# Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP)

#### **Towne Centre View**

PTS # 624751

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

☐ Check if electing for offsite alternative compliance

**Engineer of Work:** 

Gregory W. Lang, P.E. #68075 Provide Wet Signature and Stamp Above Line

#### **Prepared For:**

BRE-BMR Towne Centre Science Park LLC, c/o Project Management Advisors, Inc.
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Prepared By:

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Approved by: City of San Diego Date

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### **Acronyms**

APN Assessor's Parcel Number

ASBS Area of Special Biological Significance

BMP Best Management Practice

CEQA California Environmental Quality Act

CGP Construction General Permit
DCV Design Capture Volume
DMA Drainage Management Areas
ESA Environmentally Sensitive Area
GLU Geomorphic Landscape Unit

GW Ground Water

HMP Hvdromodification Management Plan

HSG Hvdrologic Soil Group HU Harvest and Use

INF Infiltration

LID Low Impact Development

LUP Linear Underground/Overhead Projects
MS4 Municipal Separate Storm Sewer System

N/A Not Applicable

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

PDP Priority Development Proiect

PE Professional Engineer
POC Pollutant of Concern
SC Source Control

SD Site Design

SDRWQCB San Diego Regional Water Ouality Control Board

SIC Standard Industrial Classification
SWPPP Stormwater Pollutant Protection Plan
SWQMP Storm Water Quality Management Plan

TMDL Total Maximum Daily Load

WMAA Watershed Management Area Analysis

WPCP Water Pollution Control Program WQIP Water Quality Improvement Plan



# **Certification Page**

#### Project Name: Permit Application

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 Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable 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 PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

Engineer of Work's Signature				
68075 6/30/	/2023			
PE# Expi	ration Date			
Gregory W. Lang, P.E.				
Print Name				
Pasco Laret Suiter & Asso	ociates, Inc.			
Company				
December 2021	OFF SOL			
Date	PROFESSIONAL CONTROL OF CAUTO			



Engineer's Stamp

## **Submittal Record**

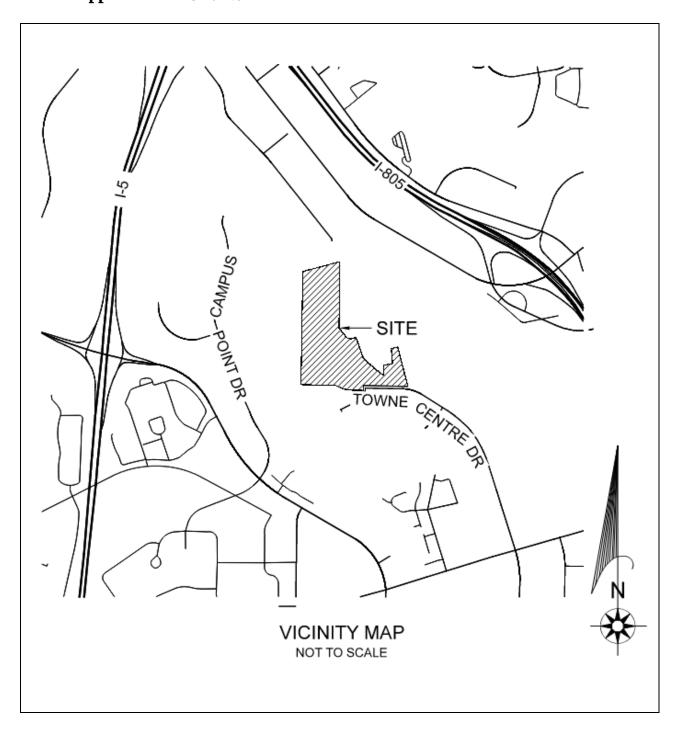
Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck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

Submittal Number	Date	Project Status	Changes
1	Sept 2020	Preliminary Design/Planning/CEQA	Initial Submittal
		Final Design	
2	Jan 2021	Preliminary Design/Planning/CEQA	Second Submittal
		Final Design	
3	December	Preliminary Design/Planning/CEQA	Third Submittal
	2021	Final Design	
4		Preliminary Design/Planning/CEQA	
		Final Design	



# **Project Vicinity Map**

**Project Name:** Towne Centre View **Permit Application** PTS # 624751





# City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.





# **Storm Water Requirements Applicability Checklist**

**FORM DS-560** 

**Остовек** 2016

Project Address: 9855, 9865, 9875, 9885 Towne Centre Drive

Project Number (for City Use Only):

#### SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the <u>Storm Water Standards Manual</u>. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)<sup>1</sup>, which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.			
<ol> <li>Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects w land disturbance greater than or equal to 1 acre.)</li> </ol>			
X Yes; SWPPP required, skip questions 2-4 No; next question			
<ol><li>Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runce</li></ol>			
Yes; WPCP required, skip 3-4 No; next question			
3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)			
Yes; WPCP required, skip 4  No; next question			
4. Does the project only include the following Permit types listed below?			
<ul> <li>Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit Spa Permit.</li> </ul>			
<ul> <li>Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.</li> </ul>			
<ul> <li>Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.</li> </ul>			
Yes; no document required			
Check one of the boxes below, and continue to PART B:			
If you checked "Yes" for question 1, a SWPPP is REQUIRED. Continue to PART B			
If you checked "No" for question 1, and checked "Yes" for question 2 or 3, a WPCP is REQUIRED. If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. Continue to PART B.			
If you checked "No" for all questions 1-3, and checked "Yes" for question 4 PART B <b>does not apply and no document is required. Continue to Section 2.</b>			
More information on the City's construction BMP requirements as well as CGP requirements can be found at:      www.sandiago.gov/ctorpyvator/regulations/index shtml			

Th pr Cit Sta an nif	le city res ojects are ty has alig ate Const id receivir ficance (A	zation must be completed within this form, noted on the plans, and included in the SW erves the right to adjust the priority of projects both before and after construction. Co assigned an inspection frequency based on if the project has a "high threat to water cannot the local definition of "high threat to water quality" to the risk determination appround the local Permit (CGP). The CGP determines risk level based on project specifically water risk. Additional inspection is required for projects within the Areas of Special SBS) watershed. <b>NOTE:</b> The construction priority does <b>NOT</b> change construction BMP o projects; rather, it determines the frequency of inspections that will be conducted by	onstruction quality." The coach of the sediment risk Biological Sig- requirements
Co	mplete	PART B and continued to Section 2	
1.		ASBS	
		a. Projects located in the ASBS watershed.	
2.	X	High Priority	
		a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Cons General Permit and not located in the ASBS watershed.	struction
		b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Cons General Permit and not located in the ASBS watershed.	truction
3.		Medium Priority	
		a. Projects 1 acre or more but not subject to an ASBS or high priority designation.	
		<ul> <li>b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction Generator not located in the ASBS watershed.</li> </ul>	al Permit and
4.		Low Priority	
		<ul> <li>a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or priority designation.</li> </ul>	medium
SE	CTION 2	2. Permanent Storm Water BMP Requirements.	
Ac	lditional i	nformation for determining the requirements is found in the Storm Water Standards N	<u>Manual</u> .
Pr ve BN	ojects tha lopment MPs. <b>"yes" is</b>	etermine if Not Subject to Permanent Storm Water Requirements.  It are considered maintenance, or otherwise not categorized as "new development propects" according to the Storm Water Standards Manual are not subject to Permaner checked for any number in Part C, proceed to Part F and check "Not Subject Mater BMP Requirements".	nt Storm Wate
		thecked for all of the numbers in Part C continue to Part D.	
1.	Does the existing	ne project only include interior remodels and/or is the project entirely within an g enclosed structure and does not have the potential to contact storm water?	☐ Yes 🗵 I
	Does th	ne project only include the construction of overhead or underground utilities without g new impervious surfaces?	☐ Yes ☒ N
2.		ne project fall under routine maintenance? Examples include, but are not limited to:	

City of San Diego • Development Services • Storm Water Requirements Applicability Checklist Page	e 3 of 4
PART D: PDP Exempt Requirements.	
PDP Exempt projects are required to implement site design and source control BM	1Ps.
If "yes" was checked for any questions in Part D, continue to Part F and check the "PDP Exempt."	box labeled
If "no" was checked for all questions in Part D, continue to Part E.	
1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:	
<ul> <li>Are designed and constructed to direct storm water runoff to adjacent vegetated ar non-erodible permeable areas? Or;</li> </ul>	-
Are designed and constructed to be hydraulically disconnected from paved streets a	=
<ul> <li>Are designed and constructed with permeable pavements or surfaces in accordance Green Streets guidance in the City's Storm Water Standards manual?</li> </ul>	with the
Yes; PDP exempt requirements apply  No; next question	
<ol><li>Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or re and constructed in accordance with the Green Streets guidance in the <u>City's Storm Water Sta</u></li></ol>	ndards Manual?
$\square$ Yes; PDP exempt requirements apply $\boxtimes$ No; project not exempt.	
If "yes" is checked for any number in PART E, continue to PART F and check the boority Development Project".  If "no" is checked for every number in PART E, continue to PART F and check the boost standard Development Project".	
<ol> <li>New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site. This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.</li> </ol>	□Yes ⊠No
<ol> <li>Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces. This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.</li> </ol>	⊠Yes □No
3. <b>New development or redevelopment of a restaurant.</b> Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands sel prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface.	ling ⊠Yes □No
4. <b>New development or redevelopment on a hillside.</b> The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater.	e □Yes ⊠No
5. New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	
6. <b>New development or redevelopment of streets, roads, highways, freeways, and driveways.</b> The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	⊠Yes □No

Pa	ge 4 of 4 City of San Diego • Development S	Services · Storm Water Requirements Applicability Checklis	it
7.	(collectively over project site), and discharged Area (ESA). "Discharging directly to" include feet or less from the project to the ESA, or	or replaces 2,500 square feet of impervious surface ges directly to an Environmentally Sensitive ges flow that is conveyed overland a distance of 200 conveyed in a pipe or open channel any distance FSA (i.e. not commingled with flows from adjacent	Yes ⊠No
8.	create and/or replaces 5,000 square fee	ojects of a retail gasoline outlet (RGO) that t of impervious surface. The development 00 square feet or more or (b) has a projected vehicles per day.	Yes ⊠No
9.	creates and/or replaces 5,000 square fe	ojects of an automotive repair shops that et or more of impervious surfaces. Development d Industrial Classification (SIC) codes 5013, 5014,	Yes 🗵 No
10.	results in the disturbance of one or more a post construction, such as fertilizers and p less than 5,000 sf of impervious surface ar use of pesticides and fertilizers, such as slo the square footage of impervious surface	e project is not covered in the categories above, acres of land and is expected to generate pollutants esticides. This does not include projects creating of where added landscaping does not require regular ope stabilization using native plants. Calculation of need not include linear pathways that are for infrequent access or bicycle pedestrian use, if they are built or to surrounding pervious surfaces.	Yes 🗵 No
PA	ART F: Select the appropriate category	based on the outcomes of PART C through PAR	T E.
1.	The project is <b>NOT SUBJECT TO PERMAN</b>	ENT STORM WATER REQUIREMENTS.	
2.	The project is a <b>STANDARD DEVELOPMEI</b> BMP requirements apply. See the <u>Storm</u> of the Storm of t	NT PROJECT. Site design and source control Water Standards Manual for guidance.	
3.	The project is <b>PDP EXEMPT</b> . Site design a See the <u>Storm Water Standards Manual</u> for	nd source control BMP requirements apply. or guidance.	
4.	structural pollutant control BMP requirem	<b>PROJECT</b> . Site design, source control, and nents apply. See the <u>Storm Water Standards Manual</u> uires a hydromodification plan management	×
	regory W. Lang ame of Owner or Agent (Please Print)	Civil Engineer	
110	ance of owner of Agene (Freuse Fring)		
Sig	gnature	Date	

Applicability of Permane Storm Wate	ent, Post-Cons er BMP Requi	Form I- I
Project Id	dentification	·
Project Name:Towne Centre View		
Permit Application Number:		Date:
Determination	of Requireme	nts
The purpose of this form is to identify permanen project. This form serves as a short <u>summary</u> of a separate forms that will serve as the backup for the Answer each step below, starting with <b>Step 1</b> and "Stop". Refer to the manual sections and/or separate of the server is to be server as the backup for the server is the	applicable requiche determinations  I progressing the	irements, in some cases referencing on of requirements.  nrough each step until reaching
Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual	Yes	Go to Step 2.
(Part 1 of Storm Water Standards) for	No	<b>Stop</b> . Permanent BMP
guidance.		requirements do not apply. No
		SWQMP will be required. Provide
Discussion / justification if the project is <u>not</u> a "de		discussion below.
Step 2: Is the project a Standard Project, PDP, or	Standard	<b>Stop.</b> Standard Project
PDP Exempt?	Project	requirements apply
To answer this item, see Section 1.4 of the manual in its entirety for guidance AND	<b>₽</b> PDP	PDP requirements apply, including PDP SWQMP. Go to <b>Step 3</b> .
complete Form DS-560, Storm Water Requirements Applicability Checklist.	PDP	<b>Stop.</b> Standard Project
Requirements Applicability Checkist.	Exempt	requirements apply. Provide discussion and list any additional
		requirements below.
Discussion / justification, and additional requirer applicable:	ments for excep	otions to PDP definitions, if



Form I-1	Page 2 of 2	
Step	Answer	Progression
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual (Part 1 of Storm Water Standards) for guidance.	Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to <b>Step 4</b> .
	No	BMP Design Manual PDP requirements apply. Go to <b>Step 4</b> .
Discussion / justification of prior lawful approval, lawful approval does not apply):	and identify re	quirements ( <u>not required if prior</u>
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	✓Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to <b>Step 5</b> .
	□No	<b>Stop</b> . PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification con	trol requireme	nts do <u>not</u> apply:
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual (Part 1 of Storm Water Standards) for guidance.	Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). <b>Stop</b> .
	No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below.  Stop.
Discussion / justification if protection of critical co There are no potential critical coarse sedi project site. Refer to the exhibit located in	ment yield a	reas on or upstream of the



Site Information Checklist Form I-3B		
	For PDPs	םכיו ווווסיו
Project Sum	mary Information	
Project Name	Towne Centre View	
Project Address	9855, 9865, 9875, 98 San Diego, CA 92121	85 Towne Centre Drive
Assessor's Parcel Number(s) (APN(s))	343-121-35, 36, 37, 4	2, 43
Permit Application Number	PTS#	
Project Watershed	Select One:  San Dieguito River  Penasquitos  Mission Bay San Diego River  San Diego Bay  Tijuana River	
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Miramar Reservoir 906.10	
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of- way)	33.52 Acres (1,460	.293 Square Feet)
Area to be disturbed by the project (Project Footprint)	20.64 Acres (898,9	<sup>20</sup> Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	10.62 Acres (46273	Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	10.02 Acres (436,1	<sup>90</sup> Square Feet)
Note: Proposed Impervious Area + Proposed Pe This may be less than the Project Area.	ervious Area = Area to	be Disturbed by the Project.
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	<u>+100</u> %	



Form I-3B Page 2 of 11
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:
The western portion of the site was rough graded for a previously approved development, PTS#6109. The site was graded and sediment basins and drainage infrastructure were installed. The eastern portion of the site is an existing office complex.
Existing Land Cover Includes (select all that apply):
✓ Vegetative Cover
☑Non-Vegetated Pervious Areas
☑Impervious Areas
Description / Additional Information:
The western portion of the site is graded dirt for storage of construction materials. The eastern portion of the site contains buildings, driveway and parking lot areas and landscaped areas.
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:
☐Groundwater Depth < 5 feet
☐5 feet < Groundwater Depth < 10 feet
□10 feet < Groundwater Depth < 20 feet
☑Groundwater Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply):
□Watercourses
□Seeps
□Springs
□Wetlands
☑None
Description / Additional Information:



#### Form I-3B Page 3 of 11

#### **Description of Existing Site Topography and Drainage**

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

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

#### **Descriptions/Additional Information**

The property is located on a ridge surrounded by steep canyons and Towne Centre Drive to the south. The western portion of the project site is currently rough graded for a previous project, Summit Point Plaza, PTS#6109, and is being used as a construction storage yard. Full build out of Summit Pointe Plaza was not completed and the project ended to include only rough grading of the site and drainage infrastructure. The eastern portion of the site consists of an existing office complex.

In the existing condition, the western portion of the site consists of 5 drainage basins. Storm water runoff flows overland to sediment basins located throughout the site. Each sediment basin has a riser pipe that conveys runoff via storm drain to a level spreader located at the discharge points in the canyons around the perimeter of the site. Along the southern boundary, drainage is conveyed from the sediment basin via storm drain to the public storm drain within Towne Centre Drive.

The eastern portion of the site consists of 3 drainage basins. Runoff flows overland and in storm drain to discharge points in the canyons around the perimeter of the site. Along the southern boundary drainage is conveyed via storm drain to the public storm drain within Towne Centre Drive.

For exhibits and detailed calculations refer to the Hydrology Report for the project located in Attachment 5.



#### Form I-3B Page 4 of 11

#### **Description of Proposed Site Development and Drainage Patterns**

Project Description / Proposed Land Use and/or Activities: The Project involves redevelopment of the Project with a five-building campus (Buildings A through E), which would include scientific R&D, laboratories, technology, and office uses, with supporting parking structures and surface parking areas, recreational facilities, amenities, and landscaping. Offsite improvements consist of three driveway entrances and a non-contiguous sidewalk along the project frontage at Towne Centre Drive. List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Impervious features include buildings, parking areas, drive aisles, sidewalk, and hardscape. List/describe proposed pervious features of the project (e.g., landscape areas): Pervious features include sports fields, landscaping and biofiltration basins. Does the project include grading and changes to site topography? **✓** Yes □No Description / Additional Information:

The proposed project disturbs 20.64 acres, with a net export of 126,500 cubic yards of material. The maximum cut for the underground parking structure is 41 feet, and the maximum fill for the proposed site improvements is 25 feet. Those measurements are taken from the existing topography of the site.



Form I-3B Page 5 of 11
Does the project include changes to site drainage (e.g., installation of new storm water conveyance
systems)?
✓Yes
□No

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

#### Description / Additional Information:

In the proposed condition, the site consists of 7 drainage basins:

Drainage Basin 1 is located in the southwest portion of the site and includes DMA A1, A2 and A3. Storm water runoff in DMA A1 and A2 will be collected in proposed storm drain and conveyed to underground storage vaults and subsequent Modular Wetland Systems. Runoff from impervious areas in DMA A3 will be directed to landscape areas for dispersion.

Drainage Basin 2 is located along the western boundary of the site and includes DMA B1. Storm water runoff from impervious areas in DMA B1 will be directed to landscape areas for dispersion.

Drainage Basin 3 is located along the western boundary of the site and includes DMA B2. Storm water runoff from impervious areas in DMA B2 will be directed to landscape areas for dispersion.

Drainage Basin 4 is located in the northwest corner of the site and includes DMA C1. Storm water runoff from impervious areas in DMA C1 will be directed to landscape areas for dispersion.

Drainage Basin 5 is located in the northwest portion of the site and includes DMA C2. Storm water runoff in DMA C2 will be collected in proposed storm drain and conveyed to an underground storage vault and subsequent biofiltration basin.

Drainage Basin 6 is located in the central portion of the site and includes DMA D1 and D2. Storm water runoff in DMA D1 will be collected in proposed storm drain and conveyed to an underground storage vault and subsequent Modular Wetland System. Runoff in DMA D2 will be collected in proposed storm drain and conveyed to an underground storage vault and subsequent biofiltration basin.

Drainage Basin 7 is located in the eastern portion of the site and includes DMA D3 and D4. Storm water runoff from impervious areas in DMA D3 will be directed to landscape areas for dispersion. Storm water runoff in DMA D4 will be collected in proposed storm drain and conveyed to underground storage vaults and subsequent Modular Wetland Systems.

The proposed underground storage vaults, Modular Wetland Systems and biofiltration basin BMPs will provide hydromodification management flow control and pollutant control treatment, as well as mitigation of the 100-year storm event peak discharge. For exhibits and detailed hydrologic calculations refer to the Hydrology Report for the project located in Attachment 5.



Form I-3B Page 6 of 11
Identify whether any of the following features, activities, and/or pollutant source areas will be
present (select all that apply):
☑Onsite 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
✓ Refuse areas
☐Industrial processes
Outdoor storage of equipment or materials
☐Vehicle and equipment cleaning
☐Vehicle/equipment repair and maintenance
☐Fuel dispensing areas
✓ Loading docks
☑Fire sprinkler test water
☑Miscellaneous drain or wash water
☑Plazas, sidewalks, and parking lots
Description/Additional Information:



#### Form I-3B Page 7 of 11

#### Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

Storm water discharges from the site at 7 locations. One discharge location is into existing storm drain within Towne Center Drive. The remaining discharge points are located around the perimeter of the site in the surrounding canyons. Discharge from the site is conveyed to Soledad Canyon which flows northerly to Los Penasquitos Lagoon and ultimately to the Pacific Ocean.

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations

Soledad Canyon: AGR, IND, REC2, WARM, COLD, WILD

Los Penasquitos Lagoon: REC1, REC2, BIOL, EST, WILD, RARE, MAR, MIGR, SPWN,

SHELL

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations

No ASBS receiving waters downstream of the project discharge locations.

Provide distance from project outfall location to impaired or sensitive receiving waters

Soledad Canyon: 0.2 miles

Los Penasquitos Lagoon: 1.5 miles

Pacific Ocean Shoreline at Los Penasquitos River Mouth: 4 miles

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands All post-construction storm water BMP's will be constructed within the project grading limits, which do not encroach into adjacent MHPA areas.



#### Form I-3B Page 8 of 11

#### **Identification of Receiving Water Pollutants of Concern**

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

303(d) Impaired Water Body (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
Soledad Canyon	Sediment Toxicity	TMDL expected 2019 per 303(d) list report
Soledad Canyon	Selenium	TMDL expected 2021 per 303(d) list report
Los Penasquitos Lagoon	Toxicity	TMDL expected 2027 per 303(d) list report
Los Penasquitos Lagoon	Siltation/Sedimentation	TMDL expected 2014 per 303(d) list report
Pacific Ocean Shoreline at Los Penasquitos River Mouth	Indicator Bacteria	TMDL expected 2011 per 303(d) list report
	Siltation/Sedimentation	WQIP Highest Priority
	Hydromodification	WQIP Highest Priority
	Freshwater discharges	WQIP Highest Priority
	Indicator Bacteria	WQIP Highest Priority

#### Identification of Project Site Pollutants\*

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see 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			



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

Form I-3B Page 9 of 11
Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6)?
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.
$\square$ 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):
Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm
water conveyance system from the project site to an exempt water body. The exhibit should include
details about the conveyance system and the outfall to the exempt water body.
details about the conveyance system and the outlant to the exempt water body.
Critical Coarse Sediment Yield Areas*
*This Section only required if hydromodification management requirements apply
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream
area draining through the project footprint?
□Yes
☑No
Discussion / Additional Information:



#### Form I-3B Page 10 of 11

#### 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.

project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.
The project has 7 Points of Compliance (POC). Refer to the HMP Exhibit located in Attachment 2a for the POC locations.
Actachment 2a for the FOC locations.
Has a geomorphic assessment been performed for the receiving channel(s)? ☑No, the low flow threshold is 0.1Q₂ (default low flow threshold)
$\square$ Yes, the result is the low flow threshold is 0.1Q $_2$
$\square$ Yes, the result is the low flow threshold is $0.3Q_2$ $\square$ Yes, the result is the low flow threshold is $0.5Q_2$
If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)
Discussion / Additional information (optional)



#### Form I-3B Page 11 of 11

#### Other Site Requirements and Constraints

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

Drainage infrastructure from previous rough grading of the site dictated our boundaries and discharge locations. Existing level spreaders at discharge locations are utilized to ensure adequate energy and flow dispersion at points of compliance.

Optional Additional Information	n or Continuation o	of Previous Sect	ions As Needed
---------------------------------	---------------------	------------------	----------------

This space provided for additional information or continuation of information from previous sections as needed.



Source Control BMP Checklist	Form I-4B				
for PDPs					
Source Control BMPs	NAD 1	12 1 1			
All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist.					
<ul> <li>Answer each category below pursuant to the following.</li> <li>"Yes" means the project will implement the source control BM and/or Appendix E of the BMP Design Manual. Discussion / justification must be project but it is Discussion / justification must be provided.</li> <li>"N/A" means the BMP is not applicable at the project site be include the feature that is addressed by the BMP (e.g., the project storage areas). Discussion / justification may be provided.</li> </ul>	fication is in not feasi ecause the	not required. ble to implement. e project does not outdoor materials			
Source Control Requirement		Applied?			
4.2.1 Prevention of Illicit Discharges into the MS4	✓Yes	No N/A			
Discussion / justification if 4.2.1 not implemented:  4.2.2 Storm Drain Stenciling or Signage	✓Yes	No N/A			
Discussion / justification if 4.2.2 not implemented:					
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run- On, Runoff, and Wind Dispersal	Yes	□ No  N/A			
Discussion / justification if 4.2.3 not implemented:					
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	Yes	No N/A			
Discussion / justification if 4.2.4 not implemented:					
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	✓Yes	□ No □ N/A			
Discussion / justification if 4.2.5 not implemented:					



Form I-4B Page 2 of 2						
Source Control Requirement			Ar	plied	?	
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each						
source listed below)					_	
On-site storm drain inlets	<u>~</u>	Yes		No	<u>Ц</u>	N/A
Interior floor drains and elevator shaft sump pumps	_	Yes		No		N/A
Interior parking garages	<b>'</b>	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	<b>V</b>	N/A
Food service	~	Yes		No		N/A
Refuse areas	<b>'</b>	Yes		No		N/A
Industrial processes		Yes		No	~	N/A
Outdoor storage of equipment or materials		Yes		No		N/A
Vehicle/Equipment Repair and Maintenance		Yes		No		N/A
Fuel Dispensing Areas	Ī	Yes	Ī	No		N/A
Loading Docks	<u></u>	Yes		No	$\overline{\sqcap}$	N/A
Fire Sprinkler Test Water	V	Yes		No		N/A
Miscellaneous Drain or Wash Water	~	Yes		No		N/A
Plazas, sidewalks, and parking lots	V	Yes		No		N/A
SC-6A: Large Trash Generating Facilities		Yes		No	~	N/A
SC-6B: Animal Facilities		Yes		No	~	N/A
SC-6C: Plant Nurseries and Garden Centers		Yes		No	~	N/A
SC-6D: Automotive Facilities		Yes		No	~	N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify whic	h s	ources o	of r	unoff	ро	llutants
are discussed. Justification must be provided for <u>all</u> "No" answers show	vn a	above.				



Site Design BMP Checklist for PDPs	Form I-5B		
Site Design BMPs  All development projects must implement site design BMPs where appl Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Winformation to implement site design BMPs shown in this checklist.  Answer each category below pursuant to the following.  • "Yes" means the project will implement the site design BMP as a Appendix E of the BMP Design Manual. Discussion / justification  • "No" means the BMP is applicable to the project but it is Discussion / justification must be provided.  • "N/A" means the BMP is not applicable at the project site be include the feature that is addressed by the BMP (e.g., the project areas to conserve). Discussion / justification may be provided.	described i is not requ not feasi ecause the ct site has	dards) for n Chapter uired. ble to im e project no existir	does not
A site map with implemented site design BMPs must be included at the	end of this		
Site Design Requirement		Applied?	TA1/A
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features  Discussion / justification if 4.3.1 not implemented:	Yes	No	✓ N/A
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	Yes	NO NO	<b>V</b> N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	Yes	No	<b>✓</b> N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	Yes	No	✓ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	Yes	No	<b>√</b> N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	<b>✓</b> Yes	No	□ N/A
Discussion / justification if 4.3.2 not implemented: MHPA areas are outside of grading limits and will be conserved.			



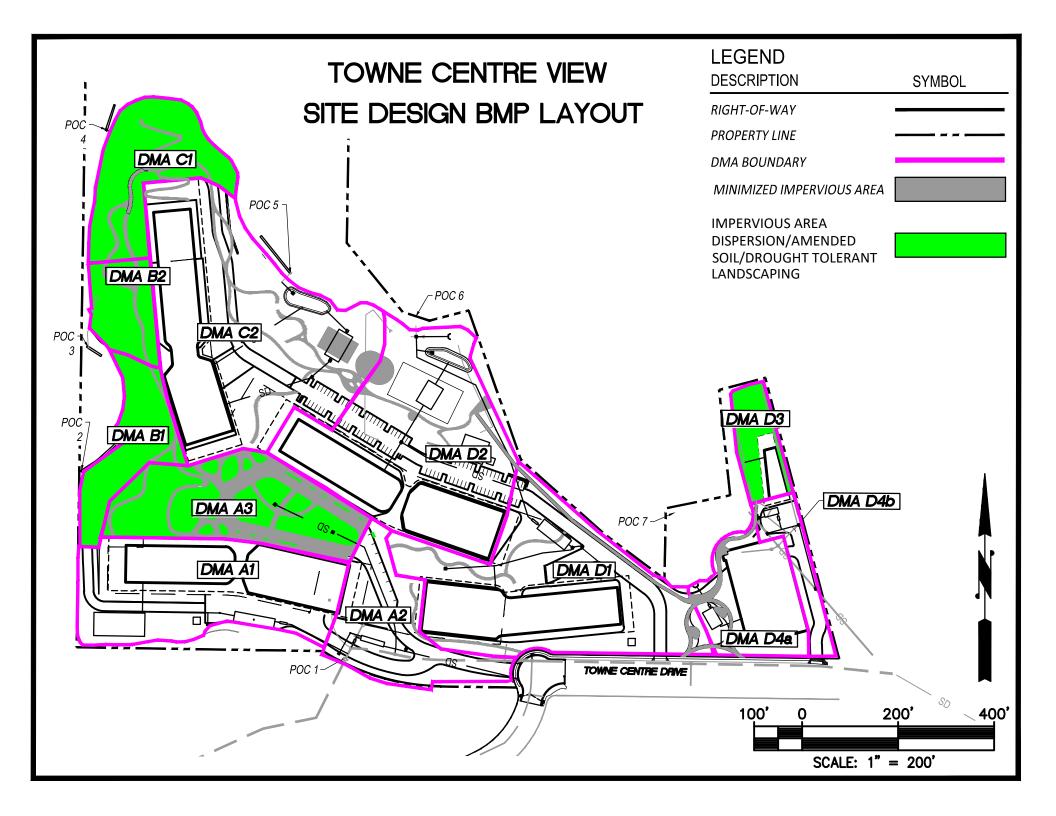
Form I-5B Page 2 of 4			
Site Design Requirement		Applied?	)
4.3.3 Minimize Impervious Area	✓ Yes	□No	□N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	✓Yes	No	□N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	✓Yes	No	□N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	<b>✓</b> Yes	No	□ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)		No	□N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	<b>✓</b> Yes	☐ No	□N/A



Form I-5B Page 3 of 4			
Site Design Requirement		Applied?	
4.3.6 Runoff Collection	✓ Yes	□No	□ N/A
Discussion / justification if 4.3.6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	Yes	No	<b>₽</b> N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	Yes	No	<b>✓</b> N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	Yes	No	<b>V</b> N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix	Yes	No	<b>₽</b> N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	✓Yes	No	□ N/A
Discussion / justification if 4.3.7 not implemented:			
4.3.8 Harvest and Use Precipitation	Yes	✓No	□N/A
Discussion / justification if 4.3.8 not implemented: Harvest and use is not a feasible BMP for this project. Refer to Attachment	ent 1c.		
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	Yes	No	<b>✓</b> N/A
8-2 Is the rain barrel credit volume calculated using Appendix	Yes	No	<b>№</b> N/A



Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:



#### Summary of PDP Structural BMPs

#### Form I-6

#### **PDP Structural BMPs**

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). 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 includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 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 (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

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

#### DMAs A1 and A2:

- Step 1- The DMAs draining to the BMPs are not "self-mitigating" or "de minimis" or "self-retaining".
- Step 2- There are no site design BMPs proposed for which the runoff factor can be adjusted.
- Step 3- Harvest and use is not feasible. Refer to Attachment 1c.
- Step 4- Infiltration is not feasible. Refer to Attachment 1d.
- Step 5- Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.

#### DMAs A3, B1, B2, C1 and D3:

The DMAs utilize impervious area dispersion to satisfy pollutant control treatment and hydromodification flow control per Fact Sheet SD-B.

#### DMA C2:

- Step 1- The DMA draining to the BMP is not "self-mitigating" or "de minimis" or "self-retaining".
- Step 2- There are no site design BMPs proposed for which the runoff factor can be adjusted.
- Step 3- Harvest and use is not feasible. Refer to Attachment 1c.
- Step 4- Infiltration is not feasible. Refer to Attachment 1d.
- Step 5- Underground storage vault combined with Biofiltration BMP BF-1 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.

(Continue on page 2 as necessary.)



#### Form I-6 Page 2 of

(Continued from page 1)

#### DMAs D1:

- Step 1- The DMA draining to the BMP is not "self-mitigating" or "de minimis" or "self-retaining".
- Step 2- There are no site design BMPs proposed for which the runoff factor can be adjusted.
- Step 3- Harvest and use is not feasible. Refer to Attachment 1c.
- Step 4- Infiltration is not feasible. Refer to Attachment 1d.
- Step 5- Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.

#### DMAs D2:

- Step 1- The DMA draining to the BMP is not "self-mitigating" or "de minimis" or "self-retaining".
- Step 2- There are no site design BMPs proposed for which the runoff factor can be adjusted.
- Step 3- Harvest and use is not feasible. Refer to Attachment 1c.
- Step 4- Infiltration is not feasible. Refer to Attachment 1d.
- Step 5- Underground storage vault combined with Biofiltration BMP BF-1 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.

#### DMA D4a and D4b:

- Step 1- The DMAs draining to the BMPs are not "self-mitigating" or "de minimis" or "self-retaining".
- Step 2- There are no site design BMPs proposed for which the runoff factor can be adjusted.
- Step 3- Harvest and use is not feasible. Refer to Attachment 1c.
- Step 4- Infiltration is not feasible. Refer to Attachment 1d.
- Step 5- Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.



Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. A1	
Construction Plan Sheet No.	
Type of Structural BMP:	
Retention by harvest and use (e.g. HU-1, cistern)	
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 with prior lawful approval to meet earlier PDP requirements (provide	
BMP type/description in discussion section below)	
Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or	
biofiltration BMP (provide BMP type/description and indicate which onsite retention or	
biofiltration BMP it serves in discussion section below)	
Flow-thru treatment control with alternative compliance (provide BMP type/description in	
discussion section below)	
Detention pond or vault for hydromodification management	
Other (describe in discussion section below)	
Purpose:	
Pollutant control only	
Hydromodification control only	
Combined pollutant control and hydromodification control	
Pre-treatment/forebay for another structural BMP	
Other (describe in discussion section below)	
Who will certify construction of this BMP?	Gregory W. Lang, PE
Provide name and contact information for the	Pasco Laret Suiter & Associates
party responsible to sign BMP verification form DS-563	535 N. Hwy 101, Ste. A Solana Beach, CA 92075
D3-303	
Who will be the final owner of this BMP?	Towne Centre Science Park, LP
M/h a will as single in this DMD into a supply it 2	Towne Centre Science Park, LP
Who will maintain this BMP into perpetuity?	·
What is the funding most arises for	Tauma Cantus Caianas Dauli ID
What is the funding mechanism for maintenance?	Towne Centre Science Park, LP



Form I-6 Page of (Copy as many as needed)	
Structural BMP ID No. A1	
Construction Plan Sheet No.	
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):	
Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.	



Form I-6 Page of (Copy as many as needed)	
Structural BMP Su	mmary Information
Structural BMP ID No. A2	
Construction Plan Sheet No.	
Type of Structural BMP:	
Retention by harvest and use (e.g. HU-1, cistern)	
Retention by infiltration basin (INF-1)	
Retention by bioretention (INF-2)	
Retention by permeable pavement (INF-3)	
Partial retention by biofiltration with partial rete	ntion (PR-1)
Biofiltration (BF-1)	
Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide	
BMP type/description in discussion section belo	w)
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 b	pelow)
Flow-thru treatment control with alternative con	npliance (provide BMP type/description in
discussion section below)	
Detention pond or vault for hydromodification n	nanagement
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 BN	1P
Other (describe in discussion section below)	
Who will certify construction of this BMP?	Gregory W. Lang, PE
Provide name and contact information for the	Pasco Laret Suiter & Associates
party responsible to sign BMP verification form	535 N. Hwy 101, Ste. A
DS-563	Solana Beach, CA 92075
Who will be the final owner of this BMP?	BMR-9885 Towne Centre LP
	BMR-9885 Towne Centre LP
Who will maintain this BMP into perpetuity?	
What is the funding mechanism for	BMR-9885 Towne Centre LP
maintenance?	DIVIN-3003 TOWITE CELLILE LF



Form I-6 Page of (Copy as many as needed)	
Structural BMP ID No. A2	
Construction Plan Sheet No.	
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):	
Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.	



Form I-6 Page of (Copy as many as needed)	
Structural BMP Su	mmary Information
Structural BMP ID No. C2	
Construction Plan Sheet No.	
Type of Structural BMP:	
Retention by harvest and use (e.g. HU-1, cistern)	
Retention by infiltration basin (INF-1)	
Retention by bioretention (INF-2)	
Retention by permeable pavement (INF-3)	
Partial retention by biofiltration with partial rete	ntion (PR-1)
☑ Biofiltration (BF-1)	
Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide	
BMP type/description in discussion section belo	w)
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 be	pelow)
Flow-thru treatment control with alternative compliance (provide BMP type/description in	
discussion section below)	
Detention pond or vault for hydromodification n	nanagement
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 BN	1P
Other (describe in discussion section below)	
Who will certify construction of this BMP?	Gregory W. Lang, PE
Provide name and contact information for the	Pasco Laret Suiter & Associates
party responsible to sign BMP verification form	535 N. Hwy 101, Ste. A
DS-563	Solana Beach, CA 92075
Who will be the final owner of this BMP?	Towne Centre Science Park, LP
The time of the line of the billion	
	Towne Centre Science Park, LP
Who will maintain this BMP into perpetuity?	
What is the funding mechanism for maintenance?	Towne Centre Science Park, LP



Form I-6 Page of (Copy as many as needed)	
Structural BMP ID No. C2	
Construction Plan Sheet No.	
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):	
Underground storage vault combined with Biofiltration BMP BF-1 have been	
selected and sized per the design criteria to meet pollutant control and	
hydromodification management flow control requirements.	



Form I-6 Page of (Copy as many as needed)	
Structural BMP Su	mmary Information
Structural BMP ID No. D1	
Construction Plan Sheet No.	
Type of Structural BMP:	
Retention by harvest and use (e.g. HU-1, cistern)	
Retention by infiltration basin (INF-1)	
Retention by bioretention (INF-2)	
Retention by permeable pavement (INF-3)	
Partial retention by biofiltration with partial reter	ntion (PR-1)
Biofiltration (BF-1)	
	proval to meet earlier PDP requirements (provide
BMP type/description in discussion section below	•
Flow-thru treatment control included as pre-trea	-
biofiltration BMP (provide BMP type/description and indicate which onsite retention or	
biofiltration BMP it serves in discussion section by	•
Flow-thru treatment control with alternative con	npliance (provide BMP type/description in
discussion section below)	
Detention pond or vault for hydromodification n	nanagement
Other (describe in discussion section below)	
Purpose:	
Pollutant control only	
Hydromodification control only	
Combined pollutant control and hydromodification control	
Pre-treatment/forebay for another structural BMP	
Other (describe in discussion section below)	
Who will certify construction of this BMP?	Gregory W. Lang, PE
Provide name and contact information for the party responsible to sign BMP verification form	Pasco Laret Suiter & Associates
DS-563	535 N. Hwy 101, Ste. A Solana Beach, CA 92075
Who will be the final owner of this BMP?	BMR-9865 Towne Centre LP
Who will maintain this BMP into perpetuity?	BMR-9865 Towne Centre LP
who will maintain this bivir into perpetuity!	
What is the funding mechanism for	BMR-9865 Towne Centre LP
maintenance?	DIVIN-2002 TOWING COURT EF



Form I-6 Page of (Copy as many as needed)	
Structural BMP ID No. D1	
Construction Plan Sheet No.	
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):	
Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.	



Form I-6 Page of (Copy as many as needed)	
Structural BMP Su	mmary Information
Structural BMP ID No. D2	
Construction Plan Sheet No.	
Type of Structural BMP:	
Retention by harvest and use (e.g. HU-1, cistern)	
Retention by infiltration basin (INF-1)	
Retention by bioretention (INF-2)	
Retention by permeable pavement (INF-3)	
Partial retention by biofiltration with partial reter	ntion (PR-1)
☑ Biofiltration (BF-1)	
Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide	
BMP type/description in discussion section below	w)
Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or	
biofiltration BMP (provide BMP type/description and indicate which onsite retention or	
biofiltration BMP it serves in discussion section below)	
Flow-thru treatment control with alternative con	npliance (provide BMP type/description in
discussion section below)	
Detention pond or vault for hydromodification n	nanagement
Other (describe in discussion section below)	
Purpose:	
Pollutant control only	
Hydromodification control only	
Combined pollutant control and hydromodification control	
Pre-treatment/forebay for another structural BMP	
Other (describe in discussion section below)	
Who will certify construction of this BMP?	Crogory W. Lang DE
Provide name and contact information for the	Gregory W. Lang, PE Pasco Laret Suiter & Associates
party responsible to sign BMP verification form	535 N. Hwy 101, Ste. A
DS-563	Solana Beach, CA 92075
Who will be the final owner of this BMP?	BMR-9885 Towne Centre LP
Wild will be the final owner of this blur?	
	DMD 0005 Towns Control D
Who will maintain this BMP into perpetuity?	BMR-9885 Towne Centre LP
What is the funding mechanism for	BMR-9885 Towne Centre LP
maintenance?	



Form I-6 Page of (Copy as many as needed)	
Structural BMP ID No. D2	
Construction Plan Sheet No.	
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):	
Underground storage vault combined with Biofiltration BMP BF-1 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.	



Form I-6 Page of (Copy as many as needed)	
Structural BMP Su	mmary Information
Structural BMP ID No. D4a	
Construction Plan Sheet No.	
Type of Structural BMP:	
Retention by harvest and use (e.g. HU-1, cistern)	
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)	
	proval to meet earlier PDP requirements (provide
BMP type/description in discussion section belo	•
Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or	
biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)	
Flow-thru treatment control with alternative con	•
discussion section below)	ipilance (provide bivii type/description iii
Detention pond or vault for hydromodification n	nanagement
Other (describe in discussion section below)	iditagement
Purpose:    Pollutant control only	
Hydromodification control only	
Combined pollutant control and hydromodificat	ion control
Pre-treatment/forebay for another structural BMP	
Other (describe in discussion section below)	
Who will certify construction of this BMP?	G W.L DE
Provide name and contact information for the	Gregory W. Lang, PE Pasco Laret Suiter & Associates
party responsible to sign BMP verification form	535 N. Hwy 101, Ste. A
DS-563	Solana Beach, CA 92075
Who will be the final owner of this BMP?	BMR-9865 Towne Centre LP
Wild will be the final owner of this bivir:	
	BMR-9865 Towne Centre LP
Who will maintain this BMP into perpetuity?	Bivit-3003 Towne Centre Li
What is the funding mechanism for	BMR-9865 Towne Centre LP
maintenance?	



Form I-6 Page of (Copy as many as needed)	
Structural BMP ID No. D4a	
Construction Plan Sheet No.	
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):	
Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.	



Form I-6 Page of (Copy as many as needed)	
Structural BMP Su	mmary Information
Structural BMP ID No. D4b	
Construction Plan Sheet No.	
Type of Structural BMP:	
Retention by harvest and use (e.g. HU-1, cistern)	
Retention by infiltration basin (INF-1)	
Retention by bioretention (INF-2)	
Retention by permeable pavement (INF-3)	
Partial retention by biofiltration with partial rete	ntion (PR-1)
Biofiltration (BF-1)	
	proval to meet earlier PDP requirements (provide
BMP type/description in discussion section below)	
Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or	
biofiltration BMP (provide BMP type/description	
biofiltration BMP it serves in discussion section by	,
Flow-thru treatment control with alternative con discussion section below)	ipliance (provide BMP type/description in
<u> </u>	aan aga mant
☐ Detention pond or vault for hydromodification n ☐ Other (describe in discussion section below)	lanagement
Purpose:	
Pollutant control only	
Hydromodification control only	ion control
Combined pollutant control and hydromodification control	
Pre-treatment/forebay for another structural BMP	
Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the	Gregory W. Lang, PE
party responsible to sign BMP verification form	Pasco Laret Suiter & Associates 535 N. Hwy 101, Ste. A
DS-563	Solana Beach, CA 9207
	BMR-9865 Towne Centre LP
Who will be the final owner of this BMP?	Bivit-9669 Towne Centre El
Who will maintain this BMP into perpetuity?	BMR-9865 Towne Centre LP
What is the funding mechanism for	BMR-9865 Towne Centre LP
maintenance?	



Form I-6 Page of (Copy as many as needed)					
Structural BMP ID No. D4b					
Construction Plan Sheet No.					
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):					
Underground storage vault combined with Modular Wetland System BF-3 have been selected and sized per the design criteria to meet pollutant control and hydromodification management flow control requirements.					



# Attachment 1 Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.



#### **Indicate which Items are Included:**

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)*	Included on DMA Exhibit in Attachment 1a
	*Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	Included as Attachment 1b, separate from DMA Exhibit
	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs)	Included  Not included because the
Attachment 1c	Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	entire project will use infiltration BMPs
Attachment 1d	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition:  No Infiltration Condition: Infiltration Feasibility Condition Letter (Note: must be stamped and signed by licensed geotechnical engineer) Form I-8A (optional) Form I-8B (optional) Partial Infiltration Condition: Infiltration Feasibility Condition Letter (Note: must be stamped and	Included  Not included because the entire project will use
	signed by licensed geotechnical engineer)  Form I-8A Form I-8B  Full Infiltration Condition: Form I-8A Form I-8B Worksheet C.4-3 Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	Included

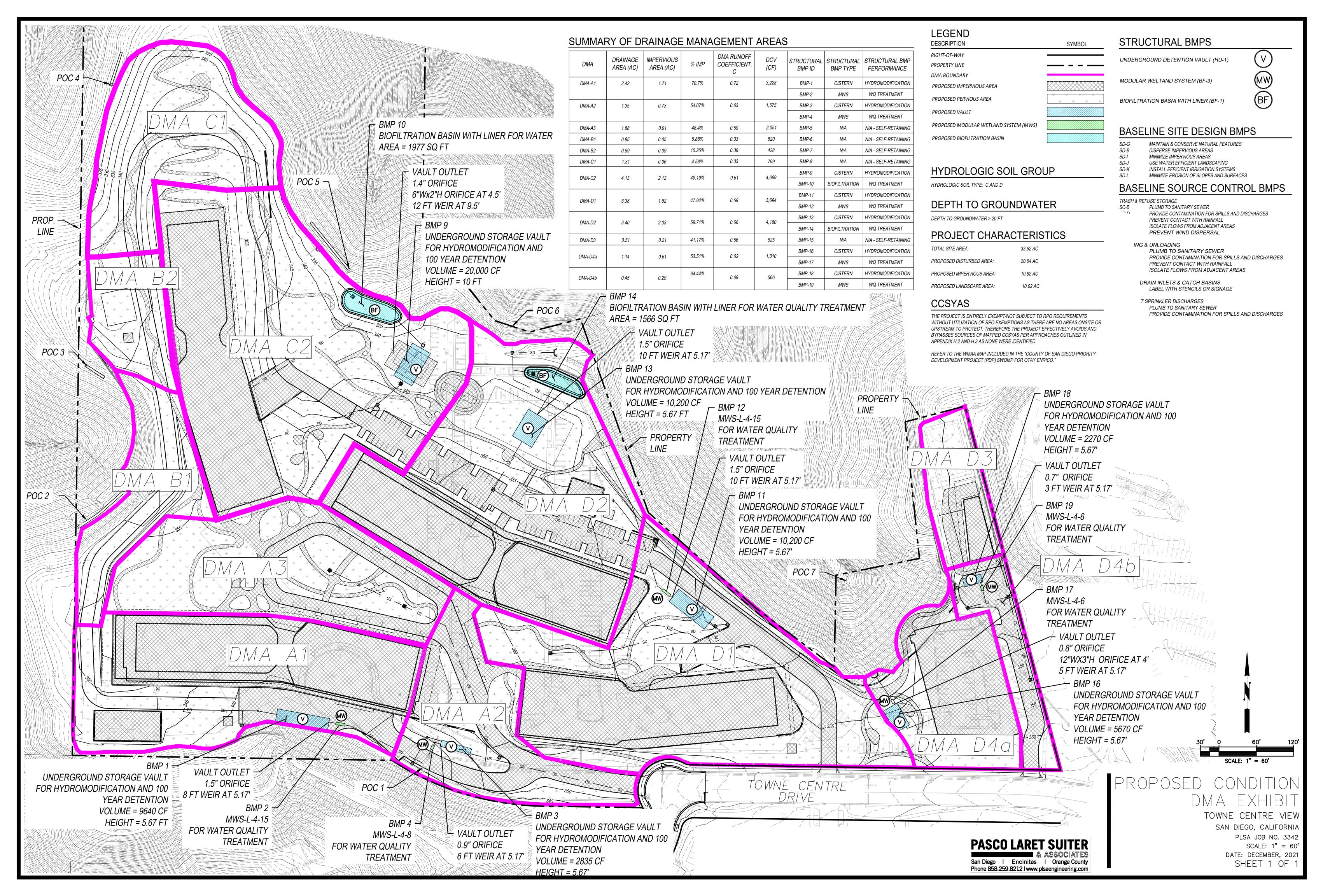
## Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

- Underlying hydrologic soil group
- Approximate depth to groundwater
- ✓ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ✔ Critical coarse sediment yield areas to be protected
- Existing topography and impervious areas
- ✓ Existing and proposed site drainage network and connections to drainage offsite
- ✔ Proposed grading
- ✔ Proposed impervious features
- Proposed design features and surface treatments used to minimize imperviousness
- ✓ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- Structural BMPs (identify location, type of BMP, size/detail, and include cross-section)



## Attachment 1a DMA Exhibit

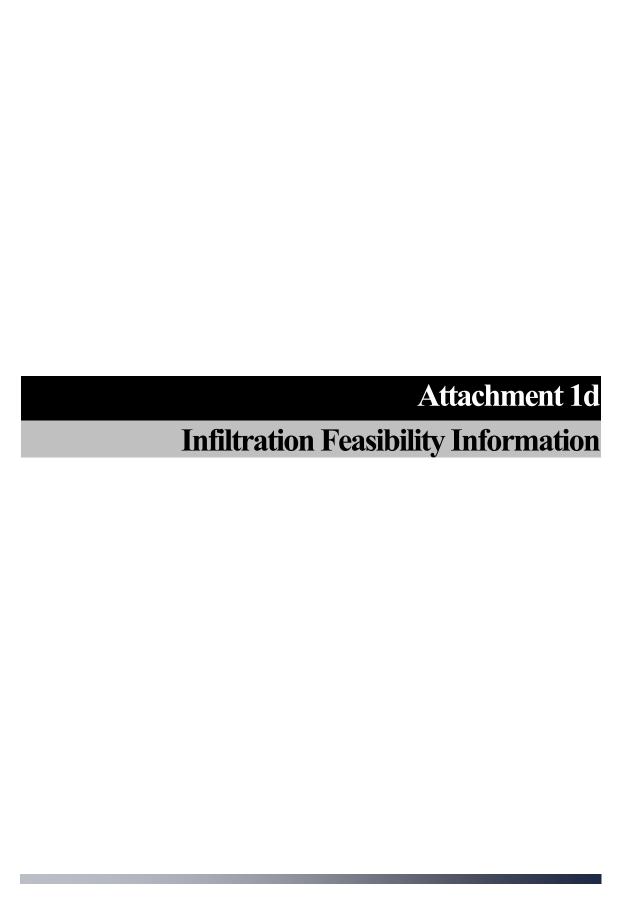


## **Attachment 1c**

Form I-7, Harvest and Use Feasibility Screening Checklist

Harvest and Use Feasi	bility Checklist	Worksheet B.3	-1 : Form I-7		
1. Is there a demand for harve reliably present during the we Toilet and urinal flushing Landscape irrigation Other:		at apply) at the proje	ct site that is		
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.  At this time, it is too early in the project phase to assess the feasibility of harvest and use. Further evaluation will be done at the construction document phase once the actual use of the buildings will be known and the demand for harvested water will be able to be better estimated.					
3. Calculate the DCV using wo DCV = (cubic [Provide a summary of calculate the DCV using wo	feet)				
3a. Is the 36-hour demand greater than or equal to the DCV?  Yes / No	3b. Is the 36-hour der than 0.25DCV but less DCV?  Yes / No	C	3c. Is the 36-hour demand less than 0.25DCV?		
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 more detailed evaluations to determ Harvest and use may used for a portion of to (optionally) the stora upsized to meet long while draining in long	on and sizing hine feasibility. Only be able to be he site, or ge may need to be term capture targets	Harvest and use is considered to be infeasible.		
Is harvest and use feasible by Yes, refer to Appendix E to so No. select alternate BMPs					





## INFILTRATION FEASIBILITY CONDITION LETTER

#### TOWNE CENTRE VIEW NORTHERN TERMINUS OF TOWNE CENTRE DRIVE SAN DIEGO, CALIFORNIA

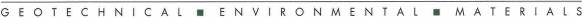


GEOTECHNICAL ENVIRONMENTAL MATERIALS PREPARED FOR

BRE-BMR TOWNE CENTRE SCIENCE PARK, LLC SAN DIEGO, CALIFORNIA

FEBRUARY 3, 2021 PROJECT NO. G2326-52-02







Project No. G2326-52-02 February 3, 2021

BRE-BMR Towne Centre Science Park, LLC 17190 Bernardo Center Drive San Diego, California 92128

Attention:

Mr. Jonathan Bergschneider

Subject:

INFILTRATION FEASIBILITY CONDITION LETTER

TOWNE CENTRE VIEW

NORTHERN TERMINUS OF TOWNE CENTRE DRIVE

SAN DIEGO, CALIFORNIA

- References: 1. Preliminary Geotechnical Investigation, Towne Centre View, Northern Terminus of Towne Centre Drive, San Diego, California, prepared by Geocon Incorporated, revised dated February 3, 2021 (Project No. G2326-52-02).
  - 2. Preliminary Grading Plans, Towne Centre View, San Diego, California, prepared by Pasco Laret Suiter & Associates, undated.

#### Dear Mr. Bergschneider:

We prepared this letter in accordance with Section C.1.1 of the Storm Water Standards (SWS – City of San Diego, October 2018) proposing a "No Infiltration" condition for the subject project located in the Sorrento Mesa area of San Diego, California.

#### PROPERTY DESCRIPTION AND PROPOSED DEVELOPMENT

The subject site includes several parcels of land located north of Towne Centre Drive at the intersection of Westerra Court. The western portion of the site was previously graded to receive two commercial buildings and is currently being used as a construction staging yard by Mid-Coast Transit Constructors. The central and eastern portions of the site include multiple two- to three-story buildings (9855, 9865, 9875 and 9885 Towne Centre Drive), accommodating utilities, surface parking, landscape and recreational areas. The elevations on the property in the areas of the existing buildings and graded pads are about 330 to 360 feet mean sea level (MSL). Descending natural slopes ranging from 100 to 250 feet in height exist on the north, west, and southwest of the properties. The descending slope located on the south side of Towne Centre Drive cul-de-sac consists of a fill slope

that was constructed under our testing and observation services. The Existing Site Map shows the current configuration of the subject property.



**Existing Site Map** 

We understand property would be developed to include construction of a new commercial campus that includes four new buildings connected with subterranean parking with accommodating utilities, surface parking and driveways and landscaping. Additionally, an above-ground parking garage and additional commercial building are proposed for the eastern portion of the site.

Based on the referenced plans, the grading for the proposed campus will consist of cuts and fills on the order of 50 and 15 feet, respectively. In order to construct the parking garage, about 50 feet of cut will be performed that would incorporate temporary slopes and soil nail walls. We expect the proposed structures will consists of a shallow foundation system that will be embedded into the underlying formational materials.

#### PREVIOUS GEOTECHNICAL STUDIES

We performed the referenced preliminary geotechnical investigation for the subject project, which including the drilling of 13 borings across the site to a maximum depth of about 61 feet. Based on the borings, the site is underlain by undocumented fill and previously placed fill overlying Very Old Paralic Deposits (Units 9 and 10), Scripps Formation, and Ardath Shale. The fill materials ranged from 5 to 58 feet in thickness. We did not encounter groundwater in the borings during the field investigation. We expect the groundwater table is at least 200 feet below existing grades and do not

expect groundwater to be encountered during construction of the proposed development. The boring logs in Appendix A of the referenced report and the Geologic Map, Figure 2, show the occurrence, distribution, and description of each unit encountered during our field investigation.

#### STORM WATER MANAGEMENT DISCUSSION

We understand storm water management devices are being proposed in accordance with the 2018 City of San Diego Storm Water Standards Manual. If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Presented herein is a discussion for each item requested in Appendix C.1.1 of the 2018 City of San Diego Storm Water Standards.

## The Phase of the Project In which the geotechnical engineer first analyzed the site for infiltration feasibility:

The site was first analyzed for infiltration feasibility during the preliminary/planning phase and still applies to the design phase.

#### Results of previous geotechnical analyses conducted in the project area, if any.

As indicated herein and in the referenced geotechnical report, the site is underlain by undocumented fill and previously placed fill overlying Very Old Paralic Deposits, Scripps Formation, and Ardath Shale. We did not encounter groundwater in any of our borings during the field investigation. We expect the groundwater table is at least 200 feet below existing grades.

## The development status of the site prior to the project application (i.e., new development with raw ungraded land, or redevelopment with existing graded conditions).

The subject project site includes several parcels of land that consist of a construction staging yard, several two- to three-story buildings, utilities, surface parking, landscape and recreational areas. The elevations on the property range from 330 to 360 feet mean sea level (MSL). Descending natural and fill slopes surround the site that range in height from about 100 to 250 feet.

#### The history of design discussion for the project footprint, resulting the final design determination.

We discussed the potential for infiltration with the project design team. However, descending natural and fill slopes surround the site. In accordance with the SWS, full or partial infiltration BMPs shall not be proposed within 50 feet of a natural slope or within a distance of 1.5H from fill slopes (where H is

the height of the fill slope). This requirement would result in setbacks on the order of about 150 to 400 feet from the top of slope boundaries. The site's footprint does not permit for the required setbacks to allow for full or partial infiltration BMPs. Therefore, due to this condition, infiltration would not be feasible on the site.

## Full/partial infiltration BMP standard setbacks to underground utilities, structures, retaining walls, fill slopes, and natural slopes applicable to the DMA that prevent full/partial infiltration.

New utilities will be constructed within the site boundaries and within the adjacent public right-of-way and roadways. Full or partial infiltration should not be allowed in the areas of the utilities to help prevent potential damage/distress to improvements. Mitigation measures to prevent water from infiltrating the utilities consist of setbacks, installing cutoff walls around the utilities and installing subdrains and/or installing liners. The horizontal and vertical setbacks for infiltration devices should be a minimum of 10 feet and a 1:1 plane of 1 foot below the closest edge of the deepest adjacent utility, respectively.

Additionally, existing natural and fill slopes descends from the property along the eastern, northern, western, and southwestern boundaries. The slopes are inclined at about 2:1 (horizontal:vertical) and range from about 100 to 250 feet high. In accordance with the SWS, full or partial infiltration BMPs shall not be proposed within 50 feet of a natural slope or within a distance of 1.5H from fill slopes (where H is the height of the fill slope). This requirement would result in setbacks on the order of about 150 to 400 feet from the top of slope boundaries. The site's footprint does not permit for the required setbacks to allow for full or partial infiltration BMPs. Therefore, due to this condition, infiltration would not be feasible on the site.

## Physical impairments (i.e., fire road egress, public safety considerations, etc.) that prevent full/partial infiltration.

There are existing improvements (roadways and utilities) and structures located adjacent to the property margin. Infiltration within a lateral distance of at least 10 from these structures and improvements should not be allowed.

### Consideration of site design alternative to achieve partial/full infiltration within the DMA.

Due to the presence of relatively large descending natural and fill slopes that surround the property, there are no locations on the property which would support full or partial infiltration using near surface BMP basins.

A site design alternative to include full or partial infiltration would be limited to a deep dry well system situated below the fill materials. Dry well systems are typically only feasible for relatively high permeability soil (infiltration rate greater than 0.5 inches per hour) and relatively homogenous soils. Based on our experience with the underlying formational materials, full or partial infiltration within a dry well system will be infeasible. Therefore, infiltration below the proposed development would not be feasible on the site.

#### The extent site design BMPs requirements were included in the overall design.

BMPs are being incorporated into the site design for storm water management. Based on discussions with the project civil engineer, the allowable proposed BMPs at the site include flow through planters, modular wetlands and a green roof. However, infiltration will not be incorporated into the design.

#### Conclusion or recommendation from the geotechnical engineer regarding the DMA's infiltration condition.

Due to the existing geologic conditions discussed herein, we opine the site (all DMAs) is not feasible for partial or full infiltration and the property should be considered to possess a "No Infiltration" condition in accordance with Appendix C of the 2018 SWS. Infiltration would increase the risk of slope instability at the site that would not be feasibly mitigated.

Liners and subdrains are recommended in the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC). The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 3 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

#### An Exhibit for all applicable DMA's that clearly labels:

- Proposed development areas and development type.
- All applicable features and setbacks that prevent partial or full infiltration, including underground utilities, structures, retaining walls, fill slopes, natural slopes, and existing fill materials greater than 5 feet.
- Potential locations for structural BMPs.
- Areas where full/partial infiltration BMPs cannot be proposed.

The Geologic Map, Figure 1, presents the grading plan as a base map. The figure shows the development area and proposed buildings and improvements. We did not include setbacks on the map due to the existing conditions and our opinion that the entire project site is infeasible for infiltration due to the geologic conditions of the site.

If you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Shawn Foy Weedon GE 2714

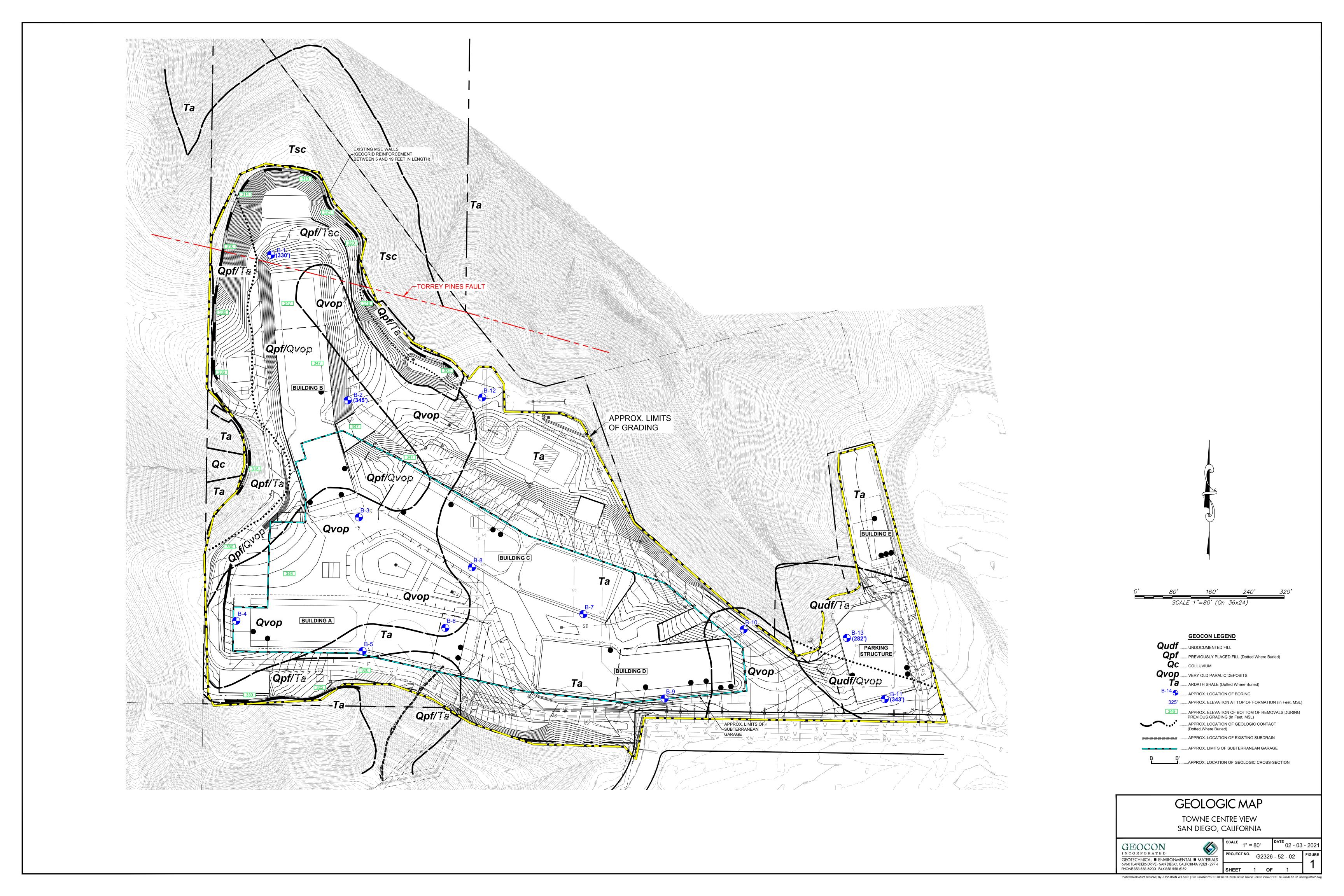
MRL:SFW:arm

Attachments: Figure 1 – Geologic Map

(e-mail) Addressee

Matt Love

RCE 84154





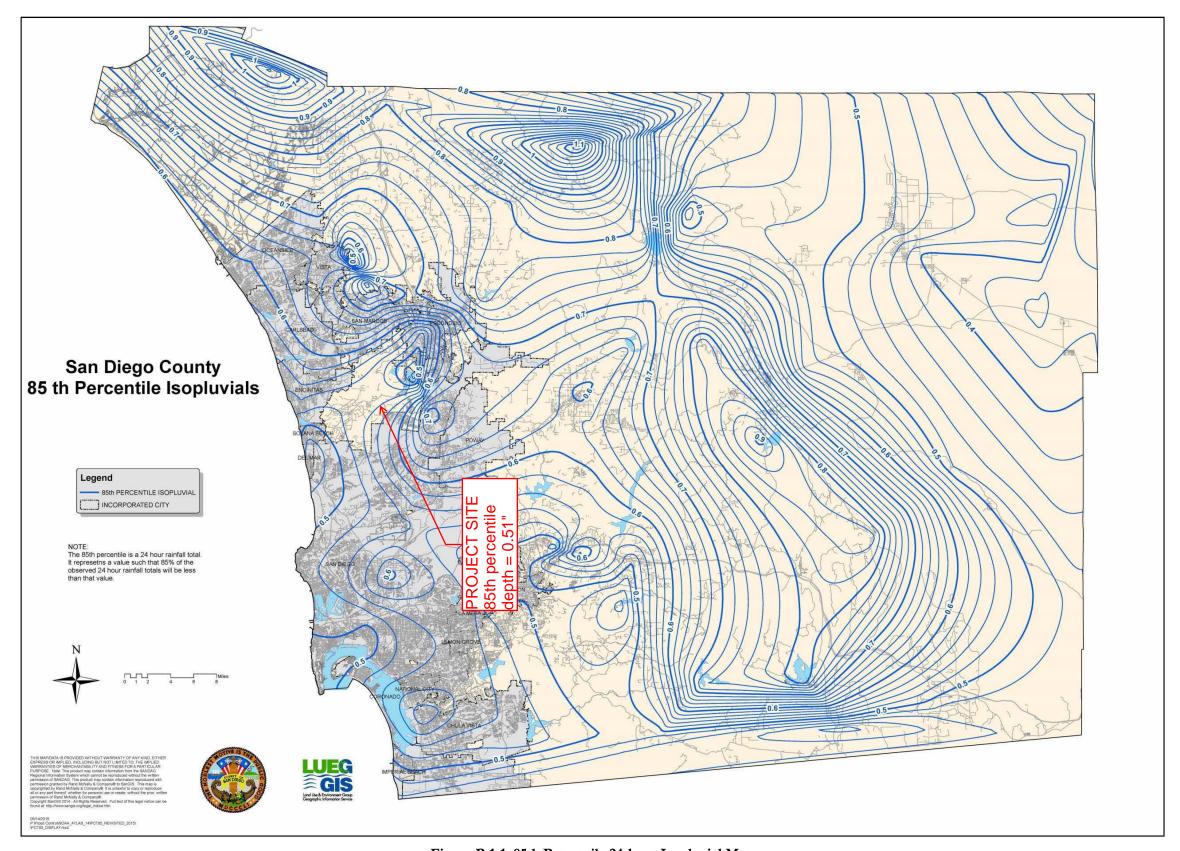


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

B-5 June 2015

**DMA Runoff Factor Calculation** 

	Prop. Drainage	Prop. Imperv.	DMA Runoff
DMA	Area (sf)	Area (sf)	Factor
A1	105,500	74,554	0.72
A2	58,805	31,965	0.63
A3	81,800	39,775	0.59
B1	37,100	2,008	0.33
B2	25,800	3,920	0.39
C1	57,000	2,577	0.33
C2	180,100	92,434	0.61
D1	147,300	70,482	0.59
D2	148,300	88,486	0.66
D3	22,050	9,400	0.56
D4a	49,700	26,480	0.62
D4b	19,600	12,550	0.68

Impervious RF = 0.9

Pervious RF = 0.3

The C	City of	Project Name	Towne	Centre View	
SAN DIEGO		BMP ID		A1	
	Sizing Method for Volume F	Retention Criteria	Works	heet B.5-2	_
1	Area draining to the BMP			105,500	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2	)	0.72	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		3228	cu. ft.
Volum	e Retention Requirement				•
5	Note:  When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30  When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05			0	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltration	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line $7 > 0.01$ in/hr. = Minimum (40, 166.9 x Line $7 + 6.62$ ) When Line $7 \le 0.01$ in/hr. = $3.5\%$			3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line $8 > 8\% = 0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line $8 \le 8\% = 0.023$			0.023	
10	Target volume retention [Line 9 x Line	e 4]		74	cu. ft.

9/25/2020 Version 1.0 - June 2017

1	The City of	Project Name	Towns	e Centre View	
	SAN DIEGO	BMP ID		A1	
		ion BMP Footprint wher of a Storage Unit		Workshee	et B.5-5
1	Area draining to the storage unit and bio	filtration BMP		105,500	sq. ft.
2	Adjusted runoff factor for drainage area	(Refer to Appendix B.1 and E	3.2)	0.72	
3	Effective impervious area draining to the 2]	e storage unit and biofiltration	n BMP [Line 1 x Line	75960	sq. ft.
4	Remaining DCV after implementing reter	ntion BMPs		3228	cu. ft.
5	Design infiltration rate (measured infiltrat	ion rate / 2)		0	ft./hr.
6	Media thickness [1.5 feet minimum], a aggregate sand thickness to this line for		ashed ASTM 33 fine		ft.
7	Media filtration rate to be used for sizin rate is controlled by the outlet use the ou		control; if the filtration		ft./hr.
8	Media retained pore space			0.05	in/in
Sto	rage Unit Requirement				
9	Drawdown time of the storage unit, biofiltration BMP, overflow elevation)	minimum(from the elevatio	n that bypasses the	37.5	hours
10	Storage required to achieve greater than 92 percent capture (see Table B.5-5)			1.5375	fraction
11	Storage required in cubic feet (Line 4 x Line 10)			4963.05	cu. ft.
12	2 Storage provided in the design, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)			8,789	cu. ft.
13	13 Is Line 12 ≥ Line 11? Storage Requirement is Met				
Crit	eria 1: BMP Footprint Biofiltration Cap	acity			
14	Peak flow from the storage unit to the bid evaluate the percent capture)	ofiltration BMP (using the ele	vation used to		cfs
15	Required biofiltration footprint [(3,600 x L	ine 14)/Line 7]		0	sq. ft.
Crit	eria 2: Alternative Minimum Sizing Fac	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
16	Alternative Minimum Footprint Sizing Fac [Line 11 of Worksheet B.5-4]				fraction
17	Required biofiltration footprint [Line 3 x L			0	sq. ft.
	eria 3: Retention requirement [Not app		ondition]		a ti
18 19	Retention Target (Line 10 in Worksheet			cu. ft.	
20	Depth retained in the optimized biofiltration BMP			0	cfs ft
21	{Line 6 x Line 8} + {[(Line 4)/(2400 x Line Required optimized biofiltration footprint			0	
	imized Biofiltration Footprint	(LING TO/LING ZO)		U	sq. ft.
22	Optimized biofiltration footprint, maximur	m(Line 15, Line 17, Line 21)	Ī	0	sq. ft.
	<u>'''</u>	. , , ,			

9/25/2020 Version 1.0 - June 2017

The City of SAN DIEGO		The City of Project Name Towns		Centre View	
54	AN DIEGO	BMP ID		A2	
	Sizing Method for Volume R	etention Criteria	Works	sheet B.5-2	
1	Area draining to the BMP			58,805	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2	2)	0.63	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		1575	cu. ft.
Volum	e Retention Requirement				
5	Note:  When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30  When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05			O	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltratio	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction targ When Line 7 > 0.01 in/hr. = Minimum When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%		
9	Fraction of DCV to be retained (Figure B.5-3) When Line $8 > 8\% = 0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line $8 \le 8\% = 0.023$			0.023	
10	Target volume retention [Line 9 x Line	: 4]		36	cu. ft.

7/9/2021 Version 1.0 - June 2017

T	he City of	Project Name	Towns	e Centre View			
	SAN DIEGO	BMP ID		A2			
		ion BMP Footprint when	1	Workshee	t B.5-5		
1	Area draining to the storage unit and biol	filtration BMP		58,805	sq. ft.		
2	Adjusted runoff factor for drainage area (	Refer to Appendix B.1 and I	3.2)	0.63			
3	Effective impervious area draining to the 2]	e storage unit and biofiltration	on BMP [Line 1 x Line	37047.15	sq. ft.		
4	Remaining DCV after implementing reter	ntion BMPs		1575	cu. ft.		
5	Design infiltration rate (measured infiltrat	ion rate / 2)		0	ft./hr.		
6	Media thickness [1.5 feet minimum], a aggregate sand thickness to this line for		ashed ASTM 33 fine		ft.		
7	Media filtration rate to be used for sizing rate is controlled by the outlet use the outlet	• .	control; if the filtration		ft./hr.		
8	Media retained pore space			0.05	in/in		
Sto	rage Unit Requirement						
9	Drawdown time of the storage unit, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)				hours		
10	Storage required to achieve greater than 92 percent capture (see Table B.5-5)			1.3875	fraction		
11	1 Storage required in cubic feet (Line 4 x Line 10)			2185.3125	cu. ft.		
12	Storage provided in the design, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)			2,585	cu. ft.		
13	Is Line 12 ≥ Line 11?	Storage Requirement is	Met				
Crit	eria 1: BMP Footprint Biofiltration Cap	acity					
14	Peak flow from the storage unit to the bid evaluate the percent capture)	ofiltration BMP (using the ele	vation used to		cfs		
15	Required biofiltration footprint [(3,600 x L	ine 14)/Line 7]		0	sq. ft.		
Crit	eria 2: Alternative Minimum Sizing Fac	tor (Clogging)					
16	Alternative Minimum Footprint Sizing Fac [Line 11 of Worksheet B.5-4]				fraction		
	Required biofiltration footprint [Line 3 x L			0	sq. ft.		
_	eria 3: Retention requirement [Not app		ondition]				
$\vdash$	Retention Target (Line 10 in Worksheet	•			cu. ft.		
19					cfs		
20	Depth retained in the optimized biofiltration BMP  {Line 6 x Line 8} + {[(Line 4)/(2400 x Line 19)] x Line 5}			0	ft		
	Required optimized biofiltration footprint	(Line 18/Line 20)		0	sq. ft.		
<u> </u>	Optimized Biofiltration Footprint						
22	Optimized biofiltration footprint, maximur	n(Line 15, Line 17, Line 21)		0	sq. ft.		

7/9/2021 Version 1.0 - June 2017

The C	City of	Project Name	Towne	Centre View	
The City of SAN DIEGO		BMP ID		A3	
	Sizing Method for Volume R	Retention Criteria	Works	sheet B.5-2	
1	Area draining to the BMP			81,800	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2	)	0.59	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		2051	cu. ft.
Volum	e Retention Requirement				•
5	Note:  When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30  When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05			0	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltratio	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line $7 > 0.01$ in/hr. = Minimum (40, 166.9 x Line $7 + 6.62$ ) When Line $7 \le 0.01$ in/hr. = $3.5\%$			3.5	%
9	Fraction of DCV to be retained (Figure B.5-3)  When Line $8 > 8\% = 0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line $8 \le 8\% = 0.023$			0.023	
10	Target volume retention [Line 9 x Line	<del>2</del> 4]		47	cu. ft.

9/23/2020 Version 1.0 - June 2017

The City of		Project Name	Towne Centre	View				
SAN	DIEGO	Project Name BMP ID	A3					
	Volume Retentio	n for No Infiltration Condition				Worksh	neet B.5-6	
1	Area draining to the biofiltra						81,800	sq. ft.
2	Adjusted runoff factor for dra	ainage area (Refer to Appendix B.1 an	d B.2)				0.59	·
3	Effective impervious area draining to the BMP [Line 1 x Line 2]						48262	sq. ft.
4	Required area for Evapotra	aspiration II ine 3 x 0 03					1448	sq. ft.
·	Biofiltration BMP Footprint	iopiidiioii [Line o x o.oo]					0	sq. ft.
	ea (must be identified on D	S-3247)					•	34. 11.
iaccape 7 ii c	(maet se identime en s	Identification	1	2	3		4	5
6	Landscape area that meet t Fact Sheet (sq. ft.)	he requirements in SD-B and SD-F	42025					
7	Impervious area draining to	the landscape area (sq. ft.)	39775					
8	Impervious to Pervious Area [Line 7/Line 6]	a ratio	0.95	0.00	0.0	0	0.00	0.00
9	Effective Credit Area If (Line 8 > 1.5, Line 6, Line	7/1.5]	26517	0	0		0	0
10	Sum of Landscape area [su	m of Line 9 Id's 1 to 5]	•			20	6517	sq. ft.
11	Provided footprint for evapo	transpiration [Line 5 + Line 10]				20	6517	sq. ft.
ume Retent	ion Performance Standard							
12	Is Line 11 ≥ Line 4?			Volume Retenti	on Perfo	mance S	Standard is Met	
13	Fraction of the performance 41	standard met through the BMP footpri	int and/or landsc	aping [Line 11/Li	ine	1	8.31	
14	Target Volume Retention [L	ine 10 from Worksheet B.5.2]					47	cu. ft.
15	Volume retention required fi [(1-Line 13) x Line 14]	om other site design BMPs				-816.0	6183776	cu. ft.
e Design BN					·			
	Identification	Site Desi	ign Type			С	redit	
	1							cu. ft.
	2							cu. ft.
	3							cu. ft.
	4							cu. ft.
16	5							cu. ft.
	Line 16 Credits for Id's 1 to	nefits from other site design BMPs (e.ç 5] ow the site design credit is calculated i			ıf		0	cu. ft.
17	Is Line 16 ≥ Line 15?			Volume Retention	l on Perfoi	mance S	Standard is Met	

The C	N DIEGO	Project Name	3342 Towne Centre \	/iew
SA	N DIEGO	BMP ID	А3	
	Volume Retention Fr	om Amended Soils	Worksheet B.5-7	
1	Impervious area draining to the pe	rvious area	39775	sq. ft.
2	Pervious area (must meet the requ	uirements in SD-B and SD-F Fact Sheets)	42025	sq. ft.
3	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not applic	Dispersion Ratio [Line 1/Line 2]  Note: This worksheet is not applicable when Line 3 > 50 or Line 3 < 0.25		
4	Adjusted runoff factor [(Line 1 * 0.9	9 + Line 2 * 0.1) / (Line 1 + Line 2)]	0.49	
5	85th percentile 24-hour rainfall dep	oth	0.51	inches
6	Design capture volume [(Line 1 +	Line 2) x Line 4 x (Line 5/12)]	1703	cu. ft.
7	Amendment Depth (Choose from	3", 6", 9", 12", 15" and 18")	12	inches
8	Storage [(porosity – field capacity)	+ 0.5 * (field capacity – wilting point)]	0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7)	(12) * Line 8]	10506	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]		6.17	
11	Type C soils enter 0.30  When in no infiltration condition ar	ups are used enter 0.10 for NRCS Type D so nd the actual measured infiltration rate is unk ndwater hazards identified in Appendix C or	nown enter 0.0 if	in/hr.
12	Factor of Safety		2	
13	Reliable Infiltration Rate [Line 11/L	ine 12]	0	in/hr.
14	Dispersion Credit (Based on Figur	es B.5.6 to B.5.11; Line 10 and Line 13)	0.412	
15	Volume retention due to amendme	ent [Line 1 * (Line 5/12) * Line 14]	696	cu. ft.

The C	City of DIEGO	Project Name	3342 Town	ne Centre View		
<b>5</b> A	N DIEGO	BMP ID		B1		
	Sizing Method for Volume R	Retention Criteria	Works	heet B.5-2		
1	Area draining to the BMP			37,100	sq. ft.	
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2)		0.33		
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches	
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		520	cu. ft.	
Volum	e Retention Requirement		,		•	
5	Note:  When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30  When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05			0	in/hr.	
6	Factor of safety			2		
7	Reliable infiltration rate, for biofiltration	n BMP sizing [Line 5 / Line 6]		0	in/hr.	
8	Average annual volume reduction targether When Line 7 > 0.01 in/hr. = Minimum When Line 7 ≤ 0.01 in/hr. = 3.5%			3.5	%	
9	Fraction of DCV to be retained (Figure B.5-3) When Line $8 > 8\% = 0.0000013 \text{ x Line } 8^3 - 0.000057 \text{ x Line } 8^2 + 0.0086 \text{ x Line } 8 - 0.014$ When Line $8 \le 8\% = 0.023$			0.023		
10	Target volume retention [Line 9 x Line	9 4]		12	cu. ft.	

The City of		Project Name	3342 Towne 0	Centre View			
SAN	DIEGO	BMP ID	B1				
	Volume Retentio	n for No Infiltration Condition			W	orksheet B.5-6	
1	Area draining to the biofiltra	tion BMP		•		37,100	sq. ft.
2	Adjusted runoff factor for dra	ainage area (Refer to Appendix B.1 an	d B.2)			0.33	
3	Effective impervious area di		12243	sq. ft.			
4	Required area for Evapotrar	nspiration [Line 3 x 0.03]				367	sq. ft.
5	Biofiltration BMP Footprint	, , ,				0	sq. ft.
	ea (must be identified on D	S-3247)					
•	,	Identification	1	2	3	4	5
6	Landscape area that meet the Fact Sheet (sq. ft.)	he requirements in SD-B and SD-F	35092				
7	Impervious area draining to	the landscape area (sq. ft.)	2008				
8	Impervious to Pervious Area [Line 7/Line 6]	a ratio	0.06	0.00	0.00	0.00	0.00
9	Effective Credit Area  If (Line 8 > 1.5, Line 6, Line	7/1.5]	1339	0	0	0	0
10	Sum of Landscape area [su	m of Line 9 Id's 1 to 5]		<del>!</del>		1339	sq. ft.
11	Provided footprint for evapo	transpiration [Line 5 + Line 10]				1339	sq. ft.
ume Retent	ion Performance Standard						
12	Is Line 11 ≥ Line 4?			Volume Retention	on Performa	ance Standard is Met	
13	Fraction of the performance 4]	standard met through the BMP footpri	nt and/or landsc	aping [Line 11/Li	ne	3.65	
14	Target Volume Retention [L	ine 10 from Worksheet B.5.2]				12	cu. ft.
15	Volume retention required fr [(1-Line 13) x Line 14]	om other site design BMPs				-31.71396113	cu. ft.
e Design BN					·		
	Identification	Site Desi	gn Type			Credit	
	1						cu. ft.
	2						cu. ft.
	3				cu. ft.		
	4						cu. ft.
16	5						cu. ft.
	Line 16 Credits for Id's 1 to	nefits from other site design BMPs (e.ç 5] ow the site design credit is calculated i			f	0	cu. ft.
17	Is Line 16 ≥ Line 15?			Volume Retention	I on Performa	ance Standard is Met	

The C	N DIEGO	Project Name	3342 Towne Centre V	/iew
SA	N DIEGO	BMP ID	B1	
	Volume Retention Fr	om Amended Soils	Worksheet B.5-7	
1	Impervious area draining to the pe	rvious area	2008	sq. ft.
2	Pervious area (must meet the requ	uirements in SD-B and SD-F Fact Sheets)	35092	sq. ft.
3	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not applic	· · · · · · · · · · · · · · · · · · ·		
4	Adjusted runoff factor [(Line 1 * 0.9	9 + Line 2 * 0.1) / (Line 1 + Line 2)]	0.14	
5	85th percentile 24-hour rainfall dep	oth	0.51	inches
6	Design capture volume [(Line 1 +	Line 2) x Line 4 x (Line 5/12)]	221	cu. ft.
7	Amendment Depth (Choose from	3", 6", 9", 12", 15" and 18")	12	inches
8	Storage [(porosity – field capacity)	+ 0.5 * (field capacity – wilting point)]	0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7)	(12) * Line 8]	8773	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]		39.7	
11	Type C soils enter 0.30  When in no infiltration condition ar	ups are used enter 0.10 for NRCS Type D soil and the actual measured infiltration rate is unkn andwater hazards identified in Appendix C or e	own enter 0.0 if	in/hr.
12	Factor of Safety		2	
13	Reliable Infiltration Rate [Line 11/L	ine 12]	0	in/hr.
14	Dispersion Credit (Based on Figur	es B.5.6 to B.5.11; Line 10 and Line 13)	0.470	
15	Volume retention due to amendme	ent [Line 1 * (Line 5/12) * Line 14]	40	cu. ft.

The (	City of DIEGO	Project Name	3342 Town	ne Centre View	
SA	AN DIEGO	BMP ID		B2	
	Sizing Method for Volume R	etention Criteria	Works	heet B.5-2	
1	Area draining to the BMP			25,800	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2	)	0.39	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		428	cu. ft.
/olum	e Retention Requirement		ļ.		
5	Note:  When mapped hydrologic soil groups C soils enter 0.30  When in no infiltration condition and the are geotechnical and/or groundwater leads.	ne actual measured infiltration rate	e is unknown enter 0.0 if there	0	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltration	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction targ When Line 7 > 0.01 in/hr. = Minimum When Line 7 ≤ 0.01 in/hr. = 3.5%			3.5	%
9	Fraction of DCV to be retained (Figure When Line $8 > 8\% = 0.0000013 \text{ x Line } 8^3 - 0.000057 \text{ x Line}$ When Line $8 \le 8\% = 0.023$	·		0.023	
10	Target volume retention [Line 9 x Line	· 4]		10	cu. ft.

The City of		Project Name	3342 Towne (	Centre View			
SAN	DIEGO	BMP ID	B2				
	Volume Retentio	n for No Infiltration Condition				Worksheet B.5-6	
1	Area draining to the biofiltra	tion BMP		•		25,800	sq. ft.
2	Adjusted runoff factor for dra	ainage area (Refer to Appendix B.1 an	d B.2)			0.39	
3	Effective impervious area di	raining to the BMP [Line 1 x Line 2]				10062	sq. ft.
4	Required area for Evapotrar	302	sq. ft.				
5	Biofiltration BMP Footprint					0	sq. ft.
ndscape Are	ea (must be identified on D	S-3247)					
		Identification	1	2	3	4	5
6	Landscape area that meet the Fact Sheet (sq. ft.)	he requirements in SD-B and SD-F	21880				
7	Impervious area draining to	the landscape area (sq. ft.)	3920				
8	Impervious to Pervious Area [Line 7/Line 6]	a ratio	0.18	0.00	0.0	0.00	0.00
9	Effective Credit Area  If (Line 8 > 1.5, Line 6, Line	7/1.5]	2613	0	0	0	0
10	Sum of Landscape area [su	m of Line 9 Id's 1 to 5]	_	<del>!</del>		2613	sq. ft.
11	Provided footprint for evapo	transpiration [Line 5 + Line 10]				2613	sq. ft.
lume Retent	ion Performance Standard				•		
12	Is Line 11 ≥ Line 4?			Volume Retenti	on Perfor	rmance Standard is Me	t
13	Fraction of the performance 4]	standard met through the BMP footpri	nt and/or landsc	aping [Line 11/Li	ne	8.66	
14	Target Volume Retention [L	ine 10 from Worksheet B.5.2]				10	cu. ft.
15	Volume retention required fr [(1-Line 13) x Line 14]	om other site design BMPs				-75.3407343	cu. ft.
e Design BN	MP						
	Identification	Site Desi	gn Type			Credit	
	1						cu. ft.
	2						cu. ft.
	3						cu. ft.
40	4						cu. ft.
16	5						cu. ft.
	Line 16 Credits for Id's 1 to	nefits from other site design BMPs (e.ç 5] ow the site design credit is calculated i			f	0	cu. ft.
17	Is Line 16 ≥ Line 15?			Volume Retenti	on Perfor	rmance Standard is Me	t

The C	City of DIEGO	Project Name	3342 Towne Centre Vi	ew
SA	N DIEGO	BMP ID	B2	
	Volume Retention Fr	om Amended Soils	Worksheet B.5-7	
1	Impervious area draining to the pe	rvious area	3920	sq. ft.
2	Pervious area (must meet the requ	uirements in SD-B and SD-F Fact Sheets)	21880	sq. ft.
3	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not applic	,		
4	Adjusted runoff factor [(Line 1 * 0.9	9 + Line 2 * 0.1) / (Line 1 + Line 2)]	0.22	
5	85th percentile 24-hour rainfall dep	oth	0.51	inches
6	Design capture volume [(Line 1 +	Line 2) x Line 4 x (Line 5/12)]	241	cu. ft.
7	Amendment Depth (Choose from	3", 6", 9", 12", 15" and 18")	12	inches
8	Storage [(porosity – field capacity)	+ 0.5 * (field capacity – wilting point)]	0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7)	(12) * Line 8]	5470	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]		22.7	
11	Type C soils enter 0.30  When in no infiltration condition ar	ups are used enter 0.10 for NRCS Type D soils and the actual measured infiltration rate is unknow andwater hazards identified in Appendix C or enter	n enter 0.0 if	in/hr.
12	Factor of Safety		2	
13	Reliable Infiltration Rate [Line 11/L	ine 12]	0	in/hr.
14	Dispersion Credit (Based on Figur	es B.5.6 to B.5.11; Line 10 and Line 13)	0.470	
15	Volume retention due to amendme	ent [Line 1 * (Line 5/12) * Line 14]	78	cu. ft.

The (	City of DIEGO	Project Name	3342 Town	ne Centre View	
SA	AN DIEGO	BMP ID		C1	
	Sizing Method for Volume R	etention Criteria	Works	heet B.5-2	
1	Area draining to the BMP			57,000	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2)	)	0.33	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		799	cu. ft.
/olum	e Retention Requirement				
5	Note:  When mapped hydrologic soil groups C soils enter 0.30  When in no infiltration condition and the are geotechnical and/or groundwater leads.	ne actual measured infiltration rate	is unknown enter 0.0 if there	O	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltration	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction targ When Line 7 > 0.01 in/hr. = Minimum When Line 7 ≤ 0.01 in/hr. = 3.5%			3.5	%
9	Fraction of DCV to be retained (Figure When Line $8 > 8\% = 0.0000013 \text{ x Line } 8^3 - 0.000057 \text{ x Line}$ When Line $8 \le 8\% = 0.023$	·		0.023	
10	Target volume retention [Line 9 x Line	4]		18	cu. ft.

The City of		Project Name	3342 Towne 0	Centre View			
SAN	DIEGO		C1				
	Volume Retentio	n for No Infiltration Condition				Worksheet B.5-6	5
1	Area draining to the biofiltra	tion BMP		•		57,000	sq. ft.
2	Adjusted runoff factor for dr	ainage area (Refer to Appendix B.1 an	d B.2)			0.33	
3	Effective impervious area d	raining to the BMP [Line 1 x Line 2]				18810	sq. ft.
4	Required area for Evapotra	nspiration [Line 3 x 0.03]				564	sq. ft.
5	Biofiltration BMP Footprint					0	sq. ft.
andscape Are	ea (must be identified on D	S-3247)					<u> </u>
		Identification	1	2	3	4	5
6	Landscape area that meet t Fact Sheet (sq. ft.)	he requirements in SD-B and SD-F	54423				
7	Impervious area draining to	the landscape area (sq. ft.)	2577				
8	Impervious to Pervious Area [Line 7/Line 6]	a ratio	0.05	0.00	0.0	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line	7/1.5]	1718	0	0	0	0
10	Sum of Landscape area [su	m of Line 9 Id's 1 to 5]				1718	sq. ft.
11	Provided footprint for evapo	otranspiration [Line 5 + Line 10]				1718	sq. ft.
olume Retent	ion Performance Standard						•
12	Is Line 11 ≥ Line 4?			Volume Retenti	on Perfo	rmance Standard is	Met
13	Fraction of the performance 4]	standard met through the BMP footpri	nt and/or landsc	aping [Line 11/L	ine	3.04	
14	Target Volume Retention [L	ine 10 from Worksheet B.5.2]				18	cu. ft.
15	Volume retention required for [(1-Line 13) x Line 14]	rom other site design BMPs				-37.509021	cu. ft.
te Design BN	MP .						
	Identification	Site Desi	gn Type			Credit	
	1						cu. ft.
	2						cu. ft.
	3						cu. ft.
	4						cu. ft.
16	5						cu. ft.
	Line 16 Credits for Id's 1 to	nefits from other site design BMPs (e.g 5] ow the site design credit is calculated in		, <u>-</u>	of	0	cu. ft.
17	Is Line 16 ≥ Line 15?			Volume Retenti	on Perfo	rmance Standard is	Met

The C	N DIEGO	Project Name	3342 Towne Centre V	iew
SA	N DIEGO	BMP ID	C1	
	Volume Retention From	om Amended Soils	Worksheet B.5-7	
1	Impervious area draining to the pe	rvious area	2577	sq. ft.
2	Pervious area (must meet the requ	irements in SD-B and SD-F Fact Sheets)	54423	sq. ft.
3	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not application	able when Line 3 > 50 or Line 3 < 0.25	0.05	
4	Adjusted runoff factor [(Line 1 * 0.9	9 + Line 2 * 0.1) / (Line 1 + Line 2)]	0.14	
5	85th percentile 24-hour rainfall dep	oth	0.51	inches
6	Design capture volume [(Line 1 +	ine 2) x Line 4 x (Line 5/12)]	339	cu. ft.
7	Amendment Depth (Choose from	3", 6", 9", 12", 15" and 18")	12	inches
8	Storage [(porosity – field capacity)	+ 0.5 * (field capacity – wilting point)]	0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7)	12) * Line 8]	13606	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]		40.14	
11	Type C soils enter 0.30  When in no infiltration condition ar	ips are used enter 0.10 for NRCS Type D soil d the actual measured infiltration rate is unkn ndwater hazards identified in Appendix C or e	0 own enter 0.0 if	in/hr.
12	Factor of Safety		2	
13	Reliable Infiltration Rate [Line 11/L	ine 12]	0	in/hr.
14	Dispersion Credit (Based on Figur	es B.5.6 to B.5.11; Line 10 and Line 13)	0.470	
15	Volume retention due to amendme	ent [Line 1 * (Line 5/12) * Line 14]	51	cu. ft.

The (	City of DIEGO	Project Name	3342 Towr	ne Centre View	
SA	AN DIEGO	BMP ID		C2	
	Sizing Method for Volume R	etention Criteria	Works	heet B.5-2	
1	Area draining to the BMP			180100	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2		0.61	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		4669	cu. ft.
Volum	e Retention Requirement		·		
5	Note:  When mapped hydrologic soil groups C soils enter 0.30  When in no infiltration condition and the are geotechnical and/or groundwater leads.	ne actual measured infiltration rate	is unknown enter 0.0 if there	0	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltration	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction targ When Line 7 > 0.01 in/hr. = Minimum When Line 7 ≤ 0.01 in/hr. = 3.5%			3.5	%
9	Fraction of DCV to be retained (Figure When Line $8 > 8\% = 0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line}$ When Line $8 \le 8\% = 0.023$	·		0.023	
10	Target volume retention [Line 9 x Line	4]		107	cu. ft.

1 Ar 2 Ac 3 Lc 4 Al /olume \text{Value of Use}	Alternative Minimum Food Non-Standard Area draining to the BMP Adjusted Runoff Factor for drainage at load to Clog (default value when using allowable Period to Accumulate Clog	tprint Sizing F Biofiltration area (Refer to Ap			C2 Worksheet B.5 180100	5-4 sq. ft.
2 Ac 3 Lc 4 Al /olume \ .and Use	Non-Standard Area draining to the BMP Adjusted Runoff Factor for drainage a Load to Clog (default value when using the control of the control	Biofiltration  area (Refer to Ap				
2 Ac 3 Lc 4 Al /olume \ .and Use	adjusted Runoff Factor for drainage a coad to Clog (default value when using allowable Period to Accumulate Clog		pendix B.1 and B.2)		180100	sq. ft.
3 Lo 4 Al /olume \ and Use	oad to Clog (default value when usin		pendix B.1 and B.2)			<del></del>
4 Al	Illowable Period to Accumulate Clog	ng Appendix E fa			0.61	
/olume \ .and Use	<u>_</u>		ct sheets is 2.0)		2	lb/sq. ft.
and Use		ging Load (T <sub>L</sub> ) (d	lefault value is 10)		10	years
	Weighted EMC Calculation					
ingle Fa		Fraction of Total DCV	TSS EMC (mg/	'L)	Prod	luct
	amily Residential		123		0	
commerc		0.7	128		89	
ndustrial			125		0	
	on (Municipal)		132		0	
ranspor			78		0	
	nily Residential		40		0	•
oof Run		0.3	14		4.2	
	ffic Areas		50	0		•
pen Spa			216		0	
other, sp					0	
ther, sp					0	•
other, sp	•				0	ī
	olume Weighted EMC (sum of all pr	roducts)			93.8	mg/L
	actor for Clogging					
6 W	Adjustment for pretreatment measure  Where: Line 6 = 0 if no pretreatment;  5 if the pretreatment has an active  reatment."	Line 6 = 0.25 wh			0.25	
	overage Annual Precipitation [Provide ox; SanGIS has a GIS layer for aver			discussion	10	inches
8 Ca	Calculate the Average Annual Runoff	(Line 7/12) x Lin	ne 1 x Line2		91551	cu-ft/yr
9 Ca	Calculate the Average Annual TSS Lo	oad			402	lb/yr
(L	Line 8 x 62.4 x Line 5 x (1 – Line 6))/	′10 <sup>6</sup>			<del>1</del> 02	10/ y1
10 Ca	Calculate the BMP Footprint Needed	(Line 9 x Line 4).	/Line 3		2009	sq. ft.
11 Ca	Calculate the Minimum Footprint Sizin	ng Factor for Clo	gging		0.018	
iscussi	Line 10/ (Line 1 x Line 2)]				0.0.0	

T	The City of	Project Name	3342 To	wne Centre View	,
•	SAN DIEGO	BMP ID		C2	
		ion BMP Footprint when of a Storage Unit		Workshee	t B.5-5
1	Area draining to the storage unit and bio	filtration BMP		180100	sq. ft.
2	Adjusted runoff factor for drainage area	Refer to Appendix B.1 and B.	2)	0.61	
3	Effective impervious area draining to the 2]	e storage unit and biofiltration	BMP [Line 1 x Line	109861	sq. ft.
4	Remaining DCV after implementing reter	ntion BMPs		4669	cu. ft.
5	Design infiltration rate (measured infiltrat	ion rate / 2)		0	ft./hr.
6	Media thickness [1.5 feet minimum], a aggregate sand thickness to this line for		shed ASTM 33 fine	1.5	ft.
7	Media filtration rate to be used for sizin rate is controlled by the outlet use the ou	ontrol; if the filtration	0.42	ft./hr.	
8	Media retained pore space	0.05	in/in		
Sto	rage Unit Requirement				
9	Drawdown time of the storage unit, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)			47.3	hours
10	Storage required to achieve greater than 92 percent capture (see Table B.5-5)			1.7825	fraction
11	Storage required in cubic feet (Line 4 x Line 10)			8322.4925	cu. ft.
12	Storage provided in the design, minimum BMP, overflow elevation)	n(from the elevation that bypa	sses the biofiltration	9000	cu. ft.
13	Is Line 12 ≥ Line 11?	St	orage Requirement is	Met	
Crit	eria 1: BMP Footprint Biofiltration Cap	acity			
14	Peak flow from the storage unit to the bid evaluate the percent capture)	ofiltration BMP (using the elev	ation used to	0.108	cfs
15	Required biofiltration footprint [(3,600 x L	ine 14)/Line 7]		926	sq. ft.
Crit	eria 2: Alternative Minimum Sizing Fac	tor (Clogging)			
16	Alternative Minimum Footprint Sizing Fac [Line 11 of Worksheet B.5-4]	ctor		0.018	fraction
-	Required biofiltration footprint [Line 3 x L			1977	sq. ft.
	eria 3: Retention requirement [Not app		ndition]		
	Retention Target (Line 10 in Worksheet	<u>,                                      </u>		107	cu. ft.
19	Average discharge rate from the storage			0.07	cfs
20	Depth retained in the optimized biofiltrati- {Line 6 x Line 8} + {[(Line 4)/(2400 x Line	e 19)] x Line 5}		0	ft
21	Required optimized biofiltration footprint	(Line 18/Line 20)		1427	sq. ft.
	imized Biofiltration Footprint	## ## 11	T		
22	Optimized biofiltration footprint, maximur	m(Line 15, Line 17, Line 21)		1977	sq. ft.

The C	City of DIEGO	Project Name	3342 Tow	ne Centre View	
SA	IN DIEGO	BMP ID		D1	
	Sizing Method for Volume R	etention Criteria	Works	sheet B.5-2	
1	Area draining to the BMP			147300	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2	2)	0.59	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		3694	cu. ft.
Volum	e Retention Requirement				•
5	Note:  When mapped hydrologic soil groups C soils enter 0.30  When in no infiltration condition and the are geotechnical and/or groundwater leads.	ne actual measured infiltration rat	e is unknown enter 0.0 if there		in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltration	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction target (Figure B.5-2)  When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62)  When Line 7 ≤ 0.01 in/hr. = 3.5%			3.5	%
9	Fraction of DCV to be retained (Figure When Line $8 > 8\% = 0.00000013 \text{ x Line } 8^3 - 0.000057 \text{ x Line}$ When Line $8 \le 8\% = 0.023$	,		0.023	
10	Target volume retention [Line 9 x Line	4]		85	cu. ft.

T	The City of	Project Name	3342 Tov	wne Centre Viev	N
1	SAN DIEGO	BMP ID		D1	
		ion BMP Footprint wher of a Storage Unit		Workshee	et B.5-5
1	Area draining to the storage unit and biol	filtration BMP		147300	sq. ft.
2	Adjusted runoff factor for drainage area (	Refer to Appendix B.1 and E	3.2)	0.59	
3	Effective impervious area draining to the 2]	e storage unit and biofiltration	n BMP [Line 1 x Line	86907	sq. ft.
4	Remaining DCV after implementing reter	ntion BMPs		3694	cu. ft.
5	Design infiltration rate (measured infiltrat	ion rate / 2)		0	ft./hr.
6		Media thickness [1.5 feet minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations			
7	Media filtration rate to be used for sizing rate is controlled by the outlet use the out		control; if the filtration		ft./hr.
8	Media retained pore space			0.05	in/in
Sto	rage Unit Requirement				
9	Drawdown time of the storage unit, biofiltration BMP, overflow elevation)	minimum(from the elevatio	n that bypasses the	39.7	hours
10	Storage required to achieve greater than 92 percent capture (see Table B.5-5)			1.6	fraction
11	Storage required in cubic feet (Line 4 x Line 10)			5910.4	cu. ft.
12	Storage provided in the design, minimum BMP, overflow elevation)	n(from the elevation that byp	asses the biofiltration	9306	cu. ft.
13	Is Line 12 ≥ Line 11?	S	storage Requirement is	Met	
Crit	eria 1: BMP Footprint Biofiltration Cap	acity			
14	Peak flow from the storage unit to the bid evaluate the percent capture)	ofiltration BMP (using the ele	vation used to		cfs
15	Required biofiltration footprint [(3,600 x L	ine 14)/Line 7]		0	sq. ft.
Crit	eria 2: Alternative Minimum Sizing Fac	tor (Clogging)			
16	Alternative Minimum Footprint Sizing Fac [Line 11 of Worksheet B.5-4]				fraction
	Required biofiltration footprint [Line 3 x L		-	0	sq. ft.
_	eria 3: Retention requirement [Not app		ondition]		
	Retention Target (Line 10 in Worksheet	,			cu. ft.
19	Average discharge rate from the storage				cfs
20	Depth retained in the optimized biofiltration of x Line 8 + {[(Line 4)/(2400 x Line 4)/(2400 x	e 19)] x Line 5}		0	ft
21	Required optimized biofiltration footprint	(Line 18/Line 20)		0	sq. ft.
	imized Biofiltration Footprint	alling AF Line AZ LL CO	ı		
22	Optimized biofiltration footprint, maximur	n(Line 15, Line 17, Line 21)		0	sq. ft.

The C	City of DIEGO	Project Name	3342 Towne Centre View	
SA	AN DIEGO	BMP ID	D2	
	Sizing Method for Volume I	Retention Criteria	Worksheet B.5-2	
1	Area draining to the BMP		148,300	sq. ft.
2	Adjusted runoff factor for drainage an	rea (Refer to Appendix B.1 and B.2)	0.66	
3	85 <sup>th</sup> percentile 24-hour rainfall depth		0.51	inches
4	Design capture volume [Line 1 x Line	e 2 x (Line 3/12)]	4160	cu. ft.
olum	e Retention Requirement		<u> </u>	•
5	C soils enter 0.30  When in no infiltration condition and	s are used enter 0.10 for NRCS Type D soils the actual measured infiltration rate is unkno hazards identified in Appendix C or enter 0	own enter 0.0 if there	in/hr.
6	Factor of safety		2	
7	Reliable infiltration rate, for biofiltration	on BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2)  When Line $7 > 0.01$ in/hr. = Minimum (40, 166.9 x Line $7 + 6.62$ )  When Line $7 \le 0.01$ in/hr. = 3.5%		3.5	%
9	Fraction of DCV to be retained (Figure When Line $8 > 8\% = 0.0000013 \text{ x Line } 8^3 - 0.000057 \text{ x Line}$ When Line $8 \le 8\% = 0.023$	0.023		
10	Target volume retention [Line 9 x Lin	e 41	96	cu. ft.

The	City of	Pro	ject Name	3	3342 Towne Centre	e View
SAN DIEGO			BMP ID		D2	
	Alternative Minimum Foo Non-Standard		Factor for		Worksheet B.5	5-4
1	Area draining to the BMP			•	148,300	sq. ft.
2	Adjusted Runoff Factor for drainage	area (Refer to Ap	opendix B.1 and B.2)		0.66	
3	Load to Clog (default value when using	ng Appendix E fa	act sheets is 2.0)		2	lb/sq. ft.
4	Allowable Period to Accumulate Clog	ging Load (T <sub>L</sub> ) (o	default value is 10)		10	years
Volun	ne Weighted EMC Calculation					
₋and	Use	Fraction of Total DCV	TSS EMC (mg	/L)	Prod	luct
Single	Family Residential		123		0	1
omm	nercial	0.6	128		76	.8
ndust			125		0	
	ition (Municipal)		132		0	
	portation		78		0	1
	amily Residential		40		0	
	Runoff	0.4	14		5.6	
	raffic Areas		50		0	
	Space		216		0	
	specify:				0	
	specify:				0	
	specify:				0	ı
5	Volume Weighted EMC (sum of all pr	roducts)			82.4	mg/L
Sizing	Factor for Clogging			Ī		<del> </del>
6	Adjustment for pretreatment measure Where: Line 6 = 0 if no pretreatment; 0.5 if the pretreatment has an activitreatment."	; Line 6 = 0.25 w			0.25	
7	Average Annual Precipitation [Provid box; SanGIS has a GIS layer for average			discussion	10	inches
8	Calculate the Average Annual Runof	f (Line 7/12) x Lir	ne 1 x Line2		81565	cu-ft/yr
9	Calculate the Average Annual TSS L				315	lb/yr
40	(Line 8 x 62.4 x Line 5 x (1 – Line 6)). Calculate the BMP Footprint Needed		// in a 2		4570	#
10	Calculate the Minimum Footprint Sizi	,			1573	sq. ft.
11	[ Line 10/ (Line 1 x Line 2)]	ng Factor for Cic	ogging 		0.016	
	ssion:					

T	The City of	Project Name	3342 Tov	vne Centre Viev	N
	SAN DIEGO	BMP ID		D2	
		on BMP Footprint when of a Storage Unit		Workshee	et B.5-5
1	Area draining to the storage unit and biof	filtration BMP		148,300	sq. ft.
2	Adjusted runoff factor for drainage area (	Refer to Appendix B.1 and E	3.2)	0.66	
3	Effective impervious area draining to the 2]	e storage unit and biofiltration	n BMP [Line 1 x Line	97878	sq. ft.
4	Remaining DCV after implementing reter	ntion BMPs		4160	cu. ft.
5	Design infiltration rate (measured infiltrat	ion rate / 2)		0	ft./hr.
6	Media thickness [1.5 feet minimum], a aggregate sand thickness to this line for	ashed ASTM 33 fine	1.5	ft.	
7	Media filtration rate to be used for sizing rate is controlled by the outlet use the out	0.42	ft./hr.		
8	Media retained pore space			0.05	in/in
Sto	rage Unit Requirement				
9	Drawdown time of the storage unit, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)			39.7	hours
10	Storage required to achieve greater than (see Table B.5-5)	92 percent capture		1.6	fraction
11	Storage required in cubic feet (Line 4 x L	ine 10)		6655.704	cu. ft.
12	Storage provided in the design, minimum BMP, overflow elevation)	n(from the elevation that bypa	asses the biofiltration	9,306	cu. ft.
13	Is Line 12 ≥ Line 11?	S	torage Requirement is	Met	
Crit	eria 1: BMP Footprint Biofiltration Cap	acity			
14	Peak flow from the storage unit to the bic evaluate the percent capture)	ofiltration BMP (using the ele	vation used to	0.133	cfs
15	Required biofiltration footprint [(3,600 x L	ine 14)/Line 7]		1140	sq. ft.
Crit	eria 2: Alternative Minimum Sizing Fac	tor (Clogging)			
16	Alternative Minimum Footprint Sizing Fac [Line 11 of Worksheet B.5-4]			0.016	fraction
17	Required biofiltration footprint [Line 3 x L	<u> </u>		1566	sq. ft.
	eria 3: Retention requirement [Not app		ondition]		
18	, , , , , , , , , , , , , , , , , , ,	,		96	cu. ft.
19	Average discharge rate from the storage			0.082	cfs
20	Depth retained in the optimized biofiltration {Line 6 x Line 8} + {[(Line 4)/(2400 x Line			0	ft
21	Required optimized biofiltration footprint	(Line 18/Line 20)		1276	sq. ft.
Opt	imized Biofiltration Footprint				

1566

sq. ft.

22 Optimized biofiltration footprint, maximum(Line 15, Line 17, Line 21)

The (	City of	Project Name	3342 Towne Ce	entre View	
54	N DIEGO	BMP ID	D3		
	Sizing Method for Volume R	etention Criteria	Worksheet	B.5-2	
1	Area draining to the BMP			22050	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2)		0.56	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		525	cu. ft.
/olum	e Retention Requirement		,		•
5	C soils enter 0.30  When in no infiltration condition and the	are used enter 0.10 for NRCS Type D so ne actual measured infiltration rate is unk hazards identified in Appendix C or enter	nown enter 0.0 if there	0	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltratio	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction target (Figure B.5-2)  When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62)  When Line 7 ≤ 0.01 in/hr. = 3.5%			3.5	%
9	Fraction of DCV to be retained (Figure B.5-3)  When Line $8 > 8\% = 0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line $8 \le 8\% = 0.023$			0.023	
10	Target volume retention [Line 9 x Line	· 4]		12	cu. ft.

The City of		Project Name	3342 Towne (	Centre View				
SAN	DIEGO	BMP ID	D3					
	Volume Retentio	n for No Infiltration Condition				Works	heet B.5-6	
1	Area draining to the biofiltra	tion BMP		· 			22050	sq. ft.
2	Adjusted runoff factor for dr	ainage area (Refer to Appendix B.1 an	d B.2)				0.56	
3	Effective impervious area d	raining to the BMP [Line 1 x Line 2]					12348	sq. ft.
4	Required area for Evapotra	nspiration [Line 3 x 0.03]					370	sq. ft.
5	Biofiltration BMP Footprint						0	sq. ft.
andscape Are	ea (must be identified on D	S-3247)						
		Identification	1	2	3		4	5
6	Landscape area that meet t Fact Sheet (sq. ft.)	he requirements in SD-B and SD-F	12650					
7	Impervious area draining to	the landscape area (sq. ft.)	9400					
8	Impervious to Pervious Area ratio [Line 7/Line 6]		0.74	0.00	0.0	00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line	7/1.5]	6267	0	0		0	0
10	Sum of Landscape area [su	m of Line 9 Id's 1 to 5]		•			6267	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10] 6267					6267	sq. ft.	
olume Retent	ion Performance Standard				<u> </u>			
12	Is Line 11 ≥ Line 4?			Volume Retenti	on Perfo	rmance	Standard is Met	
13	Fraction of the performance 4]	standard met through the BMP footpri	nt and/or landsc	aping [Line 11/Li	ne	,	16.92	
14		ine 10 from Worksheet B.5.2]					12	cu. ft.
15	Volume retention required fine [(1-Line 13) x Line 14]	rom other site design BMPs				-1	191.04	cu. ft.
ite Design BN	MP				,			
	Identification	Site Desi	gn Type			C	Credit	
	1							cu. ft.
	2							cu. ft.
	3							cu. ft.
	4							cu. ft.
16	5							cu. ft.
	Line 16 Credits for Id's 1 to	nefits from other site design BMPs (e.g 5] ow the site design credit is calculated i			f		0	cu. ft.
17	Is Line 16 ≥ Line 15?			Volume Retention	on Perfo	rmance	Standard is Met	

The Cit	ry of	Project Name	3342	. Towne Centre V	/iew
5A	N DIEGO	BMP ID		D3	
	Volume Retention From	om Amended Soils	V	Worksheet B.5-7	
1	Impervious area draining to the pe	rvious area		9400	sq. ft.
2	Pervious area (must meet the requ	irements in SD-B and SD-F Fact Sheets)		12650	sq. ft.
-2	Dispersion Ratio [Line 1/Line 2] Note: This worksheet is not application	able when Line 3 > 50 or Line 3 < 0.25		0.74	
4	Adjusted runoff factor [(Line 1 * 0.9	9 + Line 2 * 0.1) / (Line 1 + Line 2)]		0.44	
5	85th percentile 24-hour rainfall der	oth		0.51	inches
6	Design capture volume [(Line 1 +	Line 2) x Line 4 x (Line 5/12)]		412	cu. ft.
7	Amendment Depth (Choose from 3", 6", 9", 12", 15" and 18")			12	inches
8	Storage [(porosity – field capacity) + 0.5 * (field capacity – wilting point)]			0.25	in./in.
9	Pervious Storage [Line 2 * (Line 7/12) * Line 8]			3163	cu. ft.
10	Fraction of DCV [Line 9 / Line 6]			7.68	
11	Type C soils enter 0.30  When in no infiltration condition ar	ups are used enter 0.10 for NRCS Type D so nd the actual measured infiltration rate is unk ndwater hazards identified in Appendix C or	nown enter 0.0 if	0	in/hr.
12	Factor of Safety			2	
13	Reliable Infiltration Rate [Line 11/L	ine 12]		0	in/hr.
14	Dispersion Credit (Based on Figur	es B.5.6 to B.5.11; Line 10 and Line 13)		0.433	
15	Volume retention due to amendme	ent [Line 1 * (Line 5/12) * Line 14]		173	cu. ft.

The (	City of DIEGO	Project Name	3342 Towr	ne Centre View	
SA	N DIEGO	BMP ID		D4a	
	Sizing Method for Volume R	etention Criteria	Works	heet B.5-2	
1	Area draining to the BMP			49700	sq. ft.
2	Adjusted runoff factor for drainage are	ea (Refer to Appendix B.1 and B.2	)	0.62	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		1310	cu. ft.
/olum	e Retention Requirement		ļ		
5	Note:  When mapped hydrologic soil groups C soils enter 0.30  When in no infiltration condition and the are geotechnical and/or groundwater I	ne actual measured infiltration rate	e is unknown enter 0.0 if there	0	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltration	n BMP sizing [Line 5 / Line 6]		0	in/hr.
8	Average annual volume reduction target (Figure B.5-2)  When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62)  When Line 7 ≤ 0.01 in/hr. = 3.5%			3.5	%
9	Fraction of DCV to be retained (Figure B.5-3)  When Line $8 > 8\% = 0.0000013 \times 100000000000000000000000000000$			0.023	
10	Target volume retention [Line 9 x Line	4]		30	cu. ft.

The City of	
SAN	DIEGO

Project Name BMP ID

3342 Towne Centre View

IP ID D4a

		BMP ID	D4a	
	Optimized Biofiltration BMP Footprint when  Downstream of a Storage Unit  Worksheet B.5-5			
1	Area draining to the storage unit and bio		49700	sq. ft.
2	Adjusted runoff factor for drainage area	0.62	·	
3	Effective impervious area draining to the 2]	e storage unit and biofiltration BMP [Line 1 x Line	30814	sq. ft.
4	Remaining DCV after implementing reter	ntion BMPs	1310	cu. ft.
5	Design infiltration rate (measured infiltrat	tion rate / 2)	0	ft./hr.
6	Media thickness [1.5 feet minimum], a aggregate sand thickness to this line for	lso add mulch layer and washed ASTM 33 fine sizing calculations		ft.
7	Media filtration rate to be used for sizin rate is controlled by the outlet use the ou	g (0.42 ft/hr. with no outlet control; if the filtration itlet controlled rate)		ft./hr.
8	Media retained pore space		0.05	in/in
Sto	rage Unit Requirement			
9	Drawdown time of the storage unit, biofiltration BMP, overflow elevation)	minimum(from the elevation that bypasses the	68.3	hours
10	Storage required to achieve greater than 92 percent capture (see Table B.5-5)		2.14	fraction
11	Storage required in cubic feet (Line 4 x Line 10)		2803.4	cu. ft.
12	Storage provided in the design, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)		4000	cu. ft.
13	Is Line 12 ≥ Line 11? Storage Requirement is Met			
Crit	eria 1: BMP Footprint Biofiltration Cap	acity		
14	Peak flow from the storage unit to the biofiltration BMP (using the elevation used to evaluate the percent capture)			cfs
15	Required biofiltration footprint [(3,600 x Line 14)/Line 7]		0	sq. ft.
Crit	eria 2: Alternative Minimum Sizing Fac			
16	Alternative Minimum Footprint Sizing Fac [Line 11 of Worksheet B.5-4]	ctor		fraction
17	Required biofiltration footprint [Line 3 x Line 16]		0	sq. ft.
Criteria 3: Retention requirement [Not applicable for No Infiltration Condition]				
18	Retention Target (Line 10 in Worksheet B.5-2)			cu. ft.
19	Average discharge rate from the storage unit to the biofiltration BMP			cfs
20	Depth retained in the optimized biofiltration BMP {Line 6 x Line 8} + {[(Line 4)/(2400 x Line 19)] x Line 5}		0	ft
21	Required optimized biofiltration footprint (Line 18/Line 20)			sq. ft.
	Optimized Biofiltration Footprint			
22	Optimized biofiltration footprint, maximum(Line 15, Line 17, Line 21)			sq. ft.

The City of SAN DIEGO		Project Name	3342 Tow	Towne Centre View D4b	
		BMP ID			
	Sizing Method for Volume R	etention Criteria	Works	sheet B.5-2	
1	Area draining to the BMP			19600	sq. ft.
2	Adjusted runoff factor for drainage are	a (Refer to Appendix B.1 and B.2	2)	0.68	
3	85 <sup>th</sup> percentile 24-hour rainfall depth			0.51	inches
4	Design capture volume [Line 1 x Line	2 x (Line 3/12)]		566	cu. ft.
Volum	e Retention Requirement				
5	Note:  When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30  When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05			0	in/hr.
6	Factor of safety			2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]		0	in/hr.	
8	Average annual volume reduction target (Figure B.5-2) When Line $7 > 0.01$ in/hr. = Minimum (40, 166.9 x Line $7 + 6.62$ ) When Line $7 \le 0.01$ in/hr. = $3.5\%$		3.5	%	
9	Fraction of DCV to be retained (Figure B.5-3)  When Line $8 > 8\% = 0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line $8 \le 8\% = 0.023$		0.023		
10	Target volume retention [Line 9 x Line 4]			13	cu. ft.

DIEGO

Project Name BMP ID

3342 Towne Centre View

IP ID D4b

		BMP ID	D4b		
	Optimized Biofiltration BMP Footprint when  Downstream of a Storage Unit  Worksheet B.5-5				
1	Area draining to the storage unit and biofiltration BMP		19600	sq. ft.	
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.68		
3	Effective impervious area draining to the 2]	e storage unit and biofiltration BMP [Line 1 x Line	13328	sq. ft.	
4	Remaining DCV after implementing reter	ntion BMPs	566	cu. ft.	
5	Design infiltration rate (measured infiltrat	tion rate / 2)	0	ft./hr.	
6	Media thickness [1.5 feet minimum], a aggregate sand thickness to this line for	lso add mulch layer and washed ASTM 33 fine sizing calculations		ft.	
7	Media filtration rate to be used for sizing rate is controlled by the outlet use the out		ft./hr.		
8	Media retained pore space		0.05	in/in	
Sto	rage Unit Requirement				
9	Drawdown time of the storage unit, biofiltration BMP, overflow elevation)	minimum(from the elevation that bypasses the	40.5	hours	
10	Storage required to achieve greater than 92 percent capture (see Table B.5-5)		1.61	fraction	
11	Storage required in cubic feet (Line 4 x Line 10)		911.26	cu. ft.	
12	Storage provided in the design, minimum(from the elevation that bypasses the biofiltration BMP, overflow elevation)		2068	cu. ft.	
13	Is Line 12 ≥ Line 11? Storage Requirement is Met				
Crit	eria 1: BMP Footprint Biofiltration Cap	acity		_	
14	Peak flow from the storage unit to the biofiltration BMP (using the elevation used to evaluate the percent capture)			cfs	
15	Required biofiltration footprint [(3,600 x Line 14)/Line 7]		0	sq. ft.	
Crit	eria 2: Alternative Minimum Sizing Fac				
16	Alternative Minimum Footprint Sizing Fac [Line 11 of Worksheet B.5-4]	ctor		fraction	
17	Required biofiltration footprint [Line 3 x Line 16]			sq. ft.	
Criteria 3: Retention requirement [Not applicable for No Infiltration Condition]					
18	,			cu. ft.	
19				cfs	
20	Depth retained in the optimized biofiltration BMP {Line 6 x Line 8} + {[(Line 4)/(2400 x Line 19)] x Line 5}		0	ft	
	Required optimized biofiltration footprint (Line 18/Line 20)			sq. ft.	
Optimized Biofiltration Footprint					
22	Optimized biofiltration footprint, maximur	0	sq. ft.		

Project Name: Towne Centre View

# Attachment 2 Backup for PDP Hydromodification Control Measures

This is the cover sheet for Attachment 2.

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



Project Name: Towne Centre View

#### **Indicate which Items are Included:**

Attachment Sequence	Contents	Checklist	
Attachment 2a	Hydromodification Management Exhibit (Required)	Included See Hydromodification Management Exhibit Checklist.	
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  Submitted as separate standalone document	
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required)  Overflow Design Summary for each structural BMP  See Chapter 6 and Appendix G of the BMP Design Manual	✓ Included  ☐ Submitted as separate stand- alone document	

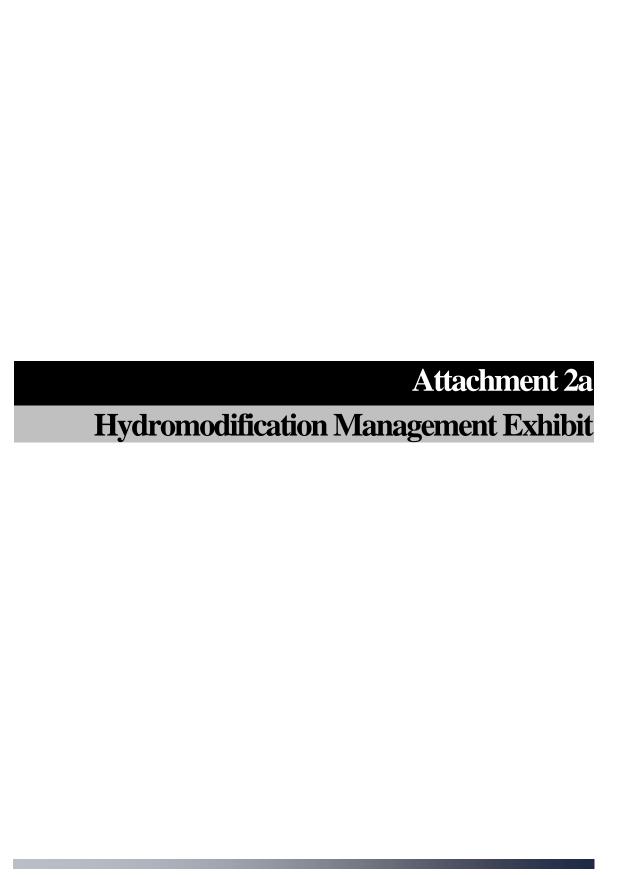
Project Name: Towne Centre View

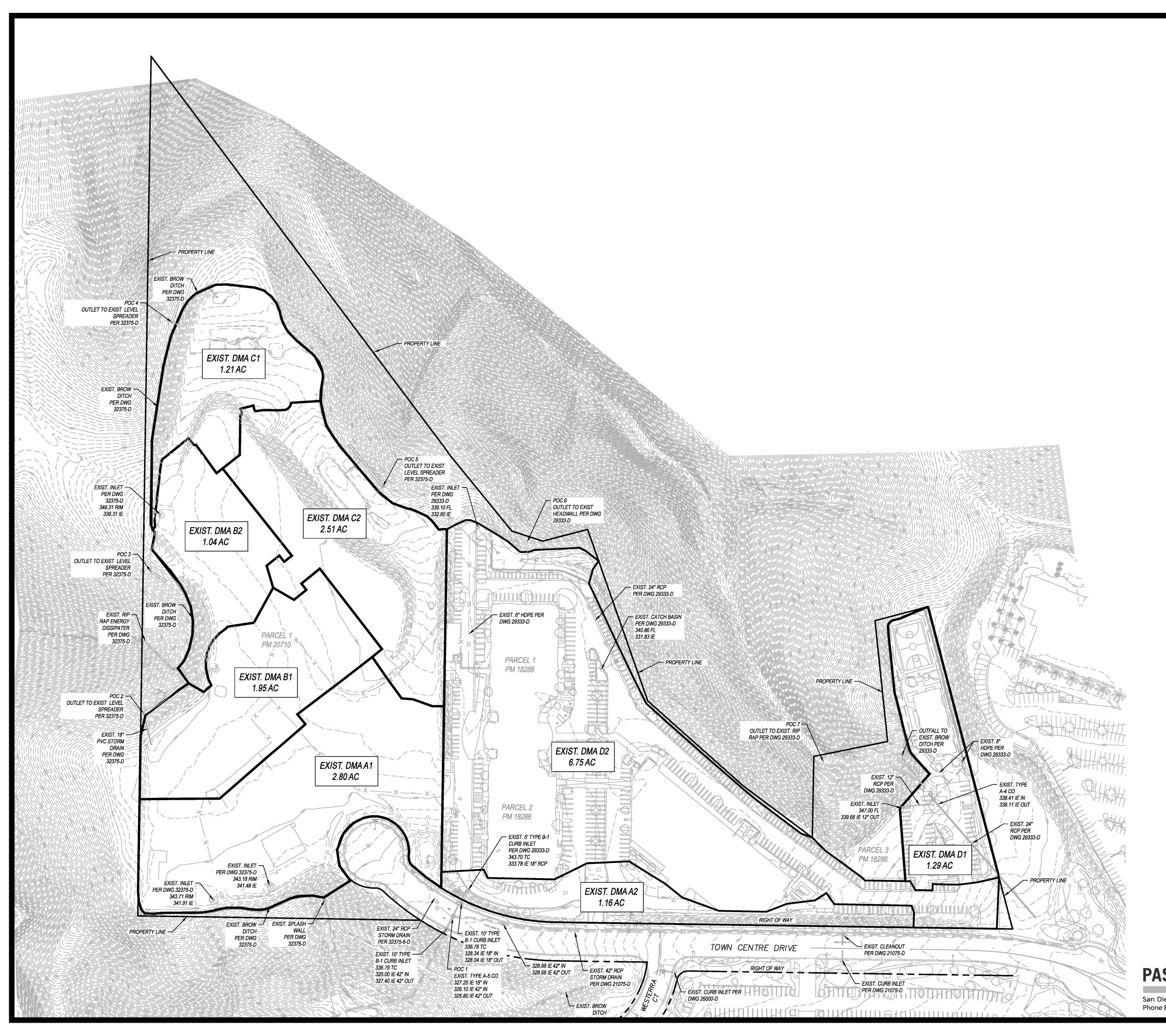
## Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

<b>'</b>	Underlying hydrologic soil group
<b>v</b>	Approximate depth to groundwater
<b>v</b>	Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
<b>'</b>	Critical coarse sediment yield areas to be protected OR provide a separate map
	showing that the project site is outside of any critical coarse sediment yield areas
1	Existing topography
<b>'</b>	Existing and proposed site drainage network and connections to drainage offsite
<b>'</b>	Proposed grading
<b>'</b>	Proposed impervious features
<b>'</b>	Proposed design features and surface treatments used to minimize imperviousness
<b>/</b>	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)







#### 

#### HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D

#### DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

#### PROJECT CHARACTERISTICS

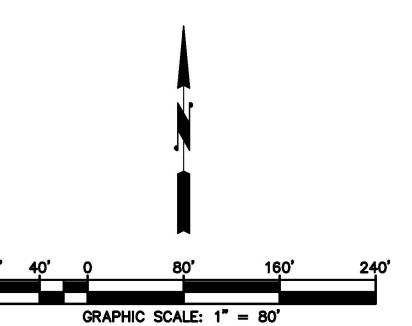
PARCEL AREA: 25.45 AC

EXISTING IMPERVIOUS AREA: 8.78 AC

EXISTING LANDSCAPE AREA: 7.62 AC

#### SUMMARY OF EXISTING CONDITIONS

P	EXIST. DRAINAGE BASIN	EXIST. DRAINAGE AREA (AC)
	(A1)	2.80
	(A2)	1.16
	(B1)	1.95
	(B2)	1.04
	(C1)	1.21
	(C2)	2.51
	(D1)	1.29
	(D2)	6.75
2		·



# EXISTING CONDITION DMA EXHIBIT

PASCO LARET SUITER

& ASSOCIATES

San Diego | Solana Beach | Orange County
Phone 858.259.8212 | www.plsaengineering.com

TOWNE CENTRE VIEW

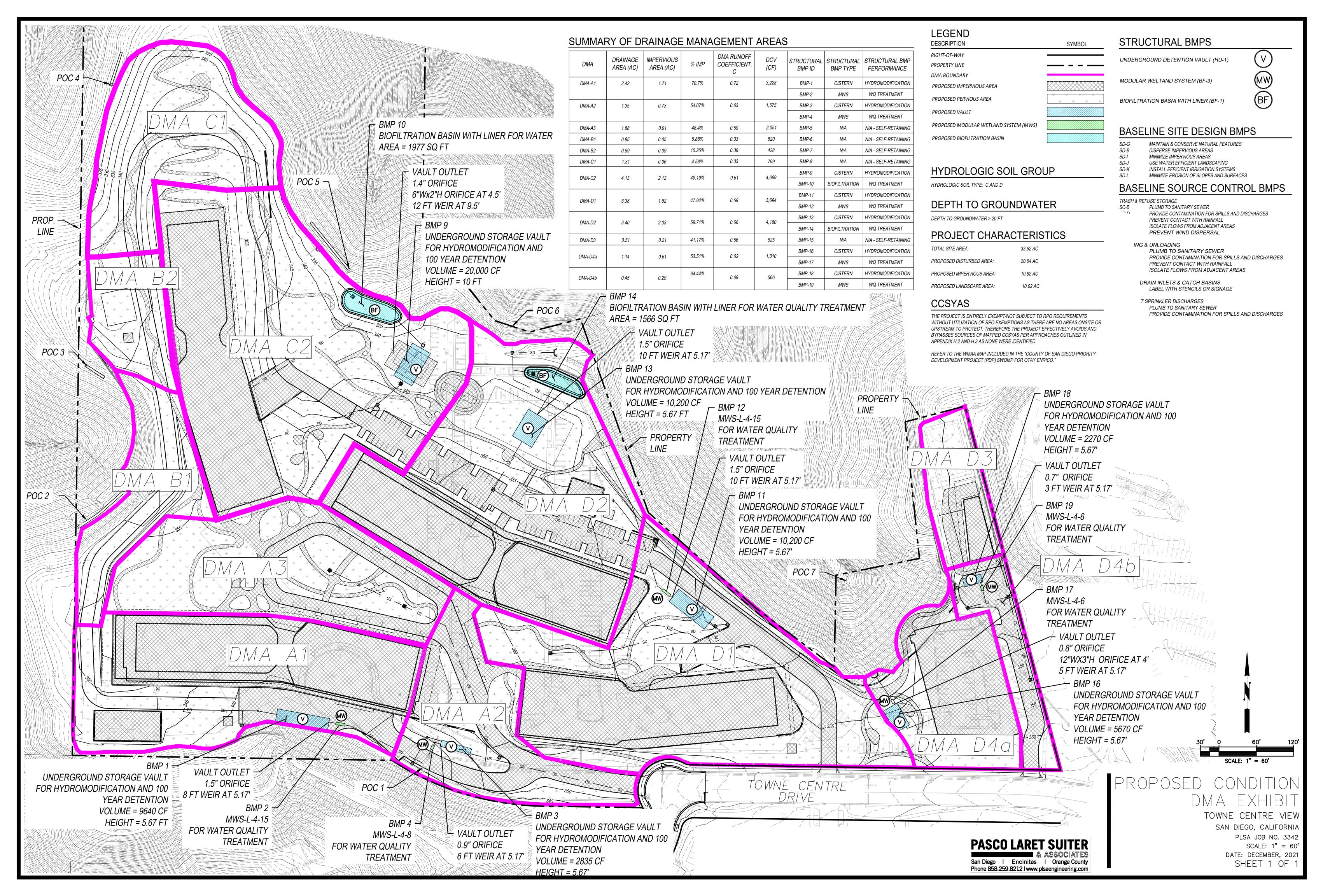
SAN DIEGO, CALIFORNIA

PLSA JOB NO. 3342

SCALE: 1" = 80'

DATE: OCTOBER 2, 2020

SHEET 1 OF 1



### **Attachment 2b**

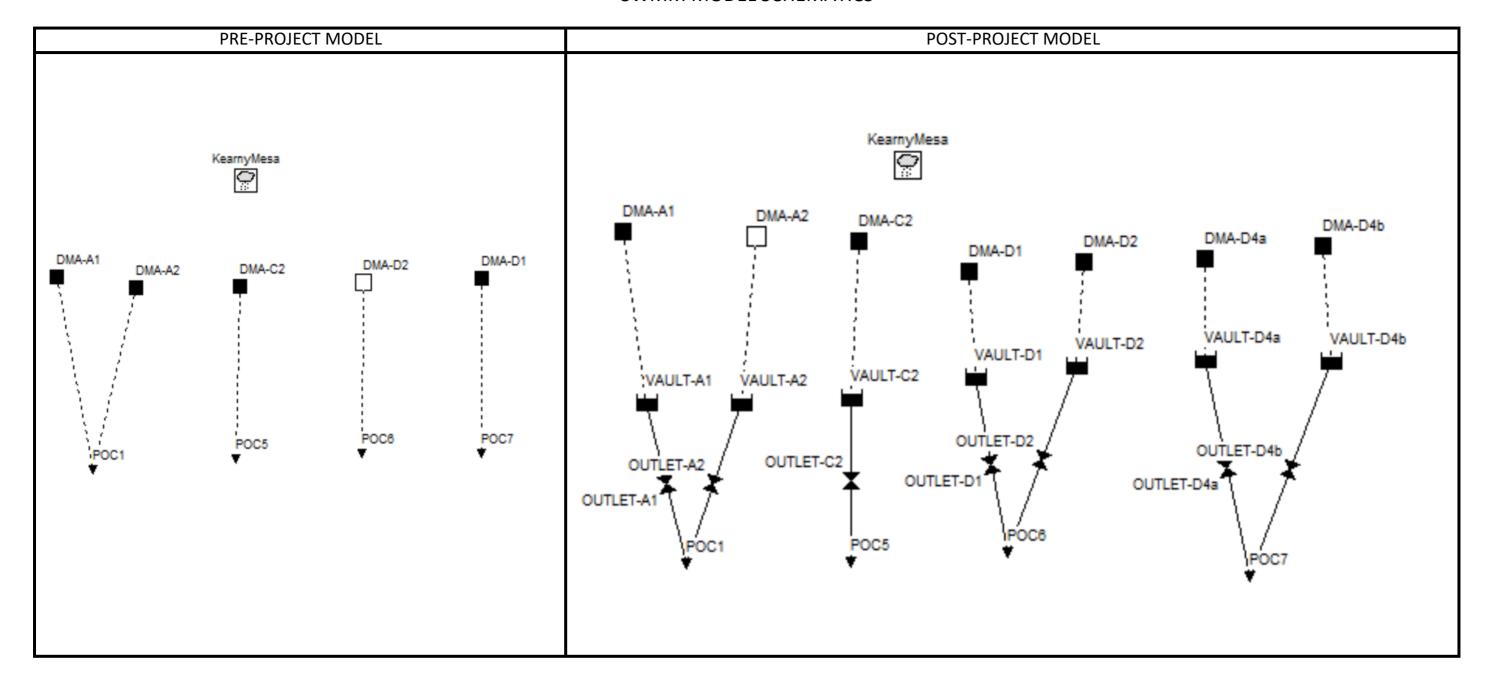
Management of Critical Coarse Sediment Yield Areas





Flow Control Facility Design and Structural BMP Drawdown Calculations

#### SWMM MODEL SCHEMATICS



### [TITLE]

;;Project Title/Notes 3342 Towne Centre View Existing Condition

#### [OPTIONS]

;;Option Value FLOW UNITS CFS

INFILTRATION GREEN\_AMPT
FLOW\_ROUTING KINWAVE
LINK\_OFFSETS DEPTH
MIN\_SLOPE 0
ALLOW\_PONDING NO
SKIP STEADY STATE NO

START DATE 09/08/1964 START TIME 06:00:00 REPORT START DATE 09/08/1964 REPORT START TIME 06:00:00 END DATE 05/23/2008 END TIME 22:00:00 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
RULE STEP 00:00:00

INERTIAL DAMPING PARTIAL NORMAL FLOW LIMITED BOTH FORCE MAIN EQUATION H-W VARIABLE STEP 0.75 LENGTHENING STEP 0 MIN SURFAREA 12.557 MAX TRIALS 8 HEAD TOLERANCE 0.005 SYS FLOW TOL 5 LAT FLOW TOL 5 MINIMUM STEP 0.5 THREADS 1

### [EVAPORATION]

;;Data Source Parameters

;;			4.5		1.0	1.0	1.5		0.0	0.6
MONTHLY DRY_ONLY	.06 .08 NO	.11	.15 .17	.19	.19	.18	.15	•11	.08 .	06
[RAINGAGES]		T								
;;Name ;;		Interval SC		ırce						
KearnyMesa		1:00 1.			KearnyMe	sa				
[SUBCATCHMENTS]										
;;Name		Outl		Area	. %Imp	erv W	idth	%Slope	CurbLen	SnowPack
;; DMA-A1		POC1		2.8	0		53	2	0 0	
DMA-D2	KearnyMesa	POC6			0		304	1	0	
DMA-C2	KearnyMesa	POC5						13	0	
DMA-A2	KearnyMesa	POC5		1 16	0	1 '	123	1.5	0	
DMA-D1	KearnyMesa				0		11	3.5	0	
2111 21	1104211711004	. 2007		1,23	ŭ	, -	<u> </u>	0.0	ŭ	
[SUBAREAS]										
;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Per	v Pct	Zero	Route'	To Pct	Routed	
; ;										
DMA-A1	0.012	0.032	0.05	0.1	25		OUTLE	Т		
DMA-D2			0.05		25		OUTLE	T		
DMA-C2	0.012	0.032 0.056	0.05 0.05	0.1	25		OUTLE'	T		
DMA-A2	0.012	0.056	0.05	0.1	25		OUTLE'	T		
DMA-D1	0.012	0.056	0.05	0.1	25		OUTLE'	Т		
[INFILTRATION] ;;Subcatchment	Suction	Ksat	IMD							
;;										
DMA-A1			0.3							
DMA-D2		.025								
DMA-C2	9		0.3							
DMA-A2	9		0.3							
DMA-D1	7.41	0.065	0.305							
[OUTFALLS]	D1 + /	m	Ottore Det		0-1-1	Danta	m -			
;;Name ;;	Elevation	туре	Stage Dat	.a 	Gated	Route	T.O			
;;======== ;Basin 1	<b></b>	<b></b>	·			<b>_</b> _	·			
POC1	0	FREE			NO					
POC6	0	FREE			NO					
POC5	0	FREE			NO					
POC7	0	FREE			NO					

```
[TIMESERIES]
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SUBCATCHMENTS ALL
NODES ALL
LINKS ALL
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DIMENSIONS 0.000 0.000 10000.000 10000.000
Units None
[COORDINATES]
;;Node
            X-Coord
                           Y-Coord
                           4100.719
POC1
            -1244.604
           2870.504
928.058
POC6
                           4345.324
                           4273.381
POC5
POC7
            4683.453
                           4345.324
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                             Y-Coord
[Polygons]
;;Subcatchment X-Coord Y-Coord
;;-----
DMA-A1 -1818.182

DMA-D2 2884.892

DMA-C2 985.612

DMA-A2 -599.174

DMA-D1 4697.842
                           6942.149
                           6863.309
                         6805.755
6797.521
                      6920.863
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;;Gage
;;-----
```

8342.318

1105.121

KearnyMesa

```
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3342 Towne Centre View
Proposed Condition
[OPTIONS]
;;Option
                   Value
FLOW UNITS
                   CFS
INFILTRATION
                   GREEN AMPT
FLOW ROUTING
                   KINWAVE
LINK OFFSETS
                   DEPTH
MIN SLOPE
                   0
ALLOW PONDING
                   NO
SKIP STEADY STATE
START DATE
                   09/08/1964
START TIME
                   06:00:00
REPORT START DATE
                   09/08/1964
REPORT START TIME
                   06:00:00
END DATE
                   05/23/2008
END TIME
                   22:00:00
SWEEP START
                   01/01
SWEEP END
                   12/31
DRY DAYS
REPORT STEP
                   01:00:00
WET STEP
                   00:15:00
DRY STEP
                   04:00:00
ROUTING STEP
                   0:01:00
RULE STEP
                   00:00:00
INERTIAL DAMPING
                   PARTIAL
NORMAL FLOW LIMITED BOTH
FORCE MAIN EQUATION H-W
VARIABLE STEP
                   0.75
LENGTHENING STEP
                   0
MIN SURFAREA
                   12.557
MAX TRIALS
                   8
HEAD TOLERANCE
                   0.005
SYS FLOW TOL
                   5
LAT FLOW TOL
                   5
MINIMUM STEP
                   0.5
THREADS
                   1
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                     .08
                           .11
                                    .15
                                          .17
                                                 .19
                                                             .18
                                                                   .15 .11
                                                                                  .08
MONTHLY
                                                      .19
                                                                                         .06
DRY ONLY
[RAINGAGES]
```

Source

[TITLE]

;;Name

Format

Interval SCF

KearnyMesa	INTENSITY	1:00	1.0 TI	MESERIES K	earnyMesa							
[SUBCATCHMENTS]												
;;Name	Rain Gage		Outlet	Area	%Imperv	Width	%Slop	e CurbLen	SnowPack			
;;				2 42	71	1351		0				
DMA-A1 DMA-A2	KearnyMes KearnyMes		VAULT-A1 VAULT-A2	2.42 1.35	71 54.1	700	6 6	0				
DMA DO	VoorniMoo	_	VAULT-D2	3.4	60	1559	6	0				
DMA-C2	KearnyMes	a	VAULT-C2	4.13	51	1475	12	0				
DMA-D1	KearnyMes	a	VAULT-D1		48 53	1583	5	0				
DMA-D4a	KearnvMes	a	VAULT-D4a	1.14	53	460	5	0				
DMA-D4b	KearnyMes KearnyMes KearnyMes KearnyMes	a	VAULT-D4B	0.45	64	280	4	0				
[SUBAREAS] ;;Subcatchment	N-Imperv	N-Perv	S-Imperv	s-Perv	PctZero	Rout	еТо	PctRouted				
;			2-Imper/			, Rout						
DMA-A1	0.012	0.06	0.05	0.1	25	OUTL	ET					
DMA-A2	0.012	0.06	0.05	0.1	25	OUTL	ET					
MA-D2	0.012	0.06	0.05	0.1	25	OUTL	ET					
MA-C2	0.012	0.06	0.05	0.1	25	OUTL	ET					
DMA-D1	0.012	0.06	0.05	0.1	25	OUTL	ET					
DMA-D4a	0.012	0.06	0.05	0.1	25	OUTL	ET					
MA-D4b	0.012	0.06	0.05	0.1	25	OUTL	ET					
[INFILTRATION]												
;;Subcatchment	Suction	Ksat	IMD									
;												
DMA-A1	9	.025	0.3									
DMA-A2	9	.025	0.3									
MA-D2	9	.025	0.3									
DMA-C2	9	.025	0.3									
	9	.025	0.3									
MA-D4a	9	.025	0.3									
DMA-D4b	9	.025	0.3									
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,	.025	0.5									
[OUTFALLS]												
;;Name	Elevation	Type	Stage Da	ata Ga	ited Rou	ite To						
:;:: :Basin 1												
POC1	0	FREE		NO	)							
20C6	0	FREE		NO								
POC7	0	FREE		NO								
OC5	0	FREE		NO								
[STORAGE]						1-		4				
;Name		MaxDepth	InitDepth		Curve Nam	ne/Params		N/A	Fevap	Psi	Ksat	IMD
;		5.67	0	TABULAR	 VAULT-A1			0	0	-		
'AIII.T-A1												
/AULT-A1 /AULT-A2	-	5.67	0	TABULAR	VAULT-A2			0	0			

VAULT-D2 VAULT-D4a	0 5 0 5 0 5	5.67 ( 5.67 ( 5.67 ( 5.67 (	) )	TABULAR	VAULT-D1 VAULT-D2 VAULT-D4a VAULT-D4b	0 0 0 0	0 0 0 0	
[OUTLETS] ;;Name	From Node	To 1	Iode	Offset	Туре	QTable/Qcoeff	Qexpon	Gated
OUTLET-A1 OUTLET-A2 OUTLET-C2 OUTLET-D1 OUTLET-D2 OUTLET-D4a OUTLET-D4b	VAULT-A1 VAULT-A2 VAULT-C2 VAULT-D1	POC1 POC1 POC5 POC6		0 0 0 0 0 0	TABULAR/DEPTH TABULAR/DEPTH TABULAR/DEPTH TABULAR/DEPTH TABULAR/DEPTH TABULAR/DEPTH TABULAR/DEPTH	OUTLET-A1 OUTLET-A2 OUTLET-C2 OUTLET-D1 OUTLET-D2 OUTLET-D4a OUTLET-D4b		NO NO NO NO NO NO NO
[CURVES] ;;Name		X-Value	Y-Value					
OUTLET-A1	Rating		0 0.02 0.03 0.04 0.05 0.06 0.06 0.07 0.07 0.08 0.09 0.09 0.09 0.1 0.1 0.11 0.11 0.11 0.11 0.12 0.12 0.12 0.12 0.12 0.12 0.13 0.15					
	Rating	0	0					

OUTLET-A2		0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3.2 3.4 3.6 3.8 4 4.2 4.4 4.6 4.8 5	0.01 0.02 0.02 0.02 0.02 0.02 0.03 0.03 0.03 0.03 0.03 0.03 0.03 0.04 0.05
OUTLET-A2 OUTLET-A2		5.2 5.4	0.15 2.22
OUTLET-A2 OUTLET-A2		5.6 5.67	5.59 6.79
; OUTLET-C2	Rating	0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8	0 0.02 0.03 0.04 0.04 0.05 0.05 0.06 0.06 0.07 0.07 0.08 0.08 0.08 0.08 0.09 0.09 0.09 0.09 0.09 0.1 0.1

OUTLET-C2		4.2 4.4 4.6 4.8 5.2 5.6 5.8 6.2 6.4 6.6 7.2 7.4 7.6 7.8 8.2 8.4 8.6 8.8 9.2 9.4 9.8 10	0.1 0.11 0.16 0.3 0.37 0.48 0.53 0.57 0.6 0.64 0.67 0.73 0.76 0.79 0.81 0.84 0.86 0.89 0.91 0.93 0.95 0.98 1.02 1.04 2.3 7.53 14.99
; OUTLET-D1	Rating	0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8	0 0.02 0.03 0.04 0.05 0.06 0.07 0.07 0.08 0.08 0.09 0.09 0.1 0.1 0.1 0.11 0.11 0.11

OUTLET-D1		4 4.2 4.4 4.6 4.8 5 5.2 5.4 5.6	0.12 0.12 0.12 0.13 0.13 0.13 0.3 3.75 9.37
OUTLET-D2	Rating	0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3.2 3.4 3.6 3.8 4 4.2 4.4 4.6 4.8 5 5.2 5.4 5.6 5.6 5.6 5.6 5.6	0 0.02 0.03 0.04 0.05 0.06 0.07 0.07 0.08 0.08 0.09 0.09 0.1 0.1 0.1 0.1 0.11 0.11 0.11 0.12 0.12 0.12 0.12 0.12 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.14
; OUTLET-D4a	Rating	0 0.2 0.4 0.6 0.8 1 1.2 1.4	0 0.01 0.01 0.01 0.01 0.02 0.02 0.02 0.0

OUTLET-D4a		1.8 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4 4.6 4.8 5 5.2 5.4 5.6 5.67	0.02 0.02 0.02 0.03 0.03 0.03 0.03 0.03
; OUTLET-D4b	Rating	0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2 2.2 2.4 2.6 2.8 3 3.2 3.4 3.6 3.8 4 4.2 4.4 4.6 4.8 5 5.2 5.4 5.6	0 0.01 0.01 0.01 0.01 0.01 0.02 0.02 0.0

```
OUTLET-D4b
                      5.67
              Storage 0
                                 1700
VAULT-A1
VAULT-A1
                       5.67
                                1700
                                 500
VAULT-A2
              Storage
                      0
                       5.67
                                 500
VAULT-A2
VAULT-C2
              Storage
                      0
                                 2000
VAULT-C2
                       10
                                 2000
VAULT-D1
              Storage
                      0
                                 1800
VAULT-D1
                       5.67
                                1800
              Storage 0
VAULT-D2
                                 1800
                                 1800
VAULT-D2
                       5.67
VAULT-D4a
              Storage 0
                                1000
VAULT-D4a
                       5.67
                                1000
              Storage 0
                                400
VAULT-D4b
VAULT-D4b
                       5.67
                                400
[TIMESERIES]
        Date Time
                              Value
::Name
;;-----
KearnyMesa FILE "J:\Active Jobs\3342 TOWNE CENTRE VIEW\CIVIL\REPORTS\SWQMP\SWMM\Rainfall\kearny mesa.dat"
[REPORT]
;;Reporting Options
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
;;-----
POC1
              -1057.554
                              3956.835
POC6
             1892.086
                              4057.554
POC7
             4123.372
                            3846.586
POC5 453.237

VAULT-A1 -1432.279

VAULT-A2 -560.413

VAULT-C2 450.880

VAULT-D1 1591.315
                             3971.223
```

3.4

5395.636 5383.000 5428.032 5622.315

VAULT-D2 VAULT-D4a VAULT-D4b	2528.505 3712.324 4863.259	5720.966 5770.292 5753.850
	X-Coord	
	X-Coord	
DMA-A1		6935.252
	-414.601	
DMA-D2	2594.273	6658.157
DMA-C2	525.180	6848.921
DMA-D1	1541.989	6575.947
DMA-D4a	3712.324	6691.040
DMA-D4b	4794.295	6804.419
[SYMBOLS]		
;;Gage	X-Coord	Y-Coord
;;		
KearnyMesa	1000.000	7500.000

### PRE-PROJECT CONDITION

3342 Towne Centre View Existing Condition  ***********************************	.013
NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.  ***********************************	
Analysis Options  *********  Flow Units CFS  Process Models:  Rainfall/Runoff YES	
RDII       NO         Snowmelt       NO         Groundwater       NO         Flow Routing       NO         Water Quality       NO         Infiltration Method       GREEN_AMPT         Starting Date       09/08/1964 06:00:00         Ending Date       05/23/2008 22:00:00         Antecedent Dry Days       0.0         Report Time Step       01:00:00         Wet Time Step       00:15:00         Dry Time Step       04:00:00	
**************************************	
**************************************	

J:\Active Jobs\3342 TOWNE CENTRE VIEW\CIVIL\REPORTS\SWQMP\SWMM\Output\3342\_PreProject\_SWMM\_results.docx

#### SWMM OUTPUT REPORT PRE-PROJECT CONDITION Wet Weather Inflow ..... 123.306 40.181 Groundwater Inflow ..... 0.000 0.000

RDII Inflow ..... 0.000 0.000 External Inflow ..... 0.000 0.000 External Outflow ..... 123.306 40.181 0.000 Flooding Loss ..... 0.000 Evaporation Loss ..... 0.000 0.000 Exfiltration Loss ...... 0.000 0.000

Initial Stored Volume .... 0.000 0.000 Final Stored Volume ..... 0.000 0.000 0.000

\*\*\*\*\*\* Subcatchment Runoff Summary \*\*\*\*\*\*\*

Continuity Error (%) .....

	Total	Total	Total	Total	Imperv	Perv	Total	Total	
Peak Runoff									
	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff	
Runoff Coeff									
Subcatchment	in	in	in	in	in	in	in	10^6 gal	
CFS									
DMA-A1	489.12	0.00	17.81	376.01	0.00	104.31	104.31	7.93	
3.46 0.213									
DMA-D2	489.12	0.00	17.70	374.40	0.00	106.58	106.58	19.53	
8.34 0.218									
DMA-C2	489.12	0.00	17.59	372.58	0.00	109.65	109.65	7.47	
3.11 0.224									
DMA-A2	489.12	0.00	17.60	372.71	0.00	109.39	109.39	3.45	
1.44 0.224									
DMA-D1	489.12	0.00	7.08	435.56	0.00	51.24	51.24	1.79	
1.42 0.105									

Analysis begun on: Tue Sep 29 12:22:34 2020 Analysis ended on: Tue Sep 29 12:23:04 2020

Total elapsed time: 00:00:30

### POST-PROJECT CONDITION

EPA STORM WATER MANAGEMENT MO	DEL - VERSION	N 5.1 (Build 5.1.013)
3342 Towne Centre View Proposed Condition		
**************************************	displayed in ry computation reporting to	this report are onal time step, ime step.
*****		
Analysis Options		
Flow Units	S S S EEN_AMPT NWAVE /08/1964 06:0 /23/2008 22:0 0 :00:00 :15:00 :00:00	
**************************************	Volume acre-feet  663.165 69.914 221.336 384.039 0.031 -1.833	Depth inches  489.120 51.565 163.247 283.249 0.023
********  Flow Routing Continuity  ***********  Dry Weather Inflow  Wet Weather Inflow  Groundwater Inflow  RDII Inflow	Volume acre-feet  0.000 384.035 0.000 0.000	Volume 10^6 gal  0.000 125.144 0.000 0.000

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#### SWMM OUTPUT REPORT

#### POST-PROJECT CONDITION

External Inflow	0.000	0.000
External Outflow	383.791	125.064
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.124	0.040
Continuity Error (%)	0.031	

All links are stable.

Minimum Time Step : 59.00 sec
Average Time Step : 60.00 sec
Maximum Time Step : 60.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

| Total | Peak | Runoff | Run

Average Maximum Maximum Time of Max Reported
Depth Depth HGL Occurrence Max Depth
Node Type Feet Feet Feet days hr:min Feet

POC1 OUTFALL 0.00 0.00 0.00 0.000 0.000 0.00

#### POST-PROJECT CONDITION

POC6	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
POC7	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
POC5	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
VAULT-A1	STORAGE	0.04	5.41	5.41	3739	02:57	5.41
VAULT-A2	STORAGE	0.05	5.36	5.36	3739	03:01	5.36
VAULT-C2	STORAGE	0.06	9.64	9.64	1999	12:37	9.64
VAULT-D1	STORAGE	0.04	5.43	5.43	3739	02:48	5.43
VAULT-D2	STORAGE	0.05	5.43	5.43	3739	02:46	5.43
VAULT-D4a	STORAGE	0.05	4.76	4.76	3739	03:07	4.68
VAULT-D4b	STORAGE	0.03	5.26	5.26	1999	12:22	5.26

SWMM OUTPUT REPORT

Maximum Maximum Lateral Total Flow Lateral Total Time of Max Inflow Inflow Balance Inflow Inflow Occurrence Volume Volume Error CFS CFS days hr:min 10^6 gal 10^6 gal Percent Node 
 OUTFALL
 0.00
 5.12
 3739
 02:57
 0
 31.8
 0.000

 OUTFALL
 0.00
 9.04
 3739
 02:48
 0
 51
 0.000

 OUTFALL
 0.00
 1.37
 3739
 03:07
 0
 12.2
 0.000

 OUTFALL
 0.00
 3.40
 1999
 12:37
 0
 30
 0.000

 STORAGE
 3.29
 3.29
 3739
 03:01
 21.7
 21.7
 0.026

 STORAGE
 1.80
 1.80
 3739
 03:01
 10.2
 10.2
 0.066

 STORAGE
 5.47
 5.47
 3739
 03:01
 30.1
 30.1
 0.023

 STORAGE
 4.46
 4.46
 3739
 03:01
 23.7
 23.7
 0.033

 STORAGE
 4.56
 4.56
 3739
 03:01
 27.3
 27.3
 0.036

 STORAGE
 1.51
 1.51
 3739
 03:01
 8.46
 8.46
 0.013

 STORAGE
 0.61
 POC1 POC6 POC7 POC5 VAULT-A1 VAULT-A2 VAULT-C2 VAULT-D1 VAULT-D2 VAULT-D4a VAULT-D4b

No nodes were flooded.

Avg Evap Exfil Maximum Max Time of Max Maximum Average Volume Pcnt Pcnt Pcnt Volume Pcnt Occurrence Outflow 1000 ft3 Full Loss Loss 1000 ft3 Full days hr:min CFS Storage Unit \_\_\_\_\_\_ VAULT-A1 0.069 1 0 0 9.205 95 3739 02:56 3.32 
 0.026
 1
 0
 0
 2.680
 95
 3739
 03:01

 0.127
 1
 0
 0
 19.286
 96
 1999
 12:36

 0.080
 1
 0
 0
 9.770
 96
 3739
 02:47
 1.80 VAULT-A2 3.40 VAULT-C2 VAULT-D1 4.49

### **SWMM OUTPUT REPORT**

### POST-PROJECT CONDITION

VAULT-D2	0.095	1	0	0	9.775	96	3739	02:45	4.58
VAULT-D4a	0.049	1	0	0	4.757	84	3739	03:06	0.98
VAULT-D4b	0.010	0	0	0	2.104	93	3739	03:07	0.38

Outfall Node	Flow	Avg	Max	Total
	Freq	Flow	Flow	Volume
	Pcnt	CFS	CFS	10^6 gal
POC1	7.55	0.04	5.12	31.811
POC6	8.74	0.06	9.04	50.978
POC7	7.37	0.02	1.37	12.221
POC5	8.61	0.03	3.40	30.045
System	8.07	0.15	3.40	125.055

Link	Type	Maximum  Flow  CFS	Time of Max Occurrence days hr:min	Maximum  Veloc  ft/sec	Max/ Full Flow	Max/ Full Depth
OUTLET-A1 OUTLET-A2 OUTLET-C2 OUTLET-D1 OUTLET-D2 OUTLET-D4a OUTLET-D4b	DUMMY DUMMY DUMMY DUMMY DUMMY DUMMY DUMMY DUMMY	3.32 1.80 3.40 4.49 4.58 0.98 0.38	3739 02:57 3739 03:01 1999 12:37 3739 02:48 3739 02:46 3739 03:07 1999 12:22			

No conduits were surcharged.

Analysis begun on: Thu Jul 8 15:59:10 2021 Analysis ended on: Thu Jul 8 16:00:02 2021

Total elapsed time: 00:00:52

## POC-1

PRE-PROJECT	-								
- 110020		Width					Weighted	Weighted	Weighted
		(Area/Flow		%		% "D"	Conductivity	Suction	Initial
DMA	Area (ac)	Length) (ft)	% Slope	Impervious	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:
DMA A1	2.80	453	2.0%	0%	0%	100%	0.025	9.000	0.300
DMA A2	1.16	1123	1.5%	0%	0%	100%	0.025	9.000	0.300

Total: 3.96

POST-PROJEC	POST-PROJECT											
		Width					Weighted	Weighted	Weighted			
		(Area/Flow	%			% "D"	Conductivity	Suction	Initial			
DMA	Area (ac)	Length) (ft)	Impervious	% Slope	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:			
DMA A1	2.42	1351	71%	6.0%	0%	100%	0.025	9.000	0.300			
DMA A2	1.35	700	54.1%	6.0%	0%	100%	0.025	9.000	0.300			

Total: 3.77

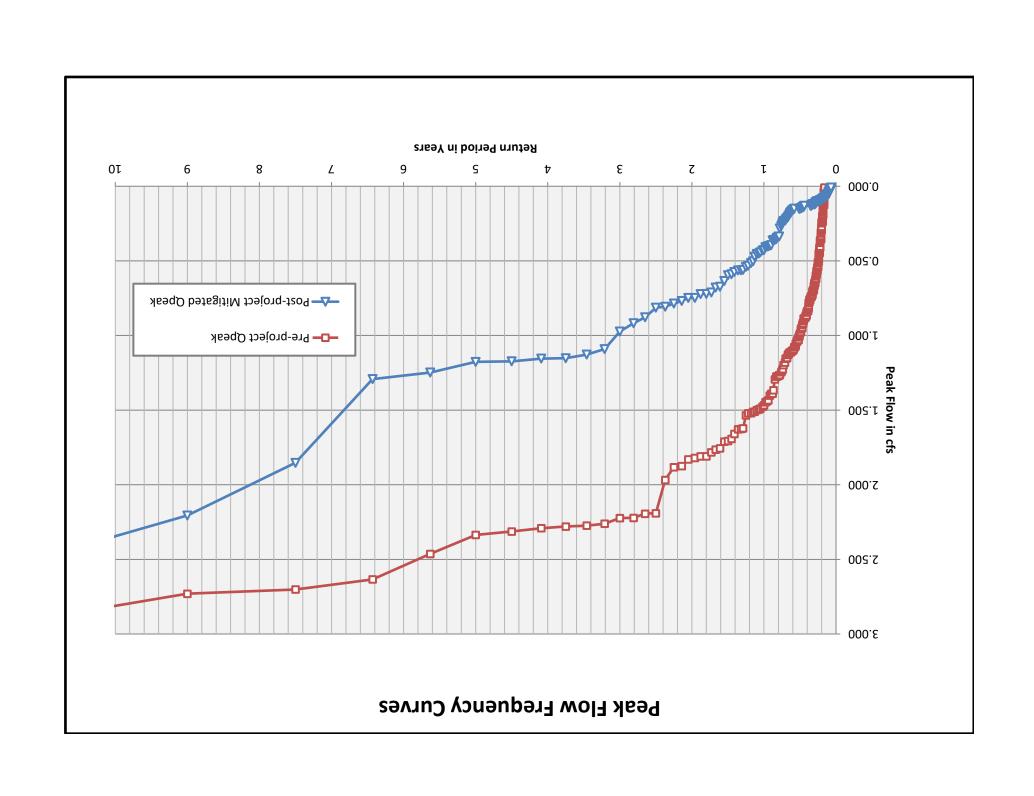
Conductivity:					
D:	0.025	in/hr			

Suction Head:					
D:	9	in			

Initial	Deficit
D:	0.30

# **Peak Flow Frequency Summary**

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.182	0.075
2-year	1.824	0.748
5-year	2.336	1.177
10-year	2.811	2.345



 Low-flow Threshold:
 10%

 0.1xQ2 (Pre):
 0.182
 cfs

 Q10 (Pre):
 2.811
 cfs

 Ordinate #:
 100

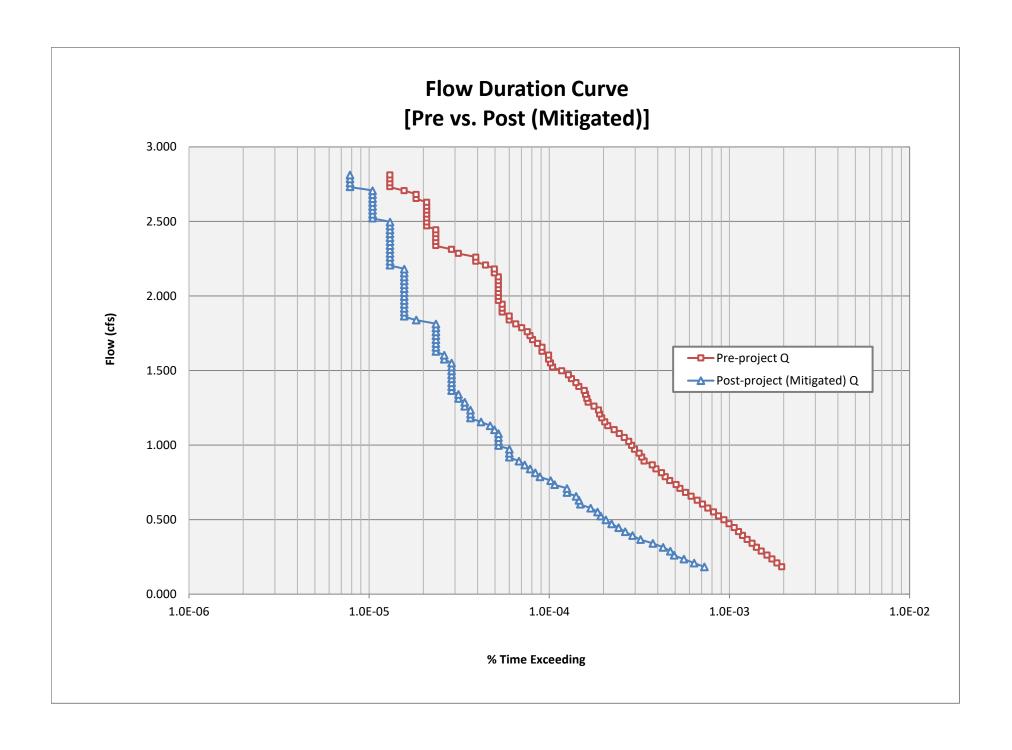
 Incremental O (Pre):
 0.02629
 cfs

Incremental Q (Pre): 0.02629 cfs
Total Hourly Data: 383127 hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.182	748	1.95E-03	278	7.26E-04	37%	Pass
1	0.209	704	1.84E-03	244	6.37E-04	35%	Pass
2	0.235	661	1.73E-03	214	5.59E-04	32%	Pass
3	0.261	620	1.62E-03	189	4.93E-04	30%	Pass
4	0.288	576	1.50E-03	180	4.70E-04	31%	Pass
5	0.314	542	1.41E-03	164	4.28E-04	30%	Pass
6	0.340	513	1.34E-03	144	3.76E-04	28%	Pass
7	0.366	481	1.26E-03	123	3.21E-04	26%	Pass
8	0.393	453	1.18E-03	111	2.90E-04	25%	Pass
9	0.419	431	1.12E-03	101	2.64E-04	23%	Pass
10	0.445	408	1.06E-03	93	2.43E-04	23%	Pass
11	0.472	382	9.97E-04	85	2.22E-04	22%	Pass
12	0.498	358	9.34E-04	79	2.06E-04	22%	Pass
13	0.524	334	8.72E-04	74	1.93E-04	22%	Pass
14	0.550	313	8.17E-04	71	1.85E-04	23%	Pass
15	0.577	291	7.60E-04	65	1.70E-04	22%	Pass
16	0.603	272	7.10E-04	57	1.49E-04	21%	Pass
17	0.629	254	6.63E-04	56	1.46E-04	22%	Pass
18	0.656	235	6.13E-04	54	1.41E-04	23%	Pass
19	0.682	219	5.72E-04	48	1.25E-04	22%	Pass
20	0.708	204	5.32E-04	48	1.25E-04	24%	Pass
21	0.735	194	5.06E-04	41	1.07E-04	21%	Pass
22	0.761	179	4.67E-04	39	1.02E-04	22%	Pass
23	0.787	169	4.41E-04	34	8.87E-05	20%	Pass
24	0.813	161	4.20E-04	32	8.35E-05	20%	Pass
25	0.840	150	3.92E-04	30	7.83E-05	20%	Pass
26	0.866	143	3.73E-04	28	7.31E-05	20%	Pass
27	0.892	129	3.37E-04	26	6.79E-05	20%	Pass
28	0.919	125	3.26E-04	23	6.00E-05	18%	Pass
29	0.945	121	3.16E-04	23	6.00E-05	19%	Pass
30	0.971	114	2.98E-04	23	6.00E-05	20%	Pass
31	0.997	110	2.87E-04	20	5.22E-05	18%	Pass
32	1.024	106	2.77E-04	20	5.22E-05	19%	Pass
33	1.050	100	2.61E-04	20	5.22E-05	20%	Pass
34	1.076	94	2.45E-04	20	5.22E-05	21%	Pass
35	1.103	88	2.30E-04	19	4.96E-05	22%	Pass
36	1.129	81	2.11E-04	18	4.70E-05	22%	Pass
37	1.155	78	2.04E-04	16	4.18E-05	21%	Pass
38	1.181	75	1.96E-04	14	3.65E-05	19%	Pass
39	1.208	73	1.91E-04	14	3.65E-05	19%	Pass
40	1.234	72	1.88E-04	14	3.65E-05	19%	Pass
41	1.260	68	1.77E-04	13	3.39E-05	19%	Pass
42	1.287	63	1.64E-04	13	3.39E-05	21%	Pass
43	1.313	62	1.62E-04	12	3.13E-05	19%	Pass
44	1.339	61	1.59E-04	12	3.13E-05	20%	Pass
45	1.365	60	1.57E-04	11	2.87E-05	18%	Pass
46	1.392	56	1.46E-04	11	2.87E-05	20%	Pass
47	1.418	54	1.41E-04	11	2.87E-05	20%	Pass
48	1.444	51	1.33E-04	11	2.87E-05	22%	Pass
49	1.471	49	1.28E-04	11	2.87E-05	22%	Pass
50	1.497	45	1.17E-04	11	2.87E-05	24%	Pass
51	1.523	40	1.04E-04	11	2.87E-05	28%	Pass
52	1.549	39	1.02E-04	11	2.87E-05	28%	Pass
53	1.576	38	9.92E-05	10	2.61E-05	26%	Pass
54	1.602	38	9.92E-05	10	2.61E-05	26%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
55	1.628	35	9.14E-05	9	2.35E-05	26%	Pass
56	1.655	35	9.14E-05	9	2.35E-05	26%	Pass
57	1.681	33	8.61E-05	9	2.35E-05	27%	Pass
58	1.707	31	8.09E-05	9	2.35E-05	29%	Pass
59	1.733	30	7.83E-05	9	2.35E-05	30%	Pass
60	1.760	29	7.57E-05	9	2.35E-05	31%	Pass
61	1.786	27	7.05E-05	9	2.35E-05	33%	Pass
62	1.812	25	6.53E-05	9	2.35E-05	36%	Pass
63	1.839	23	6.00E-05	7	1.83E-05	30%	Pass
64	1.865	23	6.00E-05	6	1.57E-05	26%	Pass
65	1.891	21	5.48E-05	6	1.57E-05	29%	Pass
66	1.918	21	5.48E-05	6	1.57E-05	29%	Pass
67	1.944	21	5.48E-05	6	1.57E-05	29%	Pass
68	1.970	20	5.22E-05	6	1.57E-05	30%	Pass
69	1.996	20	5.22E-05	6	1.57E-05	30%	Pass
70	2.023	20	5.22E-05	6	1.57E-05	30%	Pass
71	2.049	20	5.22E-05	6	1.57E-05	30%	Pass
72	2.075	20	5.22E-05	6	1.57E-05	30%	Pass
73	2.102	20	5.22E-05	6	1.57E-05	30%	Pass
74	2.128	20	5.22E-05	6	1.57E-05	30%	Pass
75	2.154	19	4.96E-05	6	1.57E-05	32%	Pass
76	2.180	19	4.96E-05	6	1.57E-05	32%	Pass
77	2.207	17	4.44E-05	5	1.31E-05	29%	Pass
78	2.233	15	3.92E-05	5	1.31E-05	33%	Pass
79	2.259	15	3.92E-05	5	1.31E-05	33%	Pass
80	2.286	12	3.13E-05	5	1.31E-05	42%	Pass
81	2.312	11	2.87E-05	5	1.31E-05	45%	Pass
82	2.338	9	2.35E-05	5	1.31E-05	56%	Pass
83	2.364	9	2.35E-05	5	1.31E-05	56%	Pass
84	2.391	9	2.35E-05	5	1.31E-05	56%	Pass
85	2.417	9	2.35E-05	5	1.31E-05	56%	Pass
86	2.443	9	2.35E-05	5	1.31E-05	56%	Pass
87	2.470	8	2.09E-05	5	1.31E-05	63%	Pass
88	2.496	8	2.09E-05	5	1.31E-05	63%	Pass
89	2.522	8	2.09E-05	4	1.04E-05	50%	Pass
90	2.548	8	2.09E-05	4	1.04E-05	50%	Pass
91	2.575	8	2.09E-05	4	1.04E-05	50%	Pass
92	2.601	8	2.09E-05	4	1.04E-05	50%	Pass
93	2.627	8	2.09E-05	4	1.04E-05	50%	Pass
94	2.654	7	1.83E-05	4	1.04E-05	57%	Pass
95	2.680	7	1.83E-05	4	1.04E-05	57%	Pass
96	2.706	6	1.57E-05	4	1.04E-05	67%	Pass
97	2.732	5	1.31E-05	3	7.83E-06	60%	Pass
98	2.759	5	1.31E-05	3	7.83E-06	60%	Pass
99	2.785	5	1.31E-05	3	7.83E-06	60%	Pass
100	2.811	5	1.31E-05	3	7.83E-06	60%	Pass



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## **Summary for Pond 17P: VAULT-A1**

Inflow 7.92 cfs @ 4.08 hrs, Volume= 0.349 af

6.19 cfs @ 4.11 hrs, Volume= 6.19 cfs @ 4.11 hrs, Volume= Outflow = 0.349 af, Atten= 22%, Lag= 1.8 min

Primary = 0.349 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.55' @ 4.11 hrs Surf.Area= 1,700 sf Storage= 9,428 cf

Plug-Flow detention time= 539.6 min calculated for 0.349 af (100% of inflow)

Center-of-Mass det. time= 539.6 min ( 751.1 - 211.5 )

Volume	Inv	ert Avail.Sto	rage Storage	Description				
#1	100.0	00' 9,6	39 cf Custom	Stage Data (Coni	c) Listed below (Re	ecalc)		
Elevation (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)			
100.0	00	1,700	0	0	1,700			
101.0		1,700	1,700	1,700	1,846			
102.0		1,700	1,700	3,400	1,992			
103.0		1,700	1,700	5,100	2,138			
104.0		1,700	1,700	6,800	2,285			
105.1		1,700	1,989	8,789	2,456			
105.6	67	1,700	850	9,639	2,529			
Device	Routing	Invert	Outlet Devices	S				
#1	Primary	100.00'	12.0" Round	Culvert				
			L= 10.0' RCF	P, groove end proje	ecting, Ke= 0.200			
Inlet / Outlet Invert= 100.00' / 99.90' S= 0.0100 '/' Cc= 0.900				Cc= 0.900				
			•	w Area= 0.79 sf				
#2	Device 1	100.00'			imited to weir flow	at low heads		
#3	Device 1	105.17'	Custom Weir, Cv= 2.62 (C= 3.28)					
			` ,	.00 0.50 0.50				
			Width (feet) 8	3.00 8.00 0.00				

## **Stage-Discharge for Pond 17P: VAULT-A1**

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
100.00	0.00	102.08	0.08	104.16	0.12
100.04	0.00	102.12	0.08	104.20	0.12
100.08	0.01	102.16	0.09	104.24	0.12
100.12	0.01	102.20	0.09	104.28	0.12
100.16	0.02	102.24	0.09	104.32	0.12
100.20 100.24	0.02 0.02	102.28 102.32	0.09 0.09	104.36 104.40	0.12 0.12
100.24	0.02	102.32	0.09	104.44	0.12
100.32	0.03	102.40	0.09	104.48	0.12
100.36	0.03	102.44	0.09	104.52	0.12
100.40	0.03	102.48	0.09	104.56	0.13
100.44	0.04	102.52	0.09	104.60	0.13
100.48 100.52	0.04 0.04	102.56 102.60	0.09 0.09	104.64	0.13 0.13
100.52	0.04	102.60	0.09	104.68 104.72	0.13
100.60	0.04	102.68	0.10	104.76	0.13
100.64	0.04	102.72	0.10	104.80	0.13
100.68	0.05	102.76	0.10	104.84	0.13
100.72	0.05	102.80	0.10	104.88	0.13
100.76	0.05	102.84	0.10	104.92	0.13
100.80 100.84	0.05 0.05	102.88 102.92	0.10 0.10	104.96 105.00	0.13 0.13
100.88	0.05	102.96	0.10	105.04	0.13
100.92	0.05	103.00	0.10	105.08	0.13
100.96	0.06	103.04	0.10	105.12	0.13
101.00	0.06	103.08	0.10	105.16	0.13
101.04	0.06	103.12	0.10	105.20	0.27
101.08 101.12	0.06 0.06	103.16 103.20	0.10 0.10	105.24 105.28	0.62 1.09
101.12	0.06	103.24	0.10	105.20	1.66
101.20	0.06	103.28	0.11	105.36	2.31
101.24	0.06	103.32	0.11	105.40	3.03
101.28	0.07	103.36	0.11	105.44	3.81
101.32	0.07	103.40	0.11	105.48	4.66
101.36 101.40	0.07 0.07	103.44 103.48	0.11 0.11	105.52 105.56	5.56 6.52
101.44	0.07	103.52	0.11	105.60	7.53
101.48	0.07	103.56	0.11	105.64	8.58
101.52	0.07	103.60	0.11		
101.56	0.07	103.64	0.11		
101.60	0.07	103.68	0.11		
101.64 101.68	0.07 0.08	103.72 103.76	0.11 0.11		
101.72	0.08	103.70	0.11		
101.76	0.08	103.84	0.11		
101.80	0.08	103.88	0.12		
101.84	0.08	103.92	0.12		
101.88	0.08 0.08	103.96	0.12		
101.92 101.96	0.08	104.00 104.04	0.12 0.12		
102.00	0.08	104.04	0.12		
102.04	0.08	104.12	0.12		

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## **Summary for Pond 5P: VAULT-A2**

Inflow 4.08 hrs, Volume= 3.13 cfs @ 0.135 af

4.08 hrs, Volume= 4.08 hrs, Volume= 0.135 af, Atten= 2%, Lag= 0.4 min Outflow = 3.06 cfs @

Primary = 3.06 cfs @ 0.135 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.46' @ 4.08 hrs Surf.Area= 500 sf Storage= 2,728 cf

Plug-Flow detention time= 353.2 min calculated for 0.135 af (100% of inflow)

Center-of-Mass det. time= 353.0 min ( 566.8 - 213.7 )

Volume	Inve	rt Avail.Sto	rage Storage	e Description				
#1	100.0	0' 2,83	35 cf Custon	n Stage Data (Coni	ic) Listed below (Re	calc)		
Elevation	on	Surf.Area	Inc.Store	Cum.Store	Wet.Area			
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)			
100.0	00	500	0	0	500			
101.0	00	500	500	500	579			
102.0	00	500	500	1,000	659			
103.0	00	500	500	1,500	738			
104.0	00	500	500	2,000	817			
105.1		500	585	2,585	910			
105.6	67	500	250	2,835	949			
Device	Routing	Invert	Outlet Device	es				
#1	Primary	100.00'	12.0" Round	d Culvert		_		
	L= 10.0' RCP, groove end projecting, Ke= 0.200							
			Inlet / Outlet	Invert= 100.00' / 99	9.90' S= 0.0100 '/'	Cc= 0.900		
			n= 0.013, Fl	ow Area= 0.79 sf				
#2	Device 1	100.00'			imited to weir flow a	at low heads		
#3	Device 1	105.17'	Custom Weir, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.50 0.50					
			Width (feet)	6.00 6.00 0.00				

## **Stage-Discharge for Pond 5P: VAULT-A2**

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
100.00	0.00	102.08	0.03	104.16	0.04
100.04	0.00	102.00	0.03	104.10	0.04
100.08	0.00	102.16	0.03	104.24	0.04
100.12	0.01	102.20	0.03	104.28	0.04
100.16	0.01	102.24	0.03	104.32	0.04
100.20	0.01	102.28	0.03	104.36	0.04
100.24	0.01	102.32	0.03	104.40	0.04
100.28	0.01	102.36	0.03	104.44	0.04
100.32	0.01	102.40	0.03	104.48	0.04
100.36 100.40	0.01 0.01	102.44 102.48	0.03 0.03	104.52 104.56	0.05 0.05
100.44	0.01	102.48	0.03	104.60	0.05
100.48	0.01	102.56	0.03	104.64	0.05
100.52	0.01	102.60	0.03	104.68	0.05
100.56	0.02	102.64	0.03	104.72	0.05
100.60	0.02	102.68	0.03	104.76	0.05
100.64	0.02	102.72	0.03	104.80	0.05
100.68	0.02	102.76	0.04	104.84	0.05
100.72	0.02	102.80	0.04	104.88	0.05
100.76 100.80	0.02 0.02	102.84 102.88	0.04 0.04	104.92 104.96	0.05 0.05
100.80	0.02	102.88	0.04	104.96	0.05
100.88	0.02	102.96	0.04	105.04	0.05
100.92	0.02	103.00	0.04	105.08	0.05
100.96	0.02	103.04	0.04	105.12	0.05
101.00	0.02	103.08	0.04	105.16	0.05
101.04	0.02	103.12	0.04	105.20	0.15
101.08	0.02	103.16	0.04	105.24	0.41
101.12	0.02	103.20	0.04	105.28	0.77
101.16 101.20	0.02 0.02	103.24 103.28	0.04 0.04	105.32 105.36	1.19 1.68
101.24	0.02	103.20	0.04	105.40	2.22
101.28	0.02	103.36	0.04	105.44	2.81
101.32	0.02	103.40	0.04	105.48	3.44
101.36	0.02	103.44	0.04	105.52	4.12
101.40	0.02	103.48	0.04	105.56	4.84
101.44	0.03	103.52	0.04	105.60	5.59
101.48	0.03	103.56	0.04	105.64	6.38
101.52 101.56	0.03 0.03	103.60 103.64	0.04		
101.60	0.03	103.64	0.04 0.04		
101.64	0.03	103.72	0.04		
101.68	0.03	103.76	0.04		
101.72	0.03	103.80	0.04		
101.76	0.03	103.84	0.04		
101.80	0.03	103.88	0.04		
101.84	0.03	103.92	0.04		
101.88 101.92	0.03 0.03	103.96 104.00	0.04 0.04		
101.92	0.03	104.00	0.04		
102.00	0.03	104.04	0.04		
102.04	0.03	104.12	0.04		

## **Vault Drawdown Calculation**

Vault-A1

Project Name Towne Centre View

 Project No
 3342
 Date
 9/29/2020

 Vault Drawdown
 hrs
 37.5

Note: Drawdown time is calculated assuming an initial water

surface depth equal to the invert of the lowest surface discharge opening in the vault outlet structur

Underdrain Orifice Diameter:	1.5	in		
C:	0.6			
Surface Depth (ft)	Volume (cf)	Qorifice (cfs)	ΔT (hr)	Total Time (hr)
5.17	8789.00	0.133	0.000	0.0
4	6800.00	0.117	4.419	4.4
3	5100.00	0.101	4.337	8.8
2	3400.00	0.082	5.171	13.9
1	1700.00	0.057	6.829	20.8
0	0.00	0.000	16.703	37.5

Average Discharge	0.082
Average Discharge	0.062

## **Vault Drawdown Calculation**

Vault-A2

Project Name Towne Centre View

 Project No
 3342
 Date
 9/29/2020

 Vault Drawdown
 hrs
 30.6

Note: Drawdown time is calculated assuming an initial water

surface depth equal to the invert of the lowest surface discharge opening in the vault outlet structur

Underdrain Orifice Diameter:	0.9	in		
C:	0.6			
Surface Depth (ft)	Volume (cf)	Qorifice (cfs)	ΔT (hr)	Total Time (hr)
5.17	2585.00	0.048	0.000	0.0
4	2000.00	0.042	3.610	3.6
3	1500.00	0.036	3.544	7.2
2	1000.00	0.029	4.225	11.4
1	500.00	0.020	5.579	17.0
0	0.00	0.000	13.646	30.6

Average Discharge	0.029
Average Discharge	0.023

POC-5

PRF-PROJECT	PRE-PROJECT								
1 11 11 11 11 11 11 11 11 11 11 11 11 1		Width					Weighted	Weighted	Weighted
		(Area/Flow		%		% "D"	Conductivity	Suction	Initial
DMA	Area (ac)	Length) (ft)	% Slope	Impervious	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:
DMA C2	2.51	502	13.0%	0%	0%	100%	0.025	9.000	0.300

Total: 2.51

POST-PROJECT									
		Width					Weighted	Weighted	Weighted
		(Area/Flow	%			% "D"	Conductivity	Suction	Initial
DMA	Area (ac)	Length) (ft)	Impervious	% Slope	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:
DMA C2	4.13	1475	51%	12.0%	0%	100%	0.025	9.000	0.300

Total: 4.13

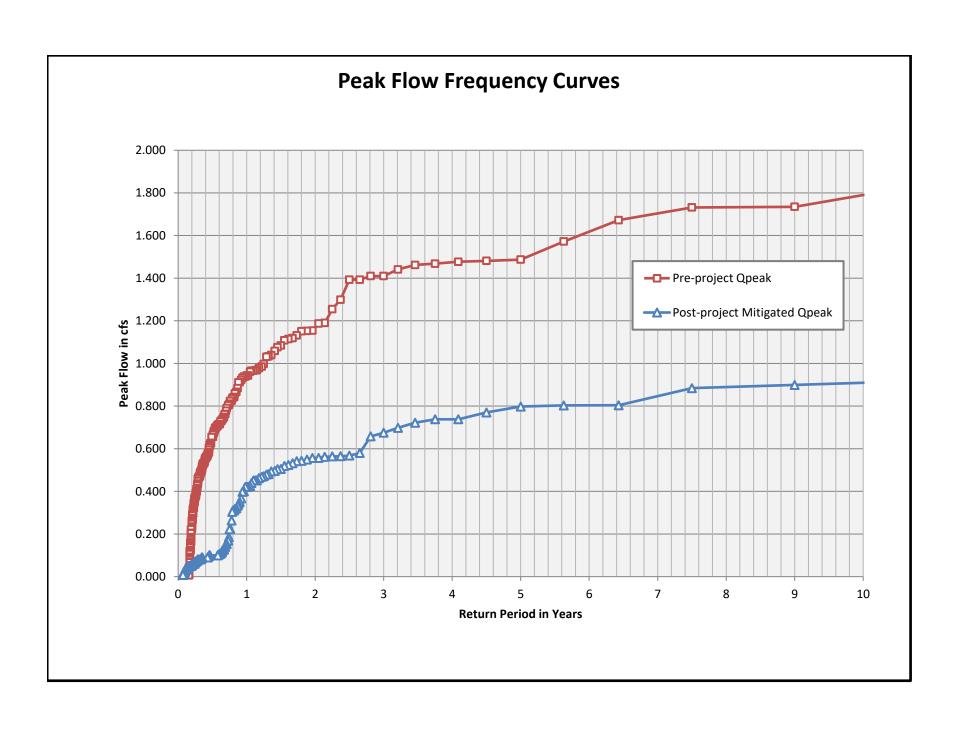
Conductivity:			
D:	0.025	in/hr	

9	Suction Head:	
D:	9	in

Initial Deficit				
D:	0.30			

# **Peak Flow Frequency Summary**

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)		
LF = 0.1xQ2	0.117	0.056		
2-year	1.169	0.557		
5-year	1.487	0.798		
10-year	1.790	0.909		



 Low-flow Threshold:
 10%

 0.1xQ2 (Pre):
 0.117
 cfs

 Q10 (Pre):
 1.790
 cfs

 Ordinate #:
 100

 Incremental Q (Pro):
 0.01673
 cfs

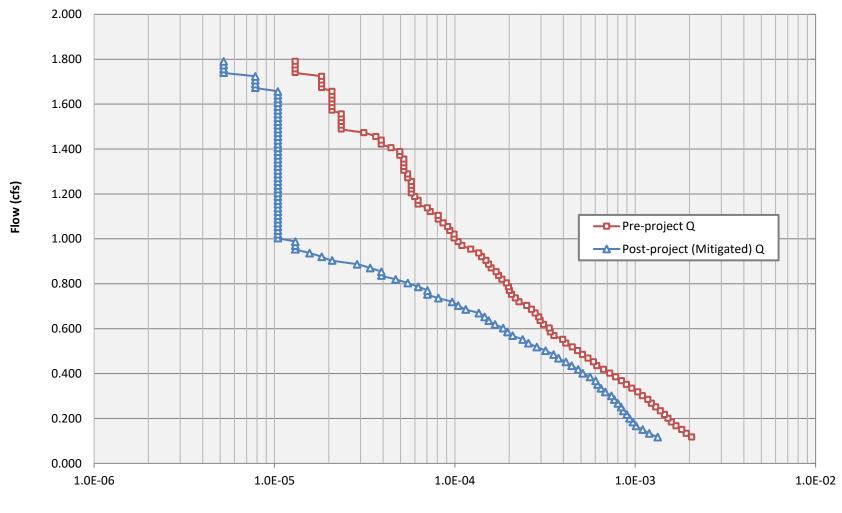
Incremental Q (Pre): 0.01673 cfs
Total Hourly Data: 383127 hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.117	788	2.06E-03	510	1.33E-03	65%	Pass
1	0.134	736	1.92E-03	458	1.20E-03	62%	Pass
2	0.150	695	1.81E-03	421	1.10E-03	61%	Pass
3	0.167	645	1.68E-03	387	1.01E-03	60%	Pass
4	0.184	608	1.59E-03	372	9.71E-04	61%	Pass
5	0.201	583	1.52E-03	356	9.29E-04	61%	Pass
6	0.217	557	1.45E-03	344	8.98E-04	62%	Pass
7	0.234	528	1.38E-03	329	8.59E-04	62%	Pass
8	0.251	498	1.30E-03	320	8.35E-04	64%	Pass
9	0.267	471	1.23E-03	307	8.01E-04	65%	Pass
10	0.284	451	1.18E-03	293	7.65E-04	65%	Pass
11	0.301	420	1.10E-03	283	7.39E-04	67%	Pass
12	0.318	396	1.03E-03	261	6.81E-04	66%	Pass
13	0.334	367	9.58E-04	247	6.45E-04	67%	Pass
14	0.351	343	8.95E-04	237	6.19E-04	69%	Pass
15	0.368	322	8.40E-04	231	6.03E-04	72%	Pass
16	0.385	299	7.80E-04	215	5.61E-04	72%	Pass
17	0.401	277	7.23E-04	196	5.12E-04	71%	Pass
18	0.418	256	6.68E-04	185	4.83E-04	72%	Pass
19	0.435	235	6.13E-04	170	4.44E-04	72%	Pass
20	0.452	225	5.87E-04	158	4.12E-04	70%	Pass
21	0.468	210	5.48E-04	144	3.76E-04	69%	Pass
22	0.485	196	5.12E-04	135	3.52E-04	69%	Pass
23	0.502	184	4.80E-04	122	3.18E-04	66%	Pass
24	0.518	172	4.49E-04	109	2.85E-04	63%	Pass
25	0.535	158	4.12E-04	98	2.56E-04	62%	Pass
26	0.552	152	3.97E-04	91	2.38E-04	60%	Pass
27	0.569	136	3.55E-04	80	2.09E-04	59%	Pass
28	0.585	130	3.39E-04	75	1.96E-04	58%	Pass
29	0.602	128	3.34E-04	71	1.85E-04	55%	Pass
30	0.619	119	3.11E-04	64	1.67E-04	54%	Pass
31	0.636	114	2.98E-04	59	1.54E-04	52%	Pass
32	0.652	112	2.92E-04	56	1.46E-04	50%	Pass
33	0.669	107	2.79E-04	52	1.36E-04	49%	Pass
34	0.686	102	2.66E-04	44	1.15E-04	43%	Pass
35	0.703	96	2.51E-04	40	1.04E-04	42%	Pass
36	0.719	87	2.27E-04	37	9.66E-05	43%	Pass
37	0.736	83	2.17E-04	31	8.09E-05	37%	Pass
38	0.753	79	2.06E-04	27	7.05E-05	34%	Pass
39	0.769	77	2.01E-04	27	7.05E-05	35%	Pass
40	0.786	76	1.98E-04	24	6.26E-05	32%	Pass
41	0.803	74	1.93E-04	21	5.48E-05	28%	Pass
42	0.820	70	1.83E-04	18	4.70E-05	26%	Pass
43	0.836	67	1.75E-04	15	3.92E-05	22%	Pass
44	0.853	65	1.70E-04	15	3.92E-05	23%	Pass
45	0.870	61	1.59E-04	13	3.39E-05	21%	Pass
46	0.887	59	1.54E-04	11	2.87E-05	19%	Pass
47	0.903	57	1.49E-04	8	2.09E-05	14%	Pass
48	0.920	54	1.41E-04	7	1.83E-05	13%	Pass
49	0.937	52	1.36E-04	6	1.57E-05	12%	Pass
50	0.953	47	1.23E-04	5	1.31E-05	11%	Pass
51	0.970	42	1.10E-04	5	1.31E-05	12%	Pass
52	0.987	40	1.04E-04	5	1.31E-05	13%	Pass
53	1.004	38	9.92E-05	4	1.04E-05	11%	Pass
54	1.020	38	9.92E-05	4	1.04E-05	11%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
55	1.037	36	9.40E-05	4	1.04E-05	11%	Pass
56	1.054	35	9.14E-05	4	1.04E-05	11%	Pass
57	1.071	33	8.61E-05	4	1.04E-05	12%	Pass
58	1.087	31	8.09E-05	4	1.04E-05	13%	Pass
59	1.104	31	8.09E-05	4	1.04E-05	13%	Pass
60	1.121	28	7.31E-05	4	1.04E-05	14%	Pass
61	1.138	27	7.05E-05	4	1.04E-05	15%	Pass
62	1.154	24	6.26E-05	4	1.04E-05	17%	Pass
63	1.171	24	6.26E-05	4	1.04E-05	17%	Pass
64	1.188	23	6.00E-05	4	1.04E-05	17%	Pass
65	1.204	22	5.74E-05	4	1.04E-05	18%	Pass
66	1.221	22	5.74E-05	4	1.04E-05	18%	Pass
67	1.238	22	5.74E-05	4	1.04E-05	18%	Pass
68	1.255	22	5.74E-05	4	1.04E-05	18%	Pass
69	1.271	21	5.48E-05	4	1.04E-05	19%	Pass
70	1.288	21	5.48E-05	4	1.04E-05	19%	Pass
71	1.305	20	5.22E-05	4	1.04E-05	20%	Pass
72	1.322	20	5.22E-05	4	1.04E-05	20%	Pass
73	1.338	20	5.22E-05	4	1.04E-05	20%	Pass
74	1.355	20	5.22E-05	4	1.04E-05	20%	Pass
75	1.372	19	4.96E-05	4	1.04E-05	21%	Pass
76	1.389	19	4.96E-05	4	1.04E-05	21%	Pass
77	1.405	17	4.44E-05	4	1.04E-05	24%	Pass
78	1.422	15	3.92E-05	4	1.04E-05	27%	Pass
79	1.439	15	3.92E-05	4	1.04E-05	27%	Pass
80	1.455	14	3.65E-05	4	1.04E-05	29%	Pass
81	1.472	12	3.13E-05	4	1.04E-05	33%	Pass
82	1.489	9	2.35E-05	4	1.04E-05	44%	Pass
83	1.506	9	2.35E-05	4	1.04E-05	44%	Pass
84	1.522	9	2.35E-05	4	1.04E-05	44%	Pass
85	1.539	9	2.35E-05	4	1.04E-05	44%	Pass
86	1.556	9	2.35E-05	4	1.04E-05	44%	Pass
87	1.573	8	2.09E-05	4	1.04E-05	50%	Pass
88	1.589	8	2.09E-05	4	1.04E-05	50%	Pass
89	1.606	8	2.09E-05	4	1.04E-05	50%	Pass
90	1.623	8	2.09E-05	4	1.04E-05	50%	Pass
91	1.640	8	2.09E-05	4	1.04E-05	50%	Pass
92	1.656	8	2.09E-05	4	1.04E-05	50%	Pass
93	1.673	7	1.83E-05	3	7.83E-06	43%	Pass
94	1.690	7	1.83E-05	3	7.83E-06	43%	Pass
95	1.706	7	1.83E-05	3	7.83E-06	43%	Pass
96	1.723	7	1.83E-05	3	7.83E-06	43%	Pass
97	1.740	5	1.31E-05	2	5.22E-06	40%	Pass
98	1.757	5	1.31E-05	2	5.22E-06	40%	Pass
99	1.773	5	1.31E-05	2	5.22E-06	40%	Pass
100	1.790	5	1.31E-05	2	5.22E-06	40%	Pass





% Time Exceeding

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#### **Summary for Pond 22P: VAULT-C2**

Inflow = 9.90 cfs @ 4.08 hrs, Volume= 0.432 af

Outflow = 0.77 cfs @ 4.52 hrs, Volume= 0.432 af, Atten= 92%, Lag= 26.7 min

Primary = 0.77 cfs @ 4.52 hrs, Volume= 0.432 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 107.10' @ 4.52 hrs Surf.Area= 2,000 sf Storage= 14,192 cf

Plug-Flow detention time= 661.1 min calculated for 0.432 af (100% of inflow) Center-of-Mass det. time= 661.5 min (873.5 - 212.0)

Volume	Invert	Avail.Sto	rage Storage l	Description		
#1	100.00	20,00	00 cf Custom	Stage Data (Conic	c) Listed below (Red	calc)
Elevatio (feet		urf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
100.0		2,000	0	0	2,000	
101.0		2,000	2,000	2,000	2,159	
102.0	0	2,000	2,000	4,000	2,317	
103.0	0	2,000	2,000	6,000	2,476	
104.0	0	2,000	2,000	8,000	2,634	
104.5	0	2,000	1,000	9,000	2,713	
105.0		2,000	1,000	10,000	2,793	
106.0		2,000	2,000	12,000	2,951	
107.0		2,000	2,000	14,000	3,110	
108.0		2,000	2,000	16,000	3,268	
109.0		2,000	2,000	18,000	3,427	
109.5	-	2,000	1,000	19,000	3,506	
110.0	0	2,000	1,000	20,000	3,585	
Device	Routing	Invert	Outlet Devices	3		
#1	Primary	100.00'	Inlet / Outlet In	, groove end proje	ecting, Ke= 0.200 90' S= 0.0100 '/'	Cc= 0.900
#2	Device 1	100.00'			mited to weir flow a	t low heads
#3	Device 1	104.50'	6.0" W x 2.0"		= 0.600	Clow Houdo
#4	Device 1	109.50'	Custom Weir, Head (feet) 0.	Cv= 2.62 (C= 3.28		

#### Stage-Discharge for Pond 22P: VAULT-C2

Elevation	Primary	Elevation	Primary
(feet)	(cfs)	(feet)	(cfs)
100.00	0.00	105.20	0.43
100.10 100.20	0.01 0.02	105.30 105.40	0.46 0.48
100.20	0.02	105.40	0.46
100.40	0.03	105.60	0.53
100.50	0.03	105.70	0.55
100.60	0.04	105.80	0.57
100.70	0.04	105.90	0.58
100.80	0.04	106.00	0.60
100.90	0.05	106.10	0.62
101.00 101.10	0.05 0.05	106.20 106.30	0.64 0.65
101.10	0.05	106.40	0.65
101.30	0.06	106.50	0.69
101.40	0.06	106.60	0.70
101.50	0.06	106.70	0.72
101.60	0.06	106.80	0.73
101.70	0.07	106.90	0.75
101.80 101.90	0.07	107.00	0.76
101.90	0.07 0.07	107.10 107.20	0.77 0.79
102.10	0.07	107.30	0.80
102.20	0.08	107.40	0.81
102.30	0.08	107.50	0.83
102.40	0.08	107.60	0.84
102.50	0.08	107.70	0.85
102.60 102.70	0.08 0.08	107.80 107.90	0.86 0.87
102.70	0.08	107.90	0.87
102.90	0.09	108.10	0.90
103.00	0.09	108.20	0.91
103.10	0.09	108.30	0.92
103.20	0.09	108.40	0.93
103.30	0.09	108.50	0.94
103.40 103.50	0.09 0.10	108.60 108.70	0.95 0.97
103.60	0.10	108.80	0.98
103.70	0.10	108.90	0.99
103.80	0.10	109.00	1.00
103.90	0.10	109.10	1.01
104.00	0.10	109.20	1.02
104.10	0.10	109.30	1.03
104.20 104.30	0.10 0.11	109.40 109.50	1.04 1.05
104.40	0.11	109.60	2.30
104.50	0.11	109.70	4.58
104.60	0.16	109.80	7.53
104.70	0.24	109.90	11.03
104.80	0.30	110.00	14.99
104.90	0.34		
105.00 105.10	0.37 0.40		
100.10	0.40		

#### **Vault Drawdown Calculation**

Vault-C2

Project Name Towne Centre View

 Project No
 3342
 Date
 9/29/2020

 Vault Drawdown
 hrs
 47.3

Note: Drawdown time is calculated assuming an initial water

surface depth equal to the invert of the lowest surface discharge opening in the vault outlet structur

Underdrain Orifice Diameter:	1.4	in		
C:	0.6			
Surface Depth (ft)	Volume (cf)	Qorifice (cfs)	ΔT (hr)	Total Time (hr)
4.5	9000.00	0.108	0.000	0.0
4	8000.00	0.102	2.646	2.6
3	6000.00	0.088	5.858	8.5
2	4000.00	0.071	6.984	15.5
1	2000.00	0.049	9.222	24.7
0	0.00	0.000	22.558	47.3

Average Discharge	0.070
Average Discharge	0.070

#### POC-6

PRE-PROJECT										
		Width					Weighted	Weighted	Weighted	
		(Area/Flow		%		% "D"	Conductivity	Suction	Initial	
DMA	Area (ac)	Length) (ft)	% Slope	Impervious	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:	
DMA D2	6.75	3304	1.0%	0%	0%	100%	0.025	9.000	0.300	

Total: 6.75

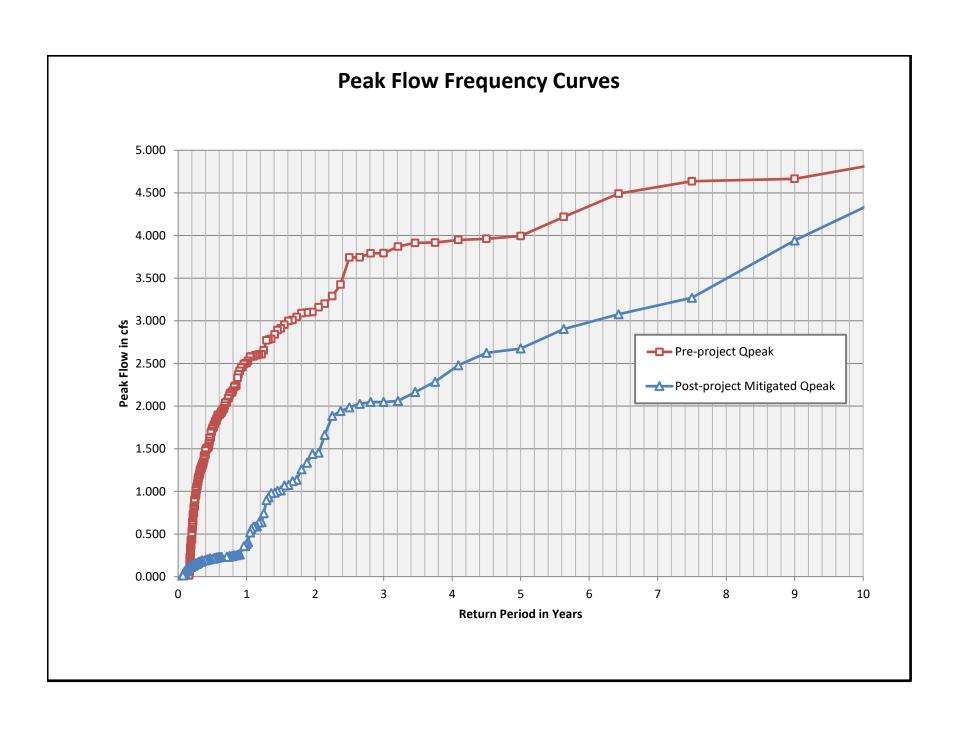
POST-PROJECT										
		Width					Weighted	Weighted	Weighted	
		(Area/Flow	%			% "D"	Conductivity	Suction	Initial	
DMA	Area (ac)	Length) (ft)	Impervious	% Slope	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:	
DMA D1	3.38	1583	48%	5.0%	0%	100%	0.025	9.000	0.300	
DMA D2	3.40	1559	60%	6.0%	0%	100%	0.025	9.000	0.300	

Total: 6.78

D:	0.025	in/hr	D:	9	in	D:	0.30
		•				1	4

# **Peak Flow Frequency Summary**

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.313	0.144
2-year	3.128	1.445
5-year	3.995	2.675
10-year	4.808	4.325



 Low-flow Threshold:
 10%

 0.1xQ2 (Pre):
 0.313
 cfs

 Q10 (Pre):
 4.808
 cfs

 Ordinate #:
 100

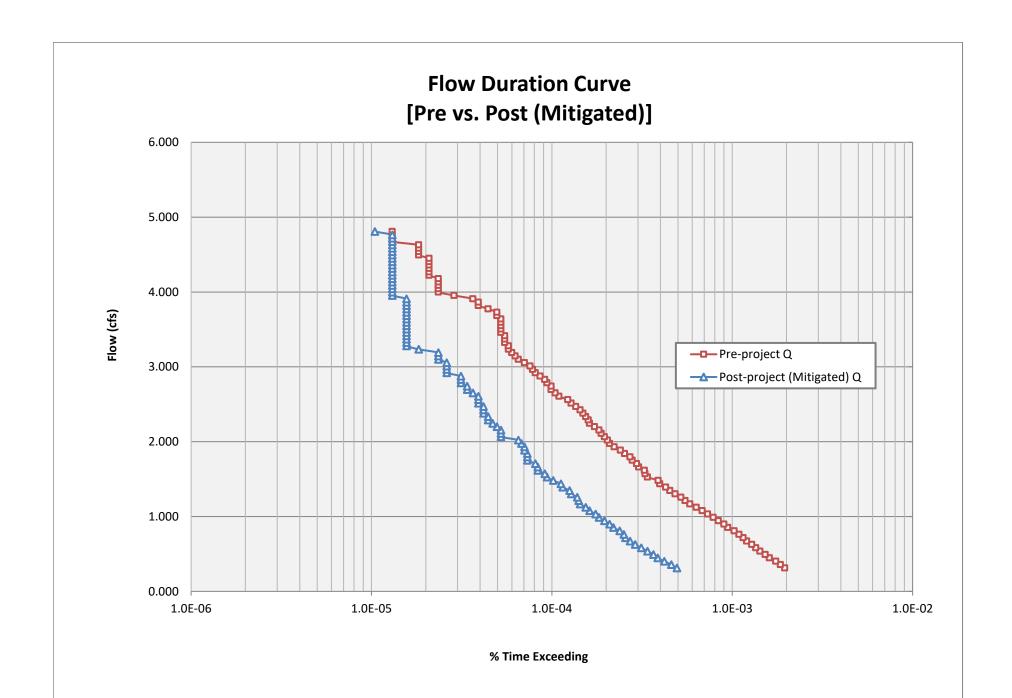
 Incremental Q (Pre):
 0.04495
 cfs

Total Hourly Data: 383127 hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.313	749	1.95E-03	189	4.93E-04	25%	Pass
1	0.358	709	1.85E-03	176	4.59E-04	25%	Pass
2	0.403	668	1.74E-03	161	4.20E-04	24%	Pass
3	0.448	616	1.61E-03	148	3.86E-04	24%	Pass
4	0.493	584	1.52E-03	140	3.65E-04	24%	Pass
5	0.538	546	1.43E-03	130	3.39E-04	24%	Pass
6	0.582	518	1.35E-03	120	3.13E-04	23%	Pass
7	0.627	492	1.28E-03	111	2.90E-04	23%	Pass
8	0.672	461	1.20E-03	104	2.71E-04	23%	Pass
9	0.717	441	1.15E-03	98	2.56E-04	22%	Pass
10	0.762	418	1.09E-03	96	2.51E-04	23%	Pass
11	0.807	393	1.03E-03	91	2.38E-04	23%	Pass
12	0.852	362	9.45E-04	84	2.19E-04	23%	Pass
13	0.897	345	9.00E-04	80	2.09E-04	23%	Pass
14	0.942	321	8.38E-04	75	1.96E-04	23%	Pass
15	0.987	301	7.86E-04	70	1.83E-04	23%	Pass
16	1.032	280	7.31E-04	67	1.75E-04	24%	Pass
17	1.077	261	6.81E-04	62	1.62E-04	24%	Pass
18	1.122	242	6.32E-04	59	1.54E-04	24%	Pass
19	1.167	223	5.82E-04	55	1.44E-04	25%	Pass
20	1.212	210	5.48E-04	54	1.41E-04	26%	Pass
21	1.257	199	5.19E-04	53	1.38E-04	27%	Pass
22	1.302	185	4.83E-04	49	1.28E-04	26%	Pass
23	1.347	173	4.52E-04	48	1.25E-04	28%	Pass
24	1.392	164	4.28E-04	44	1.15E-04	27%	Pass
25	1.437	152	3.97E-04	43	1.12E-04	28%	Pass
26	1.481	149	3.89E-04	39	1.02E-04	26%	Pass
27	1.526	130	3.39E-04	36	9.40E-05	28%	Pass
28	1.571	126	3.29E-04	35	9.14E-05	28%	Pass
29	1.616	125	3.26E-04	32	8.35E-05	26%	Pass
30	1.661	116	3.03E-04	32	8.35E-05	28%	Pass
31	1.706	113	2.95E-04	31	8.09E-05	27%	Pass
32	1.751	107	2.79E-04	28	7.31E-05	26%	Pass
33	1.796	104	2.71E-04	28	7.31E-05	27%	Pass
34	1.841	97	2.53E-04	28	7.31E-05	29%	Pass
35	1.886	92	2.40E-04	27	7.05E-05	29%	Pass
36	1.931	85	2.22E-04	27	7.05E-05	32%	Pass
37	1.976	80	2.09E-04	26	6.79E-05	33%	Pass
38	2.021	78	2.04E-04	25	6.53E-05	32%	Pass
39	2.066	75	1.96E-04	20	5.22E-05	27%	Pass
40	2.111	72	1.88E-04	20	5.22E-05	28%	Pass
41	2.156	70	1.83E-04	20	5.22E-05	29%	Pass
42	2.201	66	1.72E-04	19	4.96E-05	29%	Pass
43	2.246	62	1.62E-04	18	4.70E-05	29%	Pass
44	2.291	61	1.59E-04	17	4.44E-05	28%	Pass
45	2.335	59	1.54E-04	17	4.44E-05	29%	Pass
46	2.380	57	1.49E-04	16	4.18E-05	28%	Pass
47	2.425	55	1.44E-04	16	4.18E-05	29%	Pass
48	2.470	52	1.36E-04	16	4.18E-05	31%	Pass
49	2.515	49	1.28E-04	15	3.92E-05	31%	Pass
50	2.560	47	1.23E-04	15	3.92E-05	32%	Pass
51	2.605	42	1.10E-04	15	3.92E-05	36%	Pass
52	2.650	40	1.04E-04	14	3.65E-05	35%	Pass
53	2.695	38	9.92E-05	13	3.39E-05	34%	Pass
54	2.740	38	9.92E-05	13	3.39E-05	34%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
55	2.785	36	9.40E-05	12	3.13E-05	33%	Pass
56	2.830	35	9.14E-05	12	3.13E-05	34%	Pass
57	2.875	33	8.61E-05	12	3.13E-05	36%	Pass
58	2.920	31	8.09E-05	10	2.61E-05	32%	Pass
59	2.965	30	7.83E-05	10	2.61E-05	33%	Pass
60	3.010	29	7.57E-05	10	2.61E-05	34%	Pass
61	3.055	27	7.05E-05	10	2.61E-05	37%	Pass
62	3.100	25	6.53E-05	9	2.35E-05	36%	Pass
63	3.145	24	6.26E-05	9	2.35E-05	38%	Pass
64	3.190	23	6.00E-05	9	2.35E-05	39%	Pass
65	3.234	22	5.74E-05	7	1.83E-05	32%	Pass
66	3.279	22	5.74E-05	6	1.57E-05	27%	Pass
67	3.324	21	5.48E-05	6	1.57E-05	29%	Pass
68	3.369	21	5.48E-05	6	1.57E-05	29%	Pass
69	3.414	21	5.48E-05	6	1.57E-05	29%	Pass
70	3.459	20	5.22E-05	6	1.57E-05	30%	Pass
71	3.504	20	5.22E-05	6	1.57E-05	30%	Pass
72	3.549	20	5.22E-05	6	1.57E-05	30%	Pass
73	3.594	20	5.22E-05	6	1.57E-05	30%	Pass
74	3.639	20	5.22E-05	6	1.57E-05	30%	Pass
75	3.684	19	4.96E-05	6	1.57E-05	32%	Pass
76	3.729	19	4.96E-05	6	1.57E-05	32%	Pass
77	3.774	17	4.44E-05	6	1.57E-05	35%	Pass
78	3.819	15	3.92E-05	6	1.57E-05	40%	Pass
79	3.864	15	3.92E-05	6	1.57E-05	40%	Pass
80	3.909	14	3.65E-05	6	1.57E-05	43%	Pass
81	3.954	11	2.87E-05	5	1.31E-05	45%	Pass
82	3.999	9	2.35E-05	5	1.31E-05	56%	Pass
83	4.044	9	2.35E-05	5	1.31E-05	56%	Pass
84	4.088	9	2.35E-05	5	1.31E-05	56%	Pass
85	4.133	9	2.35E-05	5	1.31E-05	56%	Pass
86	4.178	9	2.35E-05	5	1.31E-05	56%	Pass
87	4.223	8	2.09E-05	5	1.31E-05	63%	Pass
88	4.268	8	2.09E-05	5	1.31E-05	63%	Pass
89	4.313	8	2.09E-05	5	1.31E-05	63%	Pass
90	4.358	8	2.09E-05	5	1.31E-05	63%	Pass
91	4.403	8	2.09E-05	5	1.31E-05	63%	Pass
92	4.448	8	2.09E-05	5	1.31E-05	63%	Pass
93	4.493	7	1.83E-05	5	1.31E-05	71%	Pass
94	4.538	7	1.83E-05	5	1.31E-05	71%	Pass
95	4.583	7	1.83E-05	5	1.31E-05	71%	Pass
96	4.628	7	1.83E-05	5	1.31E-05	71%	Pass
97	4.673	5	1.31E-05	5	1.31E-05	100%	Pass
98	4.718	5	1.31E-05	5	1.31E-05	100%	Pass
99	4.763	5	1.31E-05	5	1.31E-05	100%	Pass
100	4.808	5	1.31E-05	4	1.04E-05	80%	Pass



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## **Summary for Pond 23P: VAULT-D1**

Inflow 7.52 cfs @ 4.08 hrs, Volume= 0.328 af

4.14 hrs, Volume= 4.14 hrs, Volume= Outflow = 3.64 cfs @ 0.328 af, Atten= 52%, Lag= 3.7 min

3.64 cfs @ Primary = 0.328 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.39' @ 4.14 hrs Surf.Area= 1,800 sf Storage= 9,711 cf

Plug-Flow detention time= 628.4 min calculated for 0.328 af (100% of inflow)

Center-of-Mass det. time= 628.8 min ( 840.8 - 212.0 )

Volume	Inve	rt Avail.Sto	rage Storage	Description		
#1	100.0	0' 10,20	06 cf Custom	Stage Data (Coni	ic) Listed below (Re	calc)
Elevatio		Surf.Area	Inc.Store	Cum.Store	Wet.Area	
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)	
100.0		1,800	0	0	1,800	
101.0		1,800	1,800	1,800	1,950	
102.0		1,800	1,800	3,600	2,101	
103.0		1,800	1,800	5,400	2,251	
104.0	00	1,800	1,800	7,200	2,402	
105.0	00	1,800	1,800	9,000	2,552	
105.1	17	1,800	306	9,306	2,578	
105.6	67	1,800	900	10,206	2,653	
Device	Routing	Invert	Outlet Device	es		
#1	Primary	100.00'	12.0" Round	l Culvert		
	, <b>,</b>			P, groove end proje	ecting. Ke= 0.200	
					0.90' S= 0.0100 '/'	Cc= 0.900
				ow Area= 0.79 sf		
#2	Device 1	100.00'	•		imited to weir flow a	nt low heads
#3	Device 1	105.17'		r, Cv= 2.62 (C= 3.2		
				0.00 0.50 0.50		
			` ,	10.00 10.00 0.00		
			widin (leet)	10.00 10.00 0.00		

#### Stage-Discharge for Pond 23P: VAULT-D1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
100.00	0.00	102.08	0.08	104.16	0.12
100.04	0.00	102.12	0.08	104.20	0.12
100.08	0.01	102.16	0.09	104.24	0.12
100.12	0.01	102.20	0.09	104.28	0.12
100.16	0.02	102.24	0.09	104.32	0.12
100.20 100.24	0.02 0.02	102.28 102.32	0.09 0.09	104.36 104.40	0.12 0.12
100.24	0.02	102.32	0.09	104.44	0.12
100.32	0.03	102.40	0.09	104.48	0.12
100.36	0.03	102.44	0.09	104.52	0.12
100.40	0.03	102.48	0.09	104.56	0.13
100.44	0.04	102.52	0.09	104.60	0.13
100.48 100.52	0.04 0.04	102.56 102.60	0.09 0.09	104.64 104.68	0.13 0.13
100.52	0.04	102.60	0.09	104.00	0.13
100.60	0.04	102.68	0.10	104.76	0.13
100.64	0.04	102.72	0.10	104.80	0.13
100.68	0.05	102.76	0.10	104.84	0.13
100.72	0.05	102.80	0.10	104.88	0.13
100.76	0.05	102.84	0.10	104.92	0.13
100.80 100.84	0.05 0.05	102.88 102.92	0.10 0.10	104.96 105.00	0.13 0.13
100.88	0.05	102.92	0.10	105.04	0.13
100.92	0.05	103.00	0.10	105.08	0.13
100.96	0.06	103.04	0.10	105.12	0.13
101.00	0.06	103.08	0.10	105.16	0.13
101.04	0.06	103.12	0.10	105.20	0.30
101.08 101.12	0.06 0.06	103.16 103.20	0.10 0.10	105.24 105.28	0.74 1.33
101.12	0.06	103.20	0.10	105.26	2.04
101.20	0.06	103.28	0.11	105.36	2.85
101.24	0.06	103.32	0.11	105.40	3.75
101.28	0.07	103.36	0.11	105.44	4.73
101.32	0.07	103.40	0.11	105.48	5.79
101.36	0.07 0.07	103.44 103.48	0.11	105.52	6.92
101.40 101.44	0.07	103.46	0.11 0.11	105.56 105.60	8.11 9.37
101.48	0.07	103.56	0.11	105.64	10.69
101.52	0.07	103.60	0.11		
101.56	0.07	103.64	0.11		
101.60	0.07	103.68	0.11		
101.64	0.07	103.72	0.11		
101.68 101.72	0.08 0.08	103.76 103.80	0.11 0.11		
101.72	0.08	103.84	0.11		
101.80	0.08	103.88	0.12		
101.84	0.08	103.92	0.12		
101.88	0.08	103.96	0.12		
101.92	0.08	104.00	0.12		
101.96 102.00	0.08 0.08	104.04 104.08	0.12 0.12		
102.04	0.08	104.08	0.12		
-					

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## **Summary for Pond 9P: VAULT-D2**

Inflow = 9.34 cfs @ 4.08 hrs, Volume= 0.409 af

Outflow = 8.81 cfs @ 4.09 hrs, Volume= 0.409 af, Atten= 6%, Lag= 0.7 min

Primary = 8.81 cfs @ 4.09 hrs, Volume= 0.409 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.58' @ 4.09 hrs Surf.Area= 1,800 sf Storage= 10,047 cf

Plug-Flow detention time= 513.3 min calculated for 0.409 af (100% of inflow)

Center-of-Mass det. time= 513.2 min ( 725.3 - 212.1 )

Volume	Inver	t Avail.Sto	rage Storage	Description			
#1	100.00	)' 10,20	06 cf Custom	n Stage Data (Con	ic) Listed below (Re	ecalc)	
Elevatio		Surf.Area	Inc.Store	Cum.Store	Wet.Area		
(fee	t)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)		
100.0	0	1,800	0	0	1,800		
101.0	0	1,800	1,800	1,800	1,950		
102.0	0	1,800	1,800	3,600	2,101		
103.0	0	1,800	1,800	5,400	2,251		
104.0	0	1,800	1,800	7,200	2,402		
105.0	0	1,800	1,800	9,000	2,552		
105.1	7	1,800	306	9,306	2,578		
105.6	57	1,800	900	10,206	2,653		
Device	Routing	Invert	Outlet Device	es			
#1	Primary	100.00'	12.0" Round	d Culvert			
	,		L= 10.0' RC	P, groove end proj	jecting, Ke= 0.200		
					9.90' S= 0.0100 '/'	Cc= 0.900	
			n= 0.013, Flo	ow Area= 0.79 sf			
#2	Device 1	100.00'	1.5" Vert. Or	ifice C= 0.600 L	Limited to weir flow	at low heads	
#3	Device 1	105.17'	Custom Weir, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.50 0.50 Width (feet) 10.00 10.00 0.00				

#### Stage-Discharge for Pond 9P: VAULT-D2

Elevation (feet)	Primary	Elevation (feet)	Primary	Elevation (feet)	Primary
100.00	(cfs)	102.08	(cfs)	104.16	(cfs) 0.12
100.00	0.00 0.00	102.06	0.08 0.08	104.16	0.12
100.04	0.00	102.12	0.00	104.24	0.12
100.12	0.01	102.20	0.09	104.28	0.12
100.16	0.02	102.24	0.09	104.32	0.12
100.20	0.02	102.28	0.09	104.36	0.12
100.24	0.02	102.32	0.09	104.40	0.12
100.28	0.03	102.36	0.09	104.44	0.12
100.32	0.03	102.40	0.09	104.48	0.12
100.36	0.03	102.44	0.09	104.52	0.12
100.40	0.03	102.48	0.09	104.56	0.13
100.44	0.04	102.52	0.09	104.60	0.13
100.48	0.04	102.56	0.09	104.64	0.13
100.52	0.04	102.60	0.09	104.68	0.13
100.56 100.60	0.04 0.04	102.64 102.68	0.09 0.10	104.72 104.76	0.13 0.13
100.64	0.04	102.06	0.10	104.76	0.13
100.68	0.04	102.72	0.10	104.84	0.13
100.72	0.05	102.80	0.10	104.88	0.13
100.76	0.05	102.84	0.10	104.92	0.13
100.80	0.05	102.88	0.10	104.96	0.13
100.84	0.05	102.92	0.10	105.00	0.13
100.88	0.05	102.96	0.10	105.04	0.13
100.92	0.05	103.00	0.10	105.08	0.13
100.96	0.06	103.04	0.10	105.12	0.13
101.00	0.06	103.08	0.10	105.16	0.13
101.04	0.06	103.12	0.10	105.20	0.30
101.08 101.12	0.06 0.06	103.16 103.20	0.10 0.10	105.24 105.28	0.74 1.33
101.12	0.06	103.24	0.10	105.20	2.04
101.10	0.06	103.24	0.11	105.36	2.85
101.24	0.06	103.32	0.11	105.40	3.75
101.28	0.07	103.36	0.11	105.44	4.73
101.32	0.07	103.40	0.11	105.48	5.79
101.36	0.07	103.44	0.11	105.52	6.92
101.40	0.07	103.48	0.11	105.56	8.11
101.44	0.07	103.52	0.11	105.60	9.37
101.48	0.07	103.56	0.11	105.64	10.69
101.52	0.07	103.60	0.11		
101.56 101.60	0.07 0.07	103.64 103.68	0.11 0.11		
101.64	0.07	103.08	0.11		
101.68	0.07	103.72	0.11		
101.72	0.08	103.80	0.11		
101.76	0.08	103.84	0.11		
101.80	0.08	103.88	0.12		
101.84	0.08	103.92	0.12		
101.88	0.08	103.96	0.12		
101.92	0.08	104.00	0.12		
101.96	0.08	104.04	0.12		
102.00 102.04	0.08 0.08	104.08 104.12	0.12 0.12		
102.04	0.00	104.12	0.12		
		1		1	

#### **Vault Drawdown Calculation**

Vault-D1

Project Name Towne Centre View

 Project No
 3342
 Date
 9/29/2020

 Vault Drawdown
 hrs
 39.7

Note: Drawdown time is calculated assuming an initial water

surface depth equal to the invert of the lowest surface discharge opening in the vault outlet structur

Underdrain Orifice Diameter:	1.5	in		
C:	0.6			
Surface Depth (ft)	Volume (cf)	Qorifice (cfs)	ΔT (hr)	Total Time (hr)
5.17	9306.00	0.133	0.000	0.0
4	7200.00	0.117	4.679	4.7
3	5400.00	0.101	4.593	9.3
2	3600.00	0.082	5.476	14.7
1	1800.00	0.057	7.230	22.0
0	0.00	0.000	17.685	39.7

Average Discharge	0.082
riverage Bisenarge	0.002

#### **Vault Drawdown Calculation**

Vault-D2

Project Name Towne Centre View

 Project No
 3342
 Date
 9/29/2020

 Vault Drawdown
 hrs
 39.7

Note: Drawdown time is calculated assuming an initial water

surface depth equal to the invert of the lowest surface discharge opening in the vault outlet structur

Underdrain Orifice Diameter:	1.5	in		
C:	0.6			
Surface Depth (ft)	Volume (cf)	Qorifice (cfs)	ΔT (hr)	Total Time (hr)
5.17	9306.00	0.133	0.000	0.0
4	7200.00	0.117	4.679	4.7
3	5400.00	0.101	4.593	9.3
2	3600.00	0.082	5.476	14.7
1	1800.00	0.057	7.230	22.0
0	0.00	0.000	17.685	39.7

Average Discharge	0.082

POC-7

PRE-PROJECT	1								
		Width					Weighted	Weighted	Weighted
		(Area/Flow		%		% "D"	Conductivity	Suction	Initial
DMA	Area (ac)	Length) (ft)	% Slope	Impervious	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:
DMA D1	1.29	711	3.5%	0%	53%	47%	0.065	7.410	0.305

Total: 1.29

POST-PROJEC	CT .								
		Width					Weighted	Weighted	Weighted
		(Area/Flow	%			% "D"	Conductivity	Suction	Initial
DMA	Area (ac)	Length) (ft)	Impervious	% Slope	% "C" Soils	Soils	(in/hr):	Head (in):	Deficit:
DMA D4a	1.14	460	53%	5.0%	0%	100%	0.025	9.000	0.300
DMA D4b	0.45	280	64%	4.0%	0%	100%	0.025	9.000	0.300

Total: 1.59

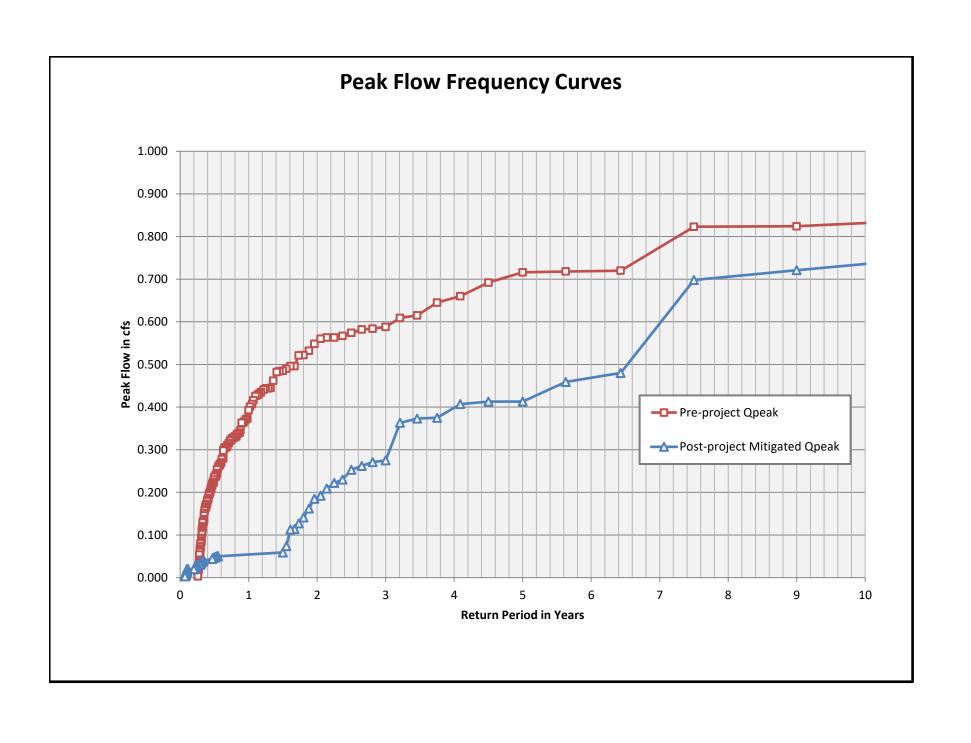
Conductivity:			
C:	0.1	in/hr	
D:	0.025	in/hr	

Suction Head:			
C:	6	in	
D:	9	in	

Initial Deficit		
C:	0.31	
D:	0.30	

# **Peak Flow Frequency Summary**

Return Period	Pre-project Qpeak (cfs)	Post-project - Mitigated Q (cfs)
LF = 0.1xQ2	0.055	0.019
2-year	0.553	0.188
5-year	0.716	0.413
10-year	0.832	0.736



 Low-flow Threshold:
 10%

 0.1xQ2 (Pre):
 0.055
 cfs

 Q10 (Pre):
 0.832
 cfs

 Ordinate #:
 100

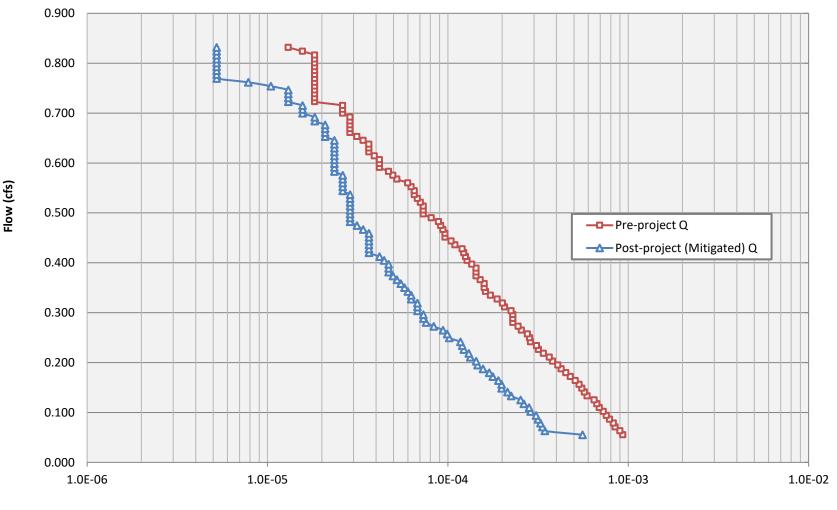
Incremental Q (Pre): 0.00776 cfs
Total Hourly Data: 383127 hours

The proposed BMP: PASSED

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
0	0.055	358	9.34E-04	214	5.59E-04	60%	Pass
1	0.063	345	9.00E-04	132	3.45E-04	38%	Pass
2	0.071	324	8.46E-04	128	3.34E-04	40%	Pass
3	0.079	317	8.27E-04	125	3.26E-04	39%	Pass
4	0.086	302	7.88E-04	121	3.16E-04	40%	Pass
5	0.094	290	7.57E-04	118	3.08E-04	41%	Pass
6	0.102	279	7.28E-04	110	2.87E-04	39%	Pass
7	0.110	265	6.92E-04	108	2.82E-04	41%	Pass
8	0.117	257	6.71E-04	101	2.64E-04	39%	Pass
9	0.125	248	6.47E-04	97	2.53E-04	39%	Pass
10	0.133	227	5.92E-04	86	2.24E-04	38%	Pass
11	0.141	219	5.72E-04	82	2.14E-04	37%	Pass
12	0.148	212	5.53E-04	76	1.98E-04	36%	Pass
13	0.156	205	5.35E-04	76	1.98E-04	37%	Pass
14	0.164	195	5.09E-04	73	1.91E-04	37%	Pass
15	0.172	183	4.78E-04	68	1.77E-04	37%	Pass
16	0.180	173	4.52E-04	65	1.70E-04	38%	Pass
17	0.187	163	4.25E-04	60	1.57E-04	37%	Pass
18	0.195	156	4.07E-04	56	1.46E-04	36%	Pass
19	0.203	146	3.81E-04	55	1.44E-04	38%	Pass
20	0.211	140	3.65E-04	51	1.33E-04	36%	Pass
21	0.218	130	3.39E-04	50	1.31E-04	38%	Pass
22	0.226	122	3.18E-04	47	1.23E-04	39%	Pass
23	0.234	119	3.11E-04	46	1.20E-04	39%	Pass
24	0.242	110	2.87E-04	45	1.17E-04	41%	Pass
25	0.249	109	2.85E-04	39	1.02E-04	36%	Pass
26	0.257	106	2.77E-04	38	9.92E-05	36%	Pass
27	0.265	98	2.56E-04	36	9.40E-05	37%	Pass
28	0.273	94	2.45E-04	32	8.35E-05	34%	Pass
29	0.280	88	2.30E-04	29	7.57E-05	33%	Pass
30	0.288	88	2.30E-04	28	7.31E-05	32%	Pass
31	0.296	88	2.30E-04	28	7.31E-05	32%	Pass
32	0.304	86	2.24E-04	26	6.79E-05	30%	Pass
33	0.311	79	2.06E-04	26	6.79E-05	33%	Pass
34	0.319	77	2.01E-04	26	6.79E-05	34%	Pass
35	0.327	72	1.88E-04	24	6.26E-05	33%	Pass
36	0.335	66	1.72E-04	24	6.26E-05	36%	Pass
37	0.343	62	1.62E-04	23	6.00E-05	37%	Pass
38	0.350	61	1.59E-04	22	5.74E-05	36%	Pass
39	0.358	61	1.59E-04	21	5.48E-05	34%	Pass
40	0.366	58	1.51E-04	20	5.22E-05	34%	Pass
41	0.374	55	1.44E-04	19	4.96E-05	35%	Pass
42	0.381	55	1.44E-04	18	4.70E-05	33%	Pass
43	0.389	55	1.44E-04	18	4.70E-05	33%	Pass
44	0.397	52	1.36E-04	18	4.70E-05	35%	Pass
45	0.405	49	1.28E-04	17	4.44E-05	35%	Pass
46	0.412	48	1.25E-04	16	4.18E-05	33%	Pass
47	0.420	47	1.23E-04	14	3.65E-05	30%	Pass
48	0.428	46	1.20E-04	14	3.65E-05	30%	Pass
49	0.436	42	1.10E-04	14	3.65E-05	33%	Pass
50	0.443	40	1.04E-04	14	3.65E-05	35%	Pass
51	0.451	37	9.66E-05	14	3.65E-05	38%	Pass
52	0.459	37	9.66E-05	14	3.65E-05	38%	Pass
53	0.467	36	9.40E-05	13	3.39E-05	36%	Pass
54	0.474	35	9.14E-05	12	3.13E-05	34%	Pass

Interval	Pre-project Flow (cfs)	Pre-project Hours	Pre-project % Time Exceeding	Post-project Hours	Post-project % Time Exceeding	Percentage	Pass/Fail
55	0.482	34	8.87E-05	11	2.87E-05	32%	Pass
56	0.490	31	8.09E-05	11	2.87E-05	35%	Pass
57	0.498	28	7.31E-05	11	2.87E-05	39%	Pass
58	0.506	28	7.31E-05	11	2.87E-05	39%	Pass
59	0.513	28	7.31E-05	11	2.87E-05	39%	Pass
60	0.521	27	7.05E-05	11	2.87E-05	41%	Pass
61	0.529	26	6.79E-05	11	2.87E-05	42%	Pass
62	0.537	25	6.53E-05	11	2.87E-05	44%	Pass
63	0.544	25	6.53E-05	10	2.61E-05	40%	Pass
64	0.552	24	6.26E-05	10	2.61E-05	42%	Pass
65	0.560	23	6.00E-05	10	2.61E-05	43%	Pass
66	0.568	20	5.22E-05	10	2.61E-05	50%	Pass
67	0.575	19	4.96E-05	10	2.61E-05	53%	Pass
68	0.583	18	4.70E-05	9	2.35E-05	50%	Pass
69	0.591	16	4.18E-05	9	2.35E-05	56%	Pass
70	0.599	16	4.18E-05	9	2.35E-05	56%	Pass
71	0.606	16	4.18E-05	9	2.35E-05	56%	Pass
72	0.614	15	3.92E-05	9	2.35E-05	60%	Pass
73	0.622	14	3.65E-05	9	2.35E-05	64%	Pass
74	0.630	14	3.65E-05	9	2.35E-05	64%	Pass
75	0.638	14	3.65E-05	9	2.35E-05	64%	Pass
76	0.645	13	3.39E-05	9	2.35E-05	69%	Pass
77	0.653	12	3.13E-05	8	2.09E-05	67%	Pass
78	0.661	11	2.87E-05	8	2.09E-05	73%	Pass
79	0.669	11	2.87E-05	8	2.09E-05	73%	Pass
80	0.676	11	2.87E-05	8	2.09E-05	73%	Pass
81	0.684	11	2.87E-05	7	1.83E-05	64%	Pass
82	0.692	11	2.87E-05	7	1.83E-05	64%	Pass
83	0.700	10	2.61E-05	6	1.57E-05	60%	Pass
84	0.707	10	2.61E-05	6	1.57E-05	60%	Pass
85	0.715	10	2.61E-05	6	1.57E-05	60%	Pass
86	0.723	7	1.83E-05	5	1.31E-05	71%	Pass
87	0.731	7	1.83E-05	5	1.31E-05	71%	Pass
88	0.738	7	1.83E-05	5	1.31E-05	71%	Pass
89	0.746	7	1.83E-05	5	1.31E-05	71%	Pass
90	0.754	7	1.83E-05	4	1.04E-05	57%	Pass
91	0.762	7	1.83E-05	3	7.83E-06	43%	Pass
92	0.769	7	1.83E-05	2	5.22E-06	29%	Pass
93	0.777	7	1.83E-05	2	5.22E-06	29%	Pass
94	0.785	7	1.83E-05	2	5.22E-06	29%	Pass
95	0.793	7	1.83E-05	2	5.22E-06	29%	Pass
96	0.801	7	1.83E-05	2	5.22E-06	29%	Pass
97	0.808	7	1.83E-05	2	5.22E-06	29%	Pass
98	0.816	7	1.83E-05	2	5.22E-06	29%	Pass
99	0.824	6	1.57E-05	2	5.22E-06	33%	Pass
100	0.832	5	1.31E-05	2	5.22E-06	40%	Pass





% Time Exceeding

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## **Summary for Pond 18P: VAULT-D4a**

Inflow 2.84 cfs @ 4.08 hrs, Volume= 0.122 af

0.26 cfs @ 4.45 hrs, Volume= 0.26 cfs @ 4.45 hrs, Volume= Outflow = 0.122 af, Atten= 91%, Lag= 22.2 min

Primary = 0.122 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 104.17' @ 4.45 hrs Surf.Area= 1,000 sf Storage= 4,171 cf

Plug-Flow detention time= 1,152.2 min calculated for 0.122 af (100% of inflow)

Center-of-Mass det. time= 1,152.6 min ( 1,364.9 - 212.3 )

Volume	Inv	ert Avail.Sto	rage Storage	Description		
#1	100.0	00' 5,6	70 cf Custom	Stage Data (Coni	c) Listed below (Re	ecalc)
Elevatio		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
100.0		1,000	0	0	1,000	
101.0		1,000	1,000	1,000	1,112	
102.0	00	1,000	1,000	2,000	1,224	
103.0	00	1,000	1,000	3,000	1,336	
104.0	00	1,000	1,000	4,000	1,448	
105.0		1,000	1,000	5,000	1,560	
105.1		1,000	170	5,170	1,580	
105.6	67	1,000	500	5,670	1,636	
Device	Routing	Invert	Outlet Device	S		
#1	Primary	100.00'	12.0" Round			
				P, groove end proje		
					.90' S= 0.0100 '/'	Cc= 0.900
			,	w Area= 0.79 sf		
#2	Device 1				imited to weir flow	at low heads
#3	Device 1	104.00'		" H Vert. Orifice		
#1	Dovine 1	105 47		ir flow at low heads		
#4	Device 1	l 105.17'		; Cv= 2.62 (C= 3.2	0)	
			` ,	0.00 0.50 0.50 5.00 5.00 0.00		
			vvidili (ieet)	3.00 3.00 0.00		

#### Stage-Discharge for Pond 18P: VAULT-D4a

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
100.00	0.00	102.08	0.02	104.16	0.24
100.04	0.00	102.12	0.02	104.10	0.32
100.08	0.00	102.12	0.02	104.24	0.41
100.12	0.00	102.10	0.02	104.28	0.49
100.16	0.01	102.24	0.02	104.32	0.56
100.20	0.01	102.28	0.03	104.36	0.61
100.24	0.01	102.32	0.03	104.40	0.66
100.28	0.01	102.36	0.03	104.44	0.71
100.32	0.01	102.40	0.03	104.48	0.75
100.36	0.01	102.44	0.03	104.52	0.79
100.40	0.01	102.48	0.03	104.56	0.83
100.44	0.01	102.52	0.03	104.60	0.86
100.48	0.01	102.56	0.03	104.64	0.90
100.52	0.01	102.60	0.03	104.68	0.93
100.56	0.01	102.64	0.03	104.72	0.96
100.60	0.01	102.68	0.03	104.76	0.99
100.64	0.01	102.72	0.03	104.80	1.02
100.68	0.01	102.76	0.03	104.84	1.05
100.72	0.01	102.80	0.03	104.88	1.08
100.76 100.80	0.01 0.01	102.84 102.88	0.03 0.03	104.92 104.96	1.11 1.14
100.80	0.01	102.88	0.03	104.90	1.14
100.88	0.02	102.92	0.03	105.04	1.10
100.92	0.02	103.00	0.03	105.04	1.13
100.96	0.02	103.04	0.03	105.12	1.24
101.00	0.02	103.08	0.03	105.16	1.26
101.04	0.02	103.12	0.03	105.20	1.37
101.08	0.02	103.16	0.03	105.24	1.61
101.12	0.02	103.20	0.03	105.28	1.93
101.16	0.02	103.24	0.03	105.32	2.31
101.20	0.02	103.28	0.03	105.36	2.73
101.24	0.02	103.32	0.03	105.40	3.20
101.28	0.02	103.36	0.03	105.44	3.72
101.32	0.02	103.40	0.03	105.48	4.27
101.36	0.02	103.44	0.03	105.52	4.85
101.40	0.02	103.48	0.03	105.56	5.47
101.44 101.48	0.02 0.02	103.52 103.56	0.03 0.03	105.60 105.64	6.12 <b>6.80</b>
101.46	0.02	103.60	0.03	105.04	0.00
101.52	0.02	103.64	0.03		
101.60	0.02	103.68	0.03		
101.64	0.02	103.72	0.03		
101.68	0.02	103.76	0.03		
101.72	0.02	103.80	0.03		
101.76	0.02	103.84	0.03		
101.80	0.02	103.88	0.03		
101.84	0.02	103.92	0.03		
101.88	0.02	103.96	0.03		
101.92	0.02	104.00	0.03		
101.96	0.02	104.04	0.06		
102.00	0.02	104.08	0.11		
102.04	0.02	104.12	0.17		

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## **Summary for Pond 24P: VAULT-D4b**

Inflow = 1.34 cfs @ 4.08 hrs, Volume= 0.060 af

Outflow = 0.10 cfs @ 5.50 hrs, Volume= 0.060 af, Atten= 93%, Lag= 85.3 min

Primary = 0.10 cfs @ 5.50 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.20' @ 5.50 hrs Surf.Area= 400 sf Storage= 2,081 cf

Plug-Flow detention time= 731.9 min calculated for 0.060 af (100% of inflow)

Center-of-Mass det. time= 732.1 min ( 946.1 - 214.0 )

Volume	Inve	ert Avail.Sto	rage Storage	Description		
#1	100.0	0' 2,26	68 cf Custom	n Stage Data (Coni	ic) Listed below (Re	ecalc)
Elevatio		Surf.Area	Inc.Store	Cum.Store	Wet.Area	
(fee	,	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)	
100.0		400	0	0	400	
101.0	0	400	400	400	471	
102.0	0	400	400	800	542	
103.0	0	400	400	1,200	613	
104.0	0	400	400	1,600	684	
105.1	7	400	468	2,068	767	
105.6	7	400	200	2,268	802	
Device	Routing	Invert	Outlet Device	es		
#1	Primary	100.00'	12.0" Round	d Culvert		
	,			P, groove end proj	ecting. Ke= 0.200	
					9.90' S= 0.0100 '/'	Cc= 0.900
				ow Area= 0.79 sf		
#2	Device 1	100.00'	•		imited to weir flow	at low heads
#3	Device 1	105.17'		r, Cv= 2.62 (C= 3.2		
				0.00 0.50 0.50	,	
			, ,	3.00 3.00 0.00		

#### Stage-Discharge for Pond 24P: VAULT-D4b

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
100.00	0.00	102.08	0.02	104.16	0.03
100.04	0.00	102.12	0.02	104.20	0.03
100.08	0.00	102.16	0.02	104.24	0.03
100.12	0.00	102.10	0.02	104.28	0.03
100.16	0.00	102.24	0.02	104.32	0.03
100.20	0.01	102.28	0.02	104.36	0.03
100.24	0.01	102.32	0.02	104.40	0.03
100.28	0.01	102.36	0.02	104.44	0.03
100.32	0.01	102.40	0.02	104.48	0.03
100.36	0.01	102.44	0.02	104.52	0.03
100.40	0.01	102.48	0.02	104.56	0.03
100.44	0.01	102.52	0.02	104.60	0.03
100.48	0.01	102.56	0.02	104.64	0.03
100.52	0.01	102.60	0.02	104.68	0.03
100.56	0.01	102.64	0.02	104.72	0.03
100.60	0.01	102.68	0.02	104.76	0.03
100.64	0.01	102.72	0.02	104.80	0.03
100.68	0.01	102.76	0.02	104.84	0.03
100.72	0.01	102.80	0.02	104.88	0.03
100.76	0.01	102.84	0.02	104.92	0.03
100.80	0.01	102.88	0.02	104.96	0.03
100.84 100.88	0.01 0.01	102.92 102.96	0.02 0.02	105.00 105.04	0.03 0.03
100.88	0.01	102.90	0.02	105.04	0.03
100.92	0.01	103.04	0.02	105.00	0.03
101.00	0.01	103.04	0.02	105.12	0.03
101.04	0.01	103.12	0.02	105.10	0.08
101.08	0.01	103.16	0.02	105.24	0.21
101.12	0.01	103.20	0.02	105.28	0.39
101.16	0.01	103.24	0.02	105.32	0.60
101.20	0.01	103.28	0.02	105.36	0.84
101.24	0.01	103.32	0.02	105.40	1.11
101.28	0.01	103.36	0.02	105.44	1.41
101.32	0.01	103.40	0.02	105.48	1.73
101.36	0.01	103.44	0.02	105.52	2.06
101.40	0.02	103.48	0.02	105.56	2.42
101.44	0.02	103.52	0.02	105.60	2.80
101.48	0.02	103.56	0.02	105.64	3.20
101.52	0.02	103.60	0.02		
101.56	0.02	103.64	0.02		
101.60	0.02	103.68 103.72	0.02		
101.64 101.68	0.02 0.02	103.72	0.02 0.02		
101.00	0.02	103.76	0.02		
101.72	0.02	103.84	0.02		
101.80	0.02	103.88	0.03		
101.84	0.02	103.92	0.03		
101.88	0.02	103.96	0.03		
101.92	0.02	104.00	0.03		
101.96	0.02	104.04	0.03		
102.00	0.02	104.08	0.03		
102.04	0.02	104.12	0.03		

#### **Vault Drawdown Calculation**

Vault-D4a

Project Name

Towne Centre View

 Project No
 3342
 Date
 9/29/2020

 Vault Drawdown
 hrs
 68.3

Note: Drawdown time is calculated assuming an initial water

surface depth equal to the invert of the lowest surface discharge opening in the vault outlet structur

Underdrain Orifice Diameter:	0.8	in		
C:	0.6			
Surface Depth (ft)	Volume (cf)	Qorifice (cfs)	ΔT (hr)	Total Time (hr)
4	4000.00	0.033	0.000	0.0
3	3000.00	0.029	8.970	9.0
2	2000.00	0.023	10.695	19.7
1	1000.00	0.016	14.122	33.8
0	0.00	0.000	34.541	68.3

Average Discharge	0.020
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#### **Vault Drawdown Calculation**

Vault-D4b

Project Name

Towne Centre View

 Project No
 3342
 Date
 9/29/2020

 Vault Drawdown
 hrs
 40.5

Note: Drawdown time is calculated assuming an initial water

surface depth equal to the invert of the lowest surface discharge opening in the vault outlet structur

Underdrain Orifice Diameter:	0.7	in		
C:	0.6			
Surface Depth (ft)	Volume (cf)	Qorifice (cfs)	ΔT (hr)	Total Time (hr)
5.17	2068.00	0.029	0.000	0.0
4	1600.00	0.025	4.774	4.8
3	1200.00	0.022	4.686	9.5
2	800.00	0.018	5.587	15.0
1	400.00	0.012	7.378	22.4
0	0.00	0.000	18.046	40.5

Average Discharge	0.018
Average Discharge	0.016



#### MAP LEGEND MAP INFORMATION The soil surveys that comprise your AOI were mapped at Area of Interest (AOI) С 1:24.000. Area of Interest (AOI) C/D Soils Warning: Soil Map may not be valid at this scale. D Soil Rating Polygons Enlargement of maps beyond the scale of mapping can cause Not rated or not available Α misunderstanding of the detail of mapping and accuracy of soil **Water Features** line placement. The maps do not show the small areas of A/D contrasting soils that could have been shown at a more detailed Streams and Canals Transportation B/D Rails ---Please rely on the bar scale on each map sheet for map measurements. Interstate Highways C/D Source of Map: Natural Resources Conservation Service **US Routes** Web Soil Survey URL: D Major Roads Coordinate System: Web Mercator (EPSG:3857) Not rated or not available -Local Roads Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts Soil Rating Lines Background distance and area. A projection that preserves area, such as the Aerial Photography Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required. This product is generated from the USDA-NRCS certified data as of the version date(s) listed below. Soil Survey Area: San Diego County Area, California Survey Area Data: Version 15, May 27, 2020 Soil map units are labeled (as space allows) for map scales 1:50.000 or larger. Not rated or not available Date(s) aerial images were photographed: Aug 22, 2018—Aug 31, 2018 **Soil Rating Points** The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background A/D imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident. B/D

# **Hydrologic Soil Group**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI						
AtF	Altamont clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	С	10.2	27.3%						
CfB	Chesterton fine sandy loam, 2 to 5 percent slopes	D	0.8	2.1%						
CfC	Chesterton fine sandy loam, 5 to 9 percent slopes	D	23.6	62.9%						
TeF	Terrace escarpments		2.9	7.7%						
Totals for Area of Inter	est		37.5	100.0%						

#### **Description**

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

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

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

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

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

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

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

#### **Rating Options**

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

# Appendix G: Guidance for Continuous Simulation and Hydromodification Sizing Factors

• Temperatures: Daily evaporation rates can be computed based on daily air temperature time series data using the Hargreaves method

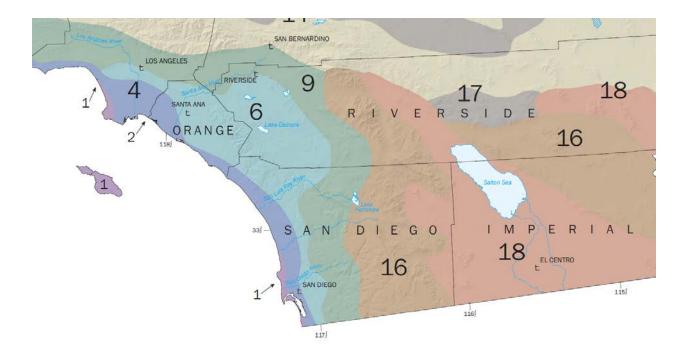


Figure G.1-2 : California Irrigation Management Information System "Reference Evapotranspiration Zones"



#### Appendix G: Guidance for Continuous Simulation and Hydromodification Sizing Factors

Table G.1-1: Monthly Average Reference Evapotranspiration by ETo Zone (inches/month and inches/day) for use in SWMM Models for Hydromodification Management Studies in San Diego County CIMIS Zones 1, 4, 6, 9, and 16 (See CIMIS ETo Zone Map)

	January	February	March	April	May	June	July	August	September	October	November	December
Zone	in/ month											
1	0.93	1.4	2.48	3.3	4.03	4.5	4.65	4.03	3.3	2.48	1.2	0.62
4	1.86	2.24	3.41	4.5	5.27	5.7	5.89	5.58	4.5	3.41	2.4	1.86
6	1.86	2.24	3.41	4.8	5.58	6.3	6.51	6.2	4.8	3.72	2.4	1.86
9	2.17	2.8	4.03	5.1	5.89	6.6	7.44	6.82	5.7	4.03	2.7	1.86
16	1.55	2.52	4.03	5.7	7.75	8.7	9.3	8.37	6.3	4.34	2.4	1.55

	January	February	March	April	May	June	July	August	September	October	November	December
Days	31	28	31	30	31	30	31	31	30	31	30	31
Zone	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day	in/day
1	0.030	0.050	0.080	0.110	0.130	0.150	0.150	0.130	0.110	0.080	0.040	0.020
4	0.060	0.080	0.110	0.150	0.170	0.190	0.190	0.180	0.150	0.110	0.080	0.060
6	0.060	0.080	0.110	0.160	0.180	0.210	0.210	0.200	0.160	0.120	0.080	0.060
9	0.070	0.100	0.130	0.170	0.190	0.220	0.240	0.220	0.190	0.130	0.090	0.060
16	0.050	0.090	0.130	0.190	0.250	0.290	0.300	0.270	0.210	0.140	0.080	0.050



Project Name: Towne Centre View

# Attachment 3 Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.



**Project Name:** Towne Centre View

#### **Indicate which Items are Included:**

Attachment Sequence	Contents	Checklist
Attachment 2	Maintenance Agreement (Form DS-3247) (when applicable)	<b>✓</b> Included
Attachment 3		Not applicable

Project Name: Towne Centre View

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

<b>Attachment 3</b> : For private entity operation and maintenance, Attachment 3 musi
include a Storm Water Management and Discharge Control Maintenance Agreement (Form
DS-3247). The following information must be included in the exhibits attached to the
maintenance agreement:
Vicinity map
Site design BMPs for which DCV reduction is claimed for meeting the pollutant
control obligations.
BMP and HMP location and dimensions
BMP and HMP specifications/cross section/model
Maintenance recommendations and frequency
LID features such as (permeable paver and LS location, dim, SF).

# BMP MAINTENANCE FACT SHEET FOR SITE DESIGN BMP SD-5 IMPERVIOUS AREA DISPERSION

**Impervious** area dispersion (dispersion) refers to the practice of effectively disconnecting impervious areas from directly draining to the storm drain system by routing runoff from impervious areas such as rooftops (through downspout disconnection), walkways, and driveways onto the surface of adjacent pervious areas. The intent is to slow runoff discharges, and reduce volumes. Typical dispersion components include:

- An impervious surface from which runoff flows will be routed with minimal piping to limit concentrated inflows
- Splash blocks, flow spreaders, or other means of dispersing concentrated flows and providing energy dissipation as needed
- Dedicated pervious area, typically vegetated, with in-situ soil infiltration capacity for partial or full infiltration
- Optional soil amendments to improve vegetation support, maintain infiltration rates and enhance treatment of flows
- Overflow route for excess flows to be conveyed from dispersion area to the storm drain system or discharge point

### **Normal Expected Maintenance**

Vegetated area shall be maintained as part of normal landscape maintenance. Additionally, ensure that storm water runoff can be conveyed into the vegetated area as designed. That is, the mechanism that allows storm water runoff from impervious area to flow into the pervious area (e.g., a curb cut allows runoff from a parking lot to drain onto adjacent landscaping area, or a roof drain outlet is directed to a lawn) shall not be removed, blocked, filled, or otherwise changed in a manner that prevents storm water from draining into the pervious area. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

### **Non-Standard Maintenance or BMP Failure**

Impervious area dispersion is a site design BMP that normally does not require maintenance actions beyond routine landscape maintenance. If changes have been made to the area, such as the vegetated area has been replaced with impervious area, or the mechanism that allows storm water runoff from impervious area to flow into the pervious area has been removed (e.g., roof drains previously directed to vegetated area have been directly connected to the street or storm drain system), the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance will be required to restore drainage into the pervious area as designed. If the pervious area has been removed, contact the [City Engineer] to determine a solution.

Runoff directed into vegetated areas is expected to be drained within 24-96 hours following a storm event. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging or compaction of the soils. Loosen or replace the soils to restore drainage.

#### **Other Special Considerations**

Site design BMPs, such as impervious area dispersion, installed within a new development or redevelopment project are components of an overall storm water management strategy for the project. The presence of site design BMPs within a project is usually a factor in the determination of the amount of runoff to be managed with structural BMPs (i.e., the amount of runoff expected to reach downstream retention or biofiltration basins that process storm water runoff from the project as a whole). When site design BMPs are not maintained or are removed, this can lead to clogging or failure of downstream structural BMPs due to greater delivery of runoff and pollutants than intended for the structural BMP. Therefore, the [City Engineer] may require confirmation of maintenance of site design BMPs as part of their structural BMP maintenance documentation requirements. Site design BMPs that have been installed as part of the project should not be removed, nor should they be bypassed by re-routing roof drains or re-grading surfaces within the project. If changes are necessary, consult the [City Engineer] to determine requirements.

#### SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR SD-5 IMPERVIOUS AREA DISPERSION

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	<ul><li>Inspect monthly.</li><li>Maintenance when needed.</li></ul>
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	Inspect monthly.     Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	<ul><li>Inspect monthly.</li><li>Maintenance when needed.</li></ul>
Standing water in vegetated pervious area for longer than 24 hours following a storm event  Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Disperse any areas of standing water to nearby landscaping (i.e., spread it out to another portion of the pervious area so it drains into the soil). Make appropriate corrective measures such as adjusting irrigation system, or repairing/replacing clogged or compacted soils.	<ul> <li>Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>Maintenance when needed.</li> </ul>
Presence of mosquitos/larvae  For images of egg rafts, larva, pupa, and adult mosquitos, see <a href="http://www.mosquito.org/biology">http://www.mosquito.org/biology</a>	Disperse any areas of standing water to nearby landscaping (i.e., spread it out to another portion of the pervious area so it drains into the soil). Loosen or replace soils to restore drainage (and prevent standing water)	<ul> <li>Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>Maintenance when needed</li> </ul>
Entrance / opening to the vegetated pervious area is blocked such that storm water from impervious area will not drain into the pervious area (e.g., a curb cut opening is blocked by debris or a roof drain outlet has been directly connected to the storm drain system)	Make repairs as appropriate to restore drainage into the vegetated pervious area.	<ul><li>Inspect monthly.</li><li>Maintenance when needed.</li></ul>

#### References

American Mosquito Control Association.

http://www.mosquito.org/

County of San Diego. 2014. Low Impact Development Handbook.

http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html

San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet SD-5.

http://www.projectcleanwater.org/index.php?option=com\_content&view=article&id=250&Itemid=220

### **SD-5**

### **Impervious Area Dispersion**

				•	
Date:	Inspector:			BMP ID No.:	
Permit No.:	APN(s):				
Property / Development Name:		Responsible Party Name and Phone Number:			
Property Address of BMP:		Responsib	ole Party Address:		
INSPECTION	AND MAINTENANCE CHECKLIST FOR	SD-5 IMPE	RVIOLIS AREA DISPI	ERSION PAGE 1 of 3	
Threshold/Indicator	Maintenance Recommendat		Date	Description of Maintenance Conducted	
Poor vegetation establishment  Maintenance Needed?  YES NO N/A  Dead or diseased vegetation  Maintenance Needed?  YES NO N/A	<ul> <li>□ Re-seed, re-plant, or re-establish vegetation per original plans</li> <li>□ Other / Comments:</li> <li>□ Remove dead or diseased vegeta seed, re-plant, or re-establish v per original plans</li> <li>□ Other / Comments:</li> </ul>	tion, re-			
Overgrown vegetation  Maintenance Needed?   YES  NO  N/A	☐ Mow or trim as appropriate ☐ Other / Comments:				

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

	AND MAINTENANCE CHECKLIST FOR SD-5 IMPE		<u> </u>
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Standing water in vegetated pervious area for longer than 24 hours following a storm event  Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health  Maintenance Needed?  YES  NO  N/A	<ul> <li>□ Disperse any areas of standing water to nearby landscaping (i.e., spread it out to another portion of the pervious area so it drains into the soil). Make appropriate corrective measures to prevent standing water such as adjusting irrigation system, or repairing/replacing clogged or compacted soils</li> <li>□ Other / Comments:</li> </ul>		
Presence of mosquitos/larvae  For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology  Maintenance Needed?  YES  NO  N/A	<ul> <li>□ Disperse any areas of standing water to nearby landscaping (i.e., spread it out to another portion of the pervious area so it drains into the soil)</li> <li>□ Make corrective measures (see above) to restore drainage (and prevent standing water)</li> <li>□ Other / Comments:</li> </ul>		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION	INSPECTION AND MAINTENANCE CHECKLIST FOR SD-5 IMPERVIOUS AREA DISPERSION PAGE 3 of 3		
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Entrance / opening to the vegetated pervious area is blocked such that storm water from impervious area will not drain into the pervious area (e.g., a curb cut opening is blocked by debris or a roof drain outlet has been directly connected to the storm drain system)  Maintenance Needed?  YES  NO  N/A	drainage into the vegetated pervious area*  ☐ Other / Comments:		

<sup>\*</sup>If the pervious area has been removed, contact the [City Engineer] to determine a solution.

# BMP MAINTENANCE FACT SHEET FOR STRUCTURAL BMP BF-1 BIOFILTRATION

**Biofiltration** facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Biofiltration facilities have limited or no infiltration. They are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Typical biofiltration components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Impermeable liner or uncompacted native soils at the bottom of the facility
- Overflow structure

### **Normal Expected Maintenance**

Biofiltration requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

### Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.
- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

### **Other Special Considerations**

Biofiltration is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, <u>routine</u> <u>maintenance</u> is key to preventing this scenario.

#### SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR BF-1 BIOFILTRATION

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	<ul> <li>Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event.</li> <li>Remove any accumulated materials found at each inspection.</li> </ul>
Obstructed inlet or outlet structure	Clear blockage.	<ul> <li>Inspect monthly and after every 0.5-inch or larger storm event.</li> <li>Remove any accumulated materials found at each inspection.</li> </ul>
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable	Inspect annually.     Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	Inspect monthly.     Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	Inspect monthly.     Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	Inspect monthly.     Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	Inspect monthly.     Replenish mulch annually, or more frequently when needed based on inspection.

<sup>\*&</sup>quot;25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

BF-1 Biofiltration

SUMMARY OF STANDARD IN	ontinued from previous page)	
Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	<ul><li>Inspect monthly.</li><li>Maintenance when needed.</li></ul>
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.	<ul> <li>Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.</li> </ul>
Standing water in BMP for longer than 24 hours following a storm event  Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	<ul> <li>Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>Maintenance when needed.</li> </ul>
Presence of mosquitos/larvae  For images of egg rafts, larva, pupa, and adult mosquitos, see <a href="http://www.mosquito.org/biology">http://www.mosquito.org/biology</a>	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water.	<ul> <li>Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event.</li> <li>Maintenance when needed.</li> </ul>
	If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	
Underdrain clogged	Clear blockage.	<ul> <li>Inspect if standing water is observed for longer than 24-96 hours following a storm event.</li> <li>Maintenance when needed.</li> </ul>

#### References

American Mosquito Control Association.

http://www.mosquito.org/

California Storm Water Quality Association (CASQA). 2003. Municipal BMP Handbook.

https://www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook

County of San Diego. 2014. Low Impact Development Handbook.

http://www.sandiegocounty.gov/content/sdc/dpw/watersheds/susmp/lid.html

San Diego County Copermittees. 2016. Model BMP Design Manual, Appendix E, Fact Sheet BF-1.

http://www.projectcleanwater.org/index.php?option=com\_content&view=article&id=250&Itemid=220

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Date:	Inspector:			BMP ID No.:
Permit No.:	APN(s):			
Property / Development Name:		Responsib	le Party Name and	Phone Number:
Property Address of BMP:		Responsib	le Party Address:	
INSP	ECTION AND MAINTENANCE CHECKL	IST FOR BF-	1 BIOFILTRATION F	PAGE 1 of 5
Threshold/Indicator	Maintenance Recommendation	on	Date	Description of Maintenance Conducted
Accumulation of sediment, litter, or debris	☐ Remove and properly dispose of			
Maintenance Needed?	accumulated materials, without to the vegetation	damage		
□ YES □ NO □ N/A	<ul> <li>☐ If sediment, litter, or debris accume xceeds 25% of the surface pond volume within one month (25% fladd a forebay or other pre-treatmeasures within the tributary and draining to the BMP to intercept materials.</li> <li>☐ Other / Comments:</li> </ul>	ling full*), ment ea		
Poor vegetation establishment  Maintenance Needed?  YES  NO N/A	<ul><li>□ Re-seed, re-plant, or re-establish vegetation per original plans</li><li>□ Other / Comments:</li></ul>			

<sup>\*&</sup>quot;25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 2 of 5			PAGE 2 of 5
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Dead or diseased vegetation	$\square$ Remove dead or diseased vegetation, re-		
Maintenance Needed?	seed, re-plant, or re-establish vegetation per original plans		
☐ YES ☐ NO ☐ N/A	☐ Other / Comments:		
Overgrown vegetation	☐ Mow or trim as appropriate		
Maintenance Needed?	☐ Other / Comments:		
☐ YES ☐ NO ☐ N/A			
2/3 of mulch has decomposed, or mulch has been removed  Maintenance Needed?  ☐ YES ☐ NO ☐ N/A	<ul> <li>□ Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches</li> <li>□ Other / Comments:</li> </ul>		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INS	PECTION AND MAINTENANCE CHECKLIST FOR B	F-1 BIOFILTRATION I	PAGE 3 of 5
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Erosion due to concentrated irrigation flow  Maintenance Needed?  YES  NO N/A	<ul> <li>□ Repair/re-seed/re-plant eroded areas and adjust the irrigation system</li> <li>□ Other / Comments:</li> </ul>		
Erosion due to concentrated storm water runoff flow  Maintenance Needed?  YES  NO N/A	□ Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan      □ If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction      □ Other / Comments:		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INS	PECTION AND MAINTENANCE CHECKLIST FOR E	F-1 BIOFILTRATION I	PAGE 4 of 5
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Obstructed inlet or outlet structure	☐ Clear blockage		
Maintenance Needed?	☐ Other / Comments:		
□ YES			
$\square$ NO			
□ N/A			
Underdrain clogged (inspect underdrain if	☐ Clear blockage		
standing water is observed for longer than 24-96 hours following a storm event)	☐ Other / Comments:		
	·		
Maintenance Needed?			
☐ YES			
$\square$ NO			
□ N/A			
Damage to structural components such as weirs,	☐ Repair or replace as applicable		
inlet or outlet structures	☐ Other / Comments:		
Maintenance Needed?	- Other / Comments.		
☐ YES			
□ YES			
□ N/A			
	1	I	1

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR BF-1 BIOFILTRATION PAGE 5 of 5			
Threshold/Indicator	Maintenance Recommendation	Date	Description of Maintenance Conducted
Standing water in BMP for longer than 24-96 hours following a storm event*  Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health  Maintenance Needed?  YES  NO  N/A	<ul> <li>□ Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils</li> <li>□ Other / Comments:</li> </ul>		
Presence of mosquitos/larvae  For images of egg rafts, larva, pupa, and adult mosquitos, see <a href="http://www.mosquito.org/biology">http://www.mosquito.org/biology</a> Maintenance Needed?    YES     NO    N/A	□ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.**      □ Other / Comments:		

<sup>\*</sup>Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.

<sup>\*\*</sup>If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

## **MAINTENANCE**

MWS – Linear Hybrid Stormwater Filtration System



### **MAINTENANCE**

### **Maintenance Summary –**

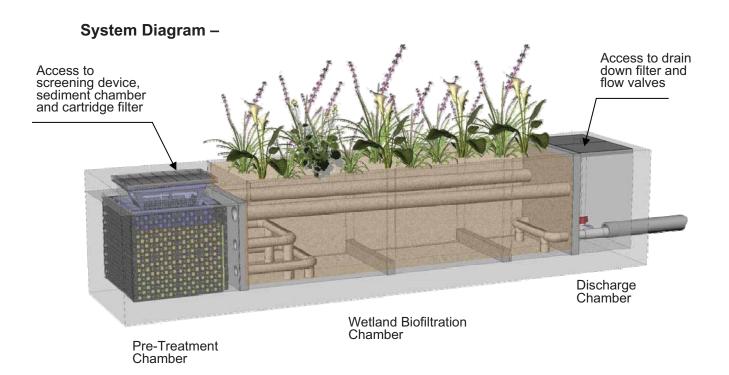
- Clean Bio Clean® Catch Basin Filter average maintenance interval is 3 to 6 months.
  - (15 minute service time).
- Clean Separation (sediment) Chamber average maintenance interval is 6 to 18 months.
  - (30 minute service time).
- Replace Cartridge Filter Media (BioMediaGREEN™) average maintenance interval 6 – 12 months.
  - (45 minute service time).
- Replace Drain Down Filter Media (BioMediaGREEN™) average maintenance interval is 6 to 12 months.
  - (5 minute service time).
- o <u>Trim Vegetations</u> average maintenance interval is 3 to 6 months.
  - (15 minute service time).
- <u>Evaluate Wetland Media Flow Hydraulic Conductivity</u> average inspection interval is once per year.
  - (5 minute inspection time).
- Wetland Media Replacement average maintenance interval is 5 to 20 years.
  - (6 hours).

For more information on maintenance procedures, to order replacement media or find an authorized service company please contact:

Modular Wetland Systems, Inc 2972 San Luis Rey Road Oceanside, CA 92058

Phone: 760-433-7640 Fax: 760-433-3176

Email: info@modularwetlands.com



### **Maintenance Overview -**

- A. Every installed MWS Linear unit is to be maintained by the Supplier, or a Supplier approved contractor. The cost of this service varies among providers.
- B. The MWS Linear is a multi-stage self-contained treatment train for stormwater treatment. Each stage protects subsequent stages from clogging. Stages include: screening, separation, cartridge media filtration, and biofiltration. The biofiltration stage contains various types of vegetation which will require annual evaluation and trimming.
  - 1. <u>Clean Bio Clean® Catch Basin Filter</u> Screening is provided by well proven catch basin filter. The filter has a trash and sediment capacity of 2 (curb type) and 4 (grate type) cubic feet. The filter removes gross solids, including litter, and sediments greater than 200 microns. This procedure is easily done by hand or with a small industrial vacuum device. This filter is located directly under the manhole or grate access cover.
  - 2. <u>Clean Separation (sediment) Chamber</u> separation occurs in the pretreatment chamber located directly under the curb or grated inlet. This chamber has a capacity of approximately 21 cubic feet for trash, debris and sediments. This chamber targets TSS, and particulate metals and nutrients. This procedure can be performed with a standard vacuum truck. This chamber is located directly under the manhole or grate access cover.

- 3. Replace Cartridge Filter Media (BioMediaGREEN™) Primary filtration is provided by a horizontal flow cartridge filter utilizing BioMediaGREEN blocks. Each cartridge has a media surface area of 35 square feet. The large surface area will insure long term operation without clogging. The cartridge filter with BioMediaGREEN targets fine TSS, metals, nutrients, hydrocarbons, turbidity and bacteria. Media life depends on local loading conditions and can easily be replaced and disposed of without any equipment. The filters are located in the pre-treatment chamber. Entry into chamber required to replace BioMediaGREEN blocks. Each cartridge contain 14 pieces of 20″ tall BioMediaGREEN.
- **4.** Replace Drain Down Filter Media (BioMediaGREEN™) A drain down filter, similar in function to the perimeter filter is located in the discharge chamber. This filter allows standing water to be drained and filtered out of the separation chamber. This addresses any vector issues, by eliminating all standing water within this system. Replacement of media takes approximately 5 minutes and is performed without any equipment.
- **5.** <u>Trim Vegetations</u> The system utilizes multiple plants in the biofiltration chamber to provide enhanced treatment for dissolved pollutants including nutrients and metals. The vegetation will need to be maintained (trimmed) as needed. This can be done as part of the project normal landscape maintenance. **NO FERTILIZER SHALL BE USED IN THIS CHAMBER.**
- **6. Evaluate Wetland Media Flow Hydraulic Conductivity** The systems flow can be assessed from the discharge chamber. This should be done during a rain event. By viewing into the discharge chamber the flow out of the system can be observed. If little to know flow is observed from the lower valve or orifice plate this is a sign of potential wetland media (biofiltration) maintenance needs.
- <u>7. Wetland Media Replacement</u> biofiltration is provided by an advance horizontal flow vegetated wetland. This natural filter contains a mix of sorptive media that supports abundant plant life. This biofilter targets the finest TSS, dissolved nutrients, dissolved metals, organics, pesticides, oxygen demanding substances and bacteria. This filter provides the final polishing step of treatment. If prior treatment stages are properly maintained, the life of this media can be up to 20 years. Replacement of the media is simple. Removal of spent media can be done with a shovel of a vacuum truck.
- C. The MWS Linear catch basin filter, separation chamber, cartridge filter media and wetland media are designed to allow for the use of vacuum removal of captured pollutants and spent filter media by centrifugal compressor vacuum units without causing damage to the filter or during normal cleaning and maintenance. Filter and chambers can be cleaned from finish surface through standard manhole or grate access.

### Maintenance Procedures -

- 1. <u>Clean Bio Clean® Catch Basin Filter</u> Modular Wetland Systems, Inc. recommends the **catch basin filter** be inspected and cleaned a minimum of once every six months and replacement of hydrocarbon booms once a year. The procedure is easily done with the use of any standard vacuum truck. *This procedure takes approximately 15 minutes*.
  - Remove grate or manhole to gain access to catch basin filter insert. Remove
    the deflector shield (grate type only) with the hydrocarbon boom attached.
    Where possible the maintenance should be performed from the ground
    surface. Note: entry into an underground stormwater vault such as an inlet
    vault requires certification in confined space training.
  - 2. Remove all trash, debris, organics, and sediments collected by the inlet filter insert. Removal of the trash and debris can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screen of the filter.
  - 3. Evaluation of the hydrocarbon boom shall be performed at each cleaning. If the boom is filled with hydrocarbons and oils it should be replaced. Attach new boom to basket with plastic ties through pre-drilled holes in basket. Place the deflector shield (grate type only) back into the filter.
  - 4. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
  - 5. The hydrocarbon boom may be classified as hazardous material and will have to be picked up and disposed of as hazardous waste. Hazardous material can only be handled by a certified hazardous waste trained person (minimum 24-hour hazwoper).
- **2.** <u>Clean Separation (sediment) Chamber</u> Modular Wetland Systems, Inc. recommends the **separation chamber** be inspected and cleaned a minimum of once a year. The procedure is easily done with the use of any standard vacuum truck. *This procedure takes approximately 30 minutes.* 
  - 1. Remove grate or manhole to gain access to the catch basin filter.
  - 2. Remove catch basin filter. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
  - 3. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
  - 4. Vacuum out separation chamber and remove all accumulated debris and sediments.
  - 5. Replace catch basin filter, replace grate or manhole cover.
  - 6. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

- 3. <u>Replace Cartridge Filter Media (BioMediaGREEN™)</u> Modular Wetland Systems, Inc. recommends the **cartridge filters** media be inspected and cleaned a minimum of once a year. The procedure will require prior maintenance of separation chamber. *Replacement of media takes approximately 45 minutes.* 
  - 1. Remove grate or manhole to gain access to the catch basin filter.
  - Remove catch basin filter. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
  - 3. Enter separation chamber.
  - 4. Unscrew the two ½" diameter bolts holding the lid on each cartridge filter and remove lid and place outside of unit.
  - 5. Remove each of the 14 BioMediaGREEN filter blocks in each cartridge and remove from chamber for disposal.
  - 6. Spray down the outside and inside of the cartridge filter to remove any accumulated sediments.
  - 7. Replace with new BioMediaGREEN filter blocks insuring the blocks are properly lined up and seated in the bottom.
  - 8. Replace the lid and tighten down bolts.
  - 9. Replace catch basin filter, replace grate or manhole cover.
  - 10. Transport all debris, trash, organics, spent media and sediments to approved facility for disposal in accordance with local and state requirements.
- **4.** Replace Drain Down Filter Media (BioMediaGREEN™) Modular Wetland Systems, Inc. recommends the drain down filter be inspected and maintained a minimum of once a year. Replacement of media takes approximately 5 minutes.
  - 1. Open hatch of discharge chamber
  - 2. Enter chamber, unlatch drain down filter cover.
  - 3. Remove BioMediaGREEN filter block
  - 4. Replace with new block, replace and latch cover.
  - 5. Exit chamber, close and lock down the hatch.
  - 6. Transport spent media to approved facility for disposal in accordance with local and state requirements.
- **5.** <u>Trim Vegetations</u> Modular Wetland Systems, Inc. recommends the plants/vegetation be inspected and maintained a minimum of once a year. It is also recommended that the plants receive the same care as other landscaped areas. **Note: No fertilizer is to be used on this area.** *Trimming of vegetation takes approximately 15 minutes.*
- <u>6. Evaluate Wetland Media Flow Hydraulic Conductivity</u> Modular Wetland Systems, Inc. recommends system flow be inspected and observed a minimum of once a year. This needs to be done during a rain event. *Inspection and Observation takes approximately 5 minutes*.
  - 1. Open hatch of discharge chamber
  - 2. Observe the level of flow from the bottom valve or orifice plate.
  - 3. If flow is steady and high the system is operating normally.

- 4. If little or no flow is observed exiting the valve possible maintenance to the biofiltration wetland chamber may be needed. Contact Modular Wetlands for further assistance.
- 5. Exit chamber, close and lock down the hatch.

<u>7. Wetland Media Replacement</u> – Modular Wetland Systems, Inc. recommends the wetland media be replaced a minimum of one every 20 years. *Inspection takes approximately 15 minutes. Replacement of rock media takes approximately 6 hours and requires a vacuum truck.* 

- 1. Remove plants from the wetland chamber.
- 2. Use a vacuum truck or shovel to remove all wetland media.
- 3. Spray down the walls and floor of the chamber and vacuum out any accumulated pollutants.
- 4. Spray down perforated piping and netting of flow matrix and the inflow and outflow end to remove any accumulated pollutants.
- 5. Vacuum out any standing water from the media removal and insure the chamber is cleaning.
- 6. Use a small backhoe to fill chamber with new media. Call Modular Wetland Systems, Inc. for media delivery information.
- 7. Install BioMediaGREEN filter blocks across over the entire filter bed. Fill with media until 9" from top. The install filter blocks which are 3" thick. Fill the top 6" inches with wetland media.
- 8. Plant new vegetation in the same configuration and quantity as old vegetation. Dig down until the BioMediaGREEN is exposed. Cut out a small circle of the BioMediaGREEN. Remove plant from container including soil ball and place in the whole cut out of the BioMediaGREEN. Cover up with wetland media.
- 9. Spray down the plants and media with water to saturate.
- 10. Continue supplemental irrigation (spray or drip) for at lest 90 days.

### 7. Other Maintenance Notes -

- 1. Following maintenance and/or inspection, the maintenance operator shall prepare a maintenance/inspection record. The record shall include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanism.
- 2. The owner shall retain the maintenance/inspection record for a minimum of five years from the date of maintenance. These records shall be made available to the governing municipality for inspection upon request at any time.
- 3. Any person performing maintenance activities must have completed a minimum of OSHA 24-hour hazardous waste worker (hazwoper) training.
- 4. Remove access manhole lid or grate to gain access to filter screens and sediment chambers. Where possible the maintenance should be performed from the ground surface. Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training.
- 5. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.
- 6. The hydrocarbon boom is classified as hazardous material and will have to be picked up and disposed of as hazardous waste. Hazardous material can only be handled by a certified hazardous waste trained person (minimum 24-hour hazwoper).

### **Maintenance Sequence –**



Access Pre-Treatment Chamber by Removing Manhole or Grate Cover



Assess Pollutant Loading in Catch Basin Filter and Sediment Chamber



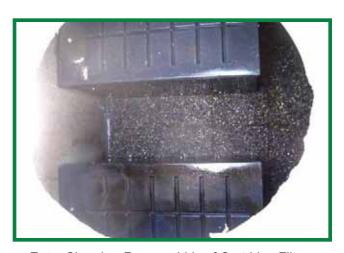
Vacuum Catch Basin Filter



Remove Catch Basin Filter



Vacuum out the Sediment Chamber



Enter Chamber Remove Lids of Cartridge Filters



Remove Spent BioMediaGREEN Filter Blocks



Spray Down and Clean Cartridge Filter Housing



Replace with New BioMediaGREEN Filter Blocks and Replace Lid, then Catch Basin Filter and Replace Manhole or Grate



Open Discharge Chamber Lid to Asses Wetland Media Flow Rate and Replace Drain Down Filter Near Bottom



Evaluate Vegetation and Trim if Needed. Maintenance Complete.

Please Contact Modular Wetland Systems, Inc. for More Information:

760-433-7640

info@modularwetlands.com



### StormTrap Maintenance Manual

#### 1. Introduction

Regular inspections are recommended to ensure that the system is functioning as designed. Please call your Authorized StormTrap Representative if you have questions in regards to the inspection and maintenance of the StormTrap system. Prior to entry into any underground storm sewer or underground detention systems, appropriate OSHA and local safety regulations and quidelines should be followed.

### 2. Inspection Schedules for Municipalities

StormTrap Stormwater Management Systems are recommended for inspection whenever the upstream and downstream catch basins and stormwater pipes of the stormwater collection system are inspected or maintained. This will economize the cost of the inspection if it is done at the same time the Municipal crews are visiting the area.

### 3. Inspection Schedules for Private Development

StormTrap Stormwater Management Systems, for a private development, are recommended for inspection after each major storm water event. At a minimum, until a cleaning schedule can be established, an annual inspection is recommended. If inspected on an annual basis, the inspection should be conducted before the stormwater season begins to be sure that everything is functioning properly for the upcoming storm season.

### 4. Inspection Process

Inspections should be done such that at least 2-3 days has lapsed since the most recent rain event to allow for draining. Visually inspect the system at all manhole locations. Utilizing a sediment pole, measure and document the amount of silt at each manhole location. Inspect each pipe opening to ensure that the silt level or any foreign objects are not blocking the pipes. Be sure to inspect the outlet pipe(s) because this is typically the smallest pipe in the system. It is common that most of the larger materials will be collected upstream of the system in catch basins, and it is therefore important at time of inspections to check these structures for large trash or blockages.

Remove any blockages if you can during the inspection process only if you can do so safely from the top of the system without entering into the system. **Do not go into the system under any circumstances** without proper ventilation equipment and training. Pass any information requiring action onto the appropriate maintenance personnel if you cannot remove the blockages from above during the inspection process. Be sure to describe the location of each manhole and the type of material that needs to be removed.

The sediment level of the system should also be measured and recorded during the inspection process. Recording the sediment level at each manhole is very important in order get a history of sediment that can be graphed over time (i.e. years) in order to estimate when the system will

need to be maintained next. It is also important to keep these records to verify that the inspection process was actually performed if anyone asks for your records in the future.

The sediment level in the underground detention system can be determined from the outside of the system by opening up all the manholes and using a sediment pole to measure the amount of sediment at each location. Force the stick to the bottom of the system and then remove it and measure the amount of sediment at that location. Again, do not go into the system under any circumstances without proper ventilation equipment and training.

#### 5. When to Clean the System

Any blockages should be safely removed as soon as practical so that the Stormwater detention system will fill and drain properly before the next stormwater event.

The Dry Detention System should be completely cleaned whenever the sediment occupies more than 10% to 15% of the originally designed system's volume. The Wet Detention System should be cleaned when the sediment occupies more than 30% or 1/3<sup>rd</sup> of the originally designed system's volume. NOTE: Check with your municipality in regards to cleaning criteria, as the allowable sediment before cleaning may be more or less then described above.

### 6. How to Clean the StormTrap

The system should be completely cleaned back to 100% of the originally designed storage volume whenever the above sediment levels have been reached. Be sure to wait at least 3 days after a stormwater event to be sure that the system is completely drained (if it is a Dry Detention System), and all of the sediments have settled to the bottom of the system (if it is a Wet Detention System).

Do not enter the System unless you are properly trained, equipped, and qualified to enter a confined space as identified by local occupational safety and health regulations.

There are many maintenance companies that are in business to help you clean your underground stormwater detention systems and water quality units. Please call your StormTrap representative for referrals in your area.

### A. Dry Detention System Cleaning

Maintenance is typically performed using a vacuum truck. Sediment should be flushed towards a vacuum hose for thorough removal. For a Dry Detention System, remove the manhole cover at the top of the system and lower a vacuum hose into one of the rows of the StormTrap system. Open up the manhole at the opposite end of the StormTrap and use sewer jetting equipment to force water in the same row from one end of the StormTrap row to the opposite side. The rows of the StormTrap are completely open in one contiguous channel from one end to the other for easy cleaning.

Place the vacuum hose and the sewer jetting equipment in the next row and repeat the process until all of the rows have been cleaned.

When finished, replace all covers that were removed and dispose of the collected material properly.

### B. Wet Detention System Cleaning

If the system was designed to maintain a permanent pool of water, floatables and any oil should be removed in a separate procedure prior to the removal of all sediment.

The floatable trash is removed first by using a bucket strainer to capture and remove any floating debris.

The floatable oils are then removed off the top of the water by using the vacuum truck to suck off any floatable fluids and liquids.

The next step is to use the vacuum truck to gently remove the clarified water above the sediment layer.

The final step is to clean the sediment for each row as described above in the paragraph "A. Dry Detention System Cleaning". For smaller systems, the vacuum truck can remove all of the sediment in the basin without using the sewer jetting equipment because of the smaller space.

8. Proof of these inspections is the responsibility of the property owner. All inspection reports and data should be kept on site or at a location where they will be accessible for years in the future. Some municipalities require these inspection and cleaning reports to be forwarded to the proper governmental permitting agency on an annual basis.

Refer to your local and national regulations for any additional maintenance requirements and schedules not contained herein. Inspections should be a part of your standard operating procedure.

### SAMPLE INSPECTION AND MAINTENANCE LOG

Date	Depth of Sediment	Accumulated Trash	Maintenance Performed	Maintenance Personnel	Comments
	3"	None	Sediment Removal/Vac	B. Johnson	

Project Name: Towne Centre View

# Attachment 4 Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

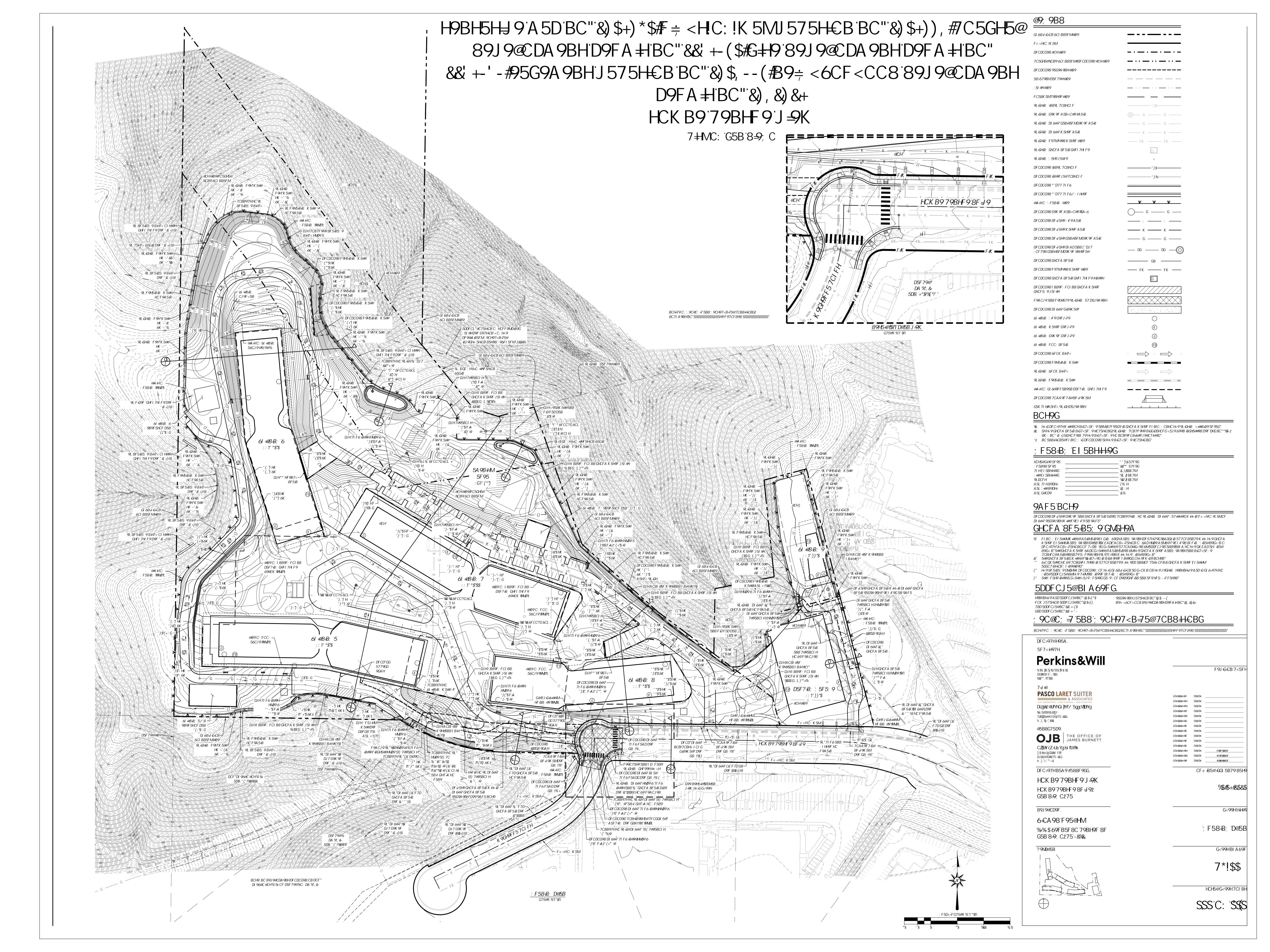


Project Name: Towne Centre View

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

Th	e plans must identify:
	Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
	The grading and drainage design shown on the plans must be consistent with the
	delineation of DMAs shown on the DMA exhibit
	Details and specifications for construction of structural BMP(s)
	Signage indicating the location and boundary of structural BMP(s) as required by the
	City Engineer
	How to access the structural BMP(s) to inspect and perform maintenance
	Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt
	posts, or other features that allow the inspector to view necessary components of
	the structural BMP and compare to maintenance thresholds)
	Manufacturer and part number for proprietary parts of structural BMP(s) when
	applicable
	Maintenance thresholds specific to the structural BMP(s), with a location-specific frame
	of reference (e.g., level of accumulated materials that triggers removal of the
	materials, to be identified based on viewing marks on silt posts or measured with a
	survey rod with respect to a fixed benchmark within the BMP)
	Recommended equipment to perform maintenance
	When applicable, necessary special training or certification requirements for inspection
	and maintenance personnel such as confined space entry or hazardous waste
_	management
	Include landscaping plan sheets showing vegetation requirements for vegetated
	structural BMP(s)
	All BMPs must be fully dimensioned on the plans
	When proprietary BMPs are used, site specific cross section with outflow, inflow
	and model number shall be provided. Broucher photocopies are not allowed.





Project Name: Towne Centre View

### Attachment 5 Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.



### DRAINAGE STUDY

For:

Towne Centre View

PTS#: 624751

APN 343-121-35, 36, 37, 42, 43 9855, 9865, 9875, 9885 Towne Centre Drive San Diego, CA 92121

Prepared By:

Gregory W. Lang, P.E.

RCE 68075

EXP: 06-30-23

No. RCE 6807

Pasco Laret Suiter & Associates, Inc. 535 N. Highway 101, Suite A Solana Beach, CA 92075



& ASSOCIATES

CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING

### ND PLANNING + LAND SURVEYING

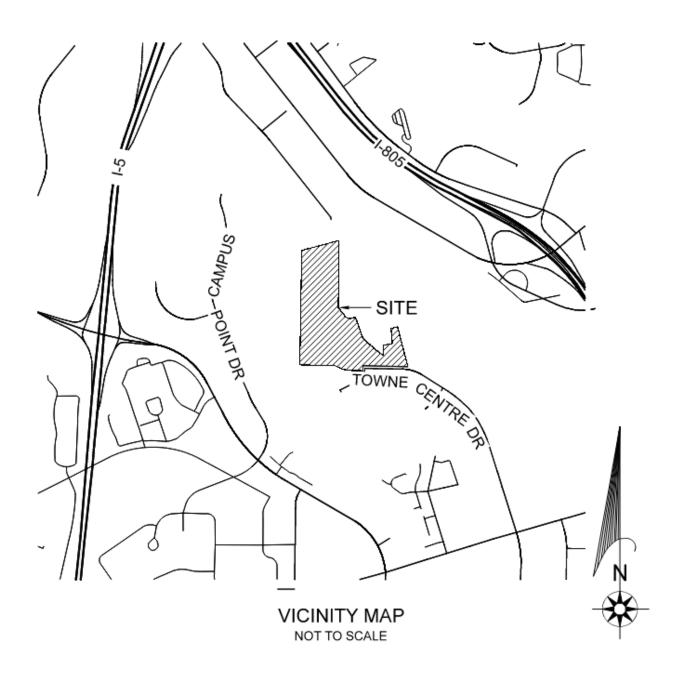
Prepared for:

BRE-BMR Towne Centre Science Park LLC c/o Project Management Advisors, Inc. 420 Stevens Avenue, Suite 170 Solana Beach, CA 92075

September 2020 Revised December 2021

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## 1. **INTRODUCTION**

#### 1.1 Project Description

The project site is located at the north end of Towne Centre Drive in San Diego, California. The site is located east of the I-5, west of I-805, south of the merge of I-5 and I-805 and north of La Jolla Village Drive.

The Project involves redevelopment of the Project with a five-building campus (Buildings A through E), which would include scientific R&D, laboratories, technology, and office uses, with supporting parking structures and surface parking areas, recreational facilities, amenities, and landscaping. Offsite improvements consist of three driveway entrances and a non-contiguous sidewalk along the project frontage at Towne Centre Drive.

#### 1.2 Existing Conditions

The total property area consists of 33.55 acres. The property is located on a ridge surrounded by steep canyons and Towne Centre Drive to the south. The western portion of the project site is currently rough graded for a previous project, Summit Point Plaza, PTS#6109. Full build out of Summit Pointe Plaza was not completed and the project ended to include only rough grading of the site and drainage infrastructure. The eastern portion of the site consists of an existing office complex.

In the existing condition the western portion of the site, per approved Summit Pointe Plaza plans PTS#6109, is rough graded with building pad sites, retaining walls, large sedimentation basins and drainage infrastructure. Refer to Appendix 4 for the approved Summit Pointe Plaza grading plans. Drainage infrastructure was installed for each of the five drainage areas of the previously approved project. For the locations of the existing drainage basins and discharge points refer to the Existing Conditions Hydrology Exhibit located in Appendix 1. Drainage areas were listed as areas A1, B1, B3, C1 and C3. The existing drainage infrastructure includes sedimentation basins, outlet structures from the sedimentation basins including perforated riser pipes or stand pipes, brow ditch conveyance channels and level spreaders to dissipate concentrated flow and minimize the erosion potential at discharge locations.

The hydrology report associated with the approved grading plans was requested from the City of San Diego and previous engineer, however, the report is not available. The approved plans have a table of previously approved hydrology characteristics for the five drainage basins, including 100-year flow rates. Table 1 below summarizes the hydrologic information of the previously approved plans.

Table 1 - EXISTING CONDITION HYDROLOGY SUMMARY (WEST)			
Control Point	Basin	Area (ac)	Q100 (cfs)
1	(A1)	2.80	12.10
2	(B1)	1.95	10.10
3	(B3)	1.04	5.40
4	(C1)	1.21	6.30
5	(C3)	2.51	12.60

The eastern portion of the site is developed and consists of office buildings, parking areas and landscape. Hydrologic calculations were performed for the eastern portion of the site. Refer to Appendix 2 for the calculations. Table 2 below summarizes the hydrologic calculations for the eastern portion of the site.

Table 2 - EXISTING CONDITION HYDROLOGY SUMMARY (EAST)			
Control Point	Basin	Area (ac)	Q100 (cfs)
1	(A2)	1.16	3.54
6	(D2)	6.75	19.72
7	(D1)	1.29	4.60

#### 1.3 Proposed Conditions

The proposed project consists of the construction of new science, research and development, laboratory, technology and office buildings, including an underground parking garage, an above ground parking garage, a surface parking area, drive aisles, sports fields, and landscaped areas. Offsite improvements consist of three driveway entrances and a non-contiguous sidewalk along the project frontage at Towne Centre Drive.

In the proposed condition, the site consists of 7 drainage basins:

Drainage Basin 1 is located in the southwest portion of the site and includes DMA A1, A2 and A3. Storm water runoff in DMA A1 and A2 will be collected in proposed storm drain and conveyed to underground storage vaults and subsequent Modular Wetland Systems. Runoff from impervious areas in DMA A3 will be directed to landscape areas for dispersion.

Drainage Basin 2 is located along the western boundary of the site and includes DMA B1. Storm water runoff from impervious areas in DMA B1 will be directed to landscape areas for dispersion.

Drainage Basin 3 is located along the western boundary of the site and includes DMA B2. Storm water runoff from impervious areas in DMA B2 will be directed to landscape areas for dispersion.

Drainage Basin 4 is located in the northwest corner of the site and includes DMA C1. Storm water runoff from impervious areas in DMA C1 will be directed to landscape areas for dispersion.

Drainage Basin 5 is located in the northwest portion of the site and includes DMA C2. Storm water runoff in DMA C2 will be collected in proposed storm drain and conveyed to an underground storage vault and subsequent biofiltration basin.

Drainage Basin 6 is located in the central portion of the site and includes DMA D1 and D2. Storm water runoff in DMA D1 will be collected in proposed storm drain and conveyed to an underground storage vault and subsequent Modular Wetland System. Runoff in DMA D2 will be collected in proposed storm drain and conveyed to an underground storage vault and subsequent biofiltration basin.

Drainage Basin 7 is located in the eastern portion of the site and includes DMA D3 and D4. Storm water runoff from impervious areas in DMA D3 will be directed to landscape areas for dispersion. Storm water runoff in DMA D4 will be collected in proposed storm drain and conveyed to underground storage vaults and subsequent Modular Wetland Systems.

The proposed underground storage vaults provide mitigation of the 100-year storm event peak discharge. For the locations of the proposed drainage basins and discharge points refer to the Proposed Condition Hydrology Exhibit located in Appendix 1.

The table below provides a summary of the hydrologic information for the proposed conditions.

Table 3 – PROPOSED CONDITION HYDROLOGY SUMMARY			
Control Point	Basin	Area (ac)	Q100 (cfs)
	A1	2.42	7.99
1	A2	1.38	3.16
	A3	1.88	4.30
2	B1	0.85	1.87
3	B2	0.59	1.30
4	C1	1.31	2.88
5	C2	4.13	9.99
6	D1	3.38	7.58
U	D2	3.40	9.42
	D3	0.51	1.12
7	D4a	1.14	2.86
	D4b	0.45	1.35

## 2. METHODOLOGY

Pursuant to the 2017 City of San Diego Drainage Design Manual, the Rational Method is recommended for analyzing the runoff response from drainage areas less than 0.5 square mile, therefore the Rational Method was used to analyze this project's hydrologic characteristics.

#### 2.1 Rational Method

Runoff was calculated for the 100-year, 6-hour storm event using the Rational Method which is calculated using the following equation:

Where:

Q = Flow rate in cubic feet per second (cfs)

C = Runoff coefficient (Table A-1 of City of SD Drainage Design Manual)

I = Rainfall Intensity in inches per hour (in/hr)

A = Drainage basin area in acres (ac)

#### 2.2 Runoff Coefficient

The runoff coefficients for the project are based on Table A-1 and Footnote 2 from the 2017 City of San Diego Drainage Design Manual.

#### 2.3 Rainfall Intensity

Rainfall intensity was determined using the Rainfall Intensity-Duration-Frequency Curves shown in Section A.1.3 of the 2017 City of San Diego Drainage Design Manual. Based on Figure A-1 and a 5-minute time of concentration, the 100-year intensity is 4.4 inches per hour.

#### 2.4 Detention

The underground storage vaults provide mitigation of the 100-year storm event peak flow rate. The 100-year storm event detention analysis was performed using HydroCAD Stormwater Modeling software. The inflow runoff hydrographs to the vaults were modeled using RatHydro which is a Rational Method Design Storm Hydrograph software that creates a hydrograph using the results of the Rational Method calculations. HydroCAD has the ability to route the 100-year 6-hour storm event inflow hydrograph through the facilities considering dynamic tailwater effects. Based on the facility cross sectional geometry, stage storage and outlet structure data, HydroCAD calculates the detained peak flow rate and detained time to peak. Refer to the plans for details of each facility.

Based on the results of the HydroCAD analysis, mitigation for the 100-year storm event peak flow rate is provided, detaining the peak flow rate in the proposed condition to below the existing condition. Refer to Appendix 3 for the HydroCAD detention detailed output.

#### 2.5 Section 401/404 Water Quality Certification

This project does not have any waters of the United States (e.g., creek, drainage, wetland) on the property and does not require Federal permitting or approval.

# 3. <u>CALCULATIONS/RESULTS</u>

#### 3.1 Existing and Proposed Peak Flow Comparison

The table below summarizes the 100-year 6-hour peak flow rate calculations for the project.

	SUMMARY OF 100-YR STORM EVENT HYDROLOGIC ANALYSIS						
	E	xisting Condi	tion	Pr	oposed Conditio	on	Proposed Detained Condition
Control Point	Basin	Area (ac)	Q100 (cfs)	Basin	Area (ac)	Q100 (cfs)	Q100 (cfs)
	A 1	2.80	12.10	A1	2.42	7.99	6.19
1	A1	2.80	12.10	A2	1.38	3.16	3.06
1	A2	1.16	3.54	A3	1.88	4.30	4.30
2	B1	1.95	10.10	B1	0.85	1.87	1.87
3	В3	1.04	5.40	B2	0.59	1.30	1.30
4	C1	1.21	6.30	C1	1.31	2.88	2.88
5	C3	2.51	12.60	C2	4.13	9.99	0.77
6	D2	6.75	19.72	D1	3.38	7.58	3.64
6	DZ	0.73	19.72	D2	3.40	9.42	8.81
				D3	0.51	1.12	1.12
7	D1	1.29	4.60	D4a	1.14	2.86	0.26
				D4b	0.45	1.35	0.10

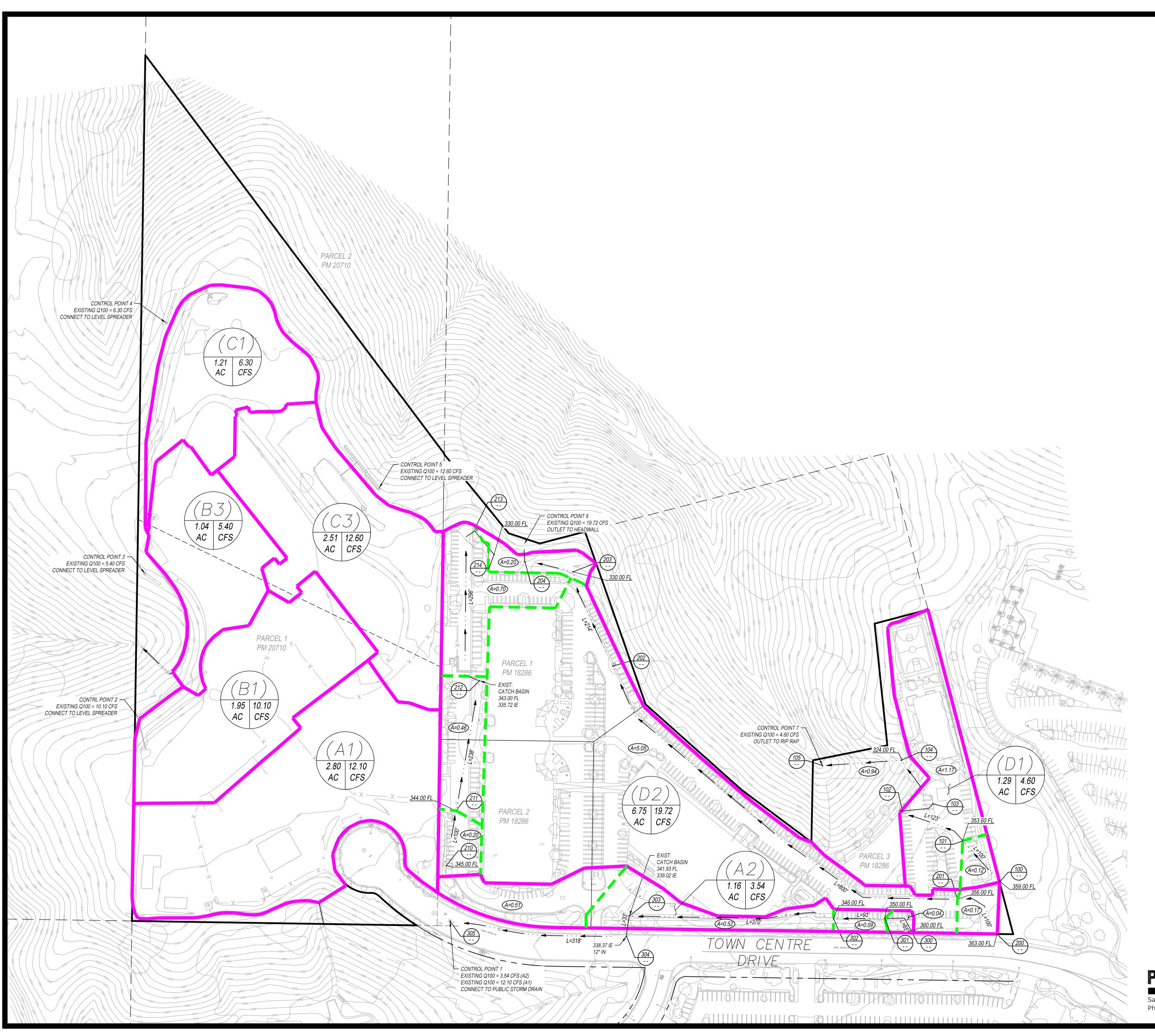
In the proposed detained condition, the 100-year storm event peak discharge rates are lower than the existing flow rates. The project will not have adverse impacts to downstream drainage facilities.

# 4. **CONCLUSION**

The proposed project was designed to honor previously approved drainage infrastructure and flow rates and minimize the effects of the development to downstream drainage facilities. Storm water runoff rates will be decreased from existing conditions.



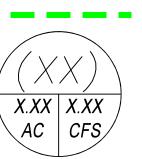
**Existing and Proposed Hydrology Exhibits** 



# LEGEND

DESCRIPTION RIGHT-OF-WAY PROPERTY LINE BASIN BOUNDARY BASIN SUBAREA

BASIN SUMMARY Q100 EXISTING (PRE MITIGATION)



# HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D\*
\*FOR THE PURPOSE OF DRAINAGE CALCS, THE ENTIRE SITE WILL BE MODELED WITH TYPE D SOILS

# DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

# PROJECT CHARACTERISTICS

PARCEL AREA:

25.45 AC

EXISTING IMPERVIOUS AREA:

EXISTING LANDSCAPE AREA: 12.83 AC

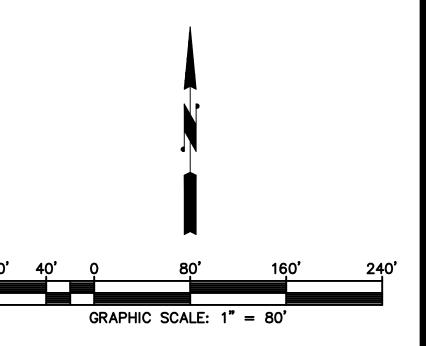
# SUMMARY OF EXISTING CONDITIONS (WEST)

EXIST. DRAINAGE BASIN	EXIST. DRAINAGE AREA (AC)*	RUNOFF COEFFICIENT, C*	Q100 (CFS)*
(A1)	2.80	0.85	12.10
(B1)	1.95	0.85	10.10
(B3)	1.04	0.85	5.40
(C1)	1.21	0.85	6.30
(C3)	2.51	0.85	12.60

\*TABULATED VALUES FROM SUMMIT POINT PLAZA GRADING PLANS, PTS#6109, 32375-6-D, DETENTION FACILITES AND DETAILS

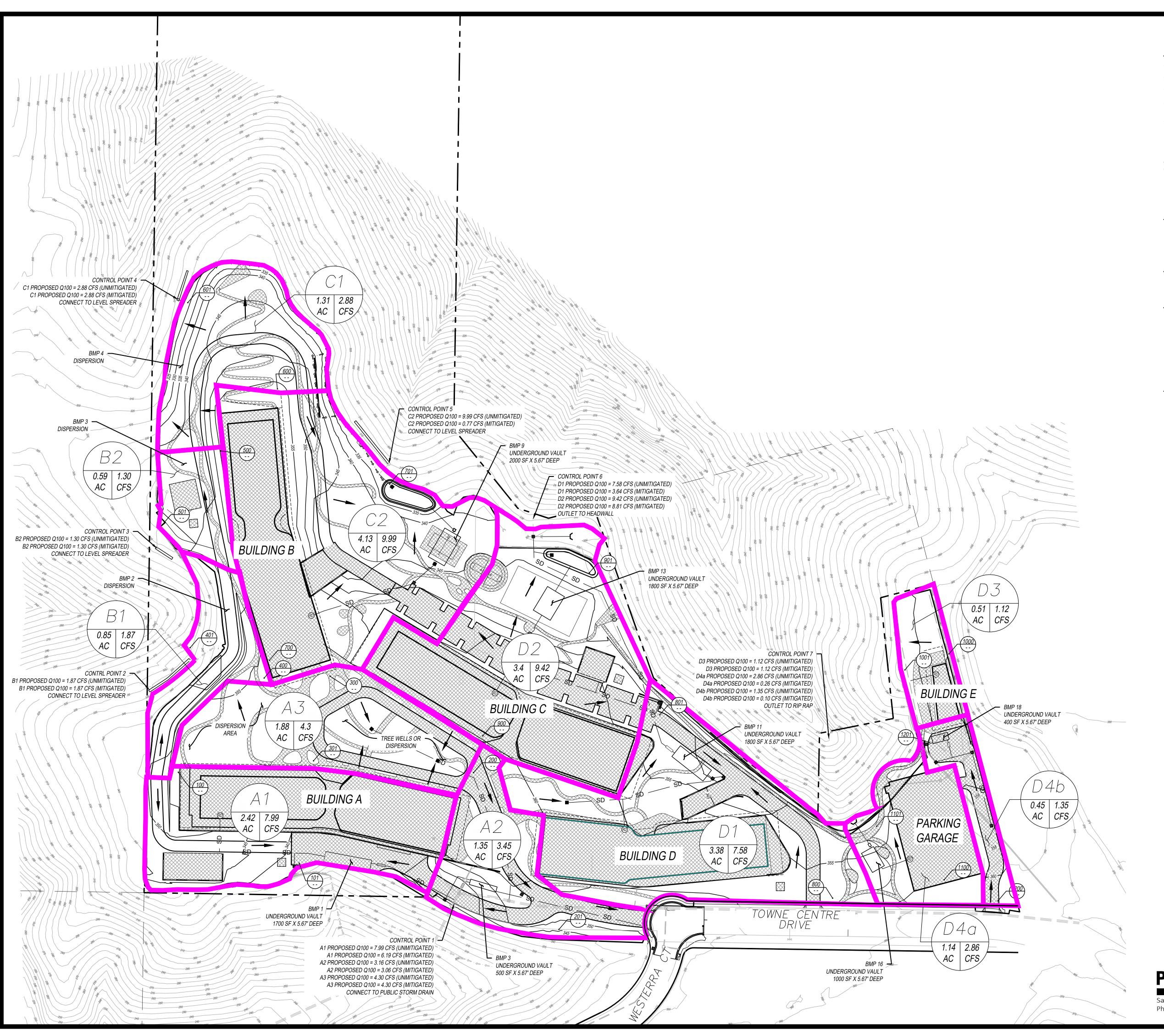
# SUMMARY OF EXISTING CONDITIONS (EAST)

EXIST. DRAINAGE BASIN	EXIST. DRAINAGE AREA (AC)	RUNOFF COEFFICIENT, C	Q100 (CFS)
(A2)	1.16	0.85	3.54
(D1)	1.29	0.85	4.60
(D2)	6.75	0.85	19.72



# EXISTING CONDITION DRAINAGE EXHIBIT

PASCO LARET SUITER San Diego | Solana Beach | Orange County Phone 858.259.8212 | www.plsaengineering.com TOWNE CENTRE VIEW
TOWN CENTRE DRIVE
SAN DIEGO, CA 92121 PLSA JOB # 3342 SCALE 1"=80' OCTOBER 2020 SHEET 1 OF 1



# LEGEND

DESCRIPTION SYMBOL

RIGHT-OF-WAY

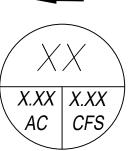
PROPERTY LINE

BASIN BOUNDARY

PROPOSED IMPERVIOS AREA

DRAINAGE ARROW

BASIN SUMMARY Q100 PROPOSED (PRE MITIGATION)



# HYDROLOGIC SOIL GROUP

HYDROLOGIC SOIL TYPE: C & D\*
\*FOR THE PURPOSE OF DRAINAGE CALCS, THE ENTIRE SITE WILL BE
MODELED WITH TYPE D SOILS

# DEPTH TO GROUNDWATER

DEPTH TO GROUNDWATER > 20 FT

# PROJECT CHARACTERISTICS

TOTAL SITE AREA: 33.52 AC

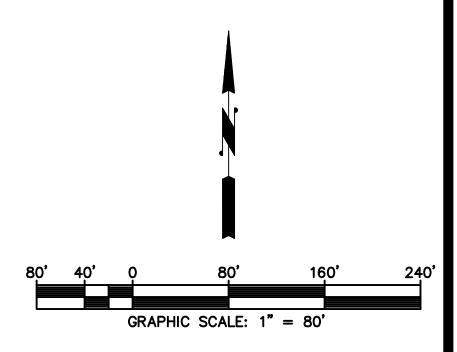
PROPOSED DISTURBED AREA: 20.64 AC

PROPOSED IMPERVIOUS AREA: 10.62 AC

PROPOSED LANDSCAPE AREA: 10.02 AC

# SUMMARY OF PROPOSED CONDITIONS

<u> </u>	<u> </u>	101 00	
PROP. DRAINAGE BASIN	PROP. DRAINAGE AREA (AC)	Q100 (CFS)	Q100 DETAINED (CFS)
A1	2.42	7.99	6.19
A2	1.35	3.45	3.34
A3	1.88	4.30	4.30
B1	0.85	1.87	1.87
B2	0.59	1.30	1.30
C1	1.31	2.88	2.88
C2	4.13	9.99	0.77
D1	3.38	7.58	3.64
D2	3.40	9.42	8.81
D3	0.51	1.12	1.12
D4a	1.14	2.86	0.26
D4b	0.45	1.35	0.10



# PROPOSED CONDITION DRAINAGE EXHIBIT

TOWNE CENTRE VIEW
TOWN CENTRE DRIVE
SAN DIEGO, CA 92121
PLSA JOB # 3342
SCALE 1"=80'
JULY, 2022
SHEET 1 OF 1

& ASSOCIATES
San Diego | Solana Beach | Orange County
Phone 858.259.8212 | www.plsaengineering.com



Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
Land Use	Soil Type (1)
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial (2)	
80% Impervious	0.85
Industrial (2)	
90% Impervious	0.95

#### Note:

Actual imperviousness = 50% Tabulated imperviousness = 80% Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

## A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the  $T_{\text{C}}$  for a selected storm frequency. Once a particular storm frequency has been selected for design and a  $T_{\text{C}}$  calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).



<sup>(1)</sup> Type D soil to be used for all areas.

<sup>(2)</sup> Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

The City of San Diego | Drainage Design Manual | January 2017 Edition

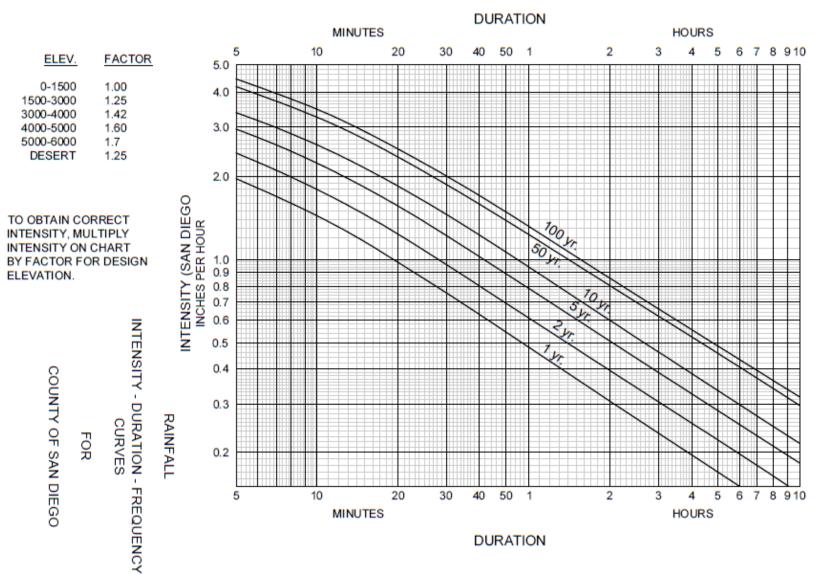


Figure A-1. Intensity-Duration-Frequency Design Chart



\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT 2003,1985,1981 HYDROLOGY MANUAL

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Analysis prepared by:

PASCO LARET SUITER & ASSOCIATES 535 NORTH HIGHWAY 101, STE A SOLANA BEACH, CA 92075 858-259-8212

* 3342 TOWNE CENTRE VIEW *  * 3342 TOWNE CENTRE VIEW *  * EASTERN SITE EXISTING CONDITION *  * 100-YR *  FILE NAME: 3342E100.DAT TIME/DATE OF STUDY: 17:12 09/17/2020  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
USER SPECIFIED STORM EVENT (YEAR) = 100.00  SPECIFIED MINIMUM PIPE SIZE (INCH) = 4.00  SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000  *USER SPECIFIED:  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 9  1) 5.000; 4.400  2) 10.000; 3.450  3) 15.000; 2.900  4) 20.000; 2.500  5) 25.000; 2.200  6) 30.000; 2.000  7) 40.000; 1.700  8) 50.000; 1.500  9) 60.000; 1.300  SPECIFIED CONSTANT RUNOFF COEFFICIENT = 0.850  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED  NOTE: DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
HALF- CROWN TO STREET-CROSSFALL: CURB GUTTER-GEOMETRIES: MANNING WIDTH CROSSFALL IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR NO. (FT) (FT) SIDE / SIDE / WAY (FT) (FT) (FT) (FT) (PT) (PT)
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0313 0.167 0.0150
GLOBAL STREET FLOW-DEPTH CONSTRAINTS:  1. Relative Flow-Depth = 0.00 FEET  as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)  2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 22
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS
*USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500

1

S.C.S. CURVE NUMBER (AMC II) = 72 USER SPECIFIED Tc (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 0.45
TOTAL AREA (ACRES) = 0.12 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 51 >>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW< >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT) <>>> ELEVATION DATA: UPSTREAM(FEET) = 353.60 DOWNSTREAM(FEET) = 347.00 CHANNEL LENGTH THRU SUBAREA(FEET) = 123.00 CHANNEL SLOPE = 0.0537 CHANNEL BASE (FEET) = 50.00 "Z" FACTOR = 50.000 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 1.00 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.197 \*USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.54 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.92AVERAGE FLOW DEPTH(FEET) = 0.03 TRAVEL TIME(MIN.) = 1.07 Tc(MIN.) = 6.07 SUBAREA AREA (ACRES) = 1.17 SUBAREA RUNOFF(CFS) = 4.17 AREA-AVERAGE RUNOFF COEFFICIENT = 0.850 PEAK FLOW RATE(CFS) = TOTAL AREA (ACRES) = 1.3 END OF SUBAREA CHANNEL FLOW HYDRAULICS: DEPTH(FEET) = 0.04 FLOW VELOCITY(FEET/SEC.) = 2.52 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 393.00 FEET. \* FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 41 \_\_\_\_\_\_ >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA< >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <>>> ELEVATION DATA: UPSTREAM(FEET) = 339.66 DOWNSTREAM(FEET) = 338.41 FLOW LENGTH (FEET) = 60.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 9.3 INCHES DEPTH OF FLOW IN 12.0 INCH PIPE IS 9.3 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 7.06
GIVEN PIPE DIAMETER (INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 4.60
PIPE TRAVEL TIME (MIN.) = 0.14 Tc (MIN.) = 6.21
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 453.00 FEET. \* FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 41 ----->>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA< >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<< \_\_\_\_\_\_ ELEVATION DATA: UPSTREAM(FEET) = 338.11 DOWNSTREAM(FEET) = 324.00 FLOW LENGTH (FEET) = 95.00 MANNING'S N = 0.013 DEPTH OF FLOW IN 24.0 INCH PIPE IS 3.8 INCHES PIPE-FLOW VELOCITY (FEET/SEC.) = 14.15 GIVEN PIPE DIAMETER (INCH) = 24.00 NUMBER OF PIPES = 1 PIPE-FLOW(CFS) = 4.60 PIPE TRAVEL TIME(MIN.) = 0.11 Tc(MIN.) = 6.32 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 104.00 = 548.00 FEET. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 22

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<
*USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72 USER SPECIFIED TC (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 0.64 TOTAL AREA(ACRES) = 0.17 TOTAL RUNOFF (CFS) = 0.64
FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 51
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<->>>>TRAVELITME THRU SUBAREA (EXISTING ELEMENT)<>>>>
ELEVATION DATA: UPSTREAM(FEET) = 356.00 DOWNSTREAM(FEET) = 340.86 CHANNEL LENGTH THRU SUBAREA(FEET) = 800.00 CHANNEL SLOPE = 0.0189 CHANNEL BASE(FEET) = 10.00 "2" FACTOR = 50.000 MANNING'S FACTOR = 0.015 MAXIMUM DEPPH(FEET) = 1.00 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.564 ** USBR SPECIFIED(GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.37 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.03 AVERAGE FLOW DEPTH(FEET) = 0.16 TRAVEL TIME(MIN.) = 4.40 TC (MIN.) = 9.40 SUBAREA AREA (ACRES) = 5.05 SUBAREA RUNOFF(CFS) = 15.30 AREA-AVERAGE RUNOFF COEFFICIENT = 0.850 TOTAL AREA (ACRES) = 5.2 PEAK FLOW RATE(CFS) = 15.81 END OF SUBAREA CHANNEL FLOW HYDRAULICS: DEPTH(FEET) = 0.21 FLOW VELOCITY(FEET/SEC.) = 3.65
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 895.00 FEET.
FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 41
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
ELEVATION DATA: UPSTREAM(FEET) = 331.83 DOWNSTREAM(FEET) = 330.00 FLOW LENGTH(FEET) = 214.00 MANNING'S N = 0.013 DEPTH OF FLOW IN 24.0 INCH PIPE IS 16.2 INCHES PIPE-FLOW VELOCITY(FEET/SEC.) = 7.01 GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1 PIPE-FLOW(CFS) = 15.81 PIPE TRAVEL TIME(MIN.) = 0.51 Tc(MIN.) = 9.91 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 1109.00 FEET.
FLOW PROCESS FROM NODE 203.00 TO NODE 204.00 IS CODE = 81
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.467 *USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C. S. CURVE NUMBER (AMC II) = 72 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500 SUBAREA AREA (ACRES) = 0.20 SUBAREA RUNOFF (CFS) = 0.59 TOTAL AREA (ACRES) = 5.4 TOTAL RUNOFF (CFS) = 15.97

FLOW PROCESS FROM NODE 204.00 TO NODE 204.00 IS CODE = 10 >>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<< \_\_\_\_\_\_ \* FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 22 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS< \*USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72 USER SPECIFIED Tc (MIN.) = 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF(CFS) = 0.75 TOTAL AREA (ACRES) = 0.20 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 211.00 TO NODE 212.00 IS CODE = 51 >>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW< >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT) < \_\_\_\_\_ ELEVATION DATA: UPSTREAM(FEET) = 344.00 DOWNSTREAM(FEET) = 343.00 CHANNEL LENGTH THRU SUBAREA(FEET) = 238.00 CHANNEL SLOPE = 0.0042 CHANNEL BASE (FEET) = 10.00 "Z" FACTOR = 50.000 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 1.00 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.691 \*USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.06
AVERAGE FLOW DEPTH(FEET) = 0.09 TRAVEL TIME(MIN.) = 3.73 Tc (MIN.) = 8.73 SUBAREA AREA(ACRES) = 0.46 SUBAREA RUNOFF(CFS) = 1.44 AREA-AVERAGE RUNOFF COEFFICIENT = 0.850 PEAK FLOW RATE(CFS) = TOTAL AREA (ACRES) = 0.7 END OF SUBAREA CHANNEL FLOW HYDRAULICS: DEPTH(FEET) = 0.11 FLOW VELOCITY(FEET/SEC.) = 1.22 LONGEST FLOWPATH FROM NODE 210.00 TO NODE 212.00 = 452 00 FEET \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* FLOW PROCESS FROM NODE 212.00 TO NODE 213.00 IS CODE = 41 \_\_\_\_\_\_ >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA< >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<< \_\_\_\_\_\_ ELEVATION DATA: UPSTREAM(FEET) = 335.72 DOWNSTREAM(FEET) = 332.60 FLOW LENGTH (FEET) = 296.00 MANNING'S N = 0.013 ASSUME FULL-FLOWING PIPELINE PIPE-FLOW VELOCITY (FEET/SEC.) = 3.07 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW AT DEPTH = 0.94 \* DIAMETER) GIVEN PIPE DIAMETER (INCH) = 6.00 NUMBER OF PIPES = 1 PIPE-FLOW(CFS) = 2.07 PIPE TRAVEL TIME (MIN.) = 1.61 Tc (MIN.) = 10.34 LONGEST FLOWPATH FROM NODE 210.00 TO NODE 213.00 = 748.00 FEET. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* FLOW PROCESS FROM NODE 213.00 TO NODE 213.00 IS CODE = 81

\*

3

TC(MIN.) = 9.91

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<
100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.413 *USER SPECIFIED (GLOBAL): NBIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500 SUBAREA AREA (ACRES) = 0.70 SUBAREA RUNOFF (CFS) = 2.03 TOTAL AREA (ACRES) = 1.4 TOTAL RUNOFF (CFS) = 3.94 TC (MIN.) = 10.34
FLOW PROCESS FROM NODE 213.00 TO NODE 214.00 IS CODE = 41
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<>>>> >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)
ELEVATION DATA: UPSTREAM(FEET) = 332.60 DOWNSTREAM(FEET) = 330.00 FLOW LENGTH (FEET) = 55.00 MANNING'S N = 0.013 DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.3 INCHES PIPE-FLOW VELOCITY(FEET/SEC.) = 9.52 GIVEN PIPE DIAMETER (INCH) = 12.00 NUMBER OF PIPES = 1 PIPE-FLOW(CFS) = 3.94 PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 10.44 LONGEST FLOWPATH FROM NODE 210.00 TO NODE 214.00 = 803.00 FEET.
**************************************
>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY
** MAIN STREAM CONFLUENCE DATA ** STREAM RUNOFF TC INTENSITY AREA NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE) 1 3.94 10.44 3.402 1.36 LONGEST FLOWPATH FROM NODE 210.00 TO NODE 204.00 = 803.00 FEET.
** MEMORY BANK # 1 CONFLUENCE DATA ** STREAM RUNOFF TC INTENSITY AREA NUMBER (CFS) (MIN.) (INCH/HOUR) (ACRE) 1 15.97 9.91 3.467 5.42 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 204.00 = 1109.00 FEET.
** PEAK FLOW RATE TABLE ** STREAM RUNOFF TC INTENSITY NUMBER (CFS) (MIN.) (INCH/HOUR) 1 19.72 9.91 3.467 2 19.62 10.44 3.402
COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS: PEAK FLOW RATE(CFS) = 19.72 Tc(MIN.) = 9.91 TOTAL AREA(ACRES) = 6.8
FLOW PROCESS FROM NODE 204.00 TO NODE 205.00 IS CODE = 41
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<>>>> >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <>>>>
ELEVATION DATA: UPSTREAM(FEET) = 328.50 DOWNSTREAM(FEET) = 328.00 FLOW LENGTH(FEET) = 26.00 MANNING'S N = 0.013 DEPTH OF FLOW IN 24.0 INCH PIPE IS 14.3 INCHES PIPE-FLOW VELOCITY(FEET/SEC.) = 10.13 GIVEN PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1

PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 9.95 LONGEST FLOWPATH FROM NODE 200.00 TO NODE 205.00 = 1135.00 FEET. \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 22 \_\_\_\_\_\_ >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS< \*USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72 USER SPECIFIED Tc (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 0.15
TOTAL AREA (ACRES) = 0.04 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 51 >>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW< >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT) < \_\_\_\_\_ ELEVATION DATA: UPSTREAM(FEET) = 350.00 DOWNSTREAM(FEET) = 346.00 CHANNEL LENGTH THRU SUBAREA(FEET) = 93.00 CHANNEL SLOPE = 0.0430 CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 50.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 1.00 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.191 \*USER SPECIFIED (GLOBAL): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500 S.C.S. CURVE NUMBER (AMC II) = 72 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.41
AVERAGE FLOW DEPTH(FEET) = 0.02 TRAVEL TIME(MIN.) = 1.10 Tc(MIN.) = 6.10SUBAREA AREA(ACRES) = 0.09 SUBAREA RUNOFF(CFS) = 0.32 AREA-AVERAGE RUNOFF COEFFICIENT = 0.850 PEAK FLOW RATE(CFS) = TOTAL AREA (ACRES) = 0.1 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.03 FLOW VELOCITY(FEET/SEC.) = 1.59 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 119.00 FEET. \* FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 41 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA< >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<< ELEVATION DATA: UPSTREAM(FEET) = 342.00 DOWNSTREAM(FEET) = 339.02 FLOW LENGTH (FEET) = 370.00 MANNING'S N = 0.013 DEPTH OF FLOW IN 6.0 INCH PIPE IS 4.7 INCHES PIPE-FLOW VELOCITY (FEET/SEC.) = 2.78
GIVEN PIPE DIAMETER (INCH) = 6.00 NUMBER OF PIPES = 1 PIPE-FLOW(CFS) = 0.46 PIPE TRAVEL TIME(MIN.) = 2.22 Tc(MIN.) = 8.32 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW< 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.769 \*USER SPECIFIED (GLOBAL):

PIPE-FLOW(CFS) =

19.72

5

```
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) = 72
AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
 SUBAREA AREA (ACRES) = 0.52 SUBAREA RUNOFF (CFS) = 1.67
TOTAL AREA (ACRES) = 0.6 TOTAL RUNOFF (CFS) = 2.08
 TC(MIN.) = 8.32
************************
 FLOW PROCESS FROM NODE 303.00 TO NODE 304.00 IS CODE = 41
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <<<<
           -----
 ELEVATION DATA: UPSTREAM(FEET) = 339.02 DOWNSTREAM(FEET) = 338.37
 FLOW LENGTH(FEET) = 33.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 5.6 INCHES
 PIPE-FLOW VELOCITY (FEET/SEC.) = 5.83
 GIVEN PIPE DIAMETER (INCH) = 12.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.08
PIPE TRAVEL TIME(MIN.) = 0.09 Tc(MIN.) = 8.42
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 304.00 =
*************************
 FLOW PROCESS FROM NODE 304.00 TO NODE 305.00 IS CODE = 41
 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT) <>>>
______
 ELEVATION DATA: UPSTREAM(FEET) = 338.37 DOWNSTREAM(FEET) = 326.10
 FLOW LENGTH (FEET) = 318.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 3.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.45
GIVEN PIPE DIAMETER(INCH) = 42.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.08

PIPE TRAVEL TIME(MIN.) = 0.82 To(MIN.) = 9.24

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 305.00 =
                                                     840.00 FEET.
*******************
 FLOW PROCESS FROM NODE 305.00 TO NODE 305.00 IS CODE = 81
______
 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<>>>
______
  100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 3.595
 *USER SPECIFIED(GLOBAL):
 NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) = 72
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8500
SUBAREA AREA(ACRES) = 0.51 SUBAREA RUNOFF(CFS) = 1.56
TOTAL AREA(ACRES) = 1.2 TOTAL RUNOFF(CFS) = 3.54
 TC (MIN.) = 9.24
END OF STUDY SUMMARY:
 TOTAL AREA (ACRES) = 1.2
PEAK FLOW RATE (CFS) = 3.54
                           1.2 TC(MIN.) = 9.24
-----
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END OF RATIONAL METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT 2003,1985,1981 HYDROLOGY MANUAL

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Analysis prepared by:

PASCO LARET SUITER & ASSOCIATES 535 NORTH HIGHWAY 101, STE A SOLANA BEACH, CA 92075 858-259-8212

**************************************						
USER SPECIFIED STORM EVENT (YEAR) = 100.00  SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00  SPECIFIED PERCENT OF GRADIENTS (DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000  *USER SPECIFIED:  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 9  1) 5.000; 4.400  2) 10.000; 3.450  3) 15.000; 2.900  4) 20.000; 2.500  5) 25.000; 2.200  6) 30.000; 1.700  8) 50.000; 1.700  8) 50.000; 1.700  8) 50.000; 1.300  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD NOTE: ONLY PEAK CONFIDENCE  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*  HALF- CROWN TO STREET-CROSSFALL: CURB GUTTER-GEOMETRIES: MANNING WIDTH CROSSFALL IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR						
NO. (FT) (FT) SIDE / SIDE / WAY (FT) (FT) (FT) (n)						
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0313 0.167 0.0150						
GLOBAL STREET FLOW-DEPTH CONSTRAINTS:  1. Relative Flow-Depth = 0.00 FEET     as (Maximum Allowable Street Flow Depth) - (Top-of-Curb) 2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*						
******************						
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 22						
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS						
*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .7500						

1

S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBARRA RUNOFF (CFS) = 7.99
TOTAL AREA (ACRES) = 2.42 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 22 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS< \*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5200 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc (MIN.) = 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 3.16 TOTAL AREA (ACRES) = 1.38 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 22 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS \*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5200 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 4.30
TOTAL AREA (ACRES) = 1.88 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 400.00 TO NODE 401.00 IS CODE = 22 \_\_\_\_\_\_ >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS< \_\_\_\_\_ \*USER SPECIFIED (SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5000 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 1.87
TOTAL AREA(ACRES) = 0.85 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 500.00 TO NODE 501.00 IS CODE = 22 \_\_\_\_\_\_ >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS \*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5000 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED TC(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 1.30

TOTAL AREA (ACRES) = 0.59 TOTAL RUNOFF (CFS) = \* FLOW PROCESS FROM NODE 600.00 TO NODE 601.00 IS CODE = 22 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS \*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5000

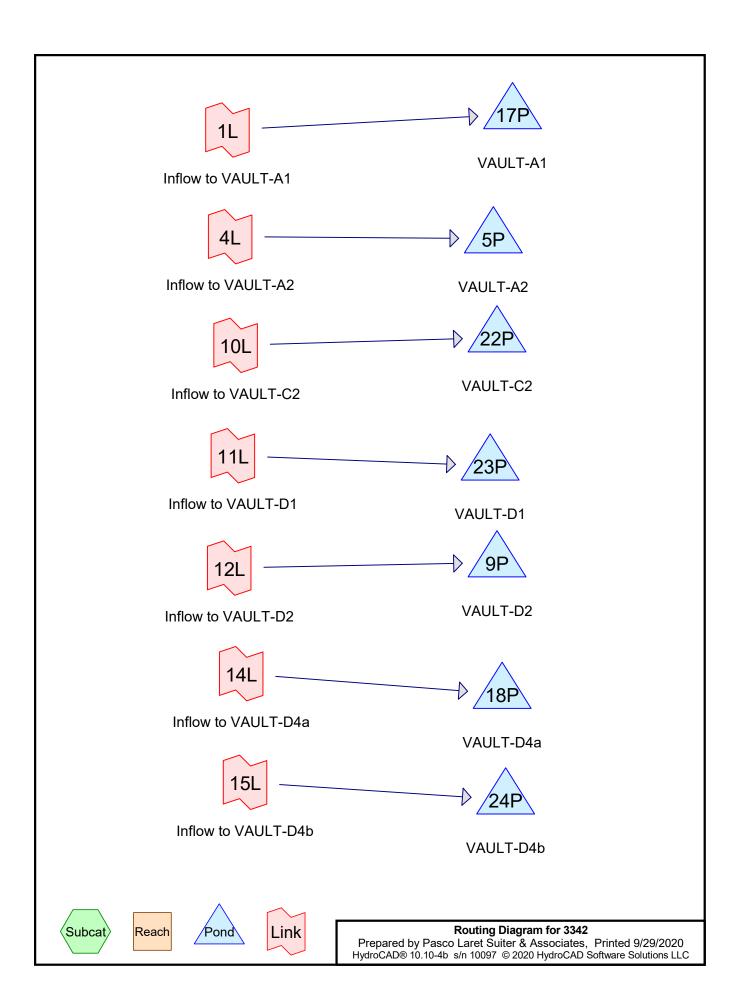
USER SPECIFIED Tc(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.400 SUBAREA RUNOFF(CFS) = 2.88 TOTAL AREA(ACRES) = 1.31 TOTAL RUNOFF(CFS) = 2.88
FLOW PROCESS FROM NODE 700.00 TO NODE 701.00 IS CODE = 22
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS
*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5500 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED TC(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.400 SUBAREA RUNOFF(CFS) = 9.99 TOTAL AREA(ACRES) = 4.13 TOTAL RUNOFF(CFS) = 9.99
FLOW PROCESS FROM NODE 800.00 TO NODE 801.00 IS CODE = 22
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS
*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5100 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED TC (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 7.58 TOTAL AREA (ACRES) = 3.38 TOTAL RUNOFF (CFS) = 7.58
FLOW PROCESS FROM NODE 900.00 TO NODE 901.00 IS CODE = 22
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS
*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6300 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED TC (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 9.42 TOTAL AREA (ACRES) = 3.40 TOTAL RUNOFF (CFS) = 9.42
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6300 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.400 SUBAREA RUNOFF(CFS) = 9.42 TOTAL AREA (ACRES) = 3.40 TOTAL RUNOFF(CFS) = 9.42
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6300 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED To(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 9.42 TOTAL AREA(ACRES) = 3.40 TOTAL RUNOFF (CFS) = 9.42  FLOW PROCESS FROM NODE 1000.00 TO NODE 1001.00 IS CODE = 22
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6300 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.400 SUBAREA RUNOFF(CFS) = 9.42 TOTAL AREA(ACRES) = 3.40 TOTAL RUNOFF(CFS) = 9.42 FLOW PROCESS FROM NODE 1000.00 TO NODE 1001.00 IS CODE = 22
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6300 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 9.42 TOTAL AREA (ACRES) = 3.40 TOTAL RUNOFF (CFS) = 9.42  FLOW PROCESS FROM NODE 1000.00 TO NODE 1001.00 IS CODE = 22  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSISS
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6300 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED To(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBARDA RUNOFF (CFS) = 9.42 TOTAL AREA(ACRES) = 3.40 TOTAL RUNOFF (CFS) = 9.42  **TOTAL AREA(ACRES) = 10.00.00 TO NODE 1001.00 IS CODE = 22  **DESTRUCTIONAL METHOD INITIAL SUBARBA ANALYSIS<***  **USER SPECIFIED(SUBARBA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5000 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED To(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBARBA RUNOFF (CFS) = 1.12 TOTAL AREA(ACRES) = 0.51 TOTAL RUNOFF (CFS) = 1.12  **FLOW PROCESS FROM NODE 1100.00 TO NODE 1101.00 IS CODE = 22
NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6300 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 9.42 TOTAL AREA (ACRES) = 3.40 TOTAL RUNOFF (CFS) = 9.42  ***FLOW PROCESS FROM NODE 1000.00 TO NODE 1001.00 IS CODE = 22  >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<***  **USER SPECIFIED (SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .5000 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED Tc(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 1.12 TOTAL AREA (ACRES) = 0.51 TOTAL RUNOFF (CFS) = 1.12

S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED TC (MIN.) = 5.000 100 YEAR RAINFALL INTENSITY (INCH/HOUR) = 4.400 SUBAREA RUNOFF (CFS) = 2.86 TOTAL AREA (ACRES) = 1.14 TOTAL RUNOFF (CFS) = 2.86
FLOW PROCESS FROM NODE 1200.00 TO NODE 1201.00 IS CODE = 22
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS
*USER SPECIFIED(SUBAREA): NEIGHBORHOOD COMMERCIAL RUNOFF COEFFICIENT = .6800 S.C.S. CURVE NUMBER (AMC II) = 0 USER SPECIFIED TC(MIN.) = 5.000 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.400 SUBAREA RUNOFF(CFS) = 1.35 TOTAL AREA(ACRES) = 0.45 TOTAL RUNOFF(CFS) = 1.35
END OF STUDY SUMMARY: TOTAL AREA (ACRES) = 0.4 TC (MIN.) = 5.00 PEAK FLOW RATE (CFS) = 1.35
END OF RATIONAL METHOD ANALYSIS



Appendix 3

Detention Output



## Summary for Link 1L: Inflow to VAULT-A1

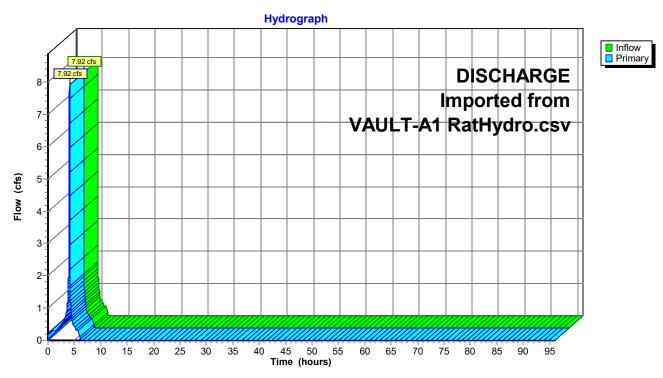
Inflow = 7.92 cfs @ 4.08 hrs, Volume= 0.349 af

Primary = 7.92 cfs @ 4.08 hrs, Volume= 0.349 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

DISCHARGE Imported from VAULT-A1 RatHydro.csv

Link 1L: Inflow to VAULT-A1



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### **Summary for Pond 17P: VAULT-A1**

Inflow = 7.92 cfs @ 4.08 hrs, Volume= 0.349 af

Outflow = 6.19 cfs @ 4.11 hrs, Volume= 0.349 af, Atten= 22%, Lag= 1.8 min

Primary = 6.19 cfs @ 4.11 hrs, Volume= 0.349 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.55' @ 4.11 hrs Surf.Area= 1,700 sf Storage= 9,428 cf

Plug-Flow detention time= 539.6 min calculated for 0.349 af (100% of inflow)

Center-of-Mass det. time= 539.6 min ( 751.1 - 211.5 )

Volume	Inve	t Avail.Sto	rage Storage	Description		
#1	100.00	9,63	39 cf Custom	Stage Data (Coni	c) Listed below (Red	calc)
Elevatio		Surf.Area	Inc.Store	Cum.Store	Wet.Area	
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)	
100.0		1,700	0	0	1,700	
101.0	00	1,700	1,700	1,700	1,846	
102.0	00	1,700	1,700	3,400	1,992	
103.0	00	1,700	1,700	5,100	2,138	
104.0	00	1,700	1,700	6,800	2,285	
105.1	17	1,700	1,989	8,789	2,456	
105.6	67	1,700	850	9,639	2,529	
Device	Routing	Invert	Outlet Device	S		
#1	Primary	100.00'	12.0" Round	Culvert		
	,				ecting, Ke= 0.200	
					0.90' S= 0.0100 '/'	Cc= 0.900
				w Area= 0.79 sf		
#2	Device 1	100.00'	,		imited to weir flow a	t low heads
#3	Device 1	105.17'		, Cv= 2.62 (C= 3.2		
	Head (feet) 0.00 0.50					
			` ,	3.00 8.00 0.00		

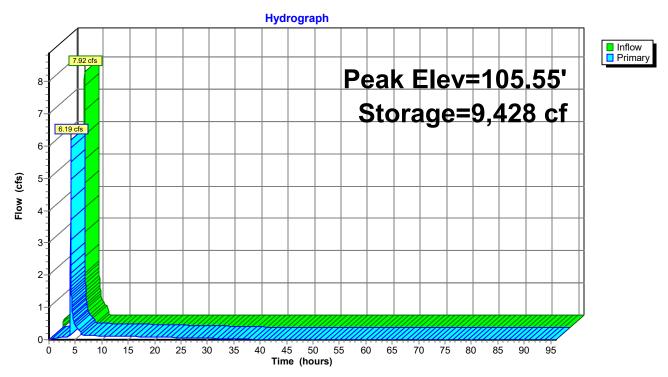
Primary OutFlow Max=6.15 cfs @ 4.11 hrs HW=105.54' (Free Discharge)

**1=Culvert** (Passes 6.15 cfs of 10.62 cfs potential flow)

**2=Orifice** (Orifice Controls 0.14 cfs @ 11.27 fps)

-3=Custom Weir (Weir Controls 6.02 cfs @ 2.01 fps)

## Pond 17P: VAULT-A1



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## **Summary for Link 4L: Inflow to VAULT-A2**

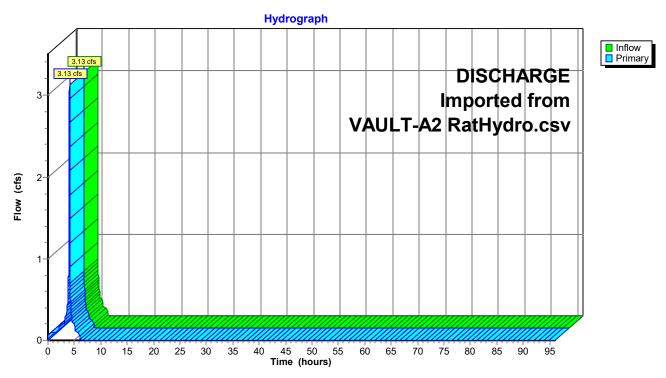
Inflow = 3.13 cfs @ 4.08 hrs, Volume= 0.135 af

Primary = 3.13 cfs @ 4.08 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

DISCHARGE Imported from VAULT-A2 RatHydro.csv

**Link 4L: Inflow to VAULT-A2** 



## **Summary for Pond 5P: VAULT-A2**

Inflow 3.13 cfs @ 4.08 hrs, Volume= 0.135 af

4.08 hrs, Volume= 4.08 hrs, Volume= Outflow = 3.06 cfs @ 0.135 af, Atten= 2%, Lag= 0.4 min

Primary = 3.06 cfs @ 0.135 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.46' @ 4.08 hrs Surf.Area= 500 sf Storage= 2,728 cf

Plug-Flow detention time= 353.2 min calculated for 0.135 af (100% of inflow)

Center-of-Mass det. time= 353.0 min ( 566.8 - 213.7 )

Volume	Inv	ert Avail.	.Storage	Storage	Description		
#1	100.0	00'	2,835 cf	Custon	n Stage Data (Co	nic) Listed below	(Recalc)
Elevatio		Surf.Area (sq-ft)		Store c-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
100.0		500	(	0	0	500	
101.0		500		500	500	579	
102.0	00	500		500	1,000	659	
103.0	00	500		500	1,500	738	
104.00		500		500	2,000	817	
105.17		500		585	2,585	910	
105.67		500		250	2,835	949	
Device	Routing	Inv	ert Outle	et Device	es		
#1	Primary	100.	00' <b>12.0</b> '	' Round	d Culvert		
	,		L= 1	0.0' RC	P, groove end pro	ojecting, Ke= 0.2	200
		Inlet	Inlet / Outlet Invert= 100.00' / 99.90' S= 0.0100 '/' Cc= 0.900				
				,	ow Area= 0.79 sf		
#2	Device 1				ifice C= 0.600		ow at low heads
#3 Device 1 105.17' <b>Custom Weir, Cv= 2.62 (C= 3.28)</b>							
				` ,	0.00 0.50 0.50		
			VVIdt	n (feet)	6.00 6.00 0.00		

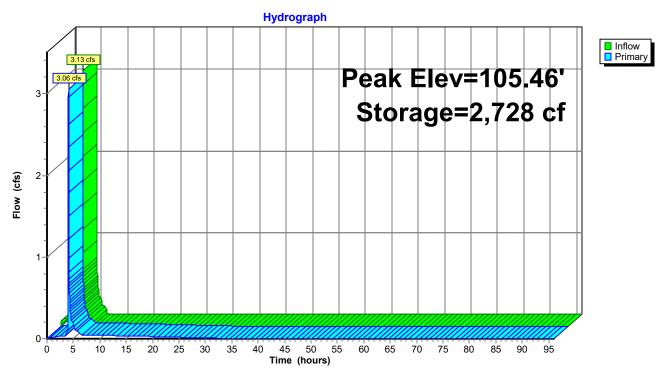
Primary OutFlow Max=3.04 cfs @ 4.08 hrs HW=105.46' (Free Discharge)

**-1=Culvert** (Passes 3.04 cfs of 10.52 cfs potential flow)

**-2=Orifice** (Orifice Controls 0.05 cfs @ 11.21 fps)

-3=Custom Weir (Weir Controls 2.99 cfs @ 1.75 fps)

Pond 5P: VAULT-A2



## **Summary for Link 10L: Inflow to VAULT-C2**

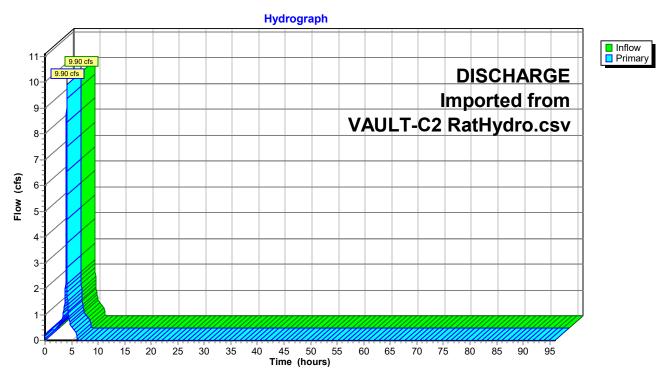
Inflow = 9.90 cfs @ 4.08 hrs, Volume= 0.432 af

Primary = 9.90 cfs @ 4.08 hrs, Volume= 0.432 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

DISCHARGE Imported from VAULT-C2 RatHydro.csv

Link 10L: Inflow to VAULT-C2



### **Summary for Pond 22P: VAULT-C2**

Inflow 9.90 cfs @ 4.08 hrs, Volume= 0.432 af

4.52 hrs, Volume= 4.52 hrs, Volume= 0.432 af, Atten= 92%, Lag= 26.7 min Outflow = 0.77 cfs @

Primary = 0.77 cfs @ 0.432 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 107.10' @ 4.52 hrs Surf.Area= 2,000 sf Storage= 14,192 cf

Plug-Flow detention time= 661.1 min calculated for 0.432 af (100% of inflow)

Center-of-Mass det. time= 661.5 min ( 873.5 - 212.0 )

Volume	Invert	Avail.Sto	rage Storage D	Description			
#1	100.00'	20,00	00 cf Custom S	Stage Data (Conic	) Listed below (Reca	ılc)	
Elevatio (fee		urf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)		
100.0	·	2,000	Ó	0	2,000		
101.0		2,000	2,000	2,000	2,159		
102.0	0	2,000	2,000	4,000	2,317		
103.0	0	2,000	2,000	6,000	2,476		
104.0	0	2,000	2,000	8,000	2,634		
104.5	0	2,000	1,000	9,000	2,713		
105.0		2,000	1,000	10,000	2,793		
106.0		2,000	2,000	12,000	2,951		
107.0		2,000	2,000	14,000	3,110		
108.0		2,000	2,000	16,000	3,268		
109.0		2,000	2,000	18,000	3,427		
109.5		2,000	1,000	19,000	3,506		
110.0	0	2,000	1,000	20,000	3,585		
Device	Routing	Invert	Outlet Devices				
#1	Primary	100.00'	Inlet / Outlet In	, groove end proje vert= 100.00' / 99.	ecting, Ke= 0.200 90' S= 0.0100 '/' C	c= 0.900	
#2 #3	Device 1 Device 1	100.00' 104.50'	n= 0.013, Flow Area= 1.77 sf  1.4" Vert. Orifice    C= 0.600    Limited to weir flow at low heads  6.0" W x 2.0" H Vert. Orifice    C= 0.600  Limited to weir flow at low heads				
#4	Device 1	109.50'	Custom Weir, Head (feet) 0.0	Cv= 2.62 (C= 3.28			

Primary OutFlow Max=0.77 cfs @ 4.52 hrs HW=107.10' (Free Discharge)

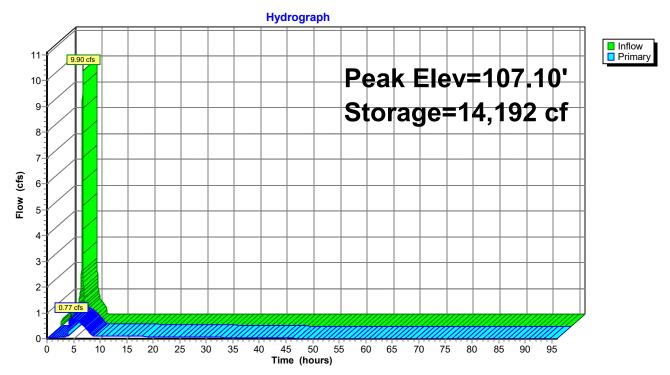
**-1=Culvert** (Passes 0.77 cfs of 26.79 cfs potential flow)

**2=Orifice** (Orifice Controls 0.14 cfs @ 12.77 fps)

-3=Orifice (Orifice Controls 0.64 cfs @ 7.63 fps)

**-4=Custom Weir** (Controls 0.00 cfs)

## Pond 22P: VAULT-C2



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## **Summary for Link 11L: Inflow to VAULT-D1**

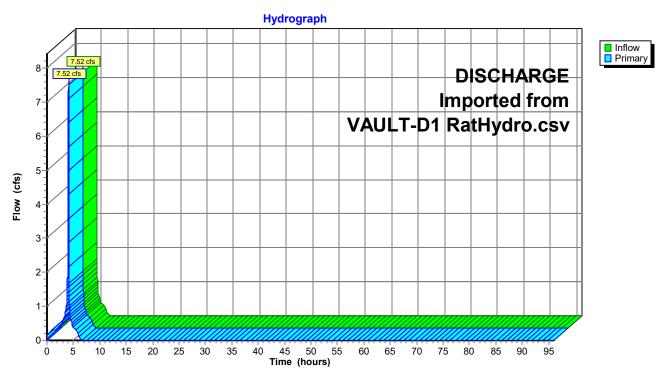
Inflow = 7.52 cfs @ 4.08 hrs, Volume= 0.328 af

Primary = 7.52 cfs @ 4.08 hrs, Volume= 0.328 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

DISCHARGE Imported from VAULT-D1 RatHydro.csv

**Link 11L: Inflow to VAULT-D1** 



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### **Summary for Pond 23P: VAULT-D1**

Inflow 7.52 cfs @ 4.08 hrs, Volume= 0.328 af

Outflow 4.14 hrs, Volume= 0.328 af, Atten= 52%, Lag= 3.7 min 3.64 cfs @

4.14 hrs, Volume= Primary 3.64 cfs @ 0.328 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.39' @ 4.14 hrs Surf.Area= 1,800 sf Storage= 9,711 cf

Plug-Flow detention time= 628.4 min calculated for 0.328 af (100% of inflow)

Center-of-Mass det. time= 628.8 min ( 840.8 - 212.0 )

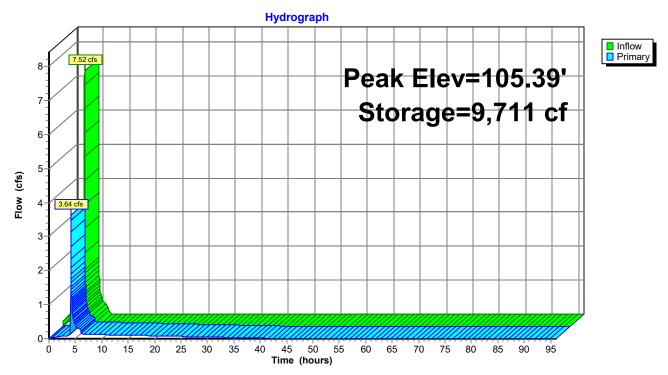
Volume	Inve	ert Avail.St	orage Storage	e Description		
#1	100.0	00' 10,2	206 cf Custon	n Stage Data (Cor	<b>nic)</b> Listed below (R	lecalc)
Elevatio		Surf.Area	Inc.Store	Cum.Store	Wet.Area	
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)	
100.0	00	1,800	0	0	1,800	
101.0	00	1,800	1,800	1,800	1,950	
102.0	00	1,800	1,800	3,600	2,101	
103.0	00	1,800	1,800	5,400	2,251	
104.0	00	1,800	1,800	7,200	2,402	
105.0	00	1,800	1,800	9,000	2,552	
105.1	17	1,800	306	9,306	2,578	
105.6	67	1,800	900	10,206	2,653	
Device	Routing	Invert	Outlet Device	es		
#1	Primary	100.00'	12.0" Round	d Culvert		
	,			P. groove end pro	ejecting, Ke= 0.200	
					9.90' S= 0.0100'/	
				ow Area= 0.79 sf		
#2	Device 1	100.00	•		Limited to weir flow	at low heads
#3	Device 1	105.17	<b>Custom Wei</b>	r, Cv= 2.62 (C= 3.	.28)	
				0.00 0.50 0.50	,	
			` ,	10.00 10.00 0.00	)	

Primary OutFlow Max=3.62 cfs @ 4.14 hrs HW=105.39' (Free Discharge)

**-1=Culvert** (Passes 3.62 cfs of 10.46 cfs potential flow)

2=Orifice (Orifice Controls 0.14 cfs @ 11.12 fps)
3=Custom Weir (Weir Controls 3.48 cfs @ 1.55 fps)

## Pond 23P: VAULT-D1



## **Summary for Link 12L: Inflow to VAULT-D2**

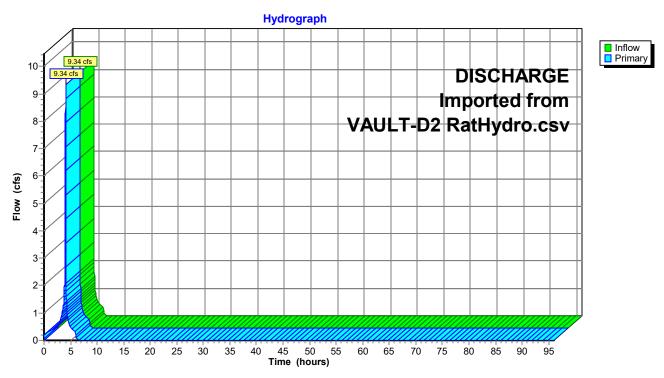
Inflow = 9.34 cfs @ 4.08 hrs, Volume= 0.409 af

Primary = 9.34 cfs @ 4.08 hrs, Volume= 0.409 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

DISCHARGE Imported from VAULT-D2 RatHydro.csv

**Link 12L: Inflow to VAULT-D2** 



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## **Summary for Pond 9P: VAULT-D2**

Inflow 9.34 cfs @ 4.08 hrs, Volume= 0.409 af

Outflow 4.09 hrs. Volume= 0.409 af, Atten= 6%, Lag= 0.7 min 8.81 cfs @

4.09 hrs, Volume= Primary 8.81 cfs @ 0.409 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.58' @ 4.09 hrs Surf.Area= 1,800 sf Storage= 10,047 cf

Plug-Flow detention time= 513.3 min calculated for 0.409 af (100% of inflow)

Center-of-Mass det. time= 513.2 min ( 725.3 - 212.1 )

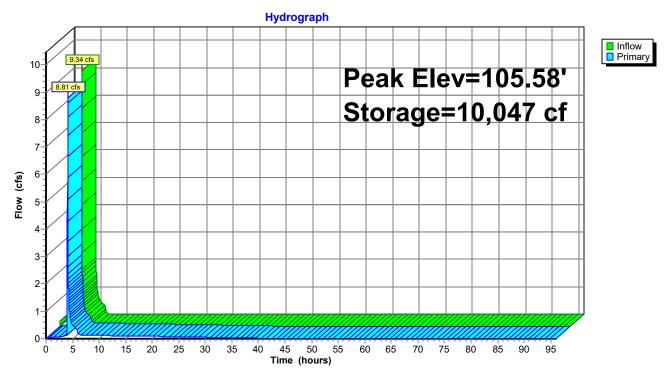
Volume	Inve	ert Avail.Sto	rage Storage	Description			
#1	#1 100.00' 10,206 cf		06 cf Custom	f Custom Stage Data (Conic) Listed below (Recalc)			
Elevation		Surf.Area	Inc.Store	Cum.Store	Wet.Area		
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)		
100.0	00	1,800	0	0	1,800		
101.0	00	1,800	1,800	1,800	1,950		
102.0	00	1,800	1,800	3,600	2,101		
103.0	00	1,800	1,800	5,400	2,251		
104.0	00	1,800	1,800	7,200	2,402		
105.00		1,800	1,800	9,000	2,552		
105.17		1,800	306	9,306	2,578		
105.67		1,800	900	10,206	2,653		
Device	Routing	Invert	Outlet Devices	S			
#1	Primary	100.00'	12.0" Round	Culvert			
,, .	· ······ary	100.00	L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 100.00' / 99.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf				
#2 #3	Device 1 Device 1	100.00' 105.17'	Custom Weir, Head (feet) 0.	ice C= 0.600 Li Cv= 2.62 (C= 3.28 .00 0.50 0.50 0.00 10.00 0.00	mited to weir flow at l	ow heads	

Primary OutFlow Max=8.79 cfs @ 4.09 hrs HW=105.58' (Free Discharge)

**-1=Culvert** (Passes 8.79 cfs of 10.66 cfs potential flow)

2=Orifice (Orifice Controls 0.14 cfs @ 11.31 fps)
3=Custom Weir (Weir Controls 8.65 cfs @ 2.10 fps)

## Pond 9P: VAULT-D2



## Summary for Link 14L: Inflow to VAULT-D4a

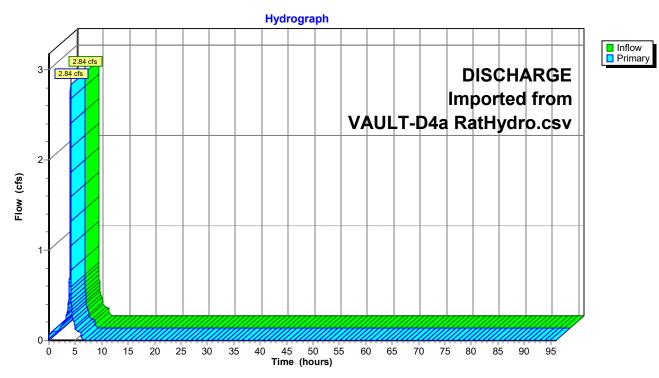
Inflow = 2.84 cfs @ 4.08 hrs, Volume= 0.122 af

Primary = 2.84 cfs @ 4.08 hrs, Volume= 0.122 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

DISCHARGE Imported from VAULT-D4a RatHydro.csv

Link 14L: Inflow to VAULT-D4a



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## **Summary for Pond 18P: VAULT-D4a**

Inflow 2.84 cfs @ 4.08 hrs, Volume= 0.122 af

Outflow 4.45 hrs, Volume= 0.122 af, Atten= 91%, Lag= 22.2 min 0.26 cfs @

4.45 hrs, Volume= Primary 0.26 cfs @ 0.122 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 104.17' @ 4.45 hrs Surf.Area= 1,000 sf Storage= 4,171 cf

Plug-Flow detention time= 1,152.6 min calculated for 0.122 af (100% of inflow)

Center-of-Mass det. time= 1,152.6 min (1,364.9 - 212.3)

Volume	Inve	ert Avail.Sto	rage Storage	Description		
#1	100.0	00' 5,6	70 cf Custom	Stage Data (Coni	c) Listed below (Re	calc)
Elevation		Surf.Area	Inc.Store	Cum.Store	Wet.Area	
(fee	et)	(sq-ft)	(cubic-feet)	(cubic-feet)	(sq-ft)	
100.0	00	1,000	0	0	1,000	
101.0	00	1,000	1,000	1,000	1,112	
102.0	00	1,000	1,000	2,000	1,224	
103.0	00	1,000	1,000	3,000	1,336	
104.0	00	1,000	1,000	4,000	1,448	
105.0	00	1,000	1,000	5,000	1,560	
105.1	17	1,000	170	5,170	1,580	
105.6	67	1,000	500	5,670	1,636	
Device	Routing	Invert	Outlet Device	s		
#1	Primary	100.00'	12.0" Round	Culvert		
	•		L= 10.0' RCF	P, groove end proje	ecting, Ke= 0.200	
			Inlet / Outlet I	nvert= 100.00' / 99	.90' S= 0.0100 '/'	Cc= 0.900
			n= 0.013, Flo	w Area= 0.79 sf		
#2	Device 1	100.00'	0.8" Vert. Ori	fice C= 0.600 Li	imited to weir flow	at low heads
#3	Device 1	104.00'	12.0" W x 3.0	" H Vert. Orifice	C= 0.600	
			Limited to wei	r flow at low heads	3	
#4	Device 1	105.17'	<b>Custom Weir</b>	, Cv= 2.62 (C= 3.2	8)	
			Head (feet) 0	.00 0.50 0.50		
			Width (feet) 5	5.00 5.00 0.00		

Primary OutFlow Max=0.26 cfs @ 4.45 hrs HW=104.17' (Free Discharge)

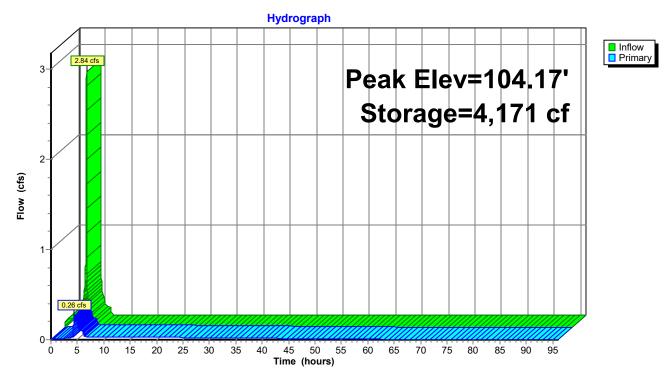
**-1=Culvert** (Passes 0.26 cfs of 9.06 cfs potential flow)

**2=Orifice** (Orifice Controls 0.03 cfs @ 9.79 fps)

-3=Orifice (Orifice Controls 0.23 cfs @ 1.33 fps)

**-4=Custom Weir** (Controls 0.00 cfs)

Pond 18P: VAULT-D4a



## Summary for Link 15L: Inflow to VAULT-D4b

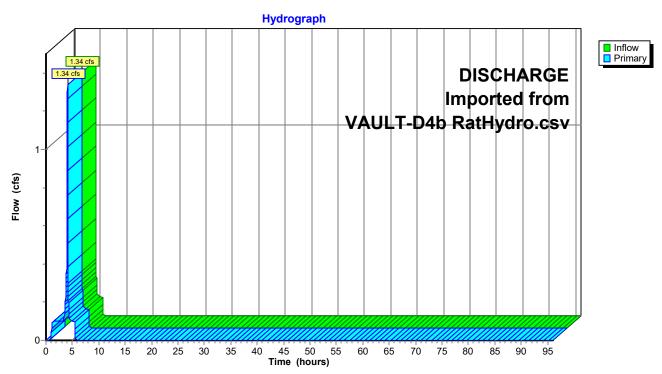
Inflow = 1.34 cfs @ 4.08 hrs, Volume= 0.060 af

Primary = 1.34 cfs @ 4.08 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

DISCHARGE Imported from VAULT-D4b RatHydro.csv

Link 15L: Inflow to VAULT-D4b



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## **Summary for Pond 24P: VAULT-D4b**

Inflow = 1.34 cfs @ 4.08 hrs, Volume= 0.060 af

Outflow =  $0.10 \text{ cfs } \overline{\textcircled{0}}$  5.50 hrs, Volume= 0.060 af, Atten= 93%, Lag= 85.3 min

Primary = 0.10 cfs @ 5.50 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs Peak Elev= 105.20' @ 5.50 hrs Surf.Area= 400 sf Storage= 2,081 cf

Plug-Flow detention time= 731.9 min calculated for 0.060 af (100% of inflow)

Center-of-Mass det. time= 732.1 min ( 946.1 - 214.0 )

Volume	Inv	ert Avail.S	torage	Storage	Description			
#1	100.0	00' 2,	268 cf	Custon	n Stage Data (Cor	nic) Listed below	(Recalc)	
Elevation (fee		Surf.Area (sq-ft)		Store -feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)		
100.0	00	400	`	Ó	0	400		
101.0		400		400	400	471		
102.0	00	400		400	800	542		
103.0	00	400		400	1,200	613		
104.0	00	400		400	1,600	684		
105.1	17	400		468	2,068	767		
105.6	67	400		200	2,268	802		
Device	Routing	Inver	t Outle	et Device	es			
#1	Primary	100.00	)' <b>12.0'</b>	' Round	l Culvert			
	•				P, groove end pro			
			Inlet / Outlet Invert= 100.00' / 99.90' S= 0.0100 '/' Cc= 0.900					
				•	ow Area= 0.79 sf			
#2	Device 1		_		ifice C= 0.600		ow at low heads	
#3	Device 1	105.17			r, Cv= 2.62 (C= 3.	28)		
				` ,	0.00 0.50 0.50			
			vviati	n (reet)	3.00 3.00 0.00			

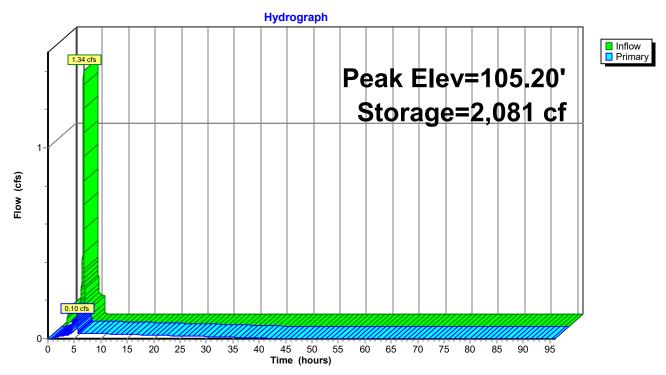
Primary OutFlow Max=0.09 cfs @ 5.50 hrs HW=105.20' (Free Discharge)

**1=Culvert** (Passes 0.09 cfs of 10.25 cfs potential flow)

**2=Orifice** (Orifice Controls 0.03 cfs @ 10.95 fps)

**-3=Custom Weir** (Weir Controls 0.06 cfs @ 0.60 fps)

## Pond 24P: VAULT-D4b





Summit Pointe Plaza Grading Plans, PTS 6109

## GENERAL NOTES

- APPROVAL OF THESE PLANS BY THE CITY ENGINEER DOES NOT AUTHORIZE ANY WORK TO BE PERFORMED UNTIL A PERMIT HAS BEEN
- 2. THE APPROVAL OF THIS PLAN OR ISSUANCE OF A PERMIT BY THE CITY OF SAN DIEGO DOES NOT AUTHORIZE THE SUBDIVIDER AND OWNER TO VIOLATE ANY FEDERAL, STATE OR CITY LAWS, ORDINANCES, REGULATIONS, OR POLICIES. INCLUDING. BUT NOT LIMITED TO, THE FEDERAL ENDANGERED SPECIES ACT OF 1973 AND AMENDMENTS THERETO (16 USC SECTION 1531 ET.SEQ.).
- 3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SURVEY MONUMENTS AND/OR VERTICAL CONTROL BENCH MARKS WHICH ARE DISTURBED OR DESTROYED BY CONSTRUCTION. A LAND SURVEYOR MUST FIELD LOCATE, REFERENCE, AND/OR PRESERVE ALL HISTORICAL OR CONTROLLING MONUMENTS PRIOR TO ANY EARTHWORK. IF DESTROYED, SUCH MONUMENTS SHALL BE REPLACED WITH APPROPRIATE MONUMENTS BY A LAND SURVEYOR. A CORNER RECORD OF RECORD OF SURVEY, AS APPROPRIATE, SHALL BE FILED AS REQUIRED BY THE LAND SURVEYORS ACT. IF ANY VERTICAL CONTROL IS TO BE DISTURBED OR DESTROYED, THE CITY OF SAN DIEGO FIELD SURVEY SECTION MUST BE NOTIFIED, IN WRITING, AT LEAST 3 DAYS PRIOR TO THE CONSTRUCTION. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST OF REPLACING ANY VERTICAL CONTROL BENCH MARKS DESTROYED BY THE CONSTRUCTION.
- 4. IMPORTANT NOTICE: SECTION 4216 OF THE GOVERNMENT CODE REQUIRES A DIG ALERT IDENTIFICATION NUMBER BE ISSUED BEFORE A "PERMIT TO EXCAVATE" WILL BE VALID. FOR YOUR DIG ALERT I.D. NUMBER, CALL UNDERGROUND SERVICE ALERT, TOLL FREE 1-800-422-4133, TWO DAYS BEFORE YOU DIG.
- 5. THE CONTRACTOR SHALL IMPLEMENT AN EROSION CONTROL PROGRAM DURING THE PROJECT GRADING AND CONSTRUCTION ACTIVITIES. THE PROGRAM SHALL MEET THE APPLICABLE REQUIREMENTS OF THE STATE WATER RESOURCES CONTROL BOARD AND THE CITY OF SAN DIEGO MUNICIPAL CODE AND STORM WATER STANDARDS MANUAL.
- 6. "PUBLIC IMPROVEMENT SUBJECT TO DESUETUDE OR DAMAGE." IF REPAIR OR REPLACEMENT OF SUCH PUBLIC IMPROVEMENTS IS REQUIRED, THE OWNER SHALL OBTAIN THE REQUIRED PERMITS FOR WORK IN THE PUBLIC RIGHT-OF-WAY SATISFACTORY TO THE PERMIT-ISSUING AUTHORITY.
- 7. ALL EXISTING AND/OR PROPOSED PUBLIC UTILITY SYSTEMS AND SERVICE FACILITIES SHALL BE INSTALLED UNDERGROUND IN ACCORDANCE WITH SECTION 144.0240 OF THE MUNICIPAL CODE.
- 8. PRIOR TO ANY DISTURBANCE TO THE SITE, EXCLUDING UTILITY MARK-OUTS AND SURVEYING, THE CONTRACTOR SHALL MAKE ARRANGEMENTS FOR A PRE-CONSTRUCTION MEETING WITH THE CITY OF SAN DIEGO FIELD ENGINEERING DIVISION (858) 627-3200.
- 9. DEVIATIONS FROM THESE SIGNED PLANS WILL NOT BE ALLOWED UNLESS A CONSTRUCTION CHANGE IS APPROVED BY THE CITY ENGINEER OR THE CHANGE IS REQUIRED BY THE CITY INSPECTOR.
- 10. AS-BUILT DRAWINGS MUST BE SUBMITTED TO THE RESIDENT ENGINEER PRIOR TO ACCEPTANCE OF THIS PROJECT BY THE CITY OF SAN DIEGO.
- 11. AN AS-GRADED GEOTECHNICAL REPORT SHALL BE SUBMITTED TO BOOTH 32 ON THE 3RD FLOOR OF DEVELOPMENT SERVICES WITHIN 15 CALENDAR DAYS OF COMPLETION OF GRADING. AN ADDITIONAL SET SHALL BE PROVIDED TO THE FIELD INSPECTION DIVISION.
- 12. THE AREA WHICH IS DEFINED AS A NONGRADING AREA AND WHICH IS NOT TO BE DISTURBED SHALL BE STAKED PRIOR TO THE START OF WORK. THE PERMIT APPLICANT AND ALL OF THEIR REPRESENTATIVES OR CONTRACTORS SHALL COMPLY WITH THE REQUIREMENTS FOR PROTECTION OF THIS AREA AS REQUIRED BY ANY APPLICABLE AGENCY.
- 13. ISSUANCE OF THE CITY'S GRADING PERMIT SHALL NOT RELIEVE THE APPLICANT OR ANY OF THEIR REPRESENTATIVES OR CONTRACTORS FROM COMPLYING WITH ANY STATE OR FEDERAL REQUIREMENTS BY AGENCIES INCLUDING BUT NOT LIMITED TO CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD AND CALIFORNIA DEPARTMENT OF FISH AND GAME. COMPLIANCE MAY INCLUDE OBTAINING PERMITS, OTHER AUTHORIZATION, OR COMPLIANCE WITH MANDATES BY ANY APPLICABLE STATE OR FEDERAL

## GRADING NOTES

- GRADING AS SHOWN ON THESE PLANS SHALL BE IN CONFORMANCE WITH CURRENT STANDARD SPECIFICATIONS AND CHAPTER 14, ARTICLE 2, DIVISION 1, OF THE SAN DIEGO MUNICIPAL CODE, 2000 EDITION.
- 2. PLANT AND IRRIGATE ALL CUT AND FILL SLOPES AS REQUIRED BY ARTICLE 2, DIVISION 4, SECTION 142.0411 OF THE SAN DIEGO LAND DEVELOPMENT CODE AND ACCORDING TO SECTION IV OR THE LAND DEVELOPMENT MANUAL LANDSCAPE STANDARDS.
- 3. GRADED PAD AREAS SHALL BE HYDROSEEDED TO PREVENT EROSION IF BUILDING CONSTRUCTION DOES NOT COMMENCE WITHIN 30 DAYS OF GRADING. HYDROSEED SHALL BE IRRIGATED OR REAPPLIED AS NECESSARY TO ESTABLISH GROWTH.
- 4. ALL GRADED, DISTURBED OR ERODED AREAS THAT WILL NOT BE PERMANENTLY PAVED OR COVERED BY STRUCTURES SHALL BE PERMANENTLY REVEGETATED AND IRRIGATED AS SHOWN IN TABLE 142-04F AND IN ACCORDANCE WITH THE STANDARDS IN THE LAND DEVELOPMENT MANUAL.

STREET	DESIGN DATA TAL	3LE		
STREET NAME	CLASSIFICATION	DESIGN SPEED	FUTURE ADT	R/W
TOWNE CENTRE DRIVE	TWO-LANE INDUSTRIAL	ЗОМРН	500	70FT
CUL-DE-SAC TO WESTERRA CT.	COLLECTOR			

CONSTRUCTION CHANGE TABLE					
CHANGE	DATE	EFFECTED OR ADDED SHEET NUMBERS			
		*			

# GRADING AND IMPROVEMENT PLANS FOR: SUMMIT POINTE PLAZA

## SPECIAL NOTES

THE FOLLOWING NOTES ARE PROVIDED TO GIVE DIRECTIONS TO THE CONTRACTOR BY THE ENGINEER OF WORK. THE CITY ENGINEER'S SIGNATURE ON THESE PLANS DOES NOT CONSTITUTE APPROVAL OF ANY OF THESE NOTES AND THE CITY WILL NOT BE RESPONSIBLE FOR THEIR ENFORCEMENT.

- 1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE TO DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES, INCLUDING SHORING, AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING TO ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS. NEITHER THE OWNER, NOR THE ENGINEER OF WORK WILL ENFORCE SAFETY MEASURES OR REGULATIONS.
- 2. THE CONTRACTOR SHALL BE RESPONSIBLE TO INSURE THAT ALL SLOPES, STREETS, UTILITIES AND STORM DRAINS ARE BUILT IN ACCORDANCE WITH THESE PLANS, IF THERE IS ANY QUESTION REGARDING THESE PLANS OR FIELD STAKES, THE CONTRACTOR SHALL REQUEST AN INTERPRETATION BEFORE DOING ANY WORK BY CALLING THE ENGINEER OF WORK AT 619-460-9000. THE CONTRACTOR SHALL ALSO TAKE THE NECESSARY STEPS TO PROTECT THE PROJECT AND ADJACENT PROPERTY FROM ANY EROSION AND SILTATION THAT RESULT FROM HIS OPERATIONS BY APPROPRIATE MEANS (SAND BAGS, HAY BALES, TEMPORARY DESILTING BASINS, DIKES, SHORING, ETC.) UNTIL SUCH TIME THAT THE PROJECT IS COMPLETED AND ACCEPTED FOR MAINTENANCE BY WHATEVER OWNER. AGENCY OR ASSOCIATION IS TO BE ULTIMATELY RESPONSIBLE FOR MAINTENANCE.
- 3. THE CONTRACTOR SHALL TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN HEREON AND ANY OTHER EXISTING LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS AND SHALL BE RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY HIS/HER FAILURE TO LOCATE AND PRESERVE ANY AND ALL UTILITIES. CALL UNDERGROUND SERVICE ALERT AT 1-800-422-4133 TWO WORKING DAYS BEFORE STARTING CONSTRUCTION.
- 4. THE CONTRACTOR SHALL REPAIR/REPLACE ALL DESTROYED OR DAMAGED SURFACE IMPROVEMENTS WITH IMPROVEMENTS EQUAL TO THOSE REMOVED.
- 5. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH THAT OF OTHER CONTRACTORS WORKING ON THE SITE INCLUDING, BUT NOT LIMITED TO, GRADING, DRAINAGE, LANDSCAPING AND IRRIGATION.
- CONSTRUCTION CHANGES MAY BE NECESSARY DUE TO FIELD CONDITIONS. THE CONTRACTOR SHALL GIVE THE ENGINEER OF WORK ADEQUATE TIME TO MAKE ADJUSTMENTS OR CLARIFICATIONS. ALL CONSTRUCTION AND/OR DESIGN CHANGES TO THE APPROVED PLANS SHALL BE PROPOSED BY THE ENGINEER OF WORK, CONSTRUCTION CHANGES SHALL BE INCORPORATED AT THE SITE AFTER APPROVAL BY THE CITY INSPECTOR.
- 7. IF THE ENGINEER OF WORK IS NOT EMPLOYED TO PROVIDE THE CONSTRUCTION REVIEW, CONSTRUCTION STAKING, AND THE PREPARATION OF THE RECORD PLANS, THE OWNER AGREES TO MAKE ARRANGEMENTS FOR SUCH SERVICES AND TO INDEMNIFY AND HOLD THE ENGINEER OF WORK HARMLESS AND RELEASE THE ENGINEER OF WORK FROM ALL LIABILITY ARISING FROM USE OF THE PLANS INCLUDING ANY COSTS TO MAKE SAID CLARIFICATIONS, ADJUSTMENTS AND CONSTRUCTION MODIFICATIONS. IT IS THE SOLE RESPONSIBILITY OF THE OWNER OR HIS CONSTRUCTION REPRESENTATIVE TO REQUEST AND COORDINATE CLARIFICATIONS OR ADJUSTMENTS FROM THE ENGINEER OF WORK AND TO SEE THAT THE ENGINEER'S RECOMMENDATIONS ARE ACCOMPLISHED DURING CONSTRUCTION.
- NOTWITHSTANDING THE MINIMUM STANDARDS SET FORTH IN THE GRADING ORDINANCE AND NOTWITHSTANDING THE APPROVAL OF THESE PLANS, THE CONTRACTOR IS RESPONSIBLE FOR THE PREVENTION OF DAMAGE TO THE ADJACENT PROPERTY. NO PERSON SHALL EXCAVATE ON LAND SO CLOSE TO THE PROPERTY LINE AS TO ENDANGER ANY ADJOINING PUBLIC STREET, SIDEWALK, ALLEY OR ANY OTHER PUBLIC OR PRIVATE PROPERTY WITHOUT SUPPORTING OR PROTECTING SUCH PROPERTY FROM SETTLING, CRACKING, EROSION, SILTING, SCOUR OR OTHER DAMAGE WHICH MIGHT RESULT FROM THE GRADING DESCRIBED ON THIS PLAN.
- THE CONTRACTOR SHALL MAINTAIN AND MAKE AVAILABLE TO THE ENGINEER ONE SET OF PLANS WITH ALL CHANGES SHOWN. A COPY OF THESE DRAWINGS SHALL BE PROVIDED TO THE ENGINEER UPON COMPLETION OF WORK.
- 10. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND JOB CONDITIONS RELATING TO THE PERFORMANCE OF HIS WORK BEFORE STARTING WORK, AND SHALL NOTIFY THE ENGINEER OF WORK IMMEDIATELY OF ANY DISCREPANCIES FOUND.
- 11. THE CONTRACTOR SHALL CONFIRM THE LOCATION AND ELEVATION OF IMPROVEMENTS TO BE MET BY WORK TO BE DONE BY FIELD MEASUREMENTS PRIOR TO CONSTRUCTION OF NEW WORK. THE CONTRACTOR WILL MAKE EXPLORATORY EXCAVATIONS (POTHOLE) AND LOCATE EXISTING UNDERGROUND FACILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS TO PLANS IF REVISIONS ARE NECESSARY BECAUSE OF THE ACTUAL LOCATION OF EXISTING FACILITIES.

## GRADING QUANTITIES

DISTURBED AREA GRADED AREA CUT FILL EXPORT	12 AC 11.5 AC 54,000 CY 54,000 CY 0 CY			DEPTH=17FT, DEPTH=42FT,			
--	--	--	--	----------------------------	--	--	--

GRADING QUANTITIES ARE GEOMETRIC ESTIMATED FOR PERMIT PURPOSES ONLY AND ARE NOT TO BE USED FOR FINAL PAY QUANTITIES.

UNAUTHORIZED CHANGES & USES: The engineer preparing these plans will not be responsible for, or liable for, unauthorized CELSOC changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.

## GRADING AND GEOTECHNICAL SPECIFICATIONS

1. ALL GRADING SHALL BE DONE UNDER OBSERVATION AND TESTING BY A QUALIFIED CIVIL ENGINEER OR GEOTECHNICAL ENGINEER AND, IF REQUIRED. BOTH A QUALIFIED CIVIL ENGINEER OR GEOTECHNICAL ENGINEER AND AN ENGINEERING GEOLOGIST. ALL GRADING MUST BE PERFORMED IN ACCORDANCE WITH APPLICABLE CITY ORDINANCE AND THE RECOMMENDATIONS AND SPECIFICATIONS SET FORTH IN THE SOILS REPORT OR GEOLOGICAL/GEOTECHNICAL INVESTIGATION

ENTITLED: UPDATE GEOTECHNICAL INVESTIGATION, TOWNE CENTRE CORPORATE PLAZA, SAN DIEGO, CALIFORNIA FOR: LAWRENCE M. CUSHMAN PREPARED BY: GEOCON, INC.

DATED: JULY 15, 2005. INCLUDING ADDENDA NOS. 1 AND 2, TOWNE CENTRE CORPORATE PLAZA, PREPARED BY GEOCON, INC., PROJECT NO. 06376-22-03 DATED AUGUST 31, 2005, AND MARCH 5, 2007, RESPECTIVELY.

- 2. ALL FILL MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MOST RECENT VERSION OF A.S.T.M. D-1557 OR AN APPROVED ALTERNATIVE STANDARD.
- 3. AT THE COMPLETION OF THE GRADING OPERATIONS FOR THE EARTHWORK SHOWN ON THIS PLAN. AN AS-GRADED SOILS REPORT, OR IF REQUIRED, AN AS-GRADED SOILS AND GEOLOGICAL REPORT WILL BE PREPARED IN ACCORDANCE WITH THE MOST RECENT EDITION OF THE CITY OF SAN DIEGO TECHNICAL GUIDELINES FOR GEOTECHNICAL REPORTS. THE FINAL "AS GRADED" GEOTECHNICAL REPORT WILL BE SUBMITTED TO THE FIELD ENGINEERING SECTION OF PUBLIC WORKS AND A SECOND COPY TO THE GEOLOGY SECTION OF DEVELOPMENT SERVICES WITHIN 15 DAYS OF THE COMPLETION OF GRADING. WHERE GEOLOGIC INSPECTION IS INDICATED IN THE PERMIT OR PROJECT PLANS, REPORTS OR SPECIFICATIONS, THE FINAL REPORT MUST ALSO BE REVIEWED AND SIGNED BY A CALIFORNIA CERTIFIED ENGINEERING GEOLOGIST.
- 4. IF THE GEOTECHNICAL CONSULTANT OF RECORD IS CHANGED FOR THE PROJECT, THE WORK SHALL BE STOPPED UNTIL THE REPLACEMENT HAS AGREED IN WRITING TO ACCEPT THE RESPONSIBILITY WITHIN THE AREA OF THEIR TECHNICAL COMPETENCE FOR APPROVAL UPON COMPLETION OF WORK. IT SHALL BE THE DUTY OF THE PERMITTEE TO NOTIFY THE CITY ENGINEER AND THE GEOLOGY SECTION OF DEVELOPMENT SERVICES IN WRITING OF SUCH CHANGE PRIOR TO THE RECOMMENCEMENT OF GRADING.
- 5. THESE PLANS HAVE BEEN REVIEWED BY THE UNDERSIGNED AND FOUND TO BE IN CONFORMANCE WITH THE RECOMMENDATIONS AND SPECIFICATIONS CONTAINED IN THE REFERENCED GEOTECHNICAL

REPORT(S) PREPARED FOR THIS PROJECT. REGISTRATION NO.: DATE CEG 1778 (SIGNATURE) REGISTRATION NO.: DATE COMPANY NAME: GEOCON, INC.

PHONE NO.: 858-558-6900

6. FOR SOIL FILE SEE CITY RECORD S-6109

## SPECIAL GEOTECHNICAL NOTES

1. THE GEOTECHNICAL CONSULTANT SHALL PROVIDE AN OBSERVAL PROGRAM DURING EXCAVATION TO VERIFY THE LOCATION OF FAULTING ON THE SITE. FAULTS DISCOVERED DURING GRADING OF THE SITE SHALL BE EVALUATED AND ANALYZED FOR ACTIVITY LEVEL BY THE GEOTECHNICAL CONSULTANT WITH DETAILED REPORTS SUBMITTED SUBJECT TO REVIEW AND APPROVAL BY CITY GEOLOGY STAFF PRIOR TO ISSUANCE OF BUILDING PERMITS.

- 2. A "NOTICE OF GEOLOGIC AND GEOTECHNICAL CONDITIONS" SHALL BE RECORDED PRIOR TO ISSUANCE OF BUILDING PERMITS FOR HABITABLE STRUCTURES SITED OVER ANY POTENTIALLY ACTIVE FAULT(S) DISCOVERED ON SITE UNLESS A SETBACK FROM THE FAULT IS RECOMMENDED BY THE GEOTECHNICAL CONSULTANT. NO STRUCTURE FOR HUMAN OCCUPANCY SHALL BE PERMITTED OVER THE TRACE OF AN ACTIVE FAULT.
- 3. THE PRECISE AS-GRADED LOCATION OF FAULT(S) SHALL BE SHOWN ON THE FINAL AS-GRADED PLANS SUBJECT TO REVIEW AND APPROVAL BY CITY GEOLOGY STAFF.

## TOPOGRAPHY NOTES

- 1. THE EXISTING TOPOGRAPHY SHOWN ON THIS PLAN IS FROM AERIAL SURVEY PROVIDED BY SAN-LO AERIAL SURVEYS, JOB NO. 7508, FLOWN AT 40 SCALE WITH 2FT CONTOUR INTERVALS ON 11-3-87, AND SUPPLEMENTED BY FIELD SURVEY MEASUREMENTS MADE BY WILLIAM A. STEEN AND ASSOCIATES.
- 2. THE LOCATIONS OF UNDERGROUND UTILITIES HAVE BEEN ESTIMATED BY PHYSICAL SURFACE FEATURES AND BY RECORD DRAWINGS PROVIDED BY THE UTILITY COMPANIES.
- 3. ADDITIONAL UNDERGROUND UTILITIES MAY EXIST ON SITE BUT CANNOT BE LOCATED FROM FIELD OBSERVATIONS. ACTUAL LOCATIONS OF ANY UTILITY SERVICES SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

## TRAFFIC CONTROL NOTES

THE CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN (11"x17") FOR APPROVAL PRIOR TO STARTING WORK. THE PLAN SHOULD BE SUBMITTED TO THE TRAFFIC CONTROL PERMIT COUNTER, 3RD FLOOR, BOOTH 22, LAND DEVELOPMENT REVIEW DIVISION, DEVELOPMENT SERVICES CENTER, 1222 FIRST AVENUE, SAN DIEGO (619-446-5150). CONTRACTOR SHALL OBTAIN A TRAFFIC CONTROL PERMIT A MINIMUM OF TWO (2) WORKING DAYS PRIOR TO STARTING WORK, AND A MINIMUM OF FIVE (5) DAYS IF WORK WILL AFFECT A BUS STOP OR AN EXISTING TRAFFIC SIGNAL, OR IF WORK WILL REQUIRE A ROAD OR ALLEY CLOSURE.

WORK TO BE DONE

THE IMPROVEMENTS CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND THE SPECIFICATIONS AND STANDARD DRAWINGS OF THE CITY OF SAN DIEGO.

STANDARD SPECIFICATIONS

1. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2006 EDITION (GREENBOOK), DOCUMENT NO. AEC1231061, FILED DECEMBER 31, 2006, INCLUDING THE REGIONAL AND CITY OF SAN DIEGO SUPPLEMENT, DOCUMENT NO. AEC1231062. FILED DECEMBER 31, 2006.

- DWG. NO.: W.O. NO.: 21075-D 118150 2. 1999 STANDARD SPECIAL PROVISIONS FOR SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS 118958
  - 3. CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (FHWA'S MUTCD, 2003 EDITION. AS AMENDED FOR USE IN CALIFORNIA), DOCUMENT NO. AEC1231064, FILED DECEMBER 31, 2006.
  - STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD SPECIFICATIONS, DOCUMENT NO. AECO925062, FILED SEPTEMBER 25, 2006.

OF THE CITY OF SAN DIEGO, DOCUMENT NO. 769842, FILED OCTOBER 22, 1999.

## STANDARD DRAWINGS

- CITY OF SAN DIEGO STANDARD DRAWINGS, INCLUDING ALL REGIONAL STANDARD DRAWINGS, DOCUMENT NO. AEC1231063, FILED DECEMBER 31, 2006.
- 2. STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, STANDARD PLANS, DOCUMENT NO. AECO925061, FILED SEPTEMBER 25, 2006.

## LEGEND

REFERENCE DRAWINGS

KEY MAP LEGEND

Original States and States and States

C 55819

EXP. 12-31-08

TOWNE CENTRE DRIVE

<u>DESCRIPTION</u>

**BOUNDARY** 

SEWER

SHEET NUMBER

SEWER TO BL

ABANDONED

23029-D

29333-D 98-0326

PLAN:

SEWER

IMPVTS.

CITY MONUMENT AT SOUTHERLY END OF CUL-DE-SAC ON ROSELLE STREET.

FI FVATION 65.363 M.S.L. DATUM PER CITY OF SAN DIEGO VERTICAL CONTROL

EXISTING: LOT "A" OF PUEBLO LOT 1320, OF PUEBLO LANDS OF SAN DIEGO,

MISC. MAP NO. 36, IN THE CITY OF SAN DIEGO, AS PER

IMPROVEMENT PLANS-SEWER MAIN AND PRIVATE STORM DRAIN

SUPERIOR COURT CASE ACTION NO. 17622.

GRADING PLAN-NOTES, LEGEND, KEY MAP

DETENTION FACILITY SPECS. AND DETAILS

ENVIRONMENTAL MITIGATION REQUIREMENTS

STORM DRAIN

OWNER/APPLICANT

2901 FIFTH AVENUE

BENCH MARK

SHEET INDEX

11.12

APN

No. 2401

EXP. 09/30/08

343-121-03

*'=300'* 

STANDARDS.

13-23

SAN DIEGO, CA 92103

TOWNE CENTRE SCIENCE PARK L.P.,

A DELAWARE LIMITED PARTNERSHIP

RECORD (INDEX 2652 17034).

PROPOSED: PARCELS 1 AND 2 OF PM \_

GRADING PLAN-NOTES

GRADING PLAN-DETAILS

EROSION CONTROL PLAN

GRADING PLAN-WALL PROFILES

LANDSCAPE AND IRRIGATION PLANS

T N75:17'03"E 570.86'

PARCEL

189°05'14"W 550.10) MHA

**KEY MAP** SCALE: 1"=300"

PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT,

THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE

PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT

SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW

10-5-07

10-5-07

DATE

ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY

DECLARATION OF RESPONSIBLE CHARGE

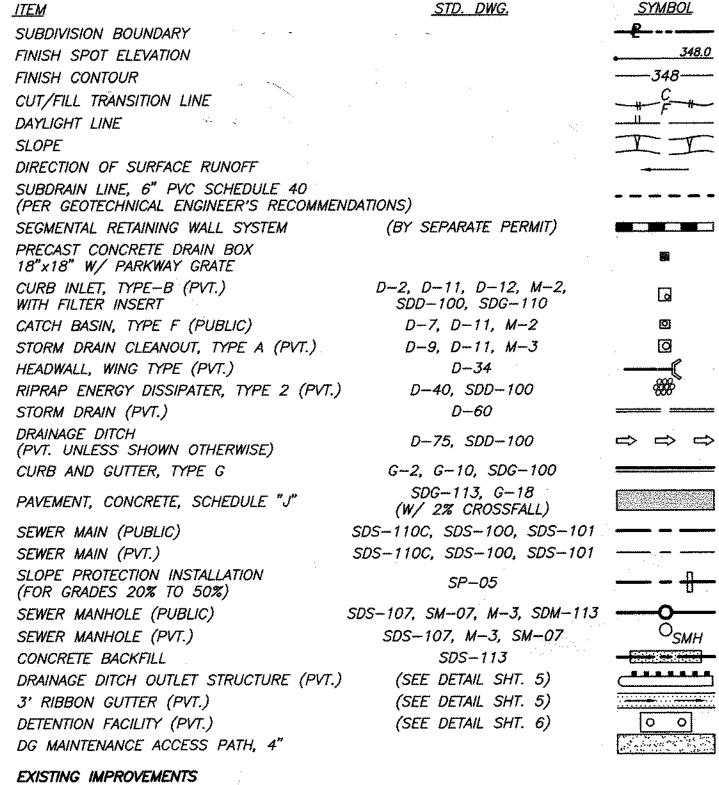
RESPONSIBILITY FOR PROJECT DESIGN.

WILLIAM A. STEEN, R.C.E. 18136

GRADING PLAN

LEGAL DESCRIPTION

## PROPOSED IMPROVEMENTS

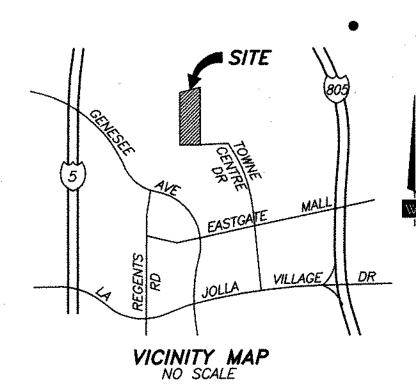


# EXISTING SURVEY MONUMENT

**ABBREVIATIONS** ASPHALT CONCRÊTE BOTTOM OF WALL

CONC CONCRETE CENTERLINE DISINTEGRATED GRANITE EXIST. **EXISTING** FG FINISHED GRADE GRADE HAND HOLE HIGH POINT INVERT ELEVATION POLYVINYL CHLORIDE PRIVATE

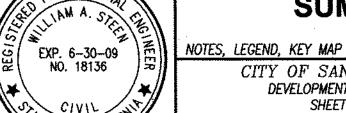
PORTLAND CEMENT CONCRETE REINFORCED CONCRETE PIPE RIGHT OF WAY SEWER MANHOLE TOP OF WALL TYPICAL



WDID NO. 937C349192 TM NO. 2761, REZONE NO. 2759, CDP NO. 117798, SDP NO. 2758 RETAINING WALL PERMIT NO. (SEÉ NOTE 4 ON SHT. 3) CONSTRUCTION SITE PRIORITY: HIGH PRIVATE CONTRACT

GRADING AND IMPROVEMENT PLANS FOR:

# **SUMMIT POINTE PLAZA**



TW TYP.

CITY OF SAN DIEGO, CALIFORNIA W.O. NO. 421166 DEVELOPMENT SERVICES DEPARTMENT P.T.S. NO. 6109 SHEET 1 OF 23 SHEETS 2761 FOR CITY ENGINEER APPROVED DATE FILMED ORIGINAL WAS 1904-6263 NAD 83 COORDINATES 264-1703 LAMBERT COORDINATES AS-BUILTS

DESCRIPTION BY WILLIAM A. STEEN & ASSOCIATES CONSULTING CIVIL ENGINEERS, LAND SURVEYING & PLANNING 8580 LA MESA BLVD., SUITE 102, LA MESA, CALIFORNIA 91941 ■ (619) 460-9000 ■ FAX (619) 460-9005 ■

6247-101

DATE STARTED CONTRACTOR 32375-1-D

DATE COMPLETED

## SWPPP NOTES

- DISCHARGING SEDIMENT LADEN WATER WHICH WILL CAUSE OR CONTRIBUTE TO AN EXCEEDANCE OF THE APPLICABLE RWQCB'S BASIN PLANS FROM A DEWATERING SITE OR SEDIMENT BASIN/TRAP INTO ANY RECEIVING WATER OR STORM DRAIN WITHOUT FILTRATION OR EQUIVALENT TREATMENT IS PROHIBITED.
- 2. THE DISCHARGER SHALL AMEND THE SWPPP WHENEVER THERE IS A CHANGE IN CONSTRUCTION OR OPERATIONS, WHICH MAY AFFECT THE DISCHARGE OF POLLUTANTS TO SURFACE WATERS, GROUNDWATERS, OR A MUNICIPAL STORM DRAIN SYSTEM. THE SWPPP SHALL ALSO BE AMENDED IF THE DISCHARGER VIOLATES ANY CONDITION OF THE GENERAL PERMIT OR HAS NOT ACHIEVED THE GENERAL OBJECTIVE OF REDUCING OR ELIMINATING POLLUTANTS IN STORMWATER DISCHARGES. ALL AMENDMENTS SHOULD BE DATED AND DIRECTLY ATTACHED TO THE
- TEMPORARY ON-SITE DRAINAGES TO CARRY CONCENTRATED FLOW SHALL BE SELECTED TO COMPLY WITH CITY REQUIREMENTS TO CONTROL EROSION. TO RETURN FLOWS TO THEIR NATURAL DRAINAGE COURSES, AND TO PREVENT DAMAGE TO DOWNSTREAM PROPERTIES.
- DISCHARGES ORIGINATING FROM OFF SITE. WHICH FLOW ACROSS OR THROUGH AREAS DISTURBED BY CONSTRUCTION THAT MAY CONTAIN POLLUTANTS, SHOULD BE REPORTED TO THE RWQCB.
- 5. DISCHARGERS WHO ARE PRESENTLY COVERED UNDER NPDES GENERAL PERMIT NO. CA000002 FOR DISCHARGE OF STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITY MAY SUBMIT A NOTICE OF TERMINATION WHEN THEY MEET THE FOLLOWING CRITERIA:
- A. THE CONSTRUCTION PROJECT HAS BEEN COMPLETED AND THE FOLLOWING CONDITIONS HAVE BEEN MET: ALL ELEMENTS OF THE STORMWATER POLLUTION PREVENTION PLAN HAVE BEEN COMPLETED; CONSTRUCTION MATERIALS AND EQUIPMENT MAINTENANCE WASTE HAVE BEEN DISPOSED OF PROPERLY; THE SITE IS IN COMPLIANCE WITH ALL LOCAL STORMWATER MANAGEMENT REQUIREMENTS INCLUDING EROSION/SEDIMENT CONTROL REQUIREMENTS AND THE APPROPRIATE USE PERMITS HAVE BEEN OBTAINED; AND A POSTCONSTRUCTION STORMWATER OPERATION AND MANAGEMENT PLAN IS IN PLACE.
- B. CONSTRUCTION ACTIVITIES HAVE BEEN SUSPENDED, EITHER TEMPORARILY OR INDEFINITELY AND THE FOLLOWING CONDITIONS HAVE BEEN MET: ALL ELEMENTS OF THE STORMWATER POLLUTION PREVENTION PLAN HAVE BEEN COMPLETED: CONSTRUCTION MATERIALS AND EQUIPMENT MAINTENANCE WASTE HAVE BEEN DISPOSED OF PROPERLY; ALL DENUDED AREAS AND ALL OTHER AREAS OF POTENTIAL EROSION ARE STABILIZED; AN OPERATION AND MAINTENANCE PLAN FOR EROSION AND SEDIMENT CONTROL IS IN PLACE: AND THE SITE IS IN COMPLIANCE WITH ALL LOCAL STORMWATER MANAGEMENT REQUIREMENTS INCLUDING EROSION/SEDIMENT CONTROL REQUIREMENTS. THE DATE CONSTRUCTION ACTIVITIES WERE SUSPENDED, AND THE EXPECTED DATE CONSTRUCTION ACTIVITIES WILL START UP AGAIN SHOULD BE PROVIDED.
- C. CONSTRUCTION SITE CANNOT DISCHARGE STORMWATER TO WATERS OF THE UNITED STATES. PLEASE INDICATE IF ALL STORMWATER IS RETAINED ON SITE OR IF STORMWATER IS COLLECTED OFF SITE.
- D. DISCHARGE OF CONSTRUCTION STORMWATER FROM THE SITE IS NOW SUBJECT TO ANOTHER NPDES GENERAL PERMIT OR AN INDIVIDUAL NPDES PERMIT. THE GENERAL PERMIT OR INDIVIDUAL PERMIT NPDES NUMBER AND DATE COVERAGE BEGAN SHOULD BE PROVIDED.
- E. THERE IS A NEW OWNER OF THE IDENTIFIED SITE. IF OWNERSHIP OR OPERATION OF THE FACILITY HAVE BEEN TRANSFERRED THEN THE PREVIOUS OWNER MUST SUBMIT A NOTICE OF TERMINATION AND THE NEW OWNER MUST SUBMIT A NOTICE OF INTENT FOR COVERAGE UNDER THE GENERAL PERMIT. THE DATE OF TRANSFER AND INFORMATION ON THE NEW OWNER SHOULD BE PROVIDED. NOTE THAT THE PREVIOUS OWNER MAY BE LIABLE FOR DISCHARGE FROM THE SITE UNTIL THE NEW OWNER FILES A NOTICE OF INTENT FOR COVERAGE UNDER THE GENERAL PERMIT.
- SEDIMENT CONTROL BMP'S ARE REQUIRED AT APPROPRIATE LOCATIONS, ALONG THE SITE PERIMETER AND AT ALL OPERATIONAL INTERNAL INLETS TO THE STORM DRAIN SYSTEM AT ALL TIMES.
- THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ADEQUATE SEDIMENT CONTROL MATERIALS ARE AVAILABLE TO CONTROL SEDIMENT DISCHARGES AT THE DOWNGRADE PERIMETER AND OPERATIONAL INLETS (WEATHER AND STORM PREDICTIONS CAN BE OBTAINED BY CALLING THE NATIONAL WEATHER SERVICE AT (858) 675-8700 OR BY VISITING THE NATIONAL WEATHER SERVICE WEB SITE AT HTTP://WWW.WRH.NOAA.GOV/SANDIEGO/INDEX.SHTML FOR WEATHER INFORMATION AND CURRENT SATELLITE/RADAR FEEDS).
- 8. THE OUTLETS OF ALL SEDIMENT BASINS, TRAPS, AND LOCATIONS OF ARTIFICIALLY CONCENTRATED FLOW SHALL BE PROVIDED WITH OUTLET PROTECTION TO PREVENT EROSION AND SCOUR.
- INSPECTIONS SHALL BE PERFORMED BEFORE AND AFTER STORM EVENTS AND ONCE EACH 24-HOUR PERIOD DURING EXTENDED STORM EVENTS TO IDENTIFY BMP EFFECTIVENESS AND IMPLEMENT REPAIRS OR DESIGN CHANGES AS SOON AS FEASIBLE, DEPENDING ON FIELD CONDITIONS. EQUIPMENT, MATERIALS, AND WORKERS MUST BE AVAILABLE FOR RAPID RESPONSE TO FAILURES AND EMERGENCIES. ALL CORRECTIVE MAINTENANCE TO BMP'S SHALL BE PERFORMED AS SOON AS POSSIBLE AFTER THE CONCLUSION OF EACH STORM. DEPENDING UPON WORKER
- 10. FOR EACH INSPECTION, A QUALIFIED PERSON SHALL COMPLETE AN INSPECTION CHECKLIST CONTAINING THE FOLLOWING MINIMUM INFORMATION: INSPECTION DATE, WEATHER INFORMATION (BEGINNING/END OF STORM EVENT, DURATION, TIME SINCE LAST STORM, APPROXIMATE RAINFALL IN INCHES), DESCRIPTION OF INADEQUATE BMP'S, LIST OF OBSERVATIONS OF ALL BMP'S AND VISIBLE INSPECTION OF OUTFALLS, DISCHARGE POINTS, DOWNSTREAM LOCATIONS, AND PROJECTED REQUIRED MAINTENANCE ACTIVITIES, CORRECTIVE ACTIONS REQUIRED, INCLUDING CHANGES TO THE SWPPP AND IMPLEMENTATION DATES, INSPECTOR'S NAME, TITLE, SIGNATURE, AND QUALIFICATIONS.

Construction contractor agrees that in accordance with generally accepted construction practices, construction contractor will be required to assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property; that this requirement shall be made to apply continuously and not be limited to normal working hours, and construction contractor further agrees to defend, indemnify and hold design professional harmless from any and all liability, real or alleged, in connection with the performance of work on this project, excepting liability arising from the sole negligence of design

## SWPPP NOTES (CONTINUED)

- 11. INDIVIDUALS RESPONSIBLE FOR SWPPP, IMPLEMENTATION, AND PERMIT COMPLIANCE SHALL BE APPROPRIATELY TRAINED. THIS INCLUDES THOSE PERSONNEL RESPONSIBLE FOR INSTALLATION, INSPECTION, MAINTENANCE, AND REPAIR OF BMP'S. THOSE RESPONSIBLE FOR OVERSEEING, REVISING, AND AMENDING THE SWPPP SHALL ALSO DOCUMENT THEIR TRAINING. THE QUALIFIED PERSON SHALL ALSO ATTEND THE PRECONSTRUCTION MEETING. THE QUALIFIED PERSON SHALL HAVE KNOWLEDGE AND TRAINING OF THE INTENT AND ENFORCEMENT OF SWPPP'S AND BMP'S AND BE PROPERLY TRAINED TO CONDUCT INSPECTIONS AND PREPARE REPORTS OF THE CONSTRUCTION SITE WITH RESPECT TO THE CITY'S CODE/ORDINANCES AND THE SWPPP.
- 12. THE CONTRACTOR SHALL MAINTAIN A COPY OF THE SWPPP AT THE CONSTRUCTION SITE WHICH SHALL BE PROVIDED, UPON REQUEST, TO THE RWOCH OR CITY PERSONNEL. THE SWPPP IS CONSIDERED A REPORT THAT SHALL BE AVAILABLE TO THE PUBLIC BY THE RWQCB UNDER SECTION 308(B) OF THE CLEAN WATER ACT.
- 13. RECORDS OF ALL INSPECTIONS, COMPLIANCE CERTIFICATIONS, NONCOMPLIANCE REPORTING, AND ANY OTHER DOCUMENTS GENERATED AS PART OF THE SWPPP, MUST BE RETAINED FOR A PERIOD OF AT LEAST THREE YEARS FROM THE DATE GENERATED.
- 14. A CONCRETE WASHOUT SHALL BE INSTALLED FOR ALL PROJECTS THAT PROPOSE CONCRETE TO BE MIXED ON SITE OR DELIVERED FROM A BATCH PLANT. THE CONCRETE WASHOUT SHALL BE LOCATED A MINIMUM OF 50' FROM ANY DRAINAGE INFRASTRUCTURE OR NATURAL DRAINAGE FEATURES OR WATER BODIES AND INCORPORATE AN IMPERMEABLE LINER (6 MIL MIN.) TO CONTAIN THE REQUIRED VOLUME. ALL DRIED CONCRETE WASTE SHALL BE BROKEN INTO MANAGEABLE PIECES AND DISPOSED OF IN A PROPER MANNER. THE CONTRACTOR OR QUALIFIED PERSON SHALL LOCATE CONCRETE WASHOUTS IN THIS PRESCRIBED MANNER AS CONSTRUCTION PROGRESSES.
- 15. THE QUALIFIED PERSON SHALL CONDUCT REGULAR INSPECTIONS OF THE PROJECT SITE IN ACCORDANCE WITH RECOMMENDATIONS OUTLINED IN THE SWPPP. EACH INSPECTION SHALL BE DOCUMENTED IN THE FORM OF WRITTEN REPORTS RETAINED ON SITE. ALL REPORTS SHALL BE MADE AVAILABLE TO THE CITY OF SAN DIEGO AND RWQCB REPRESENTATIVES UPON REQUEST.
- 16. THE CONTRACTOR SHALL HAVE EMERGENCY MATERIALS AND EQUIPMENT ON HAND FOR UNFORESEEN SITUATIONS, SUCH AS DAMAGE TO UNDERGROUND WATER AND SEWER UTILITIES WHEREBY FLOWS MAY GENERATE EROSION AND SEDIMENT POLLUTION.
- 17. THE PERMITTEE OR DESIGNEE SHALL PROVIDE EVIDENCE OF COVERAGE UNDER THE GENERAL CONSTRUCTION NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT, IN THE FORM OF A NOTICE OF INTENT (NOI) FILED WITH THE STATE WATER RESOURCES CONTROL BOARD, PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMITS.
- 18. SEDIMENT AND EROSION CONTROLS MAY BE REMOVED ONLY WHEN CONTRIBUTORY UPSTREAM AREAS BECOME STABILIZED OR ARE MANAGED UPSTREAM (I.E., SINGLE-LOT SEDIMENT CONTROLS) AND AS LONG AS SEDIMENT LADEN RUNOFF WILL NOT DISCHARGE FROM THE SITE.
- 19. WHEN FUTURE WORK BY THE DEVELOPER NOT SHOWN ON THIS PLAN IS TO BE PERFORMED, THE SWPPP SHALL BE AMENDED TO INCLUDE SAID WORK AND ANY ADDITIONAL WATER QUALITY CONTROL MEASURES REQUIRED.
- 20. WHEN OWNERSHIP CHANGES FOR PORTIONS OF THE SITE OR THE LIMITS OR NATURE OF WORK ARE ALTERED, THE DEVELOPER SHALL FILE A CHANGE OF INFORMATION (COI) OR A REVISED NOTICE OF INTENT (NOI), RESPECTIVELY, WITH THE CRWQCB AND SWRCB, RESPECTIVELY.
- 21. THIS PLAN SHALL BE IN EFFECT UNTIL ALL DISTURBED AREAS ARE PERMANENTLY STABILIZED. TRANSFERRED TO NEW OWNERSHIP, OR DEVELOPED UNDER FUTURE PLANS WITH A NEW NOI, SWPPP, AND WDID

## MINIMUM POSTCONSTRUCTION MAINTENANCE PLAN AT THE COMPLETION OF THE WORK SHOWN, THE FOLLOWING PLAN SHALL BE FOLLOWED TO ENSURE WATER QUALITY CONTROL IS MAINTAINED FOR THE

- 1. STABILIZATION: ALL PLANTED SLOPES AND OTHER VEGETATED AREAS SHALL BE INSPECTED PRIOR TO OCTOBER 1 OF EACH YEAR AND AFTER MAJOR RAINFALL EVENTS (MORE THAN 1/2 INCH) AND REPAIRED AND REPLANTED AS NEEDED UNTIL A NOTICE OF TERMINATION IS FILED.
- 2. STRUCTURAL PRACTICES: DESILTING BASINS, DIVERSION DITCHES, DOWNDRAINS. INLETS. OUTLET PROTECTION MEASURES, AND OTHER PERMANENT WATER QUALITY AND SEDIMENT AND EROSION CONTROLS SHALL BE INSPECTED PRIOR TO OCTOBER 1ST OF EACH YEAR AND AFTER MAJOR RAINFALL EVENTS (MORE THAN 1/2 INCH). REPAIRS AND REPLACEMENTS SHALL BE MADE AS NEEDED AND RECORDED IN THE MAINTENANCE LOG IN PERPETUITY.
- OPERATION AND MAINTENANCE FUNDING: POSTCONSTRUCTION MANAGEMENT MEASURES ARE THE RESPONSIBILITY OF THE DEVELOPER UNTIL THE TRANSFER OF RESPECTIVE SITES TO HOME BUILDERS, INDIVIDUAL OWNERS, HOMEOWNERS ASSOCIATIONS, SCHOOL DISTRICTS, OR LOCAL AGENCIES AND/OR GOVERNMENTS. AT THAT TIME, THE NEW OWNERS SHALL ASSUME RESPONSIBILITY FOR THEIR RESPECTIVE PORTIONS OF THE DEVELOPMENT.

## EROSION AND SEDIMENT CONTROL NOTES

TEMPORARY EROSION/SEDIMENT CONTROL, PRIOR TO COMPLETION OF FINAL IMPROVEMENTS. SHALL BE PERFORMED BY THE CONTRACTOR OR QUALIFIED PERSON AS INDICATED BELOW:

- 1. ALL REQUIREMENTS OF THE CITY OF SAN DIEGO "LAND DEVELOPMENT MANUAL, STORM WATER STANDARDS" MUST BE INCORPORATED INTO THE DESIGN AND CONSTRUCTION OF THE PROPOSED GRADING/IMPROVEMENTS CONSISTENT WITH THE APPROVED STORM WATER POLLUTION PREVENTION PLAN (SWPPP), WATER QUALITY TECHNICAL REPORT (WTQR), AND OR WATER POLLUTION CONTROL PLAN (WPCP).
- 2. FOR STORM DRAIN INLET, PROVIDE A GRAVEL BAG SILT BASIN IMMEDIATELY UPSTREAM OF INLET AS INDICATED ON DETAILS.
- 3. FOR INLETS LOCATED AT SUMPS ADJACENT TO TOP OF SLOPES. THE CONTRACTOR SHALL ENSURE THAT WATER DRAINING TO THE SUMP IS DIRECTED INTO THE INLET AND THAT A MINIMUM OF 1.0' FREEBOARD EXISTS AND IS MAINTAINED ABOVE THE TOP OF THE INLET. IF FREEBOARD IS NOT PROVIDED BY GRADING SHOWN ON THESE PLANS, THE CONTRACTOR SHALL PROVIDE IT VIA TEMPORARY MEASURES, I.E. GRAVEL BAGS OR DIKES.
- 4. THE GRADING CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANUP OF SILT AND MUD ON ADJACENT STREET(S) DUE TO CONSTRUCTION ACTIVITY.
- 5. THE CONTRACTOR SHALL CHECK AND MAINTAIN ALL LINED AND UNLINED DITCHES AFTER EACH RAINFALL.
- 6. THE CONTRACTOR SHALL REMOVE SILT AND DEBRIS AFTER EACH MAJOR
- 7. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS IMMINENT.
- 8, THE CONTRACTOR SHALL RESTORE ALL EROSION/SEDIMENT CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE CITY ENGINEER OR RESIDENT ENGINEER AFTER EACH RUNOFF PRODUCING RAINFALL.
- 9. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION/SEDIMENT CONTROL MEASURES AS MAY BE REQUIRED BY THE RESIDENT ENGINEER AND THE ENGINEER OF WORK DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.
- 10. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.
- 11. ALL EROSION/SEDIMENT CONTROL MEASURES PROVIDED PER THE APPROVED GRADING PLAN SHALL BE INCORPORATED HEREON. ALL EROSION/SEDIMENT CONTROL FOR INTERIM GRADING CONDITIONS SHALL BE DONE TO THE SATISFACTION OF THE RESIDENT ENGINEER.
- 12. GRADED AREAS AROUND THE PROJECT PERIMETER MUST DRAIN AWAY FROM THE FACE OF THE SLOPE AT THE CONCLUSION OF EACH WORKING
- 13. ALL REMOVABLE PROTECTIVE DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN RAIN IS IMMINENT.
- 14. THE CONTRACTOR SHALL ONLY GRADE, INCLUDING CLEARING AND GRUBBING, THE AREAS FOR WHICH THE CONTRACTOR CAN PROVIDE EROSION/SEDIMENT CONTROL MEASURES.
- 15. THE CONTRACTOR SHALL ARRANGE FOR WEEKLY MEETINGS DURING OCTOBER 1ST TO APRIL 30TH FOR PROJECT TEAM (GENERAL CONTRACTOR, QUALIFIED PERSON, EROSION CONTROL SUBCONTRACTOR, IF ANY, ENGINEER OF WORK, OWNER/DEVELOPER AND THE RESIDENT ENGINEER) TO EVALUATE THE ADEQUACY OF THE EROSION/SEDIMENT CONTROL MEASURES AND OTHER RELATED CONSTRUCTION ACTIVITIES.

## PERMANENT POSTCONSTRUCTION BMP NOTES

- 1. OPERATION AND MAINTENANCE SHALL BE SECURED BY AN EXECUTED AND RECORDED STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT (SWMDCM), COVENANTS CONDITIONS AND RESTRICTIONS (CC&R'S), OR ANOTHER MECHANISM APPROVED BY THE CITY ENGINEER, THAT ASSURES ALL PERMANENT BMP'S WILL BE MAINTAINED IN PERPETUITY, PER THE LAND DEVELOPMENT MANUAL, STORM WATER STANDARDS.
- 2. PERMANENT POSTCONSTRUCTION BMP DEVICES SHOWN ON PLAN SHALL NOT BE MOVED OR MODIFIED WITHOUT THE APPROVAL OF THE CITY ENGINEER OR RESIDENT ENGINEER AND THE ENGINEER OF WORK.

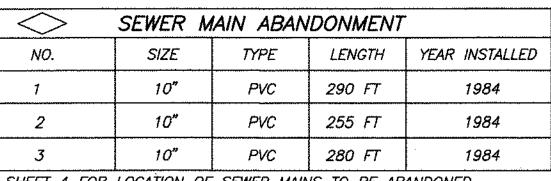
	PROPO	SED OPERA	ATION AND MAINTENANCE F	PROCEDURE D	ETAILS			
	O&M RESPO	&M RESPONSIBLE PARTY DESIGNEE: PROPERTY OWNER						
POSTCONSTRUCTION PERMANENT BMP'S		MAINTENANCE FREQUENCY	MAINTENANCE METHOD	SERVICE FREQUENCY	SERVICE METHOD			
PROPOSED SITE DESIGN								
RIPRAP ENERGY DISSIPATERS	3/YR	3/YR	REMOVE DEBRIS	AS NEEDED	(1)			
DRAINAGE DITCH OUTLET STRUCTURES	3/YR	3/YR	REMOVE DEBRIS	AS NEEDED	(1)			
CONCRETE LINED DRAINAGE DITCHES	3/YR	3/YR	REMOVE DEBRIS	AS NEEDED	(1)			
PROPOSED TREATMENT CONTROL								
CATCH BASIN FILTER INSERTS	3/YR	3/YR	REMOVE DEBRIS	AS NEEDED				
ROOF DRAIN DOWNSPOUT FILTERS (2)	3/YR	3/YR	REMOVE DEBRIS	AS NEEDED				
PROPOSED SOURCE CONTROL								
SEEDING AND PLANTING	3/YR	3/YR	REPLANT	AS NEEDED	(1)			

(1) TO BE PERFORMED BY LANDSCAPE MAINTENANCE CONTRACTOR

(2) ROOF DRAIN DOWNSPOUT FILTERS ARE NOT A PART OF THESE GRADING PLANS. THEY WILL BE INCLUDED IN THE BUILDING PLANS.

WILLIAM A. STEEN & ASSOCIATES CONSULTING CIVIL ENGINEERS, LAND SURVEYING & PLANNING 8580 LA MESA BLVD., SUITE 102, LA MESA, CALIFORNIA 91941 **■** (619) 460-9000 **■** FAX (619) 460-9005 **■** JOB NO. 10-5-07

6247-101



SEE SHEET 4 FOR LOCATION OF SEWER MAINS TO BE ABANDONED

EXP. 6-30-09 NO. 18136

PRIVATE CONTRACT

**SUMMIT POINTE PLAZA** CITY OF SAN DIEGO, CALIFORNIA W.O. NO. 421166 DEVELOPMENT SERVICES DEPARTMENT P.T.S. NO. 6109 SHEET 2 OF 23 SHEETS DZ4 10/17/07 2761 FOR CITY ENGINEER DESCRIPTION BY APPROVED DATE FILMED ORIGINAL WAS 1904-6263 NAD 83 COORDINATES 264-1703 LAMBERT COORDINATES AS-BUILTS CONTRACTOR DATE STARTED 32375-2-D

DATE COMPLETED

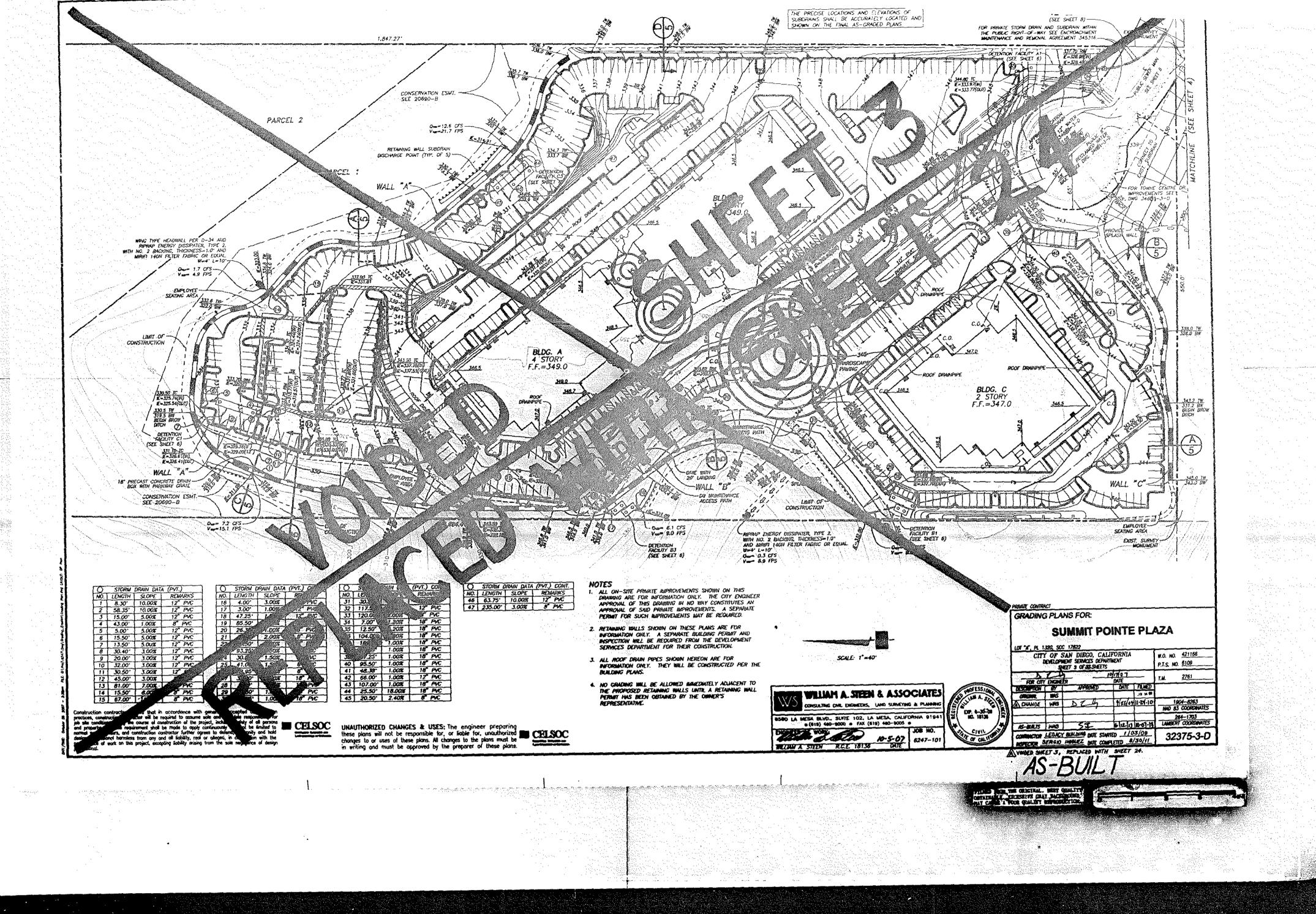
GRADING AND IMPROVEMENT NOTES FOR:

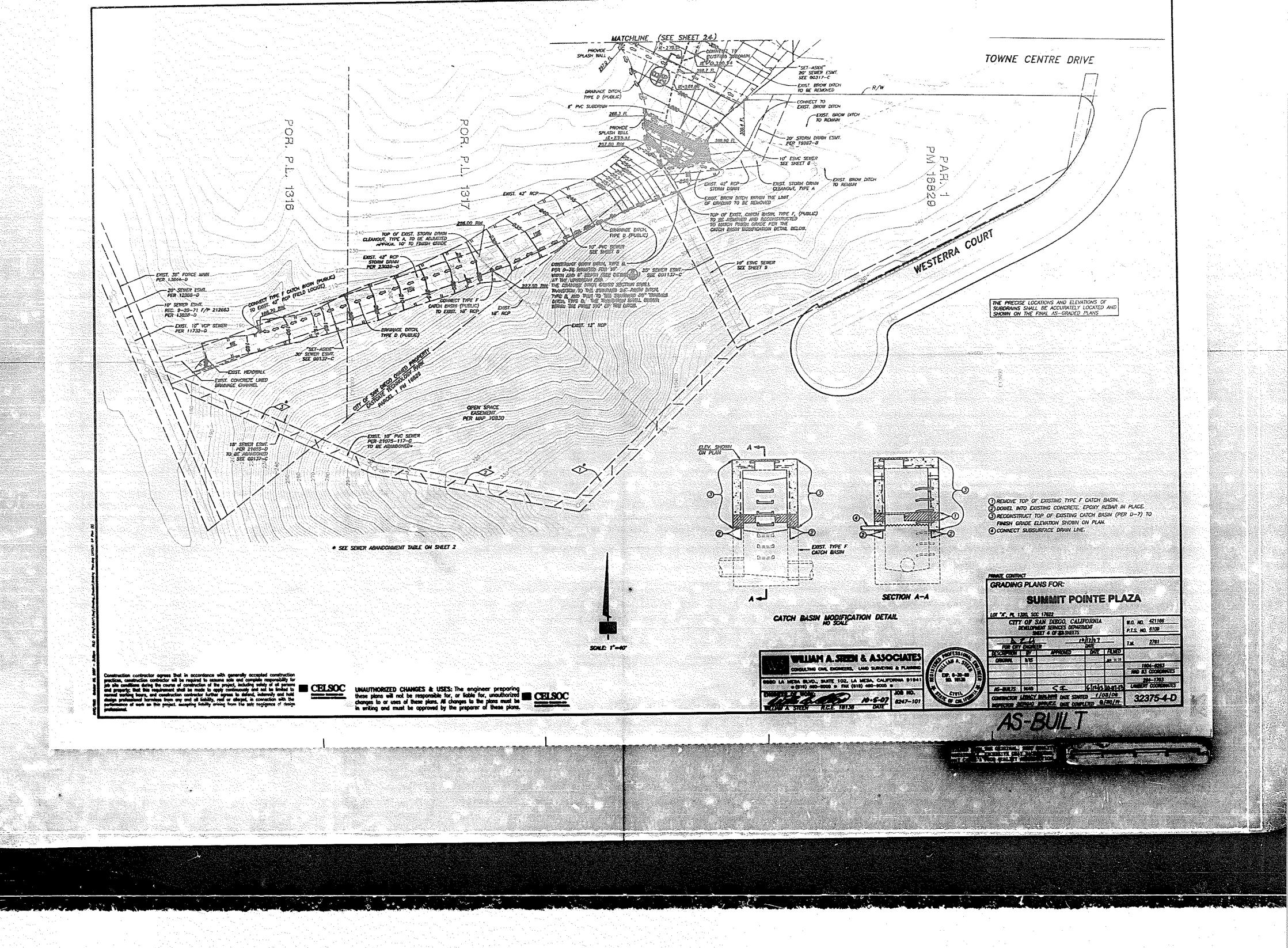
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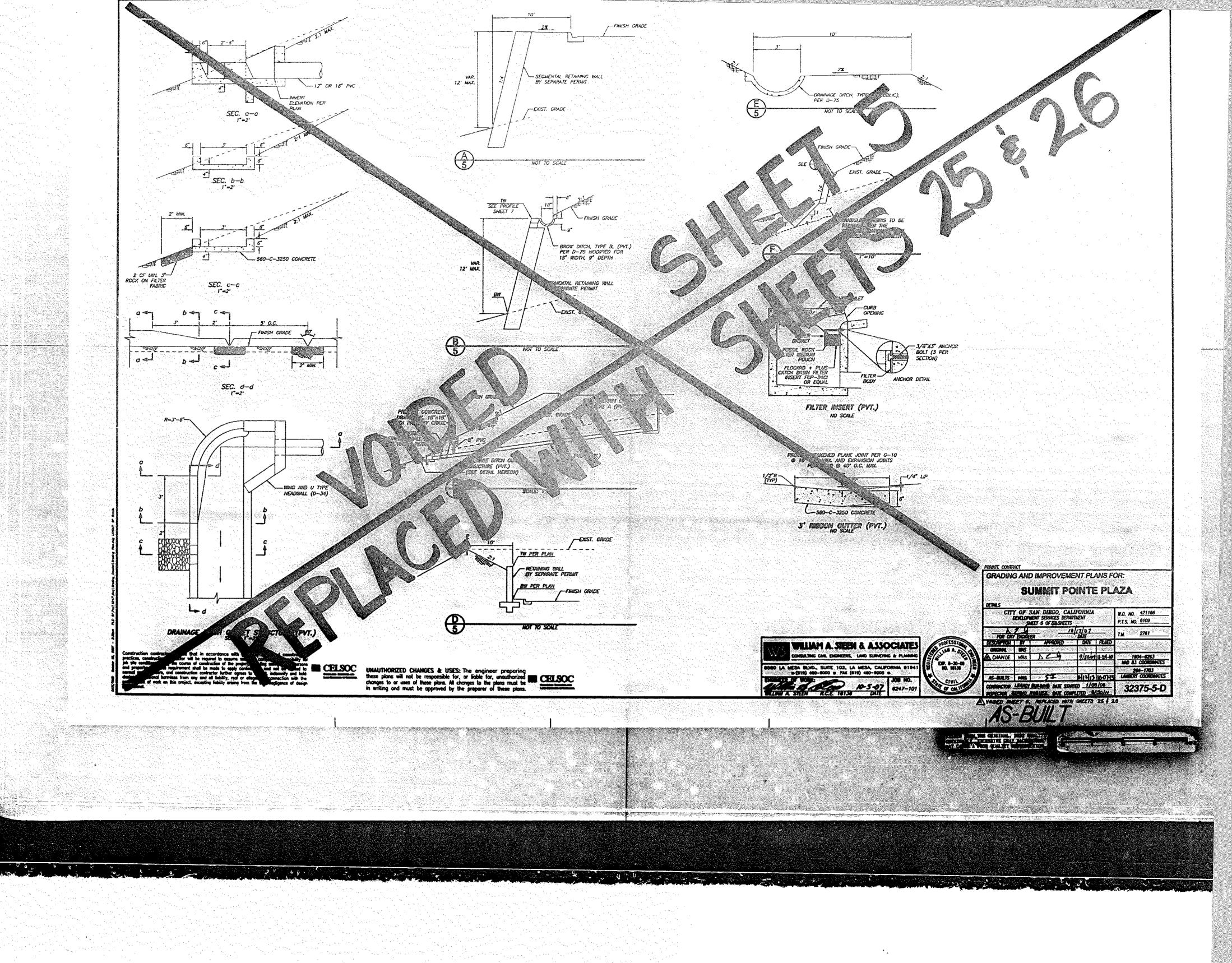
LIFE OF THE PROJECT:

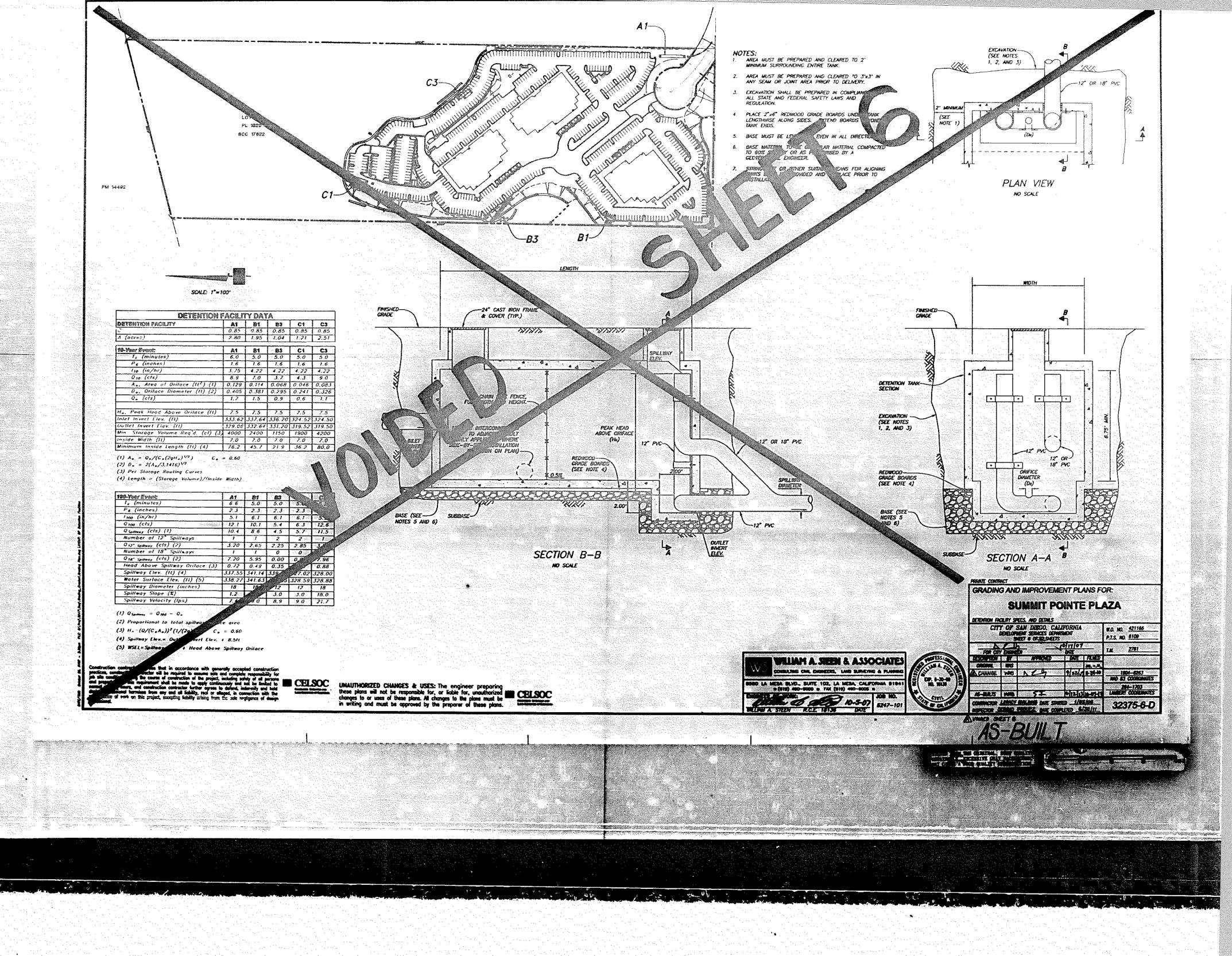
**UNAUTHORIZED CHANGES & USES:** The engineer preparing these plans will not be responsible for, or liable for, unauthorized CELSOC changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.

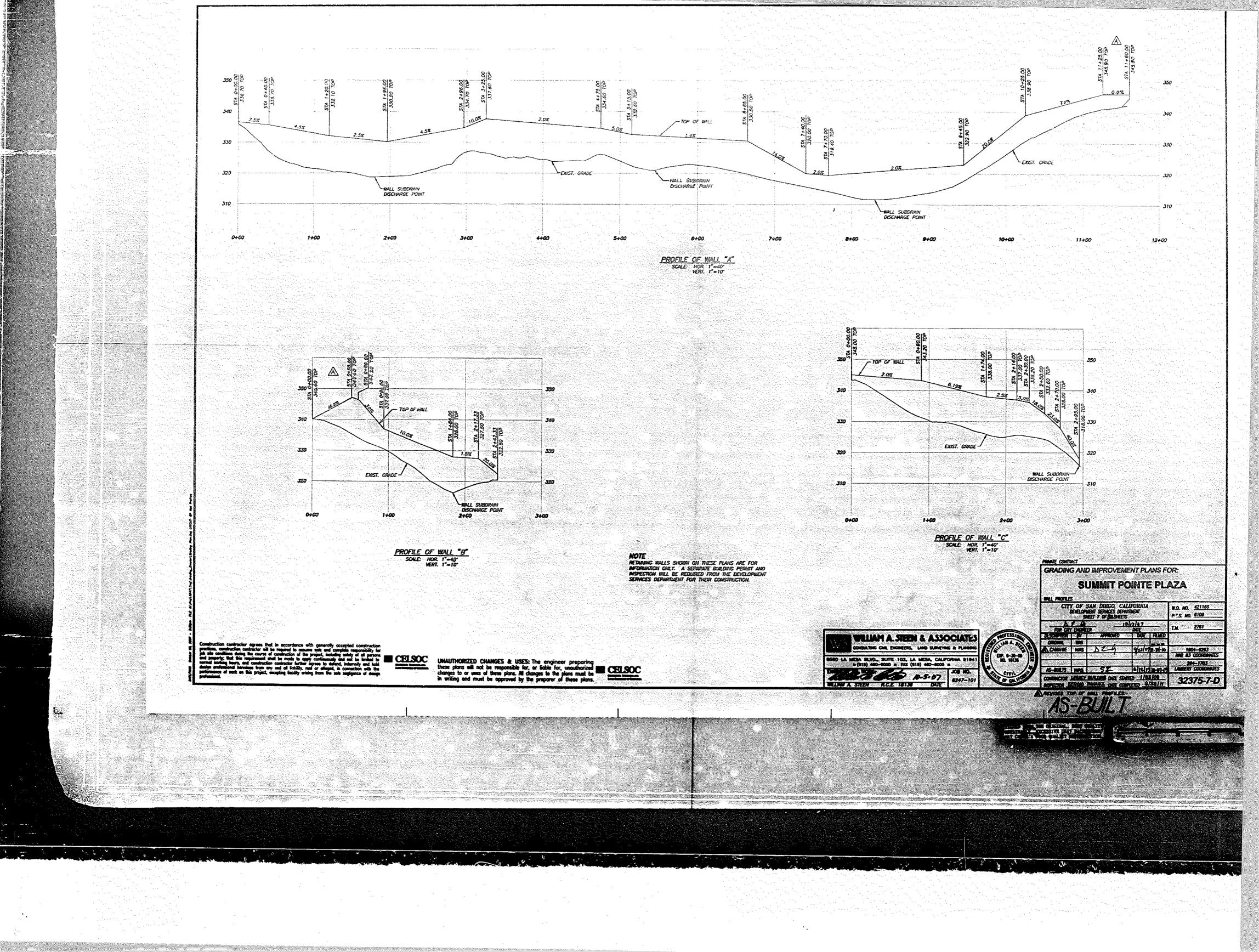


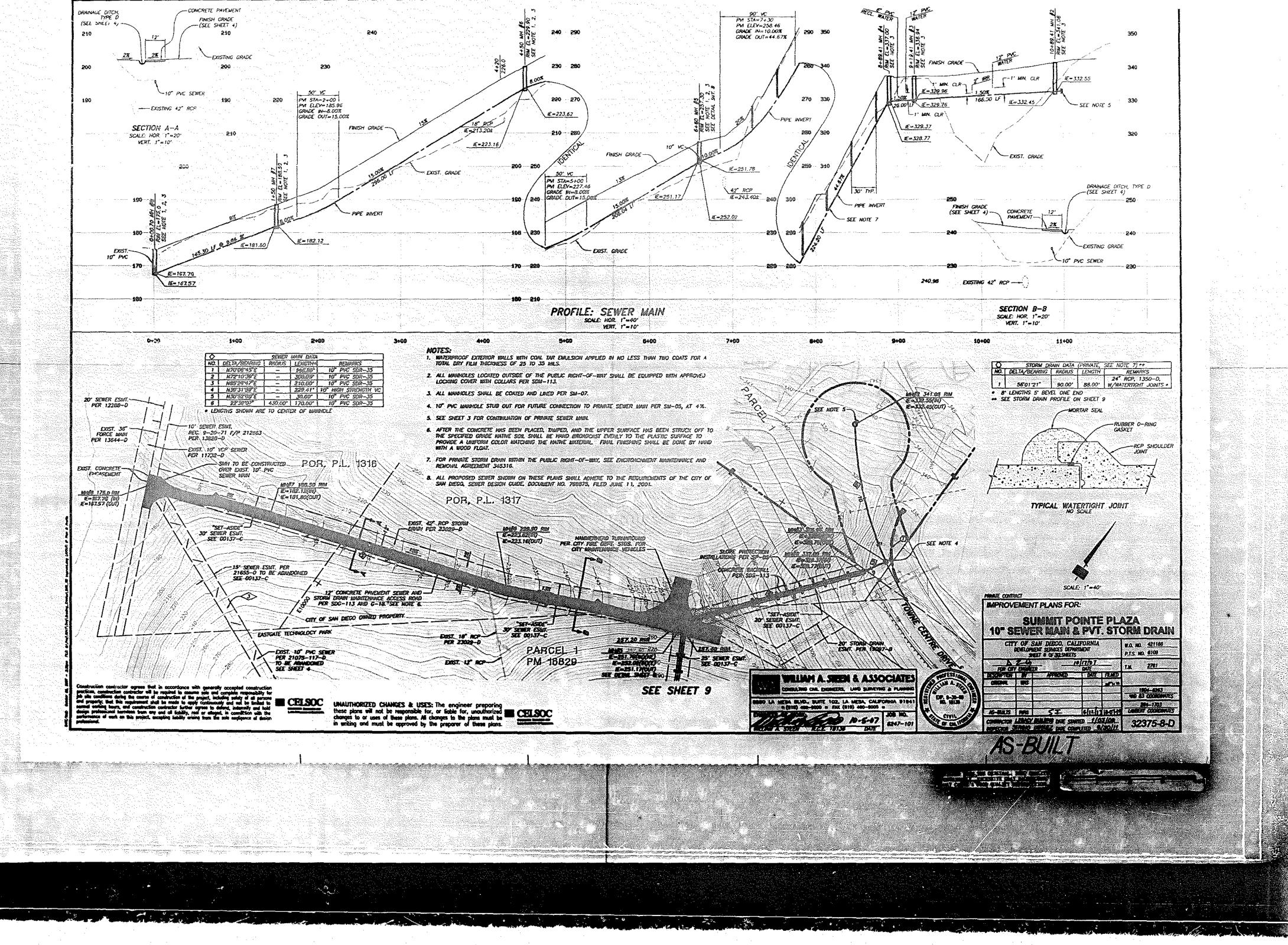


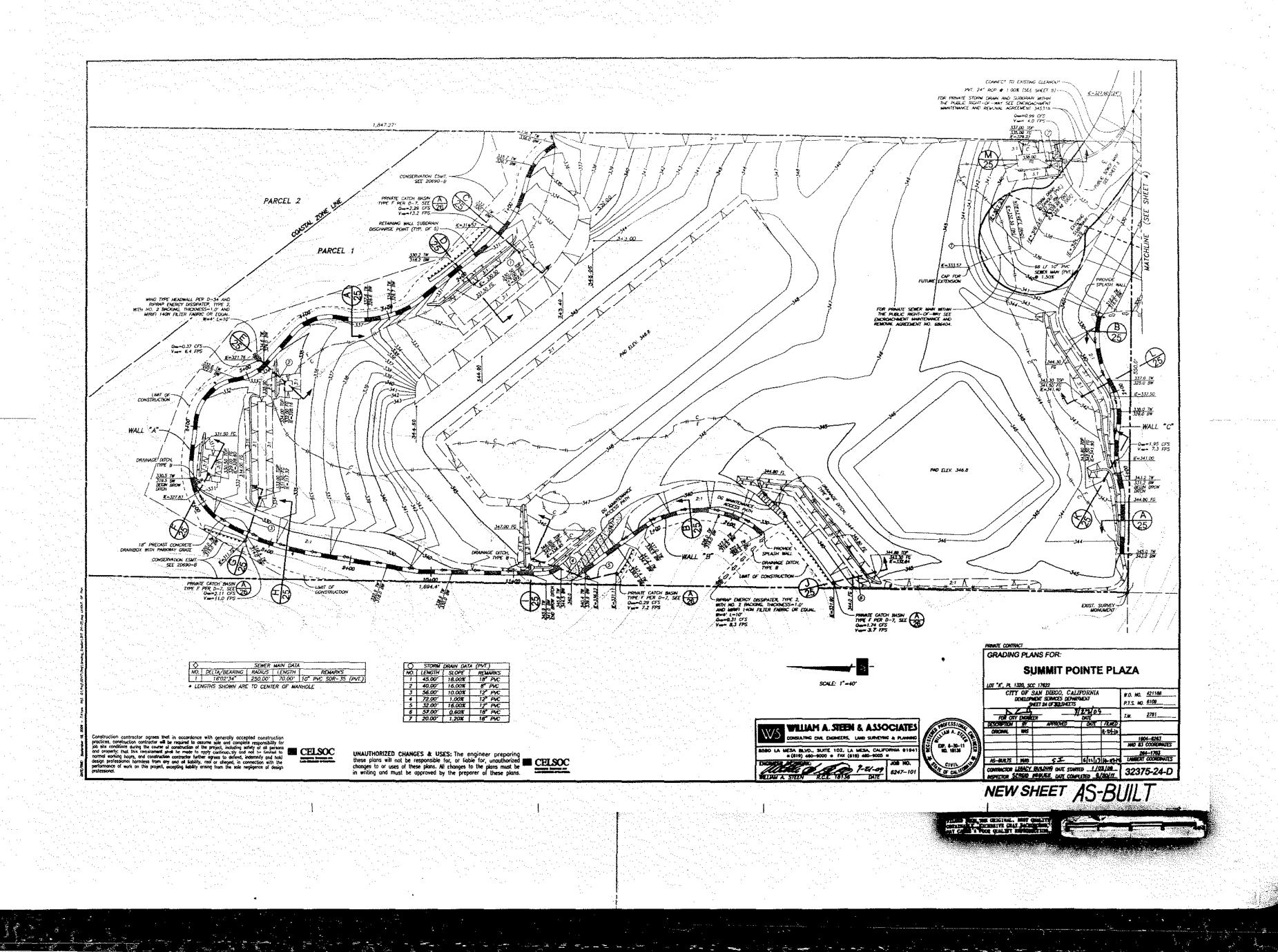


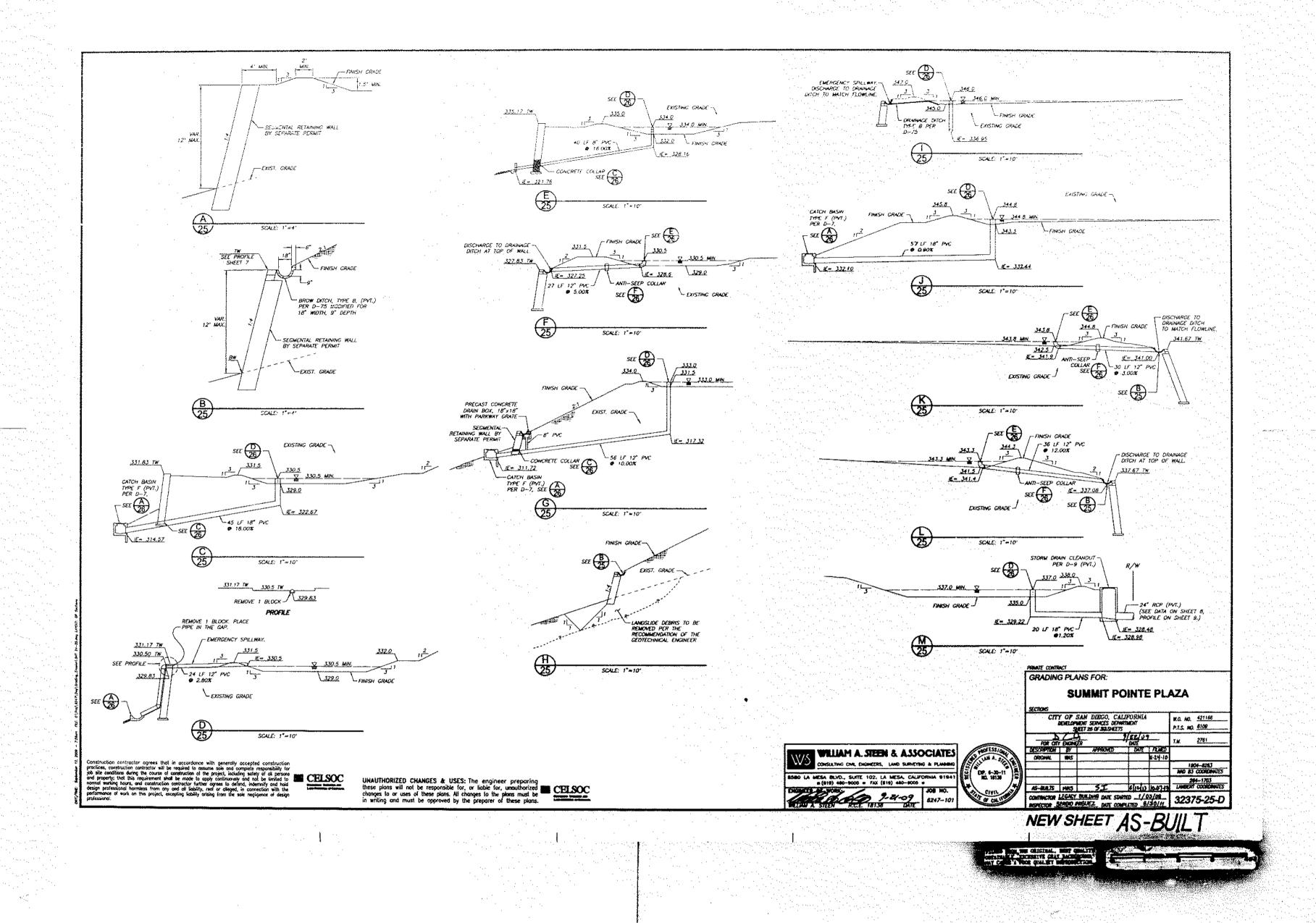


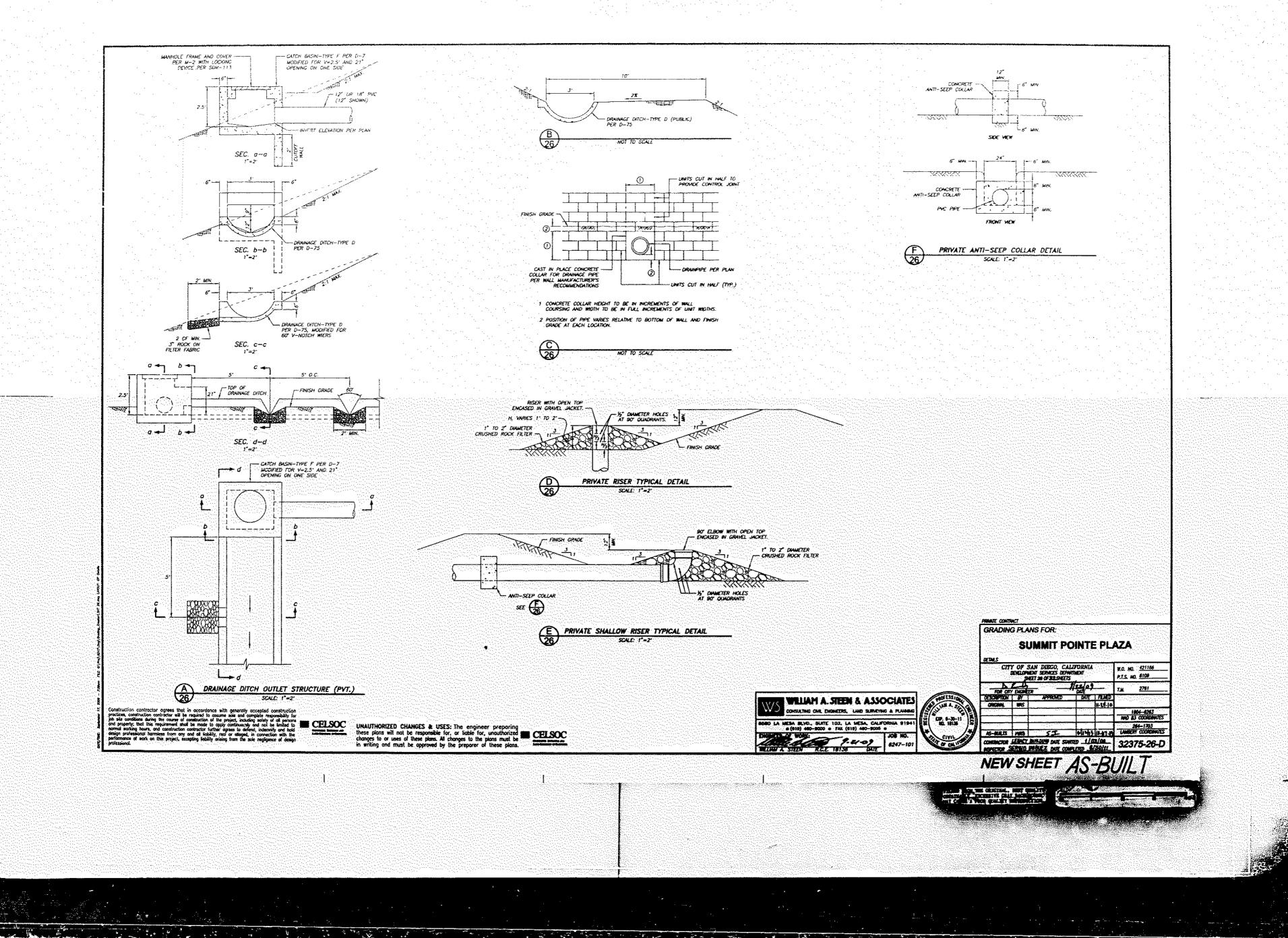












Project Name: Towne Centre View

# Attachment 6 Geotechnical and Groundwater Investigation Report

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



# PRELIMINARY GEOTECHNICAL INVESTIGATION

## TOWNE CENTRE VIEW NORTHERN TERMINUS OF TOWNE CENTRE DRIVE SAN DIEGO, CALIFORNIA

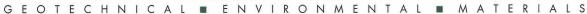


GEOTECHNICAL ENVIRONMENTAL MATERIALS

PREPARED FOR

BRE-BMR TOWNE CENTRE SCIENCE PARK, LLC SAN DIEGO, CALIFORNIA

OCTOBER 6, 2020 REVISED FEBRUARY 3, 2021 PROJECT NO. G2326-52-02





Project No. G2326-52-02 October 6, 2020 Revised February 3, 2021

BRE-BMR Towne Centre Science Park LLC, 17190 Bernardo Center Drive San Diego, California 92128

Mr. Jonathan Bergschneider Attention:

Subject: PRELIMINARY GEOTECHNICAL INVESTIGATION

TOWNE CENTRE VIEW

NORTHERN TERMINUS OF TOWNE CENTRE DRIVE

SAN DIEGO, CALIFORNIA

Dear Mr. Bergschneider:

In accordance with your request and authorization of our Proposal No. LG-20302 dated July 20, 2020, we herein submit the results of our preliminary geotechnical investigation for the subject project. We performed our investigation to evaluate the underlying soil and geologic conditions and potential geologic hazards, and to assist in the design of the proposed building and associated improvements.

The accompanying report presents the results of our study and conclusions and recommendations pertaining to geotechnical aspects of the proposed project. The site is suitable for the proposed buildings and improvements provided the recommendations of this report are incorporated into the design and construction of the planned project.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Matt Love

RCE 84154

ML:SFW:JH:arm

(e-mail) Addressee Shawn Foy Weedon

GE 2714

John Hoobs

**CEG 1524** 

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RECOMMENDED GRADING SPECIFICATIONS

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#### PRELIMINARY GEOTECHNICAL INVESTIGATION

#### 1. PURPOSE AND SCOPE

This report presents the results of our preliminary geotechnical investigation for the proposed science and technology development in the Sorrento Mesa area of San Diego, California (see Vicinity Map). The purpose of this preliminary geotechnical investigation is to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may affect development of the property including faulting, liquefaction and seismic shaking based on the 2019 CBC seismic design criteria. In addition, we provided preliminary recommendations for remedial grading, shallow foundations, concrete slab-on-grade, concrete flatwork, pavement, and retaining walls.



**Vicinity Map** 

The scope of this investigation included reviewing readily available published and unpublished geologic literature (see List of References), performing engineering analyses and preparing this report. We also advanced 14 exploratory borings to a maximum depth of about 61 feet, sampled soil and performed laboratory testing. Appendix A presents the exploratory boring logs and details of the field investigation. The details of the laboratory tests and a summary of the test results are shown in Appendix B and on the boring logs in Appendix A.

#### 2. SITE AND PROJECT DESCRIPTION

The subject site includes several parcels of land located north of Towne Centre Drive at the intersection of Westerra Court. The western portion of the site includes the Towne Centre Corporate Plaza property that was previously graded to receive two commercial buildings and is currently being used as a construction-staging yard by Mid-Coast Transit Constructors. The central portion of the site includes three office buildings (9865, 9875 and 9885 Towne Centre Drive) that are two- to three-stories with accommodating utilities, surface parking and landscaping. The eastern portion consists of a two-story commercial building with surface parking to the south and a basketball court to the north (9855 Towne Centre Drive). The elevations on the property in the areas of the existing buildings and graded pads are about 330 to 360 feet mean sea level (MSL). Descending natural slopes exist on the north, west and southwest of the properties. The descending slope located on the south side of the Towne Centre Drive cul-de-sac consists of a fill slope that was constructed under our testing and observation services. The Existing Site Map shows the current configuration of the subject property and the approximate limits of the overall property. Grading will generally be limited to the existing top of slope boundary (as shown in the Geologic Map and other Figures in this report).



**Existing Site Map** 

Based on our review of the preliminary site plan prepared by Perkins + Will (see *List of References*), we understand the proposed development will include construction of a new science, research and development, laboratory, technology and office building campus that includes four new buildings (Buildings A through D) connected with subterranean parking with accommodating utilities, surface parking and driveways and landscaping. Additionally, an above-ground parking garage and additional

commercial building (Building E) are proposed for the eastern portion of the site. Based on the referenced plans, the grading for the proposed campus will consist of cuts and fills on the order of 50 and 15 feet, respectively. In order to construct the parking garage, about 50 feet of cut will be performed that would incorporate temporary slopes and soil nail walls. We expect the proposed structures will consists of a shallow foundation system that will be embedded into the underlying formational materials.

The locations, site descriptions, and proposed development are based on our site reconnaissance, review of published geologic literature, field investigations, and discussions with project personnel. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

#### 3. PREVIOUS GRADING

The western portion of the project, which is currently being used as a construction-staging yard, consists of previously graded property originally called Summit Pointe Plaza. The grading operations of the site occurred in 2008 and 2009 and consisted of sheet grading of the site for future building pads, driveways and parking areas with maximum cuts from natural grade of approximately 20 feet and fill of up to approximately 15 feet deep. Additionally, several mechanically stabilized earth (MSE) retaining walls with a maximum height of 20 feet were constructed along the northern, western and southern perimeters of the site. The reinforcing grid behind the MSE walls ranged from 5 to 19 feet in length behind the walls. The development originally consisted of hillside topography. The general geologic conditions prior to mass grading consisted of surficial soil composed of topsoil, undocumented fill and colluvium overlying formational materials of Very Old Paralic Deposits and the Ardath Shale.

The previous grading operations consisted of performing canyon clean-outs, subdrain placement, and the removal of unsuitable materials (i.e. surficial soil and vegetation) prior to the placement of properly compacted fill and construction of retaining walls. A subdrain was installed in the major canyon area to the south of the site. Geocon Incorporated provided the testing and observation services during grading operations that consisted of performing laboratory and compaction testing. Our field density test results (provided in our Final Report of Testing and Observation During Site Grading and Installation of Retaining Walls (Geocon, 2010) indicate that the fill soil was placed at a dry density of at least 90 percent of the laboratory maximum dry density.

#### 4. GEOLOGIC SETTING

Regionally, the site is located in the Peninsular Ranges geomorphic province. The province is bounded by the Transverse Ranges to the north, the San Jacinto Fault Zone on the east, the Pacific Ocean coastline on the west, and the Baja California on the south. The province is characterized by elongated northwest-trending mountain ridges separated by straight-sided sediment-filled valleys. The northwest

trend is further reflected in the direction of the dominant geologic structural features of the province that are northwest to west-northwest trending folds and faults, such as the nearby Rose Canyon fault zone.

Locally, the site is within the coastal plain of San Diego County. The coastal plain is underlain by a thick sequence of relatively undisturbed and non-conformable sedimentary bedrock units that thicken to the west and range in age from Upper Cretaceous age through the Pleistocene age which have been deposited on Cretaceous to Jurassic age igneous and volcanic bedrock. Geomorphically, the coastal plain is characterized by a series of 21, stair-stepped marine terraces (younger to the west) that have been dissected by west flowing rivers. The coastal plain is a relatively stable block that is dissected by relatively few faults consisting of the potentially active La Nacion Fault Zone and the active Rose Canyon Fault Zone. The western portion of the coastal plain contains several inactive and potentially active faults associated with the Rose Canyon Fault Zone

The site is located on the western portion of the coastal plain. Marine sedimentary units make up the geologic sequence encountered on the site and consist of Pleistocene-age Very Old Paralic Deposits (formerly known as the Lindavista Formation) and the Tertiary-aged Scripps Formation and Ardath Shale. The Very Old Paralic Deposits are shallow near shore marine deposits generally consisting of clayey to silty sandstone interfingered with occasional thin layers of conglomerate, siltstone and claystone. The regional geologic map shows a north trending contact before grading operations between Units 9 and 10 of the Very Old Paralic Deposits. Unit 9 is exposed on the eastern portion of the site and is correlative to the Linda Vista Terrace that is roughly 855,000 years old. Unit 10 is exposed on the western portion of the site correlative to the Tecolote Terrace that is 800,000 years old. The center portion of the site removed the terraces and currently exposes the Ardath Shale. The terraces were deposits on a sloping Ardath Shale surface creating locally thick Very Old Paralic deposits.

The Scripps Formation is exposed on the north side of the Torrey Pines Fault located on the northern portion of the site above an elevation of roughly 250 feet MSL. The Scripps Formation is typically composed of silty to clayey sandstone with occasional conglomerate layers. The Ardath Shale is typically composed of fine grained soils that are exposed on the south side of the fault below the Very Old Paralic Deposits on the west and east portions of the site and in the central portion. This unit is typically several hundred feet thick. Regionally the Scripps Formation and Ardath Shale have dips up to 10 degrees and are folded into north plunging synclines and anticlines in the area. The Regional Geologic Map, Figure 2, shows the geologic units in the area of the site.

#### 5. SOIL AND GEOLOGIC CONDITIONS

We encountered two surficial soil units (consisting of previously compacted fill and undocumented fill) and three geologic units (consisting of Very Old Paralic Deposits, the Scripps Formation and the Ardath Shale). The occurrence, distribution, and description of each unit encountered is shown on the

Geologic Map, Figure 1 and on the boring logs in Appendix A. The geologic units are described herein in order of increasing age.

## 5.1 Previously Placed Fill (Qpf)

We encountered previously placed fill in Borings B-1 and B-2 to depths ranging from about 5 to 10 feet. The fill materials were placed during prior grading activities in 2008/2009 on the western portion of the site (currently used as construction-staging yard) which was observed by Geocon Incorporated (see *List of References*). In general, the fill consists of medium dense to dense, mixed silty and clayey sand with some gravel and cobble. The previously placed fill typically possess a "very low" to "medium" expansion potential (expansion index of 90 or less) and a "S0" sulfate class. With the exception of the upper 1 to 2 feet, the previously placed fill materials are considered acceptable to support the planned fill and foundation loads for the development.

## 5.2 Undocumented Fill (Qudf)

We encountered undocumented fill in our Borings B-11 and B-13 to depths ranging from about 12 to 58 feet. We expect the undocumented fill materials were placed in the early 2000's to fill the existing canyon and match adjacent site grades during previous grading at the site. While we were not able to review specific documentation of the placement of the fill, we do expect that these materials were placed as compacted fills based on the field and laboratory test results of the materials. In general, the fill consists of medium dense to dense, clayey sand and stiff to very stiff, sandy clay. The undocumented fill is considered potentially suitable in its current condition for the support of foundations or structural fill and remedial grading of the materials can be limited as recommended herein; however, the project civil and structural engineers should evaluate if the fill-related settlements can be accommodated by the proposed improvements. The undocumented fill can be reused for new compacted fill during grading operations provided it is generally free of roots and debris.

#### 5.3 Very Old Paralic Deposits (Qvop)

The Quaternary-age Very Old Paralic Deposits exist below the fill materials or at-grade across the western (Unit 10) and eastern portions (Unit 9) of the site. These deposits generally consist of dense to very dense, light to dark reddish brown and olive brown, silty to clayey, fine to medium sand with gravel and cobble. The Very Old Paralic Deposits typically possess a "very low" to "medium" expansion potential (expansion index of 90 or less) and a "S0" sulfate class. The Very Old Paralic Deposits are considered acceptable to support the planned fill and foundation loads for the development.

## 5.4 Scripps Formation (Tsc)

Tertiary-age Scripps Formation is mapped to underly the Very Old Paralic Deposits on the northern portion of the site, north of the mapped fault. The Scripps Formation is generally brown, yellowish brown to light gray, silty to clayey sandstone and sandy siltstone/claystone containing layers of strongly cemented material. Our laboratory tests and experience indicate the Scripps Formation possesses a "very low" to "medium" expansion potential (expansion index of 90 or less) and an "S0" to "S2" water-soluble sulfate exposure. The Scripps Formation is generally considered suitable for support of properly compacted structural fill and improvements. However, based on our observations at the site, we do not anticipate that the Scripps Formation will be encountered during the development of the site.

## 5.5 Ardath Shale (Ta)

We encountered the Ardath Shale underlying the fill materials and Very Old Paralic Deposits in all of our borings. The Ardath Shale generally consists of hard, gray, clayey siltstone and sandy siltstone. The Ardath Shale may contain localized areas of highly cemented concretionary beds. Soil generated from this unit typically possess a "very low" to "medium" expansion potential (expansion index of 90 or less) and an "S0" to "S2" water-soluble sulfate exposure. The Ardath Shale is generally considered suitable for support of properly compacted structural fill and improvements.

#### 6. GROUNDWATER

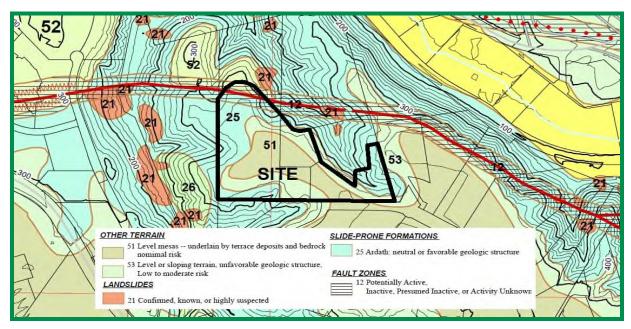
We did not encounter groundwater or seepage during our site investigation to the maximum depth explored of 61 feet. We expect the groundwater table is at least 200 feet below existing grades. However, it is not uncommon for seepage conditions to develop where none previously existed when sites are irrigated or infiltration is implemented. Seepage is dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project. We expect groundwater is deeper than about 100 feet below existing grade. We do not expect groundwater to be encountered during construction of the proposed development.

#### 7. GEOLOGIC HAZARDS

#### 7.1 Geologic Hazard Category

The City of San Diego Seismic Safety Study, Geologic Hazards and Faults, Sheet 34 defines the majority of the site with *Hazard Category 51: Level Mesas – Underlain by Terrace Deposits and Bedrock, Nominal Risk, Hazard Category 53: Level or Sloping Terrain, Unfavorable Geologic Structures, Low to Moderate Risk,* and *Hazard Category 25: Ardath – Neutral or Favorable Geologic Structure* (as shown on the Hazard Category Map). Additionally, the northwestern corner is defined

as Hazard Category 12: Fault Zone – Potentially Active, Inactive, Presumed Inactive, or Activity Unknown.



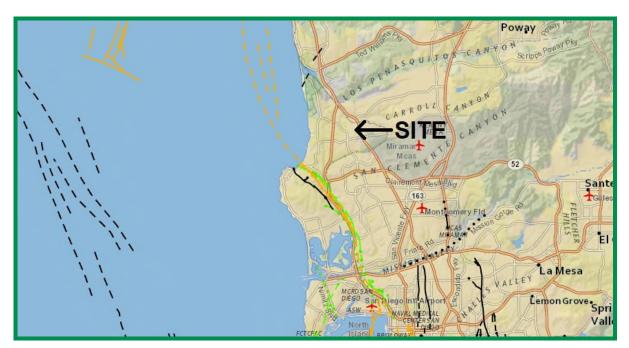
**Hazard Category Map** 

## 7.2 Faulting and Seismicity

An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,700 years. The site is not located within a State of California Earthquake Fault Zone.

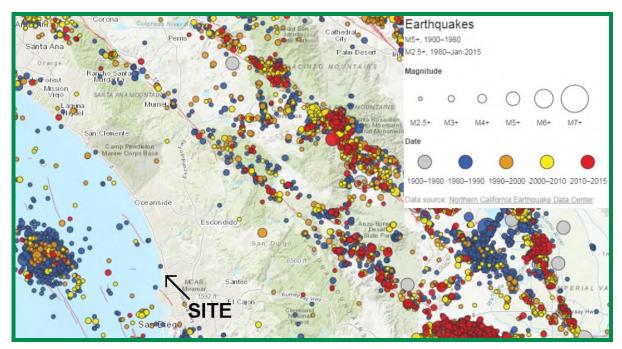
As shown in the Hazard Category Map, the City of San Diego Seismic Safety Study indicates a trace of the Torrey Pines Fault bisects the northern portion of the property generally with an east-to-west trend. The Torrey Pines Fault is not known to displace Quaternary-aged Very Old Paralic Deposits and is not classified as being active according to M. P. Kennedy, 1975, Bulletin 200, California Division of Mines and Geology (CDMG). We performed trenching within the fault trace during a previous investigation at the site (see *References*), where we observed that there was no indication of disturbance to the Pleistocene-aged Very Old Paralic Deposits Unit 10 or the Linda Vista Terrace that is roughly 800,000 years old (formerly Lindavista Formation). Based on a review of published geologic literature and observations during previous site investigations, we opine known active faults do not exist on the site. Therefore, the fault may be classified as potentially active, defined as no movement in the last 11,700 years. Based on the geologic conditions on site, the fault has not moved in at least the last 800,000 years. Furthermore, we do not consider structural setbacks would be necessary from a geotechnical engineering standpoint due to faulting.

The USGS has developed a program to evaluate the approximate location of faulting in the area of properties. The following figure shows the location of the existing faulting in the San Diego County and Southern California region. The fault traces are shown as solid, dashed and dotted that represent well-constrained, moderately constrained and inferred, respectively. The fault line colors represent fault with ages less than 150 years (red), 15,000 years (orange), 130,000 years (green), 750,000 years (blue) and 1.6 million years (black).



**Faults in Southern California** 

The San Diego County and Southern California region is seismically active. The following figure presents the occurrence of earthquakes with a magnitude greater than 2.5 from the period of 1900 through 2015 according to the Bay Area Earthquake Alliance website.



Earthquakes in Southern California

Considerations important in seismic design include the frequency and duration of motion and the soil conditions underlying the site. Seismic design of structures should be evaluated in accordance with the California Building Code (CBC) guidelines currently adopted by the local agency.

## 7.3 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects the ground surface. The potential for ground rupture is considered to be very low due to the absence of active faults at the subject site.

#### 7.4 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless or silt/clay with low plasticity, groundwater is encountered within 50 feet of the surface and soil densities are less than about 70 percent of the maximum dry densities. If the four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. Due to the lack of a permanent, near-surface groundwater table and the very dense nature of the underlying Very Old Paralic Deposits and the Ardath Shale, liquefaction potential for the site is considered very low.

## 7.5 Storm Surge, Tsunamis, and Seiches

Storm surges are large ocean waves that sweep across coastal areas when storms make landfall. Storm surges can cause inundation, severe erosion and backwater flooding along the water front. The site is located approximately 2 miles from the Pacific Ocean and is at an elevation of about 330 feet or greater above Mean Sea Level (MSL). Therefore, the potential of storm surges affecting the site is considered low.

A tsunami is a series of long period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The site is at a minimum elevation of 330 above feet MSL and is about 2 miles from the Pacific Ocean. Therefore, the potential for the site to be affected by a tsunami is negligible.

A seiche is a run-up of water within a lake or embayment triggered by fault- or landslide-induced ground displacement. The site is not located in the vicinity of or downstream from such bodies of water. Therefore, the risk of seiches affecting the site is negligible.

#### 7.6 Landslides

We did not observe evidence of previous or incipient slope instability on the southern, northern or eastern slopes during this or previous studies. We did encounter previous landslide debris in the west/northwest corner of the site previous during grading for the retaining walls. However, the majority of the landslide debris materials was removed during grading and replaced with compacted fill, and subsequent slope stability evaluations of the graded slope indicated a calculated factor of safety of at least 1.5 under static conditions. Additionally, the *City of San Diego Seismic Safety Study, Geologic Hazards and Faults*, Map Sheet 34 has mapped two landslides to the north of the property defined as Hazard Category 21: *Landslides, confirmed, known, or highly suspected.* The mapped landslides are at least 300 feet away from the proposed structures at the site and 150 feet away from the proposed limits of grading. Therefore, we do not expect landsliding is an issue for this property.

## 7.7 Slope Stability

Fill slopes are proposed at the site with heights on the order of 20 feet. Slope stability analyses for the proposed fill slopes with inclinations as steep as 2:1 (horizontal:vertical) indicate a calculated factor of safety of at least 1.5 under static conditions for both deep-seated and surficial failure. Table 7.7.1 presents the slope stability analysis for the proposed sloping conditions.

TABLE 7.7.1 SLOPE STABILITY EVALUATION

Parameter	Value
Slope Height, H	20 Feet
Slope Inclination, I (Horizontal to Vertical)	2:1
Total Soil Unit Weight, γ	130 pcf
Friction Angle, □	28 Degrees
Cohesion, C	300 psf
Slope Factor $\gamma_C \square = (\gamma H \tan \square)/C$	4.6
NCf (From Chart)	20
Factor of Safety = $(N_{Cf}C)/(\gamma H)$	2.3

Table 7.7.2 presents the surficial slope stability analysis for the proposed sloping conditions.

TABLE 7.7.2
SURFICIAL SLOPE STABILITY EVALUATION

Parameter	Value	
Slope Height, H	$\infty$	
Vertical Depth of Saturation, Z	3 Feet	
Slope Inclination, I (Horizontal to Vertical)	2:1 (26.6 Degrees)	
Total Soil Unit Weight, γ	130 pcf	
Water Unit Weight, γ <sub>W</sub>	62.4 pcf	
Friction Angle, □	28 Degrees	
Cohesion, C	300 psf	
Factor of Safety = $(C+(\gamma+\gamma_W)Z\cos^2I \tan\Box)/(\gamma Z\sin I \cos I)$	2.5	

Slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, slopes should be drained and properly maintained to reduce erosion.

# 8. CONCLUSIONS AND RECOMMENDATIONS

### 8.1 General

- 8.1.1 We did not encounter soil or geologic conditions during our exploration that would preclude the proposed development, provided the recommendations presented herein are followed and implemented during design and construction. We will provide supplemental recommendations if we observe variable or undesirable conditions during construction, or if the proposed construction will differ from that anticipated herein.
- 8.1.2 With the exception of possible moderate to strong seismic shaking, we did not observe or know of significant geologic hazards to exist on the site that would adversely affect the proposed project.
- 8.1.3 The previously placed fill, Very Old Paralic Deposits and Ardath Shale are considered suitable for the support of proposed fill and structural loads. The undocumented fill is also considered potentially suitable for support of the proposed improvements, assuming that the project civil and structural engineers consider the fill-related settlement discussed herein can be accommodated by the proposed improvements. Remedial grading of these materials should be performed as discussed herein.
- 8.1.4 We did not encounter groundwater during our subsurface exploration and we do not expect it to be a constraint to project development. However, seepage within surficial soil and formational materials may be encountered during the grading operations, especially during the rainy seasons.
- 8.1.5 Excavation of the fill and formational materials should generally be possible with moderate to heavy effort using conventional, heavy-duty equipment during construction operations. We did encounter very difficult drilling and refusal in the formational materials during our field investigation. Therefore, we expect very heavy effort with possible refusal in localized areas for excavations into strongly cemented portions of the Very Old Paralic Deposits and Ardath Shale.
- 8.1.6 Based on our review of the project plans, we opine the planned development can be constructed in accordance with our recommendations provided herein. We do not expect the planned development will destabilize or result in settlement of adjacent properties if properly constructed.
- 8.1.7 Surface settlement monuments and new canyon subdrains will not be required on this project.

### 8.2 Excavation and Soil Characteristics

- 8.2.1 Excavation of the in-situ soil should be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavation of the formational materials will require very heavy effort and may generate oversized material using conventional heavy-duty equipment during the grading operations. Oversized rock (rocks greater than 12-inches in dimension) may be generated with the formational units that can be incorporated into landscape use or deep compacted fill areas, if available. We encountered very difficult drilling and refusal in the formational materials during our field investigation. Therefore, we expect very heavy effort with possible refusal in localized areas for excavations into strongly cemented portions of the Very Old Paralic Deposits and Ardath Shale. However, we do not expect that blasting will be needed for this project.
- 8.2.2 The soil encountered in the field investigation is considered to be "non-expansive" and "expansive" (expansion index [EI] of 20 or less and greater than 20, respectively) as defined by 2019 California Building Code (CBC) Section 1803.5.3. Table 8.2.1 presents soil classifications based on the expansion index. We expect a majority of the soil encountered possess a "very low" to "medium" expansion potential (EI of 90 or less).

TABLE 8.2.1
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2019 CBC Expansion Classification
0 - 20	Very Low	Non-Expansive
21 – 50	Low	
51 – 90	Medium	<b></b>
91 – 130	High	Expansive
Greater Than 130	Very High	

8.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the locations tested possess "S0" sulfate exposure to concrete structures as defined by 2019 CBC Section 1904 and ACI 318-14 Chapter 19. However, some areas of the Ardath Shale possess "S1" to "S2" water-soluble sulfate contents and additional concrete design recommendations may be encountered during construction. Table 8.2.2 presents a summary of concrete requirements set forth by 2019 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could

yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 8.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO <sub>4</sub> ) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight <sup>1</sup>	Minimum Compressive Strength (psi)
SO	SO <sub>4</sub> <0.10	No Type Restriction	n/a	2,500
S1	0.10 <u>&lt;</u> SO <sub>4</sub> <0.20	II	0.50	4,000
S2	0.20 <u>&lt;</u> SO <sub>4</sub> <u>&lt;</u> 2.00	V	0.45	4,500
S3	SO <sub>4</sub> >2.00	V+Pozzolan or Slag	0.45	4,500

<sup>&</sup>lt;sup>1</sup> Maximum water to cement ratio limits do not apply to lightweight concrete

8.2.4 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements susceptible to corrosion are planned.

# 8.3 Preliminary Grading Recommendations

- 8.3.1 Grading should be performed in accordance with the recommendations provided in this report, the Recommended Grading Specifications contained in Appendix C and the City of San Diego's Grading Ordinance. Geocon Incorporated should observe the grading operations on a full-time basis and provide testing during the fill placement.
- 8.3.2 Prior to commencing grading, a preconstruction conference should be held at the site with the city inspector, developer, grading and underground contractors, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.
- 8.3.3 Site preparation should begin with the removal of deleterious material, debris, and vegetation. The depth of vegetation removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site. Asphalt and concrete should not be mixed with the fill soil unless approved by the Geotechnical Engineer.

- 8.3.4 Abandoned foundations and buried utilities (if encountered) should be removed and the resultant depressions and/or trenches should be backfilled with properly compacted material as part of the remedial grading.
- 8.3.5 We expect Very Old Paralic Deposits or Ardath Shale will be exposed at the base of the excavation for the subterranean parking garage. Additional remedial grading will likely not be required where the formational materials are exposed at finish grade elevation within the entire footprint of the buildings (Buildings A, C and D). We expect that the southern portion of Building B will be situated over the subterranean parking garage on formational materials and that the northern portion of Building B will likely be supported by deep foundations embedded within the underlying formational materials. Additionally, we expect that the above-grove parking structure (referred to as "Parking Structure" herein) might be supported on deep foundations due to the differential fill depths below the building pad. The minimum removal where fill materials are present at proposed grade and the building is supported by deep foundations should be 3 feet below pad grade (Building B and Parking Structure). For buildings underlain by fill, the existing fill within the building pad should be removed to expose the underlying formational materials and replaced with properly compacted fill (Building E and Parking Structure). However, if the structural engineer determines that the fill-related settlements provided herein can be accommodated by the structures, the removals can be limited to the upper 5 feet of materials (Building E and **Parking Structure**). The removals should extend at least 5 feet outside of the building areas, where possible.
- 8.3.6 In areas of proposed improvements outside of the building areas, the upper 1 to 2 feet of existing soil should be processed, moisture conditioned as necessary and recompacted. Deeper removals may be required in areas where loose or saturated materials are encountered. The removals should extend at least 2 feet outside of the improvement area, where possible. Table 8.3.1 provides a summary of the grading recommendations.

TABLE 8.3.1
SUMMARY OF GRADING RECOMMENDATIONS

Area	Removal Requirements
Building Pads A, B*, C & D – Formational Materials	Removal to Pad Grade
Building Pads B* and Parking Structure – Fill Materials (Deep Foundation Areas)	Removal to 3 Feet Below Pad Grade
Building Pads E and Parking Structure –	Removal of Undocumented Fill to Expose Underlying Formational Materials; or
Fill Materials (Shallow Foundation Areas)	Removal of Upper 5 Feet of Existing Materials (if fill- related settlement can be accommodated by structure, as determined by structural engineer).
Site Development	Process Upper 1 to 2 Feet of Existing Materials
Grading Limits	5 Feet Outside of Buildings/2 Feet Outside of Improvement Areas, Where Possible
Exposed Bottoms of Remedial Grading	Scarify Upper 12 Inches

<sup>\*</sup>The southern half of Building B will be supported by the subterranean parking structure, while the northern portion is situated at-grade over fill materials.

- 8.3.7 We understand that the existing mechanically stabilized earth (MSE) walls at the site are intended to remain in place as part of the proposed development. The geogrid reinforcement for the walls ranges from about 5 to 19 feet behind the walls. To maintain the stability of the walls, the proposed grading and foundation systems at the site should not disturb or intersect with the existing geogrid reinforcement. Based on our review of the current site plans, it appears that the excavations for the proposed subterranean parking structure do not intersect with the existing walls and geogrid. We should provide additional analysis and recommendations if it is determined that the existing walls will be disturbed during site development or if surcharge loads are added.
- 8.3.8 The bottom of the excavations should be sloped 1 percent to the adjacent street or deepest fill. Prior to fill soil being placed, the existing ground surface should be scarified, moisture conditioned as necessary, and compacted to a depth of at least 12 inches. Deeper removals may be required if saturated or loose fill soil is encountered. A representative of Geocon should be on-site during removals to evaluate the limits of the remedial grading.
- 8.3.9 Some areas of overly wet and saturated soil could be encountered due to the existing landscape and pavement areas. The saturated soil would require additional effort prior to placement of compacted fill or additional improvements. Stabilization of the soil would include scarifying and air-drying, removing and replacement with drier soil, use of

stabilization fabric (e.g. Tensar TX7 or other approved fabric), or chemical treating (i.e. cement or lime treatment).

- 8.3.10 The site should then be brought to final subgrade elevations with fill compacted in layers. In general, soil native to the site is suitable for use from a geotechnical engineering standpoint as fill if relatively free from vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM Test Procedure D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations.
- 8.3.11 Import fill (if necessary) should consist of the characteristics presented in Table 8.3.2. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to evaluate its suitability as fill material.

TABLE 8.3.2
SUMMARY OF IMPORT FILL RECOMMENDATIONS

Soil Characteristic	Values	
Expansion Potential	"Very Low" to "Low" (Expansion Index of 50 or less)	
D .: 1 6:	Maximum Dimension Less Than 3 Inches	
Particle Size	Generally Free of Debris	

## 8.4 Subdrains

8.4.1 With the exception of retaining wall drains, we do not expect the installation of additional subdrains on this project.

# 8.5 Excavation Slopes, Shoring and Tiebacks

8.5.1 The recommendations included herein are provided for stable excavations. It is the responsibility of the contractor and their competent person to ensure all excavations, temporary slopes and trenches are properly constructed and maintained in accordance with applicable OSHA guidelines in order to maintain safety and the stability of the excavations

and adjacent improvements. These excavations should not be allowed to become saturated or to dry out. Surcharge loads should not be permitted to a distance equal to the height of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

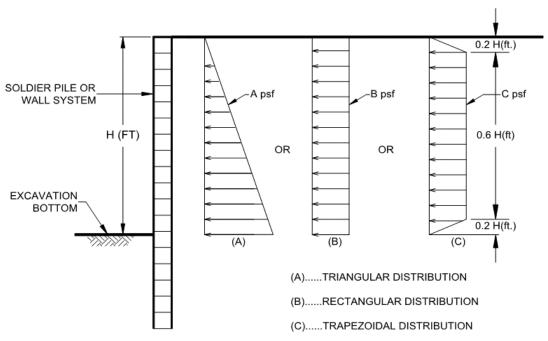
- 8.5.2 The stability of the excavations is dependent on the design and construction of the shoring system and site conditions. Therefore, Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations.
- 8.5.3 The design of temporary shoring is governed by soil and groundwater conditions, and by the depth and width of the excavated area. Continuous support of the excavation face can be provided by a system of soldier piles and wood lagging or sheet piles. Excavations exceeding 15 feet may require soil nails, tieback anchors or internal bracing to provide additional wall restraint.
- 8.5.4 The condition of existing buildings, streets, sidewalks, and other structures/improvements around the perimeter of the planned excavations should be documented prior to the start of shoring and excavation work. Special attention should be given to documenting existing cracks or other indications of differential settlement within these adjacent structures, pavements and other improvements. Underground utilities sensitive to settlement should be videotaped prior to construction to check the integrity of pipes. In addition, monitoring points should be established indicating location and elevation around the excavation and upon existing buildings. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter. Inclinometers should be installed and monitored behind any shoring sections that will be advanced deeper than 30 feet below the existing ground surface.
- 8.5.5 In general, ground conditions are moderately suited for soldier pile and tieback anchor wall construction techniques. However, gravel, cobble, cemented material and oversized material may be encountered in the existing materials that could be difficult to drill. Additionally, if cohesionless sands are encountered, some raveling may result along the unsupported portions of excavations.
- 8.5.6 Temporary shoring with a level backfill should be designed using a lateral pressure envelope acting on the back of the shoring as presented in Table 8.5.1. The distributions are shown on the Active Pressures for Temporary Shoring.

TABLE 8.5.1
SUMMARY OF TEMPORARY SHORING WALL RECOMMENDATIONS

Parameter	Value
Triangular Distribution, A	32H psf
Rectangular Distribution, B	20H psf
Trapezoidal Distribution, C	25H psf
Passive Pressure, P	350D + 500 psf
Effective Zone Angle, E	28 degrees
Maximum Design Lateral Movement	1 Inch
Maximum Design Vertical Movement	½ Inch
Maximum Design Retained Height, H	40 Feet

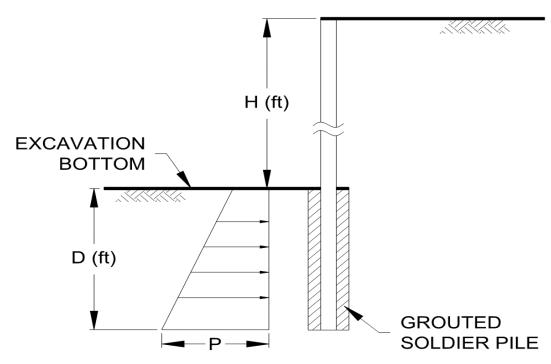
H equals the height of the retaining portion of the wall in feet D equals the embedment depth of the retaining wall in feet

8.5.7 Triangular distribution should be used for cantilevered shoring and, the trapezoidal and rectangular distribution should be used for multi-braced systems such as tieback anchors and rakers. The project shoring engineer should determine the applicable soil distribution for the design of the temporary shoring system. Additional lateral earth pressure due to the surcharging effects from construction equipment, sloping backfill, planned stockpiles, adjacent structures and/or traffic loads should be considered, where appropriate, during design of the shoring system.



**Active Pressures on Temporary Shoring** 

8.5.8 The passive resistance can be assumed to act over a width of three pile diameters. Typically, soldier piles are embedded a minimum of 0.5 times the maximum height of the excavation (this depth is to include footing excavations) if tieback anchors are not employed. The project structural engineer should determine the actual embedment depth.

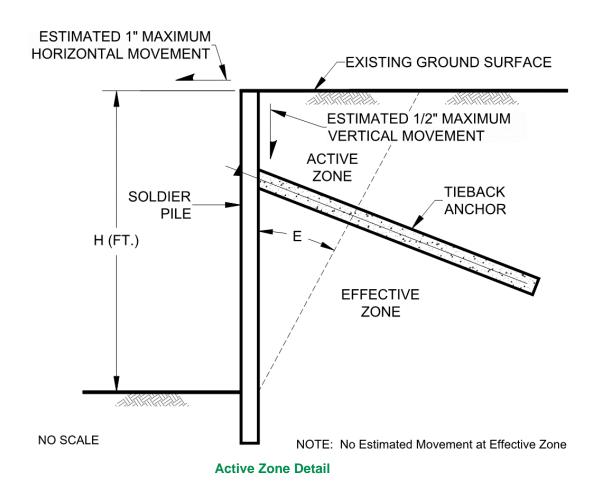


**Passive Pressures on Temporary Shoring** 

- 8.5.9 We should observe the drilled shafts for the soldier piles prior to the placement of steel reinforcement to check that the exposed soil conditions are similar to those expected and that footing excavations have been extended to the appropriate bearing strata and design depths. If unexpected soil conditions are encountered, foundation modifications may be required.
- 8.5.10 Lateral movement of shoring is associated with vertical ground settlement outside of the excavation. Therefore, it is essential that the soldier pile and tieback system allow very limited amounts of lateral displacement. Earth pressures acting on a lagging wall can cause movement of the shoring toward the excavation and result in ground subsidence outside of the excavation. Consequently, horizontal movements of the shoring wall should be accurately monitored and recorded during excavation and anchor construction.
- 8.5.11 Survey points should be established at the top of the pile on at least 20 percent of the soldier piles. An additional point located at an intermediate point between the top of the pile and the

base of the excavation should be monitored on at least 20 percent of the piles if tieback anchors will be used. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter until the permanent support system is constructed.

- 8.5.12 The project civil engineer should provide the approximate location, depth, and pipe type of the underground utilities to the shoring engineer to help select the shoring type and shoring design. The shoring system should be designed to limit horizontal soldier pile movement to a maximum of 1 inch. The amount of horizontal deflection can be assumed to be essentially zero along the Active Zone and Effective Zone boundary. The magnitude of movement for intermediate depths and distances from the shoring wall can be linearly interpolated.
- 8.5.13 Tieback anchors employed in shoring should be designed such that anchors fully penetrate the Active Zone behind the shoring. The Active Zone can be considered the wedge of soil from the face of the shoring to a plane extending upward from the base of the excavation as shown on the Active Zone Detail. Normally, tieback anchors are contractor-designed and installed, and there are numerous anchor construction methods available. Non-shrinkage grout should be used for the construction of the tieback anchors.



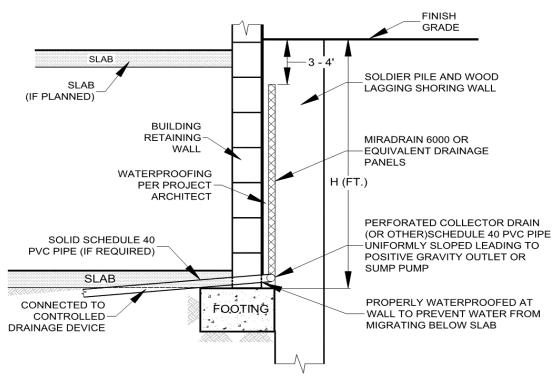
- 8.5.14 Experience has shown that the use of pressure grouting during formation of the bonded portion of the anchor will increase the soil-grout bond stress. A pressure grouting tube should be installed during the construction of the tieback. Post grouting should be performed if adequate capacity cannot be obtained by other construction methods.
- 8.5.15 Anchor capacity is a function of construction method, depth of anchor, batter, diameter of the bonded section and the length of the bonded section. Anchor capacity should be evaluated using the strength parameters shown in Table 8.5.2.

TABLE 8.5.2
SOIL STRENGTH PARAMETERS FOR TEMPORARY SHORING

Description	Cohesion (psf)	Friction Angle (Degrees)
Compacted Fill	300	28
Very Old Paralic Deposits/Ardath Shale	500	30

- 8.5.16 Grout should only be placed in the tieback anchor's bonded section prior to testing. Tieback anchors should be proof-tested to at least 130 percent of the anchor's design working load. Following a successful proof test, the tieback anchors should be locked off at 80 percent of the allowable working load. Tieback anchor test failure criteria should be established in project plans and specifications. The tieback anchor test failure criteria should be based upon a maximum allowable displacement at 130 percent of the anchor's working load (anchor creep) and a maximum residual displacement within the anchor following stressing. Tieback anchor stressing should only be conducted after sufficient hydration has occurred within the grout. Tieback anchors that fail to meet project specified test criteria should be replaced or additional anchors should be constructed.
- 8.5.17 Lagging should keep pace with excavation. The excavation should not be advanced deeper than three feet below the bottom of lagging at any time. These unlagged gaps of up to three feet should only be allowed to stand for short periods of time in order to decrease the probability of soil instability and should never be unsupported overnight. Backfilling should be conducted when necessary between the back of lagging and excavation sidewalls to reduce sloughing in this zone and all voids should be filled by the end of each day. Further, the excavation should not be advanced further than four feet below a row of tiebacks prior to those tiebacks being proof tested and locked off unless otherwise specific by the shoring engineer.

- 8.5.18 If tieback anchors are employed, an accurate survey of existing utilities and other underground structures adjacent to the shoring wall should be conducted. The survey should include both locations and depths of existing utilities. Locations of anchors should be adjusted as necessary during the design and construction process to accommodate the existing and proposed utilities.
- 8.5.19 The shoring system should incorporate a drainage system for the proposed retaining wall as shown herein.



**Shoring Retaining Wall Drainage Detail** 

# 8.6 Soil Nail Wall

8.6.1 As an alternative to temporary shoring followed by construction of a permanent basement wall, a soil nail wall can be used. Soil nail walls consist of installing closely spaced steel bars (nails) into a slope or excavation in a top-down construction sequence. Following installation of a horizontal row of nails, drains, waterproofing and wall reinforcing steel are placed and shotcrete applied to create a final wall. The wall should be designed by an engineer familiar with the design of soil nail walls.

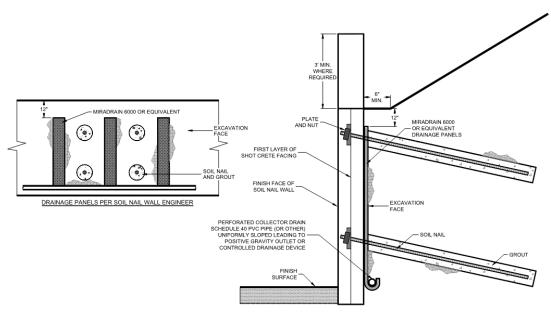
- 8.6.2 Temporary soil nail walls should not be considered a permanent design to support the seismic lateral loads and soil pressures on a building wall. Therefore, the proposed building should be designed to support the expected lateral loads.
- 8.6.3 In general, ground conditions are moderately suited to soil nail wall construction techniques. However, localized gravel, cobble, oversized material and cemented materials could be encountered in the existing materials that could be difficult to drill. Additionally, relatively clean sands may be encountered within the existing soil that may result in some raveling of the unsupported excavation. Casing or specialized drilling techniques should be planned where raveling exists (e.g. casing).
- 8.6.4 Testing of the soil nails should be performed in accordance with the guidelines of the Federal Highway Administration or similar guidelines. At least two verification tests should be performed to confirm design assumptions for each soil/rock type encountered. Verification tests nails should be sacrificial and should not be used to support the proposed wall. The bond length should be adjusted to allow for pullout testing of the verification nails to evaluate the ultimate bond stress. A minimum of 5 percent of the production nails should also be proof tested and a minimum of 4 sacrificial nails should be tested at the discretion of Geocon Incorporated. Consideration should be given to testing sacrificial nails with an adjusted bond length rather than testing production nails. Geocon Incorporated should observe the nail installation and perform the nail testing.
- 8.6.5 The soil strength parameters listed in Table 8.6.1 can be used in design of the soil nails. The bond stress is dependent on drilling method, diameter, and construction method. Therefore, the designer should evaluate the bond stress based on the existing soil conditions and the construction method.

TABLE 8.6.1
SOIL STRENGTH PARAMETERS FOR SOIL NAIL WALLS

Description	Cohesion (psf)	Friction Angle (degrees)	Estimated Ultimate Bond Stress (psi)*
Previously Placed Fill	300	28	10
Very Old Paralic Deposits/Ardath Shale	500	30	20

<sup>\*</sup>Assuming gravity fed, open hole drilling techniques.

8.6.6 A wall drain system should be incorporated into the design of the soil nail wall as shown herein. Corrosion protection should be provided for the nails if the wall will be a permanent structure.



**Soil Nail Wall Drainage Detail** 

# 8.7 Seismic Design Criteria

8.7.1 Table 8.7.1 summarizes site-specific design criteria obtained from the 2019 California Building Code (CBC; Based on the 2018 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used the computer program *U.S. Seismic Design Maps*, provided by the Structural Engineers Association (SEA) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. The buildings and improvements should be designed using a Site Class C where the fill thickness is 20 feet or less or a Site Class D where the fill is thicker than 20 feet. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2019 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake (MCE<sub>R</sub>). Sites designated as Site Class D, E and F may require additional analyses if requested by the project structural engineer and client.

TABLE 8.7.1
2019 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2019 CBC Reference
Site Class	С	D	Section 1613.2.2
Fill Thickness, T (Feet)	T<20	T>20	
Associated Buildings	A, B, C, D	Parking Structure, E	
MCE <sub>R</sub> Ground Motion Spectral Response Acceleration – Class B (short), S <sub>S</sub>	1.158g	1.158g	Figure 1613.2.1(1)
MCE <sub>R</sub> Ground Motion Spectral Response Acceleration – Class B (1 sec), S <sub>1</sub>	0.409g	0.409g	Figure 1613.2.1(2)
Site Coefficient, F <sub>A</sub>	1.200	1.200	Table 1613.2.3(1)
Site Coefficient, F <sub>V</sub>	1.500	1.891*	Table 1613.2.3(2)
Site Class Modified MCE <sub>R</sub> Spectral Response Acceleration (short), S <sub>MS</sub>	1.390g	1.390g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified $MCE_R$ Spectral Response Acceleration – (1 sec), $S_{M1}$	0.613g	0.773g*	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S <sub>DS</sub>	0.927g	0.927g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S <sub>D1</sub>	0.409g	0.515g*	Section 1613.2.4 (Eqn 16-39)

<sup>\*</sup> Using the code-based values presented in this table, in lieu of a performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed by the project structural engineer. Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis should be performed for projects for Site Class "E" sites with Ss greater than or equal to 1.0g and for Site Class "D" and "E" sites with S1 greater than 0.2g. Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed.

8.7.2 Table 8.7.2 presents the mapped maximum considered geometric mean (MCE<sub>G</sub>) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

TABLE 8.7.2
ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE <sub>G</sub> Peak Ground Acceleration, PGA	0.520g	Figure 22-7
Site Coefficient, F <sub>PGA</sub>	1.200	Table 11.8-1
Site Class Modified $MCE_G$ Peak Ground Acceleration, $PGA_M$	0.623g	Section 11.8.3 (Eqn 11.8-1)

8.7.3 Conformance to the criteria in Tables 8.7.1 and 8.7.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will

not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

### 8.8 Settlement Due to Fill Loads

- 8.8.1 Fill soil, even if properly compacted, will experience settlement over the lifetime of the improvements that it supports. The ultimate settlement potential of the fill is a function of the soil classification, placement relative compaction, and subsequent increases in the soil moisture content.
- 8.8.2 We expect that the northern portion of Building B will be supported by a deep foundation system embedded in the formational materials to mitigate the potential differential settlement due to the underlying compacted fill materials. However, the Parking Structure and Building E could be supported by a shallow foundation system underlain by fill with a maximum thickness on the order of 60 feet. The settlement of compacted fill is expected to continue over a relatively extended time period resulting from both gravity loading and hydrocompression upon wetting from rainfall and/or landscape irrigation. The previously placed fill has existed for approximately 25 years; therefore, a majority of the expected settlement has likely occurred.
- 8.8.3 Due to the variable fill thickness beneath proposed Building E and the Parking Structure, a potential for differential settlement across the proposed buildings exist and special foundation design consideration as discussed herein will be necessary. Based on measured settlement of similar fill depths on other sites and the time period since the fill was placed, we estimate that maximum settlement of the existing fill on the eastern portion of the site will be approximately 0.15 percent.
- 8.8.4 Table 8.8 presents the estimated total and differential fill thickness and settlements of the impacted building pads using an estimated settlement of 0.15 percent for the existing fill soils. These settlement magnitudes should be considered in design of the foundation system and adjacent flatwork that connects to the proposed buildings.

TABLE 8.8
EXPECTED DIFFERENTIAL SETTLEMENT OF EXISTING FILL SOIL

Building No.	Maximum Depth of Fill Beneath Structure (Feet)	Maximum Fill Differential (Feet)	Estimated Maximum Settlement (Inches)	Estimated Differential Settlement (Inches)	Approx. Distance for Differential Settlement (Feet)	Estimated Maximum Angular Distortion
Parking Structure	60	50	1.1	0.9	180	1/2,400
Building E*	20	20	0.4	0.4	70	1/2,100

<sup>\*</sup>Additional soil boring information will be necessary to verify the assumed fill depths within the area of Building E.

8.8.5 Deep foundations such as driven piles or drilled piers are the most effective means of reducing the ultimate settlement potential of the proposed structures to a negligible amount. Alternatively, highly reinforced shallow foundation systems and slabs-on-grade may be used for support of the buildings; however, the shallow foundation systems would not eliminate the potential for cosmetic distress related to differential settlement of the underlying fill. Some cosmetic distress should be expected over the life of the structure as a result of long-term differential settlement. The owner, tenants, and future owners should be made aware that cosmetic distress, including separation of caulking at wall joints, small non-structural wall panel cracks, and separation of concrete flatwork is likely to occur.

# 8.9 Shallow Foundations

8.9.1 The proposed structures situated at-grade can be supported on a shallow foundation system founded in compacted fill (i.e. Building E and Parking Structure). Foundations for the structure should consist of continuous strip footings and/or isolated spread footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope. Table 8.9.1 provides a summary of the foundation design recommendations.

TABLE 8.9.1
SUMMARY OF FOUNDATION RECOMMENDATIONS (AT-GRADE)
BUILDING E AND PARKING STRUCTURE

Parameter	Value
Minimum Continuous Foundation Width, W <sub>C</sub>	12 inches
Minimum Isolated Foundation Width, W <sub>I</sub>	24 inches
Minimum Foundation Depth, D	24 Inches Below Lowest Adjacent Grade
Minimum Steel Reinforcement	4 No. 5 Bars, 2 at the Top and 2 at the Bottom
Allowable Bearing Capacity – Fill	2,500 psf
Bearing Capacity Increase	500 psf per Foot of Depth or Width
Maximum Allowable Bearing Capacity - Fill	4,000 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet
Footing Size Used for Settlement	9-Foot Square
Design Expansion Index	90 or less

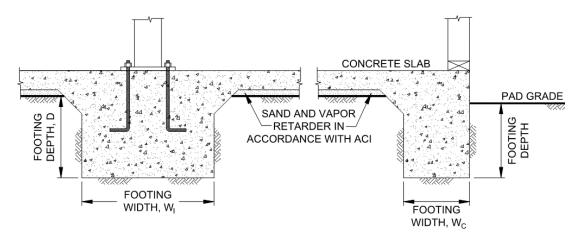
8.9.2 We understand that the subterranean parking garage for Buildings A, B, C and D are proposed to be supported at 2- to 4-levels below grade. The proposed subterranean structure can be supported on a shallow foundation system founded in formational materials. Foundations for the structure should consist of continuous strip footings and/or isolated spread footings. Table 8.9.2 provides a summary of the foundation design recommendations for subterranean levels.

TABLE 8.9.2 SUMMARY OF FOUNDATION RECOMMENDATIONS (SUBTERRANEAN) BUILDINGS A, B, C AND D

Parameter	Value
Minimum Continuous Foundation Width, W <sub>C</sub>	12 inches
Minimum Isolated Foundation Width, W <sub>I</sub>	24 inches
Minimum Foundation Depth, D	24 Inches Below Lowest Adjacent Grade
Minimum Steel Reinforcement	4 No. 5 Bars, 2 at the Top and 2 at the Bottom
Allowable Bearing Capacity – Formation	7,500 psf *
Bearing Capacity Increase	500 psf per Foot of Depth or Width
Maximum Allowable Bearing Capacity – Formation	10,000 psf *
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet
Footing Size Used for Settlement	8-Foot Square
Design Expansion Index	90 or less

<sup>\*</sup>Assuming subterranean foundations will be situated at least 20 feet below adjacent grade in formational materials.

8.9.3 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. Footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope (unless designed with a post-tensioned foundation system as discussed herein).



**Wall/Column Footing Dimension Detail** 

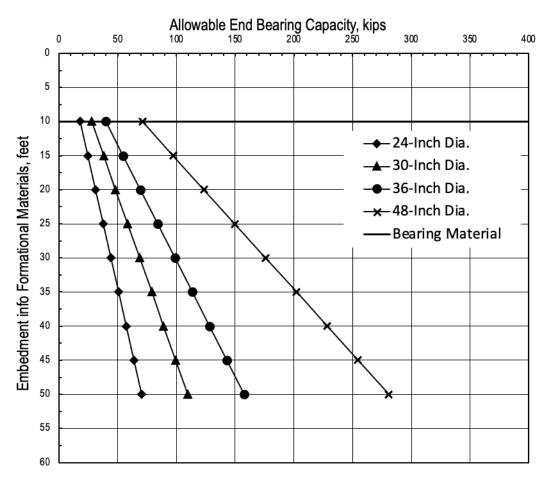
- 8.9.4 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.
- 8.9.5 For building pads that primarily expose formational materials, overexcavation of the footings and replacement with slurry can be performed in areas where formational materials are not encountered at the bottom of the footing. Minimum two-sack slurry can be placed in the excavations for the conventional foundations to the bottom of proposed footing elevation. Additional remedial grading should be considered where overexcavation depths exceed 10 feet or more than 25% of the pad exposes fill materials.
- 8.9.6 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.
  - For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
  - When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The

horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- Although other improvements, which are relatively rigid or brittle, such as concrete
  flatwork or masonry walls, may experience some distress if located near the top of a
  slope, it is generally not economical to mitigate this potential. It may be possible,
  however, to incorporate design measures that would permit some lateral soil
  movement without causing extensive distress. Geocon Incorporated should be
  consulted for specific recommendations.
- 8.9.7 We should observe the foundation excavations prior to the placement of reinforcing steel and concrete to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. Foundation modifications may be required if unexpected soil conditions are encountered.
- 8.9.8 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

### 8.10 Drilled Pier Recommendations

- 8.10.1 We understand that drilled piers will be used for foundation support for the northern portion of Building B and might be used for the Parking Structure and Building E. The foundation recommendations herein assume that the piers will extend through fill into the Very Old Paralic Deposits or Ardath Shale materials. The piers should be at least 10 feet long and be embedded at least 5 feet within the formational materials.
- 8.10.2 Piers can be designed to develop support by end bearing within the formational materials and skin friction within the formational materials and portions of the fill soil. An allowable skin friction resistance of 400 psf can be used for that portion of the drilled pier embedded in fill soil and formational materials. The end bearing capacity can be determined by the End Bearing Capacity Chart. These allowable values possess a factor of safety of at least 2 and 3 for skin friction and end bearing, respectively.



**End Bearing Capacity Chart** 

- 8.10.3 The diameter of the piers should be a minimum of 24 inches. The design length of the drilled piers should be determined by the designer based on the elevation of the pile cap or grade beam and the elevation of the top of the formational materials obtained from the Geologic Map and Geologic Cross-Sections presented herein. It is difficult to evaluate the exact length of the proposed drilled piers due to the variable thickness of the existing fill; therefore, some variation should be expected during drilling operations.
- 8.10.4 If pier spacing is at least three times the maximum dimension of the pier, no reduction in axial capacity for group effects is considered necessary. If piles are spaced between 2 and 3 pile diameters (center to center), the single pile axial capacity should be reduced by 25 percent. Geocon Incorporated should be contacted to provide single-pile capacity if piers are spaced closer than 2 diameters.
- 8.10.5 The allowable downward capacity may be increased by one-third when considering transient wind or seismic loads.

- 8.10.6 The formational materials may contain gravel and cobble and may possess very dense zones; therefore, the drilling contractor should expect difficult drilling conditions during excavations for the piers. Because a significant portion of the piers capacity will be developed by end bearing, the bottom of the borehole should be cleaned of loose cuttings prior to the placement of steel and concrete. Experience indicates that backspinning the auger does not remove loose material and a flat cleanout plate is necessary. Concrete should be placed within the excavation as soon as possible after the auger/cleanout plate is withdrawn to reduce the potential for discontinuities or caving.
- 8.10.7 Pile settlement of production piers is expected to be on the order of ½ to 1 inch if the piers are loaded to their allowable capacities. Geocon should provide updated settlement estimates once the foundation plans are available. Settlements should be essentially complete shortly after completion of the building superstructure.
- 8.10.8 We can provide a lateral pile capacity analysis using the *LPILE* computer program once the pile type, size, and approximate length has been provided. The total capacity of pile groups should be considered less than the sum of the induvial pile capacities for pile spacing of less than 8D (where D is pile diameter) for lateral loads parallel to the pile group and 3D for loads perpendicular to the pile group. The reduction in capacity is based on pile spacing and positioning and can result in group efficiency on the order of 50 percent of the sum of single-pile capacities. We can evaluate the lateral capacity of pile groups using the *GROUP* computer program, if requested.

### 8.11 Concrete Slabs-On-Grade

8.11.1 Concrete slabs-on-grade for the structures should be constructed in accordance with Table 8.11.

TABLE 8.11
MINIMUM CONCRETE SLAB-ON-GRADE RECOMMENDATIONS

Parameter	Value
Minimum Concrete Slab Thickness	5 inches
Minimum Steel Reinforcement	No. 4 Bars 18 Inches on Center, Both Directions
Typical Slab Underlayment	3 to 4 Inches of Sand/Gravel/Base
Design Expansion Index	90 or less

8.11.2 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for* 

Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

- 8.11.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common to have 3 to 4 inches of sand in the southern California region. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.
- 8.11.4 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Crack-control joints should be spaced at intervals no greater than 12 feet. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.
- 8.11.5 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.
- 8.11.6 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting expected loads.

# 8.12 Exterior Concrete Flatwork

8.12.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in Table 8.12. The recommended steel reinforcement would help reduce the potential for cracking.

TABLE 8.12
MINIMUM CONCRETE FLATWORK RECOMMENDATIONS

Expansion Index, EI	Minimum Steel Reinforcement* Options	Minimum Thickness
EL < 00	6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh	4 Ih
EI ≤ 90	No. 3 Bars 18 inches on center, Both Directions	4 Inches

<sup>\*</sup>In excess of 8 feet square.

- 8.12.2 The subgrade soil should be properly moisturized and compacted prior to the placement of steel and concrete. The subgrade soil should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557.
- 8.12.3 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade. The steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.
- 8.12.4 Concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete. Base materials will not be required below concrete improvements.
- 8.12.5 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.
- 8.12.6 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints

and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

# 8.13 Retaining Walls

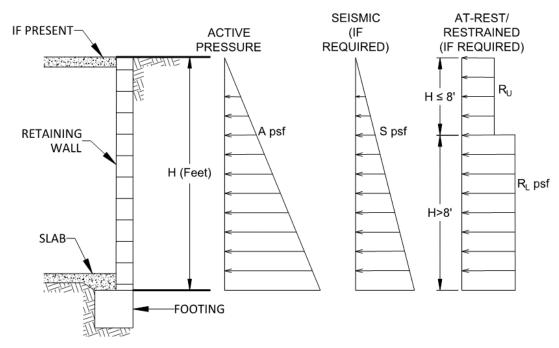
8.13.1 Retaining walls should be designed using the values presented in Table 8.13.1 Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls.

TABLE 8.13.1
RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure, A (Fluid Density, Level Backfill)	40 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	55 pcf
Seismic Pressure, S	16H psf
At-Rest/Restrained Walls Additional Uniform Pressure (0 to 8 Feet High)	7H psf
At-Rest/Restrained Walls Additional Uniform Pressure (8+ Feet High)	13H psf
Expected Expansion Index for the Subject Property	EI <u>&lt; 9</u> 0

H equals the height of the retaining portion of the wall

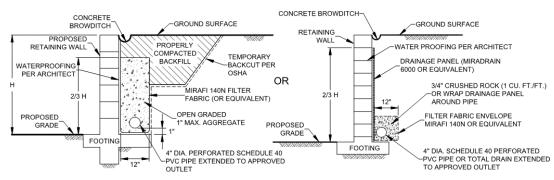
8.13.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.



**Retaining Wall Loading Diagram** 

- 8.13.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.
- 8.13.4 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer. Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.
- 8.13.5 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2019 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2019 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall.

- 8.13.6 Retaining walls should be designed to ensure stability against overturning sliding, and excessive foundation pressure. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.
- 8.13.7 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 90 or less) free-draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.



**Typical Retaining Wall Drainage Detail** 

8.13.8 In general, the site wall foundations should be designed in accordance with Table 8.13.2. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

TABLE 8.13.2
SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Retaining Wall Foundation Width	12 inches
Minimum Retaining Wall Foundation Depth	12 Inches
Minimum Steel Reinforcement	Per Structural Engineer
Allowable Bearing Capacity	2,500 psf
Estimated Total Settlement	1 Inch
Estimated Differential Settlement	½ Inch in 40 Feet

- 8.13.9 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. In the event that other types of walls (such as mechanically stabilized earth [MSE] walls, soil nail walls, or soldier pile walls) are planned, Geocon Incorporated should be consulted for additional recommendations.
- 8.13.10 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.
- 8.13.11 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

# 8.14 Lateral Loading

8.14.1 Table 8.14 should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or payement should not be included in design for passive resistance.

TABLE 8.14
SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	350 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

<sup>\*</sup>Per manufacturer's recommendations.

8.14.2 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

# 8.15 Preliminary Pavement Recommendations

8.15.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium truck traffic areas, and heavy truck traffic areas, respectively. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections for the parking lot should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We assumed an R-Value of 10 (based on laboratory testing) and 78 for the subgrade soil and base materials, respectively, for the purposes of this preliminary analysis. Table 8.15.1 presents the preliminary flexible pavement sections.

TABLE 8.15.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Parking stalls for automobiles and light-duty vehicles	5.0	10	3	8
Driveways for automobiles and light-duty vehicles	5.5	10	3	11
Medium truck traffic areas	6.0	10	31/2	12
Driveways for heavy truck traffic	7.0	10	4	15

- 8.15.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.
- 8.15.3 A rigid Portland cement concrete (PCC) pavement section should be placed in roadway aprons and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 Guide for Design and Construction of Concrete Parking Lots using the parameters presented in Table 8.15.2.

TABLE 8.15.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of subgrade reaction, k	50 pci
Modulus of rupture for concrete, $M_R$	500 psi
Concrete Compressive Strength	3,000 psi
Traffic Category, TC	A and C
Average daily truck traffic, ADTT	10 and 100

8.15.4 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 8.15.3.

TABLE 8.15.3
RIGID VEHICULAR PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Automobile Parking Stalls (TC=A)	6.0
Driveways (TC=C)	7.5

- 8.15.5 The PCC vehicular pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content.
- 8.15.6 The rigid pavement should also be designed and constructed incorporating the parameters presented in Table 8.15.4.

TABLE 8.15.4
ADDITIONAL RIGID PAVEMENT RECOMMENDATIONS

Subject	Value
	1.2 Times Slab Thickness
Thickened Edge	Minimum Increase of 2 Inches
	4 Feet Wide
	30 Times Slab Thickness
Crack Control Joint Spacing	Max. Spacing of 12 feet for 5.5-Inch-Thick
	Max. Spacing of 15 Feet for Slabs 6 Inches and Thicker
Crack Control Joint	Per ACI 330R-08
Depth	1 Inch Using Early-Entry Saws on Slabs Less Than 9 Inches Thick
	1/4-Inch for Sealed Joints
Crack Control Joint Width	3/8-Inch is Common for Sealed Joints
	<sup>1</sup> / <sub>10</sub> - to <sup>1</sup> / <sub>8</sub> -Inch is Common for Unsealed Joints

- 8.15.7 Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.
- 8.15.8 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report.
- 8.15.9 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.
- 8.15.10 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters that receives vehicular should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, or cross-gutters so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

# 8.16 Site Drainage and Moisture Protection

8.16.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2019 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into

swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

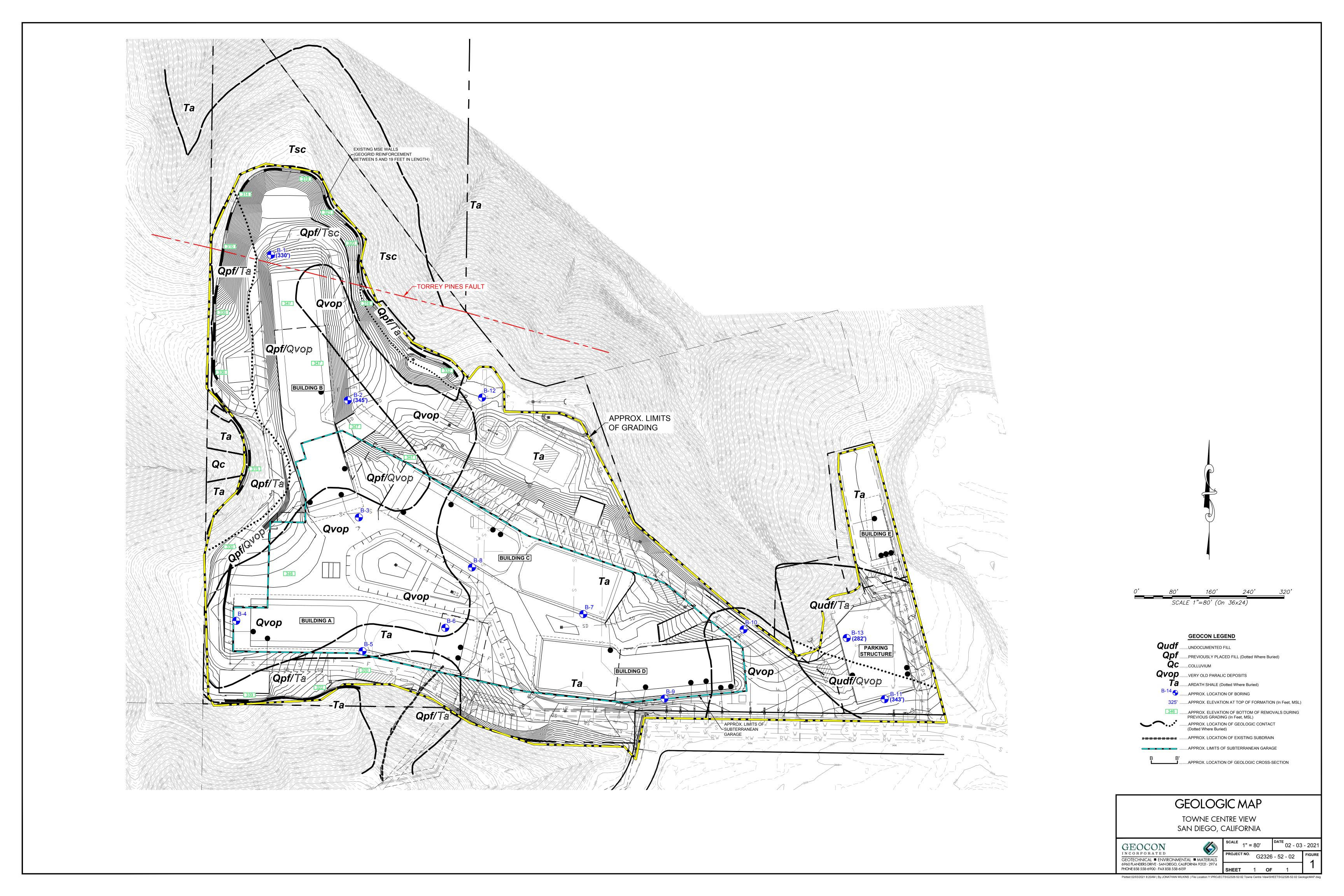
- 8.16.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.
- 8.16.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.
- 8.16.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious abovegrade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.
- 8.16.5 We should prepare a storm water infiltration feasibility report of storm water management devices are planned.

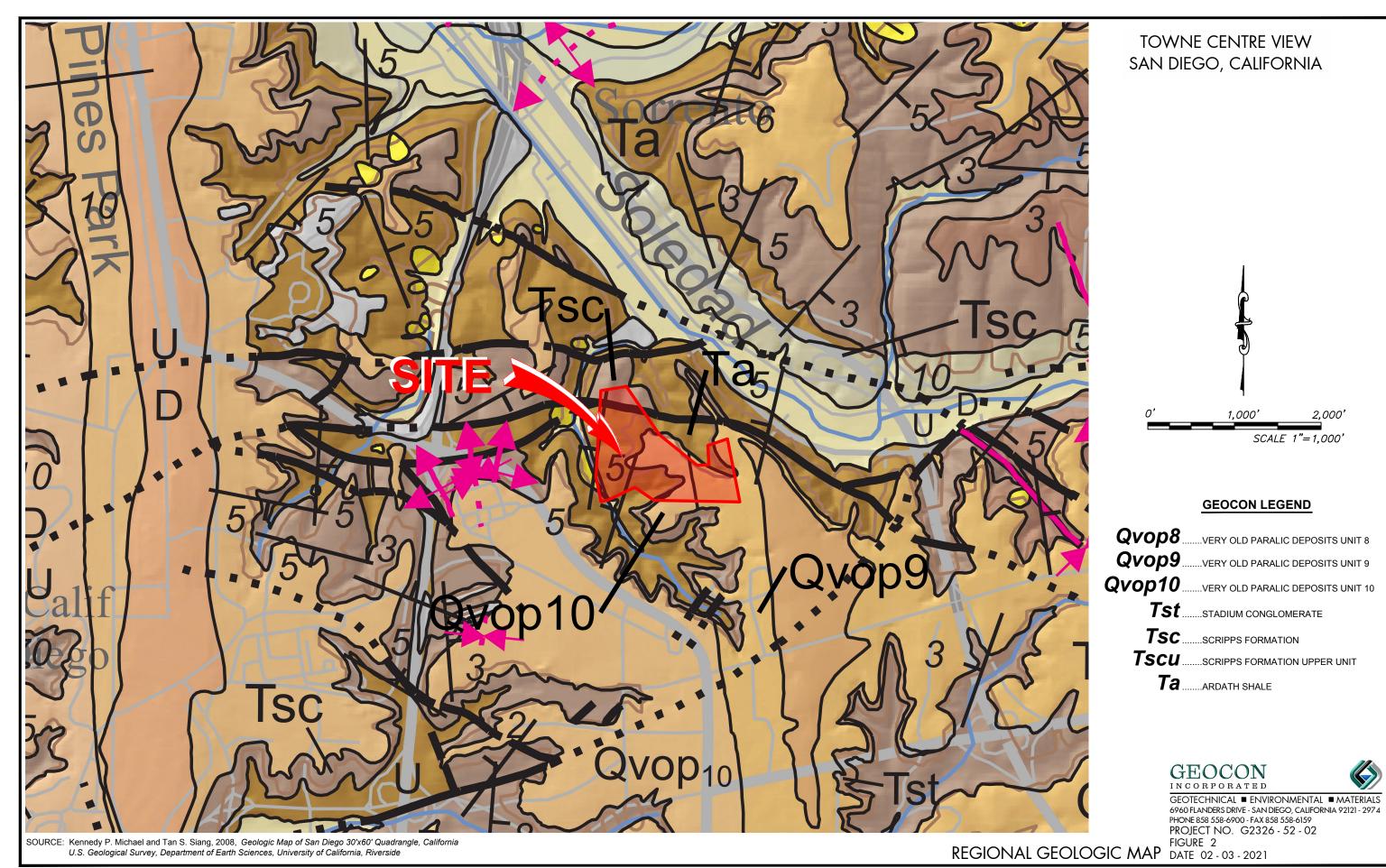
# 8.17 Updated Geotechnical Investigation

8.17.1 We should be contacted to provide an updated geotechnical investigation for the project once the grading and building foundation are available. We should provide review of the project plans prior to final design submittal to evaluate if additional analyses and/or recommendations are required.

### LIMITATIONS AND UNIFORMITY OF CONDITIONS

- 1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.
- 2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.
- 3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.
- 4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.





# APPENDIX A

### **APPENDIX A**

### FIELD INVESTIGATION

We performed the drilling operations on August 31, 2020 through September 4, 2020. The locations of the current exploratory borings are shown on the Geologic Map, Figure 1. The boring logs are presented in this Appendix. We located the borings in the field using a measuring tape and existing reference points; therefore, actual boring locations may deviate slightly. The geotechnical borings were drilled to depths ranging from approximately 20 to 61 feet below existing grade using a CME 95 drill rig equipped with hollow-stem augers.

We obtained samples during our subsurface exploration in the borings using a California split-spoon sampler or a Standard Penetration Test (SPT) sampler. Both samplers are composed of steel and are driven to obtain the soil samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 2.875 inches. Up to 18 rings are placed inside the sampler that is 2.4 inches in diameter and 1 inch in height. The SPT sampler has an inside diameter of 1.5 inches and an outside diameter of 2 inches. We obtained ring samples in moisture-tight containers at appropriate intervals and transported them to the laboratory for testing.

The samplers were driven 12 inches and 18 inches using the California and SPT samplers, respectively, into the bottom of the excavations with the use of an automatic down-hole hammer The sampler is connected to A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler. If the sampler was not driven for 12 inches, an approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values as adjustments have not been applied. We estimated elevations shown on the boring logs either from a topographic map or by using a benchmark. Each excavation was backfilled as noted on the boring logs.

We visually examined, classified, and logged the soil encountered in the borings in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained.

1110020	1 NO. G232	-0 02 0	_					
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 1         ELEV. (MSL.) 340' DATE COMPLETED 08-31-2020         EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 0 -	B1-1 🔯	70,00		9.0	2-INCHES OF CEMENT-TREATED BASE			
	D1-1			SC	PREVIOUSLY PLACED FILL (Qpf)	-		
- 2 -					Medium dense, moist, mottled brown, gray and yellowish brown, Clayey, fine	L		
			1		to coarse SAND; little gravel	L		
- 4 -						L		
L		///	1					
	B1-2		1			29	189.5	15.2
- 6 -			1					
		///				<b> </b>		
- 8 -			1			_		
						-		
- 10 -	B1-3		+	SM	SCRIPPS FORMATION (Tsc)	50/5"	120.3	8.6
				Sivi	Very dense, damp, reddish brown and brownish gray, Silty, fine	-		
- 12 -					SANDSTONE	L		
			;			_		
- 14 -								
L ' _						L		
40	B1-4				-Becomes light yellowish brown with some iron oxide staining	98/8"	116.3	7.3
– 16 <i>–</i>						Γ		
Ī Ī								
– 18 <i>–</i>			# 1	CL	Hard, moist, yellowish brown, laminated CLAYSTONE, some iron oxide			
			1		staining	F		
- 20 -	B1-5					50/6"	105.4	20.5
F -						<b>-</b>		
- 22 -						-		
F -			1			F		
- 24 -			1			-		
L -	B1-6				D	90/10		
- 26 -	Di ∪				-Becomes brownish gray	- 0,10		
L -			1			_		
- 28 -						<u> </u>		
L		<b>\</b> /////				L I		
- 30 -			1			L		
30 -	B1-7		1			90-9"	107.2	120.4
						[		
- 32 -						Γ		
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- 34 -			1			-		
		<i>V/////</i>	ı					

Figure A-1, Log of Boring B 1, Page 1 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
O/ WIT EE O TWIDOEO	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

PROJEC	I NO. G232	20-52-0						
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 1           ELEV. (MSL.) 340' DATE COMPLETED 08-31-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
<b>-</b>	B1-8		H	CL		92/10"	104.6	20.3
- 36 -			1 1			-		
L -			1			-		
- 38 -			1			L		
						L		
40			1					
- 40 -	B1-9		Ш			50/5"	107.0	19.3
			Ш		BORING TERMINATED AT 40.5 FEET			
			Ш		Groundwater not encountered			
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Figure A-1, Log of Boring B 1, Page 2 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
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L92.20-25-5	G2326		of 2	96e 1	Ч'	2 8 g	. A-2, Boring	Figure Log of
77.7	9.£01		-Becomes hard, gray				<i>L-7</i> 4	- 35 - - 37 - - 37 - - 37 -
6:07	6.201	99 _	-Becomes very stiff, olive brown				B7-9	- 52 -
6.91	2.801	6/L8 _ - - -	-Becomes gray, some iron oxide staining				B7-2	- 18 - - 20 - - 20 -
0.81	8.901		ARDATH SHALE (Ta) Hard, moist, light yellowish brown and brownish gray, laminated CLAYSTONE	CF			B7- <del>/</del>	- 21 - - 41 - 
£.č		8/76	Medium dense, moist, light reddish brown, Silty, fine to medium SAND  -Disturbed sample  Very dense, moist, light yellowish brown, Silty fine SAND	WS			87-3 B7-1 B7-1	- 7
		-	BEENIONSTA BLYCED FILL (Qpf)  7-INCHES OF CEMENT-TREATED BASE  MATERIAL DESCRIPTION	MS	-			 - 0 -
MOISTURE CONTENT (%)	DRY DENSITY (P.C.F.)	PENETRATION RESISTANCE (BLOWS/FT.)	ВА: <b>В</b> К <b>В</b> С <b>В С В С <b>В</b> С <b>В</b> С <b>В</b> С <b>В</b> С <b>В</b> С <b>В С В С <b>В</b> С <b>В</b> С <b>В С В С В С В С В С В С В С В С В С </b></b></b>	(naca) CTVaa SOIF	GROUNDWATER		. NO. G232	DEPTH IN FEET

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH   SAMPLE   NO.   D.   D.   D.   D.   D.   D.   D.	PROJEC	71 NO. G23	26-52-0	2					
B2-8	IN	1	LITHOLOGY	GROUNDWATER	CLASS	ELEV. (MSL.) <u>350'</u> DATE COMPLETED <u>08-31-2020</u>	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
- 38						MATERIAL DESCRIPTION			
- 38 40 - B2-9  BORING TERMINATED AT 40.5 FEET Groundwater not encountered Backfilled on 08-31-2020	F	B2-8		打	CL	-Becomes dark gray	50/5"		
BORING TERMINATED AT 40.5 FEET Groundwater not encountered Backfilled on 08-31-2020	-						-		
BORING TERMINATED AT 40.5 FEET Groundwater not encountered Backfilled on 08-31-2020	L	4		1 1		- Very difficult hard drilling at 38-40 feet	-		
BORING TERMINATED AT 40.5 FEET Groundwater not encountered Backfilled on 08-31-2020	L 40			1			L		
Groundwater not encountered Backfilled on 08-31-2020	40	B2-9		1		DODDIC TERMINATED AT 40.5 FEET	50/5"		
						Groundwater not encountered Backfilled on 08-31-2020			

Figure A-2, Log of Boring B 2, Page 2 of 2

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SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
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S2326-52-02.GPJ	9		7.10	- ^		SAMPLE SYMBOLS			
				) i apr	d '8	. a 6	. A-3, F Boring	Figure Log of	
			Very dense, moist, gray, Silty fine SAND; little iron oxide staining	WS		9 0		- 35 - - 34 -	
		I/08 	Lugssoonsun guilqms2-		-			- 30 - - 37 - - 57 - - 57 -	
		- - - 	Very dense, moist, grayish brown, Silty GRAVEL with sand		- -			- 22 -	
0.6 ε	E.70I ".	01/28	Very dense, moist, pale yellowish brown and reddish brown, Silty, fine to medium SAND with chunks of claystone	ZM/CT			B3-7	- 18 - - 18 - - 50 -	
6'II <i>L</i>	L'. LOI ".	S.£\08_ 					<b>■</b> 1-88	- 21 - - 41 - - 19 -	
		- - - - - -	-Gravelly layer at 8-11 feet						
		-	6-INCH CLASS 2 BASE Very dense, moist, reddish brown, Silty, fine SAND	MS		.00		- Z - - — —	
			MATERIAL DESCRIPTION			7 ~ 0 ~ 0		- 0 -	
MOISTURE CONTENT (%)	(BLOWS/FT.)  DRY DENSITY (P.C.F.)	PENETRATION RESISTANCE	EGOIDMENT CME 36         DATE COMPLETED 08-31-2020           BX: B: KUNA	(nacca) CF¥22 20IF	GROUNDWATER	LITHOLOGY	SAMPLE ON	DEPTH IN FEET	

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

■ DISTURBED OR BAG SAMPLE

... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

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0.91	0.£11	E/0S —	Groundwater not encountered				B3-8	- 09 - 
8.č1	8.011	"S.E\08" - - - -	ARDATH SHALE (Ta)  Hard, moist, gray, laminated CLAYSTONE; little iron oxide staining  -Becomes dark gray	TO.			B3-7	- 29 - - 99 - - 24 - - 25 - - 25 -
2.21	1.811	"2.602" "2.602	(AT) I IAND HTANGA	CT			B3-9 B3-2	- 09 - - 8t - - 9t - - 5t -
		<u>\2/0\$</u>	Very dense, moist, light yellowish brown and grayish brown, Silty, fine to medium SAND with abundant gravel; iron oxide staining, some chunks of claystone	_ZZ/WS_			B3-4	- 38 - - 40 - - 24 -
£.01	103.4	- E/0\$	MATERIAL DESCRIPTION	MS			B3-3	– 98 – – 9
MOISTURE CONTENT (%)	DRY DENSITY (P.C.F.)	PENETRATION RESISTANCE (BLOWS/FT.)	EQUIPMENT CME 96         BY: B. KUNA           BORING B 3         BY: B. KUNA	(naca) CFVaa 20IF	GROUNDWATER	LITHOLOGY	SAMPLE NO.	HT930 NI T334

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		_	-Intermittent gravelly layers from 34-43 feet				- 3 <del>4</del> -
		S/0S _ S/0S _	-Мо гесоиегу			B4-4 B4-3	- 30 - - 30 -
		-	Very dense, damp, brownish gray, Silty, fine SAND with iron oxide staining, little cohesion	WS_			- 8Z - - 52 -
		_ _ _					- 77 - - 77 -
1.9	£.101	- "1.01/96" -				B√-7	- 20 - - 50 - - 50 -
		-					- 91 - - 81 -
		-					- 21 -  - 41 -
8.8	8.701	<i>\$</i> `8/96_ 	Very dense, moist, pale yellowish brown, Silty, fine SAND	WS		B√-1 ■	- 01 -
		- - -					- 8 - - 9 - - 9 -
		-	VERY OLD PARALIC DEPOSITS (Qvop) Very dense, moist, brown, Clayey, fine SAUD	SC			- 7 - - 2 -
			9-INCH CEWENT-TREATED BASE WATERIAL DESCRIPTION	23	7.7.7		0 -
MOISTURE CONTENT (%)	DRY DENSITY (P.C.F.)	PENETRATION RESISTANCE (BLOWS/FT.)	ECONIBMENT <b>CME 96</b> BY: <b>B. KUNA</b> BY: <b>B. KUNA</b>	(naca) CF∀aa aoir	LITHOLOGY	ON SAMPLE	DEPTH IN FEET
_	Ì Ì		BOBING B 4			NO. G2326	

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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G2326-52-02.GPJ		2 ło	396 S	d '	<b>9</b> 8 4	. A-4, Boring	Figure Log of
	E/0S S'7/0S_	-No recovery  BORING TERMINATED AT 60.5 FEET  Groundwater not encountered				B <del>d-</del> 15	_ 09 _
		-No recovery  Very dense, moist, reddish brown, Silty, fine SAND; chunks of gray siltstone, some gravel	ZZ/WS			Bt-10 Bt-6 Bt-8	- 29 - - 27 - - 27 - - 27 - - 27 - - 29 -
	9/0\$	Very dense, moist, brownish gray, Silty, fine-medium SAND with chunks of gray claystone; iron oxide staining  Very dense, moist, brown, Clayey, fine to medium SAND; chunks of gray  Very dense, moist, brown, Clayey, fine to medium SAND; chunks of gray  siltstone; abundant gravel iron oxide staining, very hard drilling				<b>₽</b> +2 <b>1</b>	- 8t - - 9t - - + + -
	.S/0S — S't/0S _ - - - -	-Мо гесочегу	WS			B+-9 B+-2	- 38 - - 38 - - 38 -
		MATERIAL DESCRIPTION			· › .1 · · · · · ·	·	
(P.C.F.)  MOISTURE CONTENT (%)	PENETRATION RESISTANCE (BLOWS/FT.) DRY DENSITY	EGNIBMENT CME 96  ELEV. (MSL.) 346' BAY BY KUNA  BORING B 4	(naca) CIVaa SOII	GROUNDWATER	LITHOLOGY	SAMPLE ON.	NI IN FEET

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

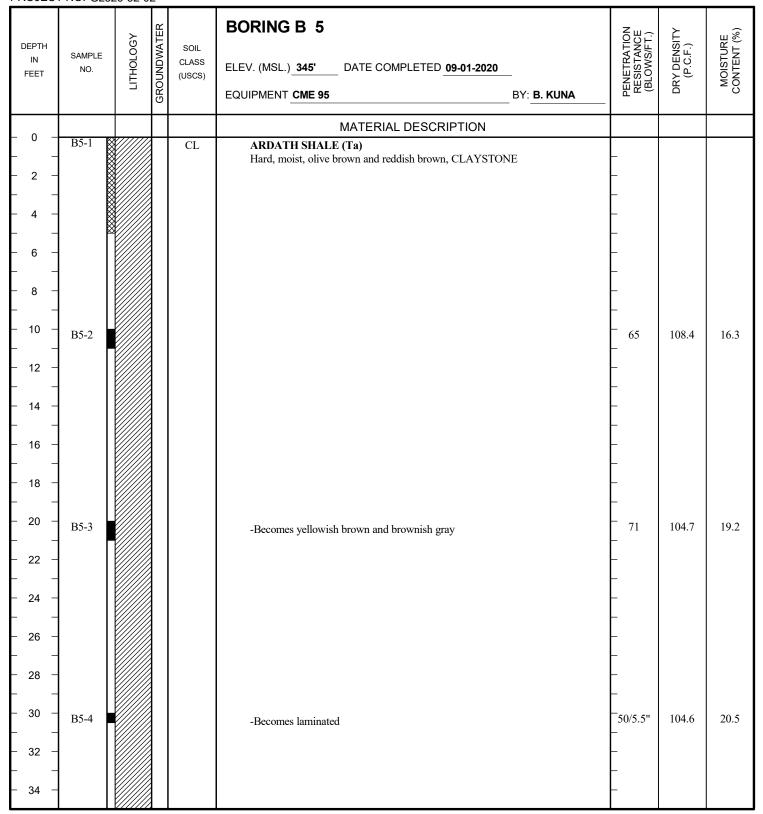


Figure A-5, Log of Boring B 5, Page 1 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

TROOLO	1		_					
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 5           ELEV. (MSL.) 345' DATE COMPLETED 09-01-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			Ħ		MATERIAL DESCRIPTION			
<b>-</b>				CL-ML				
- 36 - 								
- 38 -						_		
<u> </u>						-		
- 40 -	B5-5					76/11"	105.5	20.4
- 40						-		
- 42 - 								
- 44 -						-		
_	B5-6				-Few calcite veins	50/6"	104.3	19.7
- 46 -					Ten dalone venis	-		
40						_		
- 48 - 								
- 50 -	B5-7				-Becomes dark gray with yellow and light gray streaks at 50 feet	98/9.5"	107.5	19.7
-	B5-8				-becomes dark gray with yenow and fight gray streaks at 30 feet	-	107.5	15.7
- 52 -						-		
- 54 -								
	B5-9					50/5.5"	110.0	18.2
- 56 -	B3-9					- 30/3.3	110.0	16.2
-						-		
- 58 -						_		
- 60 -	D5 10					[ 	100.2	10.0
	B5-10	(//////			BORING TERMINATED AT 60.5 FEET	50/4.5"	108.3	18.0
					Groundwater not encountered			

Figure A-5, Log of Boring B 5, Page 2 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

	I NO. G232	-0 02 0	_					
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 6           ELEV. (MSL.) 345' DATE COMPLETED 09-01-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 0 -  - 2 -				SC	VERY OLD PARALIC DEPOSITS (Qvop) Very dense, damp, brown, Clayey, fine to coarse SAND; some gravel	- -		
- 4 - - 4 -						-  -  -		
- 6 -			1			_		
- 8 - - 8 -				CL	ARDATH SHALE (Ta) Hard, moist, yellowish brown CLAYSTONE	-		
- 10 - 	B6-1					_ 85/9" _	108.5	18.7
- 12 -  - 14 -						-  -  -		
 - 16 -						- - -		
- 18 - 						- -		
- 20 -  - 22 -	B6-2				-Becomes olive brown and yellowish brown, laminated	50/5"	106.5	20.1
- 24 - - 2 -						- - -		
- 26 - 						  -  -		
- 28 - 						-  -		
- 30 - 	В6-3					95/10.5"	104.4	20.4
- 32 -  - 34 -						-  -  -		

Figure A-6, Log of Boring B 6, Page 1 of 2

2232	6-52	-U2	GP	ı

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL

... STANDARD PENETRATION TEST

... DRIVE SAMPLE (UNDISTURBED)

... UNDISTURBED OR BAG SAMPLE

... WATER TABLE OR SEEPAGE

DEPTH	SAMPLE	.0GY	GROUNDWATER	SOIL	BORING B 6	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
IN FEET	NO.	LITHOLOGY	UND	CLASS (USCS)	ELEV. (MSL.) 345' DATE COMPLETED 09-01-2020	NETR SSIST, LOW!	RY DE (P.C.	AOIST ONTER
			GRC		EQUIPMENT CME 95 BY: B. KUNA	PE 88	PQ.	200
					MATERIAL DESCRIPTION			
- 36 -				CL		_		
- 38 -						_		
 - 40 -	B6-4					_ 	108.3	19.0
 - 42 -						- - -	100.5	13.0
 - 44 -								
-	B6-5				-Few calcite veins	50/5"	106.2	19.5
- 46 - 						_		
- 48 <i>-</i> 						<u>-</u>		
- 50 - 	В6-6				-Becomes dark gray	50/4"	107.9	17.5
- 52 -					-Few calcite veins, little iron oxide staining	_		
- 54 -					-Very hard drilling from 50-60 feet	_		
- 56 -	B6-7				-Calcite veins	50/2.5"	106.5	14.9
 - 58 -						<u>-</u>		
60 -	B6-8					- - 50/6"	102.2	20.8
					-Little iron oxide staining  BORING TERMINATED AT 60.5 FEET  Groundwater not encountered  Backfilled on 09-02-2020			

Figure A-6, Log of Boring B 6, Page 2 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

1110020	1 NO. G232	-0 02 0	_					
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 7           ELEV. (MSL.) 345' DATE COMPLETED 09-02-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 0 -		, (J., 0 (			4-INCH ASPHALT CONCRETE OVER 6-INCH AGGREGATE BASE			
	B7-1 🕏		+	CL	ARDATH SHALE (Ta)			
- 2 -	┨		1 1		Hard, moist, yellowish brown and gray, laminated CLAYSTONE	-		
<u> </u>	<b>∤</b>					-		
- 4 -	<b>∤</b>		1 1			-		
-			1 1			_		
- 6 -			1 1			-		
L -			1 1			L		
- 8 -			1 1					
- 10 -			1 1					
	B7-2		1 1			81/11"	105.9	19.4
- 12 -			1			L		
12			1 1					
– 14 <i>–</i>	1		1 1					
	1		1 1					
– 16 <i>–</i>	1		1 1					
	1		1 1					
– 18 <i>–</i>	1		1 1					
	1		1 1					
- 20 -	B7-3		1 1		-Becomes dark gray, damp	95/11.5"		
<b>†</b> -	· •		1					
- 22 -	1							
h -						-		
- 24 -						-		
h -	1		1 1			<b>-</b>		
- 26 -			1 1			-		
F -	1		1 1			-		
- 28 -			1			-		
						F		
- 30 -	B7-4					93/10.5"	107.3	19.6
-	. ~ .					-	107.3	17.0
- 32 -		<b>V////</b>	1			-		
<u> </u>			1			-		
- 34 -			1			-		
		<i>\/////</i>						

Figure A-7, Log of Boring B 7, Page 1 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 7  ELEV. (MSL.) 345' DATE COMPLETED 09-02-2020  EQUIPMENT CME 95 BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
		-	H		MATERIAL DESCRIPTION			
-			H	CL	WATERIAL DESCRIPTION			
- 36 - 								
- 38 -						-		
<b>-</b> -						-		
- 40 - 	B7-5					89/11.5"	107.2	20.2
- 42 -						-		
<b>-</b> -						-		
- 44 - 	B7-6					82/11.5"	102.5	22.9
- 46 -	В/-0					82/11.3	102.3	22.9
- 40								
- 48 <i>-</i> - <i>-</i>						_		
- 50 -	B7-7				-Trace silt	91	108.8	16.9
- 52 -								
			1-1	 ML	Very stiff, damp, brownish gray with streaks of yellowish brown, Clayey	<b></b>		
- 54 -				IVIL	SILTSTONE	-		
- 56 -	B7-8		1			60		
-						-		
- 58 -					-Very hard drilling from 57-60 feet, possible concretion	-		
- 60 -	B7-9					_50/2.5"	107.0	19.1
					BORING TERMINATED AT 60.25 FEET Groundwater not encountered			

Figure A-7, Log of Boring B 7, Page 2 of 2

3232	6-52	<b>.</b> 02	GP.	ı

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
SAMI LE STIMBOLS	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

	1 NO. G232		_					
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 8           ELEV. (MSL.) 345' DATE COMPLETED 09-02-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 0 -			$\vdash$		4-INCH ASPHALT CONCRETE OVER 9-INCH AGGREGATE BASE			
<u> </u>		7//////		CL	ARDATH SHALE (Ta)	-		
- 2 -			1 1	CL	Hard, moist, gray and yellowish brown, laminated CLAYSTONE	-		
			1 1		Tida, mone, gray and yenomen elemi, minimated C2211010112	_		
- 4 -			1					
			1 1					
_			1					
- 6 -	1							
	1		1 1					
- 8 -	1		1 1			<b> </b>		
	1					F		
– 10 –	B8-1		1 1			90/10.5"	108.4	19.9
	▎		1 1			-		
– 12 <i>–</i>			1 1			-		
-	-					- 1		
- 14 -			1 1			-		
			1 1			_		
- 16 -						L		
			1 1					
- 18 -			1 1			L		
10			1 1					
	1		1 1					
- 20 -	B8-2		1 1			98/10"	111.1	18.3
	▎		1 1					
- 22 -	1					F		
-	1		1 1			F		
- 24 -	1		1 1			- 1		
F -	1		1 1			- 1		
- 26 -	-					-		
F -		<b>/////</b>				-		
- 28 -	.	<b>V////</b>	1			-		
L -			1			-		
- 30 -	Do 2					- <b>5</b> 0/6#	100.1	10.6
L	B8-3					50/6"	109.1	19.6
- 32 -	]		1					
32	]		1					
24			1					
- 34 -	]					Γ		

Figure A-8, Log of Boring B 8, Page 1 of 2

G2326	-52-0	2.GF	٦J

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL

... STANDARD PENETRATION TEST

... DRIVE SAMPLE (UNDISTURBED)

... UNDISTURBED OR BAG SAMPLE

... WATER TABLE OR SEEPAGE

	1 NO. G23		_					
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 8           ELEV. (MSL.) 345' DATE COMPLETED 09-02-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 36 - 				CL		_		
- 38 -  - 40 -	B8-4				-Very difficult drilling from 38-60 feet -Few calcite veins	- - 78/10"	114.6	16.8
 - 42 - 						_ _ _		
- 44 -  - 46 -	B8-5					_ 50/5.5" _	111.1	19.0
 - 48 - 						- -		
- 50 -  - 52 -	B8-6 B8-7				-Becomes dark gray, damp	_ 50/5" _ _		
- 54 - - 54 -	B8-8					_ _ _ 50/3"	105.4	18.7
- 56 -  - 58 -						_ _ _		
 - 60 -	B8-9				-Becomes moist  BORING TERMINATED AT 60.5 FEET	_ 	110.0	18.6
					Groundwater not encountered			

Figure A-8, Log of Boring B 8, Page 2 of 2

32326-	52-	02.	GP	IJ

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
SAMI LE STIMBOLS	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

MATERIAL DESCRIPTION	DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 9  ELEV. (MSL.) 345' DATE COMPLETED 09-03-2020	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
A				GRC		EQUIPMENT CME 95 BY: B. KUNA	PE RE (B	D	200
4 - 10 - B9-1	_ 0 _								
Hard, moist, grayish brown and yellowish brown, laminated CLAYSTONE  Hard, moist, grayish brown and yellowish brown, laminated CLAYSTONE  10		]	.0.0.0						
- 10 - B9-1	- 2 -				CL	ARDATH SHALE (Ta) Hard, moist, grayish brown and yellowish brown, laminated CLAYSTONE	- -		
B9-1	- 4 -						_		
- 10 - B9-1	6 -	]		1					
B9-1									
B9-1	- 8 -						L		
- 12 - 14 - 16 - 18 - 20 - B9-2	<u> </u>						_		
- 14	- 10 - 	B9-1					90/10"	109.6	18.9
- 14	- 12 -								
- 16 -	L						_		
- 16 -	- 14 -						L		
- 18	<u> </u>						L		
B9-2 B9-2 B9-2 B9-2 B9-2 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3	- 16 <b>-</b>			1			_		
B9-2 B9-2 B9-2 B9-2 B9-2 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3	<u> </u>			1			_		
B9-2 B9-2 B9-2 B9-2 B9-2 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3 B9-3	- 18 -			1			_		
- 22	<b>-</b>			1			_		
- 22	- 20 -	P0 2		1			- 27	101.2	21.2
- 24	<b>-</b>	1 109-2		1		-Becomes stiff	- 37	101.2	21.2
- 26	- 22 -			1			-		
- 26	-			1			_		
- 28	- 24 -			1			F		
- 28	<b>-</b>			1			L		
Becomes hard, pale yellowish brown  - 32	- 26 -			1			F		
Becomes hard, pale yellowish brown  - 32	-						-		
Becomes hard, pale yellowish brown  - 32	- 28 -						-		
Becomes hard, pale yellowish brown  - 32				1			F		
	- 30 -	B9-3				Recomes hard, nale vellowish brown	- <sub>50/6"</sub>	102.8	21.2
	<u> </u>	5,3				-becomes nard, pare yenowish brown	-	102.0	21.2
	- 32 -						-		
	-						-		
-Very hard drilling from 34-57 feet	- 34 -					-Very hard drilling from 34-57 feet	-		

Figure A-9, Log of Boring B 9, Page 1 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
OAWI LE OTWIDOLO	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

	1 NO. G232	-0 02 0						
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 9           ELEV. (MSL.) 345' DATE COMPLETED 09-03-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 36 38 40 42 46 50 52 56 56 56	B9-4 B9-5 B9-6 B9-7			CL	-Becomes gray with yellowish brown streaks  REFUSAL AT 57 FEET Groundwater not encountered		107.7	20.8

Figure A-9, Log of Boring B 9, Page 2 of 2

G2326	-52-0	2.GF	٦J

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL

... STANDARD PENETRATION TEST

... DRIVE SAMPLE (UNDISTURBED)

... CHUNK SAMPLE

... WATER TABLE OR SEEPAGE

	1 NO. G232							
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 10           ELEV. (MSL.) 345' DATE COMPLETED 09-03-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 0 -		, <sub>U-,</sub> o o			4-INCH ASPHALT CONCRETE OVER 6-INCH AGGREGATE BASE			
- 2 - - 2 -				SC/SM	VERY OLD PARALIC DEPOSITS (Qvop)  Very dense, moist, yellowish brown, Clayey to Silty, fine to coarse SAND; little gravel	-		
- 4 - 6 -						- - -		
-			1			-		
- 8 - 				CL	ARDATH SHALE (Ta) Hard, moist, olive gray and yellowish brown, Silty CLAY; some fine sand	-		
- 10 -  - 12 -	B10-1			CL		- 74 -	111.7	16.4
12			1					
- 14 - 					Hard, moist, olive gray and yellowish brown, laminated CLAYSTONE	-		
- 16 - 						- -		
- 18 - 						-		
- 20 - 	B10-2				-Few calcite veins	- 50/5" -	109.5	17.8
- 22 - 						<u>-</u>		
- 24 -  - 26 -					-Very difficult drilling from 24-40 feet			
 - 28 -						  -  -		
 - 30 -	B10-3					- - <sub>90/10"</sub>	111.6	18.9
 - 32 -						-		
 - 34 -						<u>-</u>		

Figure A-10, Log of Boring B 10, Page 1 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
GAIVII EE OTIVIBOEO	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

BORING B 10  SAMPLE NO. DO DELTO DELTO DESCRIPTION  CL. STATE COMPLETED 09-03-2020  ELEV. (MSL.) 345  EQUIPMENT CME 95  EQUIPMENT CME 95  BY: B. KUNA  CL. SWELD AND COMPLETED 09-03-2020  EQUIPMENT CME 95  EQUIP	FINOSEC	I NO. G232	20-52-0	_					
- 36	IN	1	LITHOLOGY	GROUNDWATER	CLASS	ELEV. (MSL.) 345' DATE COMPLETED 09-03-2020	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
- 38 40 - B10-4				П		MATERIAL DESCRIPTION			
	- 38 - 				CL	-Little recovery -Large calcite vein and charcoal in sample  REFUSAL AT 40.5 FEET			

Figure A-10, Log of Boring B 10, Page 2 of 2

og of Defining D 10, 1 age 2 of 2							
SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)				
CAIVII EE CTIVIDOEC		CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE				

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

	E SAMPLE (UNDI				30F8	LE SYMI	4MA2
L92.20-52-6225		S 10	sge 1	1'\\	g 6	، A-۱۱, i Borin	Figure Log of
		-Мо гесочету				P11-2	- 35 - - 30 - - 37 - - 37 -
	- - -	ARDATH SHALE (Ta) Hard, moist, gray and yellowish brown, laminated CLAYSTONE	CT			BII- <del>4</del>	- 22 - - 54 -
	S.I/0S	-No recovery due to gravelly layer between 20-25 feet				B11-3	- 18 - - 20 - - 20 -
	9/0\$ _ 	Very dense, moist, reddish brown, Silty, fine to medium SAND with chunks of gray clay, trace gravel				BII-7	- 9l - - 7l -
2.11	- tt _ -	-Disturbed sample	TO/WS			B11-1	- 8 - - 01 - - 21 -
	- - - -			)         			- 8 - - 9 - - 7 -
	-	THACH ASH HALT CONCRETE OVER TAPHON and gray, Clayey, fine to Medium SAND; little gravel	SC	7.7	// / / G		- Z - 
	,	+INCH ASPHALT CONCRETE OVER 12-INCH AGGREGATE BASE					- 0 -
DRY DENSITY (P.C.F.)  MOISTURE CONTENT (%)	PENETRATION RESISTANCE (BLOWS/FT.)	ECONDMENT CME 96  BA: B: KNNA  BOSING B 11	(naca) CTVaa SOIL	GROUNDWATER	LITHOLOGY	ON.	DEPTH IN FEET

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

	1 110. 020							
DEPTH IN FEET	SAMPLE NO.	ГІТНОГОСУ	GROUNDWATER	SOIL CLASS (USCS)	BORING B 11           ELEV. (MSL.) 355' DATE COMPLETED 09-03-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
-	B11-6	(/////	H	CL	WATERIAL DESCRIPTION	50/5.5"	109.4	18.4
- 36 -	. B11-0		1 1	CL		-	107.4	10.4
	]							
20			1 1					
- 38 -	1							
_	1		1			-		
- 40 -						-		
-	-		1			-		
- 42 -						-		
			1 1			_		
- 44 -								
44			1					
	B11-7					50/4.5"	109.1	16.1
- 46 -	1		1					
-	1		1			-		
- 48 -						-		
<u> </u>		1////	14		 	L		
- 50 -		_		ML	Hard, moist, gray and yellowish brown, laminated SILTSTONE			
	B11-8					96/8.5"	102.2	21.7
- 52 -	1							
-			╁┤	CL	Hard, moist, pale yellowish brown and gray, laminated CLAYSTONE, hard	<del> </del>		
- 54 -			1 1		drilling from 53-61 feet	-		
-	B11-9				-	50/5"	103.4	22.1
- 56 -	111-7		1 1			_ 50/5	105.4	22.1
	]							
E0			1 1					
– 58 <i>–</i>			1					
T -	1		1 I					
- 60 -	B11-10				-Becomes gray and yellowish brown	92	104.1	21.9
F -			1—1		BORING TERMINATED AT 61 FEET			
			Ш		Groundwater not encountered			
1								

Figure A-11, Log of Boring B 11, Page 2 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
CAIMI LE CTIMBOLO	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

	1 110. 020							
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 12           ELEV. (MSL.) 340' DATE COMPLETED 09-04-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 0 -		.0.0.0			4-INCH ASPHALT CONCRETE OVER 8-INCH AGGREGATE BASE			
-	B12-1		+	CL	ARDATH SHALE (Ta)			
- 2 -			1		Very stiff, yellowish brown and gray, CLAYSTONE	-		
-						-		
- 4 -			1			L		
_	D						104.5	21.4
- 6 -	B12-2					53	104.7	21.4
			1					
- 8 -			1			-		
						-		
– 10 <i>–</i>	B12-3		1		-Becomes grayish brown and pale yellowish brown	53	103.8	21.9
			1		becomes grayish from and pale yellowish from	-		
- 12 -						-		
			1			L I		
- 14 -						L		
L '-						L		
40	B12-4		1		-Becomes hard, brownish gray with yellowish brown streaks	62	105.1	21.5
– 16 –	Ī							
			1			-		
– 18 <i>–</i>						-		
-	B12-5					65	104.9	22.1
- 20 -			1—1		BORING TERMINATED AT 20 FEET			
					Groundwater not encountered			

Figure A-12, Log of Boring B 12, Page 1 of 1

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)		
OAIMI EL OTIMBOLO	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE		

	1 NO. G232	-0 02 0						
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B 13           ELEV. (MSL.) 350' DATE COMPLETED 09-04-2020           EQUIPMENT CME 95         BY: B. KUNA	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
			П		MATERIAL DESCRIPTION			
- 0 -  - 2 -				SC	UNDOCUMENTED FILL (Qudf)  Medium dense, moist, reddish brown to brownish gray, Clayey fine to medium SAND; little gravel	_ _		
- 4 -			?			_ _		
- 6 -						_		
- 8 - 						_ _ _		
- 10 - 	B13-1					- 42 -	123.6	8.8
- 12 -  - 14 -						_		
_ '4			1					
- 16 - 						_ _		
- 18 - 						_ _		
- 20 -  - 22 -	B13-2		2		-Becomes dark brownish gray	44	118.8	14.4
- 22 - 24 -						_ _ _		
 - 26 -						_ _		
- 28 - - 2 -						_ _ _		
- 30 - 	B13-3 B13-4				-No recovery	- 62 - 48		
- 32 - 						_ _ _		
- 34 -						_		

Figure A-13, Log of Boring B 13, Page 1 of 2

SAMPLE SYMBOLS	SAMPLING UNSUCCESSFUL	STANDARD PENETRATION TEST	DRIVE SAMPLE (UNDISTURBED)
OAIMI EE OTIMBOEO	DISTURBED OR BAG SAMPLE	CHUNK SAMPLE	▼ WATER TABLE OR SEEPAGE

		AMPLE (UNDIS				STC	LE SYMB(	4MAS
-52-02.GPJ	C2326		of 2	sage 2	3 ' E	BI	. A-13, i Boring	
			BORING TERMINATED AT 61 FEET  Groundwater not encountered					
s.91	0.011	78 _					B13-10	–
		_	ARDATH SHALE (Ta) Hard, most, gray with yellowish brown streaks, CLAYSTONE	CF				- 28 -
		_						
5.12	2.601	<b>7</b> ξ _					B13-9	– 99 – –
		_						– <del>1</del> 79 –
		_						- 52 -
		88 _					8-£18 8-£18	20 -
		_						
	ļ +		Stiff, moist, dark brownish gray and yellowish brown, Silty CLAY; trace gravel, chunks of claystone	_ CF				– 8† –
<b>t</b> .9		- \$\$	few roots and other organics, little charcoal staining				9-£18	– 9 <del>1</del> –
	ļ +		Dense, moist, dark brownish gray, Silty, fine to medium SAND; trace gravel, few roots and other organice. Little charged staining	WS	-		Julia	- 77 -
		_				///		- 45 -
<i>2.</i> 81	9.701	7.0					F13-2	
581	9 201	- 52					5.818	- 0 <del>1</del> -
		_						– 38 –
		_	Very stiff, moist, dark brownish gray, Sandy CLAY; small chunks of gray and yellowish brown claystone	70				– 36 – –
			MATERIAL DESCRIPTION  Went stiff moist dark brounnish gray Sandy CI AX: small shunks of gray and	CF		/.::/::/	. 1	
CZ	무	PE RE (B	EQUIPMENT CME 95 BY: B. KUNA		GRC			
MOISTURE CONTENT (%)	DRY DENSITY (P.C.F.)	PENETRATION RESISTANCE (BLOWS/FT.)	ELEV. (MSL.) 350' DATE COMPLETED 09-04-2020	(naca)	GROUNDWATER	LITHOLOGY	SAMPLE NO.	NI FEET
JRE T (%)	YTISI	NCE /FT.)	BOKING B 13	SOIL	ATER	ЭӨҮ		DEPTH
					Ц		NO. G232	

MOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT

# APPENDIX B

# **APPENDIX B**

## **LABORATORY TESTING**

We performed laboratory tests in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for in-place dry density and moisture content, maximum density and optimum moisture content, direct shear strength, expansion index, water soluble sulfate, R-Value, consolidation, and gradation characteristics. The results of our current laboratory tests are presented herein. The in-place dry density and moisture content of the samples tested are presented on the boring logs in Appendix A.

TABLE B-I SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D 1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B2-2	Yellowish Brown, Silty, fine SAND (Qvop)	130.2	9.3
B7-1	Yellowish Brown and Gray CLAY (Ta)	117.9	12.9

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sampla	Moisture C	Content (%)	Dry	Expansion	2019 CBC	ASTM Soil	
Sample No.	Before Test	After Test	Density (pcf)	Index	Expansion Classification	Expansion Classification	
B1-1	10.9	20.7	106.9	47	Expansive	Low	
B2-2	10.0	18.6	109.8	29	Expansive	Low	
B5-1	13.6	30.2	98.8	80	Expansive	Medium	
В9-7	11.0	24.8	105.5	65	Expansive	Medium	
B11-4	7.9	16.4	117.9	21	Expansive	Low	
B13-8	12.0	22.7	104.0	44	Expansive	Low	

# TABLE B-III SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Depth (feet)	Geologic Unit	Water-Soluble Sulfate (%)	ACI 318 Sulfate Exposure
B2-3	10	Qvop	0.003	S0
B2-8	35	Ta	0.171	S1
B4-2	20	Qvop	0.012	S0
B7-3	20	Ta	0.027	S0
B7-6	45	Ta	0.016	S0
B11-7	45	Ta	0.029	S0

# TABLE B-IV SUMMARY OF LABORATORY RESISTANCE VALUE (R-VALUE) TEST RESULTS ASTM D 2844

Sample No.	Depth (Feet)	Description (Geologic Unit)	R-Value
B5-1	0 - 5	Olive and Reddish Brown CLAY (Ta)	11
B12-1	1 - 5	Yellowish Brown and Gray CLAY (Ta)	6

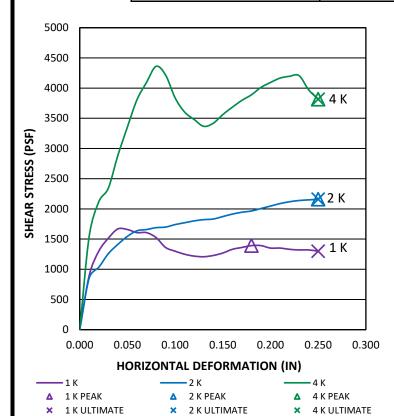
SAMPLE NO.: B2-3 GEOLOGIC UNIT: Qvop

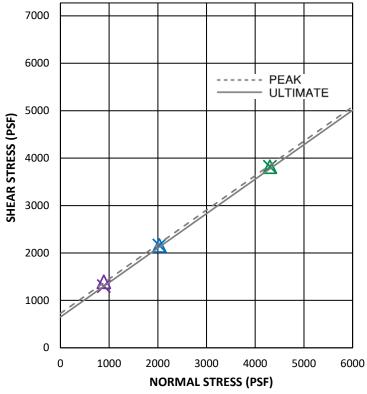
SAMPLE DEPTH (FT): 10' NATURAL/REMOLDED: N

INITIAL CONDITIONS						
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>		
ACTUAL NORMAL STRESS (PSF):	890	2030	4300			
WATER CONTENT (%):	19.0	18.5	22.7	20.1		
DRY DENSITY (PCF):	105.4	103.2	101.7	103.4		

AFTER TEST CONDITIONS					
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>	
WATER CONTENT (%):	22.8	23.3	24.4	23.5	
PEAK SHEAR STRESS (PSF):	1392	2159	3817		
ULTE.O.T. SHEAR STRESS (PSF):	1300	2159	3817		

RESULTS					
PEAK	COHESION, C (PSF)	725			
FEAR	FRICTION ANGLE (DEGREES)	36			
ULTIMATE	COHESION, C (PSF)	650			
OLTIMATE	FRICTION ANGLE (DEGREES)	36			





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**TOWNE CENTRE VIEW** 

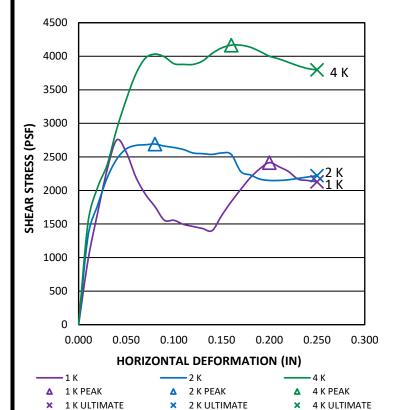
SAMPLE NO.: B2-8 GEOLOGIC UNIT: Ta

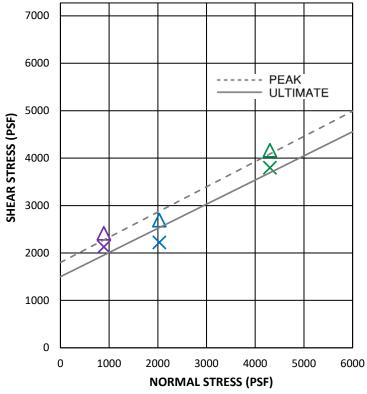
SAMPLE DEPTH (FT): 35' NATURAL/REMOLDED: N

INITIAL CONDITIONS					
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>	
ACTUAL NORMAL STRESS (PSF):	890	2030	4300		
WATER CONTENT (%):	19.1	19.6	19.8	19.5	
DRY DENSITY (PCF):	110.8	106.5	104.2	107.1	

AFTER TEST CONDITIONS					
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>	
WATER CONTENT (%):	21.7	23.6	24.3	23.2	
PEAK SHEAR STRESS (PSF):	2415	2692	4165		
ULTE.O.T. SHEAR STRESS (PSF):	2129	2221	3797		

RESULTS					
PEAK	COHESION, C (PSF)	1800			
FEAR	FRICTION ANGLE (DEGREES)	28			
ULTIMATE	COHESION, C (PSF)	1500			
OLTIMATE	FRICTION ANGLE (DEGREES)	27			





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# **TOWNE CENTRE VIEW**

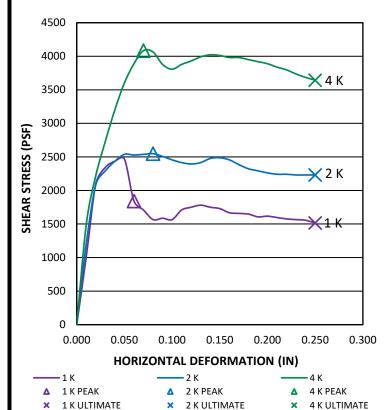
SAMPLE NO.: B7-3 GEOLOGIC UNIT: Ta

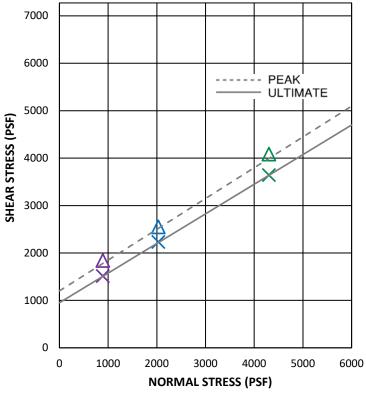
SAMPLE DEPTH (FT): 20' NATURAL/REMOLDED: N

INITIAL CONDITIONS						
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>		
ACTUAL NORMAL STRESS (PSF):	890	2030	4300			
WATER CONTENT (%):	20.4	21.2	21.1	20.9		
DRY DENSITY (PCF):	107.6	106.2	105.8	106.5		

AFTER TEST CONDITIONS					
NORMAL STRESS TEST LOAD	ΙK	2 K	4 K	<b>AVERAGE</b>	
WATER CONTENT (%):	22.7	24.4	23.7	23.6	
PEAK SHEAR STRESS (PSF):	1842	2548	4084		
ULTE.O.T. SHEAR STRESS (PSF):	1515	2231	3643		

RESULTS					
PEAK	COHESION, C (PSF)	1200			
FEAR	FRICTION ANGLE (DEGREES)	33			
ULTIMATE	COHESION, C (PSF)	950			
OLTIMATE	FRICTION ANGLE (DEGREES)	32			





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**TOWNE CENTRE VIEW** 

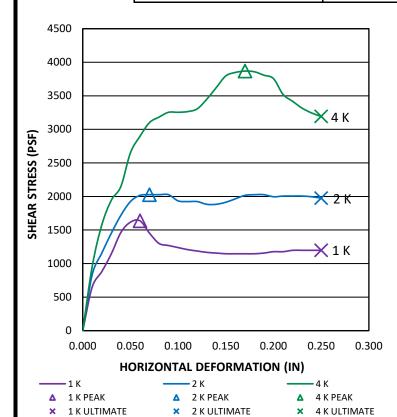
SAMPLE NO.: B9-6 GEOLOGIC UNIT: Ta

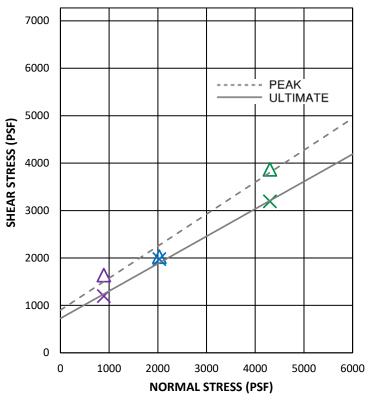
SAMPLE DEPTH (FT): 50' NATURAL/REMOLDED: N

INITIAL CONDITIONS					
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>	
ACTUAL NORMAL STRESS (PSF):	890	2030	4300		
WATER CONTENT (%):	21.3	21.1	21.5	21.3	
DRY DENSITY (PCF):	106.1	105.8	106.1	106.0	

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>
WATER CONTENT (%):	23.9	24.1	23.6	23.9
PEAK SHEAR STRESS (PSF):	1638	2026	3869	
ULTE.O.T. SHEAR STRESS (PSF):	1197	1975	3193	

RESULTS				
PEAK	COHESION, C (PSF)	900		
FEAR	FRICTION ANGLE (DEGREES)	34		
ULTIMATE	COHESION, C (PSF)	725		
OLIMATE	FRICTION ANGLE (DEGREES)	30		





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**TOWNE CENTRE VIEW** 

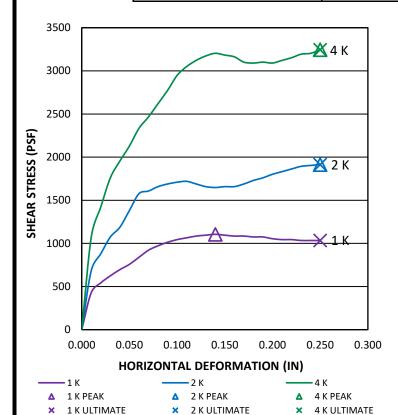
SAMPLE NO.: BII-2 GEOLOGIC UNIT: Qvop

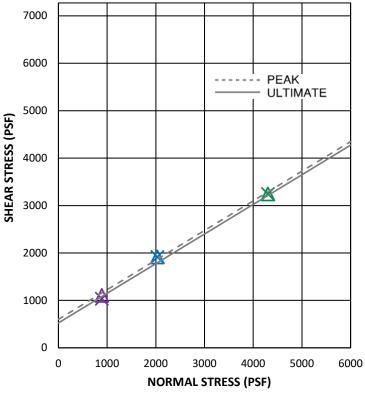
SAMPLE DEPTH (FT): 15' NATURAL/REMOLDED: N

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	
WATER CONTENT (%):	11.1	10.2	10.1	10.5
DRY DENSITY (PCF):	100.2	101.6	101.0	100.9

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>
WATER CONTENT (%):	21.1	20.8	20.6	20.8
PEAK SHEAR STRESS (PSF):	1105	1914	3244	
ULTE.O.T. SHEAR STRESS (PSF):	1034	1914	3244	

RESULTS				
PEAK	COHESION, C (PSF)	600		
FEAR	FRICTION ANGLE (DEGREES)	32		
ULTIMATE	COHESION, C (PSF)	525		
OLIMATE	FRICTION ANGLE (DEGREES)	32		





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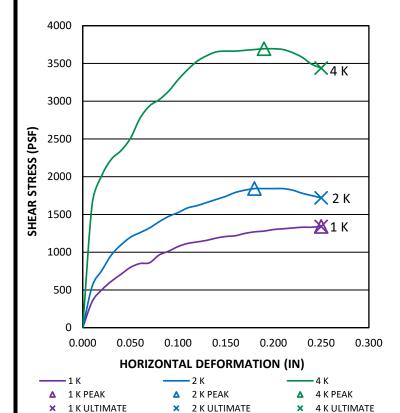
# **TOWNE CENTRE VIEW**

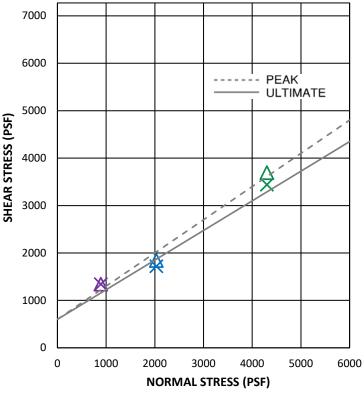
SAMPLE NO.: B13-2 GEOLOGIC UNIT: Qudf
SAMPLE DEPTH (FT): 20' NATURAL/REMOLDED: N

INITIAL CONDITIONS				
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>
ACTUAL NORMAL STRESS (PSF):	890	2030	4300	
WATER CONTENT (%):	11.5	11.1	13.6	12.1
DRY DENSITY (PCF):	116.0	112.8	115.0	114.6

AFTER TEST CONDITIONS				
NORMAL STRESS TEST LOAD	I K	2 K	4 K	<b>AVERAGE</b>
WATER CONTENT (%):	15.3	16.2	16.0	15.8
PEAK SHEAR STRESS (PSF):	1341	1842	3695	
ULTE.O.T. SHEAR STRESS (PSF):	1341	1719	3439	

RESULTS				
PEAK	COHESION, C (PSF)	600		
FEAR	FRICTION ANGLE (DEGREES)	35		
ULTIMATE	COHESION, C (PSF)	600		
OLTIMATE	FRICTION ANGLE (DEGREES)	32		





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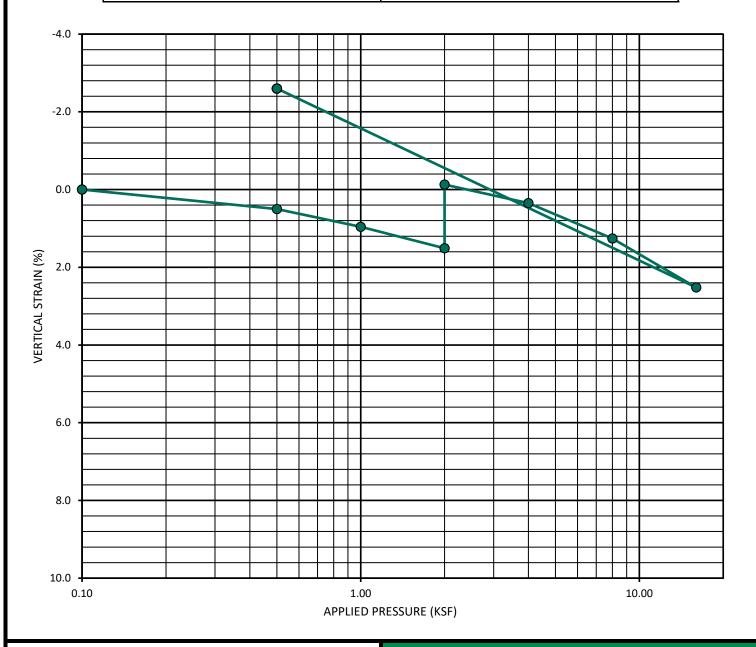


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**TOWNE CENTRE VIEW** 

SAMPLE NO.:	B1-6	GEOLOGIC UNIT:	Tsc	
SAMPLE DEPTH (ET).	25'			

TEST INFORMATION		
INITIAL DRY DENSITY (PCF):	105.9	
INITIAL WATER CONTENT (%):	21.3%	
SAMPLE SATURATED AT (KSF):	2.0	
INITIAL SATURATION (%):	100+	





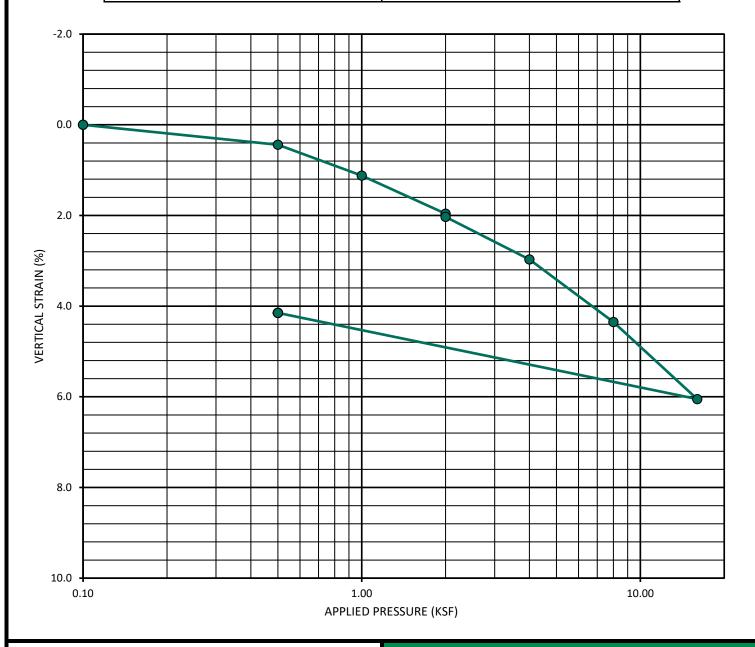


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# **TOWNE CENTRE VIEW**

SAMPLE NO.:	B4-10	GEOLOGIC UNIT:	Qvop
SAMPLE DEPTH (FT):	55'	_	

TEST INFORMATION				
INITIAL DRY DENSITY (PCF):	100.9			
INITIAL WATER CONTENT (%):	16.4%			
SAMPLE SATURATED AT (KSF):	2.0			
INITIAL SATURATION (%):	67.7%			





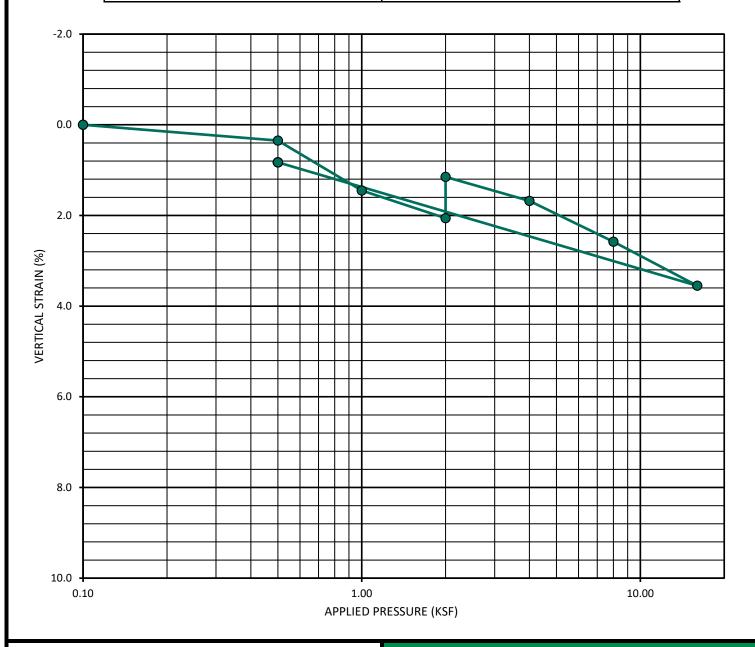


**CONSOLIDATION CURVE - ASTM D 2435** 

# **TOWNE CENTRE VIEW**

SAMPLE NO.:	B8-6	GEOLOGIC UNIT:	Та	
SAMPLE DEPTH (ET):	50'	<del>-</del>		

TEST INFORMATION				
INITIAL DRY DENSITY (PCF):	111.9			
INITIAL WATER CONTENT (%):	18.3%			
SAMPLE SATURATED AT (KSF):	2.0			
INITIAL SATURATION (%):	100+			





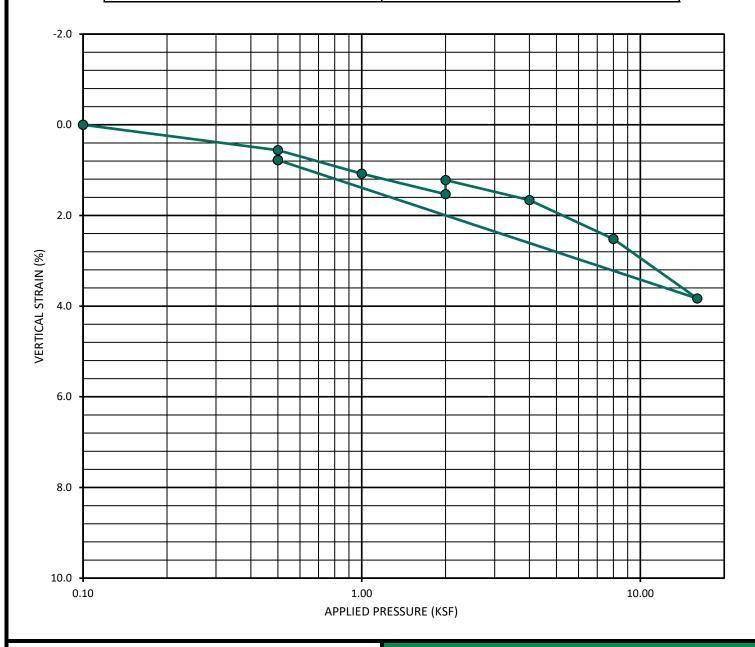


**CONSOLIDATION CURVE - ASTM D 2435** 

# **TOWNE CENTRE VIEW**

SAMPLE NO.:	<b>B9-8</b>	GEOLOGIC UNIT:	Ta	
SAMPLE DEPTH (ET).	55'	<u> </u>		

TEST INFORMATION				
INITIAL DRY DENSITY (PCF):	107.3			
INITIAL WATER CONTENT (%):	21.0%			
SAMPLE SATURATED AT (KSF):	2.0			
INITIAL SATURATION (%):	100+			





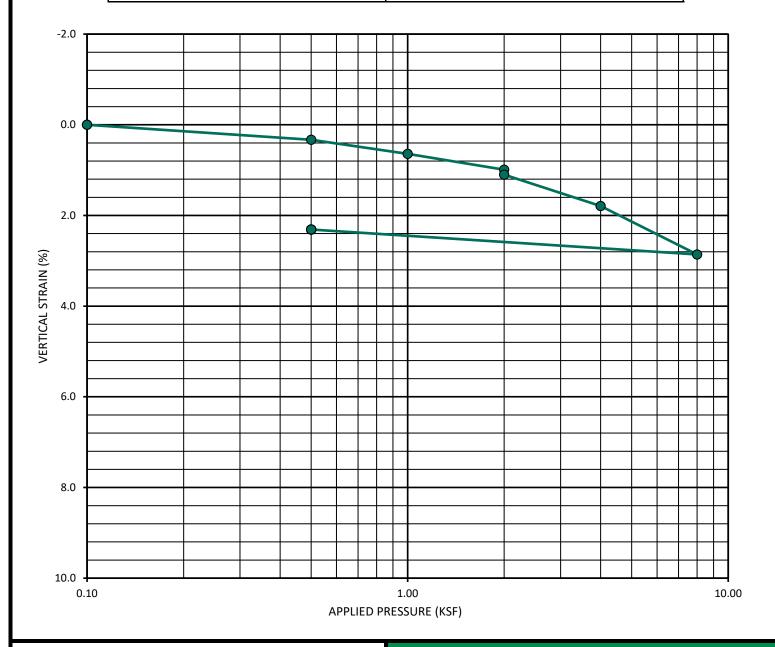


**CONSOLIDATION CURVE - ASTM D 2435** 

# **TOWNE CENTRE VIEW**

SAMPLE NO.:	B13-1	GEOLOGIC UNIT:	Qudf
SAMPLE DEPTH (FT):	10'	_	

TEST INFORMATION				
INITIAL DRY DENSITY (PCF):	121.8			
INITIAL WATER CONTENT (%):	11.5%			
SAMPLE SATURATED AT (KSF):	2.0			
INITIAL SATURATION (%):	84.7%			



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# **TOWNE CENTRE VIEW**

SAMPLE NO.:	B13-7	GEOLOGIC UNIT:	Qudf
SAMPLE DEPTH (FT):	50'	_	

TEST INFORMATION				
INITIAL DRY DENSITY (PCF):	105.4			
INITIAL WATER CONTENT (%):	22.1%			
SAMPLE SATURATED AT (KSF):	2.0			
INITIAL SATURATION (%):	100+			







**CONSOLIDATION CURVE - ASTM D 2435** 

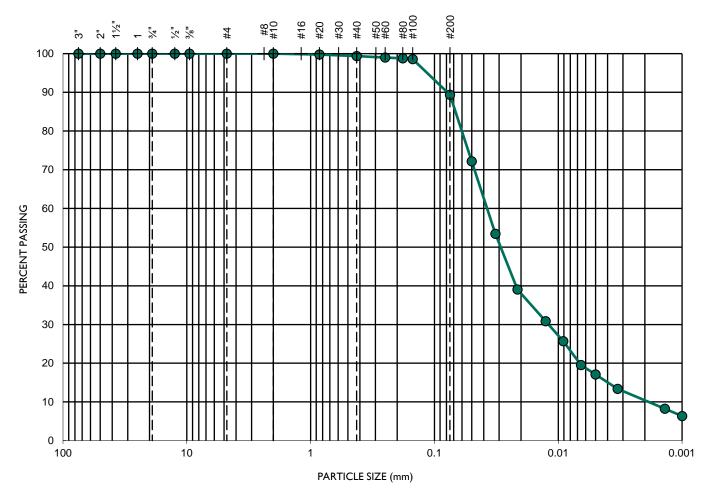
# **TOWNE CENTRE VIEW**

SAMPLE NO.:	B2-4
SAMPLE DEPTH (FT.):	15'

GEOLOGIC UNIT: Ta

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	SILT OR CLAY

#### U.S. STANDARD SIEVE SIZE



TEST DATA						
D <sub>10</sub> (mm) D <sub>30</sub> (mm) D <sub>60</sub> (mm) C <sub>c</sub> C <sub>u</sub> SOIL DESCRIPTION						
0.00205	0.01207	0.03843	1.9	18.8	CLAY	





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6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

**SIEVE ANALYSES - ASTM D 135 & D 422** 

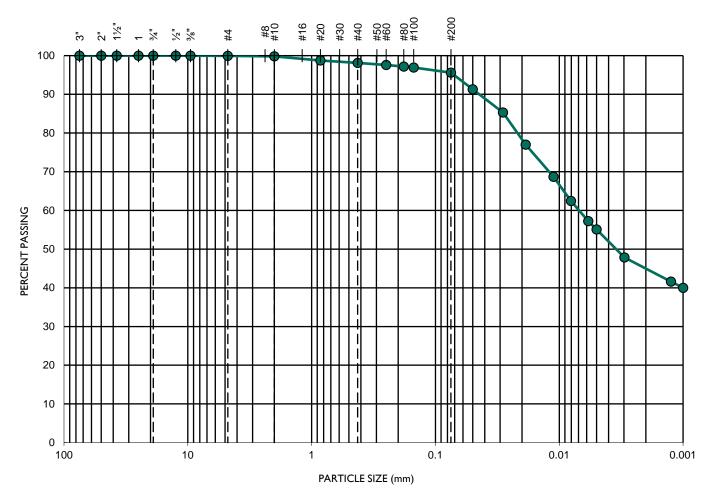
# **TOWNE CENTRE VIEW**

SAMPLE NO.:	B5-8
SAMPLE DEPTH (FT.):	50'

GEOLOGIC UNIT: Ta

GRA	VEL	SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	SILT OR CLAY

#### U.S. STANDARD SIEVE SIZE



TEST DATA						
<b>D</b> <sub>10</sub> (mm)	<b>D</b> <sub>30</sub> (mm)	D <sub>60</sub> (mm)	C <sub>c</sub>	C <sub>u</sub>	SOIL DESCRIPTION	
	-0.00056	0.00701			CLAY	





GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

**SIEVE ANALYSES - ASTM D 135 & D 422** 

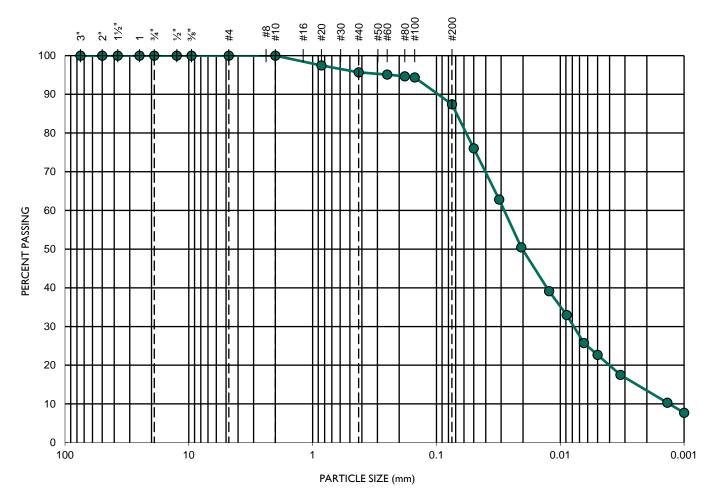
# **TOWNE CENTRE VIEW**

SAMPLE NO.:	B11-8	
SAMPLE DEPTH (FT.):	50'	_

GEOLOGIC UNIT: Ta

GRA	VEL	SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	SILT OR CLAY

#### U.S. STANDARD SIEVE SIZE



TEST DATA						
D <sub>10</sub> (mm) D <sub>30</sub> (mm) D <sub>60</sub> (mm) C <sub>c</sub> C <sub>u</sub> SOIL DESCRIPTION						
0.00132	0.00788	0.02878	1.6	21.7	SILT	





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**SIEVE ANALYSES - ASTM D 135 & D 422** 

# **TOWNE CENTRE VIEW**

# APPENDIX C

# APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

**FOR** 

TOWNE CENTRE VIEW SAN DIEGO, CALIFORNIA

#### RECOMMENDED GRADING SPECIFICATIONS

#### 1. GENERAL

- 1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.
- 1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.
- 1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

#### 2. **DEFINITIONS**

- 2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.
- 2.2 **Contractor** shall refer to the Contractor performing the site grading work.
- 2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.
- 2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

- 2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.
- 2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.
- 2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

#### 3. MATERIALS

- 3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.
  - 3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than 3/4 inch in size.
  - 3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.
  - 3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than 3/4 inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.
- 3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.
- 3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

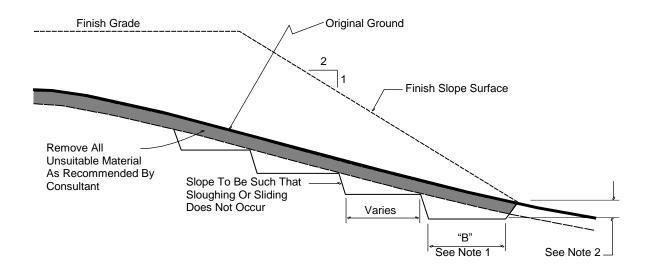
- 3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.
- 3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.
- 3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

#### 4. CLEARING AND PREPARING AREAS TO BE FILLED

- 4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.
- 4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

- 4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.
- 4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

#### TYPICAL BENCHING DETAIL



No Scale

#### DETAIL NOTES:

- (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.
- (2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.
- 4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

#### 5. COMPACTION EQUIPMENT

- 5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.
- 5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

#### 6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

- 6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:
  - 6.1.1 Soil fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.
  - 6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.
  - 6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.
  - 6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.
  - 6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

- 6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.
- 6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.
- 6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.
- 6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:
  - 6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.
  - 6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.
  - 6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.
  - 6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

- 6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.
- 6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.
- 6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:
  - 6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.
  - 6.3.2 Rock fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the rock fill shall be by dozer to facilitate seating of the rock. The rock fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a rock fill lift has been covered with soil fill, no additional rock fill lifts will be permitted over the soil fill.
  - 6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection

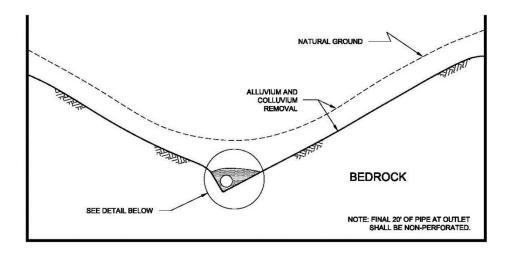
variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

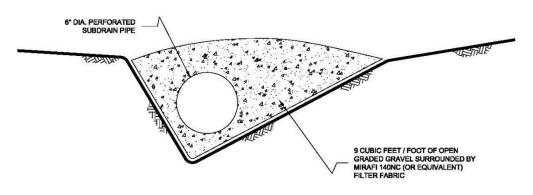
- 6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.
- 6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.
- 6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.
- 6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

#### 7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

#### TYPICAL CANYON DRAIN DETAIL





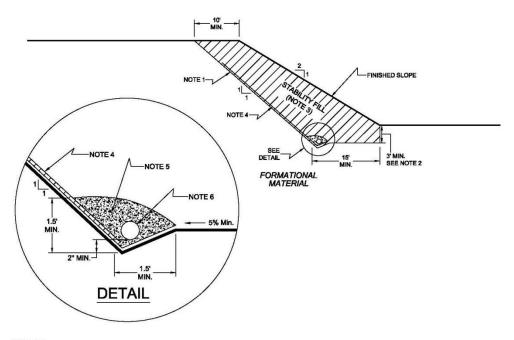
#### NOTES:

- 1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.
- 2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

#### TYPICAL STABILITY FILL DETAIL



#### NOTES:

- 1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).
- 2....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.
- 3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.
- 4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT)
  SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF
  SEEPAGE IS ENCOUNTERED.
- 5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).
- 6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

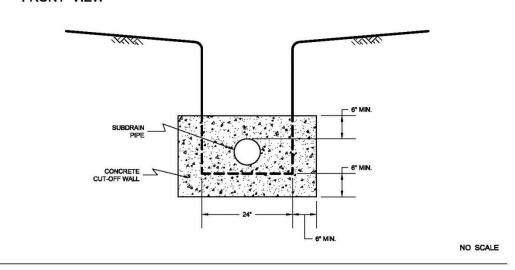
NO SCALE

- 7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.
- 7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

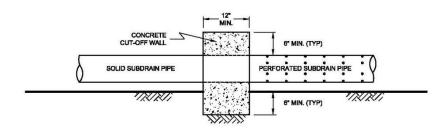
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

#### TYPICAL CUT OFF WALL DETAIL





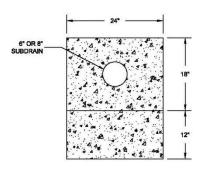
#### SIDE VIEW



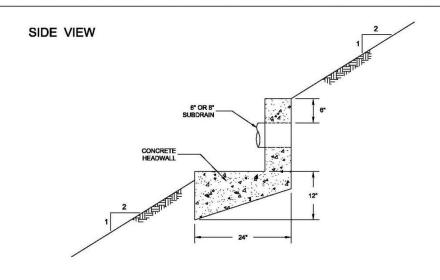
NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

#### FRONT VIEW



NO SCALE



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

#### 8. OBSERVATION AND TESTING

- 8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.
- 8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.
- During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.
- A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.
- 8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.
- 8.6 Testing procedures shall conform to the following Standards as appropriate:

#### 8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, Density of Soil In-Place By the Sand-Cone Method.

- 8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).
- 8.6.1.3 Laboratory Compaction Test, ASTM D 1557, Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.
- 8.6.1.4. Expansion Index Test, ASTM D 4829, Expansion Index Test.

#### 9. PROTECTION OF WORK

- 9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.
- 9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

#### 10. CERTIFICATIONS AND FINAL REPORTS

- 10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.
- The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

#### LIST OF REFERENCES

- 1. 2019 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2018 International Building Code, prepared by California Building Standards Commission, dated July 2019.
- 2. American Concrete Institute, ACI 318-11, Building Code Requirements for Structural Concrete and Commentary, dated August, 2011.
- 3. American Concrete Institute, ACI 330-08, Guide for the Design and Construction of Concrete Parking Lots, dated June, 2008.
- 4. American Society of Civil Engineers (ASCE), ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2017.
- 5. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California*, Open File Report 96-08, 1996.
- 6. California Geological Survey, *Seismic Shaking Hazards in California*, Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years.

  http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html
- 7. County of San Diego, San Diego County Multi Jurisdiction Hazard Mitigation Plan, San Diego, California Final Draft, dated 2017.
- 8. Geocon Incorporated, 2005, *Update Geotechnical Investigation, Towne Centre Corporate Plaza, San Diego, California*, dated July 15, 2005 (Project No. 06376-52-03).
- 9. Geocon Incorporated, 2010, Final Report of Testing and Observation Services Performed During Site Grading and Installation of Retaining Walls, Summit Pointe Plaza, Phase 1 and Phase 2, San Diego, California, dated September 22, 2010 (Project No. 06376-52-04).
- 10. Historical Aerial Photos. <a href="http://www.historicaerials.com">http://www.historicaerials.com</a>
- 11. Jennings, C. W., 1994, California Division of Mines and Geology, *Fault Activity Map of California and Adjacent Areas*, California Geologic Data Map Series Map No. 6.
- 12. Kennedy, M. P., and S. S. Tan, 2008, *Geologic Map of the San Diego 30'x60' Quadrangle, California*, USGS Regional Map Series Map No. 3, Scale 1:100,000.
- 13. Special Publication 117A, Guidelines For Evaluating and Mitigating Seismic Hazards in California 2008, California Geological Survey, Revised and Re-adopted September 11, 2008.
- 14. Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.
- 15. USGS computer program, Seismic Hazard Curves and Uniform Hazard Response Spectra, http://geohazards.usgs.gov/designmaps/us/application.php.