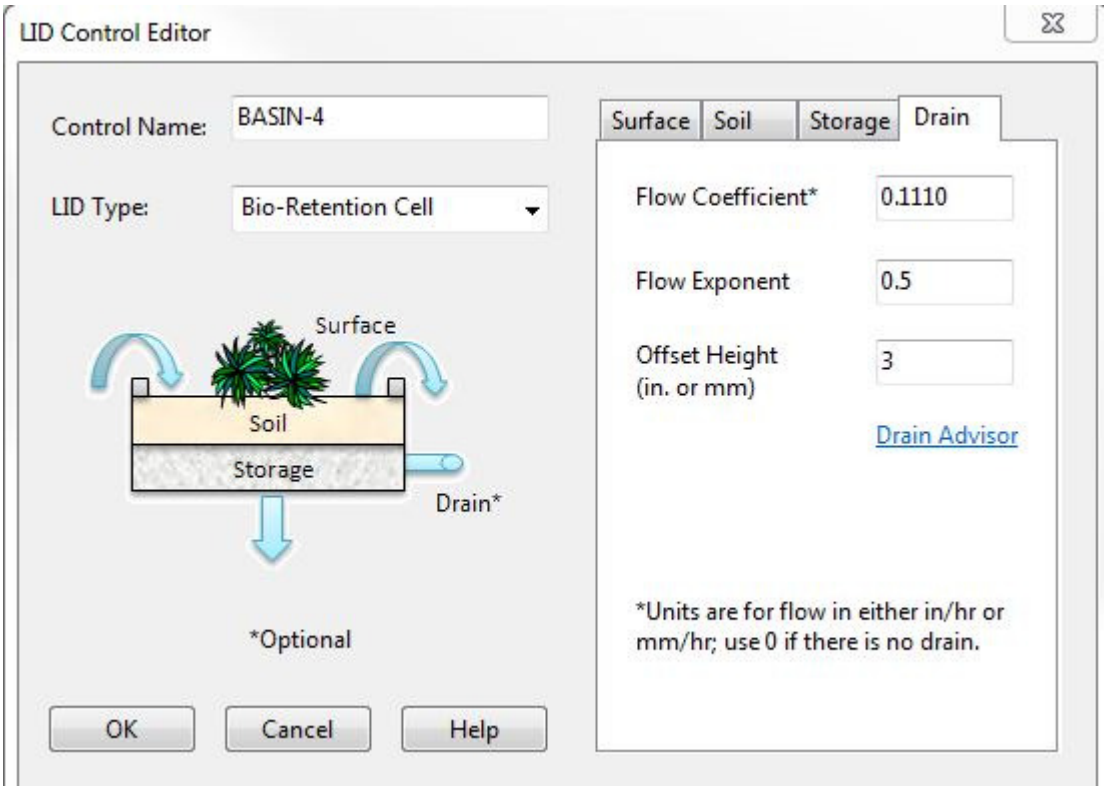

LID Control Editor
Control Name:
BASIN-3
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.5672
Flow Exponent
0.5
Offset Height
(in. or mm)
3
Drain Advisor
*Units are for flow in either in/hr or
mm/hr; use 0 if there is no drain.

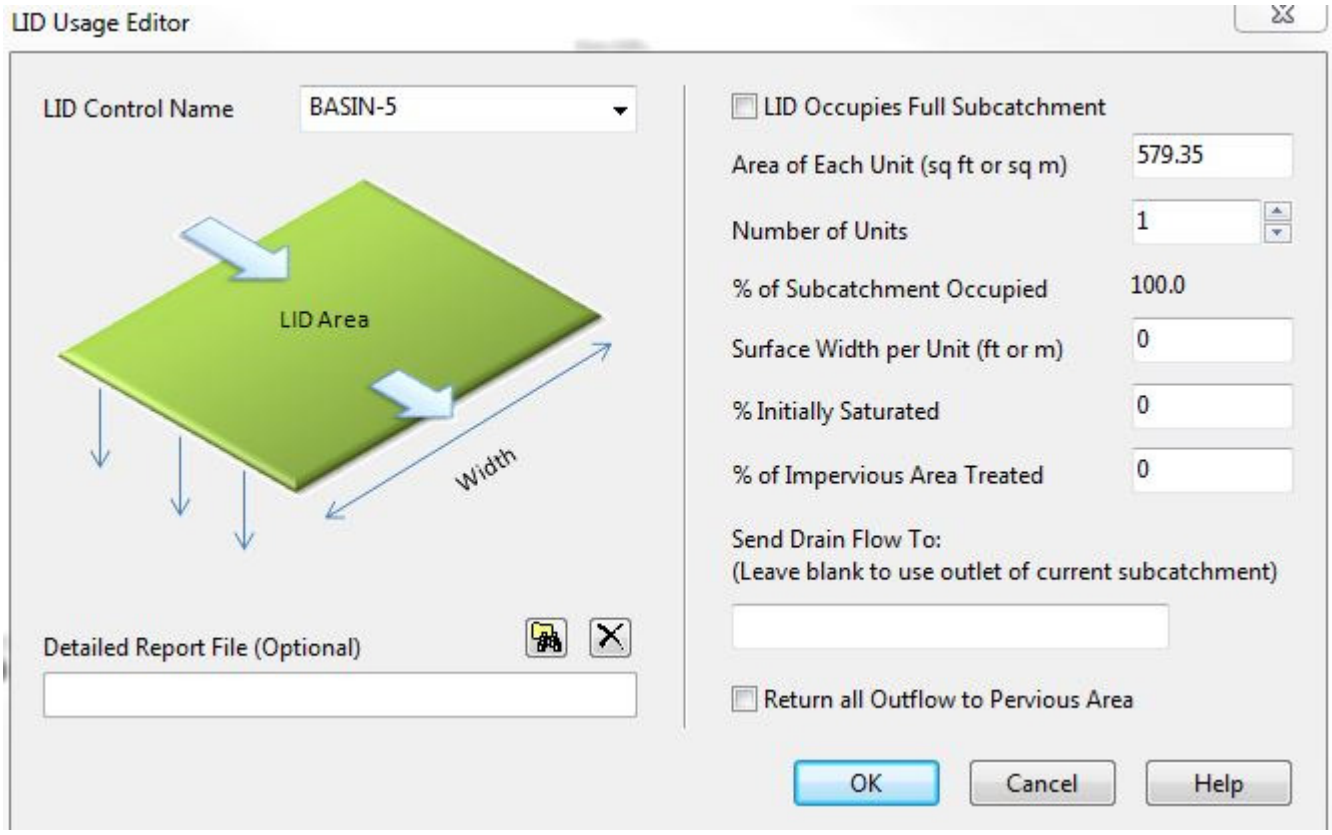

LID Usage Editor
LID Control Name
BASIN-4
LID Occupies Full Subcatchment
Area of Each Unit (sq ft or sq m)
187.31
Number of Units
1
% of Subcatchment Occupied
100.0
Surface Width per Unit (ft or m)
0
% Initially Saturated
0
% of Impervious Area Treated
0
LID Area
Width
Send Drain Flow To:
(Leave blank to use outlet of current subcatchment)
Detailed Report File (Optional)
Return all Outflow to Pervious Area
OK
Cancel
Help

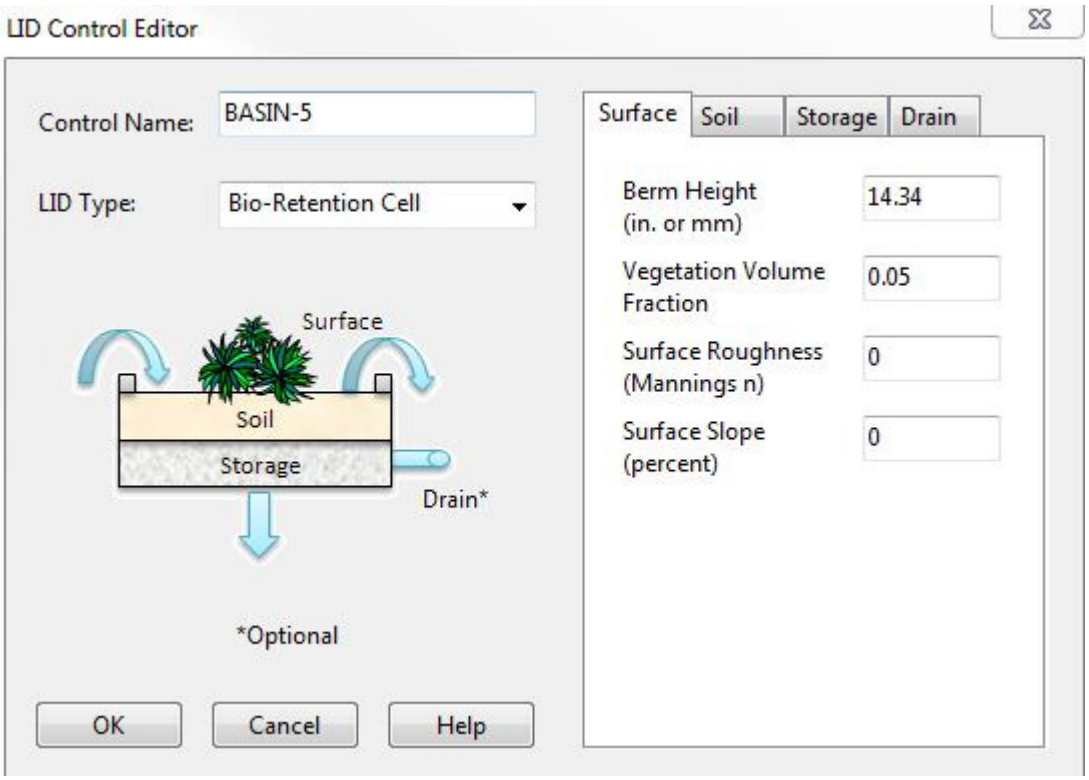

LID Control Editor
Control Name:
BASIN-4
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
18.84
Vegetation Volume Fraction
0.05
Surface Roughness (Mannings n)
0
Surface Slope (percent)
0

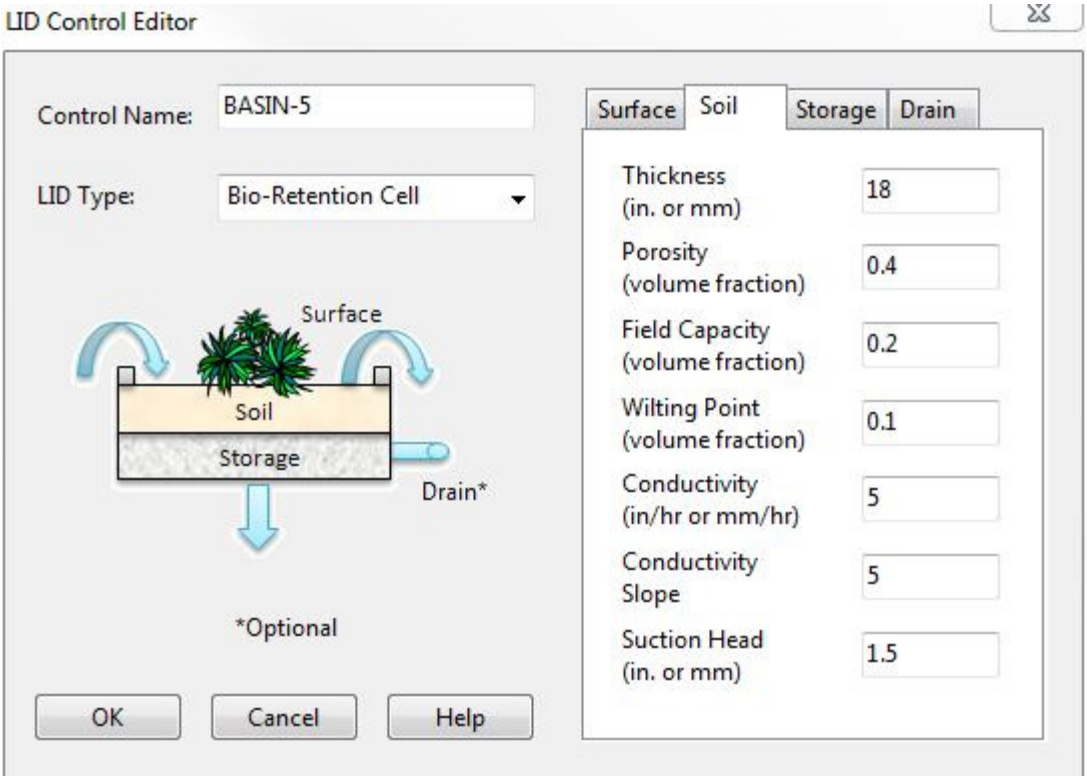

LID Control Editor
Control Name:
BASIN-4
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
18
Porosity (volume fraction)
0.4
Field Capacity (volume fraction)
0.2
Wilting Point (volume fraction)
0.1
Conductivity (in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head (in. or mm)
1.5

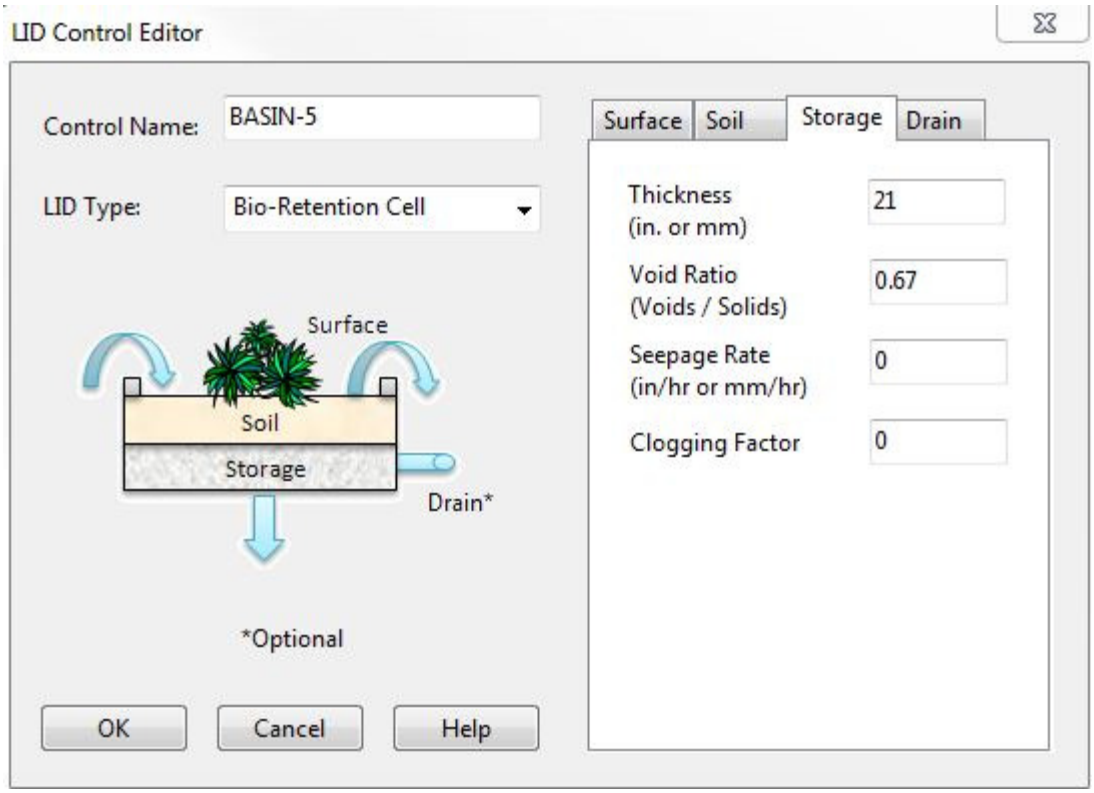

LID Control Editor
Control Name:
BASIN-4
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
12
Void Ratio
(Voids / Solids)
0.67
Seepage Rate
(in/hr or mm/hr)
0
Clogging Factor
0

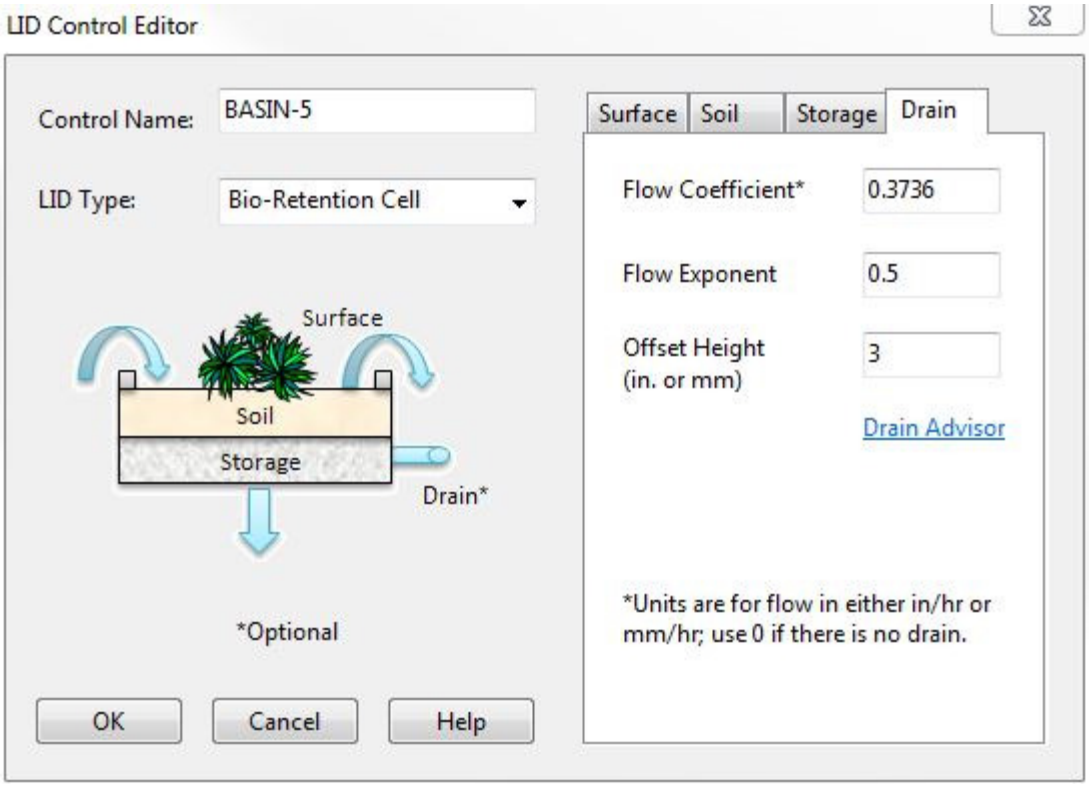

LID Control Editor
Control Name:
BASIN-4
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.1110
Flow Exponent
0.5
Offset Height
(in. or mm)
3
Drain Advisor
*Units are for flow in either in/hr or
mm/hr; use 0 if there is no drain.


LID Usage Editor
LID Control Name
BASIN-5
LID Occupies Full Subcatchment
Area of Each Unit (sq ft or sq m)
579.35
Number of Units
1
% of Subcatchment Occupied
100.0
Surface Width per Unit (ft or m)
0
% Initially Saturated
0
% of Impervious Area Treated
0
LID Area
Width
Send Drain Flow To:
(Leave blank to use outlet of current subcatchment)
Detailed Report File (Optional)
Return all Outflow to Pervious Area
OK
Cancel
Help


LID Control Editor
Control Name:
BASIN-5
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
14.34
Vegetation Volume Fraction
0.05
Surface Roughness (Mannings n)
0
Surface Slope (percent)
0


LID Control Editor
Control Name:
BASIN-5
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness (in. or mm)
18
Porosity (volume fraction)
0.4
Field Capacity (volume fraction)
0.2
Wilting Point (volume fraction)
0.1
Conductivity (in/hr or mm/hr)
5
Conductivity Slope
5
Suction Head (in. or mm)
1.5


LID Control Editor
Control Name:
BASIN-5
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
21
Void Ratio
(Voids / Solids)
0.67
Seepage Rate
(in/hr or mm/hr)
0
Clogging Factor
0


LID Control Editor
Control Name:
BASIN-5
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.3736
Flow Exponent
0.5
Offset Height
(in. or mm)
3
Drain Advisor
*Units are for flow in either in/hr or
mm/hr; use 0 if there is no drain.

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 lowest surface outlet within the biofiltration basin. This is the volume that can only discharge from the facility via the LID portion of the basin.

  In those cases where the surface storage has a variable area that is also different to the area of the gravel and amended soil, the SWMM model needs to be calibrated as the LID module will use the storage depth multiplied by the BMP area as the amount of volume stored at the surface.

  Let A_{BMP} be the area of the BMP (area of amended soil and area of gravel). The proper value of the storage depth S_D to be included in the LID module can be calculated by using geometric properties of the surface volume. Let A_0 be the surface area at the bottom of the surface pond, and let A_i be the surface area at the elevation of the invert of the first row of orifices (or at the invert of the riser if not surface orifices are included). Finally, let h_i be the difference in elevation between A_0 and A_i. By volumetric definition:

  $$A_{BMP} * S_D = \frac{(A_0 + A_i)}{2} h_i \qquad (1)$$

  Equation (1) allows the determination of SD to be included as Storage Depth in the LID module.

- 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.

  BHA considers such a value to be slightly high; however, in order to comply with the BMPDM, the value recommended by the Copermittees for the porosity of amended soil is 0.4, per Appendix G of the BMPDM. Such porosity is equal to the porosity of the gravel per the same manual.

- Porosity: The ratio of the void volume divided by the soil volume is directly related to porosity. Note, by definition, Porosity = Void Ratio ÷ (1 + Void Ratio). As the underdrain layer is composed of gravel, a porosity value of 0.4 has been selected (also per Appendix G of the BMPDM), which results in a void ratio of 0.4/(1+0.4) = 0.67 for the gravel detention layer.

- Conductivity: Due to the preliminary nature of this study, infiltration may not be a viable addition to the LID design. Even when soil types C and D are present, which generally have low infiltration rates, the possibility that a very low infiltration rate could be determined at design level must be considered. The range of potential infiltration rates to be studied when a site-specific geotechnical investigation has not been completed is shown in Table G.1-5 of the BMP Design Manual. Based on the infiltration rates shown,

a conservative low infiltration rate of 0 inches per hour was selected for soil Type D. Therefore, as the BMPs are designed without infiltration, the conductivity value was set to 0 to represent zero infiltration.

- 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.

- 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:

$$q = C(H - H_D)^n \quad (2)$$

where,

q is the peak flow in in/hr;
n is 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:

$$Q = \frac{\pi}{4} c_g \frac{D^2}{144} \sqrt{2g \frac{(H - H_D)}{12}} \quad (3)$$

where,

Q is the peak flow in cfs;
D is the underdrain orifice diameter in inches;
c_g is the typical discharge coefficient for orifices (0.60-0.65 for thin walls and 0.75-0.80 for thick walls);
g is the gravitational constant (32.2 ft/s^2); and
H and H_D are defined above are also used in inches in Equation (3).

It is clear that:

$$q = \left(\frac{in}{hr}\right) \frac{A_{BMP}}{12 * 3600} = Q(cfs) \quad (4)$$

The flow coefficient used in the SWMM Model characterizes the rate of discharge to the outlet as a function of the height of water stored in the biofiltration cell. The flow coefficient, as presented in the BMPDM, can be determined by the following equation:

$$C = c_g \left(\frac{605}{A_{lid}}\right)\left(\frac{\pi D^2}{8}\right)\sqrt{\frac{g}{6}} \quad (5)$$

where,

c_g is the orifice discharge coefficient (0.60-0.65 for thin walls and 0.75-0.80 for thick walls);
A_{lid} is the cumulative footprint area (ft2) of all LID controls;
D is the underdrain orifice diameter in inches; and
g is the gravitational constant (32.2 ft/s^2);

- Cut-Off Flow: The cut-off flow represents the maximum flow rate leaving the "low flow" outlet. The low-flow restrictor is typically more restrictive (i.e. smaller flow rate) than the percolation rate through the engineered soil; therefore, the orifice equation is used to calculate the cutoff flow when H is maximum.

ATTACHMENT 8

Geotechnical Documentation
See Attachment 7 of SWQMP

ATTACHMENT 9

Summary Files from the SWMM Model and CD

PRE-DEVELOPED RUNOFF CONDITION (POC-1) OUTPUT FILE

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

Olive Avenue, Pre-Developed Runoff Condition


***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ 08/28/1951 05:00:00
Ending Date .............. 05/23/2008 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Total Precipitation ......       181.627       675.110
Evaporation Loss .........         3.113        11.573
Infiltration Loss ........       158.562       589.376
```

Surface Runoff	20.516	76.259
Final Storage	0.001	0.004
Continuity Error (%)	-0.311	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	20.516	6.685
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	20.516	6.685
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	675.11	0.00	11.57	589.38	76.26	6.69	3.27	0.113

Analysis begun on: Mon Aug 27 17:12:41 2018
Analysis ended on: Mon Aug 27 17:12:59 2018
Total elapsed time: 00:00:18

POST-DEVELOPED RUNOFF CONDITION (POC-1) OUTPUT FILE

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  ----------------------------------------------------------

  York Drive, Lots 1 and 5 Post-Developed Runoff Condition

  WARNING 04: minimum elevation drop used for Conduit BYPASS-1
  WARNING 04: minimum elevation drop used for Conduit DRAIN-1
  WARNING 04: minimum elevation drop used for Conduit DRAIN-5
  WARNING 04: minimum elevation drop used for Conduit BYPASS-5
  WARNING 04: minimum elevation drop used for Conduit BYPASS-2
  WARNING 04: minimum elevation drop used for Conduit DRAIN-2
  WARNING 04: minimum elevation drop used for Conduit BYPASS-3
  WARNING 04: minimum elevation drop used for Conduit DRAIN-3
  WARNING 04: minimum elevation drop used for Conduit BYPASS-4
  WARNING 04: minimum elevation drop used for Conduit 3

  ***********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  ***********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... GREEN_AMPT
  Flow Routing Method ...... KINWAVE
  Starting Date ............ 08/28/1951 05:00:00
  Ending Date .............. 05/23/2008 23:00:00
  Antecedent Dry Days ...... 0.0
```

```
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Initial LID Storage ......         0.008         0.029
Total Precipitation ......       181.628       675.110
Evaporation Loss .........        12.531        46.578
Infiltration Loss ........       124.050       461.093
Surface Runoff ...........         7.667        28.499
LID Drainage .............        38.584       143.416
Final Storage ............         0.013         0.049
Continuity Error (%) .....        -0.666


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        46.251        15.072
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        43.794        14.271
Flooding Loss ............         3.035         0.989
Evaporation Loss .........         0.011         0.004
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -1.274


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
```

```
************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00


*************************
Subcatchment Runoff Summary
*************************
```

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
BASIN-1	675.11	4223.75	905.38	0.00	3994.18	1.61	0.56	0.815
DMA-1A	675.11	0.00	36.25	463.40	180.90	1.58	0.35	0.268
DMA-1B	675.11	0.00	1.45	650.54	26.25	0.04	0.06	0.039
DMA-1C	675.11	0.00	1.49	652.57	22.71	0.08	0.13	0.034
BYPASS	675.11	0.00	4.96	630.06	41.88	1.14	1.01	0.062
DMA-5A	675.11	0.00	68.10	228.79	384.65	5.92	0.64	0.570
BASIN-5	675.11	16395.35	1073.04	0.00	16004.48	5.78	0.66	0.938
DMA-2A	675.11	0.00	32.26	486.50	161.04	1.31	0.33	0.239
DMA-2B	675.11	0.00	1.45	650.12	26.71	0.12	0.16	0.040
DMA-2C	675.11	0.00	1.45	650.16	26.68	0.01	0.02	0.040
BASIN-2	675.11	4520.16	909.21	0.00	4286.24	1.36	0.52	0.825
DMA-3A	675.11	0.00	48.48	343.48	290.90	2.05	0.30	0.431
DMA-3B	675.11	0.00	99.85	0.00	586.97	1.18	0.09	0.869
BASIN-3	675.11	13589.57	1024.28	0.00	13247.47	3.17	0.43	0.929
DMA-4A	675.11	0.00	53.27	323.66	305.20	2.05	0.29	0.452
BASIN-4	675.11	17668.65	1034.97	0.00	17310.20	2.02	0.31	0.944
DMA-3C	675.11	0.00	1.45	650.76	25.86	0.01	0.01	0.038
DMA-3D	675.11	0.00	1.47	651.57	24.32	0.01	0.02	0.036
DMA-4B	675.11	0.00	1.44	649.69	27.17	0.01	0.02	0.040

```
**********************
LID Performance Summary
**********************
```

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BASIN-1	BASIN-1	4898.86	905.41	0.00	216.38	3777.93	1.80	2.07	-0.02
BASIN-5	BASIN-5	17070.46	1073.08	0.00	836.06	15168.95	1.80	2.69	-0.05
BASIN-2	BASIN-2	5195.27	909.25	0.00	399.42	3886.99	1.80	2.07	-0.01
BASIN-3	BASIN-3	14264.68	1024.31	0.00	871.70	12376.19	1.80	2.41	-0.06
BASIN-4	BASIN-4	18343.76	1035.00	0.00	5456.33	11854.31	1.80	2.41	-0.01

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-1	OUTFALL	0.01	0.54	0.54	12810 18:31	0.52
DIV-1	DIVIDER	0.01	0.22	0.22	9626 10:07	0.22
DIV-5	DIVIDER	0.01	1.00	1.00	141 06:50	1.00
DIV-2	DIVIDER	0.01	1.00	1.00	141 07:32	1.00
DIV-3	DIVIDER	0.01	1.00	1.00	141 06:47	1.00
DIV-4	DIVIDER	0.01	1.00	1.00	123 23:19	1.00
STOR-1	STORAGE	0.00	0.43	0.43	18857 12:20	0.39
STOR-5	STORAGE	0.00	0.08	0.08	18857 13:01	0.08
STOR-2	STORAGE	0.00	0.00	0.00	0 00:00	0.00
STOR-3	STORAGE	0.00	0.10	0.10	20632 02:19	0.10
STOR-4	STORAGE	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC-1	OUTFALL	1.01	1.48	18857 12:01	1.14	14.3	0.000
DIV-1	DIVIDER	0.56	0.56	18857 12:01	1.61	1.61	0.000

DIV-5	DIVIDER	0.66	0.66	18857	12:01	5.78	5.78	0.000	
DIV-2	DIVIDER	0.52	0.52	18857	12:01	1.36	1.36	0.004	
DIV-3	DIVIDER	0.43	0.43	18857	12:01	3.17	3.17	0.000	
DIV-4	DIVIDER	0.31	0.31	18857	12:01	2.02	2.02	0.073	
STOR-1	STORAGE	0.00	0.55	18857	12:01	0	0.0866	0.062	
STOR-5	STORAGE	0.00	0.08	9992	23:26	0	0.202	-0.000	
STOR-2	STORAGE	0.00	0.00	0	00:00	0	0	0.000	gal
STOR-3	STORAGE	0.00	0.08	18857	12:49	0	0.175	0.000	
STOR-4	STORAGE	0.00	0.00	0	00:00	0	0	0.000	gal

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days	hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Volume 1000 ft3
DIV-5	44.20	0.55	18857	12:01	0.142	0.000
DIV-2	83.65	0.51	18857	12:02	0.127	0.000
DIV-3	32.85	0.33	18857	12:01	0.075	0.000
DIV-4	1940.67	0.30	18857	12:02	0.645	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days	hr:min	Maximum Outflow CFS
STOR-1	0.000	0	0	0	0.421	25	18857	12:19	0.45
STOR-5	0.000	0	1	0	0.068	5	18857	13:01	0.08
STOR-2	0.000	0	0	0	0.000	0	0	00:00	0.00
STOR-3	0.000	0	1	0	0.064	5	20632	02:18	0.08
STOR-4	0.000	0	0	0	0.000	0	0	00:00	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	6.35	0.02	1.48	14.270
System	6.35	0.02	1.48	14.270

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
BYPASS-1	DUMMY	0.55	18857 12:01			
DRAIN-1	CONDUIT	0.01	11160 00:33	0.07	0.11	0.22
DRAIN-5	CONDUIT	0.04	12810 18:31	0.14	0.57	0.52
BYPASS-5	CONDUIT	0.08	9992 23:26	0.25	1.08	1.00
BYPASS-2	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
DRAIN-2	CONDUIT	0.01	11160 00:10	0.07	0.08	0.19
BYPASS-3	CONDUIT	0.08	18857 12:49	0.25	1.08	1.00
DRAIN-3	CONDUIT	0.03	10381 02:13	0.17	0.44	0.46
BYPASS-4	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
3	CONDUIT	0.00	9386 09:09	0.07	0.04	0.14
MID-FLOW-1	DUMMY	0.45	18857 12:20			
MID-FLOW-5	DUMMY	0.08	18857 13:01			
MID-FLOW-2	DUMMY	0.00	0 00:00			
MID-FLOW-3	DUMMY	0.08	20632 02:19			
MID-FLOW-4	DUMMY	0.00	0 00:00			

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
BYPASS-5	43.50	43.50	43.50	10.97	43.50
BYPASS-3	32.32	32.32	32.32	10.90	32.32

Analysis begun on: Wed Aug 29 12:04:55 2018
Analysis ended on: Wed Aug 29 12:07:11 2018
Total elapsed time: 00:02:16

ATTACHMENT 10

Drawdown Calculations

Drawdown Calculations

Note: Drawdown calculations are from invert of lowest surface discharge opening in riser structure to the surface bottom of the basin. Therefore, discharge occurs only through the underdrain orifice.

Drawdown Calculations - Basin 1

Surface Ponding Depth:	PD	12	in
Ponding Depth Surface Area:	A_{PD}	923	ft^2
Surface Ponding Volume:	V_{PD}	783	ft^3
Low Flow Orifice Diameter:	D	0.37	in
Flow Rate (volumetric):	Q	0.007	ft^3/s
Drawdown Time:		29.40	hrs

Drawdown Calculations - Basin 2

Surface Ponding Depth:	PD	12	in
Ponding Depth Surface Area:	A_{PD}	741	ft^2
Surface Ponding Volume:	V_{PD}	625	ft^3
Low Flow Orifice Diameter:	D	0.35	in
Flow Rate (volumetric):	Q	0.006	ft^3/s
Drawdown Time:		28.91	hrs

Drawdown Calculations - Basin 3

Surface Ponding Depth:	PD	12	in
Ponding Depth Surface Area:	A_{PD}	614	ft^2
Surface Ponding Volume:	V_{PD}	498	ft^3
Low Flow Orifice Diameter:	D	0.81	in
Flow Rate (volumetric):	Q	0.032	ft^3/s
Drawdown Time:		4.31	hrs

Drawdown Calculations - Basin 4

Surface Ponding Depth:	PD	12	in
Ponding Depth Surface Area:	A_{PD}	398	ft^2
Surface Ponding Volume:	V_{PD}	292	ft^3
Low Flow Orifice Diameter:	D	0.25	in
Flow Rate (volumetric):	Q	0.003	ft^3/s
Drawdown Time:		26.45	hrs

Drawdown Calculations - Basin 5

Surface Ponding Depth:	PD	12	in
Ponding Depth Surface Area:	A_{PD}	806	ft^2
Surface Ponding Volume:	V_{PD}	693	ft^3
Low Flow Orifice Diameter:	D	0.81	in
Flow Rate (volumetric):	Q	0.035	ft^3/s
Drawdown Time:		5.44	hrs

Attachment 2b

Hydromodification Management Exhibit

POST-DEVELOPMENT HYDROMODIFICATION MANAGEMENT EXHIBIT
1505 YORK DRIVE
TM 5443 RPL3

PROJECT CHARACTERISTICS	
PROJECT AREA	2.82 ACRES
DISTURBED AREA	2.63 ACRES
PROPOSED IMPERVIOUS AREA	0.85 ACRES
PROPOSED PERVIOUS AREA	1.78 ACRES
SOIL TYPE	A
DEPTH TO GROUNDWATER	> 20 FEET

HMP MODELING

DEVELOPED CONDITIONS

STORM WATER RUNOFF FROM THE PROPOSED PROJECT SITE IS ROUTED TO ONE (1) POC, LOCATED AT THE WESTERLY BOUNDARY OF THE PROJECT SITE. RUNOFF FROM THE DEVELOPED PROJECT SITE IS DRAINED TO FIVE (5) ONSITE RECEIVING BIOFILTRATION BMPS. ONCE FLOWS ARE ROUTED VIA THE PROPOSED HMP-BMPS, DEVELOPED FLOWS ARE THEN DISCHARGED TO THE EXISTING POINT OF DRAINAGE FROM THE PROJECT SITE.

3 SMALL VEGETATION AREAS (SM-1, SM-2, AND SM-3) ARE UNABLE TO DRAIN TO THE RECEIVING BIOFILTRATION BASINS AND BYPASS THESE FACILITIES, DRAINING DIRECTLY TO POC-1.

TABLE 1 - SUMMARY OF DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious
1	DMA-1	22,621	21%
	DMA-2	21,280	18%
	DMA-3	16,260	47%
	DMA-4	11,626	36%
	DMA-5	25,272	65%
	SM-1	9,021	0%
	SM-2	10,365	0%
	SM-3	2,997	0%
	DM-1	192	100%
	DM-2	339	100%

FIVE (5) BIOFILTRATION BASINS WITH NO INFILTRATION ARE LOCATED WITHIN THE PROJECT SITE AND IS RESPONSIBLE FOR HANDLING HYDROMODIFICATION REQUIREMENTS FOR POC-1. IN DEVELOPED CONDITIONS, THE BASINS WILL HAVE A TOTAL DEPTH OF FROM 17 TO 24 INCHES AND AN INTERNAL OUTLET STRUCTURE (SEE DIMENSIONS IN TABLE 2). FLOWS WILL THEN DISCHARGE FROM THE BASIN VIA THE OUTLET STRUCTURE OR INFILTRATE THROUGH THE BASE OF THE FACILITIES TO THE RECEIVING AMENDED SOIL AND LOW FLOW ORIFICE. THE RISER STRUCTURE WILL ACT AS A SPILLWAY SUCH THAT PEAK FLOWS CAN BE SAFELY DISCHARGED TO THE RECEIVING STORM DRAIN SYSTEM.

BENEATH THE BASIN'S INVERT LIES THE PROPOSED LID BIOFILTRATION PORTION OF THE DRAINAGE FACILITY. THIS PORTION OF THE BASIN IS COMPRISED OF A 3-INCH LAYER OF MULCH, AN 18 TO 21-INCH LAYER OF AMENDED SOIL (A HIGHLY SANDY, ORGANIC RICH COMPOSITE WITH AN INFILTRATION CAPACITY OF AT LEAST 5 INCHES/HR) AND A RESERVOIR LAYER OF GRAVEL. AN UNDERDRAIN PIPE WITH LOW FLOW ORIFICE WILL BE PROVIDED AT THE BOTTOM OF THE BASIN TO CARRY WAY FILTERED RUNOFF. THE UNDERDRAIN PIPE WILL BE LOCATED 3 INCHES ABOVE THE GRAVEL LAYER INVERT. THE BOTTOM OF THE BASINS WILL BE LINED WITH AN IMPERMEABLE LINER TO PREVENT INFILTRATION INTO NATIVE SOILS. A RISER STRUCTURE WILL BE CONSTRUCTED WITHIN THE BMPS WITH AN EMERGENCY OVERFLOW WEIR, SUCH THAT PEAK FLOWS CAN BE SAFELY DISCHARGED TO THE RECEIVING STORM DRAIN SYSTEM (SEE DIMENSIONS IN TABLE 3).

SINCE THE PROJECT IS LOCATED UPSTREAM FROM A RECEIVING WATER THAT IS 303d LISTED FOR A NUTRIENT POLLUTANT, NUTRIENT SENSITIVE MEDIA DESIGN (BF-2) WAS SELECTED FOR THE BIOFILTRATION BMPS TO MINIMIZE THE POTENTIAL FOR EXPORT OF NUTRIENTS FROM THE MEDIA.

THE BIOFILTRATION FACILITIES HAVE BEEN MODELED USING SWMM 5.1. THE SWMM USES CONTINUOUS SIMULATION MODELING TO DETERMINE THE MINIMUM REQUIRED HYDROMODIFICATION MANAGEMENT VOLUMES FOR EACH PROPOSED BIOFILTRATION BASIN.

IT IS ANTICIPATED THAT THE BIOFILTRATION BASINS MAY ALSO FULFILL WATER QUALITY REQUIREMENTS. THEREFORE, THE BASINS WILL BE DUAL PURPOSE TO ACHIEVE THE FLOW-DURATION REQUIREMENTS SET FORTH IN THE COUNTY HMP, AS WELL AS ADDRESS THE STORM WATER QUALITY REQUIREMENTS SET FORTH IN THE MS4 PERMIT AS REGIONAL POST-CONSTRUCTION TREATMENT BMPS FOR THE DEVELOPED AREA. SEE ATTACHMENT 1 OF THE "PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR 1505 YORK DRIVE" FOR POLLUTANT CONTROL COMPLIANCE AS PRESENTED IN APPENDIX B OF THE COUNTY OF SAN DIEGO BMP DESIGN MANUAL.

BMP MODELING FOR WATER QUALITY PURPOSES

MODELING OF DUAL PURPOSE WATER QUALITY/HMP BMPS

FIVE (5) BMPS ARE PROPOSED FOR WATER QUALITY TREATMENT FOR THE PROJECT SITE. TABLE 2 ILLUSTRATES THE DIMENSIONS REQUIRED FOR POLLUTANT CONTROL COMPLIANCE.

TABLE 2 - SUMMARY OF DEVELOPED DUAL PURPOSE BMPS: BIOFILTRATION WITH SURFACE PONDING

BMP	BMP DIMENSIONS						
	Tributary Area (ac)	BMP Area[1] (ft^2)	Underdrain Orifice, D (in)[2]	Gravel Depth (in)[3]	Depth Riser Invert[4] (in)	Total Surface Depth[5] (ft)	Total Sub-Surface Depth[6] (ft)
1	0.52	643	0.37"-dia	21	2.00	1.6	3.83
2	0.49	509	0.35"-dia	12	1.25	1.3	3.08
3	0.37	382	0.81"-dia	12	2.00	1.6	3.08
4	0.27	186	0.25"-dia	12	2.00	1.5	3.08
5	0.58	580	0.81"-dia	21	2.00	2.0	3.83

Notes: (1): BMP Area = Gravel Area = Amended Soil Area. Amended soil depth equal to 18 inches for the BMPs.
(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q_2).
(3): Total depth of gravel layer including 3 inches of saturated storage below underdrain pipe.
(4): Depth from top of amended soil layer to invert of emergency overflow weir.
(5): The total surface ponding depth from the top of amended soil layer.
(6): The total sub-surface depth from the invert of the gravel layer to top of amended soil layer.

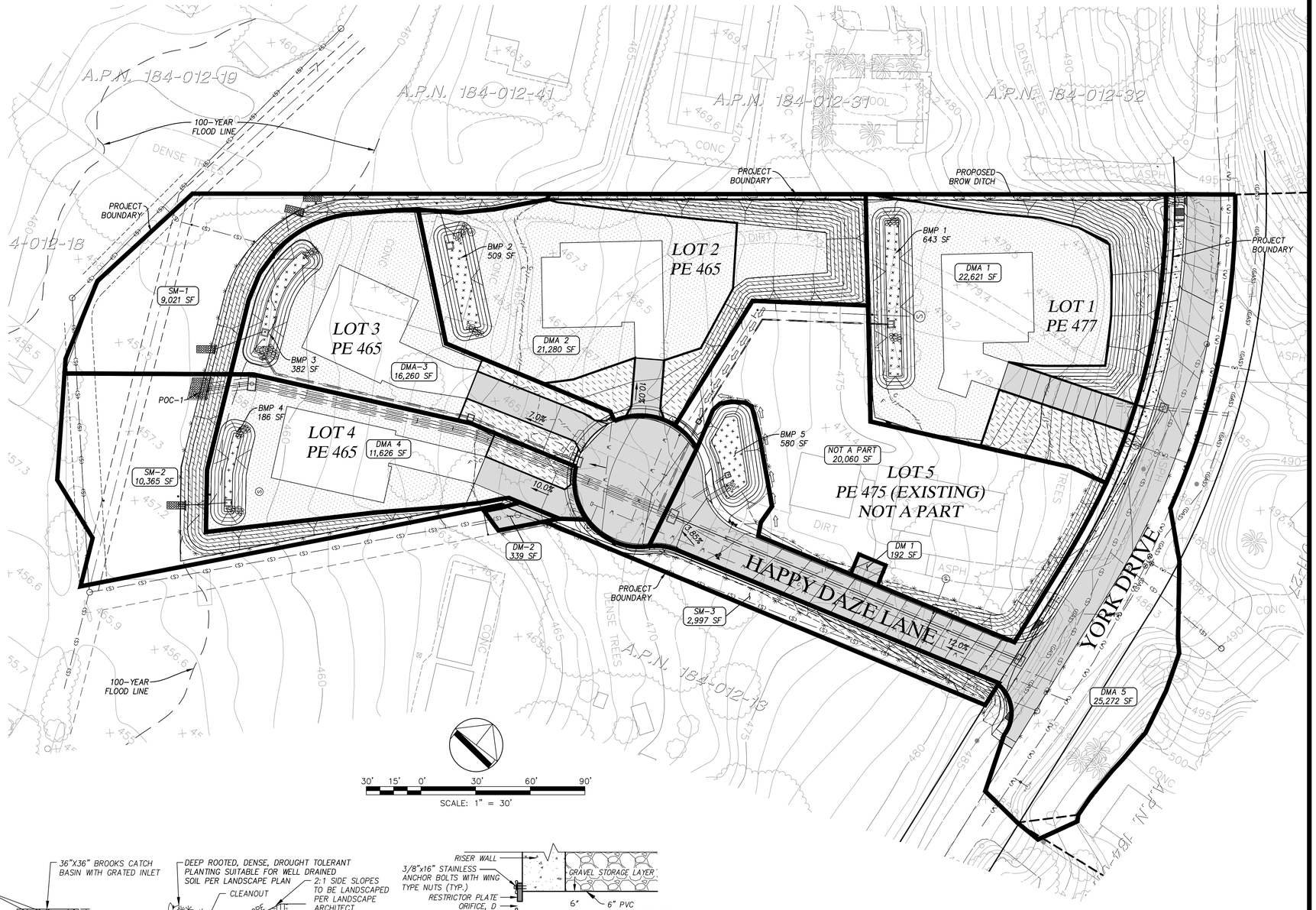
TABLE 3 - SUMMARY OF RISER DIMENSIONS

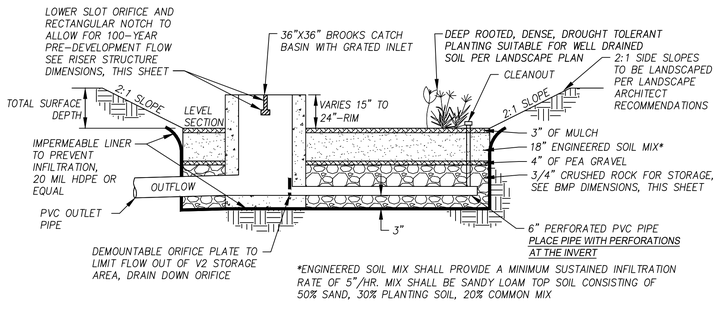
BMP	Lower Orifice Dimensions			Upper Orifice Dimensions			Emergency Weir	
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions Length x Height[3]	Outlet Type[1]	Invert Elev, HU[2] (in)	Dimensions [3]	Riser Invert Elev, Htop[4] (in)	Weir Perimeter Length[5] (ft)
1	Slot	12	(1) 3" x 6"	Vertical Notch	15	2" Wide x 9" High	24	12
2	Slot	12	(1) 3" x 3"	N/A	N/A	N/A	15	12
3	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
4	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
5	Slot	12	(1) 3" x 12	Vertical Notch	15	2" Wide x 9" High	24	12

Notes: (1): Shape of orifice opening in riser structure.
(2): Depth from top of amended soil layer to invert of lower orifice or weir.
(3): Number of orifices - (#) .
(4): Depth from bottom of pond to invert of emergency overflow weir.
(5): Overflow length, the internal perimeter of the riser is 12 ft (3 ft x 3 ft internal dimensions).

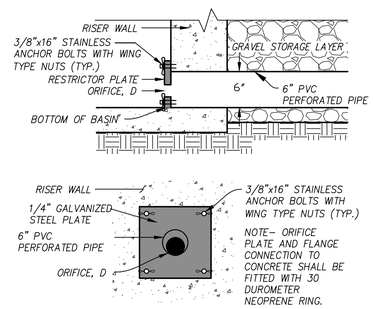
LEGEND

DMA NAME	DMA-1
AREA (SQUARE FEET)	22,621 SF
SELF-MITIGATING DMA	SM-1
DMA POINT OF COMPLIANCE (POC)	POC-1
DMA BOUNDARY	
PROJECT BOUNDARY	
BIOFILTRATION BASIN	
VEGETATED SLOPES	
IMPERVIOUS AREA DISPERSION	
CONCRETE	
ASPHALT	
FLOW DIRECTION	
BROW DITCH	
RIP RAP ENERGY DISSIPATER	

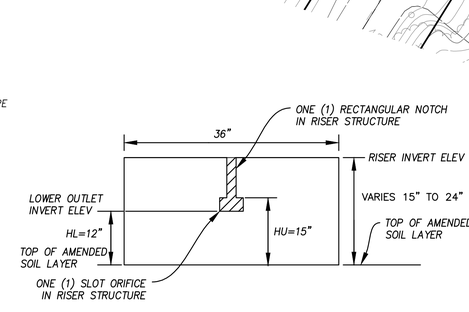




TYPICAL BIOFILTRATION BASIN DETAIL, TYP



RESTRICTOR PLATE DETAIL
NOT TO SCALE



TYPICAL OUTLET STRUCTURE DETAIL
NOT TO SCALE

PRIVATE CONTRACT

SHEET 1	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	1 SHEETS

POST-DEVELOPMENT HYDROMODIFICATION MANAGEMENT EXHIBIT FOR:

TM 5443 RPL3

CALIFORNIA COORDINATE INDEX _____

APPROVED FOR SIROUS DEYLAMIAN COUNTY ENGINEER
BY: _____
BY: _____ DATE

ENGINEER OF WORK
BRUCE RICE RCE 60676

PDS GRADING PERMIT NO:

DLA Inc. 5115 AVENIDA ENCINAS SUITE L
CARLSBAD, CA 92008 (760) 931-8700

Attachment 2c

Management of Critical Course Sediment Yield Areas

CCYSA - YORK DRIVE
Legend
Yes
York Dr
Google earth
© SPOT IMAGE
© 2016 Google
N
300 ft

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2014 Advanced Engineering Software (aes)
              Ver. 21.0 Release Date: 06/01/2014  License ID 1459

                              Analysis prepared by:

                                      BHA INC.
                                5115 AVENIDA ENCINAS, SUITE L
                                     CARLSBAD, CA 92008


 ************************** DESCRIPTION OF STUDY **************************
* BYPASS CCSYAS - PROPOSED HYDROLOGY - 2 YEAR - UNMITIGATED                *
*                                                                          *
*                                                                          *
 **************************************************************************

  FILE NAME: K:\HYDRO\1019\1019U200.DAT
  TIME/DATE OF STUDY: 14:57 08/21/2018
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =   2.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   1.550
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   12.0      1.0    0.018/0.018/0.020   0.50    1.20 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    644.50
  DOWNSTREAM ELEVATION(FEET) =    640.00
  ELEVATION DIFFERENCE(FEET) =      4.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.518
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.442
  SUBAREA RUNOFF(CFS) =      0.35
  TOTAL AREA(ACRES) =      0.27   TOTAL RUNOFF(CFS) =      0.35

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE      4.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    640.00  DOWNSTREAM(FEET) =    459.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2670.00   CHANNEL SLOPE =  0.0676
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.100
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      65.12
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.93
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   7.50
  Tc(MIN.) =   14.02
  SUBAREA AREA(ACRES) =   155.80       SUBAREA RUNOFF(CFS) =  124.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.380
  TOTAL AREA(ACRES) =      156.1         PEAK FLOW RATE(CFS) =     124.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOW VELOCITY(FEET/SEC.) =   7.13
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      4.00 =    2750.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    636.20
  DOWNSTREAM ELEVATION(FEET) =    625.00
  ELEVATION DIFFERENCE(FEET) =     11.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.381
```

```
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.895
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    625.00  DOWNSTREAM(FEET) =    496.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   627.00   CHANNEL SLOPE =  0.2057
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.871
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.21
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   3.25
  Tc(MIN.) =    8.63
  SUBAREA AREA(ACRES) =     1.40       SUBAREA RUNOFF(CFS) =    1.53
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.380
  TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       1.68

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.93
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     707.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    496.00  DOWNSTREAM(FEET) =    457.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   482.00   CHANNEL SLOPE =  0.0799
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.690
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.75
  AVERAGE FLOW DEPTH(FEET) =   0.50   TRAVEL TIME(MIN.) =   0.92
  Tc(MIN.) =    9.55
  SUBAREA AREA(ACRES) =     0.97       SUBAREA RUNOFF(CFS) =    0.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.380
  TOTAL AREA(ACRES) =        2.5         PEAK FLOW RATE(CFS) =       2.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.53   FLOW VELOCITY(FEET/SEC.) =   9.16
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =    1189.00 FEET.
```

```
****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1         2.57     9.55       2.690        2.51
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =    1189.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1       124.54    14.02       2.100      156.07
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE      4.00 =    2750.00 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
    1       87.40       9.55        2.690
    2      126.55      14.02        2.100

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     126.55   Tc(MIN.) =   14.02
 TOTAL AREA(ACRES) =      158.6

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3400
 S.C.S. CURVE NUMBER (AMC II) =  68
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    73.00
 UPSTREAM ELEVATION(FEET) =    470.00
 DOWNSTREAM ELEVATION(FEET) =    466.00
 ELEVATION DIFFERENCE(FEET) =      4.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.630
```

```
   2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.404
 SUBAREA RUNOFF(CFS) =      0.12
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
 FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    466.00  DOWNSTREAM(FEET) =    464.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   166.00   CHANNEL SLOPE =  0.0090
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  25.000
 MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
   2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.368
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3400
 S.C.S. CURVE NUMBER (AMC II) =  68
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.28
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.55
 AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   5.01
 Tc(MIN.) =   11.64
 SUBAREA AREA(ACRES) =     0.40       SUBAREA RUNOFF(CFS) =    0.32
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.340
 TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.40

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   0.58
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     52.00 =     239.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     52.00 TO NODE      4.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   460.10  DOWNSTREAM(FEET) =   459.40
 FLOW LENGTH(FEET) =    93.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.12
 GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.40
 PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   12.14
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE      4.00 =     332.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
```

```
     1        0.40    12.14       2.305        0.50
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE      4.00 =     332.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1      126.55    14.02       2.100      158.58
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE      4.00 =    2750.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     109.93      12.14        2.305
     2     126.91      14.02        2.100

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     126.91   Tc(MIN.) =   14.02
  TOTAL AREA(ACRES) =      159.1

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE     27.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    457.50  DOWNSTREAM(FEET) =    457.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =    95.00   CHANNEL SLOPE =  0.0021
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   4.00
  CHANNEL FLOW THRU SUBAREA(CFS) =     126.91
  FLOW VELOCITY(FEET/SEC.) =   2.85   FLOW DEPTH(FEET) =   2.15
  TRAVEL TIME(MIN.) =   0.56   Tc(MIN.) =   14.58
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     27.00 =    2845.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    98.00
```

```
  UPSTREAM ELEVATION(FEET) =    736.00
  DOWNSTREAM ELEVATION(FEET) =    730.00
  ELEVATION DIFFERENCE(FEET) =      6.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.014
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.283
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    730.00  DOWNSTREAM(FEET) =    485.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1753.00   CHANNEL SLOPE =  0.1396
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.383
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.96
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.47
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   4.52
  Tc(MIN.) =   11.53
  SUBAREA AREA(ACRES) =    21.29       SUBAREA RUNOFF(CFS) =   19.28
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.380
  TOTAL AREA(ACRES) =       21.4         PEAK FLOW RATE(CFS) =      19.36

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOW VELOCITY(FEET/SEC.) =   7.87
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1851.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   485.30  DOWNSTREAM(FEET) =   483.80
  FLOW LENGTH(FEET) =    36.36   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.95
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.36
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   11.58
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1887.36 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   480.70  DOWNSTREAM(FEET) =   475.40
  FLOW LENGTH(FEET) =   152.70   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.75
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.36
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   11.78
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2040.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   472.00  DOWNSTREAM(FEET) =   460.90
  FLOW LENGTH(FEET) =   204.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS   9.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.99
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.36
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   12.01
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2244.06 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
==========================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     17.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    493.80
  DOWNSTREAM ELEVATION(FEET) =    483.70
  ELEVATION DIFFERENCE(FEET) =     10.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.593
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.084
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     18.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  487.30  DOWNSTREAM ELEVATION(FEET) =  470.00
  STREET LENGTH(FEET) =   363.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 20.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  15.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.85
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    3.55
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.48
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
  STREET FLOW TRAVEL TIME(MIN.) =   1.74   Tc(MIN.) =    5.33
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.918
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6700
  S.C.S. CURVE NUMBER (AMC II) =  68
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.670
  SUBAREA AREA(ACRES) =    0.46      SUBAREA RUNOFF(CFS) =    1.21
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       1.44

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =   5.21
  FLOW VELOCITY(FEET/SEC.) =  3.71   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE     16.00 TO NODE     18.00 =     463.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.918
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =  68
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6308
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.04
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.48
  TC(MIN.) =    5.33

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     15.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   463.80  DOWNSTREAM(FEET) =   463.24
  FLOW LENGTH(FEET) =    28.12   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.17
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.48
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    5.41
  LONGEST FLOWPATH FROM NODE     16.00 TO NODE     15.00 =     491.12 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.48     5.41       3.883        0.60
  LONGEST FLOWPATH FROM NODE     16.00 TO NODE     15.00 =     491.12 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       19.36    12.01       2.321       21.38
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2244.06 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      10.20       5.41        3.883
      2      20.24      12.01        2.321

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.24   Tc(MIN.) =   12.01
  TOTAL AREA(ACRES) =       22.0

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    40.00
  UPSTREAM ELEVATION(FEET) =    481.00
  DOWNSTREAM ELEVATION(FEET) =    477.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.016
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.084
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.07
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.07

**************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     41.00 IS CODE =   7
--------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==========================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   5.00   RAIN INTENSITY(INCH/HOUR) =  4.08
  TOTAL AREA(ACRES) =     0.05   TOTAL RUNOFF(CFS) =      0.10

**************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    477.00  DOWNSTREAM(FEET) =    475.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   144.00   CHANNEL SLOPE =  0.0104
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  25.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.779
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =  68
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.59
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   4.08
  Tc(MIN.) =    9.08
  SUBAREA AREA(ACRES) =     0.47       SUBAREA RUNOFF(CFS) =    0.44
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.354
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.51

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.66
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =     184.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     43.00 IS CODE =  41
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   469.75  DOWNSTREAM(FEET) =   464.89
  FLOW LENGTH(FEET) =   111.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.97
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.51
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    9.39
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     43.00 =     295.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     19.00 TO NODE     43.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.719
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  68
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3667
  SUBAREA AREA(ACRES) =    0.48   SUBAREA RUNOFF(CFS) =    0.50
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       1.00
  TC(MIN.) =    9.39

****************************************************************************
  FLOW PROCESS FROM NODE     43.00 TO NODE     15.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   464.89  DOWNSTREAM(FEET) =   461.00
  FLOW LENGTH(FEET) =    49.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.99
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.00
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    9.48
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     15.00 =     344.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         1.00     9.48       2.702        1.00
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     15.00 =     344.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       20.24    12.01       2.321       21.98
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    2244.06 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      16.98       9.48        2.702
      2      21.10      12.01        2.321

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.10   Tc(MIN.) =   12.01
  TOTAL AREA(ACRES) =       23.0

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     26.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   460.70  DOWNSTREAM(FEET) =   458.27
  FLOW LENGTH(FEET) =   239.06   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  11.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.98
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      21.10
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =   12.58
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     26.00 =    2483.12 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     27.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   458.17  DOWNSTREAM(FEET) =   458.00
  FLOW LENGTH(FEET) =    22.20   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.28
  GIVEN PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      21.10
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   12.64
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    2505.32 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =    467.45
  DOWNSTREAM ELEVATION(FEET) =    467.19
  ELEVATION DIFFERENCE(FEET) =      0.26
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.688
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.084
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.25

**************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     31.50 IS CODE =  41
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   462.64  DOWNSTREAM(FEET) =   462.30
  FLOW LENGTH(FEET) =    60.04   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.39
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.25
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    4.11
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     31.50 =     140.04 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     31.50 TO NODE     32.00 IS CODE =  41
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   462.26  DOWNSTREAM(FEET) =   461.68
  FLOW LENGTH(FEET) =   118.62   MANNING'S N =  0.011
  DEPTH OF FLOW IN 118.6 INCH PIPE IS   1.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.61
  GIVEN PIPE DIAMETER(INCH) = 118.62    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.25
  PIPE TRAVEL TIME(MIN.) =   1.23    Tc(MIN.) =    5.33
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     258.66 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     31.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  2
```

```
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.33
  RAINFALL INTENSITY(INCH/HR) =   3.92
  TOTAL STREAM AREA(ACRES) =     0.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE     31.60 TO NODE     31.70 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4300
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    77.00
  UPSTREAM ELEVATION(FEET) =    467.50
  DOWNSTREAM ELEVATION(FEET) =    465.00
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.147
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.243
  SUBAREA RUNOFF(CFS) =      0.08
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.08

****************************************************************************
  FLOW PROCESS FROM NODE     31.70 TO NODE     31.70 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   7.15   RAIN INTENSITY(INCH/HOUR) =  3.24
  TOTAL AREA(ACRES) =     0.06   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE     31.70 TO NODE     31.80 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    465.00  DOWNSTREAM(FEET) =    463.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   125.00   CHANNEL SLOPE =  0.0096
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  25.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.424
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4300
  S.C.S. CURVE NUMBER (AMC II) =  68
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.51
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   4.08
  Tc(MIN.) =   11.23
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.24
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.447
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.31
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   0.57
  LONGEST FLOWPATH FROM NODE     31.60 TO NODE     31.80 =     202.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     31.80 TO NODE     32.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.23
  RAINFALL INTENSITY(INCH/HR) =   2.42
  TOTAL STREAM AREA(ACRES) =     0.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.31

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.25     5.33        3.917          0.07
      2        0.31    11.23        2.424          0.29

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        0.40     5.33       3.917
      2        0.47    11.23       2.424

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.47   Tc(MIN.) =   11.23
  TOTAL AREA(ACRES) =        0.4
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =     258.66 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     27.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   458.40  DOWNSTREAM(FEET) =   458.00
  FLOW LENGTH(FEET) =    24.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.31
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.47
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   11.32
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     27.00 =     282.66 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  11
```

```
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.47    11.32       2.411        0.36
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     27.00 =     282.66 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       21.10    12.64       2.245       22.98
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    2505.32 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      19.36      11.32        2.411
      2      21.54      12.64        2.245

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.54   Tc(MIN.) =   12.64
  TOTAL AREA(ACRES) =       23.3

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     61.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4700
  S.C.S. CURVE NUMBER (AMC II) =  68
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    468.00
  DOWNSTREAM ELEVATION(FEET) =    464.90
  ELEVATION DIFFERENCE(FEET) =      3.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.726
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.084
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.08
```

```
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.08

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     61.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   5.00   RAIN INTENSITY(INCH/HOUR) =  4.08
  TOTAL AREA(ACRES) =     0.04   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    464.90  DOWNSTREAM(FEET) =    463.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00   CHANNEL SLOPE =  0.0098
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  25.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.759
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4700
  S.C.S. CURVE NUMBER (AMC II) =  68
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.26
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.53
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   4.19
  Tc(MIN.) =    9.19
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.491
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     62.00 =     187.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     63.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   459.10  DOWNSTREAM(FEET) =   458.00
  FLOW LENGTH(FEET) =    22.32   MANNING'S N =  0.011
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   1.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    9.25
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     63.00 =     209.32 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     27.00 IS CODE =  11
```

```
------------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
==============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.37     9.25       2.746        0.27
  LONGEST FLOWPATH FROM NODE     60.00 TO NODE     27.00 =     209.32 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       21.54    12.64       2.245       23.34
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    2505.32 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      16.12       9.25        2.746
      2      21.83      12.64        2.245

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.83   Tc(MIN.) =   12.64
  TOTAL AREA(ACRES) =       23.6

******************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =  11
------------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
==============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       21.83    12.64       2.245       23.61
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     27.00 =    2505.32 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      126.91    14.58       2.048      159.08
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     27.00 =    2845.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     131.88      12.64        2.245
      2     146.83      14.58        2.048

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     146.83   Tc(MIN.) =   14.58
  TOTAL AREA(ACRES) =      182.7
==============================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      182.7  TC(MIN.) =     14.58
  PEAK FLOW RATE(CFS)   =     146.83
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Plan (Required)	☒ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Stormwater Maintenance Notification / Agreement (when applicable)	☒ Included ☐ Not Applicable

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

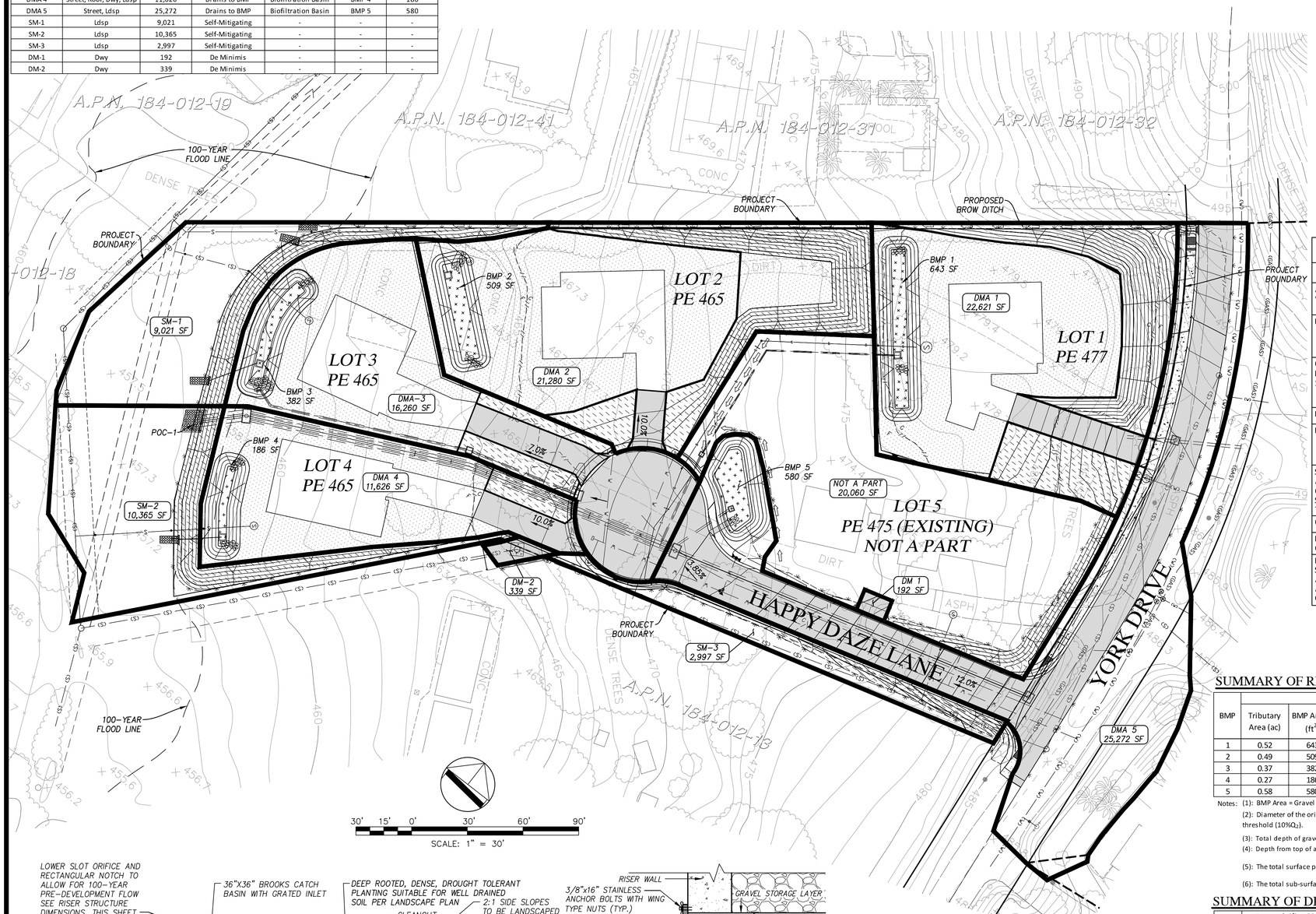
Attachment 3a must identify:

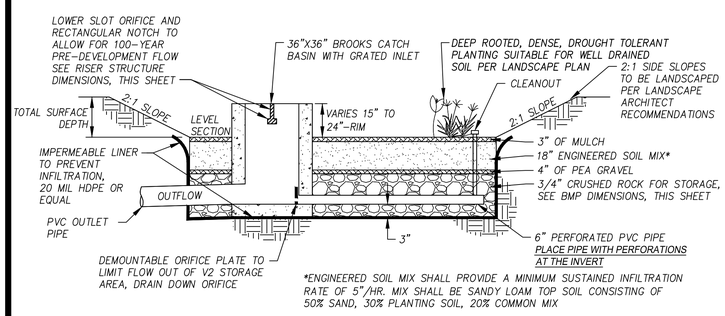
- ☒ Specific maintenance indicators and actions for proposed structural BMP(s). This must be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- ☒ How to access the structural BMP(s) to inspect and perform maintenance
- ☒ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☒ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☒ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☒ Recommended equipment to perform maintenance
- ☒ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For all Structural BMPs, Attachment 3b must include a draft maintenance agreement in the County's standard format depending on the Category (PDP applicant to contact County staff to obtain the current maintenance agreement forms). Refer to Section 7.3 in the BMP Design Manual for a description of the different categories.

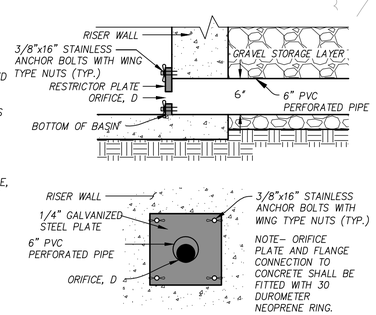
STRUCTURAL BMP PLAN SHEET
1505 YORK DRIVE
TM 5443 RPL3

DMA ID	DMA Surface Type	DMA Area (sq. ft.)	DMA Type	Proposed Structural BMP Type	Structural BMP ID	Structural BMP Area
DMA 1	Roof, Dwy, Ldsp	22,621	Drains to BMP	Biofiltration Basin	BMP 1	643
DMA 2	Roof, Dwy, Ldsp	21,280	Drains to BMP	Biofiltration Basin	BMP 2	509
DMA 3	Street, Roof, Dwy, Ldsp	16,260	Drains to BMP	Biofiltration Basin	BMP 3	382
DMA 4	Street, Roof, Dwy, Ldsp	11,626	Drains to BMP	Biofiltration Basin	BMP 4	186
DMA 5	Street, Ldsp	25,272	Drains to BMP	Biofiltration Basin	BMP 5	580
SM-1	Ldsp	9,021	Self-Mitigating	-	-	-
SM-2	Ldsp	10,365	Self-Mitigating	-	-	-
SM-3	Ldsp	2,997	Self-Mitigating	-	-	-
DM-1	Dwy	192	De Minimis	-	-	-
DM-2	Dwy	339	De Minimis	-	-	-

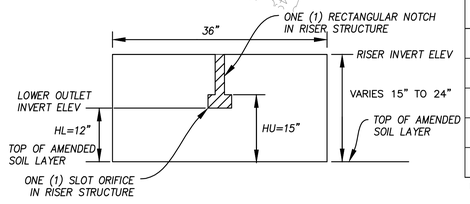




TYPICAL BIOFILTRATION BASIN DETAIL, TYP



RESTRICTOR PLATE DETAIL
NOT TO SCALE



TYPICAL OUTLET STRUCTURE DETAIL
NOT TO SCALE

GENERAL MAINTENANCE NOTES:

1. THE BIOFILTRATION BMPS WILL INCLUDE AMENDED SOILS, SUBSURFACE GRAVEL LAYER, AND AN UNDERDRAIN.
2. GRATED LIDS ON CATCH BASINS CAN BE REMOVED FOR INSPECTING ALL UNDERGROUND COMPONENTS THAT REQUIRE INSPECTION AND MAINTENANCE.
3. THE BIOFILTRATION BMPS REQUIRES ROUTINE LANDSCAPE MAINTENANCE USING THE SAME EQUIPMENT THAT IS USED FOR GENERAL LANDSCAPE MAINTENANCE.
4. REFER TO MAINTENANCE INDICATORS AND ACTIONS TABLE FOR MAINTENANCE THRESHOLDS AND ACTIONS.

LEGEND

DMA NAME	DMA-1
AREA (SQUARE FEET)	22,621 SF
SELF-MITIGATING DMA	SM-1
DMA POINT OF COMPLIANCE (POC)	POC-1
DMA BOUNDARY	
PROJECT BOUNDARY	
BIOFILTRATION BASIN	
VEGETATED SLOPES	
IMPERVIOUS AREA DISPERSION	
CONCRETE	
ASPHALT	
FLOW DIRECTION	
BROW DITCH	
RIP RAP ENERGY DISSIPATER	

MAINTENANCE INDICATORS AND ACTIONS FOR BIOFILTRATION BMPS

TYPICAL MAINTENANCE INDICATORS	TYPICAL MAINTENANCE ACTIONS
ACCUMULATION OF SEDIMENT (OVER 2 INCHES DEEP OR COVERS VEGETATION), LITTER, OR DEBRIS	REMOVE AND PROPERLY DISPOSE OF ACCUMULATED MATERIALS WITHOUT DAMAGE TO THE VEGETATION. CONFIRM THAT SOIL IS NOT CLOGGING AND THAT THE AREA DRAINS AFTER STORM EVENT. TILL OR REPLACE SOIL AS NECESSARY.
POOR VEGETATION ESTABLISHMENT	ENSURE VEGETATION IS HEALTHY AND DENSE ENOUGH TO PROVIDE FILTERING AND TO PROTECT SOILS FROM EROSION. REPLENISH MULCH AS NECESSARY (IF LESS THAN 3 INCHES DEEP), REMOVE FALLEN LEAVES AND DEBRIS, PRUNE LARGE SHRUBS OR TREES, AND MOW TURF AREAS.
OVERGROWN VEGETATION-WOODY VEGETATION NOT PART OF DESIGN IS PRESENT AND GRASS EXCESSIVELY TALL (GREATER THAN 10 INCHES)	MOW OR TRIM AS APPROPRIATE, BUT NOT LESS THAN THE DESIGN HEIGHT OF THE VEGETATION (TYPICALLY 4-6 INCHES FOR GRASS). CONFIRM THAT IRRIGATION IS ADEQUATE AND NOT EXCESSIVE AND THAT SPRAYS DO NOT DIRECTLY ENTER OVERFLOW GRATES. REPLACE DEAD PLANTS AND REMOVE NOXIOUS AND INVASIVE WEEDS.
EROSION DUE TO CONCENTRATED IRRIGATION FLOW	REPAIR/RE-SEED ERODED AREAS AND ADJUST THE IRRIGATION.
EROSION DUE TO CONCENTRATED STORMWATER RUNOFF FLOW	REPAIR/RE-SEED ERODED AREAS AND MAKE APPROPRIATE CORRECTIVE MEASURES SUCH AS ADDING EROSION CONTROL BLANKETS, ADDING STONE AT ENTRY POINTS, OR RE-GRADING WHERE NECESSARY. REMOVE OBSTRUCTIONS AND SEDIMENT ACCUMULATIONS SO WATER DISPERSES.
STANDING WATER (BMP NOT DRAINING). IF MOSQUITO LARVAE ARE PRESENT AND PERSISTENT, CONTACT THE SAN DIEGO VECTOR CONTROL PROGRAM AT (858) 694-2888. MOSQUITO LARVICIDES SHOULD BE APPLIED ONLY WHEN ABSOLUTELY NECESSARY AND THEN ONLY BY A LICENSED INDIVIDUAL CONTRACTOR.	WHERE THERE IS AN UNDERDRAIN, SUCH AS IN PLANTER BOXES AND MANUFACTURED BIOFILTERS, CHECK THE UNDERDRAIN PIPING TO MAKE SURE IT IS INTACT AND UNOBSTRUCTED. ABATE ANY POTENTIAL VECTORS BY FILLING HOLES IN THE GROUND IN AND AROUND THE BIOFILTER FACILITY AND BY INSURING THAT THERE ARE NO AREAS WHERE WATER STANDS LONGER THAN 96 HOURS FOLLOWING A STORM.
OUTLET INLET OR OUTLET STRUCTURE	CLEAR OBSTRUCTIONS.
DAMAGE TO STRUCTURAL COMPONENTS SUCH AS WEIRS, INLET, OR OUTLET STRUCTURES	REPAIR OR REPLACE AS APPLICABLE.
BEFORE THE WET SEASON AND AFTER RAIN EVENTS: REMOVE SEDIMENT AND DEBRIS FROM SCREENS AND OVERFLOW DRAINS AND DOWNSPOUTS: ENSURE PUMPS ARE FUNCTIONING, WHERE APPLICABLE; CHECK INTEGRITY OF MOSQUITO SCREENS; AND; CHECK THAT COVERS ARE PROPERLY SEALED AND LOCKED.	WHERE CISTERNS ARE PART OF THE SYSTEM

SUMMARY OF RISER DIMENSIONS:

BMP	BMP DIMENSIONS						
	Tributary Area (ac)	BMP Area[1] (ft^2)	Underdrain Orifice, D (in)[2]	Gravel Depth (in)[3]	Depth Riser Invert[4] (in)	Total Surface Depth[5] (ft)	Total Sub-Surface Depth[6] (ft)
1	0.52	643	0.37"-dia	21	2.00	1.6	3.83
2	0.49	509	0.35"-dia	12	1.25	1.3	3.08
3	0.37	382	0.81"-dia	12	2.00	1.6	3.08
4	0.27	186	0.25"-dia	12	2.00	1.5	3.08
5	0.58	580	0.81"-dia	21	2.00	2.0	3.83

Notes: (1): BMP Area = Gravel Area = Amended Soil Area. Amended soil depth equal to 18 inches for the BMPs.
(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold ($10\%Q_2$).
(3): Total depth of gravel layer including 3 inches of saturated storage below underdrain pipe.
(4): Depth from top of amended soil layer to invert of emergency overflow weir.
(5): The total surface ponding depth from the top of amended soil layer.
(6): The total sub-surface depth from the invert of the gravel layer to top of amended soil layer.

SUMMARY OF DEVELOPED DUAL PURPOSE BMPS:

BMP	Lower Orifice Dimensions			Upper Orifice Dimensions			Emergency Weir	
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions Length x Height[3]	Outlet Type[1]	Invert Elev, HU[2] (in)	Dimensions[3]	Riser Invert Elev, Htop[4] (in)	Weir Perimeter Length[5] (ft)
1	Slot	12	(1) 3" x 6"	Vertical Notch	15	2" Wide x 9" High	24	12
2	Slot	12	(1) 3" x 3"	N/A	N/A	N/A	15	12
3	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
4	Slot	12	(1) 3" x 9"	Vertical Notch	15	2" Wide x 9" High	24	12
5	Slot	12	(1) 3" x 12	Vertical Notch	15	2" Wide x 9" High	24	12

Notes: (1): Shape of orifice opening in riser structure.
(2): Depth from top of amended soil layer to invert of lower orifice or weir.
(3): Number of orifices - (#) .
(4): Depth from bottom of pond to invert of emergency overflow weir.
(5): Overflow length, the internal perimeter of the riser is 12 ft (3 ft x 3 ft internal dimensions).

PRIVATE CONTRACT

SHEET	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	SHEETS
1		1

STRUCTURAL BMP PLAN SHEET FOR:

TM 5443 RPL3

CALIFORNIA COORDINATE INDEX _____

APPROVED FOR SIROUS DEYLAMIAN
COUNTY ENGINEER
BY:
BY: DATE

ENGINEER OF WORK
BRUCE RICE RCE 60878

PDS
GRADING PERMIT NO:

bha inc. 5115 AVENIDA ENCINAS SUITE L (760) 931-8700 CARLSBAD, CA. 92008

PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM

BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS

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

Permit No.: _____

BMP Location: _____

Responsible Party: _____

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

Responsible Party Address: _____

Number Street Name & Suffix City/Zip

☐ *Check here for Address or phone number change*

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

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

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

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

County of San Diego Watershed Protection Program
Department of Public Works
5510 Overland Ave., Suite 410, MS O326
San Diego, CA 92123 ***OR***
Email: Watersheds@sdcounty.ca.gov

_____

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

REQUEST AND INSTRUCTIONS FOR PREPARATION OF STORMWATER FACILITIES MAINTENANCE AGREEMENT

Provide the following information, to enable PDS to prepare the "STORMWATER FACILITIES MAINTENANCE AGREEMENT, WITH EASEMENT AND COVENANTS":

#	Done	Information to be Inserted

[1] ☐ County staff document custodian to receive document after recording will be:

_____ _____

Name of Custodian Mail Stop

[2] ☒ Provide applicable Project **Reference Number(s)**:

Tentative Map: TM 5443 RPL3
Tentative Parcel Map: TPM_____
Grading Plan / Grading Permit: PDS2017-LDGRMJ-30120
Major Use Permit: MUP_____
Site Plan: STP_____

[3] ☒ Provide EXACT **name of Owner** [This must be word-for-word, letter-for-letter identical to vesting title information]:

Gary Otto Van Eik and Karen Van Eik, Trustors as Owners

Name of Owner

[4] ☒ Indicate the status of the Owner:

☒ a natural person; or

☐ a business entity.

If the Owner is a business entity, then please indicate what type ("a California Corporation", "a [other state] Corporation", "a California General Partnership", "a California Limited Partnership" or "a California Limited Liability Company"):

_____

Type of Owner's Business Entity

[5] ☒ Create and attach an "Exhibit A", which is an accurate Legal Description of the property involved in the entire project

[6] ☒ Provide brief Description of Type of Project [E.g. "a 100-unit residential subdivision"]:

A Five-Lot Subdivision with Private Streets

Project Description

[7] ☒ Provide official name, number and date of plan or drawing which shows the BMPs in detail ["Improvement Plans", "Site Plan", "Grading Plans" etc.]:

Grading Plan — Type of Plan

PDS2017-LDGRMJ-30120 — Plan Number

[8] ☒ Create and attach an "Exhibit B", using the format of Attachment 2 ("BMP MAINTENANCE PROGRAM") as an example.

[9] ☒ Create and attach an "Exhibit C", which shows the locations of the installed BMPs.

[10] ☒ Provide Name and Address of the person who the Owner designates as his/her/its Agent for administration of the Agreement and receipt of notices:

Name: Gary Van Eik

Address: 841 Quail Trail, Vista, Ca 92081

[11] Advise us whether or not the project is a **Common Interest Development**:

☒ No ☐ Yes

[12] ☒ Provide the Name(s) and title(s) of **persons who will sign** agreement for the Owner:

Gary Van Eik

Name

Trustee

Title

If the Owner (see #3 above) is a natural person, County Counsel will assume that person will sign the agreement, and will so provide in the signature block. If the Owner is a business entity, please indicate the names and titles of all persons who will sign on behalf of the business entity.

A sample signature block for a corporation would look like:

"Clean Water, Inc., a California Corporation

By: _____ _____
John Q. Adams, President Date

By: _____ _____
Adam Q. Johns, Secretary Date"

PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM

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

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

Biofilters include the following :

☐ **Vegetated Filter Strip/Swale** ☐ **Bioswale** ☐ **Bioretention Facility** ☐ **Planter Boxes**
☐ **Manufactered Higher-Flow-Rate Biofilters, such as Tree-Pit-Style Units.**

Routine maintenance is needed to ensure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active. Typical maintenance consists of the following:

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

Bio Retention Basin Inspection & Maintenance Checklist

Property:
Property Owner:
Date of Inspection:_____ **Inspector(s) Name:**_____
Address:_____
Basin Location: **DMA #**____ **Phone:**_____

Type of Inspection ☐ **Monthly** ☐ **pre-wet season** ☐ **After heavy runoff (1" or greater)**
☐ **End of wet season** ☐ **other:**_____

Y=Yes N=No MR=Maintenance Required NA= Not Applicable

Vegetation & Irrigation:

☐ **Vegetation is dead or diseased**
☐ **Vegetation & Irrigation systems in good condition**
☐ **Overgrown** ☐ **Neat and orderly in appearance**

Required Maintenance:_____

_____

_____

_____

_____

Soil:

☐ **Too deep or too shallow**
(the distance from the top of mulch to the top of riser pipe shall be 4")

Required Maintenance:_____

_____

_____

_____

Mulch:

- ☐ Missing or Patchy in Appearance
- ☐ Depth of mulch layer less than 3-in
- ☐ Areas of Bare earth

Required Maintenance: _____

_____

_____

_____

Sediment, Trash & Debris:

- ☐ Accumulated sediment, trash,and debris present
- ☐ Drain time exceeds 4 hours

Required Maintenance: _____

_____

_____

_____

Clogs:

- ☐ Soil too deep or too shallow
- ☐ accumulated sediment, trash and debris
- ☐ Drain time more than 5 days after rainfall

Required Maintenance: _____

_____

_____

_____

_____

Structural Components:

- ☐ Flow to basin is impeded
- ☐ inflow pipes or downspouts are cloged/damaged
- ☐ damaged splash/rock blocks
- ☐ Over flow pipe in damaged or cloged
- ☐ Underdrain pipes cloged or damaged
- ☐ Planter is cracked, leaking or falling apart

Required Maintenance: _____

_____

_____

_____

_____

Inspector Signature:_____ **Date:**_____

Inspector Signature:_____ **Date:**_____

The basin shall be drained within 5 days after each storm event, standing water for more than 5 days will cause mosquito breeding, contact County of San Diego Vector Control Program at (858) 694-2888.

** The Responsible Party shall retail the maintenance/inspection records for a minimum of 5 years from the date of maintenance.The records shall be made available to the County of San Diego for inspection upon request at any time.

BF-1
Biofiltration

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP BF-1 BIOFILTRATION

Biofiltration facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Biofiltration facilities have limited or no infiltration. They are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Typical biofiltration components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Impermeable liner or uncompacted native soils at the bottom of the facility
- Overflow structure

Normal Expected Maintenance

Biofiltration requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations

Biofiltration is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

BF-1
Biofiltration

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION		
The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district. Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable	• Inspect annually. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION (Continued from previous page)		
Threshold/Indicator	**Maintenance Action**	**Typical Maintenance Frequency**
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
Standing water in BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

References

American Mosquito Control Association.
http://www.mosquito.org/
California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.
https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook
County of San Diego. 2014. Low Impact Development Handbook.
http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html
San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet BF-1.
http://www.projectcleanwater.org/index.php?option=com_content&view=article&id=250&Itemid=220

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Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	
Property / Development Name:	Responsible Party Name and Phone Number:	
Property Address of BMP:	Responsible Party Address:	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 1 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If sediment, litter, or debris accumulation exceeds 25% of the surface ponding volume within one month (25% full*), add a forebay or other pre-treatment measures within the tributary area draining to the BMP to intercept the materials. ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

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Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
2/3 of mulch has decomposed, or mulch has been removed Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 3 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan ☐ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 4 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Underdrain clogged (inspect underdrain if standing water is observed for longer than 24-96 hours following a storm event) Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

BF-1
Biofiltration

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP for longer than 24-96 hours following a storm event* Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

**If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

ATTACHMENT 4

County of San Diego PDP Structural BMP Verification for Permitted Land Development Projects

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County of San Diego BMP Design Manual Verification Form	
Project Summary Information	
Project Name	TM 5443 RPL3
Record ID (e.g., grading/improvement plan number)	PDS2016-TM-5443TE; PDS2016-ER-05-08-019A
Project Address	1505 York Drive, Vista, CA 92084
Assessor's Parcel Number(s) (APN(s))	184-012-12
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	904 Carlsbad HU: 904.3 Agua Hedionda HA, & 904.32 Buena HSA
Responsible Party for Construction Phase	
Developer's Name	Gary Van Eik
Address	841 Quail Trail Vista, CA 92081
Email Address	gary@tristaff.com
Phone Number	(858) 453-1331
Engineer of Work	Ronald Holloway
Engineer's Phone Number	(760) 931-8700
Responsible Party for Ongoing Maintenance	
Owner's Name(s)*	Gary Van Eik
Address	841 Quail Trail Vista, CA 92081
Email Address	gary@tristaff.com
Phone Number	(858) 453-1331
*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.	

County of San Diego BMP Design Manual Verification Form Page 2 of 4					
Stormwater Structural Pollutant Control & Hydromodification Control BMPs* (List all from SWQMP)					
Description/Type of Structural BMP	**Plan Sheet #**	**STRUCT-URAL BMP ID#**	**Maint-enance Category**	**Maintenance Agreement Recorded Doc #**	**Revisions**
Biofiltration Basin	3	BMP 1	1		
Biofiltration Basin	4	BMP 2	1		
Biofiltration Basin	4	BMP 3	1		
Biofiltration Basin	4	BMP 4	1		
Biofiltration Basin	3	BMP 5	1		
*All Priority Development Projects (PDPs) require a Structural BMP					

Note: If this is a partial verification of Structural BMPs, provide a list and map denoting Structural BMPs that have already been submitted, those for this submission, and those anticipated in future submissions.

County of San Diego BMP Design Manual Verification Form Page 3 of 4

Checklist for Applicant to submit to PDCI:

- ☐ Copy of the final accepted SWQMP and any accepted addendum.
- ☐ Copy of the most current plan showing the Stormwater Structural BMP Table, plans/cross-section sheets of the Structural BMPs and the location of each verified as-built Structural BMP.
- ☐ Photograph of each Structural BMP.
- ☐ Photograph(s) of each Structural BMP during the construction process to illustrate proper construction.
- ☐ Copy of the approved Structural BMP maintenance agreement and associated security

By signing below, I certify that the Structural 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 (WPO). 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:

Ronald Holloway

Professional Engineer's Signed Name:

[SEAL]

Date:

County of San Diego BMP Design Manual Verification Form Page 4 of 4

COUNTY - OFFICIAL USE ONLY:

For PDCI: Verification Package #: _____

PDCI Inspector: _____

Date Project has/expects to close: _____

Date verification received from EOW: _____

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

PDCI Inspector's Signature: _____ Date: _____

FOR WPP:

Date Received from PDCI: _____

WPP Submittal Reviewer: _____

WPP Reviewer concurs that the information provided for the following Structural BMPs is acceptable to enter into the Structural BMP Maintenance verification inventory:

List **acceptable** Structural BMPs:

WPP Reviewer's Signature: _____ Date: _____

ATTACHMENT 5

Copy of Plan Sheets Showing Permanent Storm Water BMPs, Source Control, and Site Design

This is the cover sheet for Attachment 5.

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☒ Structural BMP(s) with ID numbers matching Step 6 Summary of PDP Structural BMPs
☒ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☒ Details and specifications for construction of structural BMP(s)
☒ Signage indicating the location and boundary of structural BMP(s) as required by County staff
☒ How to access the structural BMP(s) to inspect and perform maintenance
☒ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☒ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☒ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☒ Recommended equipment to perform maintenance
☒ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☒ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☒ All BMPs must be fully dimensioned on the plans
☒ When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number must be provided. Photocopies of general brochures are not acceptable.
☒ Include all source control and site design measures described in Steps 4 and 5 of the SWQMP. Can be included as a separate exhibit as necessary.

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ATTACHMENT 6

Copy of Project's Drainage Report

This is the cover sheet for Attachment 6.

If hardcopy or CD is not attached, the following information should be provided:

Title:
Prepared By:
Date:

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ATTACHMENT 7

Copy of Project's Geotechnical and Groundwater Investigation Report

This is the cover sheet for Attachment 7.

If hardcopy or CD is not attached, the following information should be provided:

Title:
Prepared By:
Date:

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