APPENDIX H2

Stormwater Quality Management Plan

CITY OF CHULA VISTA

PDP SWQMP

PRIORITY DEVELOPMENT PROJECT (PDP)
STORM WATER QUALITY MANAGEMENT PLAN
FOR
OTAY RANCH PORTION OF VILLAGE 4
ASSESSOR'S PARCEL NUMBER(S): 644-060-24
PERMIT APPLICATION NUMBER:

ENGINEER OF WORK:



ALISA S. VIALPANDO, RCE# 47945

PREPARED FOR:
OTAY VALLEY QUARRY, LLC
A DELAWARE LIMITED LIABILITY
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MOORPARK, CA 93021
(805) 278-7320

PREPARED BY:
HUNSAKER & ASSOCIATES - SAN DIEGO, INC.
9707 WAPLES STREET
SAN DIEGO, CALIFORNIA 92121
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DATE: August 3, 2016

Approved By: City of Chula Vista **Date:**

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ACRONYMS

APN	Assessor's Parcel Number
BMP	Best Management Practice
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWQMP	Storm Water Quality Management Plan

CERTIFICATION PAGE

Project Name: Otay Ranch Portion of Village 4
Permit Application Number:

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 City of Chula Vista BMP Design Manual, which is based on the requirements of the San Diego Regional Water Quality Control Board Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer 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 the City Engineer 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.

Alisa S. Vialpando RCE #4795 Exp. 12/31/17

Engineer of Work's Signature, PE Number & Expiration Date

Alisa S. Vialpando

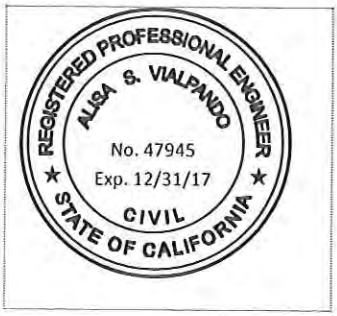
Print Name

Hunsaker & Associates - San Diego, Inc.

Company

8/1/16

Date



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SUBMITTAL RECORD

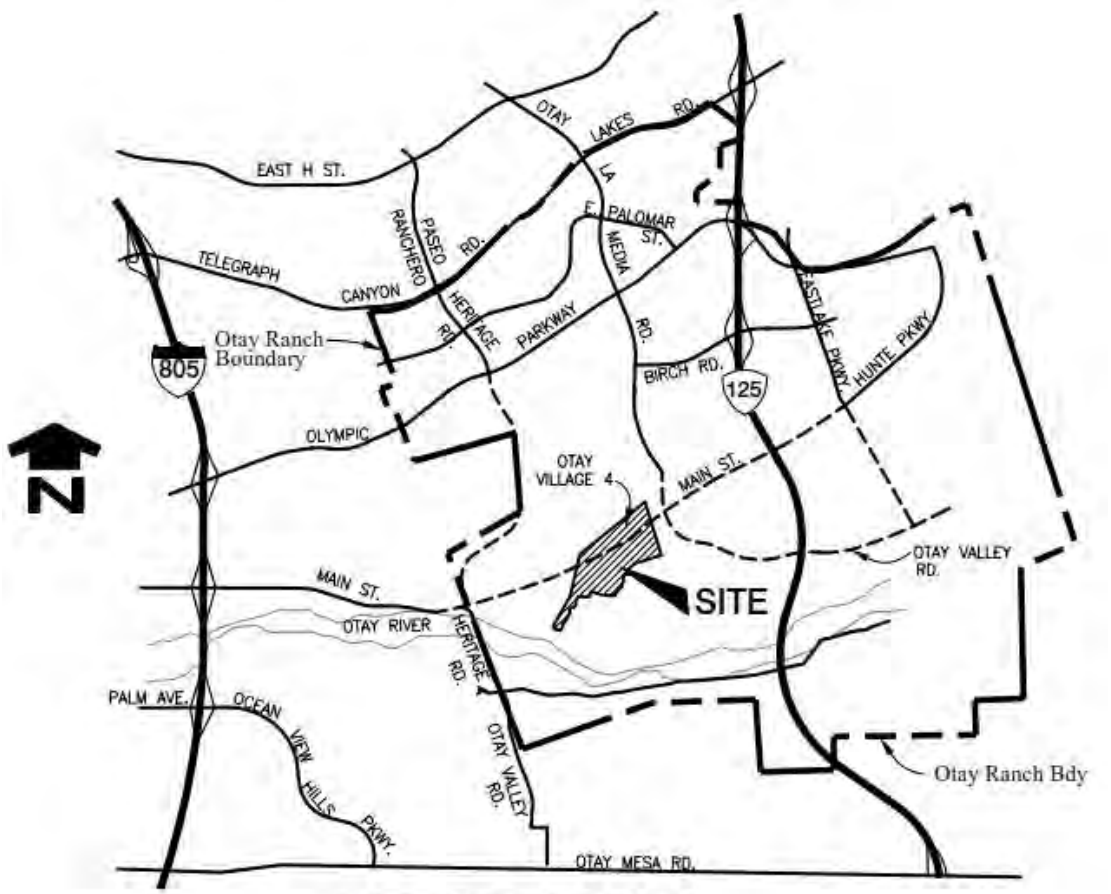
Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck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

Submittal Number	Date	Project Status	Summary of Changes
1	July 1, 2016	þ Preliminary Design / Planning/ CEQA • Final Design	Initial Submittal
2	August 3, 2016	þ Preliminary Design / Planning/ CEQA • Final Design	Relocated discharge location to Wolf Canyon.
3		• Preliminary Design / Planning/ CEQA • Final Design	
4		• Preliminary Design / Planning/ CEQA • Final Design	

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PROJECT VICINITY MAP

Project Name: Otay Ranch Portion of Village 4
Permit Application Number:



VICINITY MAP

NOT TO SCALE

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Complete and attach Storm Water Requirements Applicability Checklist (Intake Form) included in Appendix A.1

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CITY OF CHULA VISTA

Storm Water Requirements Applicability Checklist (Intake Form)

Based on forms I-1 and I-2 of the Model BMP Design Manual

FORM I-11
(January 2015)

Public Work Department-Storm Water Management Division

This form must be completed in its entirety and accompany applications for any discretionary or ministerial permits and approvals.

Project Information

Project Address: Main Street east of Wolf Canyon	Project Application Number:
Project Name: Otay Ranch Portion of Village 4	APN(s): 644-060-24

SECTION 1: Permanent Storm Water BMP Requirements

Additional information for determining the requirements is found in the BMP Design Manual

Part A: Determine if Not subject to Permanent Storm Water BMP Requirements.

1. Does the project only include interior remodels and/or is the project entirely within existing enclosed structures and does not have the potential to contact storm water?	☐Yes	☑No
2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐Yes	☑No
3. Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots, or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (i.e. grinding, overlay, and digouts).	☐Yes	☑No
4. Does the project only consists of new sidewalk construction within existing impervious footprint of existing roads without changing sheet flow to concentrated flow?	☐Yes	☑No
5. Does the project only consists of new pedestrian ramps within existing impervious footprint of existing roads?	☐Yes	☑No
6. Does the project only consists of new bike lanes construction within existing impervious footprint of existing roads without changing sheet flow to concentrated flow?	☐Yes	☑No

If "Yes" is checked for any number listed above; proceed to Part C and check Box labeled "NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS".

If "No" is checked for all of the numbers listed above, continue to Part B.

Part B: Determine if Project is a Standard Project or Priority Development Project

1. The project is (select one):
   - ☑ New Development
   - ☐ Redevelopment (is the creation and/or replacement of impervious surface on an already developed site)

2. Is the project in any of the following categories, (a) through (j)?

a. **New development that creates 10,000 square feet or more of impervious surfaces (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 project that creates and/or replaces 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 development or redevelopment of a restaurant that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the entire project site)**. 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 Code 5812).	☐Yes	☑No
d. **New development or redevelopment of hillside that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the entire project site).** This category includes development on any natural slope that is twenty-five percent or greater.	☑Yes	☐No
e. **New development or redevelopment of parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the entire project site)**. 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.	☑Yes	☐No
f. **New development or redevelopment of Streets, roads, highways, freeways, and driveways that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the entire project site)**. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles	☑Yes	☐No
g. **New development or redevelopment project that creates and/or replaces 2,500 square feet or more of impervious surface (collectively over the entire project site), 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).	☐Yes	☑No
h. **New development or redevelopment project of automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surface**. This category is defined as a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.	☐Yes	☑No
i. **New development or redevelopment projects of retail gasoline outlets that creates and/or replaces 5,000 square feet or more of impervious surface or its projected Average Daily Traffic (ADT) of 100 or more vehicles per day.**	☐Yes	☑No
j. **New development or redevelopment that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.**	☑Yes	☐No

If "Yes" is checked for any number listed above; proceed to Part C and check box labeled project is "PRIORITY DEVELOPMENT PROJECT". Complete below (if applicable) and proceed to Part C.

If "No" is checked for every number listed above; proceed to Part C and check Box labeled project is "STANDARD DEVELOPMENT PROJECT".

Complete for PDP Redeployment Projects ONLY:

The total existing (pre-project) impervious area at the project site is: 0 ft² (A)

The total proposed newly created or replaced impervious area is 1,157,389 ft² (B)

Percent impervious surface created or replaced (B/A)*100: 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 new impervious areas are considered a PDP**
OR
☑ greater than fifty percent (50%) – **the entire project site is considered a PDP**

Part C: Select the appropriate category (You must check one box)

1. Project is **"NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS"**. Continue to Section 2.	☐
2. Project is a **"STANDARD DEVELOPMENT PROJECT"**. Site design and source control BMP requirements apply. Complete and submit Standard SWQMP (refer to City of Chula Vista BMP Design Manual for guidance). Continue to Section 2.	☐
3. Project is a **"PRIORITY DEVELOPMENT PROJECT"**. Site design, sources control and structural pollutant control BMP apply. Complete and submit PDP SWQMP (refer to City of Chula Vista BMP Design Manual for guidance). Complete part D if applicable and proceed to Section 2.	☑

Part D: Determine if project is PDP Exempt

1. Does the project ONLY include new or retrofit sidewalk, bicycle lane or trails that:
   - Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
   - Are designed and constructed to be hydraulically disconnected from paved streets or roads? Or;
   - Are designed and constructed with permeable pavements or surfaces in accordance with USEPA Green Streets guidance?

   ☐ **Yes. Project is PDP Exempt.**
   Site design and source control BMP requirements apply. Complete and submit Standard SWQMP (refer to City of Chula Vista BMP Design Manual for guidance). Continue to Section 2.

   ☑ **No. Next question**

2. Does the project ONLY include retrofitting or redevelopment of existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets standards?

   ☐ **Yes. Project is PDP Exempt.**
   Site design and source control BMP requirements apply. Complete and submit Standard SWQMP (refer to City of Chula Vista BMP Design Manual for guidance). Continue to Section 2.

   ☑ **No. Project is PDP.**

SECTION 2: Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the BMP Design Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP), which is administered by the State Water Resource Control Board.

Part E: Determine Construction Phase Storm Water BMP Requirements.

This Section must be completed for all projects

1. Does the project only include the following Permit types: Electrical Permit, Pluming Permit, Mechanical Permit, Sign Permit, Fire Alarm Permit, and Fire Sprinkler Permit?

   ☐ **Yes; no document is required** ☑ **No; next question**

2. Does the project only include the following permit listed below?

   - Individual Construction Permit that exclusively include one of the following activities associated with curb/sidewalk repair, water lateral, sewer lateral, storm drain lateral, or utility service.
   - Construction Permit with a project footprint less than 150 linear feet that exclusively include only one of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, geotechnical borings, curb & gutter replacement, and retaining walls.
   - Grading/Construction permit for project proposing less than 5,000 square feet of ground disturbance AND has less than 5-foot elevation change over the entire project area.

   ☐ **Yes; Minor Water Pollution Control Plan (MWPCP) is required (refer to Form I-12 of Appendix I).** ☑ **No; next question**

3. Does the project propose construction or demolition activity, including but not limited to, clearing grading, grubbing, excavation, or any activity that results in ground disturbance of less than one 1 acre and contact with storm water runoff?

   ☐ **Yes; Water Pollution Control Plan (WPCP) is required (refer to Appendix A.4; WPCP Template).** ☑ **No; next question**

4. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as sewer/storm drain/utility replacement)

   ☐ **Yes Water Pollution Control Plan (WPCP) is required (refer to Appendix A.4; WPCP Template).** ☑ **No; next question**

5. Is the project proposing land disturbance greater than or equal to one acre OR the project is part of a larger common plan of development disturbing 1 acre or more?

   ☑ **Yes; Storm Water Pollution Prevention Plan (SWPPP) is required. (Refer to online CASQA or Caltrans Template).** A Notice of Intent (NOI) must be filed with the State Water Resources Control Board (SWRCB). Visit the SWRCB web site at http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml.

Name of Owner/Agent *(Please Print)*	Title:
Chuck Miller	Manager
Signature:	Date: 7/29/16

Site Information Checklist For PDPs	Form I-3B (for PDPs)
Project Summary Information	
Project Name	Otay Ranch Portion of Village 4
Project Address	Main Street east of Wolf Canyon
Assessor's Parcel Number(s) (APN(s))	644-060-24
Permit Application Number	
Project Hydrologic Unit	Select One: • Pueblo San Diego 908 • Sweetwater 909 þ Otay 910 • Tijuana 911
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Otay HU Otay Valley HA, 910.20
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	__166.02__ Acres (_____ Square Feet)
Area to be Disturbed by the Project (Project Area)	__76.10__ Acres (_____ Square Feet)
Project Proposed Impervious Area (subset of Project Area)	__26.57__ Acres (_____ Square Feet)
Project Proposed Pervious Area (subset of Project Area)	_49.53__ Acres (_____ Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition.	___100.00__ %

Form I-3B Page 2 of 10
Description of Existing Site Condition and Drainage Patterns
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 þ Vacant, undeveloped/natural Description / Additional Information: The site is currently undeveloped land with a hilly terrain which has historically been used for agriculture. The site drains towards the north and to Wolf Canyon which is a tributary of the Otay River. Several incised canyons convey this onsite runoff. The site does not receive any offsite runoff.
Existing Land Cover Includes (select all that apply): þ Vegetative Cover • Non-Vegetated Pervious Areas • Impervious Areas Description / Additional Information: The site's existing land cover consists of non-native grasslands throughout much of the site. Smaller areas of scrub, disturbed, and developed land are also present
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): • NRCS Type A • NRCS Type B þ NRCS Type C þ NRCS Type D
Approximate Depth to Groundwater (GW): • GW Depth < 5 feet • 5 feet < GW Depth < 10 feet • 10 feet < GW Depth < 20 feet þ GW Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): þ Watercourses • Seeps • Springs • Wetlands • None Description / Additional Information: The current site naturally drains via the incised canyons and small tributaries south towards the Otay River.

Description of Existing Site Topography and Drainage

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.

Description / Additional Information:

The existing site naturally drains via the incised canyons and their respective tributaries towards the north and Wolf Canyon which is a tributary of the Otay River located to the south. The site does not convey any offsite runoff through the site. Per the Existing Condition Hydrology Map for Otay Ranch Portion of Village 4, the Q50 flows respective of the site is 266.21 cfs. This flow as determined at a point along Wolf Canyon at the proposed condition discharge location. Please refer to the *Tentative Map Drainage Study for Otay Ranch Portion of Village 4* (August 2016) and/or Attachment 2d of this study for illustration of existing condition drainage patterns relative to the site.

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The Otay Ranch Portion of Village 4 project will consist of single and multi-family residential dwelling units, roads for circulation, and open space areas. The extension of Main Street west from the Village 8 West project boundary is also included with this development as well as offsite sewer lines and stormwater treatment facilities. This study includes sizing the basin needed to provide water quality treatment due to site's increased imperviousness and runoff.

The extension of Main Street will be approximately 3,700 linear feet from the eastern boundary of the site where it connects to Village 8 West. Runoff from Village 8 West does not drain onto Portion of Village 4. Instead, inlets within Village 8 West collect and direct runoff north towards a proposed water treatment basin before discharging into the Wolf Canyon tributary located north of Village 4. Please refer to the Proposed Condition Hydrology Exhibit 2 of the *Tentative Map Drainage Study for Otay Ranch Portion of Village 4* (August 2016) or Attachment 2d of this study. Treatment of onsite Main Street runoff will be performed with the Otay Ranch Portion of Village 4 basin.

In general, runoff from the developed site will drain north towards Main Street. Inlets placed throughout the site will collect the runoff and the storm drain will convey it towards the Main Street storm drain system. This storm drain system will continue west and then south before it reaches the future location of the proposed bridge abutment. It will outlet into the proposed basin located south of Main Street. The basin will consist of a riser with a rim height set to allow required ponding of the 'water quality' treatment design volume per the requirements set forth by the SDRWQCB Order R9-2013-0001. The basin's base will consist of 18" of engineered fill, 24" of gravel, and a perforated subdrain

The 50-year developed condition peak flows at the discharge point along Wolf Canyon was determined to be 259.09 cfs. Runoff coefficients assumed for the proposed roads, multi-family development and single family development are per the City of Chula Vista Subdivision Manual.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Development of site will include the addition of impervious features such as buildings (residential, multi-use), streets, driveways, sidewalks, and playgrounds.

List/describe proposed pervious features of the project (e.g., landscape areas):

The site will include pervious areas including open spaces, biofiltration (WQ) basins, landscaped areas, and vegetated slopes throughout.

Does the project include grading and changes to site topography?

þ Yes

• No

Description / Additional Information:

The site will require grading the site which will alter the current topography. Grading and improvements will include the construction of streets which will generally drain towards the west and to Wolf Canyon. Grading of pads and streets will require cutting and filling in existing natural drainage courses thus altering drainage patterns.

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

þ 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:

Development of the site will include construction of storm drain improvements including pipe, brow ditched, swales, inlets, cleanouts, headwalls, water quality and detention facilities with riser structures, and rip rap for energy dissipation. There are no additional drainage structures for offsite conveyance since offsite runoff is not routed through the site. In general, onsite drainage is collected via inlets and conveyed within the storm drain system within the streets. The conveyance system direction is towards Main Street then directed west up to the eastern edge of the future Wolf Canyon bridge crossing. At that point, the storm drain heads south and empties into the proposed water quality-detention facility. After treatment, the outlet pipe is routed west and discharges into Wolf Canyon. The peak Q100 flow at the discharge point within Wolf Canyon is reduced by approximately 1.56 cfs from 295.29 cfs to 293.73 cfs with the inclusion of the proposed detention basin. Please refer to the Otay Ranch Portion of Village 4 TM Drainage Study (August 2016) for flow and detention calculations and additional information.

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

þ On-site storm drain inlets
- Interior floor drains and elevator shaft sump pumps
- Interior parking garages
- Need for future indoor & structural pest control

þ Landscape/Outdoor Pesticide Use
- Pools, spas, ponds, decorative fountains, and other water features
- Food service

þ 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

Description / Additional Information:

The development will consist of single and multi-family residential, and community purpose facility (CPF) development. The BMPs above reflect the proposed source control BMPs which are typically applicable to this type of development. The site will include inlet stenciling for public awareness of pollution concerns related to street pollutants. The use of pesticides for landscape use will be discouraged and designated refuse areas (where applicable) will be protected from stormwater.

Form I-3B Page 7 of 10

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):

Stormwater runoff from the site is channeled by the street curb and gutter until it is collected by inlet. This runoff is then conveyed by storm drain downstream and towards the proposed water quality/ detention basin prior to discharging into Wolf Canyon. Wolf Canyon drains south and confluences with the Otay River which flows west and until ultimately emptying into the San Diego Bay.

List any 303(d) impaired water bodies 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
San Diego Bay	PCB's	Bacteria

Identification of Project Site Pollutants*

*Identification of project site pollutants 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)

Identify pollutants anticipated 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			

Hydromodification Management Requirements

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

þ Yes, hydromodification management flow control structural BMPs required.

- 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 for the watershed in which the project resides.

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

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

- Yes

þ No, no critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Section 6.2 of the BMP Design Manual been performed?

- 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite
- 6.2.2 Downstream Systems Sensitivity to Coarse Sediment
- 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
- No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

- No critical coarse sediment yield areas to be protected based on verification of GLUs onsite
- Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2.b of the SWQMP.
- Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

Form I-3B Page 9 of 10
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. The site has one designated point of compliance (POC1) which is coincident with the discharge point of the proposed storm drain from the water quality basin/HMP/detention basin. This POC is located within Wolf Canyon. See Attachment 2a for the existing and proposed condition hydromodification maps associated with this project.
Has a geomorphic assessment been performed for the receiving channel(s)? þ 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)

Form I-3B Page 10 of 10
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. The site will increase the peak flow to Wolf Canyon unless they are mitigated with a detention basin. Therefore, the proposed basin will need to be sized for and function as a multi-purpose facility; water quality, flow-control (HMP), and peak flow attenuation.
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.

Source Control BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-4

Project Identification

Project Name: Otay Ranch Portion of Village 4

Permit Application Number

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the 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 and/or Appendix E of the 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 may be provided.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	þ Yes	• No	• N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	þ Yes	• No	• N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	þ Yes	• No	• N/A
Discussion / justification if SC-3 not implemented:			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	• Yes	• No	þ N/A
Discussion / justification if SC-4 not implemented:			

Form I-4 Page 2 of 2			
Source Control Requirement	Applied?		
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	þ Yes	• No	• N/A
Discussion / justification if SC-5 not implemented:			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
þ Onsite storm drain inlets	þ Yes	• No	• N/A
• Interior floor drains and elevator shaft sump pumps	• Yes	• No	þ N/A
• Interior parking garages	• Yes	• No	þ N/A
þ Need for future indoor & structural pest control	þ Yes	• No	• N/A
þ Landscape/outdoor pesticide use	þ Yes	• No	• N/A
• Pools, spas, ponds, decorative fountains, and other water features	• Yes	• No	þ N/A
• Food service	• Yes	• No	þ N/A
þ Refuse areas	þ Yes	• No	• N/A
• Industrial processes	• Yes	• No	þ N/A
þ Outdoor storage of equipment or materials	þ Yes	• No	• N/A
• Vehicle and equipment cleaning	• Yes	• No	þ N/A
• Vehicle/equipment repair and maintenance	• Yes	• No	þ N/A
• Fuel dispensing areas	• Yes	• No	þ N/A
• Loading docks	• Yes	• No	þ N/A
• Fire sprinkler test water	• Yes	• No	þ N/A
• Miscellaneous drain or wash water	• Yes	• No	þ N/A
þ Plazas, sidewalks, and parking lots	þ Yes	• No	• N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

Site Design BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-5

Project Identification

Project Name: Otay Ranch Portion of Village 4

Permit Application Number

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the 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 and/or Appendix E of the 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 may be provided.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	þ Yes	• No	• N/A
Discussion / justification if SD-1 not implemented:			
SD-2 Conserve Natural Areas, Soils, and Vegetation	þ Yes	• No	• N/A
Discussion / justification if SD-2 not implemented:			
SD-3 Minimize Impervious Area	þ Yes	• No	• N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	þ Yes	• No	• N/A
Discussion / justification if SD-4 not implemented:			

Form I-5 Page 2 of 2			
Site Design Requirement	Applied?		
SD-5 Impervious Area Dispersion	þ Yes	• No	• N/A
Discussion / justification if SD-5 not implemented:			
SD-6 Runoff Collection	• Yes	þ No	• N/A
Discussion / justification if SD-6 not implemented: Treatment of onsite stormwater will be treated via the proposed biofiltration basin.			
SD-7 Landscaping with Native or Drought Tolerant Species	þ Yes	• No	• N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	• Yes	þ No	• N/A
Discussion / justification if SD-8 not implemented: This site design is not feasible for this project.			

Summary of PDP Structural BMPs	Form I-6 (For PDPs)

Project Identification

Project Name: Otay Ranch Portion of Village 4

Permit Application Number

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the 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 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 local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative to certify construction of the structural BMPs (see Section 1.12 of the manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the manual).

Use this form 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 (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

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 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.

This site will include one regional biofiltration basin at the downstream portion of the site which will act to address both pollution control and flow control measures. The BMP was selected based on their effectiveness for pollutant removal and ability to also be used for flow control.

In selection of the biofiltration BMP, the following steps were taken as presented in Section 5.1 of the BMP Design Manual.

1. The DMAs are not self-retaining, self-mitigating, or De minimis.
2. Estimated DCV.
3. Harvest is not used or feasible.
4. Infiltration is not feasible.
5. Computed sizing requirements.
6. Design BMP for DCV per design criteria and considerations listed in the fact sheets.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of X
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1)

Form I-6 Page 3 of X (Copy as many as needed)	
Structural BMP Summary Information (Copy this page as needed to provide information for each individual proposed structural BMP)	
Structural BMP ID No. BF-1-1	
Construction Plan Sheet No. N/A (this is a planning phase study)	
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) þ Biofiltration (BF-1) • 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 þ 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 if required by the City Engineer (See Section 1.12 of the manual)	Otay Valley Quarry, LLC A Delaware Limited Liability 6591 Collins Drive, Ste E11 Moorpark, Ca 93021 (805) 278-7320
Who will be the final owner of this BMP?	HOA for Otay Ranch Portion of Village 4
Who will maintain this BMP into perpetuity?	HOA for Otay Ranch Portion of Village 4
What is the funding mechanism for maintenance?	Private homeowner fees to the Homeowners Association (HOA) for Otay Ranch Portion of Village 4
Discussion (as needed):	

Form I-6 Page 4 of X (Copy as many as needed)
Structural BMP ID No.
Construction Plan Sheet No.
Discussion (as needed):

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

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Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	þ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	• Included on DMA Exhibit in Attachment 1a þ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	þ Included • Not included because the entire project will use infiltration BMPs
Attachment 1d	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.	þ Included • Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	þ Included

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

The DMA Exhibit must identify:

þ Underlying hydrologic soil group

þ Approximate depth to groundwater

þ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)

þ Critical coarse sediment yield areas to be protected

þ Existing topography and impervious areas

þ Existing and proposed site drainage network and connections to drainage offsite

- Proposed demolition

þ Proposed grading

þ Proposed impervious features

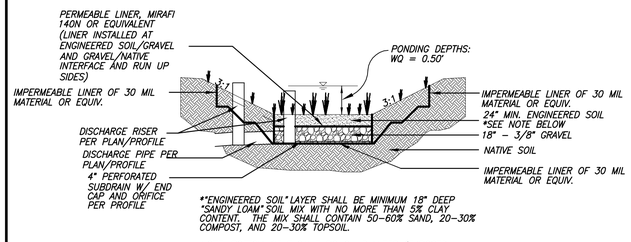
þ Proposed design features and surface treatments used to minimize imperviousness

þ 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 Form I-3B)

þ Structural BMPs (identify location, type of BMP, and size/detail)

ATTACHMENT 1a
DMA EXHIBIT



**"ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST, AND 20-30% TOPSOIL.

NOTE: BOTTOM OF FLOW THROUGH PLANTER (EXPOSED VEGETATED GRADE AND LINED SUB BASE) SHALL BE SLOPED AT 1% MINIMUM IN DIRECTION OF OUTFALL (TOWARD STREET).

SOIL SECTION FOR WATER QUALITY/HYDROMODIFICATION BIOFILTRATION BASIN (PRIVATE)

NOT TO SCALE

LEGEND

- PROJECT BOUNDARY
- DRAINAGE BOUNDARY
- FLOW DIRECTION
- ONSITE DEVELOPED AREA
- OFFSITE AREA TRIUBUTARY TO BASIN
- BASIN BOTTOM SURFACE AREA
- TRIBUTARY AREA — XX.XX ACRES

TREATMENT CONTROL BMPs

BF-1-1 BIOFILTRATION BASIN

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 20'
NO CRITICAL COARSE AREAS REQUIRE PRESERVATION

SOURCE CONTROL BMPs

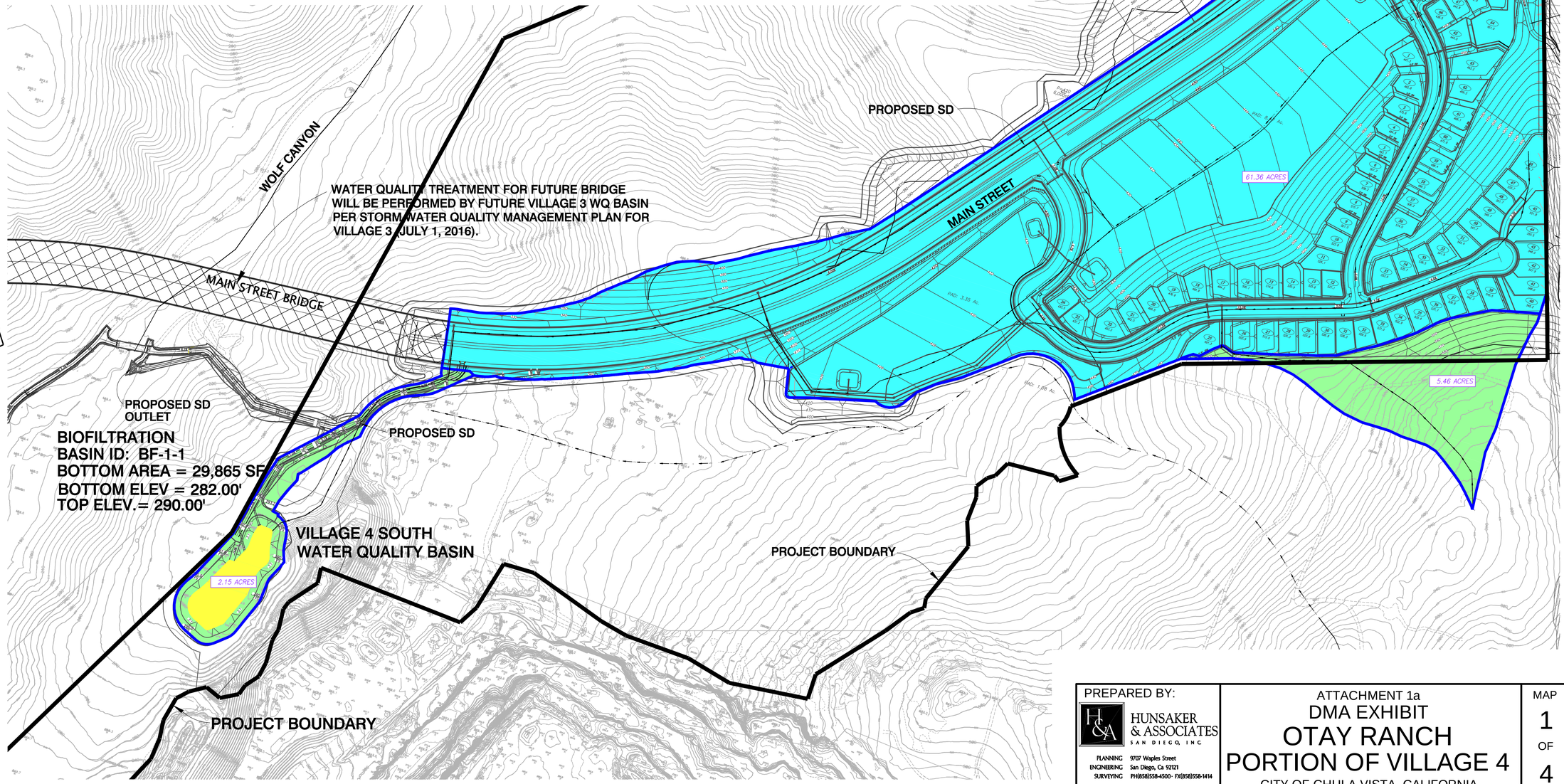
SC-1 PREVENTION OF ILLICIT DISCHARGES TO MS4
SC-2 STORM DRAIN STENCILING OR SIGNAGE
SC-3 PROTECT OUTDOOR MATERIAL STORAGE AREAS
SC-5 PROTECT TRASH STORAGE AREAS
SC-6 NEED FOR INDOOR & STRUCTURAL PEST CONTROL
SC-6 MINIMIZE PESTICIDE USE
SC-6 STREET AND SIDEWALK SWEEPING

SITE DESIGN BMPs

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

VICINITY MAP

NOT TO SCALE



PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

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ATTACHMENT 1a

DMA EXHIBIT
OTAY RANCH
PORTION OF VILLAGE 4

CITY OF CHULA VISTA, CALIFORNIA

MAP 1 OF 4

W.O.# 3206-0002

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ATTACHMENT 1b
TABULAR SUMMARY OF DMAs

OTAY RANCH PORTION OF VILLAGE 4 TM
BIOFILTRATION BMP DMA CALCULATIONS

	Imp. RF	Pervious RF	% Imp	BASIN 1 BF-1-1 (ac.)	Fraction of Total	Imp Area (ac.)	Pervious Area (ac.)	Summation RF x A
BASIN	0.90	0.10	0	0.93	0.00	0.00	0.93	0.09
Residential (20DU/AC)	0.90	0.10	57.5	5.76	0.12	3.31	2.45	3.23
Residential (14 DU/AC)	0.90	0.10	50	11.19	0.20	5.60	5.60	5.60
Residential (5DU/AC)	0.90	0.10	35	15.69	0.21	5.49	10.20	5.96
Industrial	0.90	0.10	90	0.00	0.00	0.00	0.00	0.00
ROAD	0.90	0.10	85	14.32	0.40	12.17	2.15	11.17
SCHOOL	0.90	0.10	80	0.00	0.00	0.00	0.00	0.00
SLOPES	0.90	0.10	0	19.24	0.07	0.00	19.24	1.92
				67.13	1.00	26.57	40.56	27.97
							Weighted C =	0.42

OTAY RANCH PORTION OF VILLAGE 4 TM
DCV CALCULATION

BASIN 1: Design Capture Volume		Worksheet B-2.1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.52	inches
2	Area tributary to BMP (s)	A=	67.13	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.42	unitless
4	Street trees volume reduction	TCV=	0.00	cubic-feet
5	Rain barrels volume reduction	RCV=	0.00	cubic-feet
6	Calculate DCV= (3630 x C x d x A) - TCV - RCV	DCV=	52,795	cubic-feet

ATTACHMENT 1c

FORM I-7, HARVEST AND USE FEASIBLITY SCREENING CHECKLIST

OR Village 4 South

Worksheet B.3-1. Harvest and Use Feasibility Screening

Harvest and Use Feasibility Screening	Worksheet B.3-1

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?
- ☐ Toilet and urinal flushing
- ☒ Landscape irrigation
- ☐ Other:_____

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

A = 10.31 AC

[Provide a summary of calculations here]

$ETWU = 2.7 \frac{in}{mo} \times \left[\frac{0.5 \times 449,104}{0.9} + 0^{SLA}\right] \times 0.015 = 10,165$

3. Calculate the DCV using worksheet B-2.1.

[Provide a results here] DCV = 52,795 cf

3a. Is the 36-hour demand greater than or equal to the DCV?	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36-hour demand less than 0.25DCV?
Yes / (No) ⇨ ⇩	Yes / (No) ⇨ ⇩	(Yes) ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

ATTACHMENT 1d

FORM I-8, CATEGORIZATION OF INFILTRATION FEASIBILITY CONDITION

Categorization of Infiltration Feasibility Condition			Worksheet C.4-1
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.		
Provide Basis: Summarize findings or 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.		b
Provide basis: Per the Preliminary Geotechnical Investigation for Otay Ranch Village 4 (March 25, 2015) prepared by Geocon Incorporated, the 'storm water management devices should be properly constructed to prevent water infiltration and lined with an impermeable liner due to the presence of the adjacent slope.' Summarize findings or studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

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.		
Provide Basis: Summarize findings or 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 seasonality of 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.		
Provide basis: Summarize findings or 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

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by County staff to substantiate findings.

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		b

Provide Basis:

Per the Preliminary Geotechnical Investigation for Otay Ranch Village 4 (March 25, 2015) prepared by Geocon Incorporated, the 'storm water management devices should be properly constructed to prevent water infiltration and lined with an impermeable liner due to the presence of the adjacent slope.'

Summarize findings or studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

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.		b

Provide basis:

Per the Preliminary Geotechnical Investigation for Otay Ranch Village 4 (March 25, 2015) prepared by Geocon Incorporated, the 'storm water management devices should be properly constructed to prevent water infiltration and lined with an impermeable liner due to the presence of the adjacent slope.'

Summarize findings or studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Worksheet C.4-1 Page 4 of 4

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.		
Provide Basis: Summarize findings or studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
8	Can infiltration be allowed without violating downstream water rights? The answer to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.		
Provide basis: Summarize findings or 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, then a 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	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings.

ATTACHMENT 1e
POLLUTION CONTROL BMP DESIGN WORKSHEETS

OTAY RANCH PORTION OF VILLAGE 4 TM
BIOFILTRATION BMP SIZING CALCULATION

BASIN 1: Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMP's	52,795	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.00	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36.00	hours
4	Depth of runoff that can be infiltrated (Line 2 x Line 3)	0.00	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain (Line 4/ Line 5)	0.00	inches
7	Assumed surface area of the biofiltration BMP	32,381.00	sq-ft
8	Media retained pore storage	0.10	in/in
9	Volume retained by BMP (Line 4+(Line 12 x Line 8)/12) x Line 7	6,476.20	cubic-feet
10	DCV that requires biofiltration (Line 1 - Line 9)	46,318.84	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	6.00	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	24.00	inches
13	Aggregate Storage above underdrain invert (12 inches typical) - use 0 inches for sizing if the agreagate is not over the entire bottom surface area	18.00	inches
14	Freely drained pore storage	0.20	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate)	5.00	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6.00	hours
17	Depth filtered during storm (Line 15 x Line 16)	30.00	inches
18	Depth of Detention Storage (Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5))	18.00	inches
19	Total Depth Treated (Line 17 + Line 18)	48.00	inches
Option 1 - Biofilter 1.5 times the DCV			
20	Required biofiltered volume (1.5 x Line 10)	69,478.26	cubic-feet
21	Required Footprint (Line 20/ Line 19) x 12	17,370	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume (0.75 x Line 10)	34,739.13	cubic-feet
23	Required Footprint (Line 22/ Line 18) x 12	23,159	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	2,924,182.80	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.42	unitless
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.01823	unitless
27	Minimum BMP Footprint (Line 24 x Line 25 x Line 26)	22,206	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	22,206	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]		unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion	☐ Yes ☐ No	

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until it's equivalent to the required biofiltration footprint (either line 21 or Line 23)

2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worsheet B.5-2.

4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satifies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the County, if it meets the requirements in Appendix F.

OTAY RANCH PORTION OF VILLAGE 4 TM

BIOFILTRATION BMP ALTERNATIVE SIZING FACTOR CALCULATION

BASIN 1: Alternative Minimum Footprint Sizing Factor			Worksheet B.5-2	
1	Area draining to the BMP		2,924,182.80	sq-ft
2	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)		0.42	
3	Load clog (See Table B.5-2 for guidance; L_c)		3.00	lb/sq-ft
4	Allowable Period to Accumulate Clogging Load (T_L)		10.00	years
Volume Weighted EMC (event mean concentration) Calculation				
Land Use	Fraction of Total DCV	TSS EMC (mg/L)	Product	
Single Family Residential	21.32	123	2621.97	
Commercial	0.00	128	0.00	
Industiral	0.00	125	0.00	
Education (Municipal)	0.00	132	0.00	
Transportation	39.94	78	3114.94	
Multi-Family Residential	31.54	40	1261.46	
Roof runoff	0	14	0.00	
Low Traffic Areas	0	50	0.00	
Open spaces	7.21	216	1557.67	
Other, specify				
Other, specify				
Other, specify				
Check (100?):	100.00			
5	Volume Weighted EMC (sum of all products)		8,556.05	mg/L
BMP Parameters				
6	If pretreatment measures are inlcuded in the design, apply an adjustment of 25% [(Line 5 x (1-0.25)] Use 50% for CDS Unit.		6,417.04	mg/L
7	Average Annual Precipitation		11.00	inches
8	Calculate the Average Annual Runoff (Line 7 x 43,560 /12) x Line 2		16,636.65	cu-ft/yr
9	Calculate the Average TSS Load (Line 8 x 62.4 x Line 6)/10^6		6661.70	lb/yr
10	Calculate the BMP Footprint Needed (Line 9 x Line 4)/ Line 3		22,205.66	sq-ft
11	Calculate the Alernative Minimum Footprint Sizing Factor [Line 10/ Line 1 x Line 2)]		0.01823	

1. Load to clog value should be in the range of 2-5 lb/sq-ft per Pitt and Clark (2010). If selecting a value other than 2, a justification for the value selected is required. See guidance in Table B.5-2.

2. A value of 25 percent is supported by Maniquiz-Redillas et al. (2014) study, which found a pretreatment sediment capture range of 15% - 35%. If using a value outside of this range, documentation of the selected value is required. A value of 50 percent can be claimed for a system with an active Washington State TAPE approval rating for "pre-treatment."

ATTACHMENT 2

BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

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- 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	Hydromodification Management Exhibit (Required)	þ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	þ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination • 6.2.1 Verification of Geomorphic Landscape Units Onsite • 6.2.2 Downstream Systems Sensitivity to Coarse Sediment • 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	þ Not performed • Included • Submitted as separate stand-alone document
Attachment 2d	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	þ Included • Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	• Included þ 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)

ATTACHMENT 2a
HYDROMODIFICATION MANAGEMENT EXHIBITS

VILLAGE 7
AREA = 136.52 AC.
58% IMPERVIOUS

VILLAGE 2 SOUTH
AREA = 263.5 ACRES
47% IMPERVIOUS

VILLAGE 8 WEST
AREA = 218.90 ACRES
75% IMPERVIOUS

VILLAGE 3

484.83 ACRES

WOLF CANYON

WOLF CANYON TRIBUTARY

PROJECT BOUNDARY

PARK

PARK

PARK WATER LINE EASEMENT

1

PROJECT BOUNDARY

PROJECT BOUNDARY

LEGEND

- PROJECT BOUNDARY
- POC DRAINAGE BOUNDARY
- FLOW DIRECTION
- (1) POINT OF COMPLIANCE IDENTIFIER
- BF-1-1 BIOFILTRATION BASIN IDENTIFIER

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 20'
NO CRITICALCOARSE AREAS REQUIRE PRESERVATION

0 250 500 750
SCALE 1" = 250'

PREPARED BY:

HUNSAKER & ASSOCIATES
SAN DIEGO, INC.

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

ATTACHMENT 2a - EXHIBIT 2
EXISTING CONDITION
HYDROMODIFICATION MAP
OTAY RANCH PORTION OF VILLAGE 4
CITY OF CHULA VISTA, CALIFORNIA

MAP 2 OF 4

W.O.# 3206-0002

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VILLAGE 7
AREA = 136.52 AC.
53% IMPERVIOUS

VILLAGE 2
SOUTH
AREA = 263.5 ACRES
47% IMPERVIOUS

PARK
PARK
PARK
WATER LINE EASEMENT

WOLF CANYON

VILLAGE 8
WEST
AREA = 218.90 ACRES
75% IMPERVIOUS

VILLAGE 3

WOLF CANYON

365.48 ACRES

WOLF CANYON TRIBUTARY

PROJECT BOUNDARY

WOLF CANYON

WATER QUALITY TREATMENT FOR FUTURE BRIDGE WILL BE PERFORMED BY FUTURE VILLAGE 3 WQ BASIN PER STORMWATER QUALITY MANAGEMENT PLAN FOR VILLAGE 3 (JULY 1, 2016).

MAIN STREET BRIDGE

67.13 ACRES

WOLF CANYON
Discharge Point

1

BIOFILTRATION
BASIN ID: BF-1-1
BOTTOM AREA = 29,865 SF
BOTTOM ELEV = 282.00'
TOP ELEV.= 290.00'

PROPOSED SD

54.04 ACRES

PROJECT BOUNDARY

VILLAGE 4 SOUTH
WATER QUALITY BASIN

BF-1-1

PROJECT BOUNDARY

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 20'
NO CRITICALCOARSE AREAS REQUIRE PRESERVATION

0 250 500 750
SCALE 1" = 250'

LEGEND

- PROJECT BOUNDARY
- DMA SUBAREA BOUNDARY
- FLOW DIRECTION
- (1) POINT OF COMPLIANCE IDENTIFIER
- BF-1-1 BIOFILTRATION BASIN IDENTIFIER

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SAN DIEGO, INC
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ENGINEERING San Diego, Ca 92121
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ATTACHMENT 2a- EXHIBIT 3
PROPOSED CONDITION
HYDROMODIFICATION MAP

OTAY RANCH
PORTON OF VILLAGE 4

CITY OF CHULA VISTA, CALIFORNIA

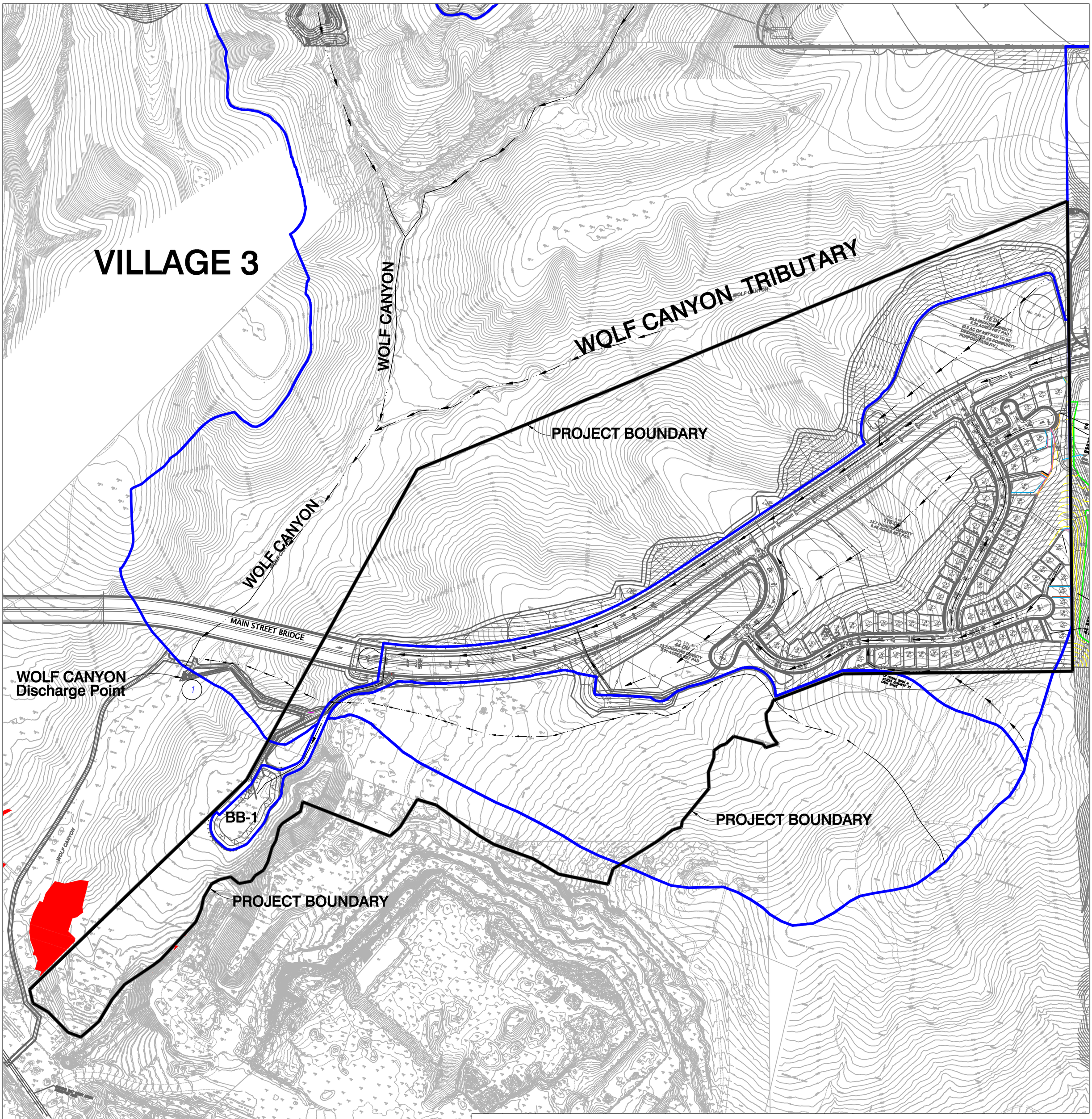
MAP 3 OF 4

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ATTACHMENT 2b

MANAGEMENT OF CRITICAL COARSE SEDIMENT YIELD AREAS



LEGEND

- PROJECT BOUNDARY
- DRAINAGE AREA TO POC
- FLOW DIRECTION
- (1) POINT OF COMPLIANCE IDENTIFIER
- BB-# BIOFILTRATION BASIN IDENTIFIER
- WMMA MAP- PCCSYA

UNDERLYING SOIL GROUP : C & D
APPROXIMATE DEPTH TO GROUNDWATER > 20'
NO CRITICALCOARSE AREAS REQUIRE PRESERVATION

0 300 600 900
SCALE 1" = 300'

PREPARED BY:
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SAN DIEGO, INC.
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ATTACHMENT 2b
WMMA MAP-
CRITICAL COARSE SEDIMENT YIELD AREAS
OTAY RANCH
PORTION OF VILLAGE 4
CITY OF CHULA VISTA, CALIFORNIA

MAP 4 OF 4

W.O.# 3206-0002

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ATTACHMENT 2c
GEOMORPHIC ASSESSMENT OF RECEIVING CHANNELS

NOT PERFORMED FOR THIS PROJECT

ATTACHMENT 2d
FLOW CONTROL FACILITY DESIGN

Attachment 2d
Flow Control Facility Design

Hydromodification Management Plan

This HMP memorandum applies only to the project condition when the storm drain routing selected discharges to Point of Compliance 1 (POC1) in Wolf Canyon.

INTRODUCTION

This report summarizes the approach used to model the proposed Otay Ranch Village 4 South project site in the City of Chula Vista, CA using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post developed conditions at the site in order to determine if the proposed bioretention facilities have sufficient footprint to meet the current Hydromodification Management Plan (HMP) requirements from the Regional Water Quality Control Board (RWQCB).

SWMM MODEL DEVELOPMENT

Two (2) SWMM models were prepared for this study at the point of compliance (POC); one for existing condition and one for the proposed condition. POC #1 was set along Wolf Canyon at the location of the proposed condition discharge point. For both SWMM models, flow duration curves were prepared to determine if the proposed bioretention footprint was sufficient to meet the current HMP requirements.

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

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

BIORETENTION MODELING

Developed storm water runoff from the main body of the project site is routed through one (1) biofiltration basin located within the Village 4 South project area. Flows from the proposed residential area drains to the aforementioned basin via storm drain, ultimately discharging downstream into the Wolf Canyon.

Basin Discussion:

Flow control to the basin will be achieved using orifices on a riser standpipe. The size, number and location of the orifices are presented in the Basin Riser Table below. Sizing and further peak flow discussion is in the *Priority Development Project Storm Water Quality Management Plan (SWQMP) for Otay Ranch Village 4 South* dated July 2016.

Basin Riser Table

	BB-1
Riser Height (ft)*	5.25
Basin Depth (ft)	8.0
Amended Soil Depth (in)	24
Class 2 Perm. Depth (in)	18
Peak Orifice	
Riser	1
Area (sq ft)	16
Top Orifice	
No. of Orifices	0
Diameter (in)	0
Depth (ft)	0.0
Middle Orifice	
No. of Orifices	0
Diameter (in)	0
Depth (ft)	0.0
Bottom Orifice	
No. of Orifices	3
Diameter (in)	4.5
Depth (ft)	0.50
Sub-Drain Orifice	
No. of Orifices	1
Diameter (in)	3.5

*From finish grade

FLOW DURATION CURVE COMPARISON

The Flow Duration Curves (FDC) for the site were compared at POC 1 by exporting the hourly runoff time series results from SWMM to a spreadsheet. 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 Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model is a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

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

FDC comparisons at the POC are illustrated in Figure 1 in both normal and logarithmic scale. Attachment 7 provides detailed drainage exhibit for the post-developed condition.

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

SUMMARY

This study has demonstrated that the proposed bioretention footprint at the Village 4 South site is sufficient to meet the current HMP criteria if the bioretention cross-section areas and volumes recommended within this technical memorandum are incorporated within the proposed project site.

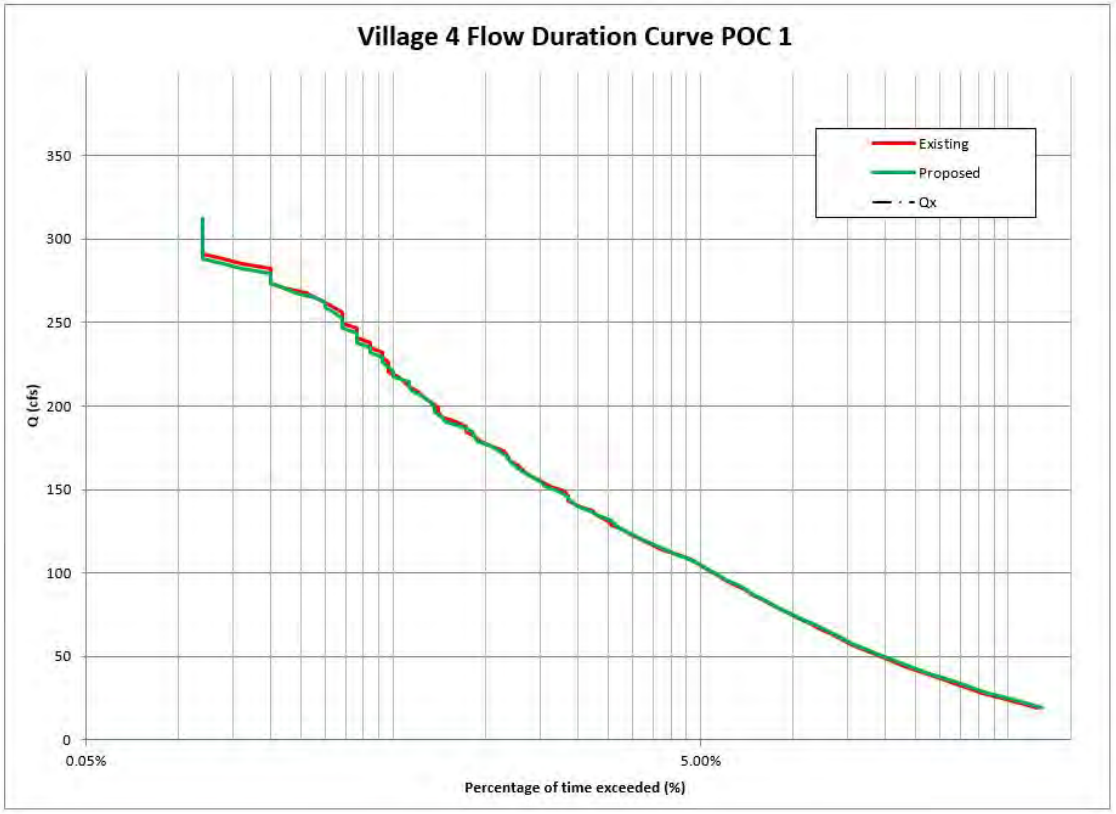
KEY ASSUMPTIONS

1. D Soils are representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Table
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. Elevation vs. Area Curves and Elevations vs. Discharge Curves to be used in SWMM
5. Project Plan and Bioretention section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Drying Time of the Surface Layer of Bio-retention cells

9. USGS Soil Map for justification of Soil Type D Conditions
10. Summary files from the SWMM Model



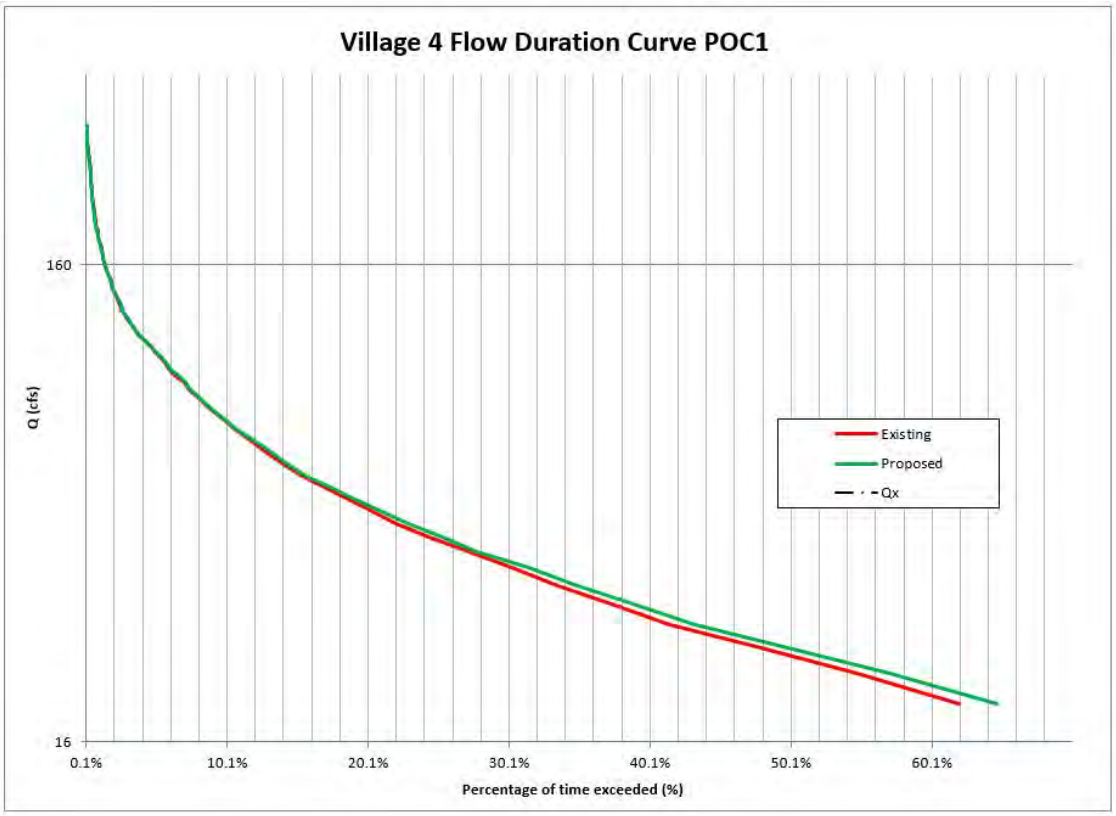


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
10-year	312.230	309.630	2.600
9-year	296.270	293.018	3.252
8-year	288.436	284.674	3.762
7-year	285.862	282.343	3.519
6-year	284.823	281.387	3.436
5-year	270.432	269.421	1.011
4-year	257.130	255.483	1.647
3-year	232.971	231.291	1.680
2-year	192.580	189.710	2.870

ATTACHMENT 2 - Flow Duration Curve Analysis, Plot & Table

Flow duration curve shall not exceed the existing conditions by more than 10% in peak flow.

The figure on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMPs is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval 0.10Q 2 – Q 10 is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%).

Consequently, the design passes the hydromodification test.

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

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

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

Flow Duration Curve Data for Village 4 South , POC 1

Q2 = 192.58 cfs Fraction Q2= 10 %
Q10 = 312.23 cfs
Step = 2.9593 cfs
Count = 499678 hours
57.00 years

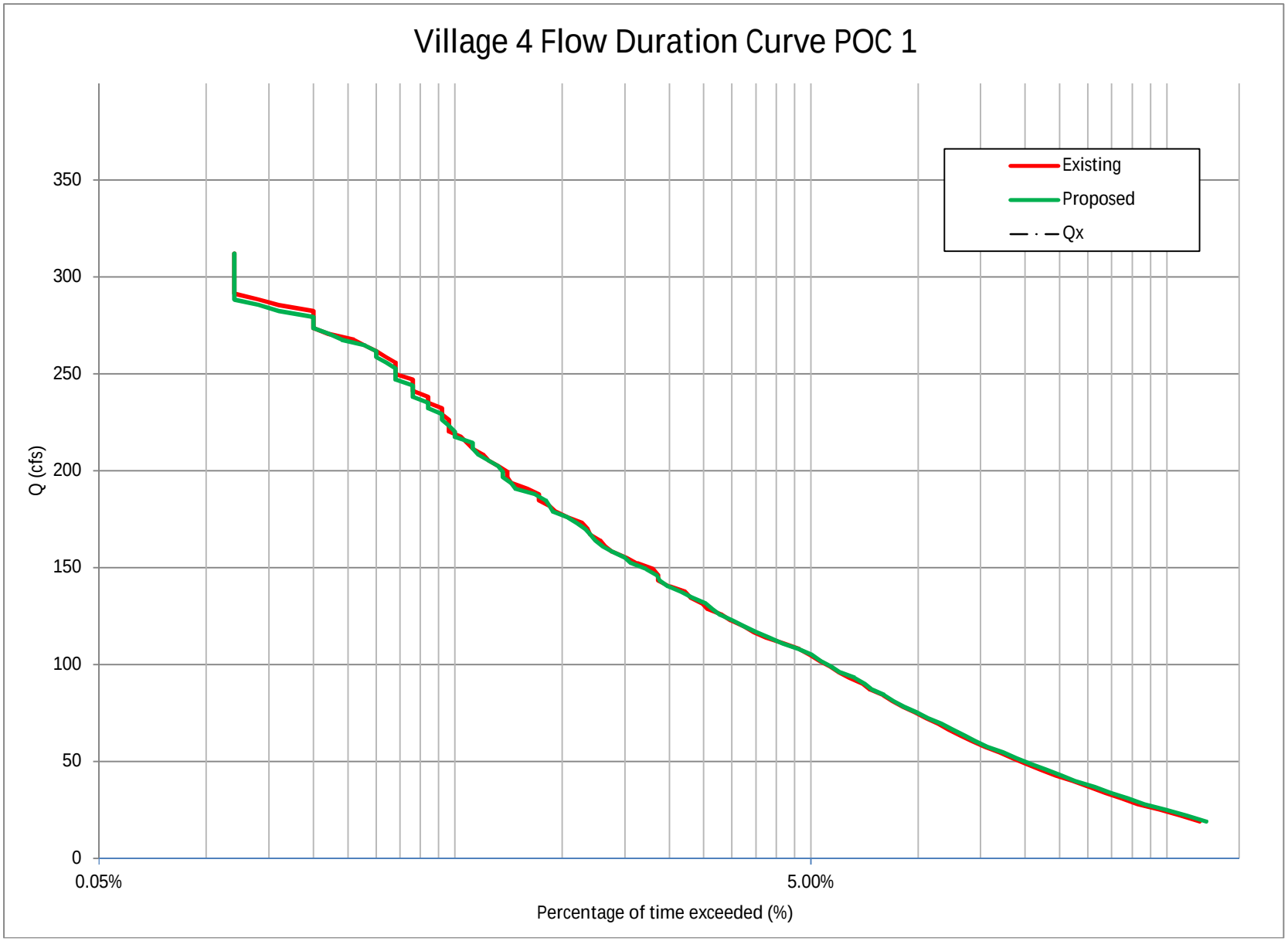
Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
1	19.258	3095	6.19E-01	3230	6.46E-01	104%	Pass
2	22.217	2735	5.47E-01	2853	5.71E-01	104%	Pass
3	25.177	2392	4.79E-01	2488	4.98E-01	104%	Pass
4	28.136	2070	4.14E-01	2163	4.33E-01	104%	Pass
5	31.095	1865	3.73E-01	1940	3.88E-01	104%	Pass
6	34.055	1676	3.35E-01	1743	3.49E-01	104%	Pass
7	37.014	1511	3.02E-01	1569	3.14E-01	104%	Pass
8	39.973	1360	2.72E-01	1384	2.77E-01	102%	Pass
9	42.933	1216	2.43E-01	1266	2.53E-01	104%	Pass
10	45.892	1102	2.21E-01	1144	2.29E-01	104%	Pass
11	48.851	1012	2.03E-01	1042	2.09E-01	103%	Pass
12	51.810	925	1.85E-01	944	1.89E-01	102%	Pass
13	54.770	846	1.69E-01	868	1.74E-01	103%	Pass
14	57.729	770	1.54E-01	784	1.57E-01	102%	Pass
15	60.688	709	1.42E-01	723	1.45E-01	102%	Pass
16	63.648	659	1.32E-01	675	1.35E-01	102%	Pass
17	66.607	609	1.22E-01	625	1.25E-01	103%	Pass
18	69.566	571	1.14E-01	581	1.16E-01	102%	Pass
19	72.526	529	1.06E-01	533	1.07E-01	101%	Pass
20	75.485	491	9.83E-02	496	9.93E-02	101%	Pass
21	78.444	455	9.11E-02	457	9.15E-02	100%	Pass
22	81.404	423	8.47E-02	428	8.57E-02	101%	Pass
23	84.363	398	7.97E-02	402	8.05E-02	101%	Pass
24	87.322	367	7.34E-02	371	7.42E-02	101%	Pass
25	90.282	350	7.00E-02	354	7.08E-02	101%	Pass
26	93.241	321	6.42E-02	332	6.64E-02	103%	Pass
27	96.200	300	6.00E-02	302	6.04E-02	101%	Pass
28	99.159	283	5.66E-02	285	5.70E-02	101%	Pass
29	102.119	265	5.30E-02	267	5.34E-02	101%	Pass
30	105.078	249	4.98E-02	252	5.04E-02	101%	Pass
31	108.037	232	4.64E-02	231	4.62E-02	100%	Pass
32	110.997	210	4.20E-02	208	4.16E-02	99%	Pass
33	113.956	187	3.74E-02	191	3.82E-02	102%	Pass
34	116.915	173	3.46E-02	176	3.52E-02	102%	Pass
35	119.875	162	3.24E-02	162	3.24E-02	100%	Pass
36	122.834	149	2.98E-02	151	3.02E-02	101%	Pass

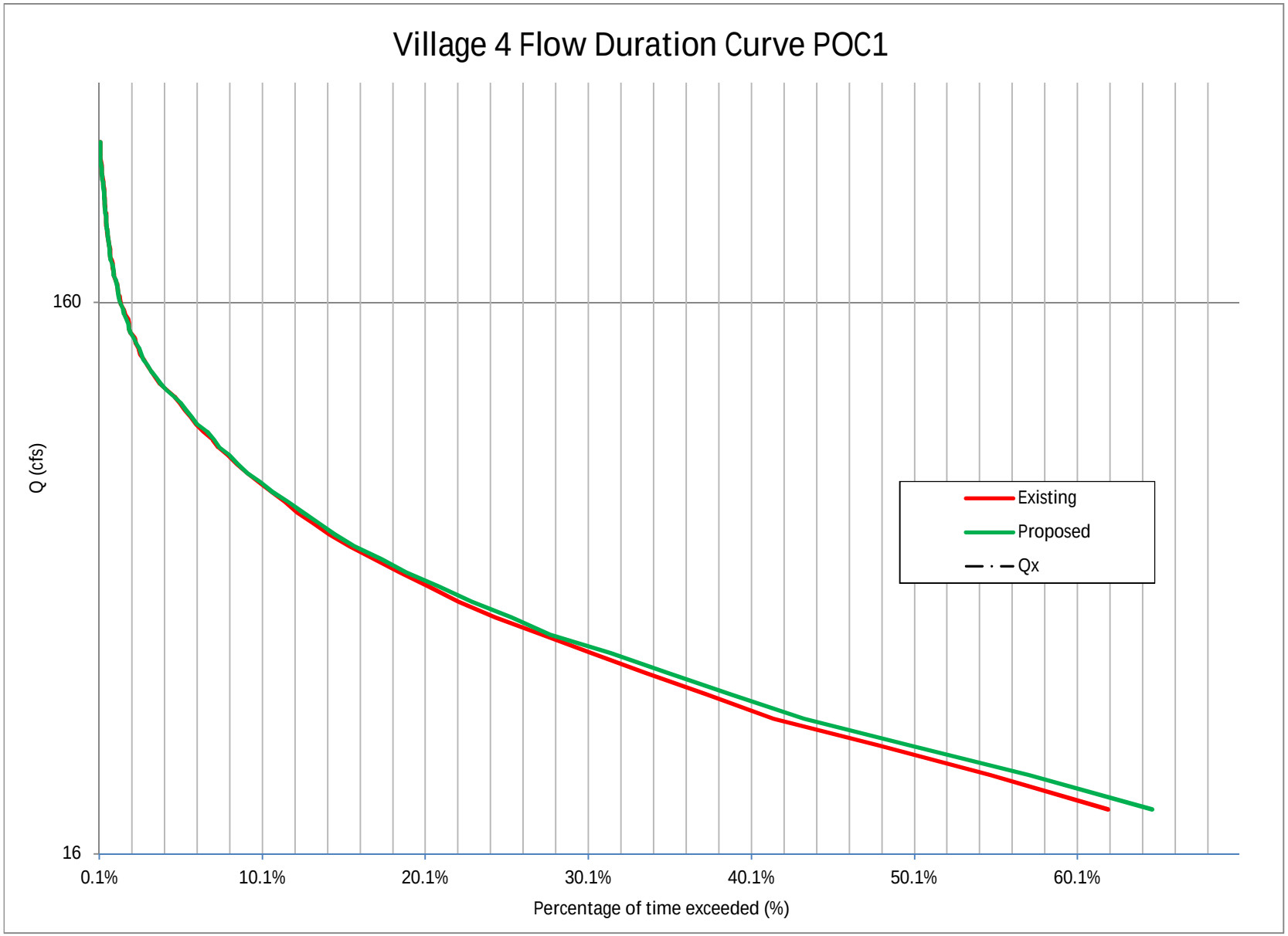
Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	125.793	141	2.82E-02	139	2.78E-02	99%	Pass
38	128.753	128	2.56E-02	132	2.64E-02	103%	Pass
39	131.712	124	2.48E-02	127	2.54E-02	102%	Pass
40	134.671	115	2.30E-02	116	2.32E-02	101%	Pass
41	137.631	111	2.22E-02	108	2.16E-02	97%	Pass
42	140.590	100	2.00E-02	99	1.98E-02	99%	Pass
43	143.549	93	1.86E-02	94	1.88E-02	101%	Pass
44	146.508	93	1.86E-02	92	1.84E-02	99%	Pass
45	149.468	90	1.80E-02	86	1.72E-02	96%	Pass
46	152.427	81	1.62E-02	78	1.56E-02	96%	Pass
47	155.386	76	1.52E-02	75	1.50E-02	99%	Pass
48	158.346	69	1.38E-02	69	1.38E-02	100%	Pass
49	161.305	66	1.32E-02	65	1.30E-02	98%	Pass
50	164.264	64	1.28E-02	62	1.24E-02	97%	Pass
51	167.224	60	1.20E-02	60	1.20E-02	100%	Pass
52	170.183	59	1.18E-02	58	1.16E-02	98%	Pass
53	173.142	57	1.14E-02	55	1.10E-02	96%	Pass
54	176.102	52	1.04E-02	52	1.04E-02	100%	Pass
55	179.061	48	9.61E-03	47	9.41E-03	98%	Pass
56	182.020	46	9.21E-03	46	9.21E-03	100%	Pass
57	184.980	43	8.61E-03	45	9.01E-03	105%	Pass
58	187.939	43	8.61E-03	42	8.41E-03	98%	Pass
59	190.898	40	8.01E-03	37	7.40E-03	93%	Pass
60	193.857	36	7.20E-03	36	7.20E-03	100%	Pass
61	196.817	35	7.00E-03	34	6.80E-03	97%	Pass
62	199.776	35	7.00E-03	34	6.80E-03	97%	Pass
63	202.735	33	6.60E-03	33	6.60E-03	100%	Pass
64	205.695	31	6.20E-03	31	6.20E-03	100%	Pass
65	208.654	30	6.00E-03	29	5.80E-03	97%	Pass
66	211.613	28	5.60E-03	28	5.60E-03	100%	Pass
67	214.573	27	5.40E-03	28	5.60E-03	104%	Pass
68	217.532	26	5.20E-03	25	5.00E-03	96%	Pass
69	220.491	24	4.80E-03	25	5.00E-03	104%	Pass
70	223.451	24	4.80E-03	24	4.80E-03	100%	Pass
71	226.410	24	4.80E-03	23	4.60E-03	96%	Pass
72	229.369	23	4.60E-03	23	4.60E-03	100%	Pass
73	232.329	23	4.60E-03	21	4.20E-03	91%	Pass
74	235.288	21	4.20E-03	21	4.20E-03	100%	Pass
75	238.247	21	4.20E-03	19	3.80E-03	90%	Pass
76	241.206	19	3.80E-03	19	3.80E-03	100%	Pass
77	244.166	19	3.80E-03	19	3.80E-03	100%	Pass
78	247.125	19	3.80E-03	17	3.40E-03	89%	Pass
79	250.084	17	3.40E-03	17	3.40E-03	100%	Pass
80	253.044	17	3.40E-03	17	3.40E-03	100%	Pass
81	256.003	17	3.40E-03	16	3.20E-03	94%	Pass

Interval	Existing Condition			Detention Basin Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	258.962	16	3.20E-03	15	3.00E-03	94%	Pass
83	261.922	15	3.00E-03	15	3.00E-03	100%	Pass
84	264.881	14	2.80E-03	14	2.80E-03	100%	Pass
85	267.840	13	2.60E-03	12	2.40E-03	92%	Pass
86	270.800	11	2.20E-03	11	2.20E-03	100%	Pass
87	273.759	10	2.00E-03	10	2.00E-03	100%	Pass
88	276.718	10	2.00E-03	10	2.00E-03	100%	Pass
89	279.678	10	2.00E-03	10	2.00E-03	100%	Pass
90	282.637	10	2.00E-03	8	1.60E-03	80%	Pass
91	285.596	8	1.60E-03	7	1.40E-03	88%	Pass
92	288.555	7	1.40E-03	6	1.20E-03	86%	Pass
93	291.515	6	1.20E-03	6	1.20E-03	100%	Pass
94	294.474	6	1.20E-03	6	1.20E-03	100%	Pass
95	297.433	6	1.20E-03	6	1.20E-03	100%	Pass
96	300.393	6	1.20E-03	6	1.20E-03	100%	Pass
97	303.352	6	1.20E-03	6	1.20E-03	100%	Pass
98	306.311	6	1.20E-03	6	1.20E-03	100%	Pass
99	309.271	6	1.20E-03	6	1.20E-03	100%	Pass
100	312.230	6	1.20E-03	6	1.20E-03	100%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period	Pre-dev. Q	Post-Dev. Q	Reduction
10	312.230	309.630	2.600
9	296.270	293.018	3.252
8	288.436	284.674	3.762
7	285.862	282.343	3.519
6	284.823	281.387	3.436
5	270.432	269.421	1.011
4	257.130	255.483	1.647
3	232.971	231.291	1.680
2	192.580	189.710	2.870


Village 4 Flow Duration Curve POC 1
Existing
Proposed
Qx
Q (cfs)
350
300
250
200
150
100
50
0
0.05%
5.00%
Percentage of time exceeded (%)


Village 4 Flow Duration Curve POC1
160
16
Q (cfs)
0.1%
10.1%
20.1%
30.1%
40.1%
50.1%
60.1%
Percentage of time exceeded (%)
Existing
Proposed
Qx

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

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

T	Cunnane	Weibull				Period of Return	
10	312.23	322.14	Peaks	Date	Position	Weibull	Cunnane
9	296.27	303.73	142.27	3/16/1954	57	1.02	1.01
8	288.44	289.76	142.55	2/11/1959	56	1.04	1.03
7	285.86	286.24	146.88	12/2/1961	55	1.05	1.05
6	284.82	284.96	147.05	1/21/1964	54	1.07	1.07
5	270.43	270.65	147.89	11/16/1965	53	1.09	1.09
4	257.13	257.75	150.63	11/17/1972	52	1.12	1.11
3	232.97	233.01	150.65	3/20/1973	51	1.14	1.13
2	192.58	192.58	150.76	1/6/1977	50	1.16	1.15
			152.46	1/14/1978	49	1.18	1.18
			154.12	3/11/1978	48	1.21	1.20
			154.29	11/25/1985	47	1.23	1.23
			156.23	1/18/1952	46	1.26	1.25
			157.41	12/18/1967	45	1.29	1.28
			159.36	1/14/1969	44	1.32	1.31
			161.93	2/6/1969	43	1.35	1.34
			166.51	2/17/1971	42	1.38	1.38
			171.03	2/8/1976	41	1.41	1.41
			172.21	12/31/1976	40	1.45	1.44
			173.43	5/8/1977	39	1.49	1.48
			175.33	1/6/1979	38	1.53	1.52
			175.33	3/1/1981	37	1.57	1.56
			177.48	3/17/1982	36	1.61	1.61
			178.41	3/24/1983	35	1.66	1.65
			183.14	11/25/1983	34	1.71	1.70
			189.79	1/18/1993	33	1.76	1.75
			190.11	3/11/1995	32	1.81	1.81
			190.24	12/28/2004	31	1.87	1.87
			191.53	2/21/2005	30	1.93	1.93
			192.58	2/21/2005	29	2.00	2.00
			193.15	2/3/1958	28	2.07	2.07
			205.16	3/6/1975	27	2.15	2.15
			208.63	2/25/1981	26	2.23	2.23
			212.2	3/1/1983	25	2.32	2.33
			216.47	11/17/1986	24	2.42	2.42
			219.89	12/4/1987	23	2.52	2.53
			220.08	4/21/1988	22	2.64	2.65
			227.15	1/31/1993	21	2.76	2.78
			232.82	2/14/1995	20	2.90	2.92
			233.11	12/23/1995	19	3.05	3.08
			239.62	1/12/1960	18	3.22	3.25
			240.96	3/8/1968	17	3.41	3.45
			249.19	12/4/1974	16	3.63	3.67
			256.24	3/16/1986	15	3.87	3.92
			259.36	11/5/1987	14	4.14	4.21
			270.2	1/10/1955	13	4.46	4.54
			270.29	1/10/1978	12	4.83	4.93
			271.25	1/25/1995	11	5.27	5.40
			284.79	10/27/2004	10	5.80	5.96
			285.34	11/21/1967	9	6.44	6.65
			286.65	2/28/1970	8	7.25	7.53
			290.95	11/16/1972	7	8.29	8.67
			315.65	1/31/1979	6	9.67	10.21
			353.3	2/24/1998	5	11.60	12.43
			359.23	12/29/2004	4	14.50	15.89
			366.06	2/20/1980	3	19.33	22.00
			406.99	3/7/1952	2	29.00	35.75
			421.47	12/10/1965	1	58.00	95.33

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

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

T	Cunnane	Weibull				Period of Return	
10	309.63	319.18	Peaks	Date	Position	Weibull	Cunnane
9	293.02	300.78	141.63	1/13/1952	57	1.02	1.01
8	284.67	286.16	146.07	1/18/1952	56	1.04	1.03
7	282.34	282.51	146.08	1/18/1952	55	1.05	1.05
6	281.39	281.58	146.56	12/20/1952	54	1.07	1.07
5	269.42	269.89	146.92	1/10/1955	53	1.09	1.09
4	255.48	255.91	149.16	1/7/1957	52	1.12	1.11
3	231.29	231.50	149.87	1/20/1962	51	1.14	1.13
2	189.71	189.71	150.28	4/8/1965	50	1.16	1.15
			152.21	3/22/1954	49	1.18	1.18
			152.26	12/5/1957	48	1.21	1.20
			154.26	1/12/1960	47	1.23	1.23
			154.49	12/2/1961	46	1.26	1.25
			157.64	11/20/1963	45	1.29	1.28
			160.35	12/5/1966	44	1.32	1.31
			160.4	1/14/1969	43	1.35	1.34
			165.05	12/21/2002	42	1.38	1.38
			169.28	2/14/2003	41	1.41	1.41
			170.86	2/22/2004	40	1.45	1.44
			172.25	3/7/1952	39	1.49	1.48
			172.46	3/16/1958	38	1.53	1.52
			174.31	3/1/1981	37	1.57	1.56
			176.56	3/17/1982	36	1.61	1.61
			176.81	2/2/1983	35	1.66	1.65
			181.28	3/1/1983	34	1.71	1.70
			187.58	11/25/1985	33	1.76	1.75
			188.91	3/1/1991	32	1.81	1.81
			188.97	2/19/1993	31	1.87	1.87
			189.26	3/11/1995	30	1.93	1.93
			189.71	3/11/1995	29	2.00	2.00
			190.55	2/3/1998	28	2.07	2.07
			203.12	2/8/1998	27	2.15	2.15
			205.5	2/12/2003	26	2.23	2.23
			207.84	3/5/2005	25	2.32	2.33
			215.23	12/30/1951	24	2.42	2.42
			216.85	3/16/1952	23	2.52	2.53
			222.92	3/16/1986	22	2.64	2.65
			223.65	1/14/1990	21	2.76	2.78
			230.5	1/15/1993	20	2.90	2.92
			232.02	1/25/1995	19	3.05	3.08
			236.78	1/25/1995	18	3.22	3.25
			236.92	11/22/1996	17	3.41	3.45
			245.67	10/27/2004	16	3.63	3.67
			254.87	12/29/2004	15	3.87	3.92
			257.02	1/3/2005	14	4.14	4.21
			266.13	3/6/1975	13	4.46	4.54
			269.12	1/10/1978	12	4.83	4.93
			271.15	1/14/1978	11	5.27	5.40
			281.34	1/11/2001	10	5.80	5.96
			282.12	3/2/1983	9	6.44	6.65
			282.68	11/5/1987	8	7.25	7.53
			287.48	11/21/1967	7	8.29	8.67
			313.19	2/28/1970	6	9.67	10.21
			347.91	11/16/1972	5	11.60	12.43
			355.47	1/31/1979	4	14.50	15.89
			363.73	1/4/1995	3	19.33	22.00
			399.95	2/21/2005	2	29.00	35.75
			411.78	12/10/1965	1	58.00	95.33

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

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

Elevation vs. Area

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

Elevation vs Discharge

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

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

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

Stage -Area

Depth	Area (sf)
0	29865
1	32381
2	34956
3	37590
4	40282
5	43034
6	45844
7	48715
8	51343

Basin #1 Discharge

Discharge vs Elevation Table

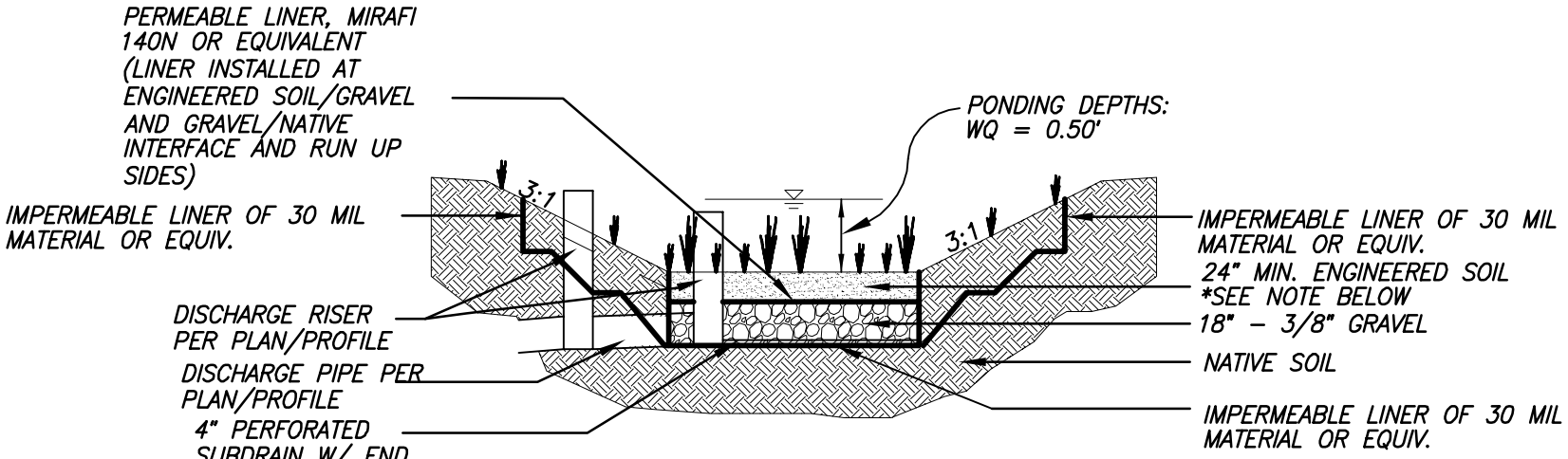
Low orifice:	4.5 "	Top orifice:	8 "	
Number:	3	Number:	0	
Cg-low:	0.61	Cg-low:	0.61	
invert elev:	0.50 ft	invert elev:	0.00 ft	
Middle orifice:	3 "	Emergency inlet:		
number of orif:	0	Rim height:	5.25 ft	
Cg-middle:	0.61	Area	16.00 sq ft	<--- 4' x 4'
invert elev:	3.50 ft	Circumference	16.00 ft	

h (ft)	H/D-low -	H/D-mid -	H/D-top -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qtop-orif (cfs)	Qtop-weir (cfs)	Qtot-top (cfs)	Qemerg (cfs)	Qtot (cfs)
0.0	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.1	0.00	0.00	0.15	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.2	0.00	0.00	0.30	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.3	0.00	0.00	0.45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.4	0.00	0.00	0.60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.5	0.00	0.00	0.75	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.6	0.27	0.00	0.90	0.000	0.060	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060
0.7	0.53	0.00	1.05	0.181	0.223	0.223	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.223
0.8	0.80	0.00	1.20	0.544	0.462	0.462	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.462
0.9	1.07	0.00	1.35	0.748	0.744	0.744	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.744
1.0	1.33	0.00	1.50	0.907	1.035	0.907	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.907
1.1	1.60	0.00	1.65	1.042	1.305	1.042	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.042
1.2	1.87	0.00	1.80	1.161	1.528	1.161	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.161
1.3	2.13	0.00	1.95	1.269	1.687	1.269	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.269
1.4	2.40	0.00	2.10	1.369	1.778	1.369	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.369
1.5	2.67	0.00	2.25	1.462	1.812	1.462	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.462
1.6	2.93	0.00	2.40	1.549	1.820	1.549	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.549
1.7	3.20	0.00	2.55	1.632	1.855	1.632	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.632
1.8	3.47	0.00	2.70	1.711	1.994	1.711	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.711
1.9	3.73	0.00	2.85	1.786	2.346	1.786	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.786
2.0	4.00	0.00	3.00	1.858	3.050	1.858	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.858
2.1	4.27	0.00	3.15	1.928	4.282	1.928	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.928
2.2	4.53	0.00	3.30	1.995	6.257	1.995	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.995
2.3	4.80	0.00	3.45	2.060	9.231	2.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.060
2.4	5.07	0.00	3.60	2.123	13.508	2.123	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.123
2.5	5.33	0.00	3.75	2.184	19.439	2.184	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.184
2.6	5.60	0.00	3.90	2.243	27.430	2.243	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.243
2.7	5.87	0.00	4.05	2.301	37.940	2.301	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.301
2.8	6.13	0.00	4.20	2.357	51.490	2.357	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.357
2.9	6.40	0.00	4.35	2.413	68.660	2.413	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.413
3.0	6.67	0.00	4.50	2.467	90.099	2.467	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.467
3.1	6.93	0.00	4.65	2.519	116.525	2.519	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.519
3.2	7.20	0.00	4.80	2.571	148.726	2.571	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.571
3.3	7.47	0.00	4.95	2.622	187.568	2.622	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.622
3.4	7.73	0.00	5.10	2.671	233.997	2.671	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.671
3.5	8.00	0.00	5.25	2.720	289.039	2.720	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.720
3.6	8.27	0.40	5.40	2.768	353.808	2.768	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.768
3.7	8.53	0.80	5.55	2.815	429.507	2.815	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.815
3.8	8.80	1.20	5.70	2.862	517.431	2.862	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.862
3.9	9.07	1.60	5.85	2.907	618.972	2.907	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.907
4.0	9.33	2.00	6.00	2.952	735.619	2.952	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.952
4.1	9.60	2.40	6.15	2.996	868.966	2.996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.996
4.2	9.87	2.80	6.30	3.040	1020.713	3.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.040
4.3	10.13	3.20	6.45	3.083	1192.669	3.083	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.083
4.4	10.40	3.60	6.60	3.125	1386.754	3.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.125
4.5	10.67	4.00	6.75	3.167	1605.007	3.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.167
4.6	10.93	4.40	6.90	3.208	1849.584	3.208	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.208
4.7	11.20	4.80	7.05	3.249	2122.766	3.249	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.249
4.8	11.47	5.20	7.20	3.289	2426.957	3.289	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.289
4.9	11.73	5.60	7.35	3.329	2764.694	3.329	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.329
5.0	12.00	6.00	7.50	3.368	3138.644	3.368	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.368
5.1	12.27	6.40	7.65	3.407	3551.611	3.407	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.407
5.2	12.53	6.80	7.80	3.446	4006.540	3.446	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.446
5.3	12.80	7.20	7.95	3.483	4506.518	3.483	0.000	0.000	0.000	0.000	0.000	0.000	0.555	4.038
5.4	13.07	7.60	8.10	3.521	5054.776	3.521	0.000	0.000	0.000	0.000	0.000	0.000	2.881	6.403
5.5	13.33	8.00	8.25	3.558	5654.697	3.558	0.000	0.000	0.000	0.000	0.000	0.000	6.200	9.758
5.6	13.60	8.40	8.40	3.595	6309.817	3.595	0.000	0.000	0.000	0.000	0.000	0.000	10.270	13.865
5.7	13.87	8.80	8.55	3.631	7023.827	3.631	0.000	0.000	0.000	0.000	0.000	0.000	14.973	18.604
5.8	14.13	9.20	8.70	3.667	7800.578	3.667	0.000	0.000	0.000	0.000	0.000	0.000	20.231	23.899
5.9	14.40	9.60	8.85	3.703	8644.084	3.703	0.000	0.000	0.000	0.000	0.000	0.000	25.993	29.696
6.0	14.67	10.00	9.00	3.738	9558.525	3.738	0.000	0.000	0.000	0.000	0.000	0.000	32.216	35.955
6.1	14.93	10.40	9.15	3.774	10548.252	3.774	0.000	0.000	0.000	0.000	0.000	0.000	38.870	42.643
6.2	15.20	10.80	9.30	3.808	11617.787	3.808	0.000	0.000	0.000	0.000	0.000	0.000	45.927	49.735
6.3	15.47	11.20	9.45	3.843	12771.830	3.843	0.000	0.000	0.000	0.000	0.000	0.000	53.366	57.209
6.4	15.73	11.60	9.60	3.877	14015.259	3.877	0.000	0.000	0.000	0.000	0.000	0.000	61.169	65.045
6.5	16.00	12.00	9.75	3.910	15353.137	3.910	0.000	0.000	0.000	0.000	0.000	0.000	69.318	73.229

6.6	16.27	12.40	9.90	3.944	16790.711	3.944	0.000	0.000	0.000	0.000	0.000	0.000	77.800	81.744
6.7	16.53	12.80	10.05	3.977	18333.420	3.977	0.000	0.000	0.000	0.000	0.000	0.000	86.603	90.580
6.8	16.80	13.20	10.20	4.010	19986.894	4.010	0.000	0.000	0.000	0.000	0.000	0.000	95.715	99.725
6.9	17.07	13.60	10.35	4.043	21756.962	4.043	0.000	0.000	0.000	0.000	0.000	0.000	100.609	104.651
7.0	17.33	14.00	10.50	4.075	23649.649	4.075	0.000	0.000	0.000	0.000	0.000	0.000	103.612	107.688
7.1	17.60	14.40	10.65	4.107	25671.188	4.107	0.000	0.000	0.000	0.000	0.000	0.000	106.532	110.639
7.2	17.87	14.80	10.80	4.139	27828.014	4.139	0.000	0.000	0.000	0.000	0.000	0.000	109.373	113.512
7.3	18.13	15.20	10.95	4.171	30126.773	4.171	0.000	0.000	0.000	0.000	0.000	0.000	112.142	116.313
7.4	18.40	15.60	11.10	4.202	32574.327	4.202	0.000	0.000	0.000	0.000	0.000	0.000	114.845	119.047
7.5	18.67	16.00	11.25	4.234	35177.750	4.234	0.000	0.000	0.000	0.000	0.000	0.000	117.485	121.719
7.6	18.93	16.40	11.40	4.264	37944.339	4.264	0.000	0.000	0.000	0.000	0.000	0.000	120.068	124.332
7.7	19.20	16.80	11.55	4.295	40881.613	4.295	0.000	0.000	0.000	0.000	0.000	0.000	122.596	126.891
7.8	19.47	17.20	11.70	4.326	43997.318	4.326	0.000	0.000	0.000	0.000	0.000	0.000	125.073	129.399
7.9	19.73	17.60	11.85	4.356	47299.429	4.356	0.000	0.000	0.000	0.000	0.000	0.000	127.502	131.858
8.0	20.00	18.00	12.00	4.386	50796.155	4.386	0.000	0.000	0.000	0.000	0.000	0.000	129.885	134.271

LID Outlet #1			
ABMP=	29,865.00	sq-ft	(Area above engineered fill/bio-retention section)
			(It can also be area of infiltration at the bottom)
Cg=	0.61		(coefficient of discharge of the bottom orifice)
Dorif=	3.5	in	(diameter in inches of the bottom orifice)
Aorifice=	0.06681	sq-ft	(area of orifice in sq-ft)
$C_{SWMM=}$	0.1366		C coefficient to be inserted into SWMM
H-gravel=	2	ft	Depth of the gravel layer where water is ponding
	24	in	(In this case: superior bottom - mulch - ammended soil - invert of French drain)
	20.5	in	
H-design=	1.708	ft	H-gravel minus radius of the discharge
$Q_{orif\text{-}classic}$=	0.42749	cfs	
$Q_{orif\text{-}SWMM}$=	0.42749	cfs	
$Q_{diversion}$=	0.43176	cfs	1% additional to the Qorifice.

ATTACHMENT 5 - Bio Retention Details



*"ENGINEERED SOIL" LAYER SHALL BE MINIMUM 18" DEEP "SANDY LOAM" SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50–60% SAND, 20–30% COMPOST, AND 20–30% TOPSOIL.

NOTE: BOTTOM OF FLOW THROUGH PLANTER (EXPOSED VEGETATED GRADE AND LINED SUB BASE) SHALL BE SLOPED AT 1% MINIMUM IN DIRECTION OF OUTFALL (TOWARD STREET).

SOIL SECTION FOR WATER QUALITY/HYDROMODIFICATION BIOFILTRATION BASIN (PRIVATE)

NOT TO SCALE

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

Village 4 POC 1 DMA Calculations					
Pre-Developed Condition					
POC	Neighborhood	% Imperviousness	Total Area	Pervious Area	Impervious Area
1	Natural	0%	484.83	484.83	0.00
1	Village 2 South	47%	263.50	140.00	123.50
1	Village 7	58%	136.52	57.34	79.18
1	Village 8 West	75%	218.90	54.73	164.18
1	Total	33%	1103.75	736.89	366.86

Village 4 POC 1 DMA Calculations					
Post-Developed Condition					
POC	Neighborhood	% Imperviousness	Total Area	Pervious Area	Impervious Area
1-Direct	Natural	0%	419.52	419.52	0.00
1-Direct	Village 2 South	47%	263.50	140.00	123.50
1-Direct	Village 7	58%	136.52	57.34	79.18
1-Direct	Village 8 West	75%	218.90	54.73	164.18
1-Direct	1-Direct-SubTotal	35%	1038.44	671.58	366.86
1-via Basin	Slope - Developed	0%	0.66	0.66	0.00
1-via Basin	Basin	0%	0.93	0.93	0.00
1-via Basin	Roadway - Developed	40.51%	65.54	38.99	26.55
1-via Basin	1-Basin- SubTotal	39.55%	67.13	40.58	26.55
1-Total	1-Total-Total	36%	1105.57	712.16	393.41

Village 4 POC1 Watershed Parameters		
Watershed #1-EX		
L=	11439	ft
A=	1103.75	ac
% Impervious	33.2%	
W=	4203	ft
US Elev=	532	ft
DS Elev=	195	ft
S=	2.95%	
Watershed #1 (via Basin)-PR		
L=	4471	ft
A=	66.20	ac
% Impervious	40.1%	
W=	645	ft
US Elev=	550	ft
DS Elev=	290	ft
S=	5.82%	
Basin #1		
L=	365	ft
A=	0.93	ac
W=	111	
US Elev=	284.00	ft
DS Elev=	283.50	ft
S=	0.1%	
Watershed #1 (Non-Basin)-PR		
L=	11439	ft
A=	1038.44	ac
% Impervious	35.33%	
W=	3954	ft
US Elev=	532	ft
DS Elev=	195	ft
S=	2.95%	

LID Outlet #1			
ABMP=	29,865.00	sq-ft	(Area above engineered fill/bio-retention section)
			(It can also be area of infiltration at the bottom)
Cg=	0.61		(coefficient of discharge of the bottom orifice)
Dorif=	3.5	in	(diameter in inches of the bottom orifice)
Aorifice=	0.06681	sq-ft	(area of orifice in sq-ft)
$C_{SWMM=}$	0.1366		C coefficient to be inserted into SWMM
H-gravel=	2	ft	Depth of the gravel layer where water is ponding
	24	in	(In this case: superior bottom - mulch - ammended soil - invert of French drain)
	20.5	in	
H-design=	1.708	ft	H-gravel minus radius of the discharge
$Q_{orif\text{-}classic}$=	0.42749	cfs	
$Q_{orif\text{-}SWMM}$=	0.42749	cfs	
$Q_{diversion}$=	0.43176	cfs	1% additional to the Qorifice.

ATTACHMENT 7 - SWMM Screens and Explanation of Significant Variables

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

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

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

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

Description of model parameters and assumptions:

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

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

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

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

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

Suction Head – Soil capillary suction head (in)

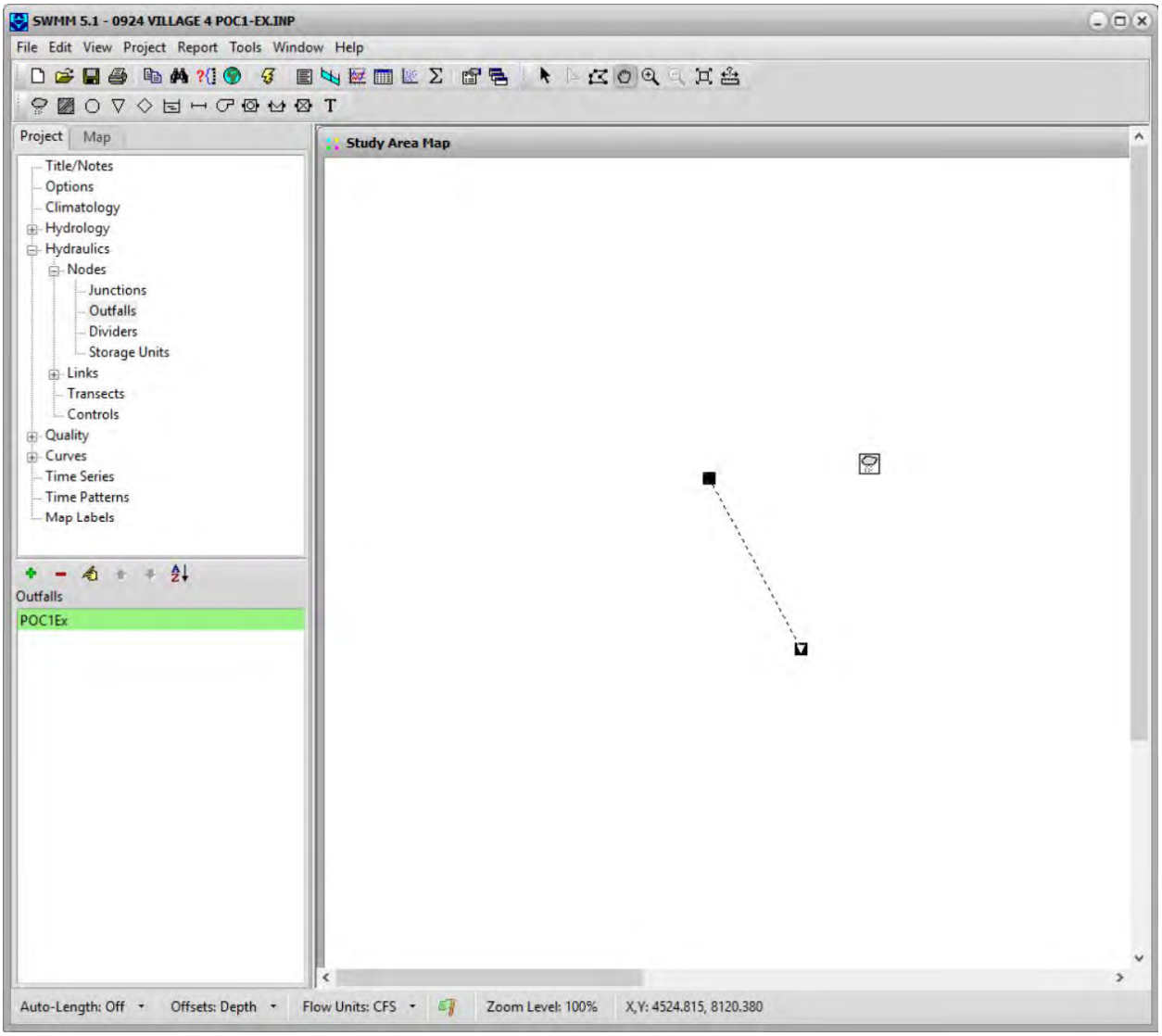
Conductivity – Soil saturated hydraulic comfuctivity (in/hr)
    -75% of these values if subcatchment is graded/compacted

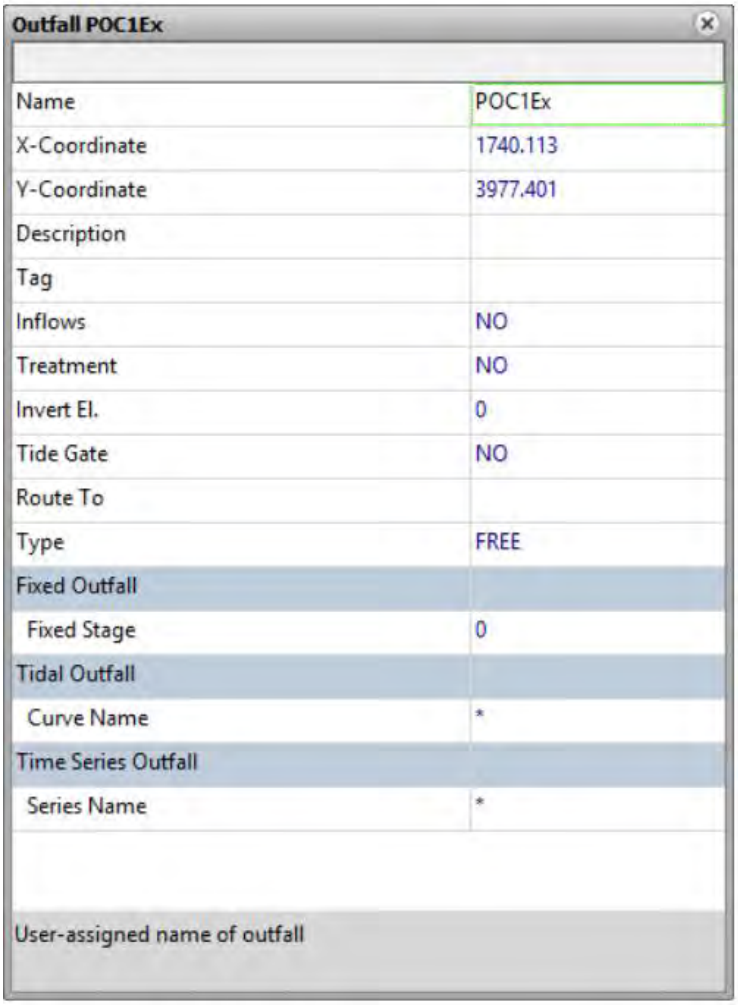
Initial Deficit – Initial moisture deficit (fraction)

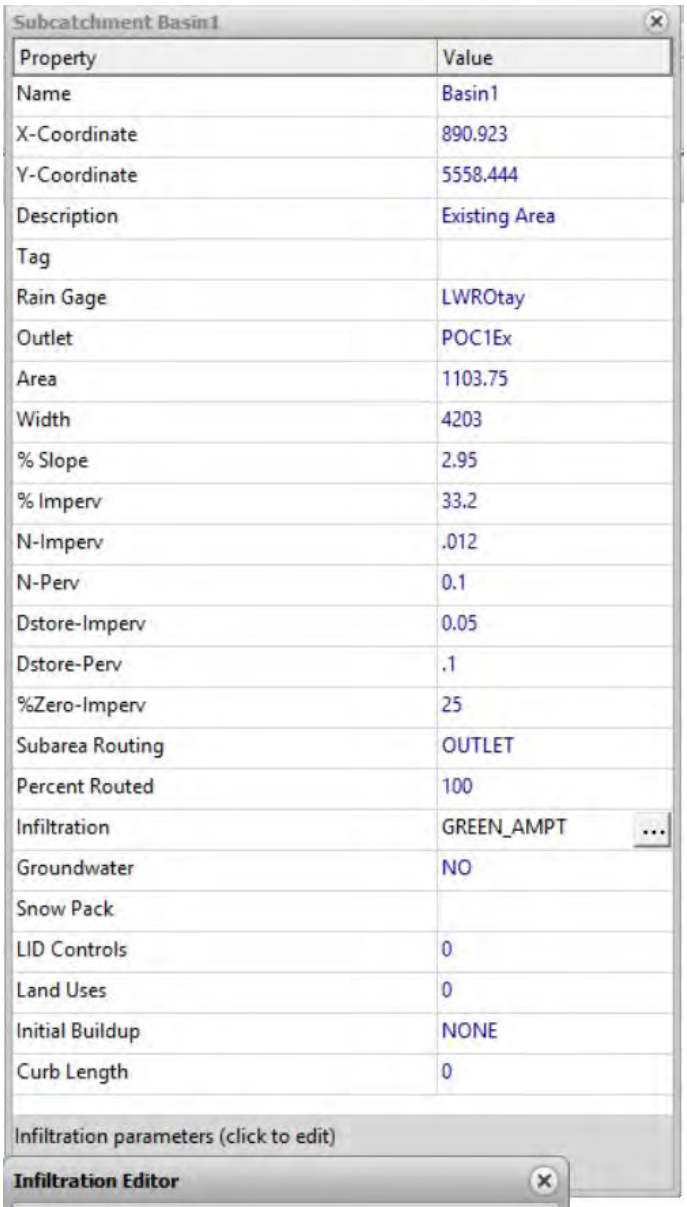
Soil Type	Suction Head	Conductivity	Initial Deficit
A	1.5	0.3	0.30
B	3	0.2	0.32
C	6	0.1	0.31
D	9	0.025	0.33

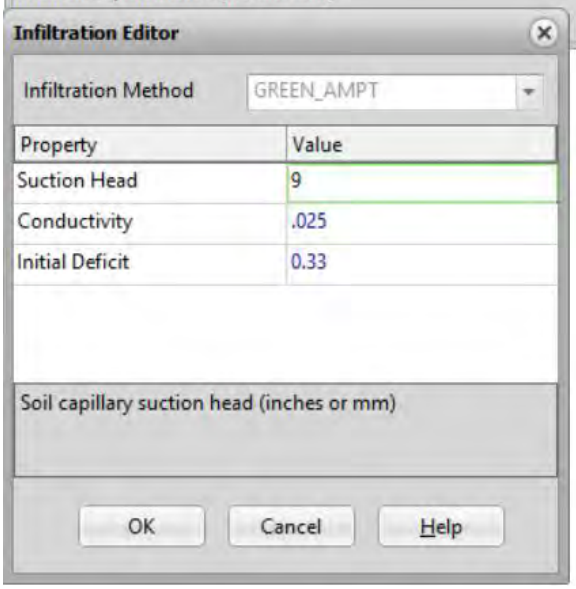
NOTE : These values are based on Maidment's Handbook of Hydrology, Orange County calibrations for SWMM and recommended values form the EPA SWMM program.

POC 1 – Pre-Developed Condition

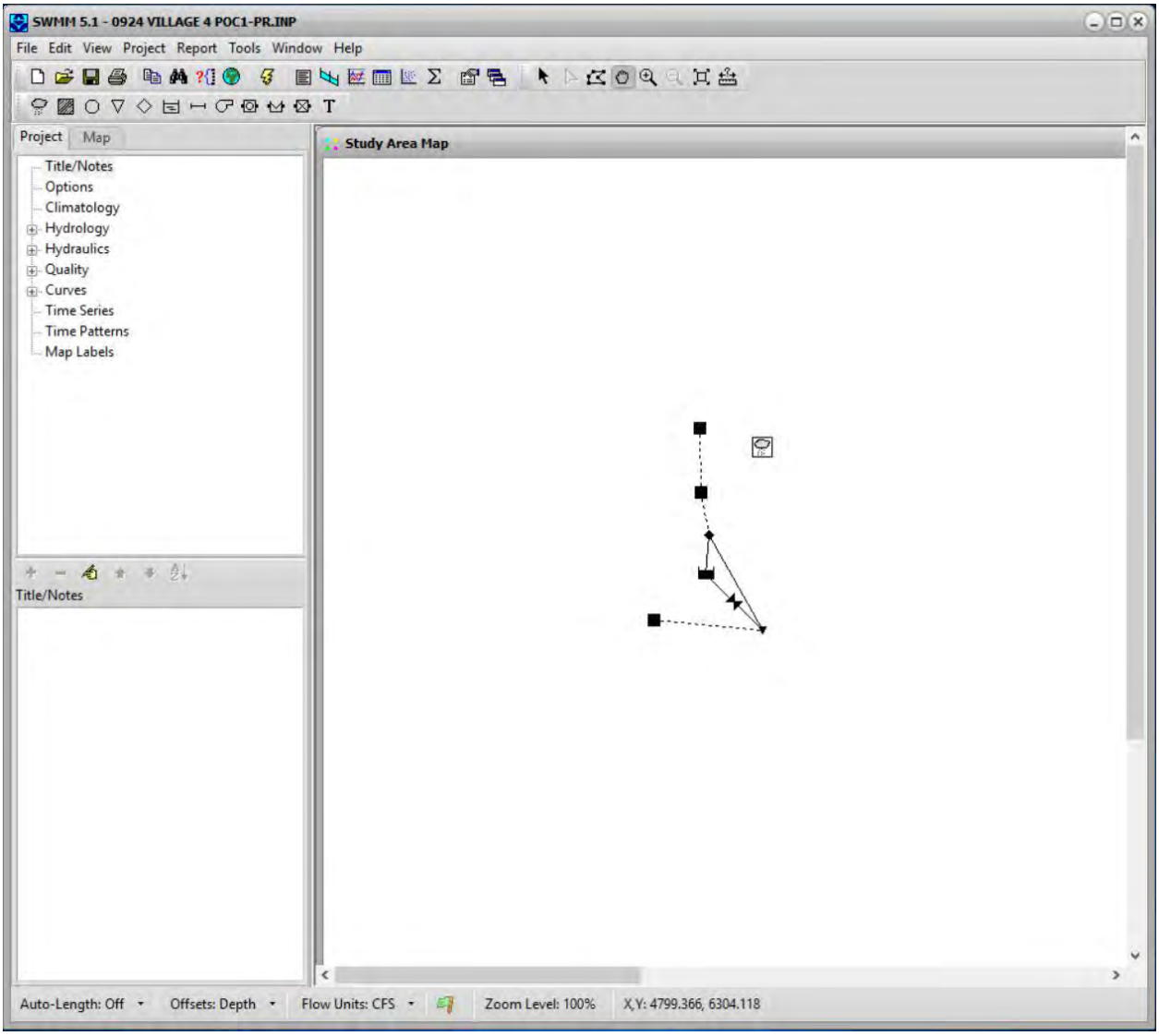


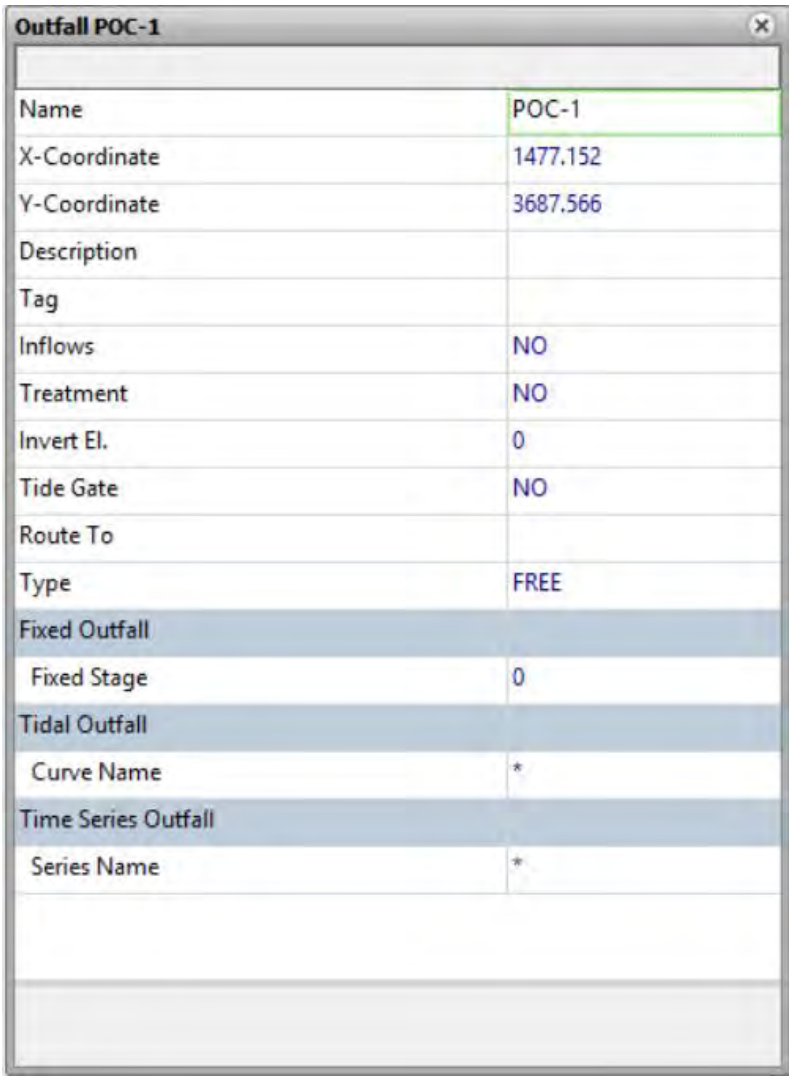

Outfall POC1Ex
Name
POC1Ex
X-Coordinate
1740.113
Y-Coordinate
3977.401
Description
Tag
Inflows
NO
Treatment
NO
Invert El.
0
Tide Gate
NO
Route To
Type
FREE
Fixed Outfall
Fixed Stage
0
Tidal Outfall
Curve Name
*
Time Series Outfall
Series Name
*
User-assigned name of outfall

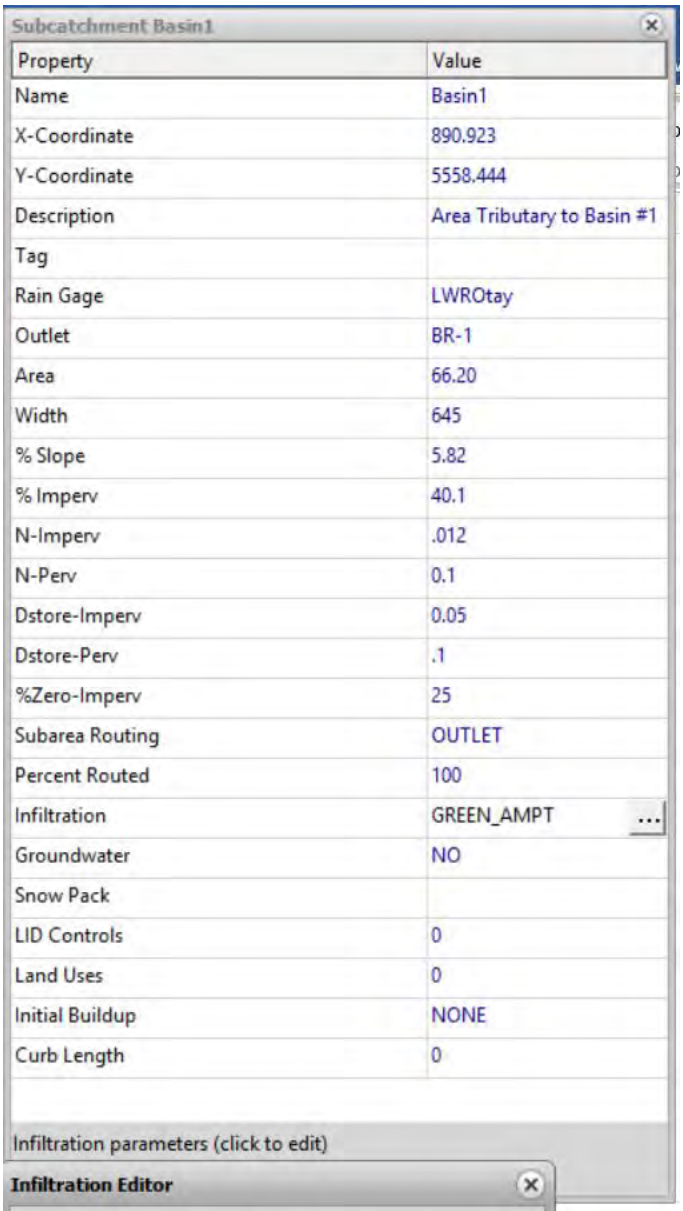

Subcatchment Basin1
Property
Value
Name
Basin1
X-Coordinate
890.923
Y-Coordinate
5558.444
Description
Existing Area
Tag
Rain Gage
LWROtay
Outlet
POC1Ex
Area
1103.75
Width
4203
% Slope
2.95
% Imperv
33.2
N-Imperv
.012
N-Perv
0.1
Dstore-Imperv
0.05
Dstore-Perv
.1
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
Groundwater
NO
Snow Pack
LID Controls
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration parameters (click to edit)

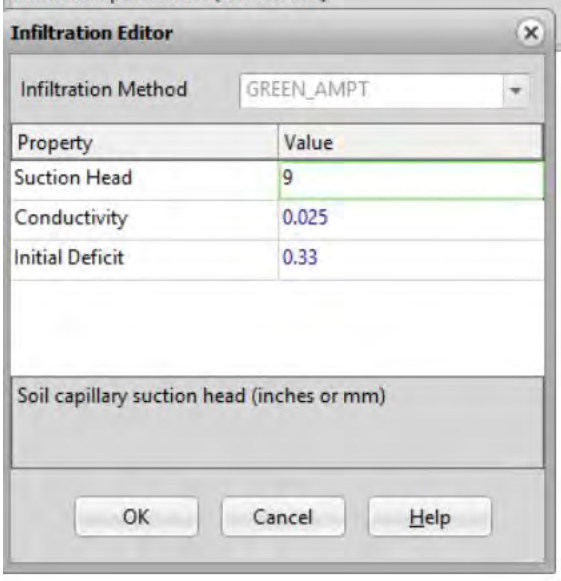

Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
9
Conductivity
.025
Initial Deficit
0.33
Soil capillary suction head (inches or mm)
OK
Cancel
Help

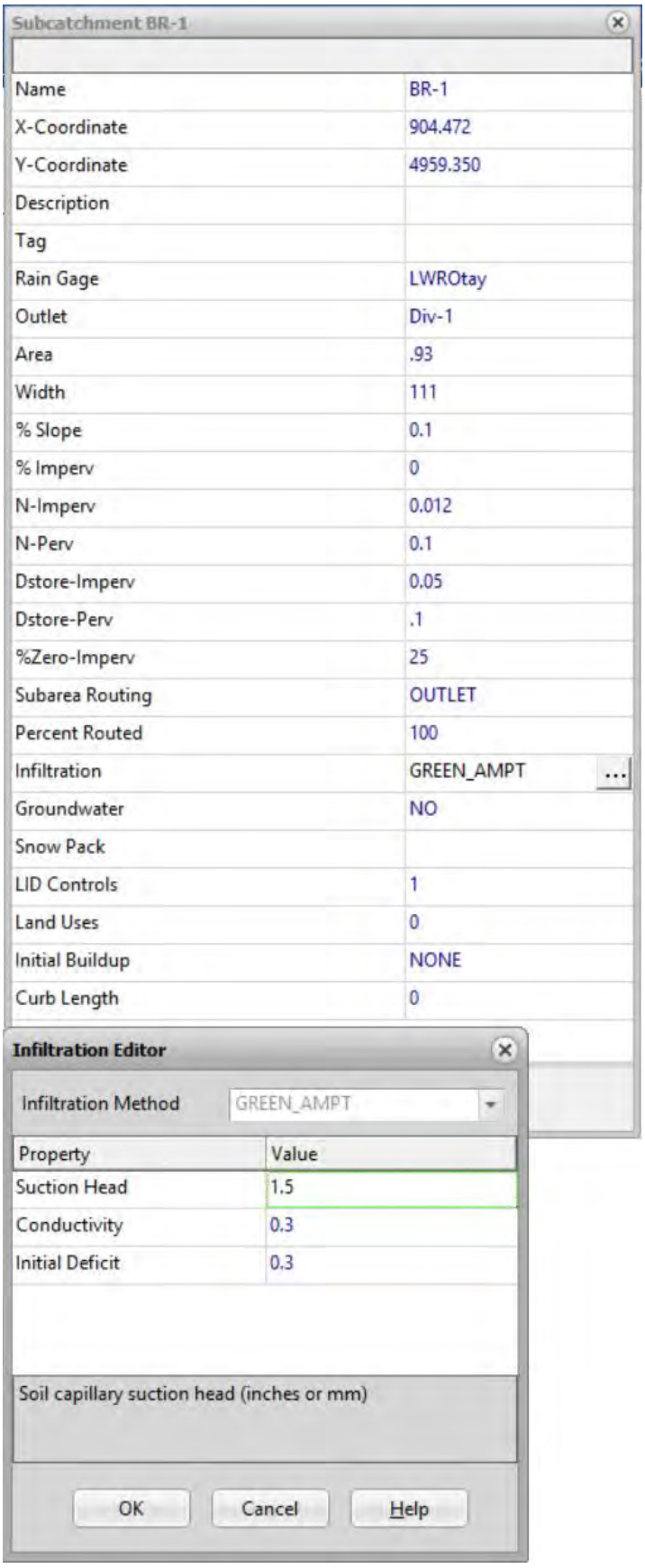
POC 1 – Developed Condition




Outfall POC-1
Name
POC-1
X-Coordinate
1477.152
Y-Coordinate
3687.566
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
*


Subcatchment Basin1
Property
Value
Name
Basin1
X-Coordinate
890.923
Y-Coordinate
5558.444
Description
Area Tributary to Basin #1
Tag
Rain Gage
LWROtay
Outlet
BR-1
Area
66.20
Width
645
% Slope
5.82
% Imperv
40.1
N-Imperv
.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 parameters (click to edit)


Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
9
Conductivity
0.025
Initial Deficit
0.33
Soil capillary suction head (inches or mm)
OK
Cancel
Help

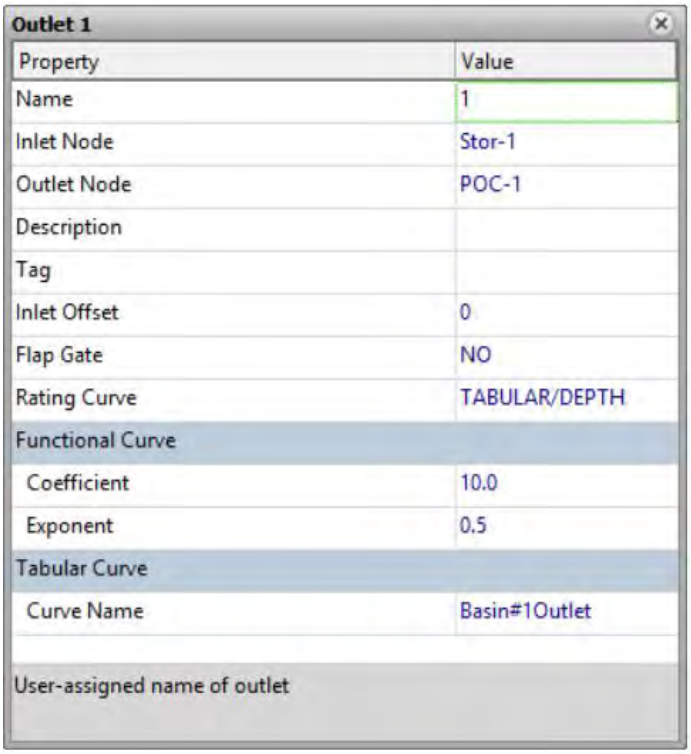

Subcatchment BR-1
Name BR-1
X-Coordinate 904.472
Y-Coordinate 4959.350
Description
Tag
Rain Gage LWROtay
Outlet Div-1
Area .93
Width 111
% Slope 0.1
% Imperv 0
N-Imperv 0.012
N-Perv 0.1
Dstore-Imperv 0.05
Dstore-Perv .1
%Zero-Imperv 25
Subarea Routing OUTLET
Percent Routed 100
Infiltration GREEN_AMPT
Groundwater NO
Snow Pack
LID Controls 1
Land Uses 0
Initial Buildup NONE
Curb Length 0
Infiltration Editor
Infiltration Method GREEN_AMPT
Property Value
Suction Head 1.5
Conductivity 0.3
Initial Deficit 0.3
Soil capillary suction head (inches or mm)
OK
Cancel
Help

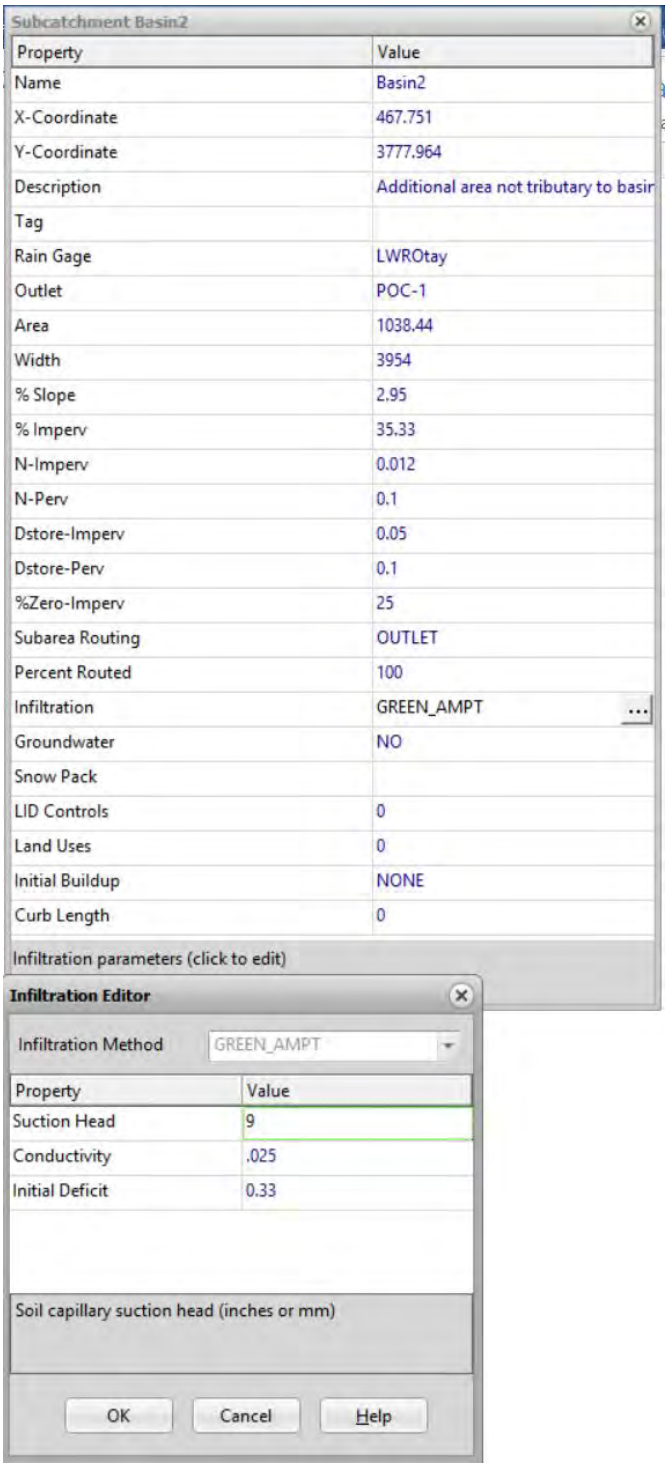
Divider Div-1

Property	Value
Name	Div-1
X-Coordinate	981.151
Y-Coordinate	4560.296
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	0
Initial Depth	0
Surcharge Depth	0
Ponded Area	0
Diverted Link	Bypass-1
Type	CUTOFF
Cutoff Divider	
Cutoff Flow	0.43176
Tabular Divider	
Curve Name	*
Weir Divider	
Min. Flow	0
Max. Depth	0
Coefficient	0

Storage Unit Stor-1

Name	Stor-1
X-Coordinate	947.368
Y-Coordinate	4198.830
Description	Basin #1
Tag	
Inflows	NO
Treatment	NO
Invert El.	282
Max. Depth	7.5
Initial Depth	0
Ponded Area	37936
Evap. Factor	1
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Basin#1


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


Subcatchment Basin2
Property
Value
Name
Basin2
X-Coordinate
467.751
Y-Coordinate
3777.964
Description
Additional area not tributary to basir
Tag
Rain Gage
LWROtay
Outlet
POC-1
Area
1038.44
Width
3954
% Slope
2.95
% Imperv
35.33
N-Imperv
0.012
N-Perv
0.1
Dstore-Imperv
0.05
Dstore-Perv
0.1
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
Groundwater
NO
Snow Pack
LID Controls
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration parameters (click to edit)
Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
9
Conductivity
.025
Initial Deficit
0.33
Soil capillary suction head (inches or mm)
OK
Cancel
Help


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

EXPLANATION OF SELECTED VARIABLES

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

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

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

Sub-catchments BR-1 & Basin1:

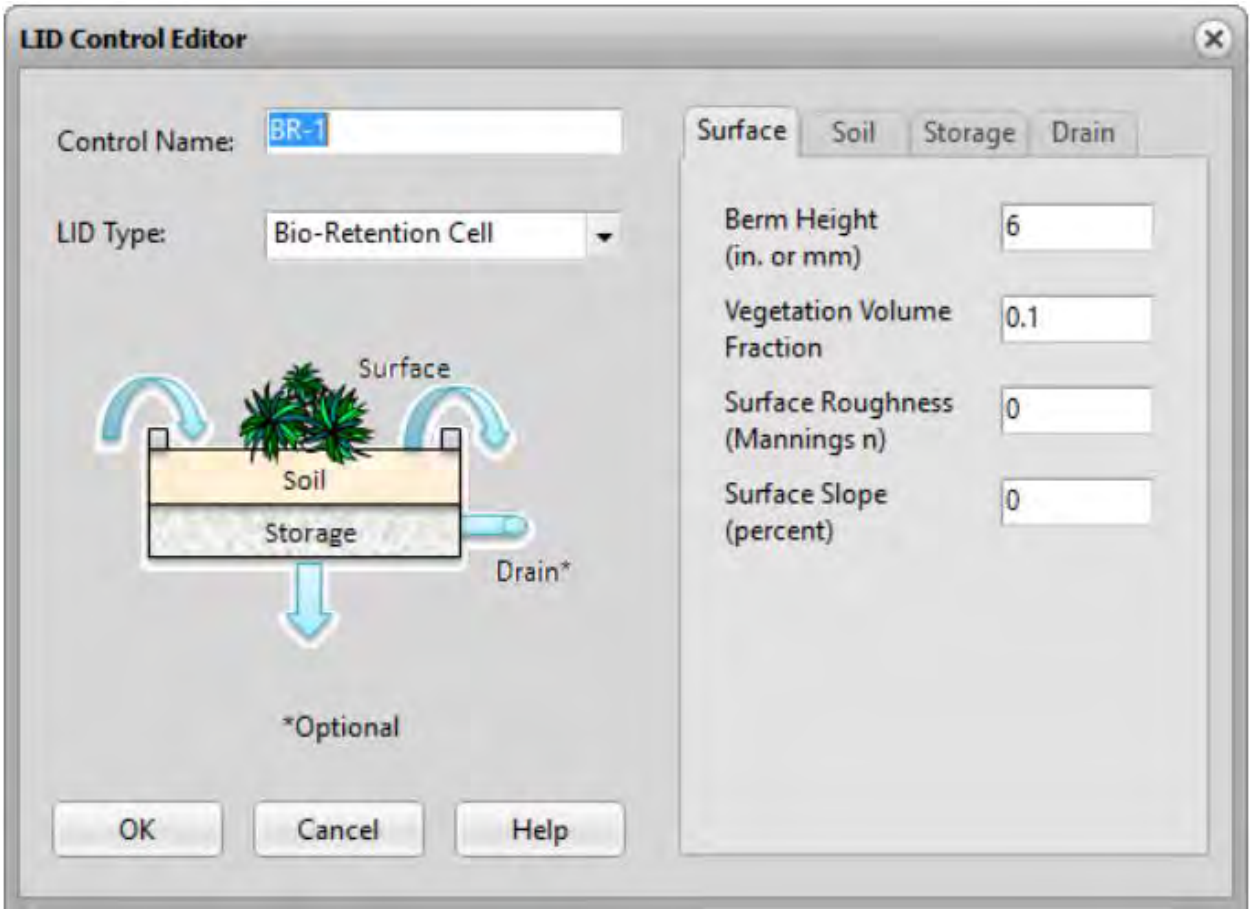
The area of Subcatchment Basin 1 + BR-1 must be equal to the area of the development tributary to that particular bio-retention facility. Five (5) decimal places were given regarding the areas of the bio-retention to insure that the area used by the program for the LID subroutine corresponds exactly with these tributaries.

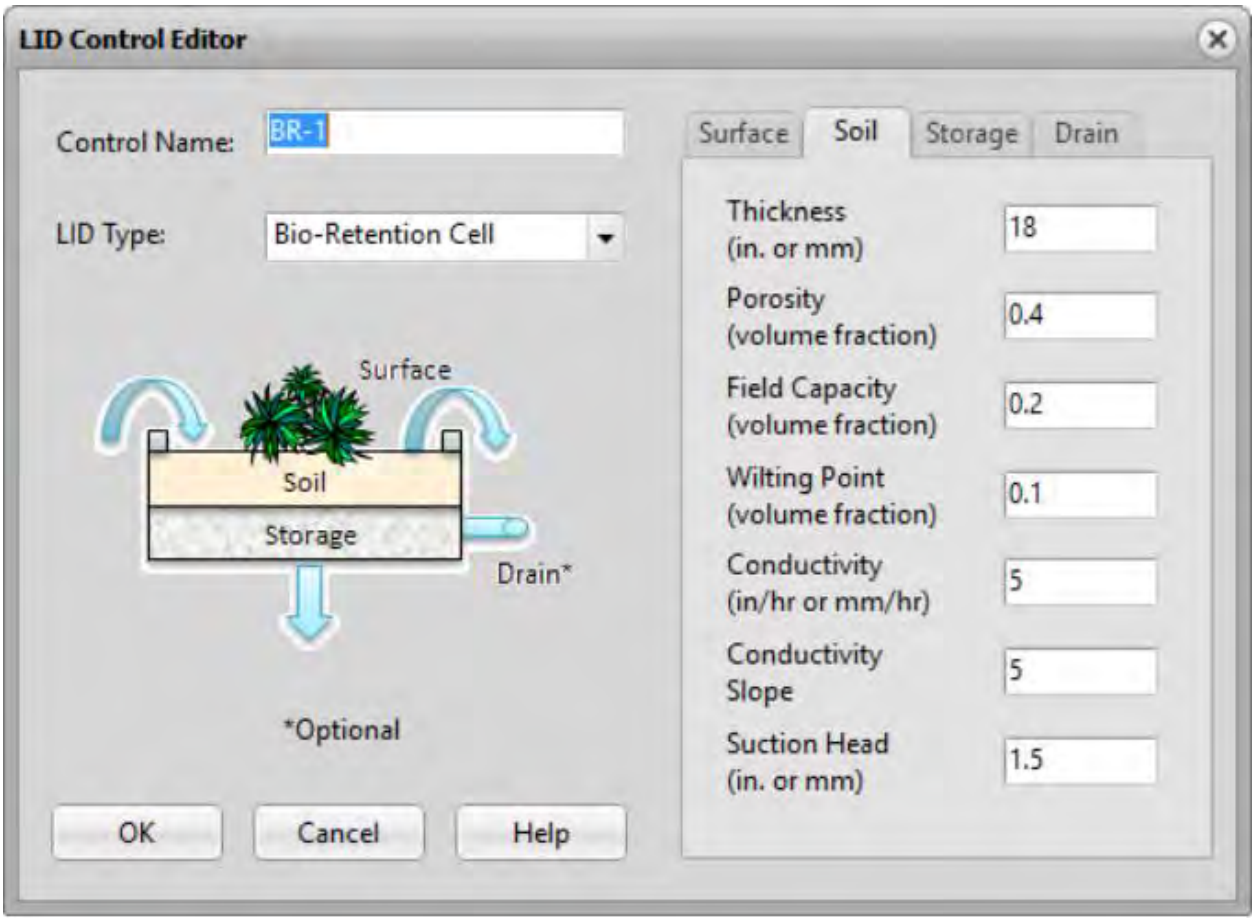
BIORETENTION 1

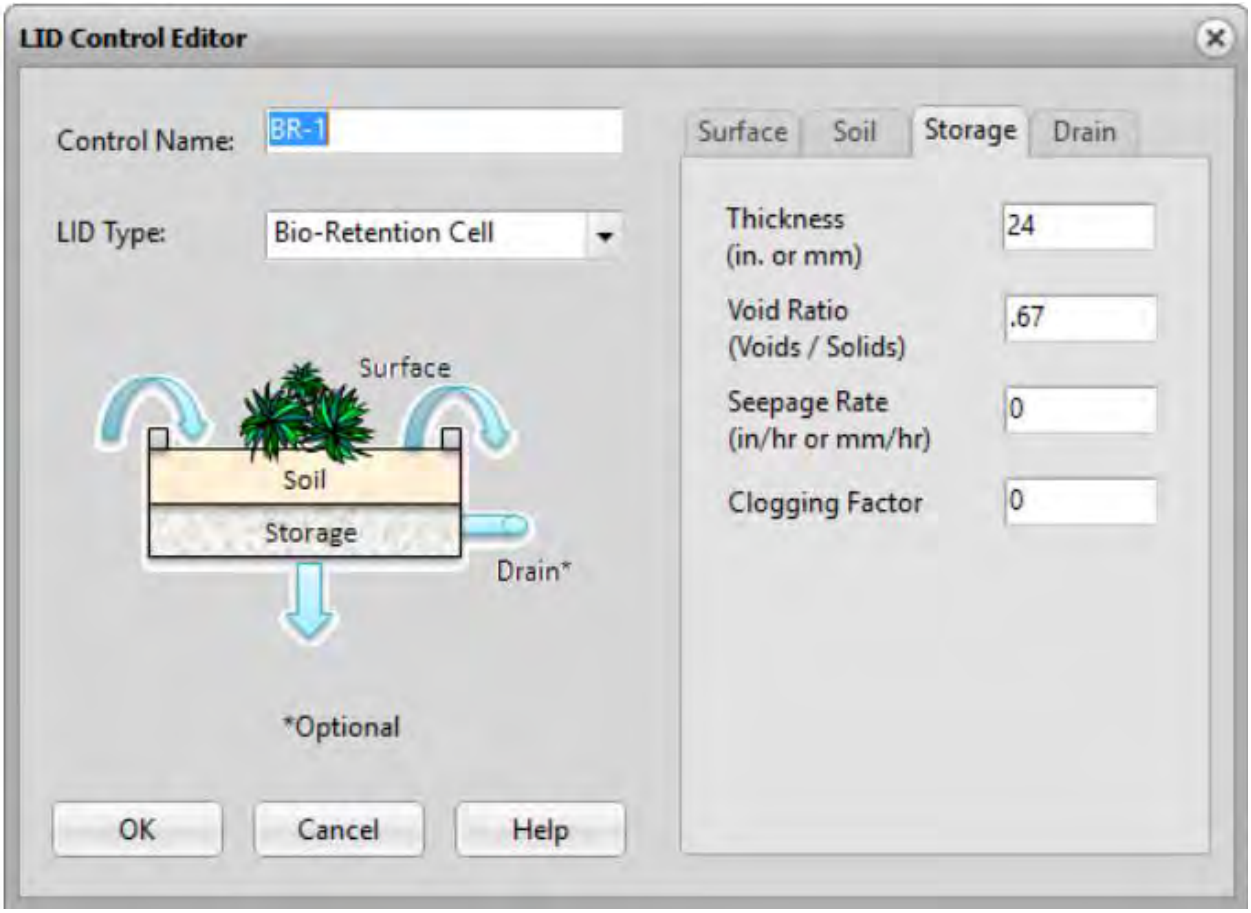
Subcatchment BR-1

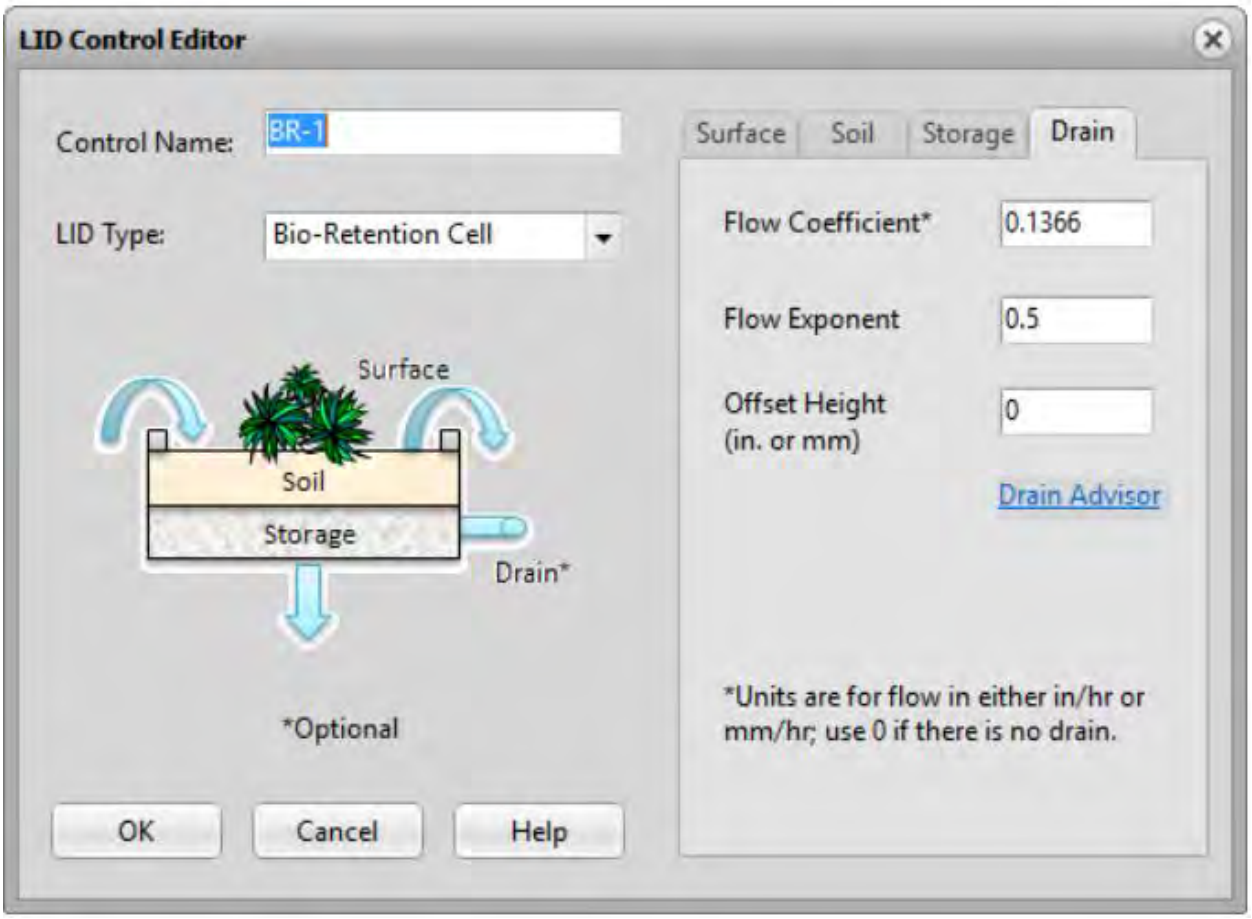
Property	Value
Name	BR-1
X-Coordinate	904.472
Y-Coordinate	4959.350
Description	
Tag	
Rain Gage	LWROtay
Outlet	Div-1
Area	.93
Width	111
% Slope	0.1
% Imperv	0
N-Imperv	0.012
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment


LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Berm Height (in. or mm)
6
Vegetation Volume Fraction
0.1
Surface Roughness (Mannings n)
0
Surface Slope (percent)
0


LID Control Editor
Control Name:
BR-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:
BR-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
24
Void Ratio
(Voids / Solids)
.67
Seepage Rate
(in/hr or mm/hr)
0
Clogging Factor
0


LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help
Surface
Soil
Storage
Drain
Flow Coefficient*
0.1366
Flow Exponent
0.5
Offset Height
(in. or mm)
0
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 engineered soil and mulch components of the bioretention facility. This storage volume is comprised of a gravel located bed beneath a layer of engineered soil and a 0.25 foot (3-inch) layer of landscaping mulch.

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

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

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

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

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

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

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

The general orifice equation can be expressed as:

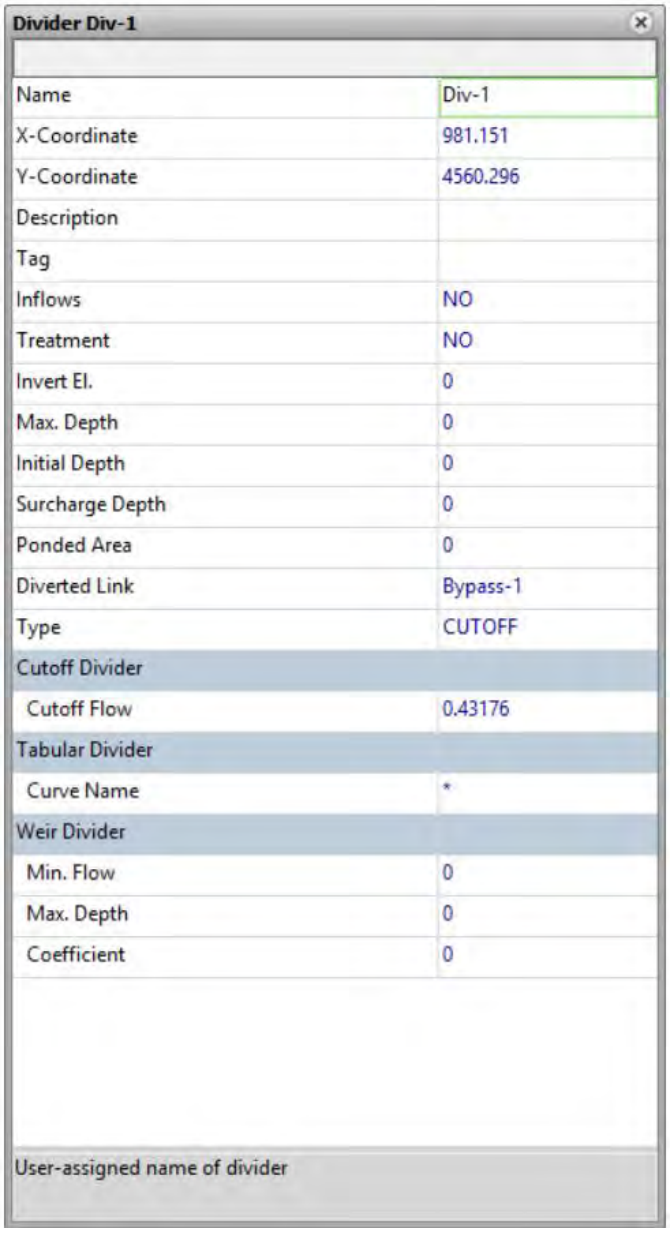
$$Q = \frac{\pi}{4} c_g \frac{D^2}{144} \sqrt{2g \frac{(H - H_D)}{12}} \qquad (2)$$

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

Cutoff Flow:

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

LID Outlet #1			
ABMP=	29,865.00	sq-ft	(Area above engineered fill/bio-retention section)
			(It can also be area of infiltration at the bottom)
Cg=	0.61		(coefficient of discharge of the bottom orifice)
Dorif=	3.5	in	(diameter in inches of the bottom orifice)
Aorifice=	0.06681	sq-ft	(area of orifice in sq-ft)
$C_{SWMM=}$	0.1366		C coefficient to be inserted into SWMM
H-gravel=	2	ft	Depth of the gravel layer where water is ponding
	24	in	(In this case: superior bottom - mulch - ammended soil - invert of French drain)
	20.5	in	
H-design=	1.708	ft	H-gravel minus radius of the discharge
$Q_{orif\text{-}classic}$=	0.42749	cfs	
$Q_{orif\text{-}SWMM}$=	0.42749	cfs	
$Q_{diversion}$=	0.43176	cfs	1% additional to the Qorifice.



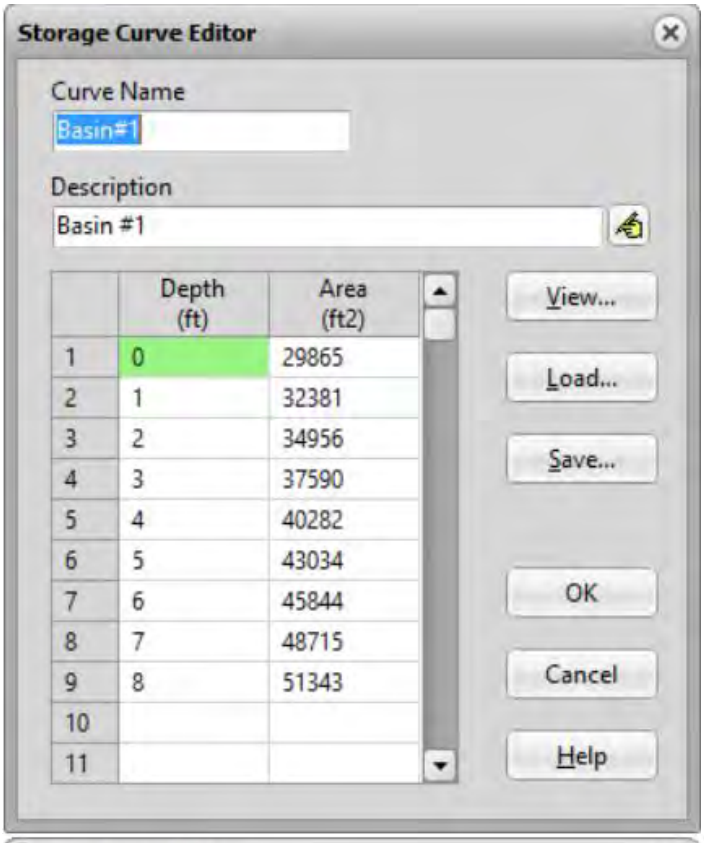
Note:
The complete storage and rating curves and the respective explanation is shown at the end of this appendix. A variable area vs. elevation storage curve was used for the final model, and a discharge that is a function of the outlet structure in the surface was used also.

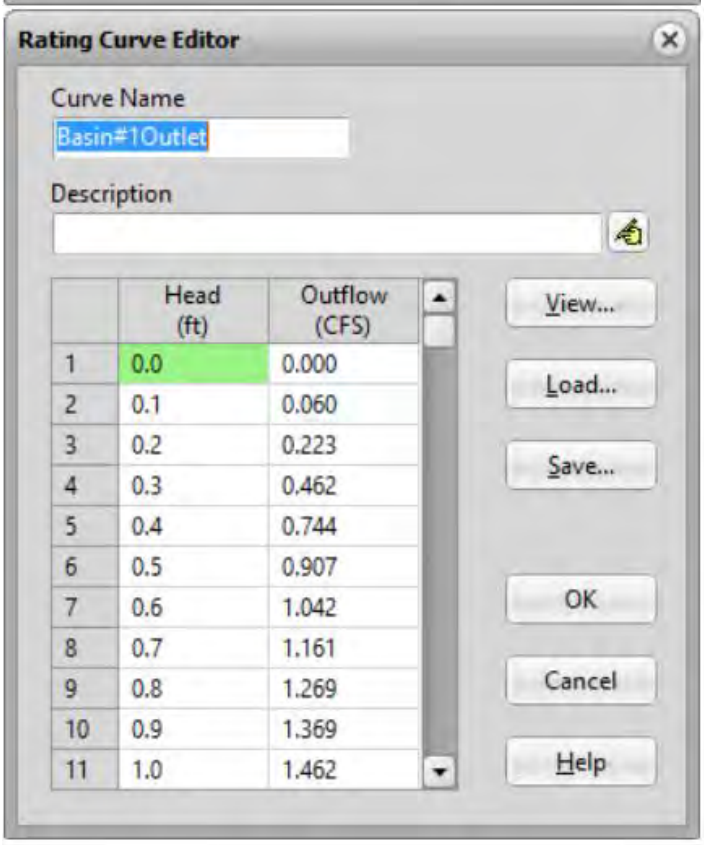
BIORETENTION 1

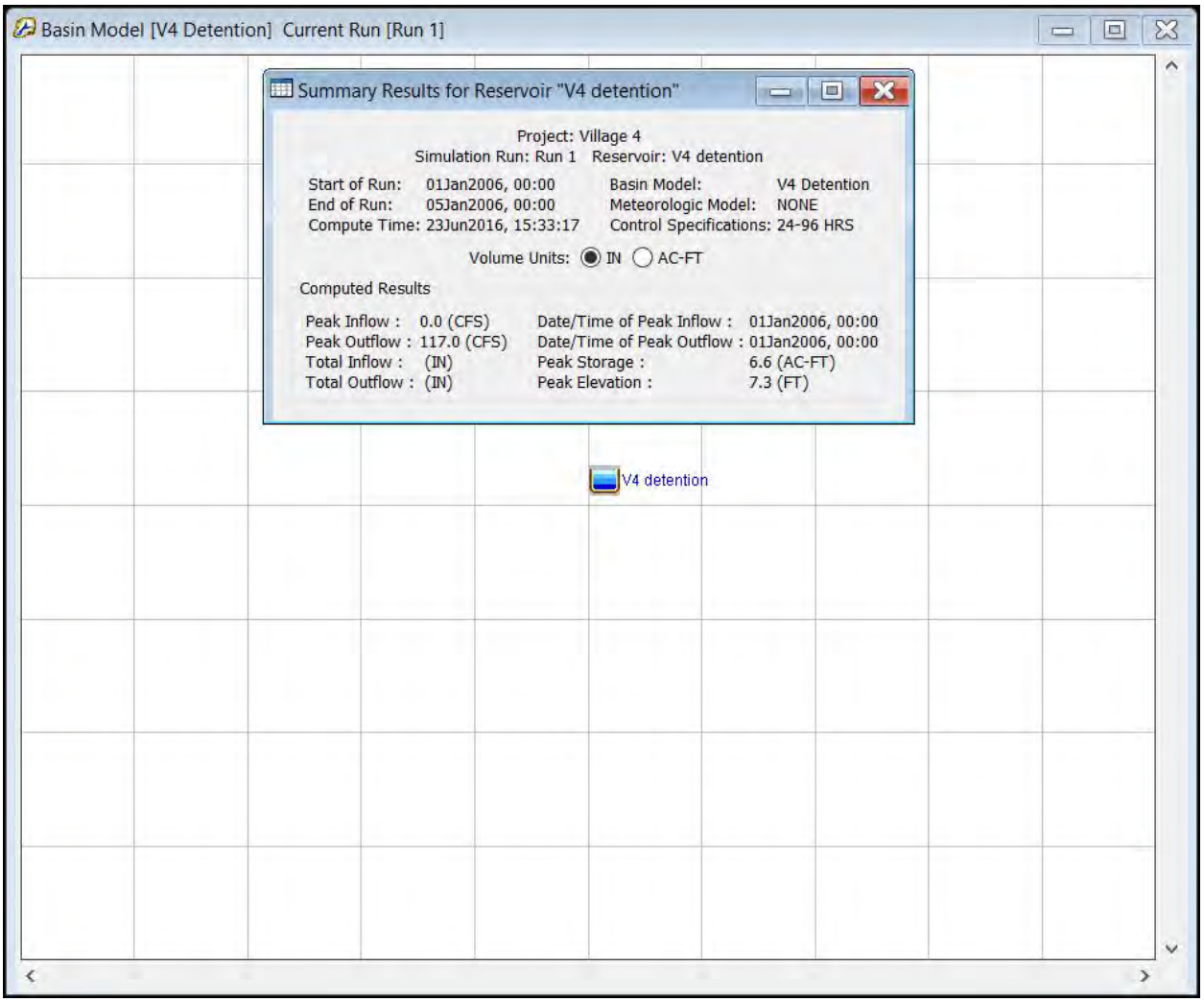
Storage Unit Stor-1

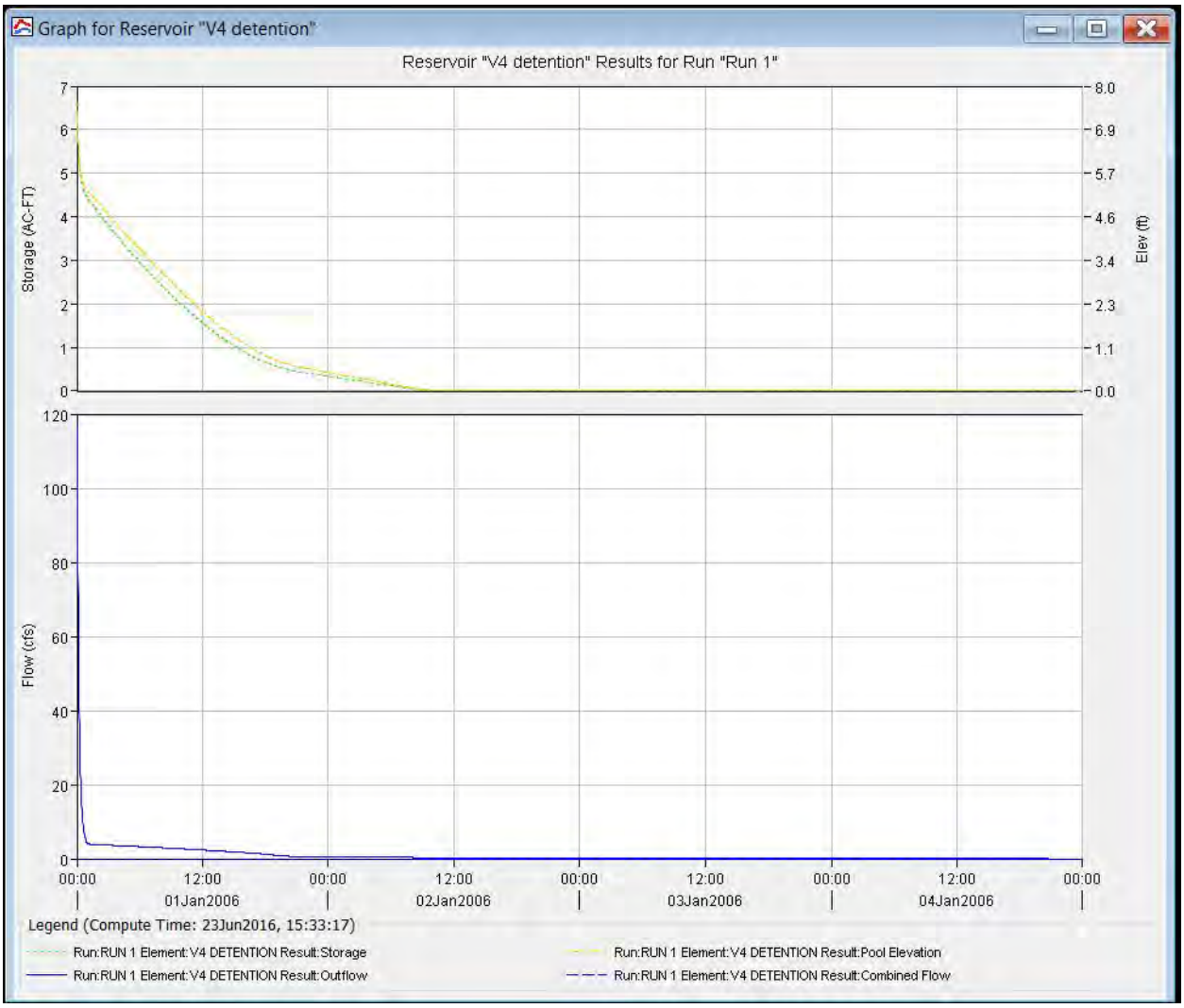
Property	Value
Name	Stor-1
X-Coordinate	947.368
Y-Coordinate	4198.830
Description	Basin #1
Tag	
Inflows	NO
Treatment	NO
Invert El.	282
Max. Depth	7.5
Initial Depth	0
Ponded Area	37936
Evap. Factor	1
Seepage Loss	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Basin#1

User-assigned name of storage unit


Storage Curve Editor
Curve Name
Basin#1
Description
Basin #1
Depth (ft)
Area (ft2)
1 0 29865
2 1 32381
3 2 34956
4 3 37590
5 4 40282
6 5 43034
7 6 45844
8 7 48715
9 8 51343
10
11
View...
Load...
Save...
OK
Cancel
Help


Rating Curve Editor
Curve Name
Basin#1Outlet
Description
Head (ft)
Outflow (CFS)
1 0.0 0.000
2 0.1 0.060
3 0.2 0.223
4 0.3 0.462
5 0.4 0.744
6 0.5 0.907
7 0.6 1.042
8 0.7 1.161
9 0.8 1.269
10 0.9 1.369
11 1.0 1.462
View...
Load...
Save...
OK
Cancel
Help


Basin Model [V4 Detention] Current Run [Run 1]
Summary Results for Reservoir "V4 detention"
Project: Village 4
Simulation Run: Run 1 Reservoir: V4 detention
Start of Run: 01Jan2006, 00:00
End of Run: 05Jan2006, 00:00
Compute Time: 23Jun2016, 15:33:17
Basin Model: V4 Detention
Meteorologic Model: NONE
Control Specifications: 24-96 HRS
Volume Units: IN AC-FT
Computed Results
Peak Inflow : 0.0 (CFS)
Peak Outflow : 117.0 (CFS)
Total Inflow : (IN)
Total Outflow : (IN)
Date/Time of Peak Inflow : 01Jan2006, 00:00
Date/Time of Peak Outflow : 01Jan2006, 00:00
Peak Storage : 6.6 (AC-FT)
Peak Elevation : 7.3 (FT)
V4 detention


Graph for Reservoir "V4 detention"
Reservoir "V4 detention" Results for Run "Run 1"
Storage (AC-FT)
Elev (ft)
Flow (cfs)
00:00
12:00
01Jan2006
02Jan2006
03Jan2006
04Jan2006
Legend (Compute Time: 23Jun2016, 15:33:17)
Run:RUN 1 Element:V4 DETENTION Result:Storage
Run:RUN 1 Element:V4 DETENTION Result:Pool Elevation
Run:RUN 1 Element:V4 DETENTION Result:Outflow
Run:RUN 1 Element:V4 DETENTION Result:Combined Flow

ATTACHMENT 2e
VECTOR CONTROL PLAN

NOT NECESSARY FOR THIS BASIN AS IT DRAINS WITHIN 96 HRS.

ATTACHMENT 3

Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

TABLE 7-2. Maintenance Indicators and Actions for Vegetated BMPs

Typical Maintenance Indicator(s) for Vegetated BMPs	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.
Overgrown vegetation	Mow or trim as appropriate, but not less than the design height of the vegetation per original plans when applicable (e.g. a vegetated swale may require a minimum vegetation height).
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.
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.
Standing water in vegetated swales	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. 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 bioretention, biofiltration with partial retention, or biofiltration areas, or flow-through planter boxes for longer than 96 hours following a storm event*	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains (where applicable), or repairing/replacing clogged or compacted soils.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.
*These BMPs typically include a surface ponding layer as part of their function which may take 96 hours to drain following a storm event.	

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Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	þ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Maintenance Agreement (when applicable)	• Included þ Not Applicable

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

þ Preliminary Design / Planning / CEQA level submittal:

Attachment 3a must identify:

þ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

- Final Design level submittal:

Attachment 3a must identify:

- Specific maintenance indicators and actions for proposed structural BMP(s). This shall 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 private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

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ATTACHMENT 3a
STRUCTURAL BMP MAINTENANCE THRESHOLDS

ATTACHMENT 3b

DRAFT MAINTENANCE AGREEMENT (WHEN APPLICABLE)

NOT APPLICABLE FOR PLANNING PHASE

ATTACHMENT 4

Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

INLCUDED ON CD LOCATED AT END OF ATTACHMENT 6

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

The plans must identify:

þ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs

þ 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 the [City Engineer]

þ 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)

þ All BMPs must be fully dimensioned on the plans

- When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number shall be provided. Photocopies of general brochures are not acceptable.

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ATTACHMENT 5

Copy of Project's Drainage Report

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ATTACHMENT 6

Copy of Project's Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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