K&S ENGINEERING, INC.
Planning Engineering Surveying

CITY OF CARLSBAD

PRIORITY DEVELOPMENT PROJECT (PDP)
STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)
FOR

VALLEY VIEW

MS 2018-0007

SDP 2018-007, HDP 2018-0004, GPA 2018-0001,
HMP 2018-0004 & ZC 2018-001

ENGINEER OF WORK:

2/27/2020

KAMAL S SWEIS RCE 48532 EXP 6/30/2020

PREPARED FOR:

LAND DEVELOPMENT, LLC
P. O. BOX #12409
EL CAJON, CA 92022
CONTACT: SOLOMON LEVY
TELEPHONE: 250.516.0445

PREPARED BY:

K&S ENGINEERING, INC
7801 MISSION CENTER COURT, SUITE 100
SAN DIEGO CA, 92108
(619) 296-5565
CONTACT: KAMAL S SWEIS

DATE:

DECEMBER 4, 2018

REVISION FEBRUARY 27, 2020

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CERTIFICATION PAGE

Project Name: VALLEY VIEW
Project ID: GPA 2018-0001

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the BMP Design Manual, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 (MS4 Permit) or the current Order.

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 SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design 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 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.

48592 6/30/2020

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

KAMAL S SWEIS

Print Name

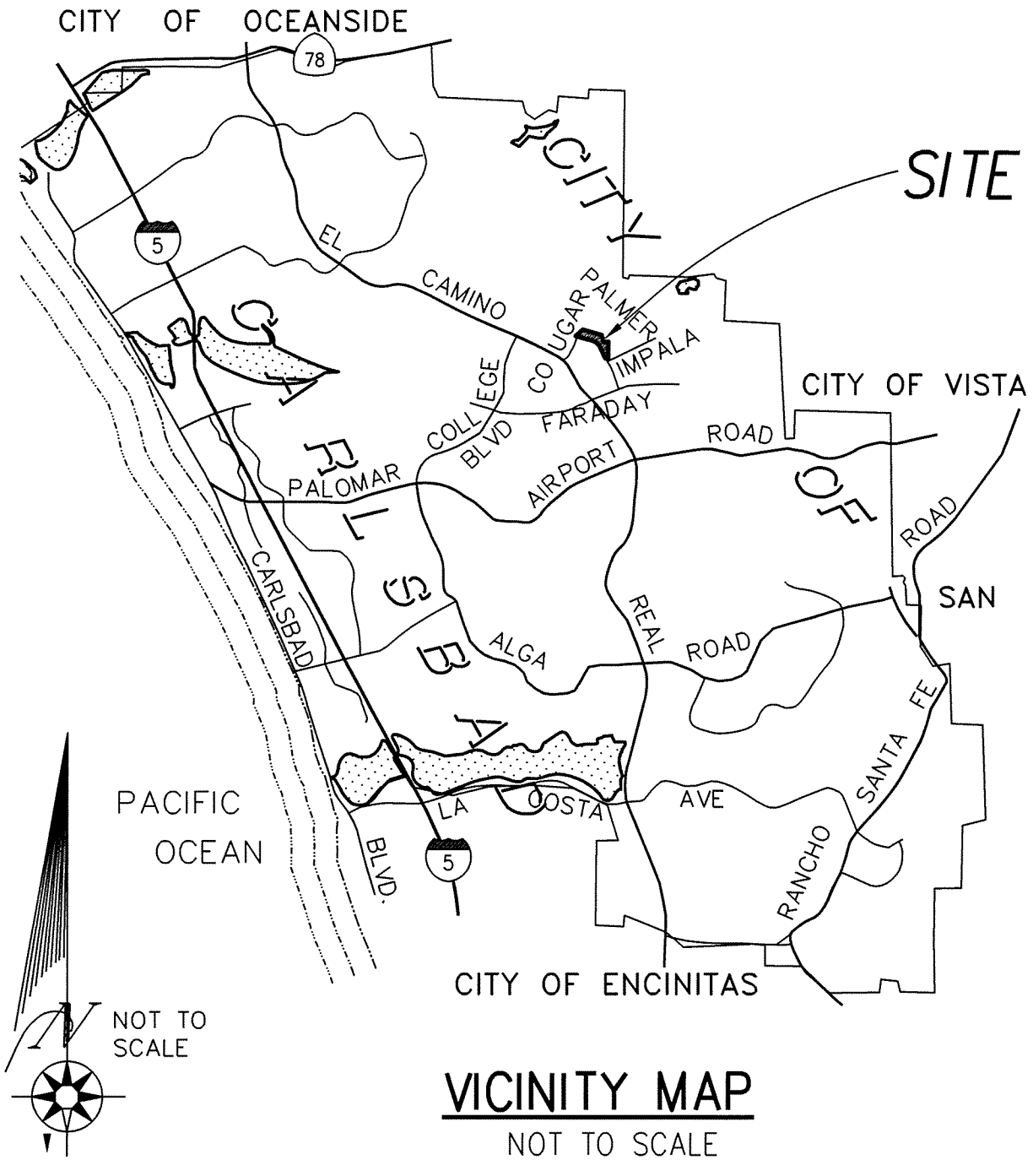
K & S ENGINEERING, INC.

Company

2/27/2020

Date

PROJECT VICINITY MAP



VICINITY MAP

NOT TO SCALE

STORM WATER STANDARDS QUESTIONNAIRE E-34

Development Services
Land Development Engineering
1635 Faraday Avenue
(760) 602-2750
www.carlsbadca.gov

INSTRUCTIONS:

To address post-development pollutants that may be generated from development projects, the city requires that new development and significant redevelopment priority projects incorporate Permanent Storm Water Best Management Practices (BMPs) into the project design per Carlsbad BMP Design Manual (BMP Manual). To view the BMP Manual, refer to the Engineering Standards (Volume 5).

This questionnaire must be completed by the applicant in advance of submitting for a development application (subdivision, discretionary permits and/or construction permits). The results of the questionnaire determine the level of storm water standards that must be applied to a proposed development or redevelopment project. Depending on the outcome, your project will either be subject to '**STANDARD PROJECT**' requirements or be subject to '**PRIORITY DEVELOPMENT PROJECT' (PDP)** requirements.

Your responses to the questionnaire represent an initial assessment of the proposed project conditions and impacts. City staff has responsibility for making the final assessment after submission of the development application. If staff determines that the questionnaire was incorrectly filled out and is subject to more stringent storm water standards than initially assessed by you, this will result in the return of the development application as incomplete. In this case, please make the changes to the questionnaire and resubmit to the city.

If you are unsure about the meaning of a question or need help in determining how to respond to one or more of the questions, please seek assistance from Land Development Engineering staff.

A completed and signed questionnaire must be submitted with each development project application. Only one completed and signed questionnaire is required when multiple development applications for the same project are submitted concurrently.

PROJECT INFORMATION	
PROJECT NAME: VALLEY VIEW	PROJECT ID: GPA 2018-0001
ADDRESS: Palmer Way, Carlsbad CA 92010	APN: 209-040-43-00
The project is (check one): ☑ New Development ☐ Redevelopment	RELATED PROJ. ID: MS 2018-0007 , SDP 2018-0007
The total proposed disturbed area is: 30,745 ft² (0.71) acres	
The total proposed newly created and/or replaced impervious area is: 24,234 ft² (0.56) acres	
If your project is covered by an approved SWQMP as part of a larger development project, provide the project ID and the SWQMP # of the larger development project: Project ID_____ SWQMP #: _____ Then, go to Step 1 and follow the instructions. When completed, sign the form at the end and submit this with your application to the city.	

STEP 1 TO BE COMPLETED FOR ALL PROJECTS		
To determine if your project is a "development project", please answer the following question:		
	YES	NO
Is your project LIMITED TO routine maintenance activity and/or repair/improvements to an existing building or structure that do not alter the size (See Section 1.3 of the BMP Design Manual for guidance)?	☐	☑
If you answered "yes" to the above question, provide justification below then **go to Step 5**, mark the third box stating "my project is **not a 'development project'** and not subject to the requirements of the BMP manual" and complete applicant information. Justification/discussion: (e.g. the project includes only interior remodels within an existing building): If you answered "no" to the above question, the project is a '**development project**', **go to Step 2**.		

STEP 2 TO BE COMPLETED FOR ALL DEVELOPMENT PROJECTS		
To determine if your project is exempt from PDP requirements pursuant to MS4 Permit Provision E.3.b.(3), please answer the following questions:		
Is your project LIMITED to one or more of the following:	YES	NO
1. Constructing new or retrofitting paved sidewalks, bicycle lanes or trails that meet the following criteria: a) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; b) Designed and constructed to be hydraulically disconnected from paved streets or roads; c) Designed and constructed with permeable pavements or surfaces in accordance with USEPA Green Streets guidance?	☐	☑
2. Retrofitting or redeveloping existing paved alleys, streets, or roads that are designed and constructed in accordance with the USEPA Green Streets guidance?	☐	☑
3. Ground Mounted Solar Array that meets the criteria provided in section 1.4.2 of the BMP manual?	☐	☑
If you answered "yes" to one or more of the above questions, provide discussion/justification below, then **go to Step 5**, mark the second box stating "my project is **EXEMPT** from PDP …" and complete applicant information. Discussion to justify exemption (e.g. the project redeveloping existing road designed and constructed in accordance with the USEPA Green Street guidance): If you answered "no" to the above questions, your project is not exempt from PDP, **go to Step 3**.		

STEP 3 TO BE COMPLETED FOR ALL NEW OR REDEVELOPMENT PROJECTS		
To determine if your project is a PDP, please answer the following questions (MS4 Permit Provision E.3.b.(1)):		
	YES	NO
1. Is your project 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.*	☑	☐
2. Is your project a redevelopment project creating and/or replacing 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 surface? *This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.*	☐	☑
3. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface collectively over the entire project site and supports a restaurant? A restaurant is a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812).	☐	☑
4. Is your project a new or redevelopment project that creates 5,000 square feet or more of impervious surface collectively over the entire project site and supports a hillside development project? A hillside development project includes development on any natural slope that is twenty-five percent or greater.	☑	☐
5. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface collectively over the entire project site and supports a parking lot? A parking lot is a land area or facility for the temporary parking or storage of motor vehicles used personally for business or for commerce.	☑	☐
6. Is your project a new or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface collectively over the entire project site and supports a street, road, highway freeway or driveway? *A street, road, highway, freeway or driveway is any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.*	☑	☐
7. Is your project a new or redevelopment project that creates and/or replaces 2,500 square feet or more of impervious surface collectively over the entire site, and discharges 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).**	☐	☑
8. Is your project a new development or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surface that supports an automotive repair shop? *An automotive repair shop is a facility that is categorized in any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.*	☐	☑
9. Is your project a new development or redevelopment project that creates and/or replaces 5,000 square feet or more of impervious area that supports a retail gasoline outlet (RGO)? *This category includes RGO's that meet the following criteria: (a) 5,000 square feet or more or (b) a project Average Daily Traffic (ADT) of 100 or more vehicles per day.*	☐	☑
10. Is your project a new or redevelopment project that results in the disturbance of one or more acres of land and are expected to generate pollutants post construction?	☐	☑
11. Is your project located within 200 feet of the Pacific Ocean and (1) creates 2,500 square feet or more of impervious surface or (2) increases impervious surface on the property by more than 10%? (CMC 21.203.040)	☐	☑
If you answered "yes" to one or more of the above questions, your project is a **PDP**. If your project is a redevelopment project, **go to step 4**. If your project is a new project, **go to step 5,** check the first box stating "My project is a **PDP** ..." and complete applicant information. If you answered "no" to all of the above questions, your project is a '**STANDARD PROJECT.**' **Go to step 5**, check the second box stating "My project is a 'STANDARD PROJECT'..." and complete applicant information.		

STEP 4
TO BE COMPLETED FOR REDEVELOPMENT PROJECTS THAT ARE PRIORITY DEVELOPMENT PROJECTS (PDP) ONLY

Complete the questions below regarding your redevelopment project (MS4 Permit Provision E.3.b.(2)):

	YES	NO
Does the redevelopment project result in the creation or replacement of impervious surface in an amount of less than 50% of the surface area of the previously existing development? Complete the percent impervious calculation below: Existing impervious area (A) = _____ sq. ft. Total proposed newly created or replaced impervious area (B) = _____ sq. ft. Percent impervious area created or replaced (B/A)*100 = _____ %	☐	☐

If you answered "yes", the structural BMPs required for PDP apply only to the creation or replacement of impervious surface and not the entire development. **Go to step 5,** check the first box stating "My project is a **PDP** ..." and complete applicant information.

If you answered "no," the structural BMP's required for PDP apply to the entire development. **Go to step 5**, check the check the first box stating "My project is a **PDP** ..." and complete applicant information.

STEP 5
CHECK THE APPROPRIATE BOX AND COMPLETE APPLICANT INFORMATION

☑ My project **is a PDP** and must comply with **PDP** stormwater requirements of the BMP Manual. I understand I must prepare a Storm Water Quality Management Plan **(SWQMP)** for submittal at time of application.

☐ My project **is a 'STANDARD PROJECT'** OR **EXEMPT** from PDP and must only comply with **'STANDARD PROJECT'** stormwater requirements of the BMP Manual. As part of these requirements, I will submit a "*Standard Project Requirement Checklist Form E-36*" and incorporate low impact development strategies throughout my project.

Note: For projects that are close to meeting the PDP threshold, staff may require detailed impervious area calculations and exhibits to verify if 'STANDARD PROJECT' stormwater requirements apply.

☐ My Project is **NOT a 'development project'** and is not subject to the requirements of the BMP Manual.

Applicant Information and Signature Box

Applicant Name: LAND DEVELOPMENT, LLC - SOLOMON LEVY Applicant Title: SOLE MEMBER

Applicant Signature: _____ Date: 5/18/18

* Environmentally Sensitive Areas include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); water bodies designated with the RARE beneficial use by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin (1994) and amendments); areas designated as preserves or their equivalent under the Multi Species Conservation Program within the Cities and County of San Diego; Habitat Management Plan; and any other equivalent environmentally sensitive areas which have been identified by the City.

This Box for City Use Only

City Concurrence:	YES	NO
	☐	☐
By:		
Date:		
Project ID:		

SITE INFORMATION CHECKLIST

Project Summary Information	
Project Name	VALLEY VIEW
Project ID	GPA 2018-0001
Project Address	Palmer Way, Carlsbad CA 92010
Assessor's Parcel Number(s) (APN(s))	209-040-43-00
Project Watershed (Hydrologic Unit)	Carlsbad 904
Parcel Area	6.34 Acres (276,170 Square Feet)
Existing Impervious Area (subset of Parcel Area)	0.00 Acres (0 Square Feet)
Area to be disturbed by the project (Project Area)	0.71 Acres (30,927 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	0.61 Acres (26,759 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	0.10 Acres (4,168 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

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
- ☐ Agricultural or other non-impervious use
- ☑ Vacant, undeveloped/natural

Description / Additional Information:

Existing site consist of a flat area of approximately 0.71 acres and the remainder of the lot has slopes greater than 40%.

Existing Land Cover Includes (select all that apply):

- ☑ Vegetative Cover
- ☐ Non-Vegetated Pervious Areas
- ☐ Impervious Areas

Description / Additional Information:

The existing site is undeveloped

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

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

Approximate Depth to Groundwater (GW):

- ☐ GW Depth < 5 feet
- ☑ No GW
- ☐ 5 feet < GW Depth < 10 feet
- ☐ 10 feet < GW Depth < 20 feet
- ☐ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- ☐ Watercourses
- ☐ Seeps
- ☐ Springs
- ☐ Wetlands
- ☑ None

Description / Additional Information:

The lot on the existing condition surface drains towards the north side discharging into the Agua Hedionda Creek and then to the Pacific Ocean.

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) describe existing constructed storm water conveyance systems, if applicable; and (3) is runoff from offsite conveyed through the site? if so, describe]:

The existing drainage conveyance is natural. The existing site has a relatively flat pad along Palmer Way that drains to the north into the Agua Hedionda Creek, only approximately 0.20 acres of the site drain to the south into Palmer Way. There is no off-site contributing to the on-site basins.

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The proposed construction of an office building about 10' higher than the street level with parking at street level, landscape areas and court yard. In addition to the proposed bio-retentions for water quality purposes and installation of a Bio-Clean curb filter insert on the existing public curb inlet at the NW side of Palmer Way.

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

Building, parking, walkways and trash enclosure

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

Landscape areas

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

The proposed project includes minor grading for the parking lot at street level.

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

☑ Yes

☐ No

Runoff generated drains to proposed bio-filtrations for cleansing purposes then will be conveyed to proposed underground vault for detention and hydromodification. then the runoff will be connected to the existing 36" public storm drain in Palmer Way. There is a small increase of runoff due solely to increase "C" value from vacant lot to office land, this increase in flow will not have a negative impact to the existing downstream storm drain system since it will be detained on-site to release the same amount of Q as the ex. condition.

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

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

Identification of Receiving Water Pollutants of Concern

Describe path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable):

The proposed runoff from the project drain to Agua Hedionda Creek then to Agua Hedionda Lagoon and ultimately to the Pacific Ocean

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 for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs
Agua Hedionda Lagoon	Toxicity	Required
Agua Hedionda Creek	Enterococcus, Fecal Coliform,	Required
	TDS, Heavy Metals, Toxicity	

Identification of Project Site Pollutants

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)?

- ☑ 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
- ☑ 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 8 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:

Project is not within critical coarse sediment yield areas, see Attachment 2b for exhibit

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. There will be one point of compliance (POC)
Has a geomorphic assessment been performed for the receiving channel(s)? ☑ No, the low flow threshold is 0.1Q2 (default low flow threshold) ☐ Yes, the result is the low flow threshold is 0.1Q2 ☐ Yes, the result is the low flow threshold is 0.3Q2 ☐ Yes, the result is the low flow threshold is 0.5Q2 If a geomorphic assessment has been performed, provide title, date, and preparer: Discussion / Additional Information: (optional)

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 City codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements. Due to zoning limitations and restriction we can not grade within the 40% slope areas, and the proposed site has been designed to meet the minimum width necessary without putting on risk the public safety.
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.

City of Carlsbad

STANDARD PROJECT REQUIREMENT CHECKLIST E-36

Development Services
Land Development Engineering
1635 Faraday Avenue
(760) 602-2750
www.carlsbadca.gov

Project Information
Project Name: VALLEY VIEW
Project ID: GPA 2018-0001
DWG No. or Building Permit No.:

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.1 of the BMP Design Manual (Volume 5 of City Engineering Standards) 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.1 of the Model BMP Design Manual. Discussion/justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion/justification must be provided. Please add attachments if more space is needed.
- "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	■ Yes	☐ No	☐ N/A
Discussion/justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	■ 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	☐ Yes	☐ No	■ N/A
Discussion/justification if SC-3 not implemented:			

Source Control Requirement (continued)	Applied?		
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	▣ N/A
Discussion/justification if SC-4 not implemented:			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	▣ 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 and identify additional BMPs. (See Table in Appendix E.1 of BMP Manual for guidance).			
▣ On-site storm drain inlets	▣ Yes	☐ No	☐ N/A
☐ Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	▣ N/A
☐ Interior parking garages	☐ Yes	☐ No	▣ N/A
▣ Need for future indoor & structural pest control	☐ Yes	☐ No	☐ N/A
▣ Landscape/Outdoor Pesticide Use	☐ Yes	☐ No	☐ N/A
☐ Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	▣ N/A
☐ Food service	☐ Yes	☐ No	▣ N/A
☐ Refuse areas	☐ Yes	☐ No	▣ N/A
☐ Industrial processes	☐ Yes	☐ No	▣ N/A
☐ Outdoor storage of equipment or materials	☐ Yes	☐ No	▣ N/A
☐ Vehicle and Equipment Cleaning	☐ Yes	☐ No	▣ N/A
☐ Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	▣ N/A
☐ Fuel Dispensing Areas	☐ Yes	☐ No	▣ N/A
☐ Loading Docks	☐ Yes	☐ No	▣ N/A
▣ Fire Sprinkler Test Water	☐ Yes	☐ No	☐ N/A
▣ Miscellaneous Drain or Wash Water	☐ Yes	☐ No	☐ N/A
▣ Plazas, sidewalks, and parking lots	☐ Yes	☐ No	☐ N/A
For "Yes" answers, identify the additional BMP per Appendix E.1. Provide justification for "No" answers.			

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.2 thru E.6 of the BMP Design Manual (Volume 5 of City Engineering Standards) 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 BMPs as described in Chapter 4 and/or Appendix E.2 thru E.6 of the Model BMP Design Manual. Discussion / justification is not required.
- "No" means the BMPs is applicable to the project but it is not feasible to implement. Discussion/justification must be provided. Please add attachments if more space is needed.
- "N/A" means the BMPs is not applicable at the project site because the project does not include the feature that is addressed by the BMPs (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	☐ Yes	■ No	☐ N/A
Discussion/justification if SD-1 not implemented: PER SOILS ENGINEER RECOMMENDATION, NO RUNOFF CAN BE DIRECTED TO THE NORTH SIDE (STEEP SLOPE) DUE TO POSSIBLE SLOPE LANDSLIDES. ALL RUNOFF FROM THE PROPOSED CONDITION WILL NEED TO BE DIRECTED TO PALMER WAY. A DETENTION BASIN IS PROVIDED ON THE PROPOSED CONDITION TO ONLY RELEASE THE SAME "Q" AS THE EXISITNG CONDITION.			
SD-2 Conserve Natural Areas, Soils, and Vegetation	■ Yes	☐ No	☐ N/A
Discussion/justification if SD-2 not implemented: WHERE POSSIBLE.			
SD-3 Minimize Impervious Area	■ Yes	☐ No	☐ N/A
Discussion/justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	☐ Yes	■ No	☐ N/A
Discussion/justification if SD-4 not implemented: DUE TO SLOPE STABILITY CONSTRAINTS.			
SD-5 Impervious Area Dispersion	☐ Yes	■ No	☐ N/A
Discussion/justification if SD-5 not implemented: DUE TO SLOPE STABILITY CONSTRAINTS.			

Site Design Requirement (continued)	Applied?		
SD-6 Runoff Collection	■ Yes	☐ No	☐ N/A
Discussion/justification if SD-6 not implemented:			
SD-7 Landscaping with Native or Drought Tolerant Species	■ Yes	☐ No	☐ N/A
Discussion/justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	☐ Yes	■ No	☐ N/A
Discussion/justification if SD-8 not implemented: DUE TO SLOPE STABILITY CONSTRAINTS.			

SUMMARY OF PDP STRUCTURAL BMPS

PDP Structural BMPs
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). PDP structural BMPs must be verified by the City 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 BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the City must confirm the maintenance (see Section 7 of the BMP Design 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 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 BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated together or separate. The proposed project consist's of 2 proposed bio-filtration basins where the stormwater will be treated, addressing water quality requirements before exiting the site. At a different location an underground vault will be provided for hydromodification and detention. Regarding the Management of Critical Coarse Sediment Yield Areas the proposed development is not within the CCSYA This SWQMP has shown LID design, source control and treatment BMP's that should satisfy the requirements identified in the order and standards by treating and mitigating runoff to the most extent practicable, and it is anticipated that the downstream water will not be affected by the proposed development. The bio-retention basins will be lined and have a perforated storm drain system, as [Continue on next page as necessary.]

[Continued from previous page – This page is reserved for continuation of description of general strategy for structural BMP implementation at the site.]

recommended by the Soils Engineer to prevent landslides due to the proximity of the steep slopes of more than 100' vertically.

Also, in addition to the Self Treatment Green Street Design for the new meandering public sidewalk we are installing a Bio-clean inlet filter insert for treatment purposes. Filter insert will be installed by the project property owner and maintained by the City of Carlsbad.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-1

DWG _____ Sheet No. _____

Type of structural BMP:

- ☐ Retention by harvest and use (HU-1)
- ☐ Retention by infiltration basin (INF-1)
- ☐ Retention by bioretention (INF-2)
- ☐ Retention by permeable pavement (INF-3)
- ☐ Partial retention by biofiltration with partial retention (PR-1)
- ☑ Biofiltration (BF-1)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

- ☑ Pollutant control only
- ☐ Hydromodification control only
- ☐ Combined pollutant control and hydromodification control
- ☐ Pre-treatment/forebay for another structural BMP
- ☐ Other (describe in discussion section below)

Discussion (as needed):

The bio-filtration basin 1 will be receiving surface runoff from the uncovered parking stalls, hardscape and driveway areas to be treated for pollutants generated on the site. Then the runoff will be directed o the proposed vault that will take care of the hydro-modification and detention control after confluencing with the runoff from basin 2.

The proposed vault will have an orifice control to release equal or less runoff than the existing condition, see hydrology and hydraulic report for additional information.

Structural BMP Summary Information
[Copy this page as needed to provide information for each individual proposed structural BMP]

Structural BMP ID No. BMP-2

DWG _____ Sheet No. _____

Type of structural BMP:

- ☐ Retention by harvest and use (HU-1)
- ☐ Retention by infiltration basin (INF-1)
- ☐ Retention by bioretention (INF-2)
- ☐ Retention by permeable pavement (INF-3)
- ☐ Partial retention by biofiltration with partial retention (PR-1)
- ☑ Biofiltration (BF-1)
- ☐ 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)
- ☐ Detention pond or vault for hydromodification management
- ☐ Other (describe in discussion section below)

Purpose:

- ☑ Pollutant control only
- ☐ Hydromodification control only
- ☐ Combined pollutant control and hydromodification control
- ☐ Pre-treatment/forebay for another structural BMP
- ☐ Other (describe in discussion section below)

Discussion (as needed):

The bio-filtration basin 2 will be receiving runoff from the building roof that covers part of the parking and driveway area, the downspouts will be directed to basin 2 for pollutant control. Then the runoff will be directed o the proposed vault that will take care of the hydro-modification and detention control after confluencing with the runoff from basin 1.

The proposed vault will have an orifice control to release equal or less runoff than the existing condition, see hydrology and hydraulic report for additional information.

ATTACHMENT 1

BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Check 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. (24"x36" Exhibit typically required)	☑ 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 ☐ 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.	☑ Included ☐ Not included because the entire project will use infiltration BMPs per soils engineer recommendations no infiltration is allowed on this project
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.	☐ Included ☐ Not included because the entire project will use harvest and use BMPs per soils engineer recommendations no infiltration is allowed on this project.
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	☑ Included

A
+
B

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

The DMA Exhibit must identify:

- ☑ Underlying hydrologic soil group
- ☑ Approximate depth to groundwater
- ☑ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☑ Critical coarse sediment yield areas to be protected (if present)
- ☑ Existing topography and impervious areas
- ☑ 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
- ☑ 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)
- ☑ Structural BMPs (identify location and type of BMP)

C

Harvest and Use Feasibility Checklist	Form I-7

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.

Land type (Table B.3-1) = Office
Total Use per employee and visitor (Table B.3-1) = 7 * 1.1 = 7.7
Plant water use (Table B.3-2) = Moderate
36hr Irrigation demand (Table B.3-3) = 1,470 gal/ac per 36 hr period
Total employee and visitors = 55 persons
Landscape area = 23,082 sf = 0.53 acres

$$T\&U = \frac{7.7\ gal}{day} * \frac{55\ persons \times 1.5\ days}{7.48\ gal/ft3} = 84.93$$

$$LI = \frac{0.53\ acres}{day\text{-}acre} = \frac{1{,}470\ gal * 0.53 * 1.5\ day}{7.48\ gal/ft3} = 156.24$$

3. Calculate the DCV using worksheet B-2.1.

DCV = 777 (cubic feet)

$$\text{Total 36hr Demand} = \frac{T\&U + LI}{DCV} = \frac{84.93 + 156.24}{777} = 0.31$$

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.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.

☐ No, select alternate BMPs.

Harvest and Use Feasibility Checklist	Form I-7

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.

Land type (Table B.3-1) = Office
Total Use per employee and visitor (Table B.3-1) = 7 * 1.1 = 7.7
Plant water use (Table B.3-2) = Moderate
36hr Irrigation demand (Table B.3-3) = 1,470 gal/ac per 36 hr period
Total employee and visitors = 55 persons
Landscape area = 23,082 sf = 0.53 acres

$$T\&U = \frac{7.7\ gal}{day} * \frac{55\ persons \times 1.5\ days}{7.48\ gal/ft3} = 84.93$$

$$LI = \frac{0.53\ acres}{day\text{-}acre} = \frac{1{,}470\ gal * 0.53 * 1.5\ day}{7.48\ gal/ft3} = 156.24$$

3. Calculate the DCV using worksheet B-2.1.

DCV = 384 (cubic feet)

$$\text{Total 36hr Demand} = \frac{T\&U + LI}{DCV} = \frac{84.93 + 156.24}{384} = 0.63$$

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.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.

☐ No, select alternate BMPs.

D

NOT INCLUDED

E

E

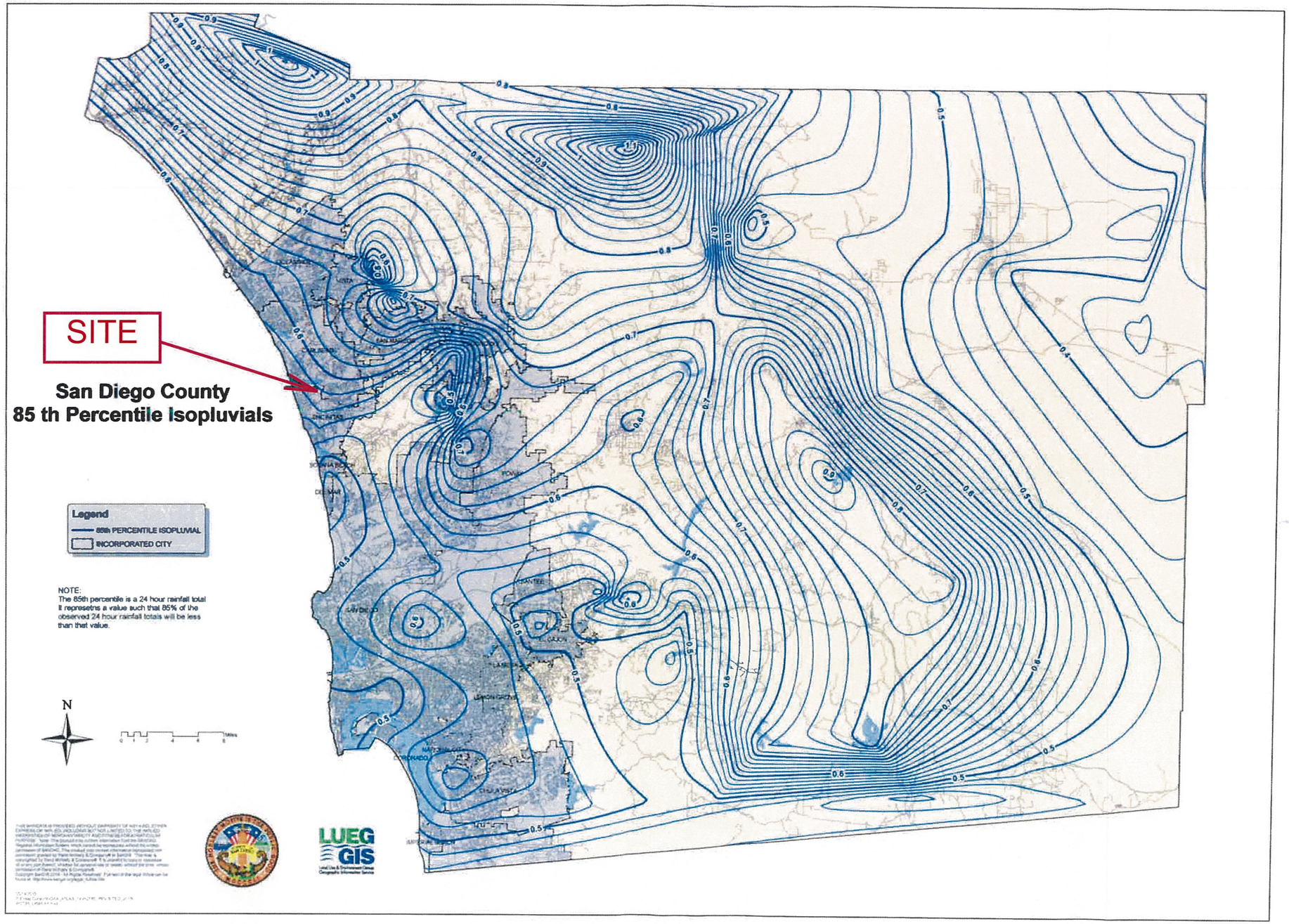


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	BF-1	BF-2									unitless
	2	85th Percentile 24-hr Storm Depth	0.58	0.58									inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	17,728	8,527									sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	2,077	837									sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)											sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	No	No	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	19,805	9,364	0	0	0	0	0	0	0	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.82	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.82	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	26	Initial Design Capture Volume	785	376	0	0	0	0	0	0	0	0	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.82	0.83	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	785	376	0	0	0	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.82	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	36	Final Effective Tributary Area	16,240	7,772	0	0	0	0	0	0	0	0	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	785	376	0	0	0	0	0	0	0	0	cubic-feet

No Warning Messages

Automated Worksheet B.2: Retention Requirements (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Basic Analysis	1	Drainage Basin ID or Name	BF-1	BF-2	-	-	-	-	-	-	-	-	unitless
	2	85th Percentile Rainfall Depth	0.58	0.58	-	-	-	-	-	-	-	-	inches
	3	Predominant NRCS Soil Type Within BMP Location	D	D									unitless
	4	Is proposed BMP location Restricted or Unrestricted for Infiltration Activities?	Restricted	Restricted									unitless
	5	Nature of Restriction	Slopes	Slopes									unitless
	6	Do Minimum Retention Requirements Apply to this Project?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes/no
	7	Are Habitable Structures Greater than 9 Stories Proposed?	No	No									yes/no
Advanced Analysis	8	Has Geotechnical Engineer Performed an Infiltration Analysis?	No	No									yes/no
	9	Design Infiltration Rate Recommended by Geotechnical Engineer											in/hr
Result	10	Design Infiltration Rate Used To Determine Retention Requirements	0.000	0.000	-	-	-	-	-	-	-	-	in/hr
	11	Percent of Average Annual Runoff that Must be Retained within DMA	4.5%	4.5%	-	-	-	-	-	-	-	-	percentage
	12	Fraction of DCV Requiring Retention	0.02	0.02	-	-	-	-	-	-	-	-	ratio
	13	Required Retention Volume	16	8	-	-	-	-	-	-	-	-	cubic-feet

No Warning Messages

Automated Worksheet B.3: BMP Performance (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	1	Drainage Basin ID or Name	BF-1	BF-2	-	-	-	-	-	-	-	-	sq-ft
	2	Design Infiltration Rate Recommended	0.000	0.000	-	-	-	-	-	-	-	-	in/hr
	3	Design Capture Volume Tributary to BMP	785	376	-	-	-	-	-	-	-	-	cubic-feet
	4	Is BMP Vegetated or Unvegetated?	Vegetated	Vegetated									unitless
	5	Is BMP Impermeably Lined or Unlined?	Lined	Lined									unitless
	6	Does BMP Have an Underdrain?	Underdrain	Underdrain									unitless
	7	Does BMP Utilize Standard or Specialized Media?	Standard	Standard									unitless
	8	Provided Surface Area	580	595									sq-ft
	9	Provided Surface Ponding Depth	6	6									inches
	10	Provided Soil Media Thickness	18	18									inches
	11	Provided Gravel Thickness (Total Thickness)	12	12									inches
	12	Underdrain Offset	3	3									inches
	13	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	6.00	6.00									inches
	14	Specialized Soil Media Filtration Rate											in/hr
	15	Specialized Soil Media Pore Space for Retention											unitless
	16	Specialized Soil Media Pore Space for Biofiltration											unitless
	17	Specialized Gravel Media Pore Space											unitless
Retention Calculations	18	Volume Infiltrated Over 6 Hour Storm	0	0	0	0	0	0	0	0	0	0	cubic-feet
	19	Ponding Pore Space Available for Retention	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	unitless
	20	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	21	Gravel Pore Space Available for Retention (Above Underdrain)	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	22	Gravel Pore Space Available for Retention (Below Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	23	Effective Retention Depth	2.10	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	24	Fraction of DCV Retained (Independent of Drawdown Time)	0.13	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	25	Calculated Retention Storage Drawdown Time	120	120	0	0	0	0	0	0	0	0	hours
	26	Efficacy of Retention Processes	0.15	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	27	Volume Retained by BMP (Considering Drawdown Time)	118	109	0	0	0	0	0	0	0	0	cubic-feet
	28	Design Capture Volume Remaining for Biofiltration	667	267	0	0	0	0	0	0	0	0	cubic-feet
Biofiltration Calculations	29	Max Hydromod Flow Rate through Underdrain	1.4948	1.4948	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	cfs
	30	Max Soil Filtration Rate Allowed by Underdrain Orifice	111.34	108.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	31	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	32	Soil Media Filtration Rate to be used for Sizing	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	in/hr
	33	Depth Biofiltered Over 6 Hour Storm	30.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	34	Ponding Pore Space Available for Biofiltration	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	35	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	36	Gravel Pore Space Available for Biofiltration (Above Underdrain)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	unitless
	37	Effective Depth of Biofiltration Storage	13.20	13.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	38	Drawdown Time for Surface Ponding	1	1	0	0	0	0	0	0	0	0	hours
	39	Drawdown Time for Effective Biofiltration Depth	3	3	0	0	0	0	0	0	0	0	hours
	40	Total Depth Biofiltered	43.20	43.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	41	Option 1 - Biofilter 1.50 DCV: Target Volume	1,000	401	0	0	0	0	0	0	0	0	cubic-feet
	42	Option 1 - Provided Biofiltration Volume	1,000	401	0	0	0	0	0	0	0	0	cubic-feet
	43	Option 2 - Store 0.75 DCV: Target Volume	500	200	0	0	0	0	0	0	0	0	cubic-feet
	44	Option 2 - Provided Storage Volume	500	200	0	0	0	0	0	0	0	0	cubic-feet
	45	Portion of Biofiltration Performance Standard Satisfied	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	46	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	Yes	-	-	-	-	-	-	-	-	yes/no
	47	Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	48	**Deficit of Effectively Treated Stormwater**	**0**	**0**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

No Warning Messages

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

[This is the cover sheet for Attachment 2.]

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☑ 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.	☑ 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.	☑ Not performed ☐ Included
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☑ Included

A

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

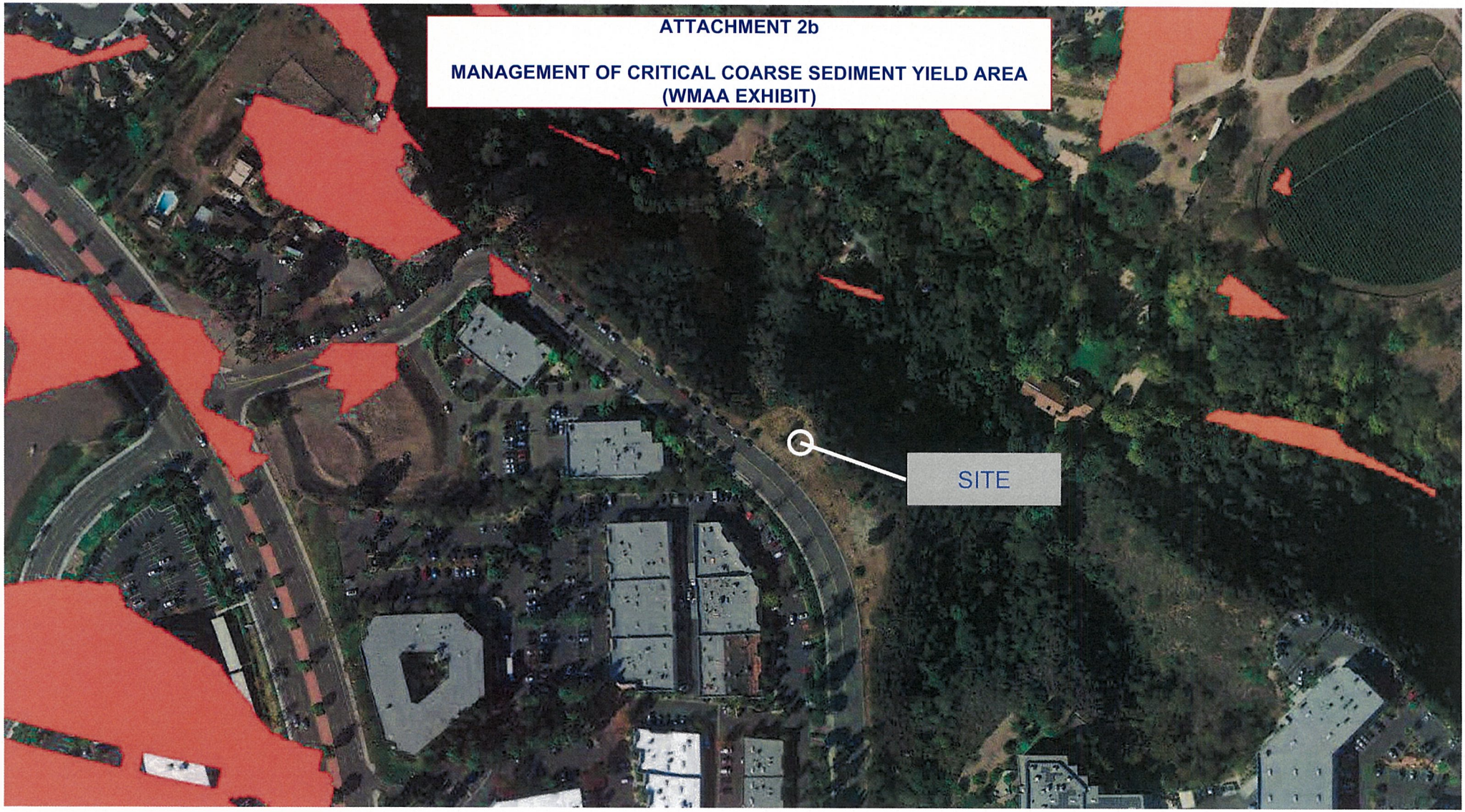
The Hydromodification Management Exhibit must identify:

- ☑ Underlying hydrologic soil group
- ☑ Approximate depth to groundwater
- ☑ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☑ Critical coarse sediment yield areas to be protected (if present)
- ☑ 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)

B

ATTACHMENT 2b

MANAGEMENT OF CRITICAL COARSE SEDIMENT YIELD AREA
(WMAA EXHIBIT)



C

NOT PERFORMED

D

ATTACHMENT 2d

TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

Valley View

Prepared For:

Land Development, LLC

Prepared by:

Luis Parra, PhD, CPSWQ, ToR, D.WRE.
R.C.E. 66377

REC Consultants
2442 Second Avenue
San Diego, CA 92101
Telephone: (619) 232-9200

R·E·C

TECHNICAL MEMORANDUM

TO: Land Development, LLC

FROM: Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE.
David Edwards, PE.

DATE: April 6, 2018

RE: Summary of SWMM Modeling for Hydromodification Compliance for Valley View, Carlsbad, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed commercial site in the City of Carlsbad 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 HMP facilities have sufficient volume to meet Order R9-2013-001 requirements of the California Regional Water Quality Control Board San Diego Region (SDRWQCB), as explained in the Final Hydromodification Management Plan (HMP), dated March 2011, prepared for the County of San Diego by Brown and Caldwell.

SWMM MODEL DEVELOPMENT

The Valley View project site consists of a proposed commercial development. Two (2) SWMM models were prepared for this study: the first for the pre-developed and the second for the post-developed conditions. The project site drains to two (2) Points of Compliance (POC) located to the north and south of the project site.

Per Section G1.2 in Appendix G of the 2016 City of Carlsbad BMP Design Manual, the EPA SWMM model was used to perform the continuous hydrologic simulation. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facilities are sufficient to meet the current HMP requirements.

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

Per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 4 Evapotranspiration Area. Thus evapotranspiration vales for the site were modeled using Zone 4 average monthly values from Table G.1-1 from the 2016 BMP Design Manual. Per the site specific geotechnical investigation, the project site is situated upon Class D soils. Soils have been assumed to be uncompacted in the existing condition to represent the current natural condition of the site, while fully compacted in the post developed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of parameters is explained in detail.

HMP MODELING

PRE DEVELOPED CONDITIONS

In current existing conditions, runoff from the development site discharges via overland flow to two (2) points of compliance located at the northern boundary of the project site and the adjacent curb and gutter to the south of the project site. In developed conditions, all runoff from the project site is drained to the southern curb and gutter due to the fact the geotechnical consultant had concerns in regards to draining concentrated flows to the northern discharge location. As such, given that no developed flow will drain to the northern POC, only the southern POC will be analyzed for this study.

Table 1 below illustrates the southern POC pre-developed area tributary and impervious percentage accordingly.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip[(1)]
POC-1	DMA-1-D	0.2	0%
TOTAL	--	**0.2**	--

Notes: (1) – Per the 2013 RWQCB permit, existing condition impervious surfaces are not to be accounted for in existing conditions analysis.

DEVELOPED CONDITIONS

In developed conditions, runoff from the project site is drained to three (3) onsite receiving HMP detention facilities. Once flows are routed via the proposed detention basins, onsite flows are then discharged to the adjacent storm drain at POC-1. Table 2 summarizes the post-developed area and impervious percentage accordingly.

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
POC-1	DMA-1-D	0.419	85.44%
	DMA-BR-1	0.013315	0.0%
	DMA-2-D	0.218	91.18%
	DMA-BR-2	0.013659	0.0%
	DMA-DEMIN	0.052	47.98%
TOTAL	--	**0.715**	N/A

Runoff from the developed project site drains to two (2) surface LID bio-filtration BMP facilities prior to then discharging to an underground detention vault for additional HMP storage. The two (2) LID treatment basins have a surface ponding depth of 0.6 feet and 1 foot which then overflows into the underground detention vault. Flows will discharge from the surface basins via a low flow orifice outlet within the gravel layer or the riser outlet structure to the underground detention basin. The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving POC.

Beneath the LID basins' invert lays the proposed LID biofiltration portion of the drainage facility. This portion of the basin is comprised of a 3-inch layer of mulch, an 18-inch layer of amended soil (a highly sandy, organic rich composite with an infiltration capacity of at least 5 inches/hr), a 6-inch sand and pea gravel filter layer and an 12-inch layer of gravel for additional detention and to accommodate the French drain system. These systems are to be located beneath the biofiltration layers to intercept treated storm water and convey these flows to a small diameter lower outlet orifice. Once flows have been routed by the outlet structure, flows are then drained to the receiving underground detention vault.

The underground detention vault has a width of 20 feet, length of 200 feet and a depth of 4 feet, providing additional HMP detention volume. Flows from the surface LID bio-filtration basins discharge to this receiving vault for additional routing, draining from the vault via an outlet structure constructed at the discharge location of the basin.

Water Quality BMP Sizing

It is assumed all storm water quality requirements for the project will be met by the BMPs included within the site design. However, detailed water quality requirements are not discussed within this technical memo.

The BMPs have been designed in accordance with City of Carlsbad sizing criteria. For further information in regards to storm water quality requirements for the project (including sizing and drawdown) please refer to the site specific Storm Water Quality Management Plan (SWQMP).

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP BMPs

Two (2) HMP LID BMP biofiltration basins with an underground overflow detention basin are proposed for hydromodification conformance for the project site. Tables 3, 4 and 5 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project.

TABLE 3 – SUMMARY OF DEVELOPED HMP LID BMPS:

BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area[(1)] (ft^2)	Gravel Depth[(2)] (in)	Lower Orif. D (in)[(3)]	Depth Riser Invert (ft)[(4)]	Weir Perimeter Length[(5)] (ft)	Total Surface Depth[(6)] (ft)
BR-1	0.419	580	18	0.5	0.5	8	0.6
BR-2	0.218	595	18	0.5	0.8	8	1.0

Notes:
(1): Area of amended soil equal to area of gravel
(2): Includes filter gravel layer and 3-inch dead storage layer beneath French Drain.
(3): Diameter of orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold ($0.1 \cdot Q_2$).
(4): Depth of ponding beneath spillway.
(5): Overflow length of riser box opening (2' x 2' = 8')
(6): Total surface depth of BMP from top crest elevation to surface invert.

TABLE 4 – SUMMARY OF HMP DETENTION VAULT

BMP	Tributary Area (Ac)	DIMENSIONS		
		Vault Area [4] (ft^2)	Vault Depth (ft)	Storage Volume (ft^3)
Basin 1	0.663	4,000	4.0	16,000

TABLE 5 – SUMMARY OF RISER DETAILS:

BASIN	Lower Orifice			Lower Slot			Emergency Weir	
	Diam. (in)	Number	Elev.[1] (ft)	Width (ft)	Height (ft)	Elev.[1] (ft)	Width (ft)	Elev.[1] (ft)
BR-1	NA	-	--	NA	-	--	8	0.5
BR-2	NA	-	--	NA	-	--	8	0.8
DET BASIN	0.4	1	0.0	0.75	0.083	2.9	4	3.5

Notes: (1): Invert of the basins assumed to be 0.0 elevation.

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at the POC by exporting the hourly runoff time series results from SWMM to a spreadsheet.

Q_2 and Q_{10} were determined with 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 includes 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 comparison at the POC is illustrated in Figure 1 in both normal and logarithmic scale. Attachment 5 provides a detailed drainage exhibit for the post-developed condition.

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

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

Typically the Manning's coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. Due to the complexity of the model carried out in pre and post-development conditions, a more accurate value of the Manning's coefficient for pervious areas has been chosen. Taken into consideration the "Handouts on Supplemental Guidance – Handout #2: Manning's "n" Values for Overland Flow Using EPA SWMM V.5" by the County of San Diego (Reference [6]) a more accurate value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between pasture and shrubs and bushes (which is also the value of dense grass) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

BMP DRAWDOWN TIME

To ensure compliance with the 96 hour drawdown requirements per Section 6.4.6 of the Final HMP dated March 2011 for surface detention basins, drawdown calculations are provided in Attachment 4 of this report. Per the drawdown calculations, the drying time of the basins area as follows; BMP 1 is 11.4 hours and BMP 2 is 20.3 hours satisfying drawdown time requirements.

SUMMARY

This study has demonstrated that the proposed HMP BMPs provided for the Valley View project site is sufficient to meet the current HMP criteria if the cross-section areas and volumes recommended within this technical memorandum, and the respective orifice and outlet structure are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type D Soils is representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table.
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge Curves to be used in SWMM
5. Pre & Post Development Maps, Project plan and section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model

REFERENCES

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

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

[3] - Order R9-20013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Handbook of Hydrology*", David R. Maidment, Editor in Chief. 1992, McGraw Hill.

[5] – "*City of Carlsbad BMP Design Manual*", February 2016.

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

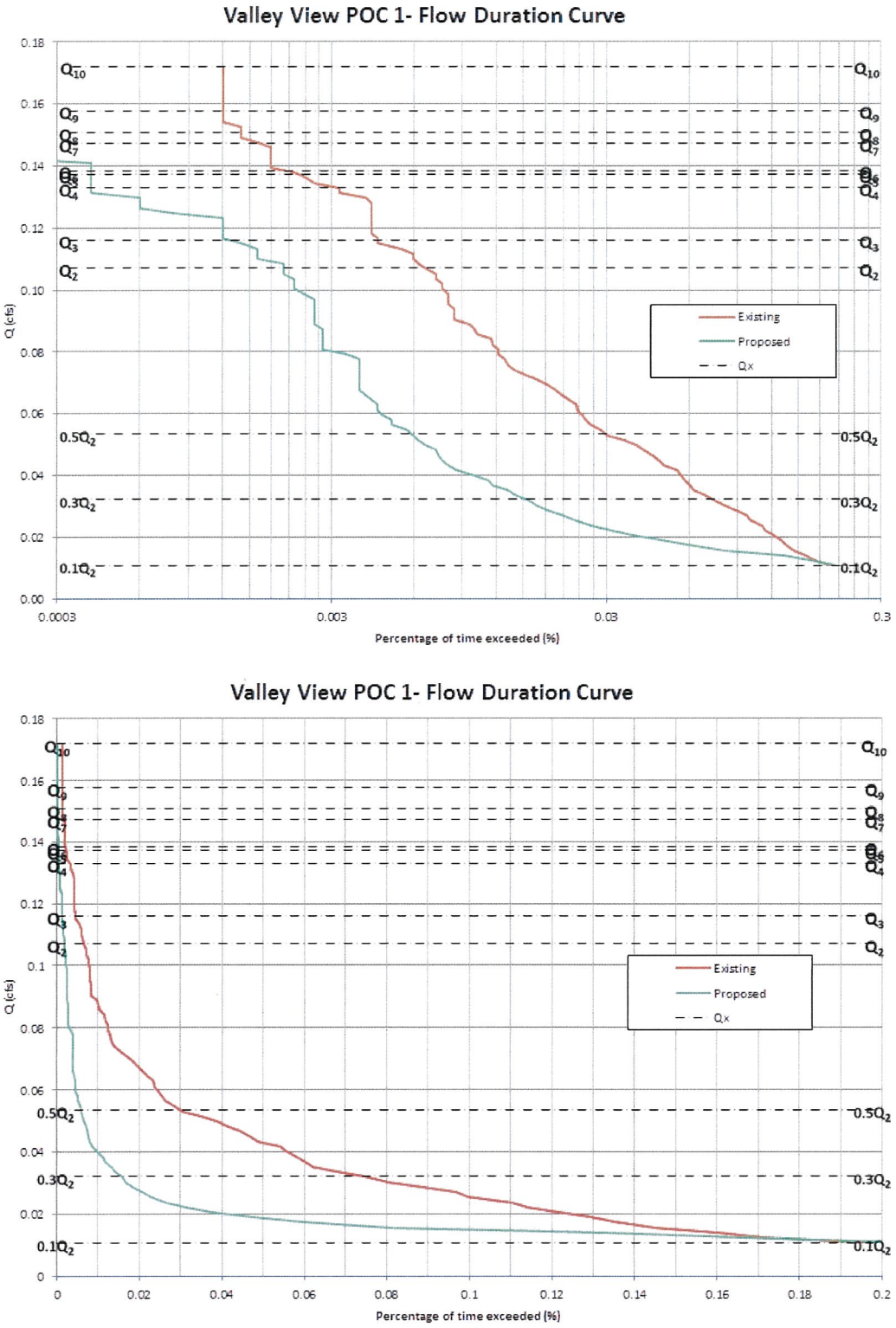


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	0.107	0.006	0.101
3-year	0.116	0.010	0.106
4-year	0.133	0.012	0.121
5-year	0.137	0.013	0.124
6-year	0.138	0.014	0.125
7-year	0.147	0.017	0.131
8-year	0.151	0.017	0.133
9-year	0.158	0.018	0.140
10-year	0.172	0.019	0.153

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

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

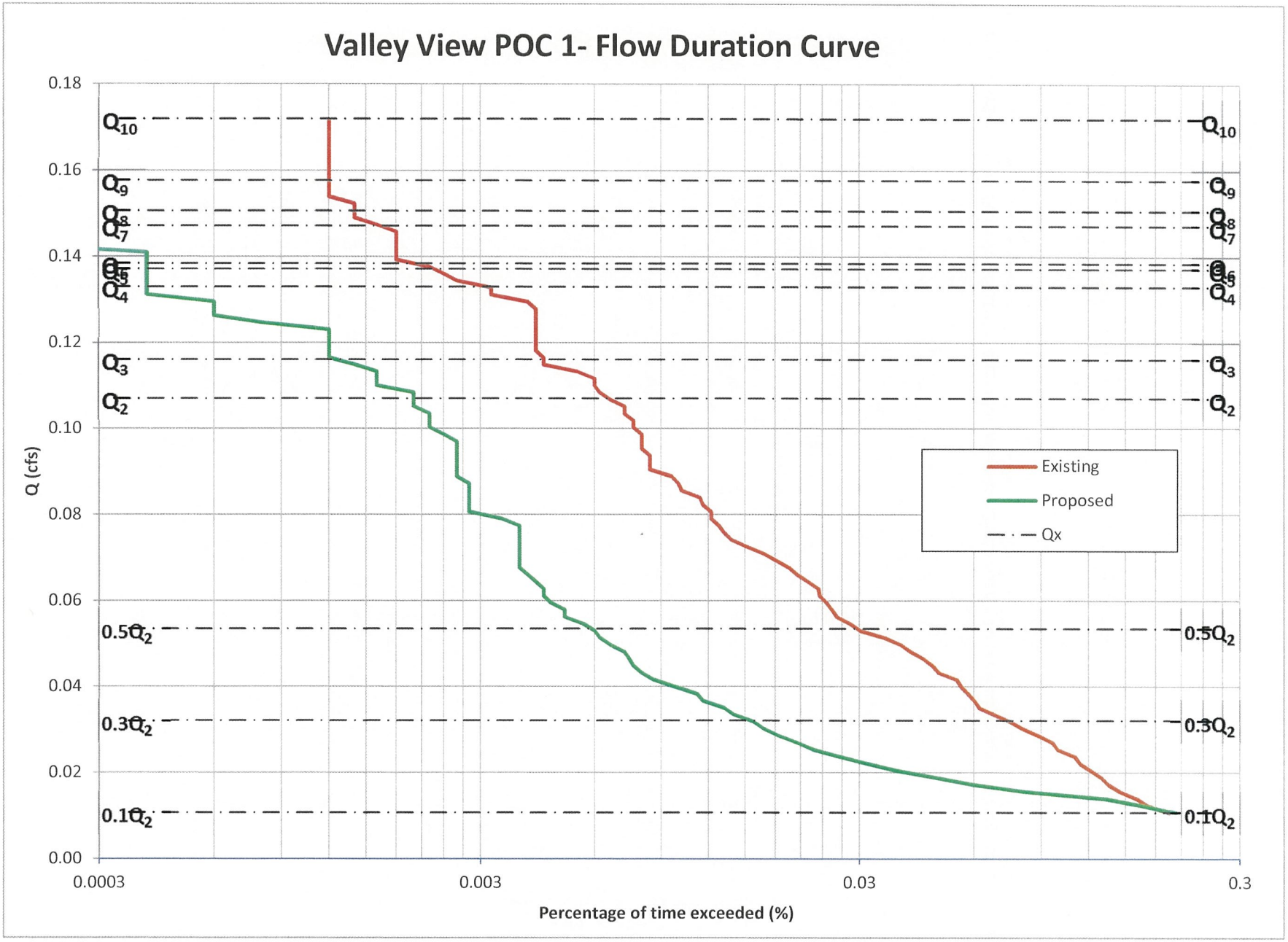
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 - Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

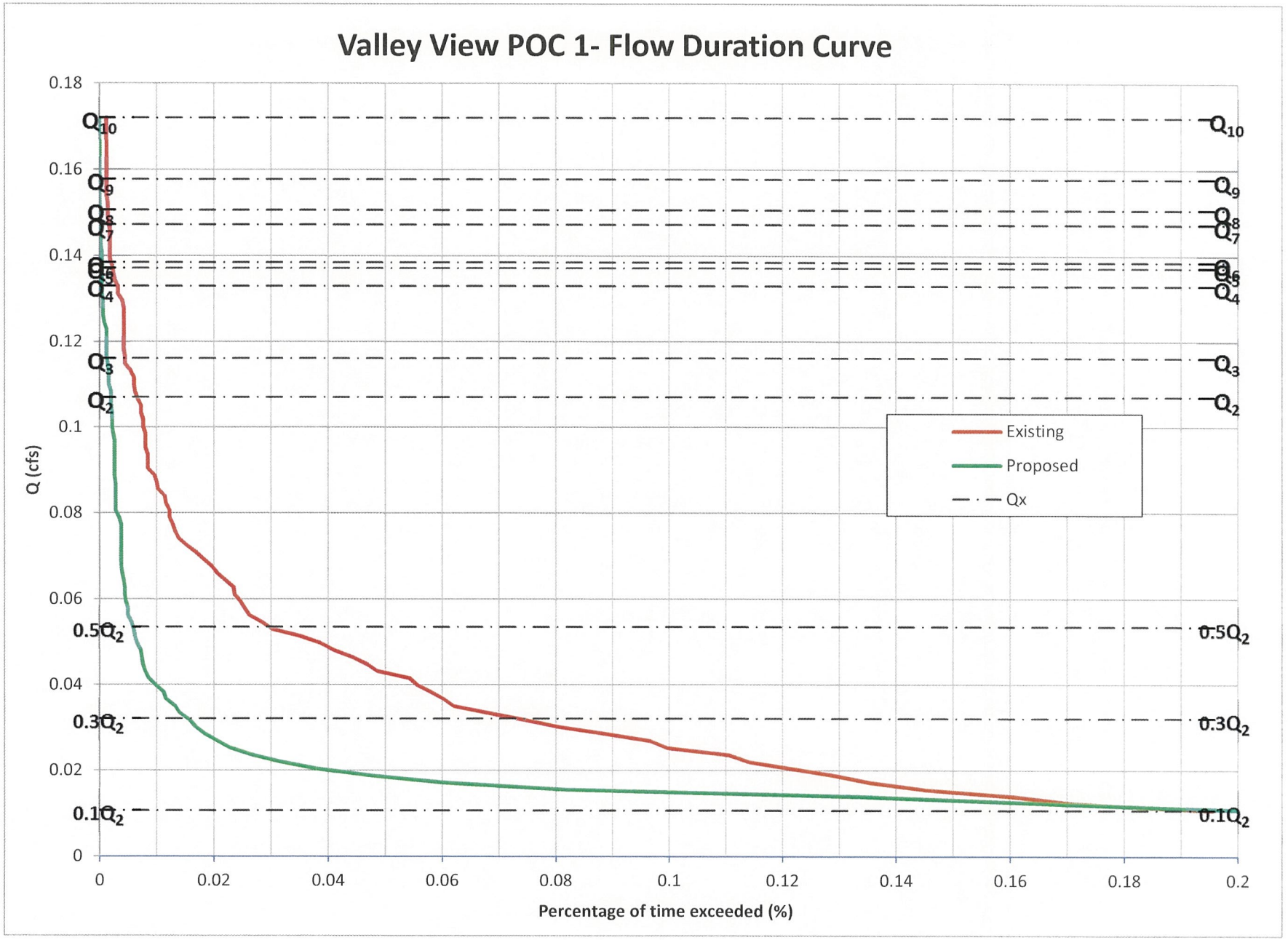
Consequently, the design passes the hydromodification test.

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

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by REC, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8 and Q_9) in order to demonstrate compliance at any range $Q_x - Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). REC 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.


Valley View POC 1- Flow Duration Curve
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q (cfs)
Q_{10}
Q_9
Q_8
Q_7
Q_6
Q_5
Q_4
Q_3
Q_2
$0.5Q_2$
$0.3Q_2$
$0.1Q_2$
Existing
Proposed
Qx
0.0003
0.003
0.03
0.3
Percentage of time exceeded (%)


Valley View POC 1- Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
Existing
Proposed
Qx
Q_{10}
Q_9
Q_8
Q_7
Q_6
Q_5
Q_4
Q_3
Q_2
$0.5Q_2$
$0.3Q_2$
$0.1Q_2$

Flow Duration Curve Data for Valley View POC-1 , City of Carlsbad CA

Q2 =	0.11	cfs	Fraction	10 %
Q10 =	0.17	cfs		
Step =	0.0016	cfs		
Count =	499679	hours		
	57.00	years		

	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.011	977	1.96E-01	1016	2.03E-01	104.0%	Pass
2	0.012	855	1.71E-01	833	1.67E-01	97%	Pass
3	0.014	803	1.61E-01	668	1.34E-01	83%	Pass
4	0.016	725	1.45E-01	408	8.17E-02	56%	Pass
5	0.017	677	1.35E-01	300	6.00E-02	44%	Pass
6	0.019	647	1.29E-01	238	4.76E-02	37%	Pass
7	0.020	608	1.22E-01	189	3.78E-02	31%	Pass
8	0.022	570	1.14E-01	158	3.16E-02	28%	Pass
9	0.024	552	1.10E-01	133	2.66E-02	24%	Pass
10	0.025	498	9.97E-02	114	2.28E-02	23%	Pass
11	0.027	483	9.67E-02	103	2.06E-02	21%	Pass
12	0.029	444	8.89E-02	92	1.84E-02	21%	Pass
13	0.030	403	8.07E-02	84	1.68E-02	21%	Pass
14	0.032	374	7.48E-02	79	1.58E-02	21%	Pass
15	0.034	340	6.80E-02	70	1.40E-02	21%	Pass
16	0.035	310	6.20E-02	66	1.32E-02	21%	Pass
17	0.037	301	6.02E-02	58	1.16E-02	19%	Pass
18	0.038	290	5.80E-02	56	1.12E-02	19%	Pass
19	0.040	278	5.56E-02	49	9.81E-03	18%	Pass
20	0.042	271	5.42E-02	43	8.61E-03	16%	Pass
21	0.043	243	4.86E-02	40	8.01E-03	16%	Pass
22	0.045	234	4.68E-02	38	7.60E-03	16%	Pass
23	0.047	221	4.42E-02	37	7.40E-03	17%	Pass
24	0.048	205	4.10E-02	36	7.20E-03	18%	Pass
25	0.050	193	3.86E-02	33	6.60E-03	17%	Pass
26	0.051	175	3.50E-02	31	6.20E-03	18%	Pass
27	0.053	151	3.02E-02	30	6.00E-03	20%	Pass
28	0.055	142	2.84E-02	28	5.60E-03	20%	Pass
29	0.056	131	2.62E-02	25	5.00E-03	19%	Pass
30	0.058	127	2.54E-02	25	5.00E-03	20%	Pass
31	0.060	123	2.46E-02	23	4.60E-03	19%	Pass
32	0.061	118	2.36E-02	22	4.40E-03	19%	Pass
33	0.063	117	2.34E-02	22	4.40E-03	19%	Pass
34	0.064	110	2.20E-02	21	4.20E-03	19%	Pass
35	0.066	103	2.06E-02	20	4.00E-03	19%	Pass
36	0.068	98	1.96E-02	19	3.80E-03	19%	Pass
37	0.069	91	1.82E-02	19	3.80E-03	21%	Pass
38	0.071	84	1.68E-02	19	3.80E-03	23%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
39	0.073	76	1.52E-02	19	3.80E-03	25%	Pass
40	0.074	69	1.38E-02	19	3.80E-03	28%	Pass
41	0.076	66	1.32E-02	19	3.80E-03	29%	Pass
42	0.077	64	1.28E-02	19	3.80E-03	30%	Pass
43	0.079	61	1.22E-02	17	3.40E-03	28%	Pass
44	0.081	61	1.22E-02	14	2.80E-03	23%	Pass
45	0.082	58	1.16E-02	14	2.80E-03	24%	Pass
46	0.084	57	1.14E-02	14	2.80E-03	25%	Pass
47	0.086	51	1.02E-02	14	2.80E-03	27%	Pass
48	0.087	50	1.00E-02	14	2.80E-03	28%	Pass
49	0.089	48	9.61E-03	13	2.60E-03	27%	Pass
50	0.091	42	8.41E-03	13	2.60E-03	31%	Pass
51	0.092	42	8.41E-03	13	2.60E-03	31%	Pass
52	0.094	42	8.41E-03	13	2.60E-03	31%	Pass
53	0.095	40	8.01E-03	13	2.60E-03	33%	Pass
54	0.097	40	8.01E-03	13	2.60E-03	33%	Pass
55	0.099	40	8.01E-03	12	2.40E-03	30%	Pass
56	0.100	38	7.60E-03	11	2.20E-03	29%	Pass
57	0.102	38	7.60E-03	11	2.20E-03	29%	Pass
58	0.104	36	7.20E-03	11	2.20E-03	31%	Pass
59	0.105	36	7.20E-03	10	2.00E-03	28%	Pass
60	0.107	33	6.60E-03	10	2.00E-03	30%	Pass
61	0.108	31	6.20E-03	10	2.00E-03	32%	Pass
62	0.110	30	6.00E-03	8	1.60E-03	27%	Pass
63	0.112	30	6.00E-03	8	1.60E-03	27%	Pass
64	0.113	27	5.40E-03	8	1.60E-03	30%	Pass
65	0.115	22	4.40E-03	7	1.40E-03	32%	Pass
66	0.117	22	4.40E-03	6	1.20E-03	27%	Pass
67	0.118	21	4.20E-03	6	1.20E-03	29%	Pass
68	0.120	21	4.20E-03	6	1.20E-03	29%	Pass
69	0.121	21	4.20E-03	6	1.20E-03	29%	Pass
70	0.123	21	4.20E-03	6	1.20E-03	29%	Pass
71	0.125	21	4.20E-03	4	8.01E-04	19%	Pass
72	0.126	21	4.20E-03	3	6.00E-04	14%	Pass
73	0.128	21	4.20E-03	3	6.00E-04	14%	Pass
74	0.130	20	4.00E-03	3	6.00E-04	15%	Pass
75	0.131	16	3.20E-03	2	4.00E-04	13%	Pass
76	0.133	16	3.20E-03	2	4.00E-04	13%	Pass
77	0.134	13	2.60E-03	2	4.00E-04	15%	Pass
78	0.136	12	2.40E-03	2	4.00E-04	17%	Pass
79	0.138	11	2.20E-03	2	4.00E-04	18%	Pass
80	0.139	9	1.80E-03	2	4.00E-04	22%	Pass
81	0.141	9	1.80E-03	2	4.00E-04	22%	Pass
82	0.143	9	1.80E-03	1	2.00E-04	11%	Pass
83	0.144	9	1.80E-03	1	2.00E-04	11%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
84	0.146	9	1.80E-03	0	0.00E+00	0%	Pass
85	0.148	8	1.60E-03	0	0.00E+00	0%	Pass
86	0.149	7	1.40E-03	0	0.00E+00	0%	Pass
87	0.151	7	1.40E-03	0	0.00E+00	0%	Pass
88	0.152	7	1.40E-03	0	0.00E+00	0%	Pass
89	0.154	6	1.20E-03	0	0.00E+00	0%	Pass
90	0.156	6	1.20E-03	0	0.00E+00	0%	Pass
91	0.157	6	1.20E-03	0	0.00E+00	0%	Pass
92	0.159	6	1.20E-03	0	0.00E+00	0%	Pass
93	0.161	6	1.20E-03	0	0.00E+00	0%	Pass
94	0.162	6	1.20E-03	0	0.00E+00	0%	Pass
95	0.164	6	1.20E-03	0	0.00E+00	0%	Pass
96	0.165	6	1.20E-03	0	0.00E+00	0%	Pass
97	0.167	6	1.20E-03	0	0.00E+00	0%	Pass
98	0.169	6	1.20E-03	0	0.00E+00	0%	Pass
99	0.170	6	1.20E-03	0	0.00E+00	0%	Pass
100	0.172	6	1.20E-03	0	0.00E+00	0%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	0.172	0.019	0.153
9	0.158	0.018	0.140
8	0.151	0.017	0.133
7	0.147	0.017	0.131
6	0.138	0.014	0.125
5	0.137	0.013	0.124
4	0.133	0.012	0.121
3	0.116	0.010	0.106
2	0.107	0.006	0.101

ATTACHMENT 3

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

Basic Probabilistic Equation:

R = 1/P R: Return period (years).

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

Cunnane Equation:

$$P = \frac{i-0.4}{n+0.2}$$

Weibull Equation:

$$P = \frac{i}{n+1}$$

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

n: number of years analyzed.

Explanation of Variables for the Tables in this Attachment

Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.

Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.

Date: Date of the occurrence of the peak at the outlet from the continuous simulation

Note: all peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt = 0, and the peak is the largest value in 25 hours (12 hours before, the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

List of Peak events and Determination of Q2 and Q10 (Pre-Development)
Valley View - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**0.17**	**0.18**
9	**0.16**	**0.16**
8	**0.15**	**0.15**
7	**0.15**	**0.15**
6	**0.14**	**0.14**
5	**0.14**	**0.14**
4	**0.13**	**0.13**
3	**0.12**	**0.12**
2	**0.11**	**0.11**

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

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.076	8/17/1977	57	1.02	1.01
0.078	12/24/1983	56	1.04	1.03
0.079	2/12/2003	55	1.05	1.05
0.081	2/6/1969	54	1.07	1.07
0.081	2/22/1998	53	1.09	1.09
0.082	2/8/1993	52	1.12	1.11
0.083	4/27/1960	51	1.14	1.13
0.084	1/16/1972	50	1.16	1.15
0.084	4/28/2005	49	1.18	1.18
0.085	3/19/1981	48	1.21	1.20
0.087	3/1/1991	47	1.23	1.23
0.088	12/22/1982	46	1.26	1.25
0.088	3/15/1986	45	1.29	1.28
0.089	3/17/1963	44	1.32	1.31
0.089	2/15/1986	43	1.35	1.34
0.089	2/27/1991	42	1.38	1.38
0.089	2/12/1992	41	1.41	1.41
0.09	1/29/1980	40	1.45	1.44
0.09	2/14/1998	39	1.49	1.48
0.094	1/16/1978	38	1.53	1.52
0.095	3/11/1995	37	1.57	1.56
0.099	1/18/1993	36	1.61	1.61
0.1	2/4/1994	35	1.66	1.65
0.102	12/2/1961	34	1.71	1.70
0.102	2/17/1998	33	1.76	1.75
0.106	11/15/1952	32	1.81	1.81
0.106	11/11/1985	31	1.87	1.87
0.106	10/20/2004	30	1.93	1.93
0.107	2/18/1993	29	2.00	2.00
0.108	2/23/1998	28	2.07	2.07
0.11	2/16/1980	27	2.15	2.15
0.112	12/19/1970	26	2.23	2.23
0.113	2/3/1998	25	2.32	2.33
0.114	11/22/1965	24	2.42	2.42
0.114	2/10/1978	23	2.52	2.53
0.114	1/29/1983	22	2.64	2.65
0.114	2/27/1983	21	2.76	2.78
0.114	12/30/1991	20	2.90	2.92
0.118	3/2/1980	19	3.05	3.08
0.13	4/1/1958	18	3.22	3.25
0.13	3/1/1978	17	3.41	3.45
0.131	1/16/1952	16	3.63	3.67
0.133	2/20/1980	15	3.87	3.92
0.133	3/17/1982	14	4.14	4.21
0.135	2/18/2005	13	4.46	4.54
0.137	10/29/2000	12	4.83	4.93
0.138	1/14/1993	11	5.27	5.40
0.138	10/27/2004	10	5.80	5.96
0.146	2/25/1969	9	6.44	6.65
0.149	2/4/1958	8	7.25	7.53
0.153	2/25/2003	7	8.29	8.67
0.175	9/23/1986	6	9.67	10.21
0.183	1/4/1995	5	11.60	12.43
0.19	1/15/1979	4	14.50	15.89
0.202	10/1/1983	3	19.33	22.00
0.211	1/4/1978	2	29.00	35.75
0.225	4/14/2003	1	58.00	95.33

List of Peak events and Determination of Q2 and Q10 (Post-Development)
Valley View - POC-1

T (Year)	Cunnane (cfs)	Weibull (cfs)	Peaks (cfs)	Date	Posit	Period of Return (Years)	
10	**0.02**	**0.02**				Weibull	Cunnane
9	**0.02**	**0.02**	0.0056	1/23/1952	57	1.02	1.01
8	**0.02**	**0.02**	0.0056	1/23/1952	56	1.04	1.03
7	**0.02**	**0.02**	0.0056	1/23/1952	55	1.05	1.05
6	**0.01**	**0.01**	0.0056	1/26/1952	54	1.07	1.07
5	**0.01**	**0.01**	0.0057	11/14/1952	53	1.09	1.09
4	**0.01**	**0.01**	0.006	1/21/1952	52	1.12	1.11
3	**0.01**	**0.01**	0.006	1/21/1952	51	1.14	1.13
2	**0.01**	**0.01**	0.0061	1/21/1952	50	1.16	1.15
			0.0061	1/21/1952	49	1.18	1.18
			0.0062	1/25/1954	48	1.21	1.20
			0.0063	1/19/1952	47	1.23	1.23
			0.0063	1/19/1952	46	1.26	1.25
			0.0063	1/19/1952	45	1.29	1.28
			0.0063	1/19/1952	44	1.32	1.31
			0.0063	1/19/1952	43	1.35	1.34
			0.0063	1/19/1952	42	1.38	1.38
			0.0063	1/19/1952	41	1.41	1.41
			0.0063	1/19/1952	40	1.45	1.44
			0.0063	1/19/1952	39	1.49	1.48
			0.0063	1/19/1952	38	1.53	1.52
			0.0063	1/19/1952	37	1.57	1.56
			0.0063	1/20/1952	36	1.61	1.61
			0.0063	1/20/1952	35	1.66	1.65
			0.0063	1/20/1952	34	1.71	1.70
			0.0063	1/20/1952	33	1.76	1.75
			0.0063	1/20/1952	32	1.81	1.81
			0.0063	1/20/1952	31	1.87	1.87
			0.0063	1/20/1952	30	1.93	1.93
			0.0063	1/20/1952	29	2.00	2.00
			0.0065	4/10/1952	28	2.07	2.07
			0.0066	12/20/1952	27	2.15	2.15
			0.0069	3/22/1954	26	2.23	2.23
			0.0073	3/12/1952	25	2.32	2.33
			0.0074	1/24/1954	24	2.42	2.42
			0.0077	3/16/1952	23	2.52	2.53
			0.0088	12/11/1951	22	2.64	2.65
			0.009	11/23/1952	21	2.76	2.78
			0.0097	1/25/1952	20	2.90	2.92
			0.0101	3/23/1954	19	3.05	3.08
			0.0112	1/13/1952	18	3.22	3.25
			0.0115	12/30/1952	17	3.41	3.45
			0.0121	3/25/1954	16	3.63	3.67
			0.0123	3/1/1953	15	3.87	3.92
			0.0125	3/8/1952	14	4.14	4.21
			0.0126	11/23/1951	13	4.46	4.54
			0.0131	3/7/1952	12	4.83	4.93
			0.0134	3/30/1954	11	5.27	5.40
			0.0138	12/29/1951	10	5.80	5.96
			0.0164	1/18/1952	9	6.44	6.65
			0.017	3/16/1954	8	7.25	7.53
			0.0177	1/19/1954	7	8.29	8.67
			0.019	11/30/1952	6	9.67	10.21
			0.0193	2/13/1954	5	11.60	12.43
			0.0205	12/2/1952	4	14.50	15.89
			0.0235	3/15/1952	3	19.33	22.00
			0.0326	11/15/1952	2	29.00	35.75
			0.0391	1/16/1952	1	58.00	95.33

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

ATTACHMENT 4

AREA VS ELEVATION

The storage provided by the LID BMP is entered into the LID Module within SWMM – please refer to Attachment 7 for further information. For verification, a stage storage relationship for the facilities is provided on the following pages.

DISCHARGE VS ELEVATION

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

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

A stage-discharge relationship is provided on the following pages for the surface outlet structure. The LID low flow orifice discharge relationship is addressed within the LID Module within SWMM – please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

Drawdown calculations are provided on the following page assuming the only discharge outlet is the low flow orifice and the basin is full to the emergency spillway (an extremely conservative assumption). Based on these assumptions, the LID facilities are dry within 11.4 hours and 20.3 hours respectively.

DISCHARGE EQUATIONS

1) Weir:

$$Q_W = C_W \cdot L \cdot H^{3/2} \quad (1)$$

2) Slot:

As an orifice: $$Q_s = B_s \cdot h_s \cdot c_g \cdot \sqrt{2g\left(H - \frac{h_s}{2}\right)} \quad (2.a)$$

As a weir: $$Q_s = C_W \cdot B_s \cdot H^{3/2} \quad (2.b)$$

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

3) Vertical Orifices

As an orifice: $$Q_o = 0.25 \cdot \pi D^2 \cdot c_g \cdot \sqrt{2g\left(H - \frac{D}{2}\right)} \quad (3.a)$$

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

$$\frac{Q_O^2}{g} = \frac{A_{cr}^3}{T_{cr}}; \quad H = y_{cr} + \frac{A_{cr}}{2 \cdot T_{cr}}; \; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}; \quad A_{cr} = \frac{D^2}{8}[\alpha_{cr} - sin(\alpha_{cr})];$$

$$y_{cr} = \frac{D}{2}[1 - sin(0.5 \cdot \alpha_{cr})] \quad (3.b.1, 3.b.2, 3.b.3, 3.b.4 \text{ and } 3.b.5)$$

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

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

The following are the variables used above:

Q_W, Q_s, Q_O = Discharge of weir, slot or orifice (cfs)

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

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

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

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

STAGE STORAGE & DRAW DOWN CALCULATIONS

BMP 1

Elev (ft)	Area (ft^2)	Volume (ft^3)	
0	580	0.0	LID AREA
0.5	647	306.7	FIRST SURFACE OUTLET
0.6	660	372.0	

LID 0.5" Orifice Flow	0.00745	cfs
Drawdown time (hrs)	**11.4**	

Note: It is assumed the basin is full to the top of basin crest

BMP 1

Elev (ft)	Area (ft^2)	Volume (ft^3)	
0	595	0.0	LID AREA
0.8	769	545.8	FIRST SURFACE OUTLET
1	813	704.0	

LID 0.5" Orifice Flow	0.00745	in/hr
Drawdown time (hrs)	**20.3**	

Note: It is assumed the basin is full to the top of basin crest

It should be noted to be conservative the minimum basin footprint was assumed at all depths to provide minimum storage volume estimates. This will be finalized in detail in final engineering grading plans.

Outlet structure for Discharge of Detention Basin 1

Discharge vs Elevation Table

Low orifice:	0.4 "	Lower slot		Emergency Weir	
Number:	1	Invert:	2.90 ft	Invert:	3.500 ft
Cg-low:	0.62	B	0.75 ft	B:	4 ft
Middle orifice:	1 "	h	0.083 ft		
number of orif:	0	Upper slot			
Cg-middle:	0.62	Invert:	0.000 ft		
invert elev:	0.17 ft	B:	0.00 ft		
		h	0.000 ft		

h (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qemer (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000
0.100	3.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.0013
0.200	6.000	0.400	0.002	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.0019
0.300	9.000	1.600	0.002	0.023	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.0023
0.400	12.000	2.800	0.003	0.027	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.0027
0.500	15.000	4.000	0.003	0.030	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.0030
0.600	18.000	5.200	0.003	0.033	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.0033
0.700	21.000	6.400	0.004	0.036	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.0036
0.800	24.000	7.600	0.004	0.038	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.0038
0.900	27.000	8.800	0.004	0.041	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.0041
1.000	30.000	10.000	0.004	0.043	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.0043
1.100	33.000	11.200	0.005	0.045	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.0045
1.200	36.000	12.400	0.005	0.047	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.0047
1.300	39.000	13.600	0.005	0.049	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.0049
1.400	42.000	14.800	0.005	0.051	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.0051
1.500	45.000	16.000	0.005	0.053	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.0053
1.600	48.000	17.200	0.005	0.055	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.0055
1.700	51.000	18.400	0.006	0.056	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.0056
1.800	54.000	19.600	0.006	0.058	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.0058
1.900	57.000	20.800	0.006	0.060	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.0060
2.000	60.000	22.000	0.006	0.061	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.0061
2.100	63.000	23.200	0.006	0.063	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.0063
2.200	66.000	24.400	0.006	0.064	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.0064
2.300	69.000	25.600	0.007	0.066	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.0066
2.400	72.000	26.800	0.007	0.067	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.0067
2.500	75.000	28.000	0.007	0.068	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.0068
2.600	78.000	29.200	0.007	0.070	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.0070
2.700	81.000	30.400	0.007	0.071	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.0071
2.800	84.000	31.600	0.007	0.072	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.0072
2.900	87.000	32.800	0.007	0.074	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.0074
3.000	90.000	34.000	0.007	0.075	0.007	0.000	0.000	0.000	0.074	0.000	0.000	0.0810
3.100	93.000	35.200	0.008	0.076	0.008	0.000	0.000	0.000	0.122	0.000	0.000	0.1294
3.200	96.000	36.400	0.008	0.077	0.008	0.000	0.000	0.000	0.156	0.000	0.000	0.1633
3.300	99.000	37.600	0.008	0.079	0.008	0.000	0.000	0.000	0.183	0.000	0.000	0.1910
3.400	102.000	38.800	0.008	0.080	0.008	0.000	0.000	0.000	0.207	0.000	0.000	0.2151
3.500	105.000	40.000	0.008	0.081	0.008	0.000	0.000	0.000	0.229	0.000	0.000	0.2367
3.600	108.000	41.200	0.008	0.082	0.008	0.000	0.000	0.000	0.248	0.000	0.392	0.6480
3.700	111.000	42.400	0.008	0.083	0.008	0.000	0.000	0.000	0.266	0.000	1.108	1.3830
3.800	114.000	43.600	0.008	0.084	0.008	0.000	0.000	0.000	0.283	0.000	2.037	2.3284
3.900	117.000	44.800	0.009	0.086	0.009	0.000	0.000	0.000	0.300	0.000	3.136	3.4439
4.000	120.000	46.000	0.009	0.087	0.009	0.000	0.000	0.000	0.315	0.000	4.383	4.7062

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention

Section Sketches

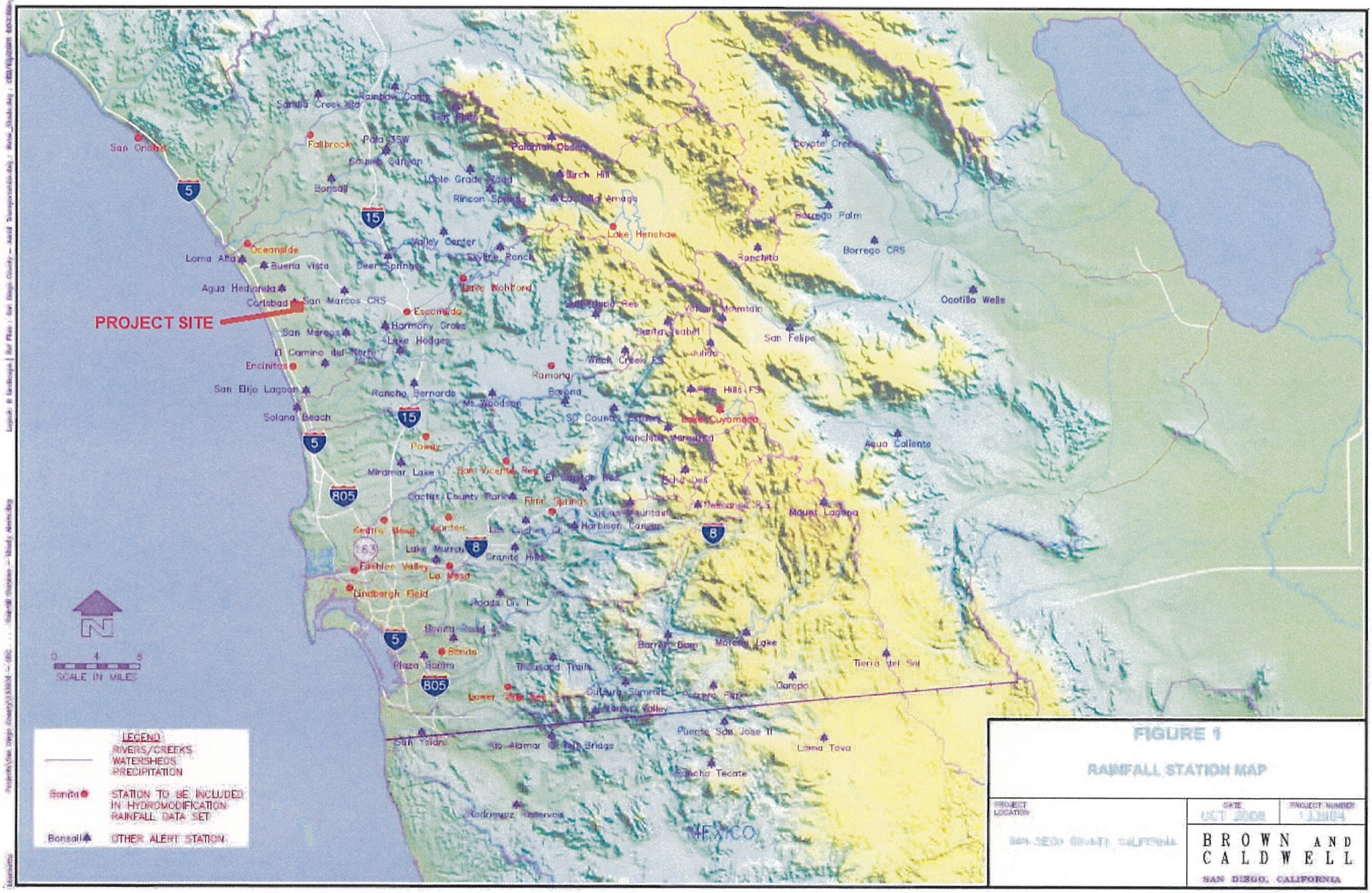


FIGURE 1

RAINFALL STATION MAP

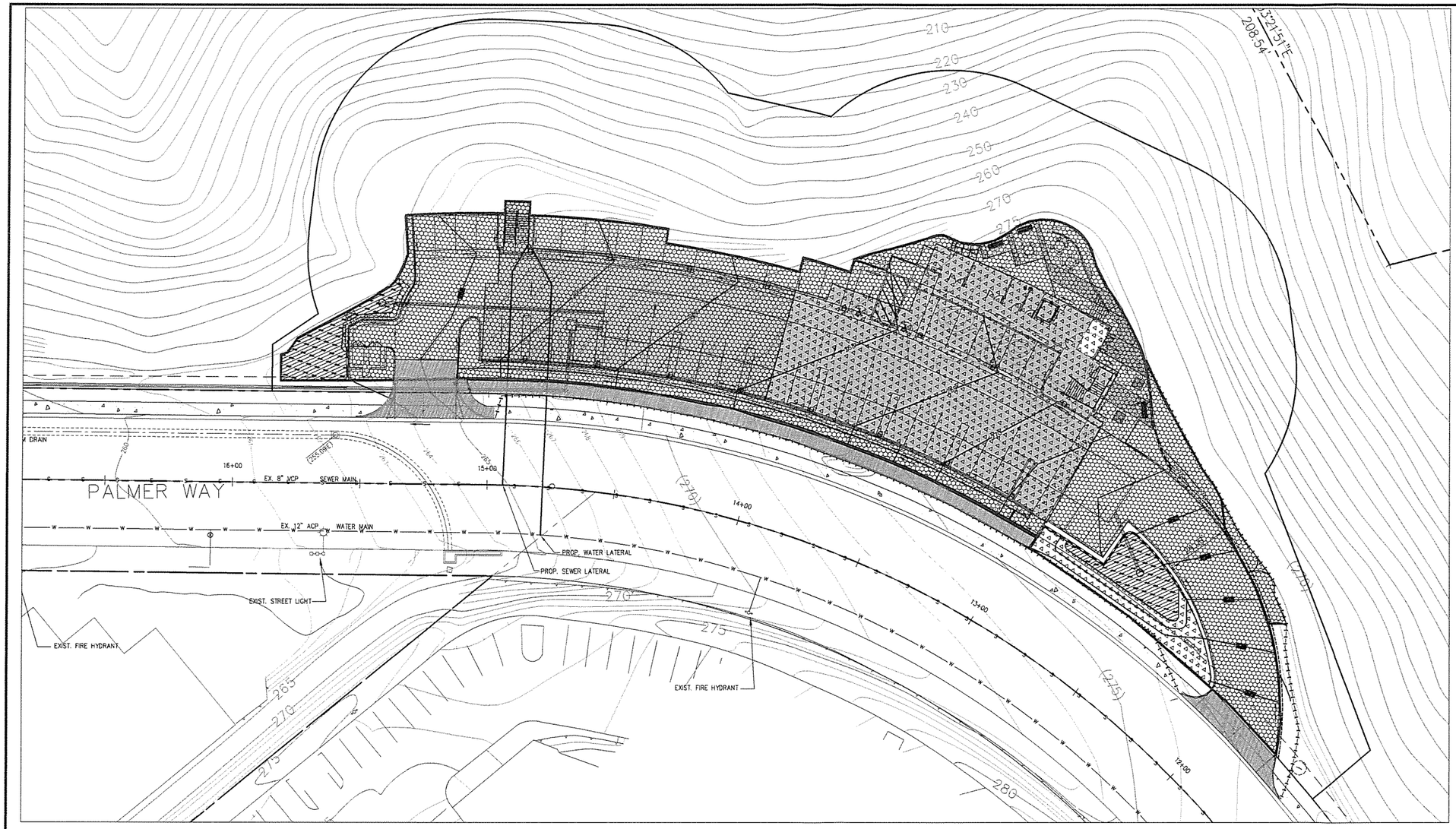
PROJECT LOCATION: SAN DIEGO COUNTY, CALIFORNIA

DATE: OCT 2008

PROJECT NUMBER: 13084

BROWN AND CALDWELL

SAN DIEGO, CALIFORNIA



LEGEND

ITEM	SYMBOL
LIMIT OF DRAINAGE MANAGEMENT AREA	
AREA CONTRIBUTING TO BF-1	
AREA CONTRIBUTING TO BF-2	

PROJECT AREA:

6.34 ACRES – 276,170 SF

DISTURBED AREA:

0.71 ACRES – 30,745 SF

CCSYA NOTE:

NO UPSTREAM CCSYA DRAIN INTO SITE, THERE IS NO CCYSA ONSITE.

SOIL TYPE NOTE:

THE ENTIRE SITE IS CLASSIFIED AS RdC REDDIGN GRAVELLY LOAM SOIL TYPE D

GROUNDWATER NOTE:

GROUNDWATER WAS NOT ENCOUNTERED IN THE EXPLORATORY EXCAVATIONS AT THE TIME OF EXCAVATION. IT MUST BE NOTED, HOWEVER, THAT FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO VARIATIONS IN GROUND SURFACE TOPOGRAPHY, SUBSURFACE STRATIFICATION, RAINFALL, AND OTHER POSSIBLE FACTORS THAT MAY NOT HAVE BEEN EVIDENT AT THE TIME OF FIELD INVESTIGATION, PER GEOTECHNICAL REPORT DATED FEBRUARY 23, 2018 JOB NO. 18-11749
THERES IS NO GROUNDWATER ONSITE PER GAMA TRACKER.

IMP AREA CALCULATION FACILITY (FOR WATER QUALITY ONLY)

LOW IMPACT DEVELOPMENT DESIGN (LID) SUMMARY TABLE		
DRAINAGE MANAGEMENT AREA (DMA-1)		BMP BIOFILTRATION BF-1
IMPERVIOUS – ROOF	5,404 SF	
IMPERVIOUS – PAVEMENT	7,394 SF	
IMPERVIOUS – HARDSCAPE	2,786 SF	TOTAL IMP. 15,584 SF
PERVIOUS – LANDSCAPE	2,655 SF	
PERVIOUS – BMP BIOFILTRATION	580 SF	TOTAL PERV. 3,235 SF
TOTAL DMA-1	18,819 SF	
DRAINAGE MANAGEMENT AREA (DMA-2)		BMP BIOFILTRATION BF-2
IMPERVIOUS – ROOF	8,650 SF	TOTAL IMP. 8,650 SF
PERVIOUS – LANDSCAPE	837 SF	
PERVIOUS – BMP BIOFILTRATION	595 SF	TOTAL PERV. 1,432 SF
TOTAL DMA-2	10,082 SF	
TOTAL DMA-1 + DMA-2	28,488 SF	

RUNOFF COEFFICIENT = 0.90 Commercial

IF PLAN SIZE IS LESS THAN 24"x36", THIS IS A REDUCED COPY. SCALE PLAN ACCORDINGLY.

SOURCE CONTROL

-MARK ALL ALL CATCH BASINS, CURB INLETS WITH "NO DUMPING GOES TO THE OCEAN, NO TIRAR BASURA LLEGA AL MAR"
-NOTE BUILDING DESIGN FEATURES THAT DISCOURAGE ENTRY OF PEST
-CONSIDER USING PEST-RESISTENT PLANT, DESIGN LANDSCAPE TO MINIMIZE IRRIGATION AND RUNOFF TO PROMOTE SURFACE INFILTRATION WHERE APPROPRIATE.
-FIRE SPRINKLER TEST WATER SHALL DRAIN TO THE SANITARY SEWER.
-SIDEWALK SHALL BE SWEPT REGULARLY. DEBRIS FROM PRESSURE WASHING AND WASHWATER CONTAINING ANY CLEANING AGENT SHALL BE DISCHARGE TO THE SANITARY SEWER AND NOT DISCHARGED TO A STORM DRAIN SYSTEM.

K&S ENGINEERING, INC.
Planning . Engineering . Surveying
7801 Mission Center Court, Suite 100 San Diego, CA 92108
(619) 296-5565 Fax: (619) 296-5564

PRIVATE CONTRACT

Attachment 1a

DMA PLAN FOR:

VALLEY VIEW

CITY OF CARLSBAD, CALIFORNIA
Development Services Department
SHEET 1 OF 1 SHEETS

I.O. NO. _____
PROJECT NO. _____
V.T.M. _____

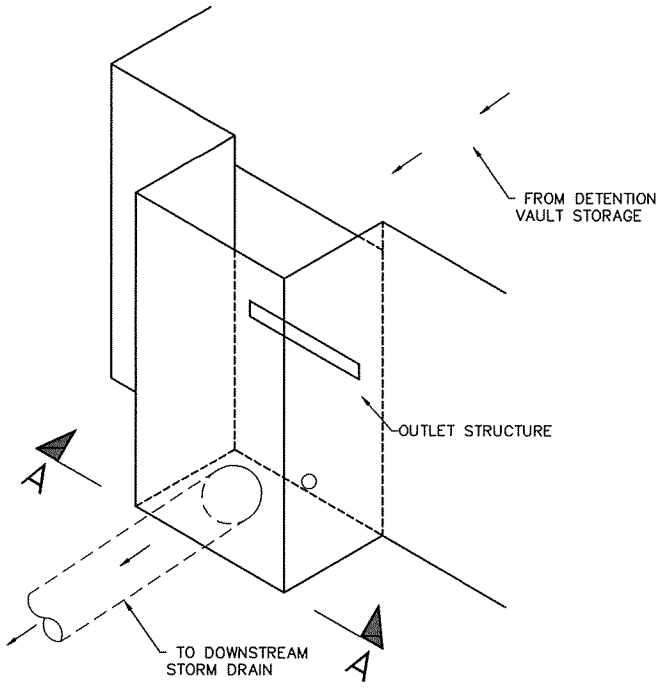
FOR CITY ENGINEER _____ DATE _____

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	KS			
AS-BUILTS				

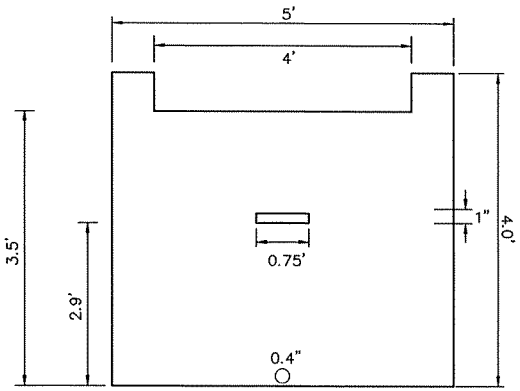
NAD83 COORDINATES

LAMBERT COORDINATES

CONTRACTOR _____ DATE STARTED _____
INSPECTOR _____ DATE COMPLETED _____



BASIN
(N.T.S.)



SECTION A–A
(N.T.S.)

REC Consultants, Inc.
Civil Engineering Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

BASIN 1 DETAIL

NTS

ATTACHMENT 6

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

PRE_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.15   0.17   0.19   0.19   0.18   0.15   0.11   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
OCEANSIDE        INTENSITY 1:00   1.0    TIMESERIES OCEANSIDE

[SUBCATCHMENTS]
;;                                                  Total     Pcnt.             Pcnt.     Curb      Snow
;;Name           Raingage         Outlet           Area      Imperv    Width    Slope     Length    Pack
;;-------------- ---------------- ---------------- --------- --------- -------- --------- --------- ---------
DMA-1            OCEANSIDE        POC-1            0.2       0         87       1         0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      0.05       0.02       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-1            9          0.0225     0.33

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
OCEANSIDE        FILE "OsideRain.prn"

[REPORT]
INPUT      NO
```

```
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2500.000           2700.000

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            2427.184           5983.010
DMA-1            2427.184           5983.010

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OCEANSIDE        1525.424           6864.407
```

POST_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.15   0.17   0.19   0.19   0.18   0.15   0.11   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
OCEANSIDE        INTENSITY 1:00   1.0    TIMESERIES OCEANSIDE

[SUBCATCHMENTS]
;;                                                  Total     Pcnt.             Pcnt.     Curb      Snow
;;Name           Raingage         Outlet           Area      Imperv   Width    Slope     Length    Pack
;;-------------- ---------------- ---------------- --------- -------- -------- --------- --------- ---------
DMA-1            OCEANSIDE        BR-1             0.419     85.44    54       1         0
BR-1             OCEANSIDE        DET_VAULT        0.013315  0        10       0         0
DMA-2            OCEANSIDE        BR-2             0.218     91.18    58       1         0
BR-2             OCEANSIDE        DET_VAULT        0.013659  0        10       0         0
DMA-DE-MIN       OCEANSIDE        POC-1            0.052     47.98    45       1         0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      0.05       0.02       0.1        25         OUTLET
BR-1             0.01       0.1        0.05       0.05       25         OUTLET
DMA-2            0.012      0.05       0.02       0.1        25         OUTLET
BR-2             0.012      0.05       0.02       0.1        25         OUTLET
DMA-DE-MIN       0.012      0.05       0.02       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-1            9          0.01875    0.33
BR-1             9          0.01875    0.33
DMA-2            9          0.01875    0.33
BR-2             9          0.01875    0.33
DMA-DE-MIN       9          0.01875    0.33

[LID_CONTROLS]
```

POST_DEV

```
;;               Type/Layer Parameters
;;-------------- ---------- ----------
BR-1             BC
BR-1             SURFACE    7.54       0.05       0          0          5
BR-1             SOIL       18         0.4        0.2        0.1        5          5          1.5
BR-1             STORAGE    18         0.67       0          0
BR-1             DRAIN      0.1435     0.5        3          6

BR-2             BC
BR-2             SURFACE    12.21      0.05       0.0        0.0        5
BR-2             SOIL       18         0.4        0.2        0.1        5          5          1.5
BR-2             STORAGE    18         0.67       0          0
BR-2             DRAIN      0.1399     0.5        3          6

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSatur  FromImprv  ToPerv     Report File
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- -----------
BR-1             BR-1             1       580        0          0          100        0
BR-2             BR-2             1       595        0          0          100        0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                    Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                   Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- ----------
------
DET_VAULT        0        4        0        TABULAR    Basin_1                  0        0

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet          Qcoeff/                    Flap
;;Name           Node             Node             Height     Type            QTable           Qexpon    Gate
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- ----
OUTLET           DET_VAULT        POC-1            0          TABULAR/DEPTH   Out_Vault                  NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Out_Vault        Rating     0.000      0.0000
Out_Vault                   0.100      0.0013
Out_Vault                   0.200      0.0019
Out_Vault                   0.300      0.0023
Out_Vault                   0.400      0.0027
Out_Vault                   0.500      0.0030
Out_Vault                   0.600      0.0033
Out_Vault                   0.700      0.0036
Out_Vault                   0.800      0.0038
Out_Vault                   0.900      0.0041
Out_Vault                   1.000      0.0043
Out_Vault                   1.100      0.0045
Out_Vault                   1.200      0.0047
Out_Vault                   1.300      0.0049
Out_Vault                   1.400      0.0051
Out_Vault                   1.500      0.0053
Out_Vault                   1.600      0.0055
Out_Vault                   1.700      0.0056
Out_Vault                   1.800      0.0058
Out_Vault                   1.900      0.0060
Out_Vault                   2.000      0.0061
Out_Vault                   2.100      0.0063
Out_Vault                   2.200      0.0064
Out_Vault                   2.300      0.0066
Out_Vault                   2.400      0.0067
Out_Vault                   2.500      0.0068
Out_Vault                   2.600      0.0070
Out_Vault                   2.700      0.0071
```

```
Out_Vault                   2.800      0.0072
Out_Vault                   2.900      0.0074
Out_Vault                   3.000      0.0810
Out_Vault                   3.100      0.1294
Out_Vault                   3.200      0.1633
Out_Vault                   3.300      0.1910
Out_Vault                   3.400      0.2151
Out_Vault                   3.500      0.2367
Out_Vault                   3.600      0.6480
Out_Vault                   3.700      1.3830
Out_Vault                   3.800      2.3284
Out_Vault                   3.900      3.4439
Out_Vault                   4.000      4.7062

Basin_1          Storage    0          4000
Basin_1                     4          4000

[TIMESERIES]
;;Name            Date       Time       Value
;;--------------- ---------- ---------- ----------
OCEANSIDE        FILE "OsideRain.prn"

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node            X-Coord            Y-Coord
;;--------------- ------------------ ------------------
POC-1            4346.734           536.013
DET_VAULT        4329.983           2428.811

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

[Polygons]
;;Subcatchment    X-Coord            Y-Coord
;;--------------- ------------------ ------------------
DMA-1            3400.000           6500.000
DMA-1            3400.000           6500.000
BR-1             3400.000           5000.000
DMA-2            5167.504           6599.665
BR-2             5234.506           5041.876
DMA-DE-MIN       812.395            3936.348

[SYMBOLS]
;;Gage            X-Coord            Y-Coord
;;--------------- ------------------ ------------------
OCEANSIDE        1525.424           6864.407
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

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

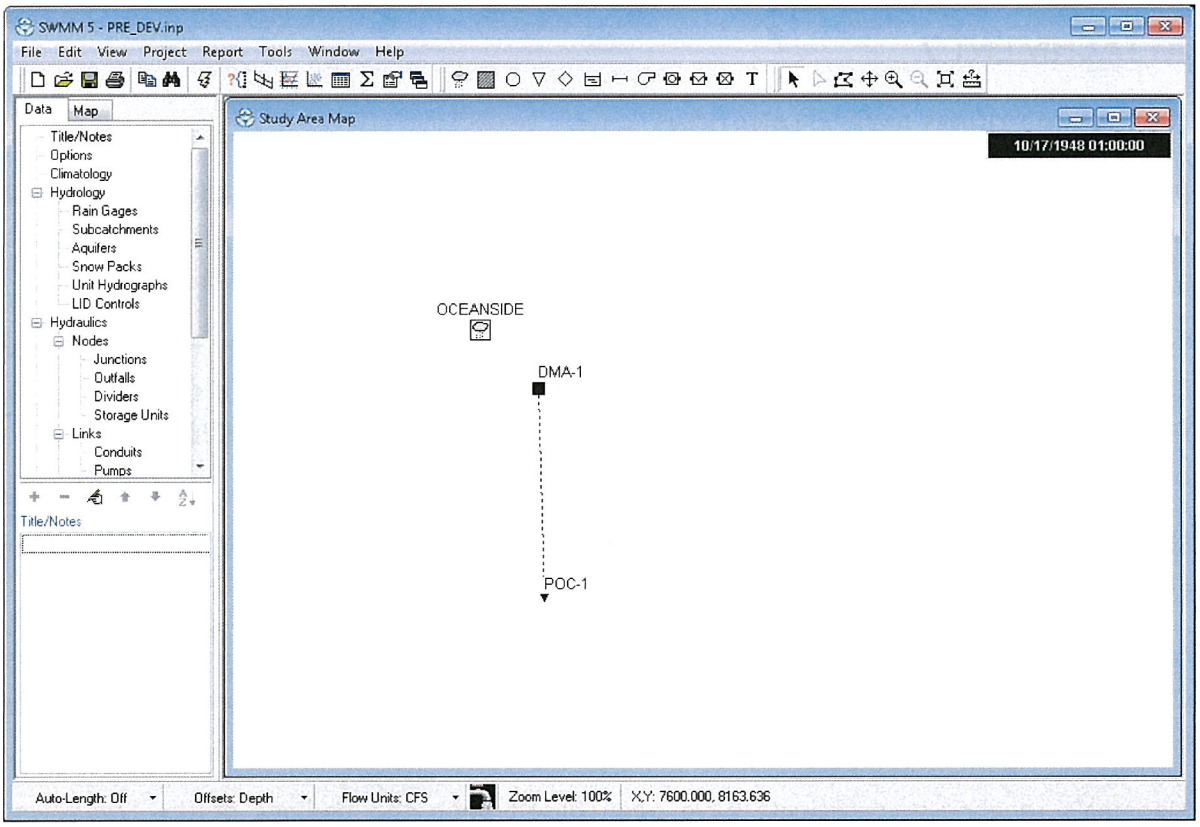
Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from Appendix G of the 2016 City of San Diego BMP Design Manual.

Soil characteristics of the existing soils were determined from the Geotechnical Investigation and the NRCS Web Soil Survey (located in Attachment 8 of this report).

A Technical document prepared by Tory R Walker Engineering for the Cities of San Marcos, Oceanside and Vista (Reference [1]) can also be consulted for additional information regarding typical values for SWMM parameters.

Manning's roughness coefficients have been based upon the findings of the "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*" date 2016 by TRW Engineering (Reference [6]).

PRE-DEVELOPED CONDITION



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	2500.000
Y-Coordinate	2700.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage OCEANSIDE

Property	Value
Name	OCEANSIDE
X-Coordinate	1525.424
Y-Coordinate	6864.407
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	OCEANSIDE
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	2427.184
Y-Coordinate	5983.010
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	POC-1
Area	0.2
Width	87
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
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

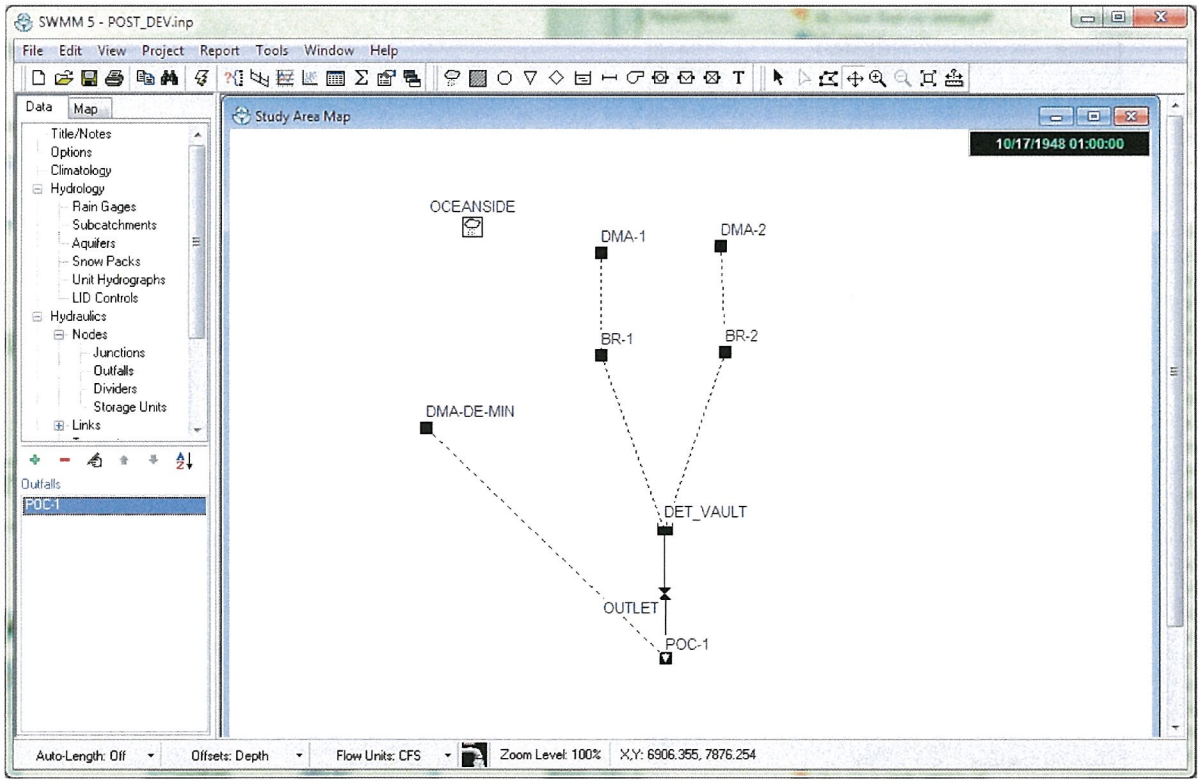
User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.0225
Initial Deficit	0.33

POST-DEVELOPED CONDITION



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	4744.526
Y-Coordinate	2554.745
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage OCEANSIDE

Property	Value
Name	OCEANSIDE
X-Coordinate	1525.424
Y-Coordinate	6864.407
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	OCEANSIDE
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	3400.000
Y-Coordinate	6500.000
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BR-1
Area	0.419
Width	54
% Slope	1
% Imperv	85.44
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
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

User-assigned name of subcatchment

Subcatchment DMA-2

Property	Value
Name	DMA-2
X-Coordinate	5167.504
Y-Coordinate	6599.665
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	BR-2
Area	0.218
Width	58
% Slope	1
% Imperv	91.18
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
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	0.01875
Initial Deficit	0.33

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment DMA-DE-MIN

Property	Value
Name	DMA-DE-MIN
X-Coordinate	812.395
Y-Coordinate	3936.348
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	POC-1
Area	0.052
Width	45
% Slope	1
% Imperv	47.98
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
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)

Subcatchment BR-1

Property	Value
Name	BR-1
X-Coordinate	3400.000
Y-Coordinate	5000.000
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	DET_VAULT
Area	0.013315
Width	10
% Slope	0
% Imperv	0
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment BR-2

Property	Value
Name	BR-2
X-Coordinate	5234.506
Y-Coordinate	5041.876
Description	
Tag	
Rain Gage	OCEANSIDE
Outlet	DET_VAULT
Area	0.013659
Width	10
% Slope	0
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.02
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Detention Basin 1

Storage Unit DET_VAULT

Property	Value
Name	DET_VAULT
X-Coordinate	4329.983
Y-Coordinate	2428.811
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	4
Initial Depth	0
Ponded Area	0
Evap. Factor	0
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Basin_1

Outlet OUTLET

Property	Value
Name	OUTLET
Inlet Node	DET_VAULT
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	Out_Vault

User-assigned name of outlet

Storage Curve Editor

Curve Name: Basin_1

Description:

	Depth (ft)	Area (ft2)
1	0	4000
2	4	4000
3		
4		
5		
6		
7		
8		
9		

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

Rating Curve Editor

Curve Name: Out_Vault

Description:

	Head (ft)	Outflow (CFS)
1	0.000	0.0000
2	0.100	0.0013
3	0.200	0.0019
4	0.300	0.0023
5	0.400	0.0027
6	0.500	0.0030
7	0.600	0.0033
8	0.700	0.0036
9	0.800	0.0038

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

EXPLANATION OF SELECTED VARIABLES

Sub Catchment Areas:

Please refer to the attached diagrams that indicate the DMA and Bio-Retention BMPs (BMP) sub areas modeled within the project site at both the pre and post developed conditions draining to the POC.

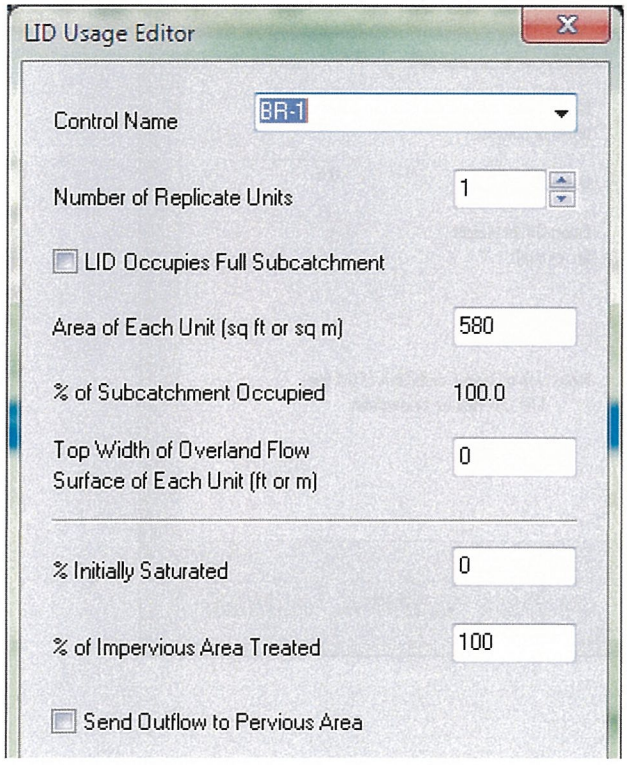
Parameters for the pre- and post-developed models include soil type D as determined from the San Diego Hydrology Manual Soils Map (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for these soils types, according to Appendix G of the 2016 City of San Diego BMP Design Manual.

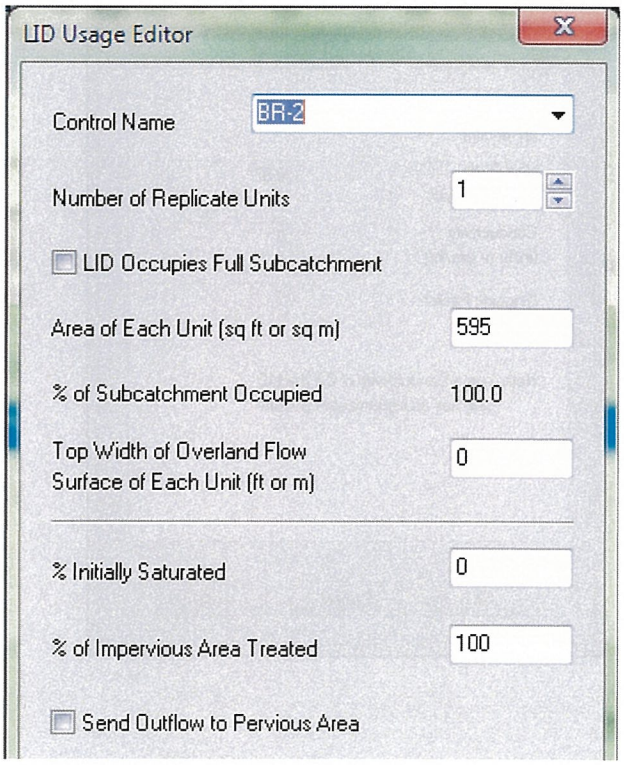
For surface runoff infiltration values, REC selected infiltration values per Appendix G of the 2016 City of Carlsbad BMP Design Manual corresponding to hydrologic soil type.

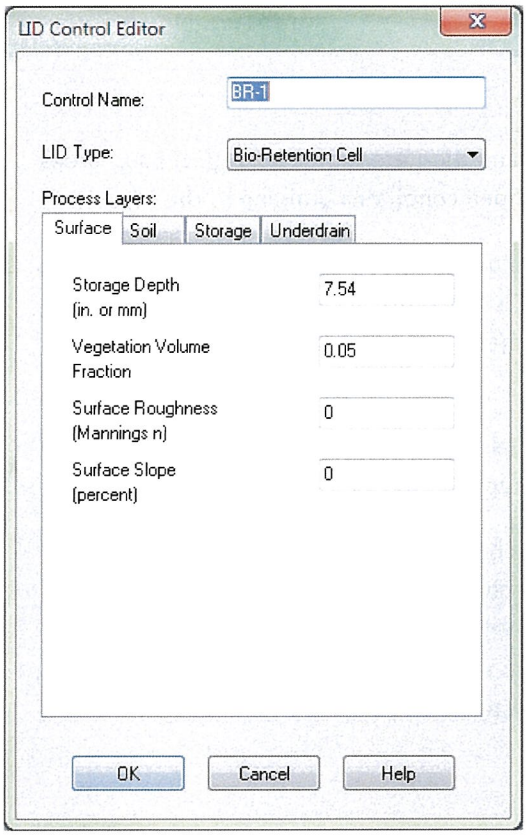
Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, 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.

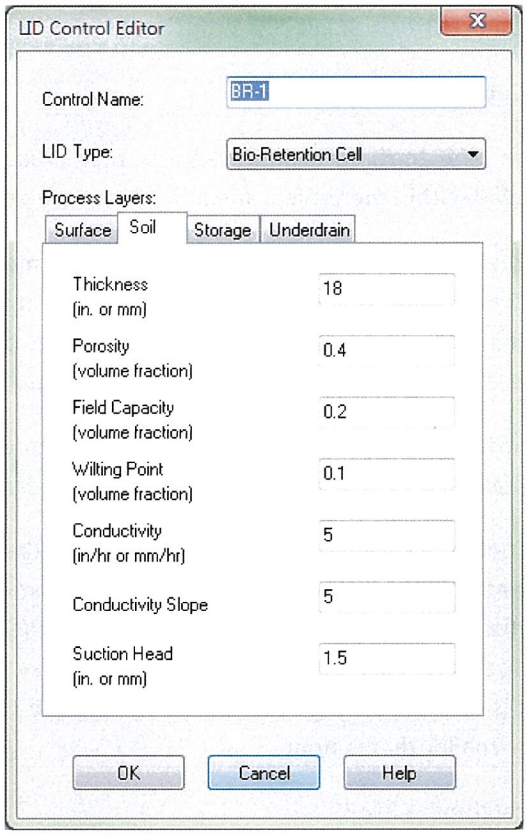
Sub-catchment BMP:

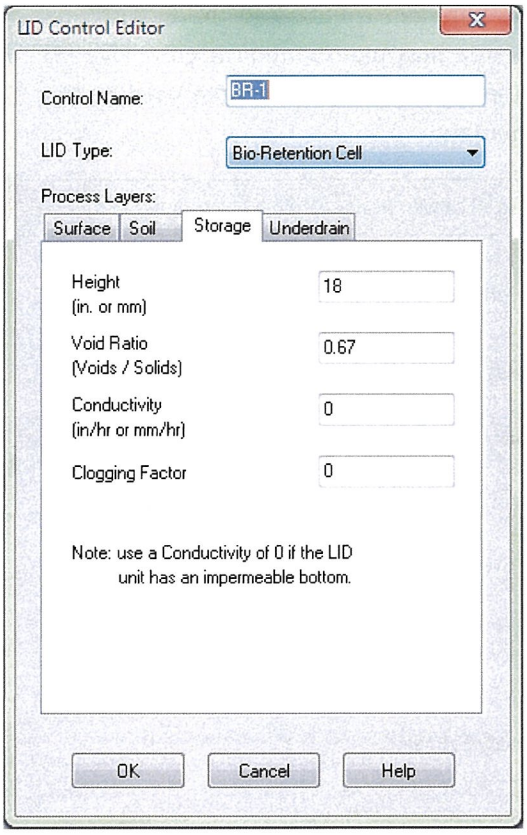
The area of biofiltration must be equal to the area of the development tributary to the biofiltration facility (area that drains into the biofiltration, equal external area plus bio-retention itself). Five (5) decimal places were given regarding the areas of the biofiltration to insure that the area used by the program for the LID subroutine corresponds exactly with this tributary.

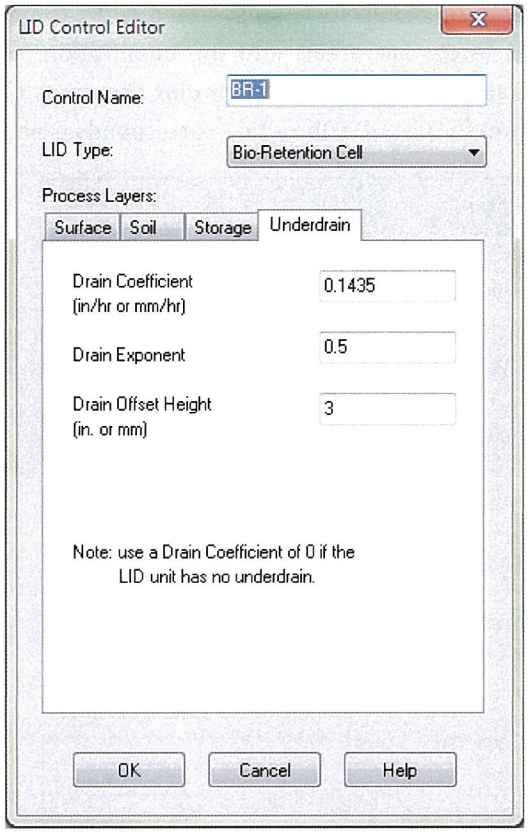


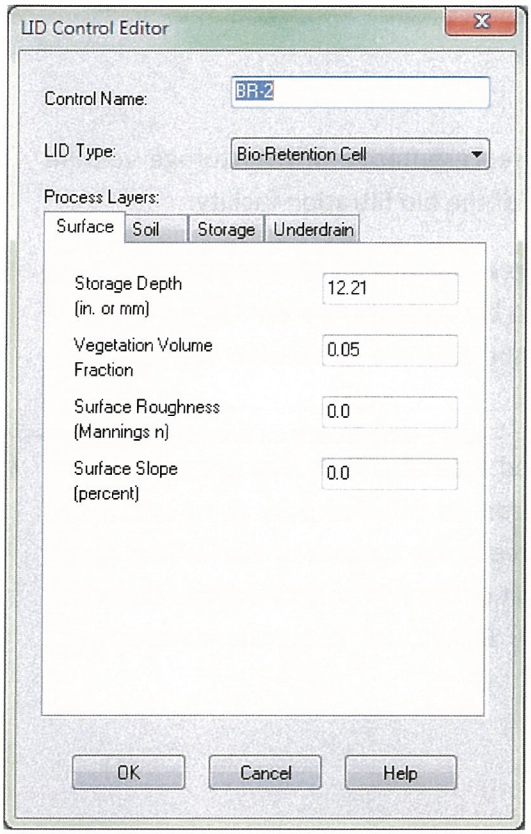



LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Storage Depth
(in. or mm)
7.54
Vegetation Volume
Fraction
0.05
Surface Roughness
(Mannings n)
0
Surface Slope
(percent)
0
OK
Cancel
Help


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


LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Height
(in. or mm)
18
Void Ratio
(Voids / Solids)
0.67
Conductivity
(in/hr or mm/hr)
0
Clogging Factor
0
Note: use a Conductivity of 0 if the LID
unit has an impermeable bottom.
OK
Cancel
Help


LID Control Editor
Control Name:
BR-1
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Drain Coefficient
(in/hr or mm/hr)
0.1435
Drain Exponent
0.5
Drain Offset Height
(in. or mm)
3
Note: use a Drain Coefficient of 0 if the
LID unit has no underdrain.
OK
Cancel
Help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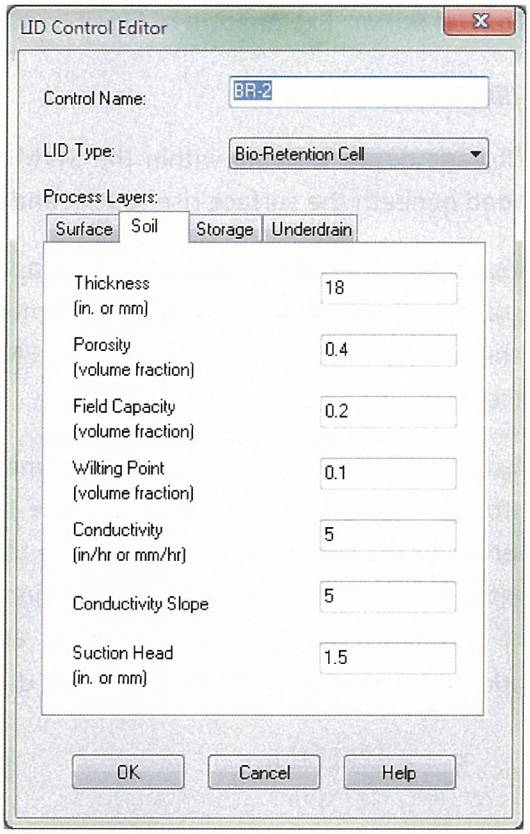
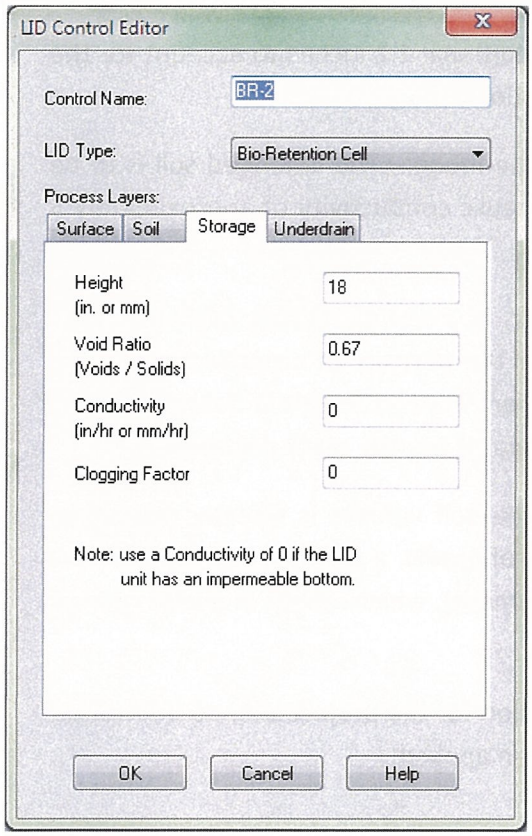
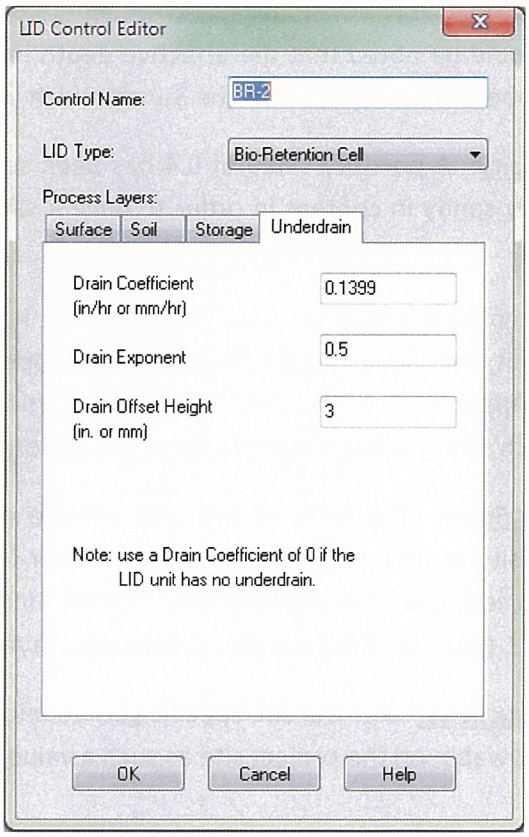
Control Name:
BR-2
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Storage Depth
(in. or mm)
12.21
Vegetation Volume
Fraction
0.05
Surface Roughness
(Mannings n)
0.0
Surface Slope
(percent)
0.0
OK
Cancel
Help


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


LID Control Editor
Control Name:
BR-2
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Height
(in. or mm)
18
Void Ratio
(Voids / Solids)
0.67
Conductivity
(in/hr or mm/hr)
0
Clogging Factor
0
Note: use a Conductivity of 0 if the LID
unit has an impermeable bottom.
OK
Cancel
Help


LID Control Editor
Control Name:
BR-2
LID Type:
Bio-Retention Cell
Process Layers:
Surface
Soil
Storage
Underdrain
Drain Coefficient
(in/hr or mm/hr)
0.1399
Drain Exponent
0.5
Drain Offset Height
(in. or mm)
3
Note: use a Drain Coefficient of 0 if the
LID unit has no underdrain.
OK
Cancel
Help

LID Control Editor: Explanation of Significant Variables

Storage Depth:

The storage depth variable within the SWMM model is representative of the storage volume provided beneath the surface riser outlet and the surface of the bio filtration facility.

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

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

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

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

It should be noted that the effective depth includes an additional 1.2 inches to account for the volume of solids present in the 3-inch mulch layer (void ratio of 60%).

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.

REC 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. Such porosity is equal to the porosity of the gravel per the same document.

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 (also per Appendix A of the Final HMP document), which results in a void ratio of 0.4/(1-0.4) = 0.67 for the gravel detention layer.

Conductivity: Per the site specific geotechnical investigation for the project site, no infiltration is allowable on the project site as such a value of 0 has been applied.

Clogging factor: A clogging factor was not used (0 indicates that there is no 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 C in the SWMM Model is the coefficient needed to transform the orifice equation into a general power law equation of the form:

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

where q is the peak flow in in/hr, n is 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:

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

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 (3).

It is clear that:

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

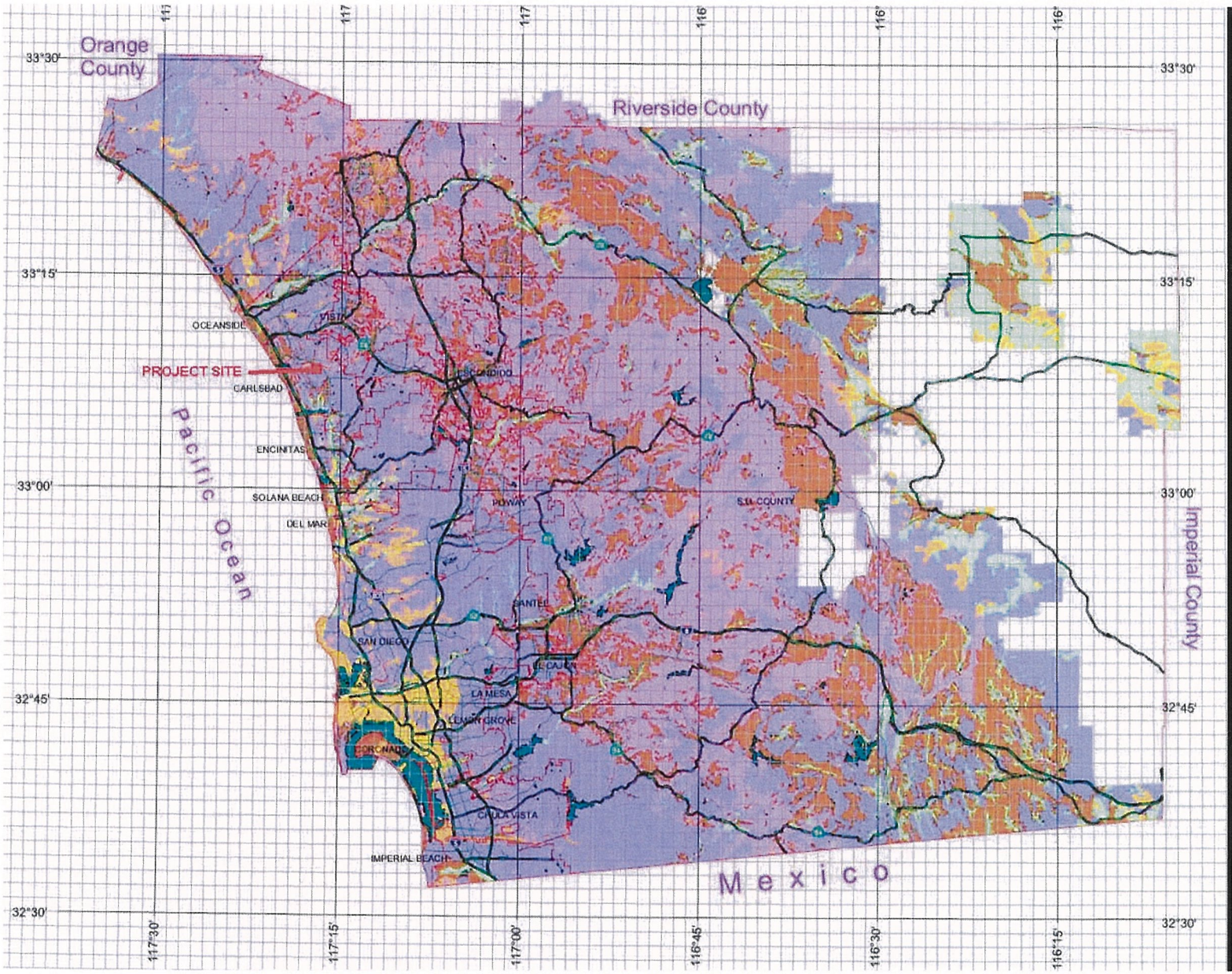
Cut-Off Flow: Q (cfs) and q (in/hr) are also the cutoff flow. For numerical reasons to insure the LID is full, the model uses cut-off = 1.01 Q.

ATTACHMENT 8

Geotechnical Documentation

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

ATTACHMENT 9

Summary Files from the SWMM Model

PRE_DEV

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

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

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Starting Date OCT-17-1948 00:00:00
Ending Date OCT-17-2005 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:15:00
Dry Time Step 04:00:00

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	608.455	650.290
Evaporation Loss	1.961	2.095
Infiltration Loss	591.986	632.689
Surface Runoff	15.759	16.842
Final Surface Storage	0.000	0.000
Continuity Error (%)	-0.206	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	15.759	5.135
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	15.759	5.135
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	650.29	0.00	2.10	632.69	16.84	5.13	10.98	0.026

Analysis begun on: Tue Mar 06 13:44:24 2018
Analysis ended on: Tue Mar 06 13:44:40 2018
Total elapsed time: 00:00:16

POST_DEV

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

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

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ OCT-17-1948 00:00:00
Ending Date .............. OCT-17-2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Total Precipitation ......        38.799       650.290
Evaporation Loss .........         6.046       101.333
Infiltration Loss ........         4.134        69.283
Surface Runoff ...........        29.126       488.168
Final Surface Storage ....         0.009         0.146
Continuity Error (%) .....        -1.329


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        29.126         9.491
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        29.113         9.487
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.013         0.004
Continuity Error (%) .....         0.000


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


************************
Routing Time Step Summary
************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
```

POST_DEV

Maximum Time Step : 60.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1	650.29	0.00	67.18	67.45	522.21	5.94	0.50	0.803
BR-1	650.29	16433.19	1059.61	0.00	16069.89	5.81	0.52	0.941
DMA-2	650.29	0.00	67.06	40.63	551.25	3.26	0.26	0.848
BR-2	650.29	8798.02	986.88	0.00	8485.22	3.15	0.28	0.898
DMA-DE-MIN	650.29	0.00	42.22	240.11	377.80	0.53	0.06	0.581

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Init. Storage in	Final Storage in	Pcnt. Error
BR-1	BR-1	17083.48	1059.65	0.00	4257.23	11813.28	0.00	4.38	-0.30
BR-2	BR-2	9448.31	986.89	0.00	417.02	8068.31	0.00	3.39	-0.29

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00
DET_VAULT	STORAGE	0.12	3.17	3.17	11448 22:38

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
POC-1	OUTFALL	0.06	0.15	11448 22:38	0.533	9.486
DET_VAULT	STORAGE	0.79	0.79	19902 17:00	8.957	8.957

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
DET_VAULT	STORAGE	499679.02	3.170	0.830

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
DET_VAULT	0.487	3	0	12.681	79	11448 22:37	0.15

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
POC-1	21.33	0.00	0.15	9.486
System	21.33	0.00	0.15	9.486

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
OUTLET	DUMMY	0.15	11448 22:38			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Apr 05 13:53:21 2018
Analysis ended on: Thu Apr 05 13:53:47 2018
Total elapsed time: 00:00:26

ATTACHMENT 3
Structural BMP Maintenance Information

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

Preliminary Design/Planning/CEQA level submittal:

Attachment 3 must identify:

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

Final Design level submittal:

Attachment 3 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 for BMPs subject to siltation or heavy trash(e.g., silt level posts or other markings shall be included in all BMP components that will trap and store sediment, trash, and/or debris, so that the inspector may determine how full the BMP is, and the maintenance personnel may determine where the bottom of the BMP is . If required, posts or other markings shall be indicated and described on structural BMP plans.)
- ☐ 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

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 used for pretreatment and/or site design BMPs	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 inspecting/unclogging orifice opening, 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.	

* Vegetated swales and flow-through planter boxes in regards to flow-thru treatment control BMPs are not options as structural BMPs. Carlsbad has not adopted an Alternative Compliance Program.

ATTACHMENT 4
City standard Single Sheet BMP (SSBMP) Exhibit

[Use the City's standard Single Sheet BMP Plan.]