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

University Self Storage

PTS-668875

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

☐ **Check if electing for offsite alternative compliance**

REGISTERED PROFESSIONAL ENGINEER
MELLOR R. LANDY
No. 81085
Exp. 09-30-23
CIVIL
STATE OF CALIFORNIA

Engineer of Work:

Mellor R. Landy, P.E. RCE 81085

Provide Wet Signature and Stamp Above Line

Prepared For:

Mr. Robert Stacks, RDS Contracting Inc.

12064 Woodside Avenue, Suite 102

Lakeside, CA 92040

(619) 577-4010

NOVA Engineering

Nova Engineering

4373 Viewridge Avenue, Suite A

San Diego, CA 92123

619-296-1010

Date:

1/28/2021

Approved by: City of San Diego Date

The City of SAN DIEGO

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Table of Contents

- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
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- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

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	Hydromodification Management Plan
HSG	Hydrologic 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 Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality 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: 51st & University Self Storage
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

81085	9-30-2023
PE#	Expiration Date

Mellor R. Landy, P.E.

Print Name

Nova Engineering, Inc.

Company

1/28/2021

Date

Engineer's Stamp

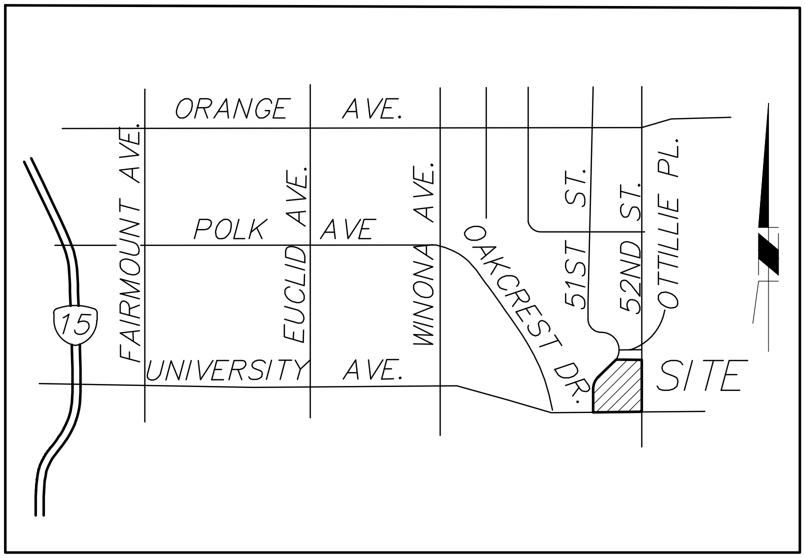
Submittal Record

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	5/27/2020	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	**Initial Submittal**
2	9/3/2020	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Second Submittal
3	1/28/2021	☑ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	Third Submittal. See comment response letter for changes
4		☐ **Preliminary Design/Planning/CEQA** ☐ **Final Design**	

Project Vicinity Map

Project Name: University Self Storage
Permit Application PTS-668875



VICINITY MAP
N.T.S.

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

Attach DS-560 form.

City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
November 2018

Project Address: 5150 University Ave., San Diego, CA 92105	Project Number: PTS-668875

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State Regional Water Quality 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.

1. 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 with land disturbance greater than or equal to 1 acre.)

☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. 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/or contact with storm water?

☐ Yes; WPCP required, skip questions 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 question 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?

- Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
- Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
- 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.

☐ 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 **does not apply and no document is required. Continue to Section 2.**

1. More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**

a. Projects located in the ASBS watershed.

2. ☐ **High Priority**

a. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and not located in the ASBS watershed.

b. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and not located in the ASBS watershed.

3. ☒ **Medium Priority**

a. Projects that are not located in an ASBS watershed or designated as a High priority site.

b. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and not located in an ASBS watershed.

c. WPCP projects (>5,000sf of ground disturbance) located within the Los Penasquitos watershed management area.

4. ☐ **Low Priority**

a. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes ☒ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes ☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes ☒ No

Clear Page 2

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

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:

- **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
- **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
- **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

☐ Yes; PDP exempt requirements apply ☒ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1.	**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.	☐ Yes ☒ No
2.	**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.	☒ Yes ☐ No
3.	**New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling 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.	☐ Yes ☒ No
4.	**New development or redevelopment on a hillside.** 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.	☐ 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).**	☐ Yes ☒ No
6.	**New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☐ Yes ☒ No

Clear Page 3

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☐ Yes ☒ No

8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ☐ Yes ☒ No

9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**. ☐
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☒

Name of Owner or Agent *(Please Print)*	Title
Signature	Date

Clear Page 4

Clear Form

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Applicability of Permanent, Post-Construction Storm Water BMP Requirements			Form I-1
Project Identification			
Project Name: University Self Storage			
Permit Application Number: PTS-668875			Date: 1/28/2021
Determination of Requirements			
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.			
Step	**Answer**	**Progression**	
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.	
	☐ No	**Stop.** Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.	
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):			
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply	
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.	
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.	
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:			

Project Name: University Self Storage

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 **Step 4**.
	☑ No	BMP Design Manual PDP requirements apply. Go to **Step 4**.
Discussion / justification of prior lawful approval, and identify requirements (not required if prior lawful approval does not apply):		
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 **Step 5**.
	☐ No	**Stop.** PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do not 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). **Stop.**
	☑ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. **Stop.**
Discussion / justification if protection of critical coarse sediment yield areas does not apply: The presence of critical coarse sediment yield areas to not appear to be in the vicinity of the project site, or project site downstream discharge. Please refer to the provided exhibit from section 6.2.		

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody. Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

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Project Name: University Self Storage

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	University Self Storage
Project Address	5150 University Avenue, San Diego, CA 92105
Assessor's Parcel Number(s) (APN(s))	472-38-30-400
Permit Application Number	PTS-668875
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)	Chollas - San Diego Mesa - Pueblo San Diego 908.22
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	2.26 Acres (98,723 Square Feet) 0.08 Acres off- site run on
Area to be disturbed by the project (Project Footprint)	2.18 Acres (94,960 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	1.58 Acres (68,962 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.60 Acres (25,997 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	-33 %

Project Name: University Self Storage

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 current existing project site is comprised of a single large commercial building with an adjacent asphalt paved large parking lot with loading ramps and container storage areas. The project site has minimal landscaping.
Existing Land Cover Includes (select all that apply): ☑ Vegetative Cover ☐ Non-Vegetated Pervious Areas ☑ Impervious Areas Description / Additional Information: The project site is mostly comprised of impervious areas with a building and parking lot. some minimal landscaping is found on the periphery edges of the existing site.
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: 1. Whether existing drainage conveyance is natural or urban; 2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site; 3. Provide details regarding existing project site drainage conveyance network, including 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
1. The existing drainage conveyance is urban 2. Some runoff is conveyed through the site. An existing landscaped slope at the southerly edge of the project property line, adjacent to University Avenue, sheet flows into the existing parking lot. This off site run-on is approximately 0.08 acres. 3. The existing project site run-off drains westerly to 51st Street and easterly to 52nd Street. No on site private storm drain system exists and it is understood the project site runoff sheet flows to public storm drain conveyances. The storm water run-off draining westerly sheet flows from the project site and down a natural slope to an existing public curb inlet located at the southerly end of 51st Street. The project site run-off that is directed easterly sheet flows into the existing curb and gutter on 52nd Street and enters an existing curb inlet. The curb inlet connects to an existing 30-inch storm drain that runs through the existing project site and connects with the public curb inlet on 51st Street that was previously mentioned as receiving the runoff from the westerly portion of the project site. The confluence of the project sites runoff is routed through a series of public storm water culverts southerly under University Avenue where it discharges into an existing varying concrete lined and natural earthen drainage channel known as the Home Avenue Channel. The Home Avenue Channel confluences with the earthen Chollas Creek where the eventual project site storm water run-off discharges into the San Diego Bay (Pacific Ocean) at the mouth of Chollas Creek. 4. The existing project site storm water discharge is 8.33 CFS. The project site has two discharge locations that sheet flow beyond the private property towards 51st and 52nd Street.

Project Name: University Self Storage

Form I-3B Page 4 of 11
Description of Proposed Site Development and Drainage Patterns
Project Description / Proposed Land Use and/or Activities: The proposed land use is a self storage facility which will include one multi-story building. The proposed project will include associated landscaping, asphalt paved parking lot, on-site concrete sidewalks, and public improvements. The public improvements will be two City of San Diego standard commercial driveways located on 51st Street and 52nd Street.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): A single multi-story building is proposed and comprises a large portion of the project site. The parking lot will be minimal in size as the intent for the self-storage facility is to not have vehicles parked for long periods of time. Two new public standard driveways are proposed as well on 51st Street and 52nd Street.
List/describe proposed pervious features of the project (e.g., landscape areas): The project site will have landscaping features surrounding the building and on the periphery of the project site. The landscaping will break up impervious areas.
Does the project include grading and changes to site topography? ☑ Yes ☐ No Description / Additional Information: The project proposes the rerouting of an existing 30-inch RCP storm drain that crosses the entirety of the project site. An on-site private storm drain connection is proposed to connect to the relocated 30-inch RCP storm drain. This will result in grading and site topography changes.

Project Name: University Self Storage

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: This project proposes changes to the site drainage to comply with current storm water standards for treatment and flow control requirements. The project also proposes the rerouting of an existing public 30-inch RCP storm drain that conflicts with the proposed building. The on-site storm water will be captured and routed via roof drains, private pre-cast catch basins and an underground network of PVC storm drains. The storm water on-site will be conveyed to a proprietary Biofiltration BMP consisting of an MWS treatment unit that routes the treated storm water to an underground water-tight storage pipe system. Additionally, to comply with treatment and flow control requirements a proposed weir wall and orifice will be sized and constructed downstream of both the proprietary Biofiltration BMP and the underground storage pipe system. The weir wall will mitigate storm events up to the 100-year storm and will be over topped if that occurs. The orifice has been sized to comply with pre-developed site conditions. A Self-Mitigating area has been proposed within the south-easterly portion of the project site and is approximately 0.30 acres. The Self-mitigating area will have area drains that connect to the proposed relocated 30-inch RCP storm drain. The area is hydraulically disconnected from the rest of the site and receives no roof drainage or additional drainage from off-site areas. The proposed project runoff has been calculated to be less than the existing conditions. This is due large in part to the vast increase of pervious areas for the proposed condition. The existing runoff has been calculated to be 8.33 CFS while the proposed runoff has been estimated to be 7.15 CFS.

Project Name: University Self Storage

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 ☐Food service ☐Refuse areas ☐Industrial processes ☐Outdoor storage of equipment or materials ☐Vehicle and equipment cleaning ☐Vehicle/equipment repair and maintenance ☐Fuel dispensing areas ☐Loading docks ☑Fire sprinkler test water ☑Miscellaneous drain or wash water ☑Plazas, sidewalks, and parking lots 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) The project site storm water runoff is routed to the public storm drain system via a 30-inch RCP located at 51st Street which is routed through a series of public storm water culverts southerly under University Avenue where it discharges into an existing varying concrete lined and natural earthen drainage channel known as the Home Avenue Channel less than a mile south of the project site. The Home Avenue Channel confluences with the earthen Chollas Creek where the eventual project site storm water run-off discharges into the San Diego Bay (Pacific Ocean) at the mouth of Chollas Creek.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations Chollas Creek existing beneficial use: REC 2, WARM, WILD
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations Not applicable
Provide distance from project outfall location to impaired or sensitive receiving waters Chollas Creek - ~3 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 Not applicable. The City's Multi Habitat Planning Area and Environmentally Sensitive lands are not within the proximity of the project site.

Project Name: University Self Storage

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)
Chollas Creek	Copper	Dissolved Copper
	Diazinon	Pesticides
	Indicator Bacteria	Bacteria
	Lead	Heavy Metals
	Phosphorus	Nutrients, Oxygen Demanding
	Total Nitrogen as N	Nutrients, Oxygen Demanding
	Trash	Trash & Debris
	zinc	Heavy Metals
San Diego Bay near Chollas Creek	benthic community effects	sediment
San Diego Bay near Chollas Creek	Sediment Toxicity	sediment

Identification of Project Site Pollutants*			
*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated) Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see 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	☐	☑	☑

Project Name: University Self Storage

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. ☐ 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.
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: Per section 6.2 of Appendix H, CCSYA does not appear to exist on the project footprint. Additionally, the project site is contained and does not receive upstream areas draining through the project footprint.

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. The project site proposes one point of compliance (POC#1). The point of compliance will occur downstream of the proprietary Biofiltration MWS unit and the underground storage pipe system. An overflow structure will be constructed with a weir wall and orifice. The weir wall has been sized to retain storm events that do not exceed the 100-year storm event. An orifice has been sized to comply with project site pre-development conditions in order to mitigate impacts to Chollas Creek downstream.
Has a geomorphic assessment been performed for the receiving channel(s)? ☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold) ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ 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)

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. Not applicable
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

Project Name: University Self Storage

Source Control BMP Checklist for PDPs			Form I-4B
Source Control BMPs			
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. Answer each category below pursuant to the following. • "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.			
Source Control Requirement	**Applied?**		
4.2.1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
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: Project site does not propose storing of materials in outdoor areas			
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: Project site does not propose storing of materials in outdoor work areas			
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: Project site does not propose outdoor trash areas. Any trash storage areas will be contained inside the proposed building.			

Form I-4B Page 2 of 2			
Source Control Requirement	**Applied?**		
4.2.6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☑ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☑ Yes	☐ No	☐ N/A
Interior parking garages	☐ Yes	☐ No	☑ N/A
Need for future indoor & structural pest control	☑ Yes	☐ No	☐ N/A
Landscape/Outdoor Pesticide Use	☑ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☑ N/A
Food service	☐ Yes	☐ No	☑ N/A
Refuse areas	☑ Yes	☐ No	☐ N/A
Industrial processes	☐ Yes	☐ No	☑ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☑ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☑ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☑ N/A
Loading Docks	☐ Yes	☐ No	☑ N/A
Fire Sprinkler Test Water	☑ Yes	☐ No	☐ N/A
Miscellaneous Drain or Wash Water	☑ Yes	☐ No	☐ N/A
Plazas, sidewalks, and parking lots	☑ Yes	☐ No	☐ N/A
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 which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Site Design BMP Checklist for PDPs			Form I-5B
Site Design BMPs			
All development projects must implement site design BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist. Answer each category below pursuant to the following. • "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required. • "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided. • "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided. A site map with implemented site design BMPs must be included at the end of this checklist.			
Site Design Requirement	**Applied?**		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.1 not implemented:			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☑ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☑ Yes	☐ No	☐ 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	☐ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☑ No	☐ N/A
Discussion / justification if 4.3.2 not implemented: The project will clear and grub any existing vegetation onsite. The proposed amount of landscaping is significant when compared to existing conditions.			

Project Name: University Self Storage

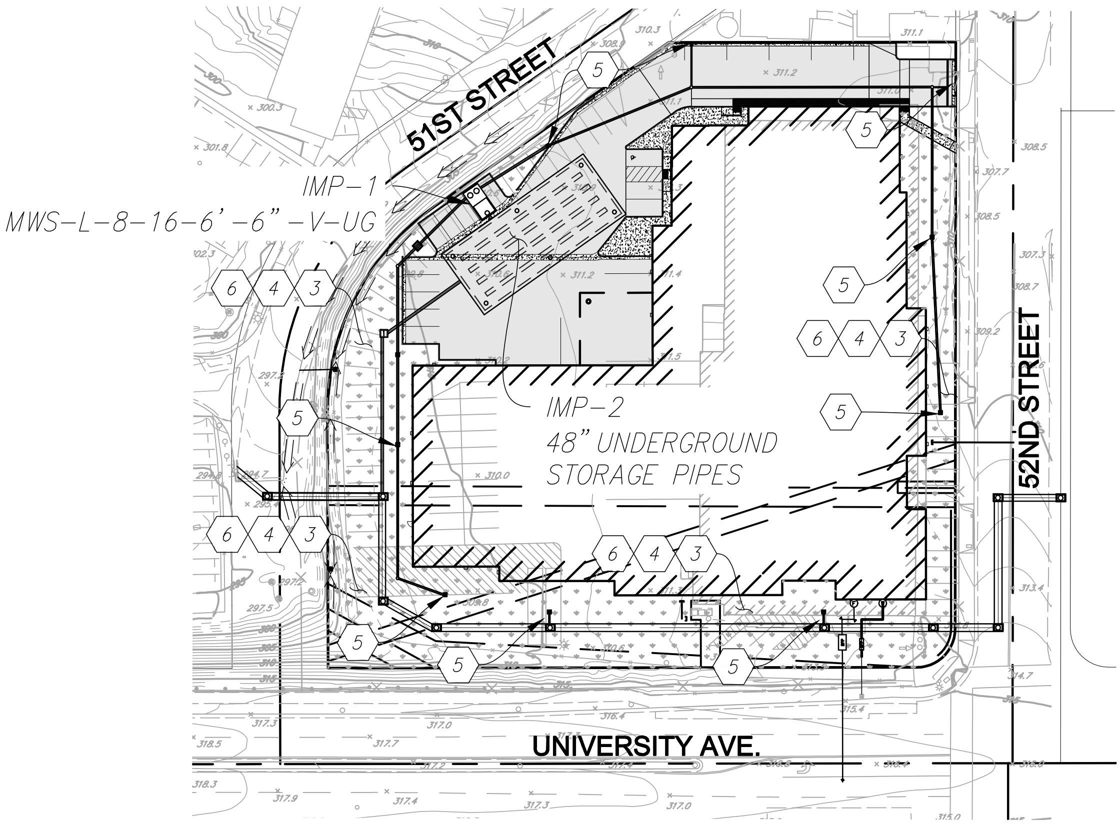
Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented:			
4.3.5 Impervious Area Dispersion	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.5 not implemented: Impervious area dispersion requires a minimum width of 10 feet of pervious area as well as a maximum slope of 5 percent. The proposed footprint could not accomplish the implementation of impervious dispersion.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ 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.)	☐ Yes	☐ 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?	☐ Yes	☐ No	☑ N/A

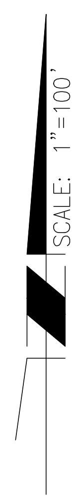
Project Name: University Self Storage

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	☑ 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	☑ 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	☑ 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 E?	☐ Yes	☐ No	☑ 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 was found to be infeasible. See the attached Harvest and Use worksheet.			
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	☑ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Form I-5B Page 4 of 4

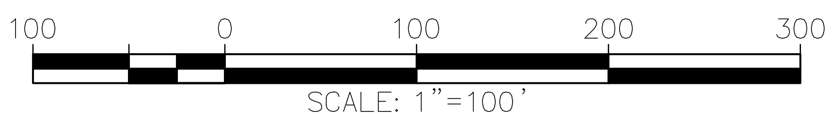
Insert Site Map with all site design BMPs identified:





SITE DESIGN BMPS

1. 4.3.1–2, 4.3.1–3 IMPLEMENT TREE.
2. 4.3.1–4 STREET TREE (VOLUME REDUCTION).
3. 4.3.3 MINIMIZE IMPERVIOUS AREA.
4. 4.3.4 MINIMIZE SOIL COMPACTION WITHIN ALL LANDSCAPE AREAS.
5. 4.3.6 COLLECT RUNOFF.
6. 4.3.7 LANDSCAPE WITH NATIVE OR DROUGHT TOLERANT SPECIES WITHIN ALL LANDSCAPE AREAS (TYPICAL)



Project Name: University Self Storage

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. Per the Nova Services Geotechnical Investigation and subsequent I-8 Form the project has been determined to be a 'No-Infiltration' condition. The investigations resulted in a minimal measurable amount of infiltration. Since 0.01" of infiltration was observed it has been concluded that the project is a no-infiltration condition project. Please reference the I-8 Form and Geotechnical report found herein. Harvest & Use was considered for the project but was found to be infeasible. Please reference the Harvest & Use Form I-7 found in Attachment 1. The project proposes the use of a proprietary Biofiltration BMP consisting of a treatment system and a downstream underground storage solid pipe system. These devices have been sized per the City of San Diego storm water worksheets and comply with treatment and flow sizing requirements. Additionally, downstream of both the treatment and storage systems a concrete box with a weir wall and orifice have been proposed to comply with flow control requirements. The weir wall will retain storm events up to the 100-year and the orifice has been sized to comply with pre-developed project site conditions. (Continue on page 2 as necessary.)	

Project Name: University Self Storage

Form I-6 Page 2 of 4
(Continued from page 1)

Form I-6 Page 1 of 4 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. IMP-1 - MWS-L-8-16-6'-6"-V-UG	
Construction Plan Sheet No. C4.0 &C4.1	
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? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Mellor Landy, RCE 81085, NOVA Eng. 4373 Viewridge Ave., Suite A San Diego, CA 92123 - 619-296-1010
Who will be the final owner of this BMP?	Integritas Partners - Gary Delaney gdelaney@integritaspartners.net
Who will maintain this BMP into perpetuity?	Integritas Partners - Gary Delaney gdelaney@integritaspartners.net
What is the funding mechanism for maintenance?	Private

Project Name: University Self Storage

Form I-6 Page 2 of 4 (Copy as many as needed)
Structural BMP ID No. IMP-1 - MWS-L-8-16-6'-6"-V-UG
Construction Plan Sheet No. C4.0 &C4.1
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page 3 of 4 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. IMP-2 - Water Tight Storage Pipe System	
Construction Plan Sheet No. C4.0 &C4.1	
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? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Mellor Landy, RCE 81085, NOVA Eng. 4373 Viewridge Ave., Suite A San Diego, CA 92123 - 619-296-1010
Who will be the final owner of this BMP?	Integritas Partners - Gary Delaney gdelaney@integritaspartners.net
Who will maintain this BMP into perpetuity?	Integritas Partners - Gary Delaney gdelaney@integritaspartners.net
What is the funding mechanism for maintenance?	Private

Project Name: University Self Storage

Form I-6 Page 4 of 4 (Copy as many as needed)
Structural BMP ID No. IMP-2 - Water Tight Storage Pipe System
Construction Plan Sheet No. C4.0 & C4.1
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: University Self Storage

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)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☑ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs
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 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.	☑ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included

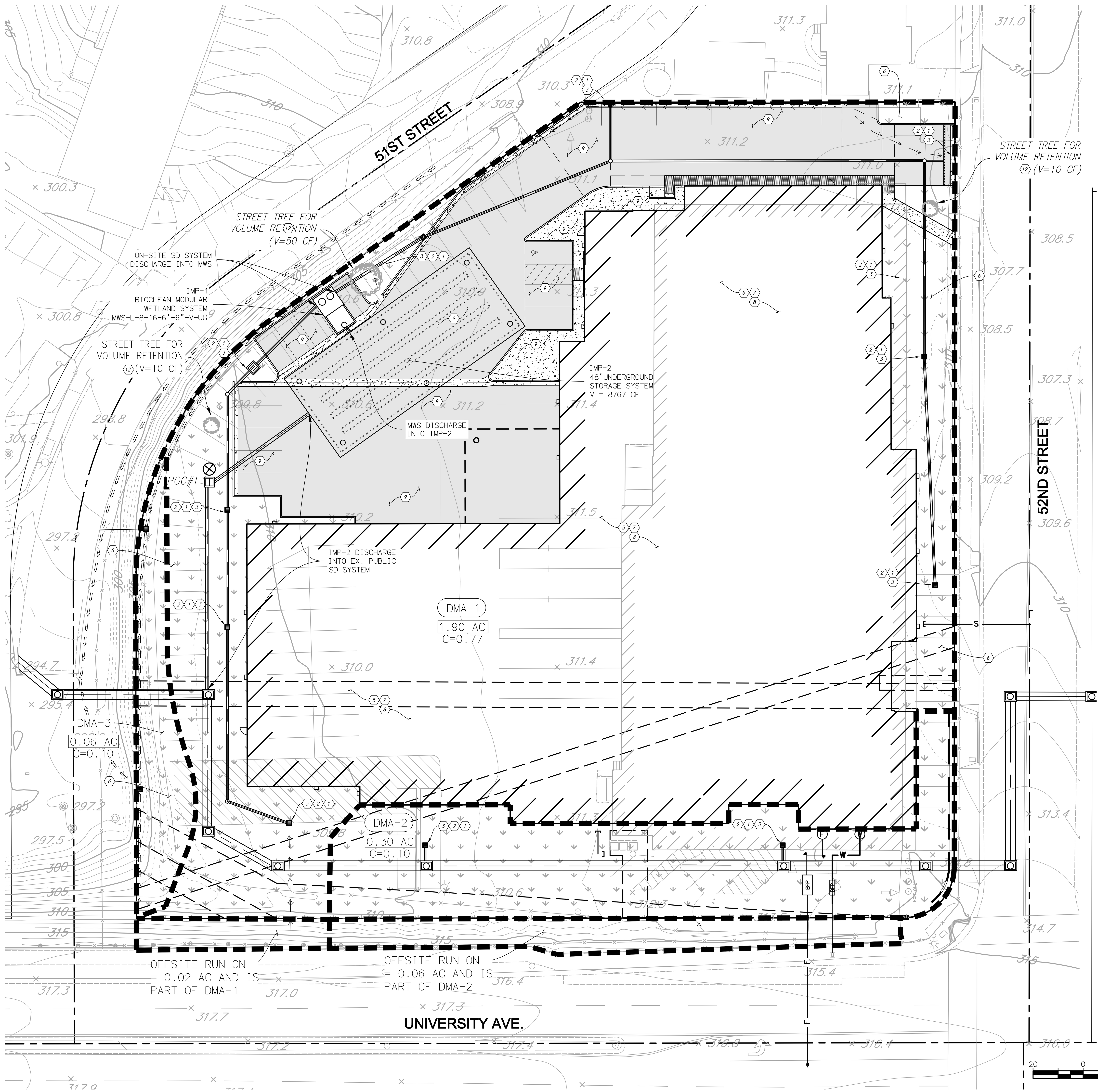
Use this checklist to ensure the required information has been included on the DMA Exhibit:

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



PROJECT INFORMATION:

PROJECT NAME: UNIVERSITY SELF STORAGE
PROJECT ADDRESS: 5150 UNIVERSITY AVENUE, SAN DIEGO, CA 92105
PROJECT SIZE: 2.26 ACRES (0.08 ACRES OFF-SITE RUNON)
PROJECT TYPE: COMMERCIAL REDEVELOPMENT
APN NUMBERS: 472-38-30-400
PROJECT PRIORITY: PRIORITY DEVELOPMENT PROJECT (PDP)
OFFSITE RUN-ON: ANTICIPATED
SUBJECT TO HMP REQUIREMENTS: YES
STREAM SUSCEPTIBILITY: HIGH -> 0.1Q2
AVAILABLE CHANNEL SCREENING REPORT: NO, DEFAULT SELECTED
UNDERLYING HYDROLOGIC SOIL GROUP: SOIL TYPE 'D'
DEPTH TO GROUNDWATER: ~35 FT
EXISTING NATURAL HYDROLOGIC FEATURES: N/A
INFILTRATION CONDITION: 'NO INFILTRATION' CONDITION
PER 'UPDATE GEOTECHNICAL INVESTIGATION - PROPOSED UNIVERSITY SELF STORAGE 5150 UNIVERSITY AVENUE, SAN DIEGO' DATED MAY 20, 2020 BY NOVA SERVICES.
CRITICAL COARSE SEDIMENT YIELD AREAS: N/A

SOURCE CONTROL BMPS

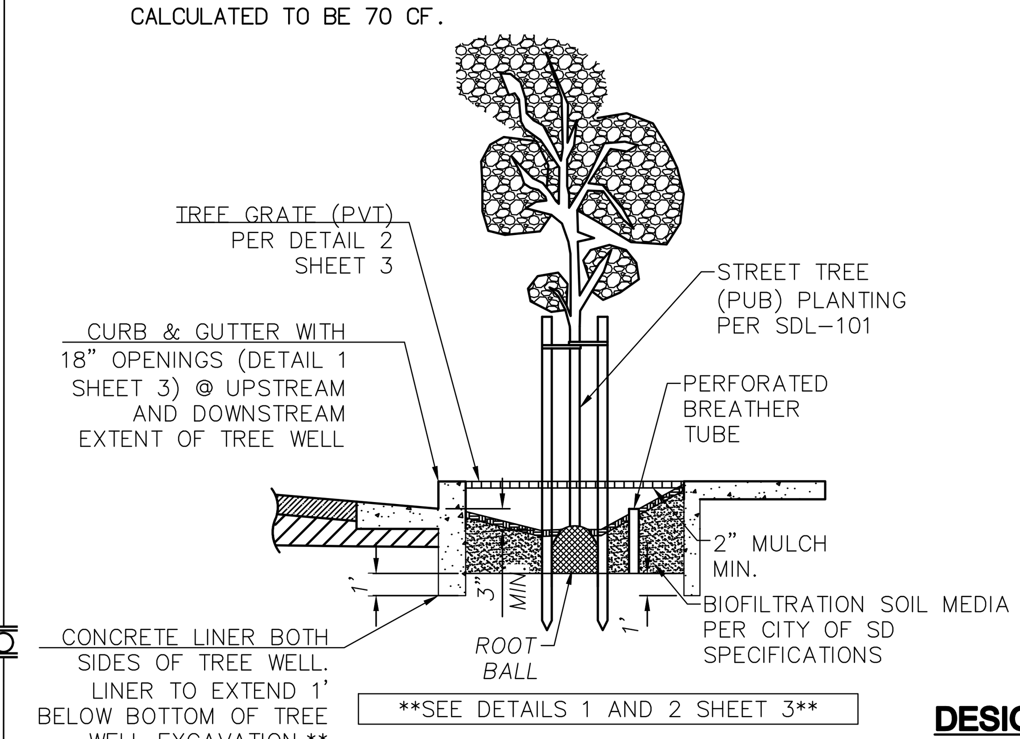
1. 4.2.1 PREVENT ILLICIT DISCHARGE INTO MS4
2. 4.2.2 STORM DRAIN STENCILING OR SIGNAGE

ADDITIONAL SOURCE CONTROL BMPS

3. 4.2.6 ONSITE STORM DRAIN INLETS
4. 4.2.6 INTERIOR FLOOR DRAINS AND ELEVATOR SHAFT PUMPS
5. 4.2.6 FUTURE INDOOR & STRUCTURAL PEST CONTROL
6. 4.2.6 LANDSCAPE/OUTDOOR PESTICIDE USE
7. 4.2.6 FIRE SPRINKLER TEST WATER
8. 4.2.6 MISCELLANEOUS DRAIN OR WASH WATER
9. 4.2.6 PARKING LOT, SIDEWALK

TREE CREDIT VOLUME:

12. THE PROJECT PROPOSES THE IMPLEMENTATION OF THREE STREET TREES. THE TREE CREDIT VOLUME (TCV) WAS CALCULATED TO BE 70 CF.



TYPICAL SECTION: TREE WELLS

NOT TO SCALE

LEGEND

DMA BOUNDARY
DMA DESIGNATOR — DMA-1
DMA AREA — 2.26 AC
RUNOFF COEFFICIENT — C=0.73
DIRECTION OF FLOW
PROPOSED LANDSCAPING
IMP-1 BIOCLEAN MODULAR WETLAND SYSTEM MWS-L-8-16-6'-6"-V-UG
POINT OF COMPLIANCE (POC) FOR FLOW CONTROL & LOW FLOW THRESHOLD (0.1Q2) — POC#1
PROPOSED STREET TREE (VOLUME REDUCTION FOR DMA-1) — TBD
IMP-2 48" UNDERGROUND STORAGE SYSTEM (HYDROMODIFICATION) V=8767 CF
PROP BUILDING
FINISH MINOR CONTOUR — 311
FINISH MAJOR CONTOUR — 310
GRADE BREAK — GB
LIMITS OF GRADING (DAYLIGHT LINE)
PROP CONCRETE PAVING
PROP AC PAVING
PROP TRUNCATED DOMES
PROP CURB
PROP CURB AND GUTTER
PROP RETAINING WALL
PROP EARTHEN SWALE
PROP TYPE A-4 CLEANOUT
PROP CATCH BASIN
PROP STORM DRAIN CLEANOUT
PROP STORM DRAIN
PROP TRENCH DRAIN
PROP WEIR STRUCTURE
EX WATER — W
EX SEWER — S
EX STORM DRAIN — SD
EX GAS — G
EX COMMUNICATION — COMM
EX CABLE/TELEVISION — CATV
EX CONTOUR — 340
EX BUILDING
EX SPOT ELEVATION — (344.7±)
PROPERTY/RIGHT-OF-WAY LINE
CENTER LINE OF STREET
EASEMENT LINE

DESIGN INFILTRATION RATES:

1. THE FOLLOWING DESIGN INFILTRATION RATES HAVE BEEN PROVIDED BY NOVA SERVICES. ALSO REFER TO 'UPDATE GEOTECHNICAL INVESTIGATION - PROPOSED UNIVERSITY SELF STORAGE 5150 UNIVERSITY AVENUE, SAN DIEGO' DATED MAY 20, 2020. (NOVA PROJECT NO. 2020062):

Table 7-1. Infiltration Rates Determined by Percolation Testing

Boring	Approximate Ground Elevation	Depth of Test	Approximate Test Elevation (feet, msl)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour,
P-1	+311	5	+306	0.01	0.01
P-2	+310.5	6	+305.5	0.01	0.01

Notes: (1) 'F' indicates 'Factor of Safety' (2) elevations are approximate and should be reviewed

SUMMARY OF DMAS

DMA ID	SURFACE	AREA [SF]	PERVIOUS [SF]	IMPERVIOUS [SF]	AREA [AC]
DMA 1	AC PVMT, CONC.PVMT, LANDSCAPE, ROOF	82,693	13,730	68,963	1.90
DMA 2	LANDSCAPING (SELF-MITIGATING)	13,364	13,364	0	0.30
DMA 3	LANDSCAPING (SELF-MITIGATING)	2,666	2,666	0	0.06
DMA TOTAL		98,723	29,760	68,963	2.26

DIGALERT
CALL BEFORE YOU DIG
1-800-227-2600
2 WORKING DAY NOTICE REQUIRED

SCALE: 1"=20'

DRAINAGE MANAGEMENT AREA EXHIBIT

NOVA ENGINEERING
4373 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123 (619) 296-1010
EMAIL:MEL@NOVA-ENG.COM

DESIGNER: M.D.D
DRAWN: M.D.D
DATE: 1/28/2021
JOB NO.: 6044

Attachment 1b:

Tabular Summary of DMAs (Worksheet B-1 from Appendix B) and Design Capture Volume Calculations

Project Name: University Self Storage

Tabular Summary of DMAs							Worksheet B-1		
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
DMA #1	1.90	1.58	0.81	D	0.75	2,868	BMP #1	MWS	1
DMA #2	0.30	0.0	0.0	D	0.10	59	N/A	Self-Mitigating	N/A
DMA #3	0.06	0.0	0.0	D	0.10	12	N/A	Self-Mitigating	N/A
Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
3	2.26	1.58	0.70		0.66	2939	2.26		1

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

Attachment 1c:

Form I-7: Worksheet B.3-1 Harvest and Use Feasibility Screening

Harvest and Use Feasibility Checklist	Worksheet B.3-1 : Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☑ Toilet and urinal flushing
☐ Landscape irrigation
☐ Other:___________

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

The anticipated number of employees for both is 5 employees.
The commercial usage is 5 x 7 = 35 gallons (4.7 cf)
36 hour demand (1.5 days) -> 1.5*7.5 = 7.0 cf
0.25DCV = 0.25 x 2,939 = 735 cf

3. Calculate the DCV using worksheet B-2.1.
DCV = 2,939 (cubic feet)
[Provide a summary of calculations here]

The DCV was calculated based on DMA-1 and DMA-2.

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

Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☑ No, select alternate BMPs.

Attachment 1d:

Form I-7: Infiltration Feasibility Information: Form I-8A: Worksheet C.4-1 Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed: DMA- 1		Project Phase:
Location at P-1 and P-2		Design Phase
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☒ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☐ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☐ No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.	

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.	
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.	
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.	
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.	

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

The findings of this geotechnical investigation and infiltration assessment are detailed in "Report Updated Geotechnical Investigation - Proposed University Self Storage 5150 University Avenue, San Diego" dated May 20, 2020

A qualified representative of NOVA Services directed the drilling of two percolation test borings to depths of approximately 5 ft at P-1 to 6 ft at P-2 below ground surface (bgs) with a continuously sampled exploratory boring to accompany each test to 31.5 ft bgs.

The tests were conducted in compliance with the Borehole Percolation Tests method (D.3.3.2) of the BMP Manual. The percolation rates were converted to infiltration rates by the Porchet Method. Percolation testing indicated infiltration rates of 0.01-inches per hour, utilizing a factor of safety of F=2.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 1 Result – Full Infiltration Geotechnical Screening[12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☒ Complete Part 2

[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed: DMA-1	Project Phase:
	Design Phase
Criteria 3 : Infiltration Rate Screening	
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☒ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☒ No: Skip to Part 2 Result.
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Percolation test methods and infiltration results are detailed in a geotechnical investigation report (NOVA 2020). Percolation testing indicated infiltration rates of 0.01-inches per hour, utilizing a factor of safety of F=2. Full and partial BMPs are not required on sites with infiltration rates less than 0.05 inches per hour. Per "Report Updated Geotechnical Investigation - Proposed University Self Storage 5150 University Avenue, San Diego" dated May 20, 2020	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits. See geotechnical investigation NOVA 2020. Per "Report Updated Geotechnical Investigation - Proposed University Self Storage 5150 University Avenue, San Diego" dated May 20, 2020			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Attachment 1e:

Pollutant Control BMP Design Worksheets/ Calculations

Worksheet B.2-1: DCV

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.54	inches
2	Area tributary to BMP (s)	A=	1.90	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.77	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	70	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	2,865	cubic-feet

DMA-1

Treatment				
	Total DMA AREA (AC)	PERVIOUS AREA (AC)	IMPERVIOUS AREA (AC)	C
DMA#1	1.90	0.32	1.58	0.77

Weighted runoff factor (C) calculations:

$$\frac{(0.1 \text{ x Pervious Area} + 0.9 \text{ x Impervious Area})}{\text{Total Treatment Area}} = \text{Weighted Runoff Factor}$$

$$\frac{(0.1 \text{ x } 13{,}730 \text{ SF} + 0.9 \text{ x } 68{,}963 \text{ SF})}{82{,}693 \text{ SF}} = 0.77$$

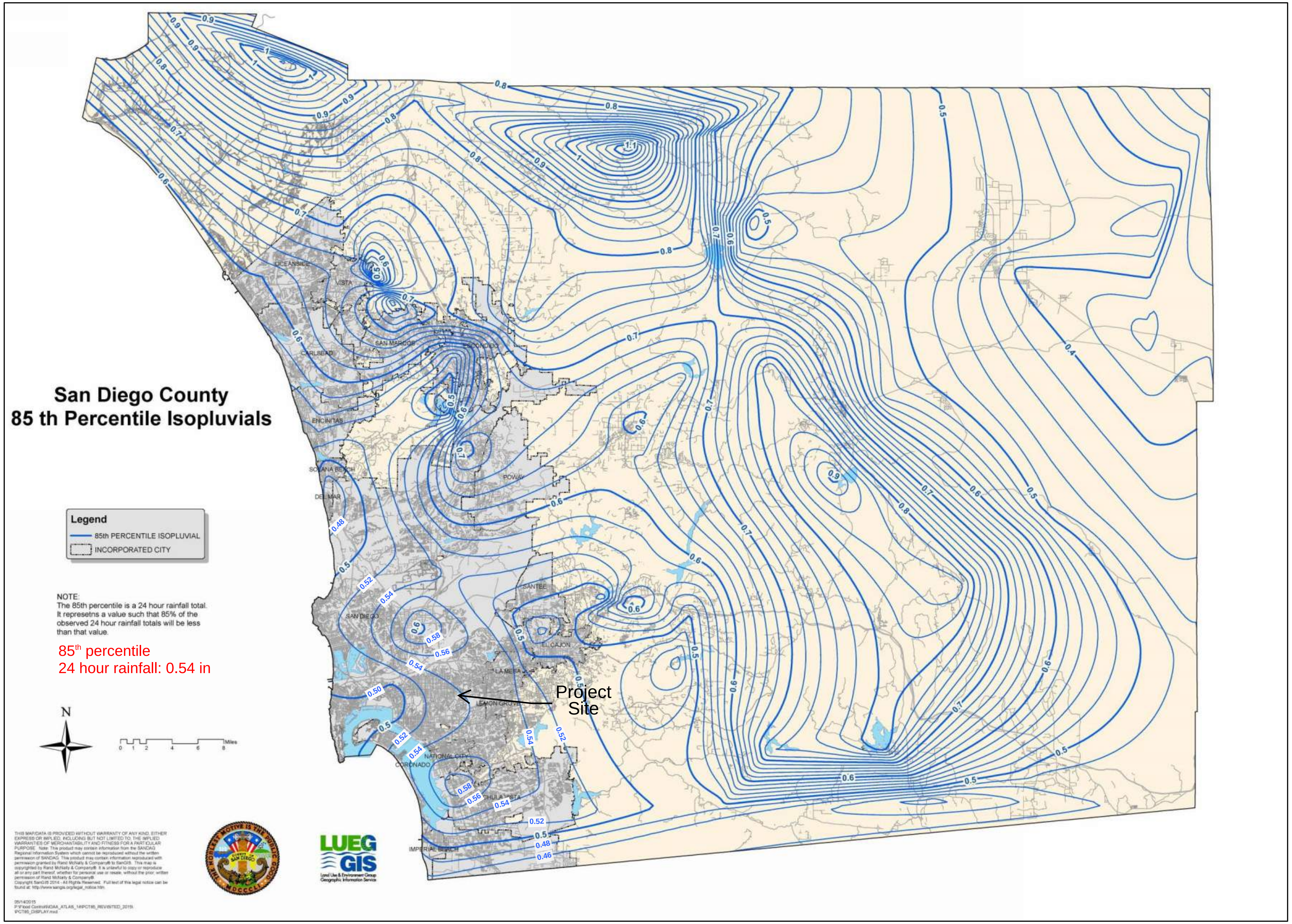


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

*Three (3) Trees will be implemented into the design.

Total Tree Credit Volume:
1 x 50 + 2 x 10 = 70 cf

Table B.2-2: Allowable Reduction in DCV

Tree Credit Volume (ft^3/tree)[1]	Contributing Area (ft^2)	Soil Volume (ft^3)
10	267	33
50	1,333	167
100	2,667	333
150	4,000	500
200	5,333	667
300	8,000	1,000
400	10,667	1,333

Note: [1]If an underdrain is installed only 1/3rd of the tree credit volume shown in Table B.2-2 is allowed.

Applicant can also estimate the tree credit volume using Equation B.2-1.

Equation B.2-1: Tree Credit Volume

$$\boldsymbol{TCV = Minimum(SV \times 0.3,\ 3{,}630 \times d \times C \times A)}$$ **;** With no underdrains installed

$$\boldsymbol{TCV = Minimum(SV \times 0.1,\ 3{,}630 \times d \times C \times A)}$$ **;** When an underdrain is installed

where:

TCV	=	Tree credit volume (ft^3); maximum of 400 ft^3 for one tree and not more than 0.25*DCV from the project footprint for all trees proposed as site design BMPs
SV	=	Soil volume installed with the tree (ft^3)
d	=	85th percentile 24-hr storm depth (inches) from Figure B.1-1
C	=	Area weighted runoff factor (calculate using Appendix B.1.1 and B.2.1)
A	=	Area tributary to the tree (acres)

B.2.2.2 Rain Barrels

Rain barrels are containers that can capture rooftop runoff and store it for future use. Credit can be taken for the full rain barrel volume when each barrel volume is smaller than 100 gallons, implemented per SD-E fact sheet and meet the following criteria:

- Total rain barrel volume is less than 0.25 DCV **and**
- Landscape areas are greater than 30 percent of the project footprint.

Credit for harvest and use systems that do not meet the above criteria must be based on the criteria in **Appendix B.3** and HU-1 fact sheet in **Appendix E**.

The City of SAN DIEGO	Project Name	UNIVERSITY SELF STORAGE	
	BMP ID	IMP 1 / DMA-1	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	

1	Area draining to the BMP	82693.3	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.77	
3	85th percentile 24-hour rainfall depth	0.54	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2865	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA 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	0.01	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0.005	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 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	66	cu. ft.

The City of SAN DIEGO

	Project Name	UNIVERSITY SELF STORAGE	
	BMP ID	IMP 1 / DMA-1	

Volume Retention for No Infiltration Condition — **Worksheet B.5-6**

1	Area draining to the biofiltration BMP					82693.3	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)					0.77	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]					63674	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]					1910	sq. ft.
5	Biofiltration BMP Footprint					159	sq. ft.
Landscape Area (must be identified on DS-3247)							
	Identification	**1**	**2**	**3**	**4**	**5**	
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)						
7	Impervious area draining to the landscape area (sq. ft.)						
8	Impervious to Pervious Area ratio [Line 7/Line 6]	0.00	0.00	0.00	0.00	0.00	
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]	0	0	0	0	0	
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]					0	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]					159	sq. ft.
Volume Retention Performance Standard							
12	Is Line 11 ≥ Line 4?	No, Proceed to Line 13					
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]					0.08	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]					66	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]					60.6302314	cu. ft.
Site Design BMP							
	Identification	**Site Design Type**				**Credit**	
16	1	Implementation of 3 Trees (50 Ft3/Tree +10 Ft3/tree + 10Ft3/tree)				70	cu. ft.
	2	Volume reduction per table B.2-2					cu. ft.
	3						cu. ft.
	4						cu. ft.
	5						cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.					70	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met					

SIZING OF PROPRIETARY BIOFILTRATION BMP (MWS)

Sizing of Flow-Based Biofiltration BMP per F.2.2 City of City of San Diego Storm Water Standards Modular Wetland Systems (MWS)																	
DMA Name	**IMP Name**	**Total DMA Area [sf]**	**DMA Area [acre]**	**Pervious Area [sf]**	**Pervious [acre]**	**Impervious Area [sf]**	**Impervious [acre]**	**Post Project Surface Type**	**Area [sf]**	**DMA Runoff Factor**	**Intensity [in/h]**	**Treatment Flow Rate (Q_{Treat}=Cx0.2xA) [cfs]**	**1.5xTreatment Flow Rate [cfs]**	**Model Modular Wetland Unit**	**MWS Treatment Flow Rate [cfs]**	**MWS Treatment Flow Rate > Required 1.5xTreatment Flow Rate?**	**Above or Below Grade**
DMA-1	IMP #1	82,693	1.90	13,731	0.32	68,963	1.58	Mixed	82,693	0.77	0.20	0.291	0.437	MWS-L-8-16-6"-6"-V-UG	0.462	YES	Below
	TOTAL	**82,693**	**1.90**	**13,731**		**68,963**											

Worksheet B.6-1: Flow-Thru Design Flows

Flow-thru Design Flows		Worksheet B.6-1 DMA-1		
1	DCV	DCV	2,868	cubic-feet
2	DCV retained	$DCV_{retained}$		cubic-feet
3	DCV biofiltered	$DCV_{biofiltered}$		cubic-feet
4	DCV requiring flow-thru (Line 1 – Line 2 – 0.67*Line 3)	$DCV_{flow-thru}$	2,868	cubic-feet
5	Adjustment factor (Line 4 / Line 1)	AF=	1.00	unitless
6	Design rainfall intensity	i=	0.20	in/hr.
7	Area tributary to BMP (s)	A=	1.90	acres
8	Area-weighted runoff factor (estimate using Appendix B.2)	C=	0.77	unitless
9	Calculate Flow Rate = AF x (C x i x A)	Q=	0.292	cfs

1. Adjustment factor shall be estimated considering only retention and biofiltration BMPs located upstream of flow-thru BMPs. That is, if the flow-thru BMP is upstream of the project's retention and biofiltration BMPs then the flow-thru BMP shall be sized using an adjustment factor of 1.
2. Volume based (e.g., dry extended detention basin) flow-thru treatment control BMPs shall be sized to the volume in Line 4 and flow based (e.g., vegetated swales) shall be sized to flow rate in Line 9. Sand filter and media filter can be designed either by volume in Line 4 or flow rate in Line 9.
3. Proprietary BMPs, if used, shall provide certified treatment capacity equal to or greater than the calculated flow rate in Line 9; certified treatment capacity per unit shall be consistent with third party certifications.
4. The Treatment Rate of the proposed MWS-L-8-16-6'-6"-V-UG (IMP'1') is 0.462 cfs > 0.292
5. The Treatment Rate of the proposed MWS-L-8-16-6'-6"-V-UG (IMP'1') is 0.462 cfs > 0.439.
0.292 x 1.5 (safety factor) = 0.439

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	○ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	○ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	⦿ No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

Nova Engineering's Response:
B.5- 2 and B.5- 6 are included in Attachment 1e.

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Meets Flow based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	○ Meets Volume based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	○ Does not Meet either criteria	**Stop**. Compact biofiltration BMP is not allowed.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

Nova Engineering's Response:
The proposed MWS unit has been sized accordingly per Appendix F.2 of the Storm Water Standards. Third-party testing information and MWS calculations are included in this Attachment.

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	○ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

Nova Engineering's response:
The MWS Linear has been tested under the Washington State TAPE protocol which is full scale field testing and has received General Use Level Designation under that protocol. Table F.1-1 requires a biofiltration BMP to have Basic Treatment, Phosphorus Treatment, and Enhanced Treatment under this protocol. The MWS Linear has GULD approval for all three and therefore meets this minimum requirement 4. Per Table B.6-1 below the project best fits into the 'commercial development' category. The most significant pollutants of concern for this project are: sediments, nutrients, heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil & grease, and pesticides. Tape approval certification can be found in this Attachment 1e.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
<u>Criteria 5</u>: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 5:

Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.

Nova Engineering's response:
See response after Form I-10.

Criteria	**Answer**	**Progression**
<u>Criteria 6</u>: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	◉ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 6:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).

Nova Engineering's Response:
The MWS Linear is a self-contained system with a pre-treatment chamber. Unlike other biofiltration BMPs erosion, scour, and channeling within the BMP is not an issue. The system pre-treatment chamber prevents any erosion or scour. The system downstream orifice control prevents channeling of the media.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	◉ Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	○ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

Nova Engineering response:
Biofiltration BMP must include operations and maintenance design features and planning considerations to provide for continued effectiveness of pollutant and flow control functions.
The MWS Linear provides activation along with the first year of maintenance and inspection free on all installation in the County of San Diego. Unlike other biofiltration BMPs the City and Co-permitees can be assured the system is being properly installed and maintained. The first year of inspections is used to gauge the amount of loading in the system and this information is used to set appropriate maintenance interval for subsequent years. A copy of the maintenance manual for the MWS Linear is included in Attachment 3.

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	◉ Yes ○ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

Provide basis for Criteria 5

Nova Engineering's response:

The MWS Linear an advanced vegetated biofiltration promotes biological processes found in both upland bioretention systems and wetlands. The system utilizes an advanced horizontal flow design to ensure maximum contact with the vegetation root mass. Bacterial growth, supported by the root system in the wetland chamber, performs a number of treatment processes. These vary as a function of moisture, temperature, pH, salinity, and pollutant concentrations. Biologically available forms of nitrogen, phosphorus, and carbon are actively taken into the cells of vegetation and bacteria, and used for metabolic processes (i.e., energy production and growth). Nitrogen and phosphorus are actively taken up as nutrients that are vital for a number of cell functions, growth, and energy production. These processes remove metabolites from the media during and between storm events, making the media available to capture more nutrients from subsequent storms.

Soil organisms in the wetland chamber can break down a wide array of organic compounds into less toxic forms or completely break them down into carbon dioxide and water (Means and Hinchee 1994).

Bacteria can also cause metals to precipitate out as salts, bind them within organic material, and accumulate metals in nodules within the cells. Finally, plant growth may metabolize many pollutants, sequester them or rendering them less toxic (Reeves and Baker 2000).

July 2017

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.
3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment
   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

- Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

- Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
- Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
- Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
  - Standing water remains in the vault between rain events, or
  - Bypass occurs during storms smaller than the design storm.
  - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
  - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant: Modular Wetland Systems, Inc.
Applicant's Address: *PO. Box 869*
Oceanside, CA 92054

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

<u>Laboratory Testing</u>

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:

Applicant: Zach Kent
BioClean A Forterra Company.
398 Vi9a El Centro
Oceanside, CA 92058
zach.kent@forterrabp.com

Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Revision History

Date	**Revision**
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)

TAPE PERFORMANCE SUMMARY

MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.

TAPE PERFORMANCE

Modular Wetland System Linear 2.0 (MWS-L 2.0) completed its TAPE field testing in the spring of 2013. The Washington DOE has approved the system under the TAPE protocol. The MWS-Linear has met the performance benchmarks for the three major pollutant categories as defined by TAPE: Basic Treatment (TSS), Phosphorus and Enhanced (dissolved zinc and copper). It is the first system tested under the protocol to meet the benchmarks for all three categories.

Pollutant	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Total Suspended Solids	75.0	15.7	85%	Summary of all data meeting TAPE parameters pertaining to this pollutant. Mean of 8 microns.
Total Phosphorus	0.227	0.074	64%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Ortho Phosphorus	0.093	0.031	67%	Summary of all data meeting TAPE parameters for total phosphorus.
Nitrogen	1.40	0.77	45%	Utilizing the Kjeldahl method (Total Kjeldahl nitrogen). Summary of all data during testing.
Dissolved Zinc	0.062	0.024	66%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Dissolved Copper	0.0086	0.0059	38%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Total Zinc	0.120	0.038	69%	Summary of all data during testing.
Total Copper	0.017	0.009	50%	Summary of all data during testing.
Motor Oil	24.157	1.133	95%	Summary of all data during testing.

NOTES:
1. The MWS-Linear was proven effective at infiltration rates of up to 121 in/hr.
2. A minimum of 10 aliquots were collected for each event.
3. Sampling was targeted to capture at least 75 percent of the hydrograph.

Modular Wetland System, Inc.
2972 San Luis Rey Rd
Oceanside, CA 92058

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P 760-433-7640
F 760-433-3179

PERFORMANCE SUMMARY

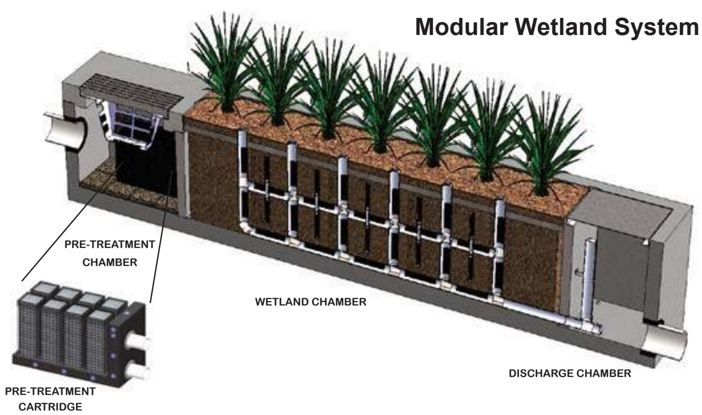
MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.



Modular Wetland System Linear 2.0 (MWS-L 2.0) has been independently tested in laboratory and field conditions since 2008.

Oceanside Test Site

Portland Test Site

HEAVY METALS: Copper / Zinc

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.76 / .95	.06 / .19	92% / 80%	Majority Dissolved Fraction
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.04 / .24	< .02 / < .05	>50% / >79%	Effluent Concentrations Below Detectable Limits
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.058 / .425	.032 / .061	44% / 86%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	.017/ .120	.009 / .038	50% / 69%	Total Metals

TOTAL SUSPENDED SOLIDS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	270	3	99%	Sil-co-sil 106 - 20 micron mean particle size
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	45.67	8.24	82%	Mean Particle Size by Count < 8 Microns
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	676	39	94%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	75.0	15.7	85%	Means particle size of 8 microns

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PERFORMANCE SUMMARY
MWS-LINEAR 2.0

PHOSPHORUS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
TAPE Field Testing / Portland, OR 2011/2012	Field	.227	.074	64%	TOTAL P
TAPE Field Testing / Portland, OR 2011/2012	Field	.093	.031	67%	ORTHO P

NITROGEN:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.85	.21	75%	NITRATE
TAPE Field Testing / Portland, OR 2011/2012	Field	1.40	0.77	45%	TKN

HYDROCARBONS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	10	1.625	84%	Oils & Grease
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.83	0	100%	TPH Motor Oil
TAPE Field Testing / Portland, OR 2011/2012	Field	24.157	1.133	95%	Motor Oil

BACTERIA:

Description	Type	Avg. Influent (MPN)	Avg. Effluent (MPN)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	1600 / 1600	535 / 637	67% / 60%	Fecal / E. Coli
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	31666 / 6280	8667 / 1058	73% / 83%	Fecal / E. Coli

TURBIDITY:

Description	Type	Avg. Influent (NTU)	Avg. Effluent (NTU)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	21	1.575	93%	Field Measurement
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	21	6	71%	Field Measurement

LEAD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.54	.10	82%	Total
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.01 / .043	.004 / .014	60% / 68%	Both Test Units
TAPE Field Testing / Portland, OR 2011/2012	Field	.011	.003	70%	Total

COD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	516 / 1450	90 / 356	83% / 75%	Both Test Units

All removal efficiencies and concentrations rounded up for easy viewing. Please call us for more information, including full copies of the reports reference above.

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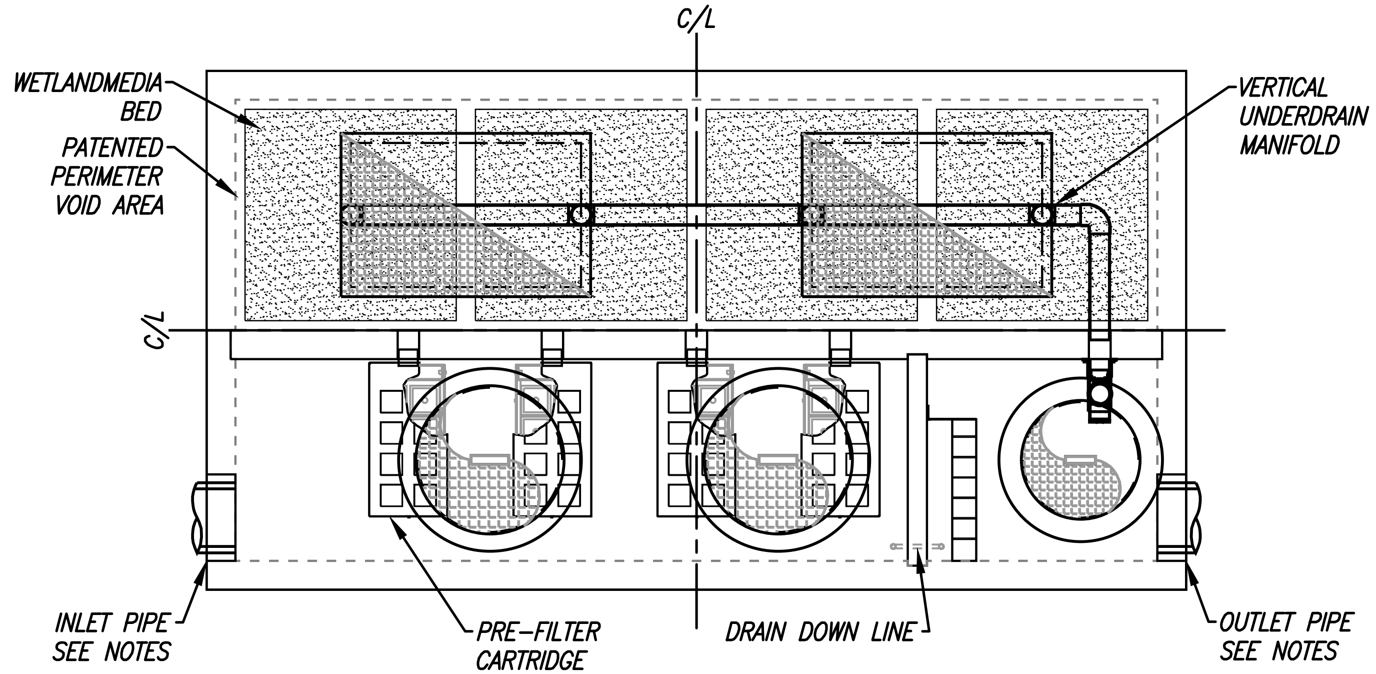
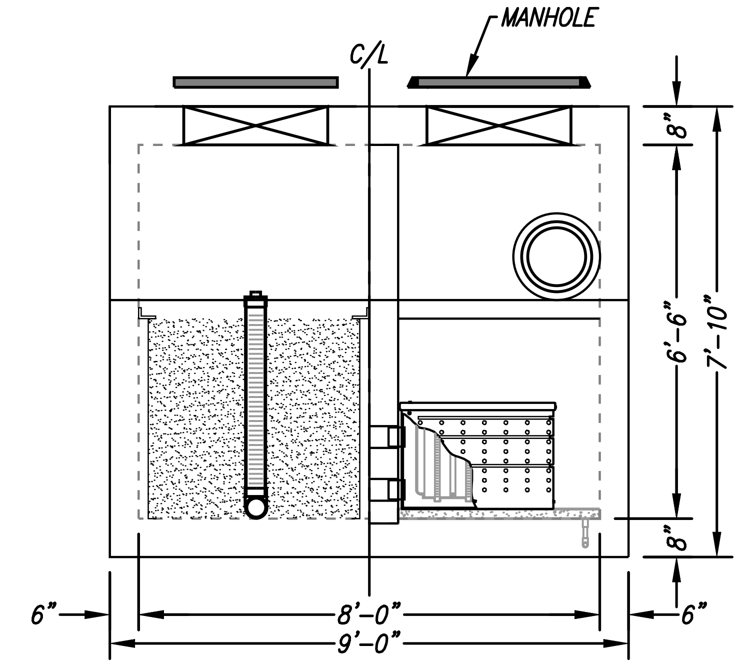
SITE SPECIFIC DATA

PROJECT NUMBER		10978	
PROJECT NAME		UNIVERSITY SELF STORAGE	
PROJECT LOCATION		SAN DIEGO, CA	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
		0.448	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			9.65
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	305.03	PVC	12"
OUTLET PIPE	300.90	PVC	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	308.64	308.64	308.64
SURFACE LOAD	LOAD LEVEL 5 PER ASTM C1802		
FRAME & COVER	2EA ø30"	2EA 30" X 48"	ø24"
WETLANDMEDIA VOLUME (CY)			6.92
ORIFICE SIZE (DIA. INCHES)			5 EA ø1.67"

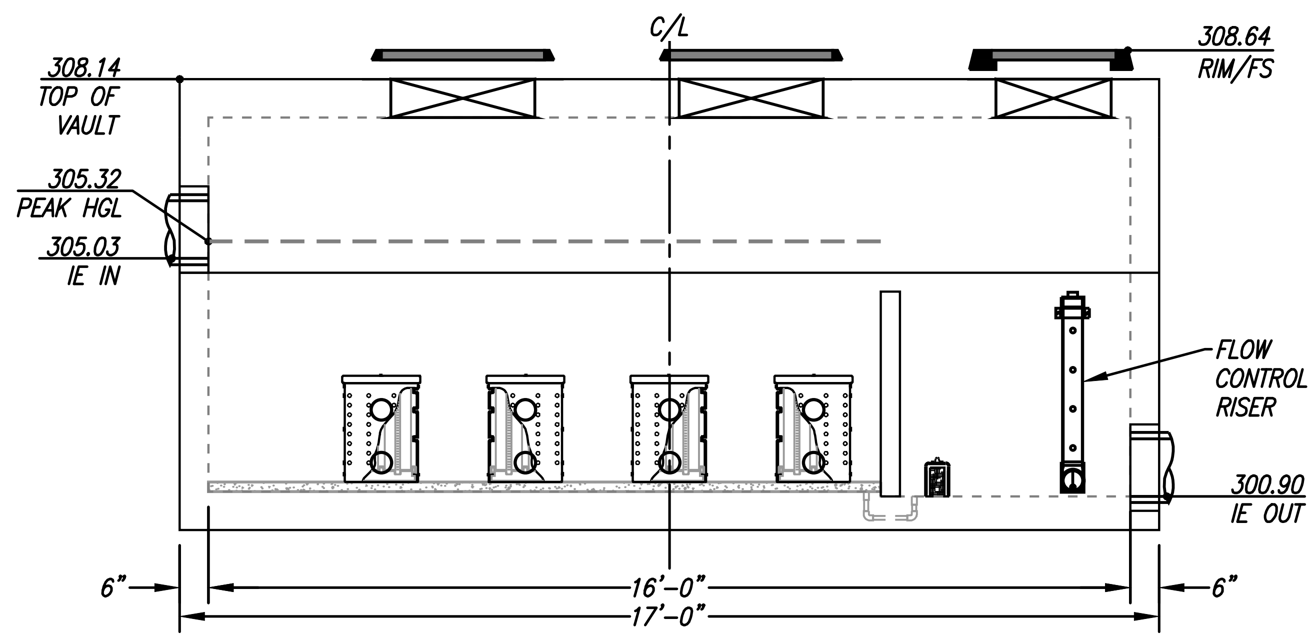
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.



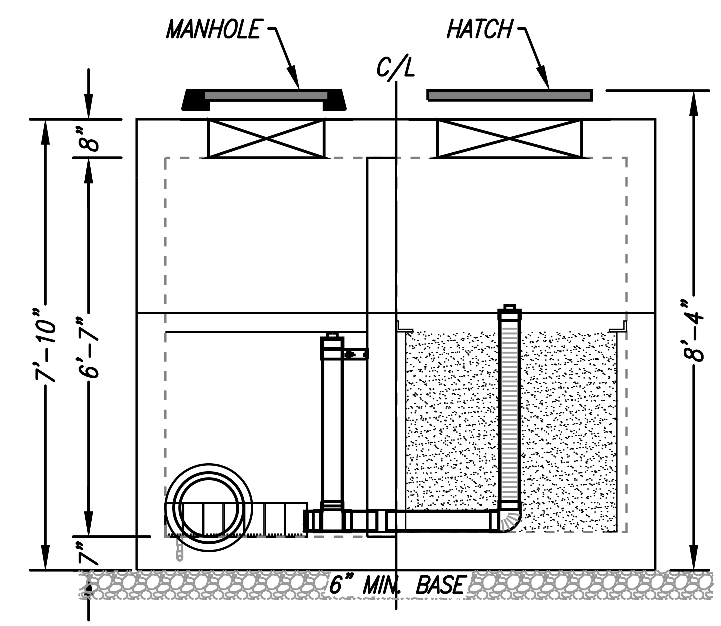
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

INTERNAL BYPASS DISCLOSURE:

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

TREATMENT FLOW (CFS)	0.462
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-8-16-6'-6"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/6/20 JCHIANG

SELF-MITIGATING AREA

Self-Mitigating Landscape Areas*					
DMA NAME	**IMP Name**	**Basin Area [sf]**	**Basin Area [acre]**	**Basin Percent Pervious [%]**	**Minimum Percent Pervious [%]**
DMA-2	N/A	13,364	0.30	100	95
DMA-3	N/A	2,666	0.06	100	95

*Self-Mitigating areas are natural, landscaped, or turf area that do not generate significant pollutants and drain directly offsite or to the public storm drain system without being treated by a structural BMP.

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Attachment 2
Backup for PDP Hydromodification Control Measures

This is the cover sheet for Attachment 2.

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

Project Name: University Self Storage

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 stand-alone 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

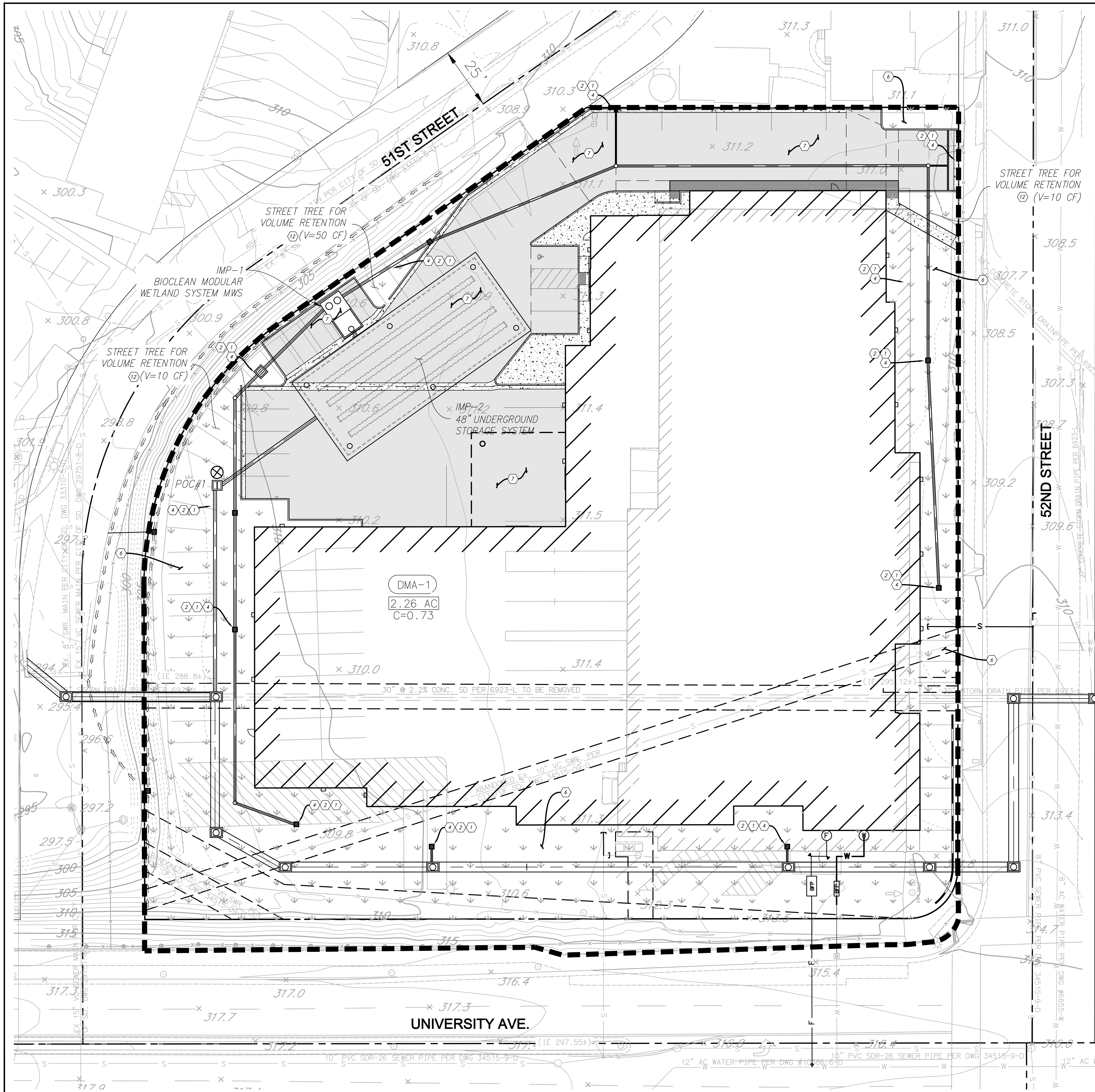
Attachment 2a:

Hydromodification Exhibit

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

The Hydromodification Management Exhibit must identify:

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



PROJECT INFORMATION:

PROJECT NAME: UNIVERSITY SELF STORAGE
PROJECT ADDRESS: 5150 UNIVERSITY AVENUE, SAN DIEGO, CA 92105
PROJECT SIZE: 2.26 ACRES (0.08 ACRES OF OFFSITE RUN-ON)
PROJECT TYPE: COMMERCIAL REDEVELOPMENT
APN NUMBERS: 472-38-30-400
PROJECT PRIORITY: PRIORITY DEVELOPMENT PROJECT (PDP)
OFFSITE RUN-ON: ANTICIPATED
SUBJECT TO HMP REQUIREMENTS: YES
STREAM SUSCEPTIBILITY: HIGH -> 0.1Q2
AVAILABLE CHANNEL SCREENING REPORT: NO, DEFAULT SELECTED
UNDERLYING HYDROLOGIC SOIL GROUP: SOIL TYPE 'D'
DEPTH TO GROUNDWATER: ~26 FT
EXISTING NATURAL HYDROLOGIC FEATURES: N/A
INFILTRATION CONDITION: 'NO INFILTRATION' CONDITION
PER 'UPDATE GEOTECHNICAL INVESTIGATION - PROPOSED UNIVERSITY SELF STORAGE 5150 UNIVERSITY AVENUE, SAN DIEGO' DATED MAY 20, 2020 BY NOVA SERVICES.
CRITICAL COARSE SEDIMENT YIELD AREAS: N/A

SOURCE CONTROL BMPS

(1) 4.2.1 PREVENT ILLICIT DISCHARGE INTO MS4
(2) 4.2.2 STORM DRAIN STENCILING OR SIGNAGE
(3) 4.2.6 ADDITIONAL SOURCE CONTROL BMPS
ONSITE STORM DRAIN INLETS
INTERIOR FLOOR DRAINS AND ELEVATOR SHAFT PUMPS
LANDSCAPE/OUTDOOR PESTICIDE USE
FIRE SPRINKLER TEST WATER
PARKING LOT, SIDEWALK
(8) SC-34 WASTE HANDLING & DISPOSAL
(9) SC-42 BUILDING & GROUNDS MAINTENANCE
(10) SC-43 PARKING AREA MAINTENANCE
(11) SC-44 DRAINAGE SYSTEM MAINTENANCE

TREE CREDIT VOLUME:

(12) THE PROJECT PROPOSES THE IMPLEMENTATION OF ONE STREET TREE. THE TREE CREDIT VOLUME (TCV) WAS CALCULATED TO BE 50 CF. THE MINIMUM SOIL VOLUME IS 167 CF. (9.0FT X 8.0FT X 2.4FT) (L X W X D). PERORATED PIPES SHALL BE INSTALLED. REFER TO DETAIL SHEET FOR ADDITIONAL INFORMATION.

LEGEND

DMA BOUNDARY
DMA DESIGNATOR — DMA-1
DMA AREA — 2.26 AC
RUNOFF COEFFICIENT — C=0.73
DIRECTION OF FLOW
PROPOSED LANDSCAPING
MODULAR WETLAND SYSTEM MWS-L-8-16-6'-6"-V-UG
POINT OF COMPLIANCE (POC) FOR FLOW CONTROL & LOW FLOW THRESHOLD (0.1Q2) — POC#1
PROPOSED BUILDING
PROPOSED STORM DRAIN
EX STORM DRAIN
PROPERTY/ROW LINE
PROPOSED STREET TREE (VOLUME REDUCTION FOR DMA-1) — TBD
IMP-2 48" UNDERGROUND STORAGE SYSTEM (HYDROMODIFICATION)

DESIGN INFILTRATION RATES:

1. THE FOLLOWING DESIGN INFILTRATION RATES HAVE BEEN PROVIDED BY NOVA SERVICES. ALSO REFER TO 'UPDATE GEOTECHNICAL INVESTIGATION - PROPOSED UNIVERSITY SELF STORAGE 5150 UNIVERSITY AVENUE, SAN DIEGO' DATED MAY 20, 2020. (NOVA PROJECT NO. 2020062):

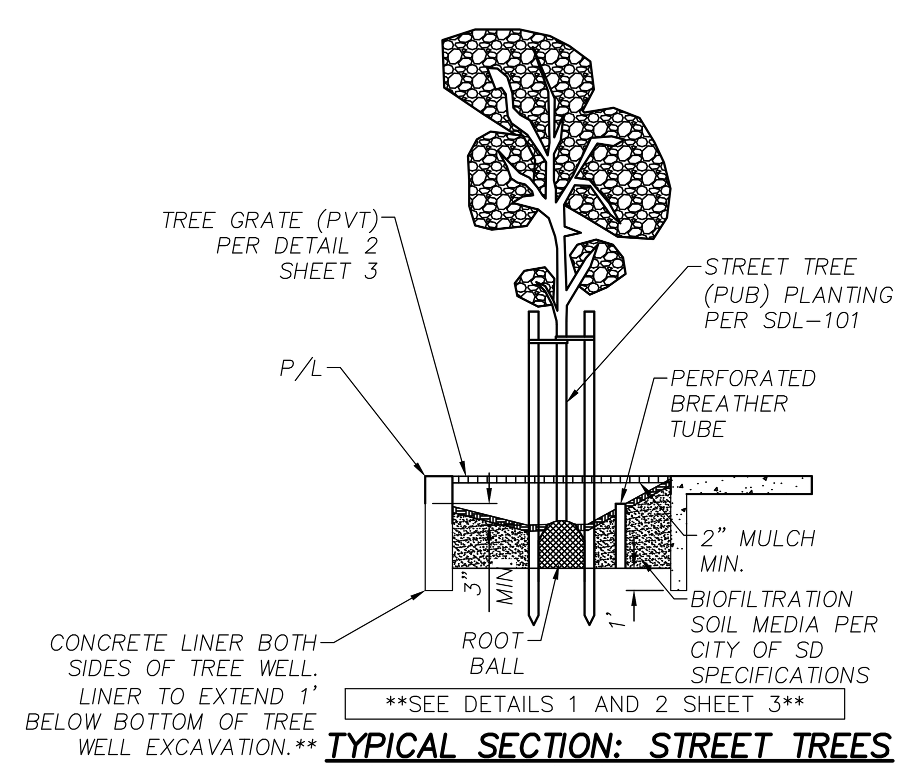
Table 7-1. Infiltration Rates Determined by Percolation Testing

Boring	Approximate Ground Elevation	Depth of Test	Approximate Test Elevation (feet, msl)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour,
P-1	+311	5	+306	0.01	0.01
P-2	+310.5	6	+305.5	0.01	0.01

Notes: (1) 'F' indicates 'Factor of Safety' (2) elevations are approximate and should be reviewed

SUMMARY OF DMAS

DMA ID	SURFACE	AREA [SF]	PERVIOUS [SF]	IMPERVIOUS [SF]	AREA [AC]
DMA 1	AC PVMT, CONC.PVMT, LANDSCAPE, ROOF	98,723	29,761	68,963	2.26



TYPICAL SECTION: STREET TREES
SCALE: NOT TO SCALE

SCALE: 1"=20'

DIGALERT
CALL BEFORE YOU DIG
1-800-227-2600
2 WORKING DAY NOTICE REQUIRED

HYDROMODIFICATION MANAGEMENT EXHIBIT

NOVA ENGINEERING
4373 VIEWRIDGE AVE, SUITE A
SAN DIEGO, CA 92123 (619) 296-1010
EMAIL: MEL@NOVA-ENG.COM

DESIGNER: M.D.D
DRAWN: M.D.D
DATE: 10/14/2022
JOB NO.: 6044

Attachment 2b:

Management of Critical Coarse Sediment Yield Areas

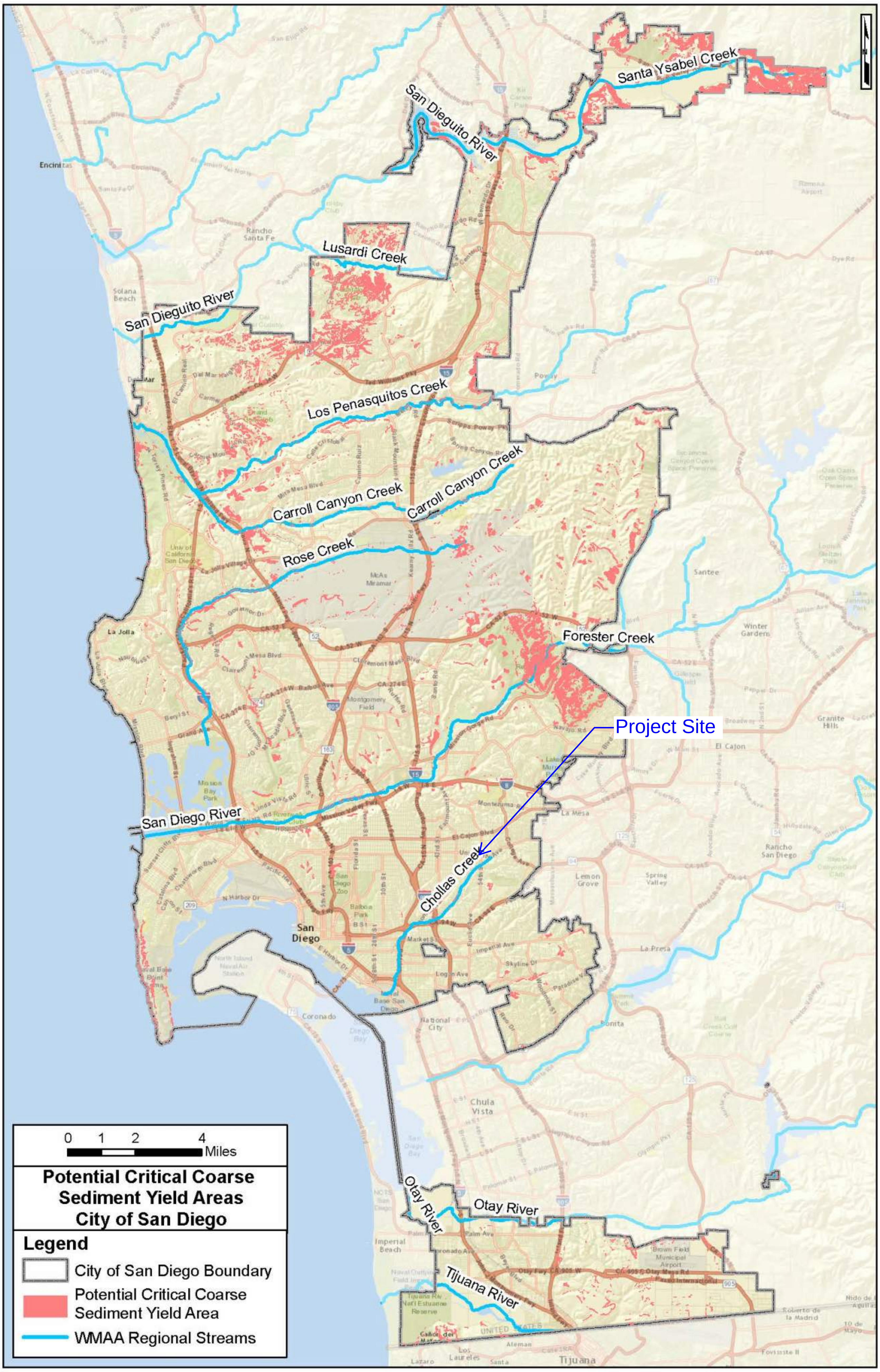
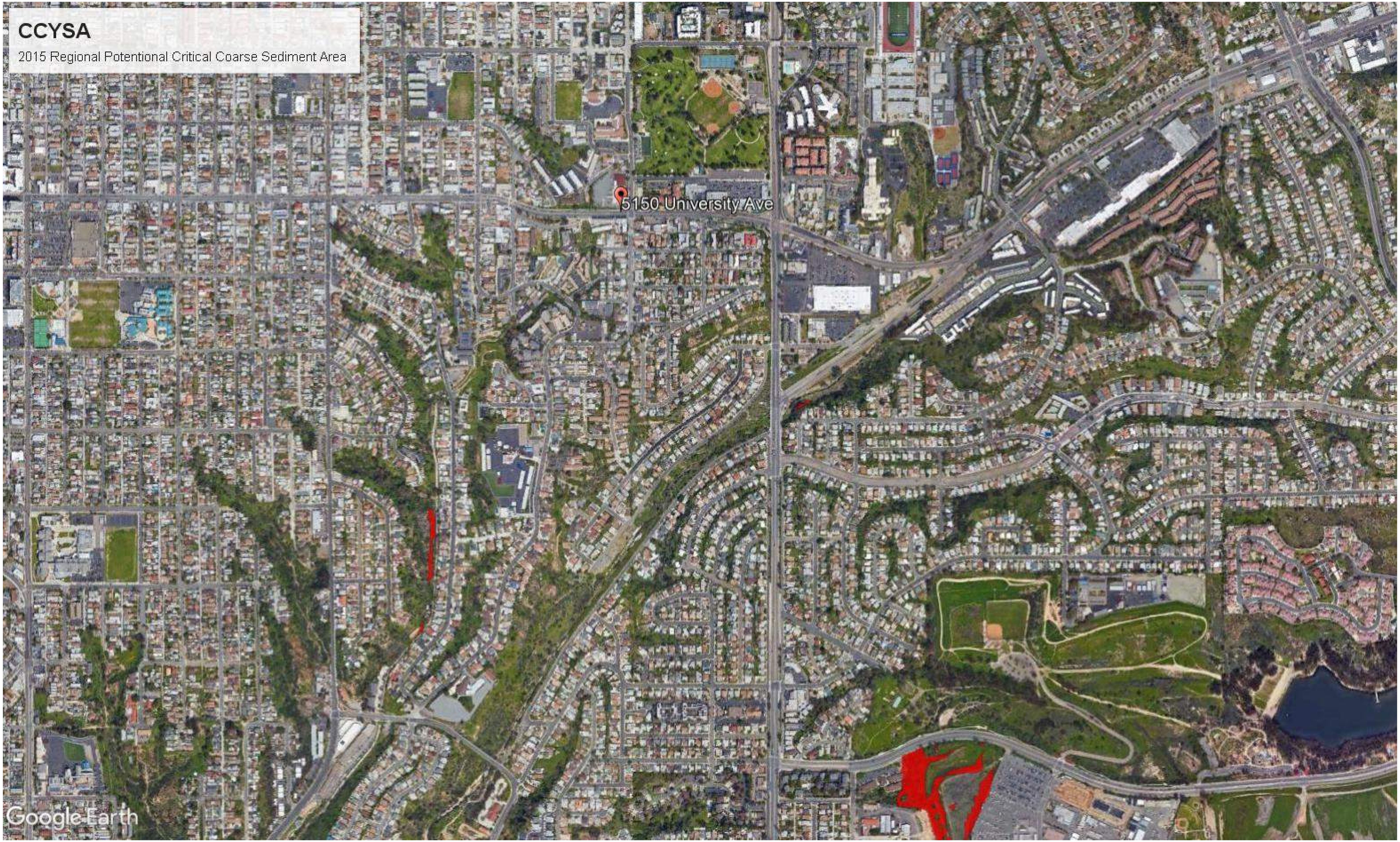


Figure H.9-1 : Potential Critical Coarse Sediment Yield Areas


CCYSA
2015 Regional Potentional Critical Coarse Sediment Area
5150 University Ave
Google Earth

Attachment 2c:

Geomorphic Assessment of Receiving Channels

Not Applicable

Attachment 2d:

Flow Control Facility Design

BMP Sizing Spreadsheet V3.1

Project Name:	University and 51st Street
Project Applicant:	NOVA Engineering
Jurisdiction:	City of San Diego
Parcel (APN):	472-383-04
Hydrologic Unit:	908.22
Rain Gauge:	Oceanside
Total Project Area (sf):	98,723
Channel Susceptibility:	High

BMP Sizing Spreadsheet V3.1			
Project Name:	University and 51st Street	Hydrologic Unit:	908.22
Project Applicant:	NOVA Engineering	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	98,723
Parcel (APN):	472-383-04	Low Flow Threshold:	0.1Q2
BMP Name:	IMP 2	BMP Type:	Cistern
BMP Native Soil Type:	N/A - Impervious Liner	BMP Infiltration Rate (in/hr):	NA

Areas Draining to BMP						HMP Sizing Factors	Minimum BMP Size
DMA Name	Area (sf)	Pre Project Soil Type	Pre-Project Slope	Post Project Surface Type	Area Weighted Runoff Factor (Table G.2-1)[1]	Volume	Volume (CF)
DMA-1	82,693	D	Flat	Mixed	0.85	0.12	8435
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
BMP Tributary Area	82,693					Minimum BMP Size	8435
						Proposed BMP Size*	8767

* Assumes standard configuration

Standard Cistern Depth (Overflow Elevation)	3.5	ft
Provided Cistern Depth (Overflow Elevation)	4.00	ft
Minimum Required Cistern Footprint)	2109	CF

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Ma

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, May 2018. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V3.1			
Project Name:	University and 51st Street	Hydrologic Unit:	908.22
Project Applicant:	NOVA Engineering	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	98,723
Parcel (APN):	472-383-04	Low Flow Threshold:	0.1Q2
BMP Name	IMP 2	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition		Unit Runoff Ratio (cfs/ac)	DMA Area (ac)	Orifice Flow - %Q_2 (cfs)	Orifice Area (in^2)
		Soil Type	Slope				
DMA-1	Oceanside	D	Flat	0.571	1.898	0.108	**1.50**

4.00	**0.108**	**1.50**	**1.38**
Max Orifice Head (feet)	**Max Tot. Allowable Orifice Flow (cfs)**	**Max Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

Provide Hand Calc.	**0.108**	**1.50**	**1.38**
Average outflow during surface drawdown (cfs)	Max Orifice Outflow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	Provide Hand Calculation

Orifice Calculations

Orifice Parameters	Values
Lower Flow threshold per Table G.2-2	0.108
Head (H_o ft)	4.0
Coefficient of Discharge (C_o)	0.65
Gravitational acceleration (g) (ft^2/s)	32.2
Orifice Calculations	**Result**
$Q = C_o A_o \sqrt{[2g(H_o)]}$	
Cross-sectional area of flow through the orifice (A_o in^2)	1.50
Max Diameter of Orifice (in)	**1.38**
Proposed Diameter of Orifice (in)	**1.38**

48" Underground Storage System BMP Hydromodification Orifice & Drawdown Time Calculations (IMP-2)	
Orifice Parameters	**Values**
Contributing Area for Storage System IMP '2' (SF)	82,693
Contributing Area for Storage System IMP '2' (ACRES)	1.90
Hydromodification = Pre-Existing Conditions Per Table G.2-2 Q_2 (CFS)	0.571
Hydromodification = Pre-Existing Conditions Q_2 (CFS) for Storage System IMP '2'	0.108
Height of water above center of orifice hole (H_o ft)	4.0
Coefficient of Discharge (C_o)	0.65
Gravitational Acceleration (g) (ft^2/s)	32.2
Orifice Calculations	**Result**
$Q=C_o A_o \sqrt{[2g(H_o)]}$	
Diameter of Orifice (in)	**1.38**
Cross-sectional area of flow through the orifice (A_o in^2)	1.496
Cross-sectional area of flow through the orifice (A_o ft^2)	0.010
Orifice Rate, Q (cfs)	0.108
Orifice Rate, Q (cf/hr)	390.23
Volume Storage System IMP '2', V (ft^3)	8,767
Drawdown Time, $T_{Drawdown}$ (hr)	**22.47**

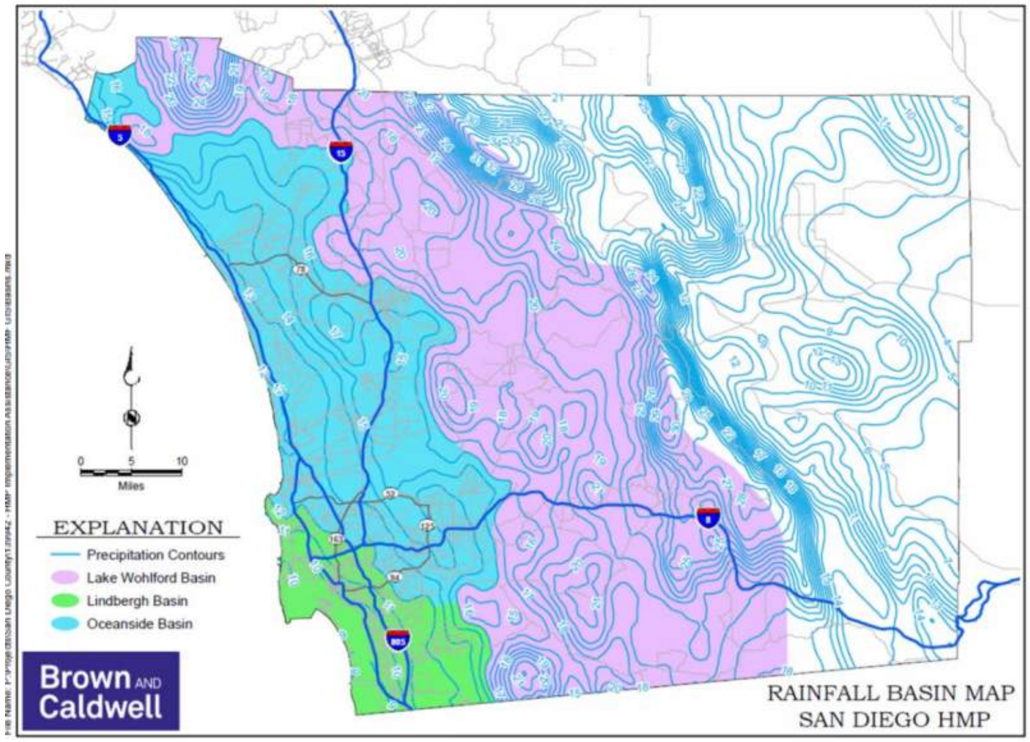


Figure G.2-2: Rainfall Basin Map

Table G.2-1: Runoff factors for surfaces draining to BMPs for Hydromodification Sizing Factor Method

Surface	Runoff Factor
Roofs	1.0
Concrete	1.0
Pervious Concrete	0.10
Porous Asphalt	0.10
Grouted Unit Pavers	1.0
Solid Unit Pavers on granular base, min. 3/16 inch joint space	0.20
Crushed Aggregate	0.10
Turf block	0.10
Amended, mulched soils	0.10
Landscape	0.10

HMP				
	Total DMA AREA	PERVIOUS AREA (SF)	IMPERVIOUS AREA (SF)	C
DMA#1	1.96	0.38	1.58	0.83

G.2.5 Sizing Factors for "Cistern" BMP

Table G.2-6 presents sizing factors for calculating the required volume (V) for a cistern BMP. In this context, a "cistern" is a detention facility that stores runoff and releases it at a controlled rate. A cistern can be a component of a harvest and use system, however the sizing factor method will not account for any retention occurring in the system. The sizing factors were developed assuming runoff is released from the cistern. The sizing factors presented in this section are to meet the hydromodification management performance standard only. The cistern BMP is based on the following assumptions:

- **Cistern configuration**: The cistern is modeled as a 4-foot tall vessel. However, designers could use other configurations (different cistern heights), as long as the lower outlet orifice is sized to properly restrict outflows and the minimum required volume is provided.
- **Cistern upper outlet**: The upper outlet from the cistern would consist of a weir or other flow control structure with the overflow invert set at an elevation of 7/8 of the water height associated with the required volume of the cistern – V. For the assumed 4-foot water depth in the cistern associated with the sizing factor analysis, the overflow invert is assumed to be located at an elevation of 3.5 feet above the bottom of the cistern. The overflow weir would be sized to pass the peak design flow based on the tributary drainage area.

How to use the sizing factors:

Obtain sizing factors from Table G.2-6 based on the project's lower flow threshold fraction of Q_2, hydrologic soil group, post-project slope, and rain gauge (rainfall basin). Multiply the area tributary to the structural BMP (A, square feet) by the area weighted runoff factor (C, unitless) (see Table G.2-1) by the sizing factors to determine the required volume (V, cubic feet). Select a low flow orifice that will discharge the lower flow threshold flow at the overflow elevation (i.e. when there is 3.5 feet of head over the lower outlet orifice or adjusted head as appropriate if the cistern overflow elevation is not 3.5 feet tall). The civil engineer shall provide the necessary volume of the BMP and the lower outlet orifice detail on the plans.

Additional steps to use this BMP as a combined pollutant control and flow control BMP:

A cistern could be a component of a full retention, partial retention, or no retention BMP depending on how the outflow is disposed. However, use of the sizing factor method for design of the cistern in a combined pollutant control and flow control system is not recommended. The sizing factor method for designing a cistern does not account for any retention or storage occurring in BMPs combined with the cistern (i.e., cistern sized using sizing factors may be larger than necessary because sizing factor method does not recognize volume losses occurring in other elements of a combined system). Furthermore, when the cistern is designed using the sizing factor method, the cistern outflow must be set to the low flow threshold flow for the drainage area, which may be inconsistent with requirements for other elements of a combined system. To optimize a system in which a cistern provides temporary storage for runoff to be either used onsite (harvest and use), infiltrated, or biofiltered, project-specific continuous simulation modeling is recommended. Refer to Sections 5.6 and 6.3.6.

Table G.2-6: Sizing Factors for Hydromodification Flow Control Cistern BMPs Designed Using Sizing Factor Method

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	V
$0.1Q_2$	A	Flat	Lindbergh	0.54
$0.1Q_2$	A	Moderate	Lindbergh	0.51
$0.1Q_2$	A	Steep	Lindbergh	0.49
$0.1Q_2$	B	Flat	Lindbergh	0.19
$0.1Q_2$	B	Moderate	Lindbergh	0.18
$0.1Q_2$	B	Steep	Lindbergh	0.18
$0.1Q_2$	C	Flat	Lindbergh	0.11
$0.1Q_2$	C	Moderate	Lindbergh	0.11
$0.1Q_2$	C	Steep	Lindbergh	0.11
$0.1Q_2$	D	Flat	Lindbergh	0.09
$0.1Q_2$	D	Moderate	Lindbergh	0.09
$0.1Q_2$	D	Steep	Lindbergh	0.09
$0.1Q_2$	A	Flat	Oceanside	0.26
$0.1Q_2$	A	Moderate	Oceanside	0.25
$0.1Q_2$	A	Steep	Oceanside	0.25
$0.1Q_2$	B	Flat	Oceanside	0.16
$0.1Q_2$	B	Moderate	Oceanside	0.16
$0.1Q_2$	B	Steep	Oceanside	0.16
$0.1Q_2$	C	Flat	Oceanside	0.14
$0.1Q_2$	C	Moderate	Oceanside	0.14
$0.1Q_2$	C	Steep	Oceanside	0.14
$0.1Q_2$	D	Flat	Oceanside	0.12
$0.1Q_2$	D	Moderate	Oceanside	0.12
$0.1Q_2$	D	Steep	Oceanside	0.12
$0.1Q_2$	A	Flat	L Wohlford	0.53
$0.1Q_2$	A	Moderate	L Wohlford	0.49
$0.1Q_2$	A	Steep	L Wohlford	0.49
$0.1Q_2$	B	Flat	L Wohlford	0.28
$0.1Q_2$	B	Moderate	L Wohlford	0.28
$0.1Q_2$	B	Steep	L Wohlford	0.28

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Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: University Self Storage

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☐ Included ☐ Not applicable

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

Attachment 3: For private entity operation and maintenance, Attachment 3 must 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).

Modular Wetlands System™ Linear

Biofiltration

Comprehensive Stormwater Solutions

A Forterra Company

OVERVIEW

The Bio Clean Modular Wetlands System™ Linear (MWS Linear) represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pretreatment, the MWS Linear incorporates an advanced pretreatment chamber that includes separation and pre-filter cartridges. In this chamber, sediment and hydrocarbons are removed from runoff before entering the biofiltration chamber, in turn reducing maintenance costs and improving performance.

The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands, our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate waterways in urban areas.

PERFORMANCE

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With its advanced pretreatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses nature's ability to process, transform, and remove even the most harmful pollutants.

66% REMOVAL OF DISSOLVED ZINC	69% REMOVAL OF TOTAL ZINC	38% REMOVAL OF DISSOLVED COPPER	64% REMOVAL OF TOTAL PHOSPHORUS	
45% REMOVAL OF NITROGEN	50% REMOVAL OF TOTAL COPPER	95% REMOVAL OF MOTOR OIL	67% REMOVAL OF ORTHO PHOSPHORUS	85% REMOVAL OF TSS

APPROVALS

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world.

WASHINGTON STATE TAPE APPROVED

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

DEQ ASSIGNMENT

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Regulation technical criteria.

MARYLAND DEPARTMENT OF THE ENVIRONMENT APPROVED

Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP EVALUATION

The University of Massachusetts at Amherst – Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.

RHODE ISLAND DEM APPROVED

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

OPERATION

The MWS Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure 1 and Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

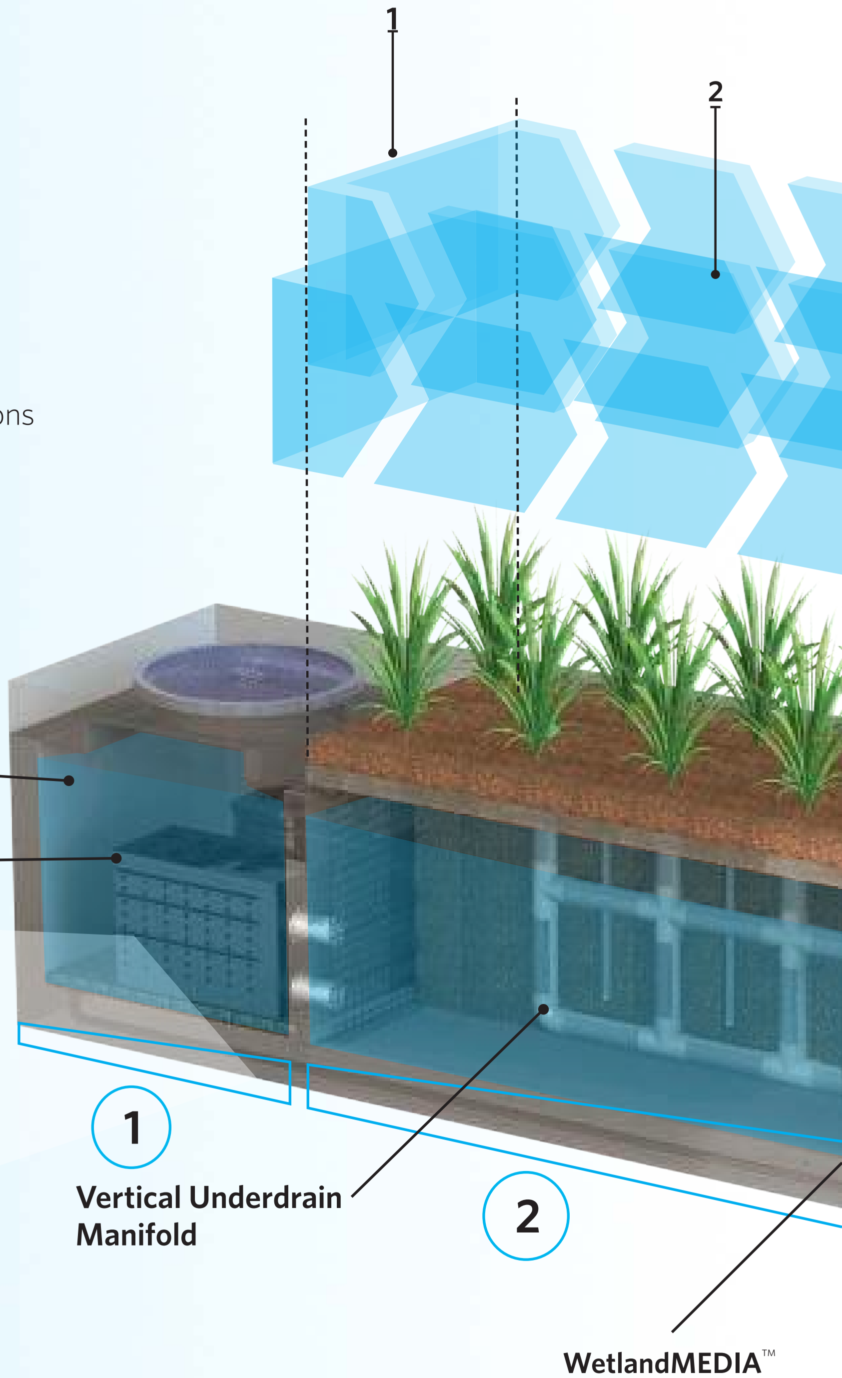
1 PRETREATMENT

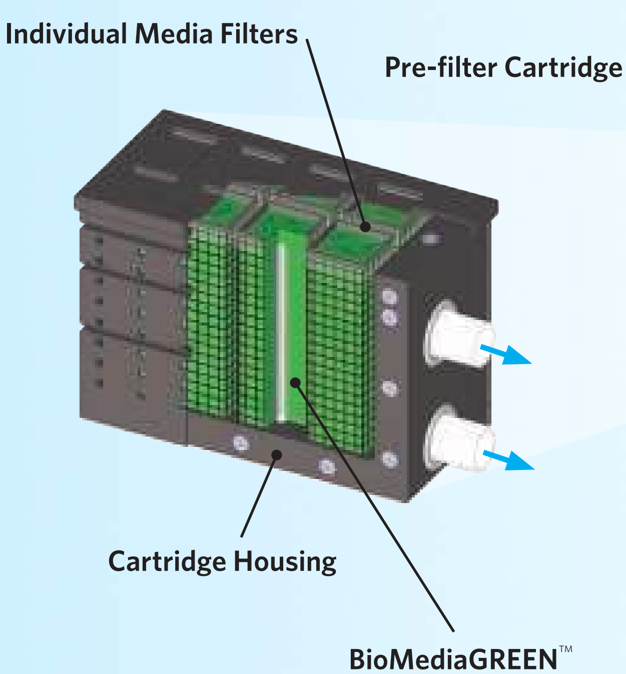
SEPARATION

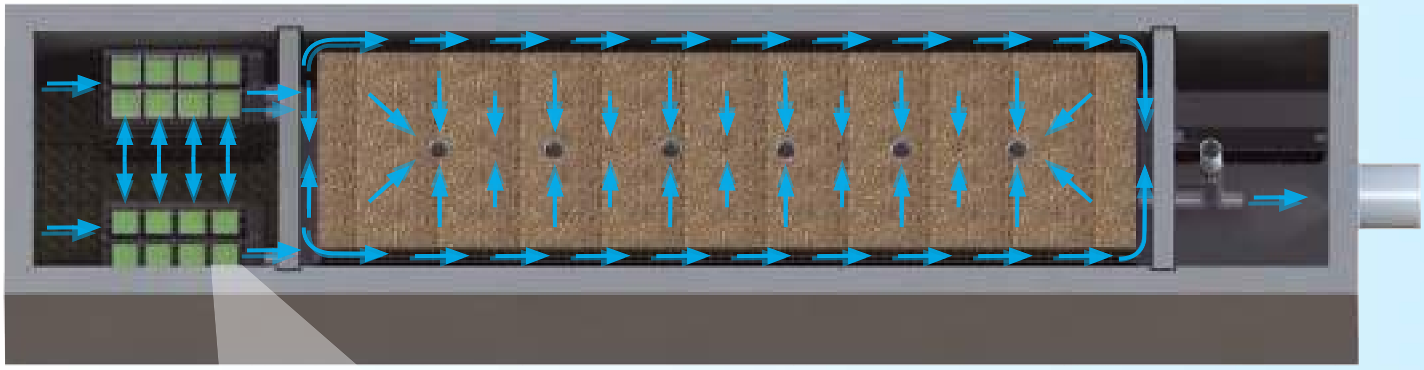
- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

PRE-FILTER CARTRIDGES

- Over 25 sq. ft. of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS and 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber

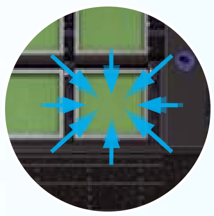






2x to 3x more surface area than traditional downward flow bioretention systems.

Figure 2, Top View



2 BIOFILTRATION

HORIZONTAL FLOW

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

PATENTED PERIMETER VOID AREA

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides
- Maximizes surface area of the media for higher treatment capacity

WETLANDMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and lightweight

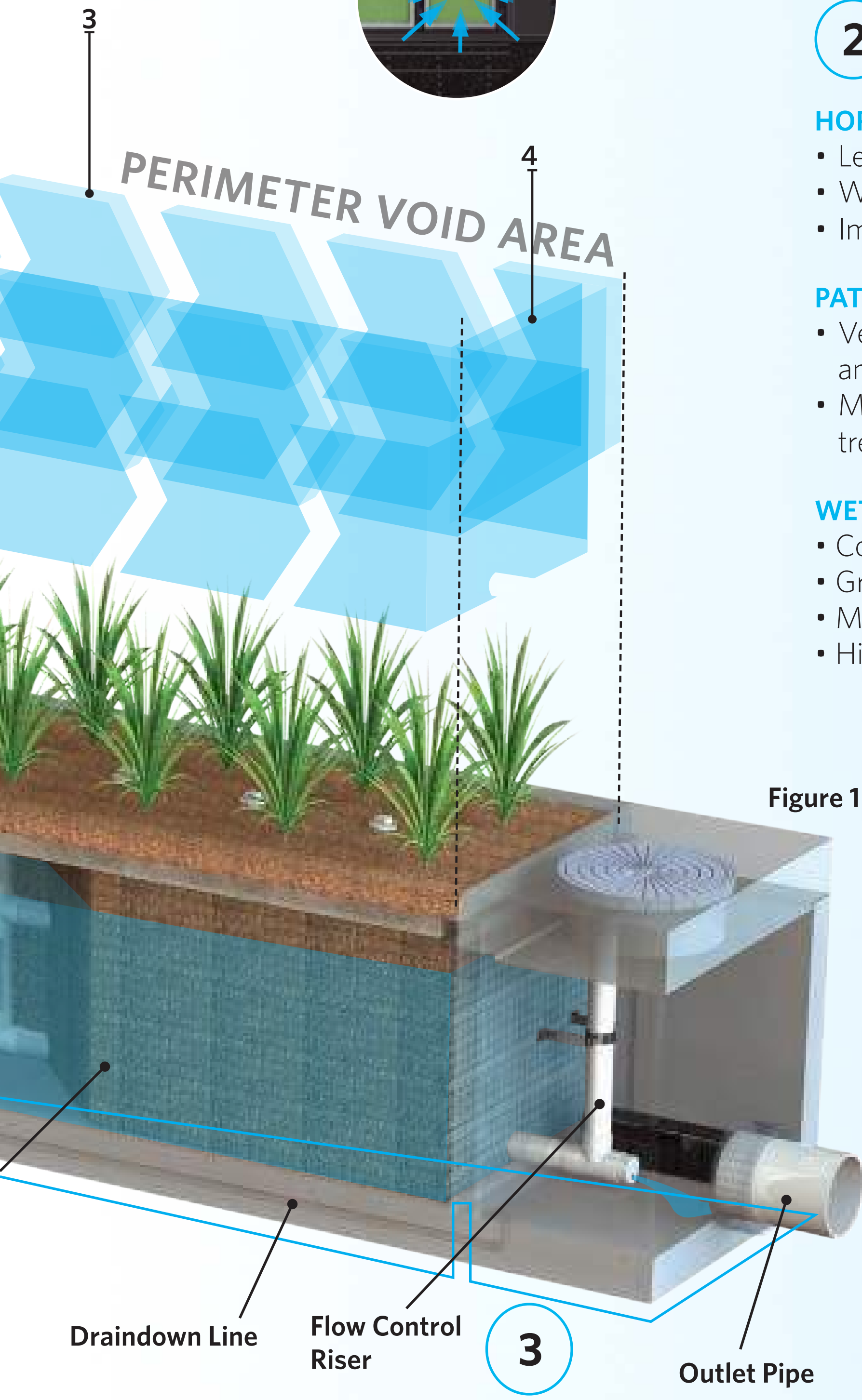


Figure 1

3 DISCHARGE

FLOW CONTROL

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity
- Extends the life of the media and improves performance

DRAINDOWN FILTER

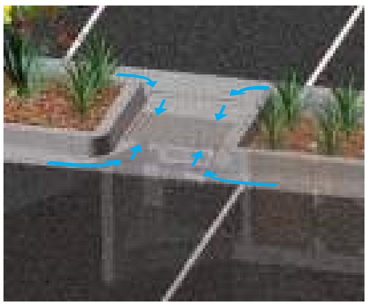
- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

CONFIGURATIONS

The MWS Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

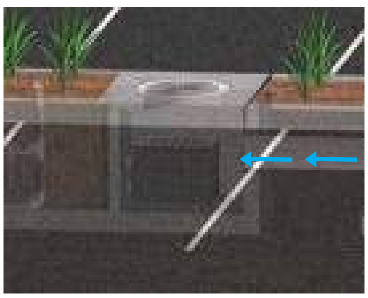
CURB TYPE

The Curb Type configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions. Length of curb opening varies based on model and size.



GRATE TYPE

The Grate Type configuration offers the same features and benefits as the Curb Type but with a grated/drop inlet above the systems pretreatment chamber. It has the added benefit of allowing pedestrian access over the inlet. ADA-compliant grates are available to assure easy and safe access. The Grate Type can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



VAULT TYPE

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pretreatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

DOWNSPOUT TYPE

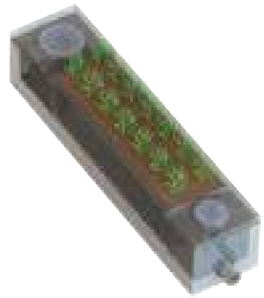
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

ORIENTATIONS

SIDE-BY-SIDE

The Side-By-Side orientation places the pretreatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side.This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.

END-TO-END



The End-To-End orientation places the pretreatment and discharge chambers on opposite ends of the biofiltration chamber, therefore minimizing the width of the system to 5 ft. (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is that bypass must be external.

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

The Side-By-Side orientation places the pretreatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pretreatment chamber directly to the discharge chamber.

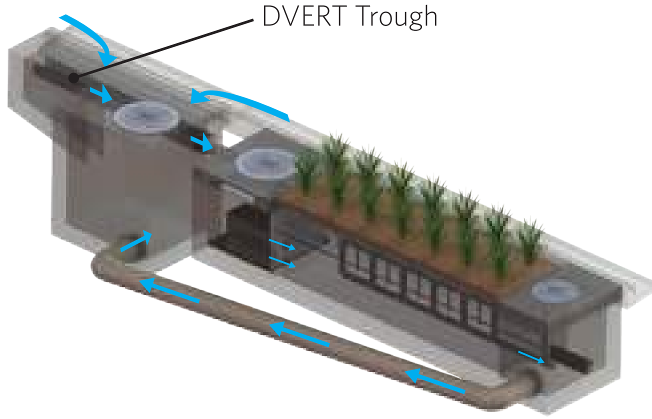
EXTERNAL DIVERSION WEIR STRUCTURE

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

FLOW-BY-DESIGN

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT LOW FLOW DIVERSION



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the MWS Linear to be installed anywhere space is available.

APPLICATIONS

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

INDUSTRIAL

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA-mandated effluent limits for dissolved metals and other pollutants.

RESIDENTIAL

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

STREETS

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and it offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

PARKING LOTS

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

COMMERCIAL

Compared to bioretention systems, the MWS Linear can treat far more area in less space, meeting treatment and volume control requirements.

MIXED USE

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications include:

- Agriculture
- Reuse
- Low Impact Development
- Waste Water

PLANT SELECTION

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade, the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

INSTALLATION

The MWS Linear is simple, easy to install, and has a space-efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles precast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.

MAINTENANCE

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pretreatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pretreatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long-term operation, and there is absolutely no need to replace expensive biofiltration media.

Bio Clean
A Forterra Company

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biocleanenvironmental.com

072318R1

TAPE PERFORMANCE SUMMARY

MWS-LINEAR 2.0

Application: Stand Alone Stormwater Treatment Best Management Practice
Type of Treatment: High Flow Rate Media Filtration and Biofiltration (dual-stage)

DESCRIPTION

Modular Wetland System Linear 2.0 (MWS-L 2.0) is an advanced dual-stage high flow rate media and biofiltration system for the treatment of urban stormwater runoff. Superior pollutant removal efficiencies are achieved by treating runoff through a pre-treatment chamber containing a screening device for trash and larger debris, a separation chamber for larger TSS and a series of media filter cartridges for removal of fine TSS and other particulate pollutants. Pre-treated runoff is transferred to the biofiltration chamber which contains an engineered ion exchange media designed to support an abundant plant and microbe community that captures, absorbs, transforms and uptakes pollutants through an array of physical, chemical, and biological mechanisms.

MWS-L 2.0 is a self-contained treatment train that is supplied to the job site completely assembled and ready for use. Once installed, stormwater runoff drains directly from impervious surfaces through an built-in curb inlet, drop in, or via pipe from upstream inlets or downspouts. Treated runoff is discharged from the system through an orifice control riser to assure the proper amount of flow is treated. The treated water leaving the system is connected to the storm drain system, infiltration basins, or to be re-used on site for irrigation or other uses.

TAPE PERFORMANCE

Modular Wetland System Linear 2.0 (MWS-L 2.0) completed its TAPE field testing in the spring of 2013. The Washington DOE has approved the system under the TAPE protocol. The MWS-Linear has met the performance benchmarks for the three major pollutant categories as defined by TAPE: Basic Treatment (TSS), Phosphorus and Enhanced (dissolved zinc and copper). It is the first system tested under the protocol to meet the benchmarks for all three categories.

Pollutant	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Total Suspended Solids	75.0	15.7	85%	Summary of all data meeting TAPE parameters pertaining to this pollutant. Mean of 8 microns.
Total Phosphorus	0.227	0.074	64%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Ortho Phosphorus	0.093	0.031	67%	Summary of all data meeting TAPE parameters for total phosphorus.
Nitrogen	1.40	0.77	45%	Utilizing the Kjeldahl method (Total Kjeldahl nitrogen). Summary of all data during testing.
Dissolved Zinc	0.062	0.024	66%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Dissolved Copper	0.0086	0.0059	38%	Summary of all data meeting TAPE parameters pertaining to this pollutant.
Total Zinc	0.120	0.038	69%	Summary of all data during testing.
Total Copper	0.017	0.009	50%	Summary of all data during testing.
Motor Oil	24.157	1.133	95%	Summary of all data during testing.

NOTES:
1. The MWS-Linear was proven effective at infiltration rates of up to 121 in/hr.
2. A minimum of 10 aliquots were collected for each event.
3. Sampling was targeted to capture at least 75 percent of the hydrograph.

Modular Wetland System, Inc.
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Oceanside, CA 92058

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F 760-433-3179

PERFORMANCE SUMMARY

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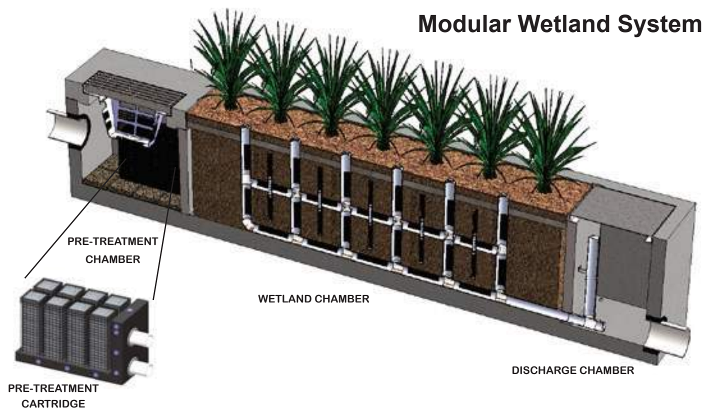

Modular Wetland System Linear 2.0 (MWS-L 2.0) has been independently tested in laboratory and field conditions since 2008.

Oceanside Test Site

Portland Test Site

HEAVY METALS: Copper / Zinc

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.76 / .95	.06 / .19	92% / 80%	Majority Dissolved Fraction
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.04 / .24	< .02 / < .05	>50% / >79%	Effluent Concentrations Below Detectable Limits
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.058 / .425	.032 / .061	44% / 86%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	.017/ .120	.009 / .038	50% / 69%	Total Metals

TOTAL SUSPENDED SOLIDS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	270	3	99%	Sil-co-sil 106 - 20 micron mean particle size
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	45.67	8.24	82%	Mean Particle Size by Count < 8 Microns
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	676	39	94%	Test Unit 2
TAPE Field Testing / Portland, OR 2011/2012	Field	75.0	15.7	85%	Means particle size of 8 microns

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PERFORMANCE SUMMARY

MWS-LINEAR 2.0

PHOSPHORUS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
TAPE Field Testing / Portland, OR 2011/2012	Field	.227	.074	64%	TOTAL P
TAPE Field Testing / Portland, OR 2011/2012	Field	.093	.031	67%	ORTHO P

NITROGEN:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.85	.21	75%	NITRATE
TAPE Field Testing / Portland, OR 2011/2012	Field	1.40	0.77	45%	TKN

HYDROCARBONS:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	10	1.625	84%	Oils & Grease
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	.83	0	100%	TPH Motor Oil
TAPE Field Testing / Portland, OR 2011/2012	Field	24.157	1.133	95%	Motor Oil

BACTERIA:

Description	Type	Avg. Influent (MPN)	Avg. Effluent (MPN)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	1600 / 1600	535 / 637	67% / 60%	Fecal / E. Coli
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	31666 / 6280	8667 / 1058	73% / 83%	Fecal / E. Coli

TURBIDITY:

Description	Type	Avg. Influent (NTU)	Avg. Effluent (NTU)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	21	1.575	93%	Field Measurement
City of Oceanside Boat Wash / Waves Environmental - 2008	Field	21	6	71%	Field Measurement

LEAD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Waves Environmental - 1/4 Scale Lab Testing - 2007	Lab	.54	.10	82%	Total
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	.01 / .043	.004 / .014	60% / 68%	Both Test Units
TAPE Field Testing / Portland, OR 2011/2012	Field	.011	.003	70%	Total

COD:

Description	Type	Avg. Influent (mg/L)	Avg. Effluent (mg/L)	Removal Efficiency	Notes
Recycling Facility, Kileen, TX / CERL - 2011-2012	Field	516 / 1450	90 / 356	83% / 75%	Both Test Units

All removal efficiencies and concentrations rounded up for easy viewing. Please call us for more information, including full copies of the reports reference above.

Modular Wetland System, Inc.
2972 San Luis Rey Rd
Oceanside, CA 92058

MODULAR WETLANDS
Nature & Technology Working Together In Perfect Harmony™

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P 760-433-7640
F 760-433-3179

Appendix I.2. Flow Control BMP Information (Underground Storage Pipe System)

TECHNICAL NOTE

Retention/Detention System Maintenance

TN 6.01
February 2007

This document is provided for informational purposes only and is meant only to be a guide. Individuals using this information should make their own decisions as to suitability of this guideline for their individual projects and adjust accordingly.

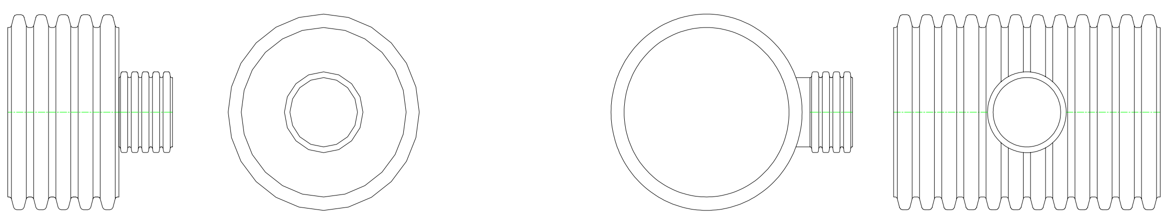
Introduction

A retention/detention system is comprised of a series of pipes and fittings that form an underground storage area, which retains or detains storm water runoff from a given area. As sediment and debris settle out of the detained stormwater, build up occurs that requires the system to be regularly inspected and cleaned in order for the system to perform as originally designed. The following provides the available fittings and guidelines for inspection and maintenance of an HDPE underground storage system.

System Accessories and Fittings

Concentric Reducers

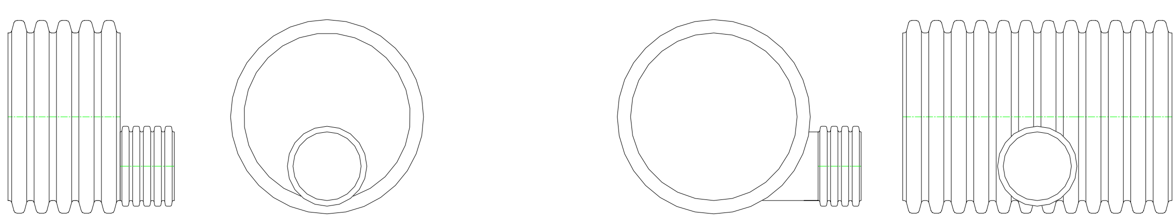
Concentric Reducers are fittings that transition between two pipes, either in line with one another or at perpendicular angles. The centerlines of the two pipes are at the same elevation. When a concentric reducer is used to connect the manifold pipe to the lateral pipes, most debris will be trapped in the manifold pipe.



SIDE VIEW SECTION VIEW SIDE VIEW SECTION VIEW

Eccentric Reducers

Eccentric Reducers are fittings that transition between two pipes, either in line with one another or at perpendicular angles. The inverts of the two pipes are at the same elevations. When an eccentric reducer is used to connect the manifold pipe to the lateral pipes, most debris will follow the flow of the storm water into the lateral pipes.



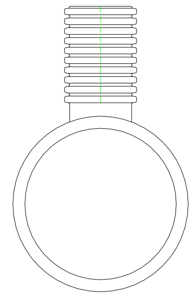
SIDE VIEW SECTION VIEW SIDE VIEW SECTION VIEW

Riser

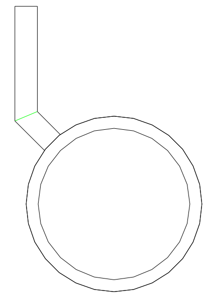
Each retention/detention system typically has risers strategically placed for maintenance and inspection of the system. These risers are typically 24” in diameter or larger and are placed on the manifold fittings.

Cleanouts

Cleanout ports are usually 4-, 6-, or 8-in diameter pipe and are placed on the manifold fittings. They are used for entrance of a pipe from a vacuum truck or a water-jetting device.



RISER
CROSS-SECTION VIEW



CLEANOUT
CROSS-SECTION VIEW

For a complete listing of available fittings and components please refer to the *ADS Fittings Manual*.

Maintenance Overview of a Retention/Detention System

Maintaining a clean and obstruction-free retention/detention system helps to ensure the system performs the intended function of the primary design. Build up of debris may obstruct flow through the laterals in a retention system or block the entranceway of the outlet pipe in a detention system. This may result in ineffective operation or complete failure of the system . Additionally, surrounding areas may potentially run the risk of damage due to flooding or other similar issues.

Inspection/Maintenance Frequency

All retention/detention systems must be cleaned and maintained. Underground systems may be maintained more cost effectively if these simple guidelines are followed. Inspection should be performed at a minimum of once per year. Cleaning should be done at the discretion of individuals responsible to maintain proper storage and flow. While maintenance can generally be performed year round, it should be scheduled during a relatively dry season.

Pre-Inspection

A post-installation inspection should be performed to allow the owner to measure the invert prior to accumulation of sediment. This survey will allow the monitoring of sediment build-up without requiring access to the retention/detention system.

The following is the recommended procedure for pre-inspections:

1) Locate the riser section or cleanouts of the retention/detention system. The riser will typically be 24” in diameter or larger and the cleanouts are usually 4”, 6” or 8” in diameter.
2) Remove the lid of the riser or clean outs.
3) Insert a measuring device into the opening and make note to a point of reference on the stick or string. (This is done so that sediment build up can be determined in the future without having to enter the system.)

TECHNICAL NOTE

Rainwater Harvesting with HDPE Pipe Cisterns

TN 7.01
January 2009

Introduction

For the past several years, the use of smooth interior corrugated high density polyethylene (HDPE) pipe has been a viable alternative for the control of stormwater quality through underground systems. Typically, stormwater has either been infiltrated through perforated pipe or detained in solid pipe and then discharged at a controlled rate to the local storm sewer system or tributary. In both situations, the design did not provide for the potential reuse of stormwater. There is a growing demand for the construction industry to provide for resource reuse. In some situations, the reuse is being driven by a regulatory requirement. In many cases, the reuse of resources can provide an economic benefit. This is especially applicable to stormwater in areas where water resources are at a premium. Water reclamation should be considered in situations where infiltration is not feasible due to site constraints. This document provides information on the installation, storage capacity and system layouts for rainwater harvesting systems using ADS HDPE pipe cisterns.

HDPE Pipe Cisterns

ADS HDPE N-12 pipe is the building block of our cisterns. The Specifications section of the Drainage Handbook provides additional information on pipe dimensions and properties. The pipe has a smooth inner wall and a corrugated outer wall. The smooth inner wall combines superior hydraulics and the ability to resist abrasion and corrosion. The corrugated outer wall provides the strength necessary to withstand heavy traffic loads with varying cover heights. In addition to pipe, the ADS cistern uses specially designed manifolds and other fittings to complete the pipe component of the cistern. ADS can assist with system layout including pipe and necessary components for the cistern.

System Layout

A typical cistern layout includes at least one inlet into the system. This inlet can be on the cistern manifold as shown below or can be done on a lateral. Further, the inlet can be accomplished via a pre-fabricated stub or with a reducer and tee fittings in the system corner. Both inlet types are shown below. When designing system inlets, attention should be given to the hydraulic grade line of the site to limit or prevent conveyance system surcharging.

The outlet of the cistern should be directed to a reinforced concrete manhole. The manhole should be reinforced to limit the effects of vibration from the pump system. The outlet invert should be the same as the pipe invert elevation to ensure that the entire system is able to drain. An underdrain should be installed within the stone backfill of the cistern. The invert of the underdrain should be at the bottom of the stone backfill envelope. The underdrain from the stone backfill should be directed to the outlet manhole so that the stone backfill can be completely drained.

The outlet manhole serves multiple purposes. In addition to acting as an outlet structure, the manhole also houses a discharge pump (designed by others) to remove stormwater from the cistern. Installing a pump within the system piping or pumping directly from piping is not recommended for hydraulic reasons. The manhole should be located outside the footprint of the thermoplastic liner as shown in the detail below.

The outlet manhole will also include the cistern overflow. It is recommended that an overflow be incorporated into the system in the event that the cistern is not completely emptied between storm events. If the cistern is not completely empty and there is no overflow, the potential exists for the entire system to be surcharged and flooding could occur. The invert of the overflow should be set at the top of the cistern.

Lastly, the outlet manhole can also include a vent from the system. System venting is recommended to allow adequate airflow through the cistern and equalize air pressures within the cistern. If not vented, there can be issue with cistern pressures under some circumstances. In the sample layout shown below, the system includes a 4-inch HDPE vent line leading from the cistern to the outlet manhole. To prevent backflow into the cistern through the vent, it is recommended that the vent be located above the crown of the overflow pipe. The use of a vent is recommended for installations in which the cistern is encased within the thermoplastic liner. For cisterns that are not completely encased within the thermoplastic liner, the use of a vent is at the engineer's discretion.

Figure 1
Example Cistern Layout

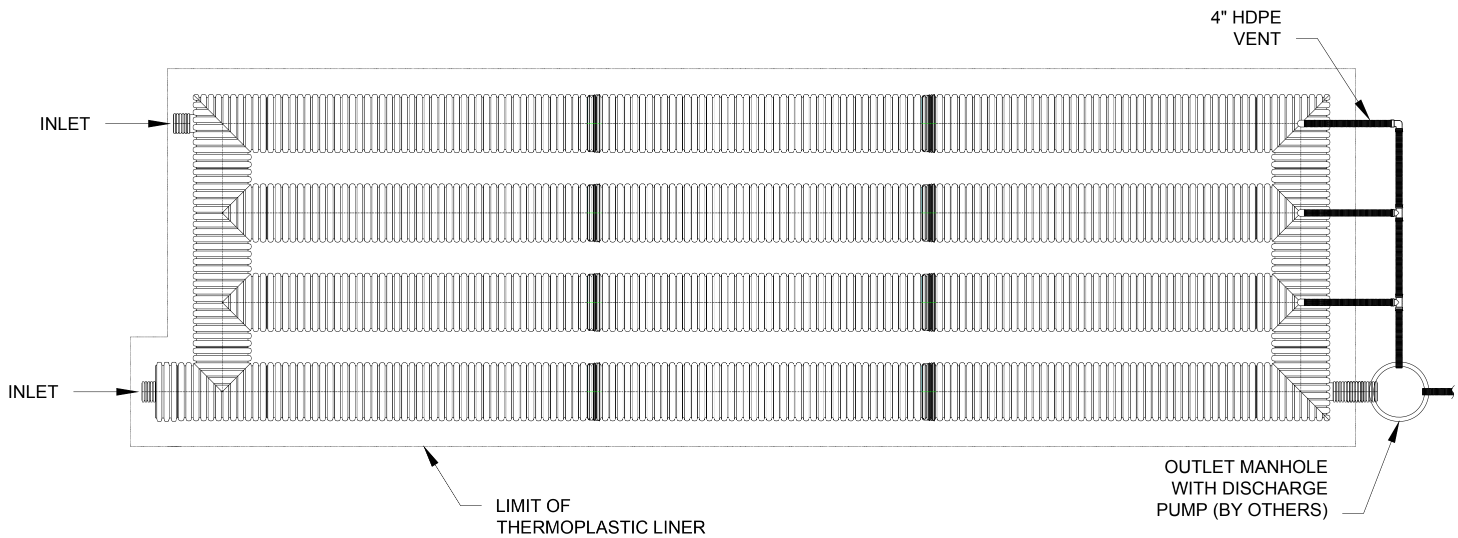
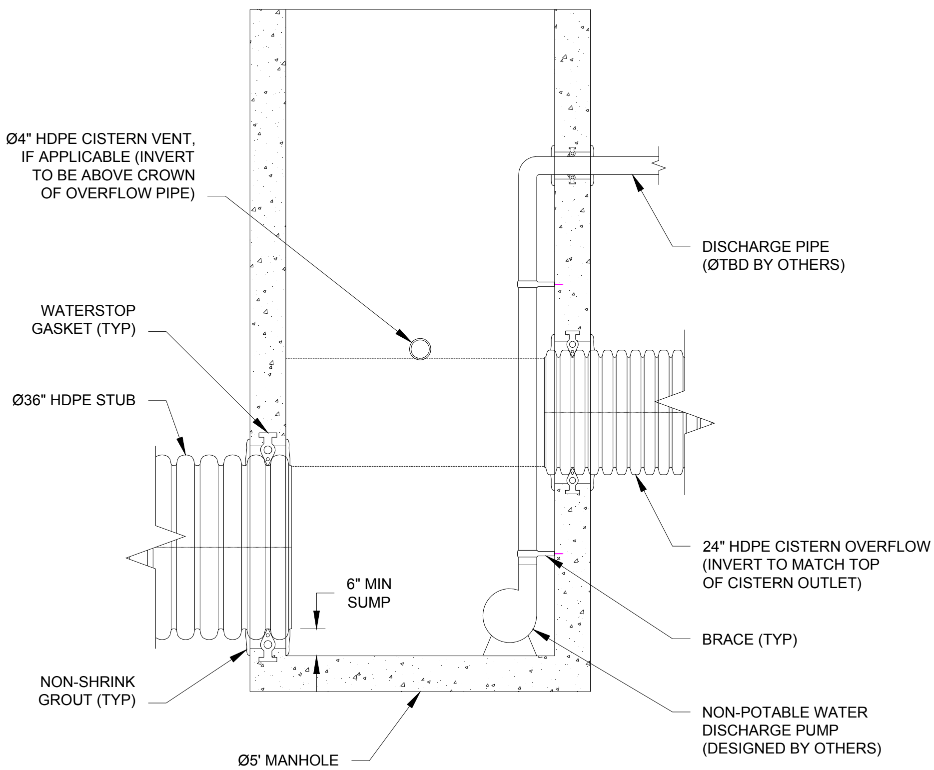


Figure 2
Outlet Manhole Typical Detail



Storage Capacity

ADS cisterns maximize storage capacity by using pipe and stone voids together for total system storage. Table 1 lists storage volume per pipe diameter, stone void volume per pipe diameter and total storage volume for pipe and stone together.

Table 1
Pipe Storage Capacity

Nominal Inside Diameter	Average Outside Diameter	"X" Spacing	"S" Spacing[1]	"C" Spacing[1]	Pipe Volume[2]	Stone Void Volume[3,4,5]	Total Storage
in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	ft^3/ft (m^3/m)	ft^3/ft (m^3/m)	ft^3/ft (m^3/m)
12 (300)	14.5 (368)	8 (200)	11 (279)	25.4 (645)	0.79 (0.07)	1.1 (0.10)	1.8 (0.16)
15 (375)	18 (457)	8 (200)	12 (305)	28.9 (734)	1.2 (0.11)	1.4 (0.13)	2.6 (0.24)
18 (450)	21 (533)	9 (230)	17 (434)	33.9 (862)	1.8 (0.16)	1.7 (0.15)	3.5 (0.32)
24 (600)	28 (711)	10 (250)	13 (330)	40.7 (1034)	3.1 (0.29)	2.6 (0.24)	5.7 (0.52)
30 (750)	36 (914)	18 (450)	18 (457)	53.1 (1347)	4.9 (0.46)	3.7 (0.34)	8.6 (0.79)
36 (900)	42 (1067)	18 (450)	22 (559)	63 (1600)	7.1 (0.66)	4.7 (0.43)	11.8 (1.08)
42 (1050)	48 (1219)	18 (450)	24 (610)	71.9 (1826)	9.3 (0.87)	5.8 (0.53)	15.1 (1.38)
48 (1200)	54 (1372)	18 (450)	25 (1219)	78.5 (1994)	12.4 (1.15)	7.0 (0.64)	19.4 (1.78)
60 (1500)	67 (1702)	18 (450)	24 (1524)	90 (2286)	19.3 (1.79)	9.7 (0.89)	29.0 (2.66)

Notes:
See Figure 3 for typical cross section used in volume calculations
Bedding depth assumed 4" for 12"-24" pipe and 6" for 30"-60" pipe.
1. *Based on A-profile pipe.*
2. *Actual ID values used in calculation.*
3. *Stone Porosity assumed 40%.*
4. *Stone height above crown of pipe is not included in void volume calculations.*
5. *Calculation is based on the average OD of the pipe.*

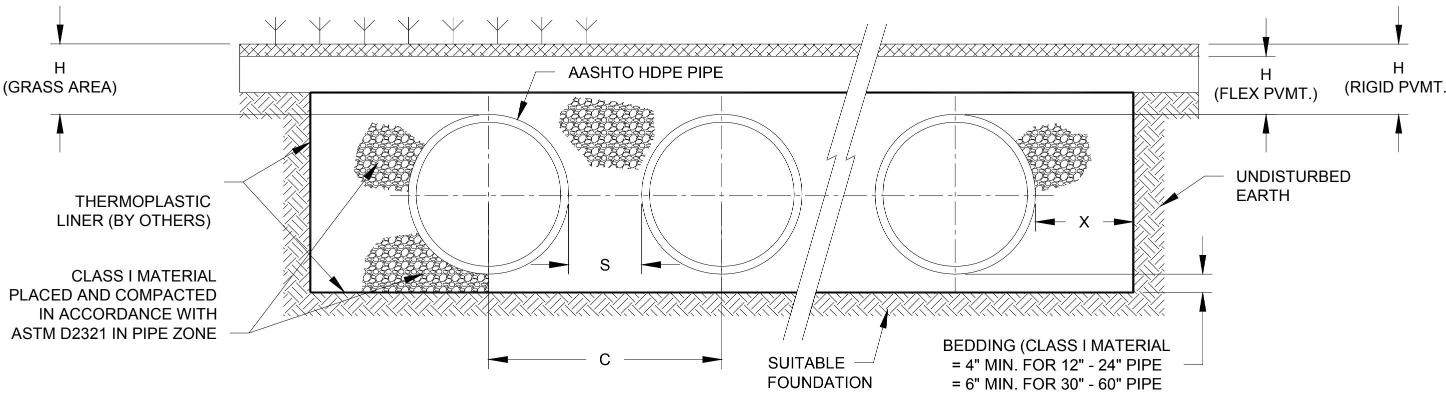
Installation

For a cistern application, ADS N-12 perforated pipe embedded in a Class I crushed stone backfill is recommended. See Figure 3 for minimum recommended cover heights for standard installations. A maximum of 1 ½" aggregate size is preferred and the stone should be clean with no fines. The stone backfill provides two critical elements to the cistern design. First, the stone provides necessary structural support for the system to withstand dead loads and vehicular loading. Secondly, the stone provides a certain void volume which can be incorporated into the total storage volume that the cistern can provide. This can help with the reduction of the cistern size and keep the overall footprint to a minimum.

Up to this point, the design is no different than the traditional ADS HDPE pipe infiltration system. The traditional infiltration system would include the use of a geotextile to separate the stone backfill from the native material. For a cistern, a thermoplastic liner shall be used in place of the geotextile as shown in Figure 1. The liner will maintain the water tight integrity of the cistern and hold the stormwater in place before it is reclaimed. Because of the use of a thermoplastic liner, installation of cisterns below groundwater is not recommended due to potential issues with buoyancy and hydrostatic head. To prevent issues with groundwater, an underdrain can be placed under the liner so long as gravity discharge is available. Additional consultation with a geotechnical engineer may be necessary to address groundwater concerns.

Figure 3
Typical Cistern Cross Section

Note: This is a typical cross section only. See Structures, Section 2, or Installation, Section 5, of the Drainage Handbook for specific installation guidelines.

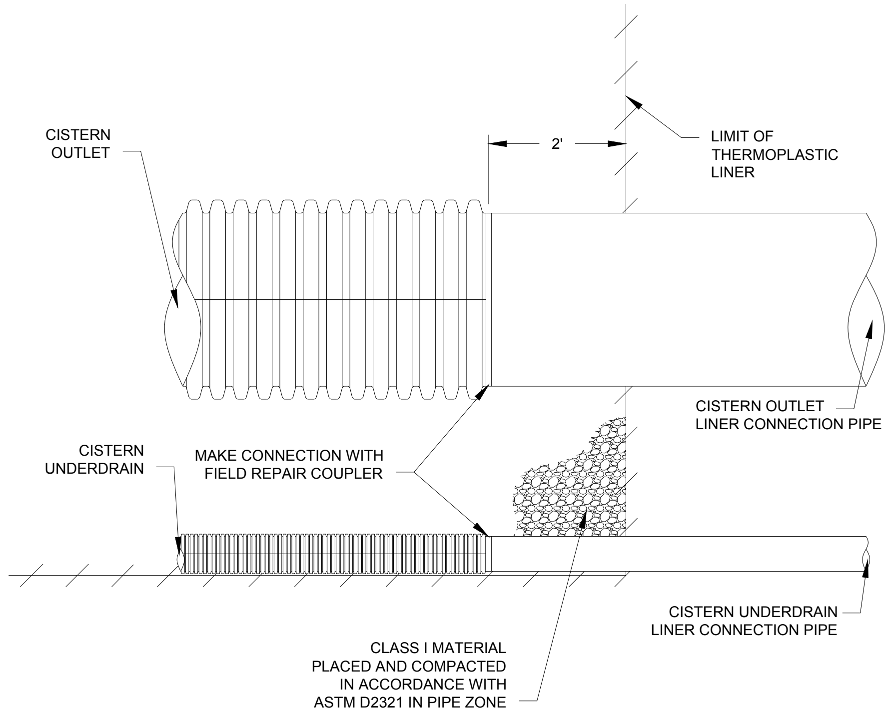


Thermoplastic Liner

ADS does not design, fabricate, install or sell thermoplastic liners. The following product details are based on information supplied and published by thermoplastic liner manufacturers. Generally speaking, there are two liner materials that are suitable for this application: polyvinyl chloride (PVC) and linear low density polyethylene (LLDPE). PVC liners are easy to install making it a low cost alternative. Some PVC liners contain fillers and plasticizers. Under prolonged exposure to sunlight, these compounds can leach from the liner. With use in a cistern application, exposure from sunlight is not a concern since the system is located underground. The LLDPE is an inert material that is suitable for the storage of stormwater and would be acceptable for this application. Medium and high density liners are also available but are not as flexible as the low density product and are typically higher in cost.

For any liner, puncture resistance needs to be considered. This can be addressed by the placement of non-woven geotextile on either side of the membrane. The liner seam, if applicable, should be watertight to maintain the integrity of the system. Pipe “boots” need to be pre or field fabricated for locations where system piping is either entering or exiting the cistern footprint, i.e. inlet and outlet piping. A detail depicting the liner “boot” is shown as Figure 4. The other factor that needs to be considered when using a thermoplastic liner is the seasonal high water table. High water tables can create excessive hydrostatic pressure and potentially damage the liner.

Figure 4
Liner Pipe Connection Detail



Installation of liners should be in accordance with the manufacturer's recommendations. ADS recommends consulting with the liner manufacturers for final design, installation and cost information regarding the liner component of the cistern design.

Cistern Design

Due to the similarity of the cistern to an infiltration system, the ADS Retention/Detention Calculator can be used to size the pipe, fittings and stone component of the cistern. The Calculator can be accessed via the ADS website at www.ads-pipe.com.

The required bed size is indicated in the excavation section of the Calculator. The required amount of thermoplastic liner can be calculated from these bed dimensions as follows:

$$((H * L * 2) + (H * W * 2) + (L * W * 2)) = \text{required amount of liner in square feet}$$

where:

H = height of cistern section

L = length of cistern section
W = width of cistern section.

This calculation is based on a design in which the cistern is completely encased within the thermoplastic liner which is at the engineer's discretion. In the event that the system is not completely encased and the liner extends below and along the sides of the cistern, the caluculation is as follows:

((H * L * 2) + (H * W * 2) + (L * W)) = required amount of liner in square feet

where:

H = height of cistern section
L = length of cistern section
W = width of cistern section.

Technical Assistance

Throughout cistern design, ADS can assist with a variety of technical issues on the use of our HDPE pipe and fittings, including:

- Product performance information and suggested product usage
- Manifold pipe configuration and design
- Number and spacing of system laterals (based on provided design storage)
- Existing product modifications; custom product fabrication
- Suggestions to maximize cost effectiveness

Please contact an ADS representative for further information.

Note: The use of cisterns is not recommended as a fire suppression source due to impact of weather variations on water supply and ultimately availability.

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Project Name: University Self Storage

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

The plans must identify:

- ☐ Structural BMP(s) with ID numbers matching 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.

GENERAL NOTES

1. APPROVAL OF THESE PLANS BY THE CITY ENGINEER DOES NOT AUTHORIZE ANY WORK TO BE PERFORMED UNTIL A PERMIT HAS BEEN ISSUED.

2. UPON ISSUANCE OF A PERMIT, NO WORK WILL BE PERMITTED ON WEEKENDS OR HOLIDAYS UNLESS APPROVED BY TRAFFIC CONTROL PERMIT FROM THE DEVELOPMENT SERVICES DEPARTMENT.

3. THE APPROVAL OF THIS PLAN OR ISSUANCE OF A PERMIT BY THE CITY OF SAN DIEGO DOES NOT AUTHORIZE THE PERMIT HOLDER OR OWNER TO VIOLATE ANY FEDERAL, STATE OR CITY LAWS, ORDINANCES, REGULATIONS, OR POLICIES.

4. IMPORTANT NOTICE: SECTION 4216 OF THE GOVERNMENT CODE REQUIRES A DIG ALERT IDENTIFICATION NUMBER ISSUED BEFORE A ''PERMIT TO EXCAVATE" WILL BE VALID. FOR YOUR DIG ALERT I.D. NUMBER, CALL UNDERGROUND SERVICE ALERT, TOLL FREE (800) 422-4133, TWO DAYS BEFORE YOU DIG.

5. CONTRACTOR SHALL BE RESPONSIBLE FOR POTHOLING AND LOCATING ALL EXISTING UTILITIES THAT CROSS THE PROPOSED TRENCH LINE WHILE MAINTAINING A 1 FOOT VERTICAL CLEARANCE.

6. ''PUBLIC IMPROVEMENT SUBJECT TO DESUETUDE OR DAMAGE." IF REPAIR OR REPLACEMENT OF SUCH PUBLIC IMPROVEMENTS IS REQUIRED, CONTRACTOR SHALL OBTAIN THE REQUIRED PERMITS FOR WORK IN THE PUBLIC RIGHT-OF-WAY, SATISFACTORY TO THE PERMIT ISSUING AUTHORITY.

7. 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 RESIDENT ENGINEER.

8. CONTRACTOR SHALL REPLACE OR REPAIR ALL TRAFFIC SIGNAL LOOPS, CONDUITS, AND LANE STRIPING DAMAGED DURING CONSTRUCTION.

9. PRIOR TO SITE DISTURBANCE, CONTRACTOR SHALL MAKE ARRANGEMENTS FOR A PRECONSTRUCTION MEETING WITH THE CITY OF SAN DIEGO, CONSTRUCTION MANAGEMENT AND FIELD SERVICES DIVISION (858) 627-3200.

10. CONTRACTOR SHALL ONLY PERFORM SITE SURVEY AND UTILITY MARK OUT SERVICES PRIOR TO THE PRECONSTRUCTION MEETING.

11. CONTRACTOR SHALL IMPLEMENT AN EROSION CONTROL PROGRAM DURING THE PROJECT CONSTRUCTION ACTIVITIES. THE PROGRAM SHALL COMPLY WITH ALL APPLICABLE REQUIREMENTS OF THE STATE WATER RESOURCE CONTROL BOARD.

12. CONTRACTOR SHALL HAVE EMERGENCY MATERIAL AND EQUIPMENT ON HAND FOR UNFORESEEN SITUATIONS, SUCH AS DAMAGE TO UNDERGROUND WATER, SEWER, AND STORM DRAIN FACILITIES WHERE FLOW MAY GENERATE EROSION AND SEDIMENT POLLUTION.

13. AN AS-GRADED GEOTECHNICAL REPORT AND SET OF THE REDLINE "AS-BUILT" GRADING PLANS SHALL BE SUBMITTED TO AREA 3 ON THE THIRD FLOOR OF DEVELOPMENT SERVICES WITHIN 30 CALENDAR DAYS OF THE COMPLETION OF GRADING. AN ADDITIONAL SET SHALL BE PROVIDED TO THE RESIDENT ENGINEER OF THE CONSTRUCTION MANAGEMENT & FIELD SERVICES DIVISION AT 9573 CHESAPEAKE DRIVE, SAN DIEGO, CA 92123.

14. "AS-BUILT" DRAWINGS MUST BE SUBMITTED TO THE RESIDENT ENGINEER PRIOR TO ACCEPTANCE OF THIS PROJECT BY THE CITY OF SAN DIEGO.

15. MANHOLES AND PULL BOX COVER SHALL BE LABELED WITH NAME OF COMPANY.

16. CONTRACTOR SHALL PROVIDE RED-LINES DRAWINGS IN ACCORDANCE WITH 2-5.4 OF THE WHITEBOOK, "RED-LINES AND RECORD DOCUMENTS."

17. CONTRACTOR SHALL MAINTAIN A MINIMUM OF 1 FOOT VERTICAL SEPARATION TO ALL UTILITIES UNLESS OTHERWISE SPECIFIED ON THE PLANS.

18. CONTRACTOR SHALL REMOVE AND REPLACE ALL UTILITY BOXES SERVING AS HANDHOLES THAT ARE NOT IN "AS-NEW" CONDITION IN PROPOSED SIDEWALK, DAMAGED BOXES, OR THOSE THAT ARE NOT IN COMPLIANCE WITH CURRENT CODE SHALL BE REMOVED AND REPLACED WITH NEW BOXES, INCLUDING WATER, SEWER, TRAFFIC SIGNALS, STREET LIGHTS, DRY UTILITIES-SDG&E, COX, ETC. ALL NEW METAL LIDS SHALL BE SLIP RESISTANT AND INSTALLED FLUSH WITH PROPOSED SIDEWALK GRADE. IF A SLIP RESISTANT METAL LID IS NOT COMMERCIALLY AVAILABLE FOR THAT USE, NEW BOXES AND LIDS SHALL BE INSTALLED.

19. THE AREA WHICH IS DEFINED AS A NON GRADING AREA AND WHICH IS NOT TO BE DISTURBED SHALL BE STAKED PRIOR TO START OF THE 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. 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, CALIFORNIA DEPARTMENT OF FISH AND GAME. COMPLIANCE MAY INCLUDE OBTAINING PERMITS, OTHER AUTHORIZATIONS, OR COMPLIANCE WITH MANDATES BY ANY APPLICABLE STATE OR FEDERAL AGENCY.

20. PRIOR TO CONSTRUCTION, SURVEY MONUMENTS (HORIZONTAL AND VERTICAL) THAT ARE LOCATED IN THE CONSTRUCTION AREA SHALL BE TIED-OUT AND REFERENCED BY A LAND SURVEYOR.

21. UPON COMPLETION OF CONSTRUCTION, ALL DESTROYED SURVEY MONUMENTS ARE REQUIRED TO BE REPLACED, AND A CORNER RECORD OR RECORD OF SURVEY SHALL BE PREPARED AND FILED WITH THE COUNTY SURVEYOR AS REQUIRED BY THE PROFESSIONAL LAND SURVEYOR ACT, SECTION 8771 OF THE BUSINESS AND PROFESSIONS CODE OF THE STATE OF CALIFORNIA.

MONUMENT PRESERVATION CERTIFICATION

THE PERMITTEE SHALL BE RESPONSIBLE FOR THE COST OF REPLACING ALL SURVEY MONUMENTS DESTROYED BY CONSTRUCTION. IF A VERTICAL CONTROL MONUMENT IS TO BE DISTURBED OR DESTROYED, THE CITY OF SAN DIEGO FIELD SURVEY SECTION SHALL BE NOTIFIED IN WRITING AT LEAST 7 DAYS PRIOR TO DEMOLITION/CONSTRUCTION.

☐ THE TYPE OF CONSTRUCTION WILL NOT AFFECT ANY SURVEY MONUMENTS (THIS LINE IS FOR PROJECTS THAT ARE PROPOSING NO DEMOLITION, TRENCHING, ASSOCIATED WITH A CIP, ETC)

NAME ______________________ DATE ________

PRIOR TO PERMIT ISSUANCE, THE PERMITTEE SHALL RETAIN THE SERVICE OF A PROFESSIONAL LAND SURVEYOR OR CIVIL ENGINEER AUTHORIZED TO PRACTICE LAND SURVEYING WHO WILL BE RESPONSIBLE FOR MONUMENT PRESERVATION AND SHALL PROVIDE A CORNER RECORD OR RECORD OF SURVEY TO THE COUNTY SURVEYOR AS REQUIRED BY THE PROFESSIONAL LAND SURVEYORS ACT, IF APPLICABLE. (SECTION 8771 OF THE BUSINESS AND PROFESSIONS CODE OF THE STATE OF CALIFORNIA)

I HAVE INSPECTED THE SITE AND DETERMINED THAT:

☒ NO SURVEY MONUMENTS WERE FOUND WITHIN THE LIMITS OF WORK
☐ SURVEY MONUMENTS EXISTING IN OR NEAR LIMITS OF WORK WILL BE PROTECTED IN PLACE
☐ SURVEY MONUMENTS HAVE BEEN TIED OUT AND A FINAL OR PARCEL MAP WILL BE FILED (NO CORNER RECORD OR RECORD OF SURVEY WILL BE REQUIRED)
☐ OTHER AGENCY SURVEY MONUMENT (CORNER RECORD OR RECORD OF SURVEY MAY NOT BE REQUIRED). AGENCY HAS BEEN NOTIFIED OF POSSIBLE MONUMENT DESTRUCTION AND A LETTER PROVIDED TO CITY
☐ A DRAFT PRE-CONSTRUCTION CORNER RECORD (OR RECORD OF SURVEY) FOR SURVEY MONUMENTS FOUND WITHIN THE LIMITS OF WORK HAS BEEN FILED.

CORNER RECORD #__________ OR RECORD OF SURVEY #__________

DEAN JOHNSON P.L.S. NO. LS 4878 EXP. 09-30-24 DATE

POST CONSTRUCTION CORNER RECORD (AS-BUILT ITEM)

☐ POST CONSTRUCTION CORNER RECORD FOR SURVEY MONUMENTS DESTROYED DURING CONSTRUCTION AND REPLACED AFTER CONSTRUCTION.

CORNER RECORD #__________ OR RECORD OF SURVEY #__________

DEAN JOHNSON P.L.S. NO. 4878 EXP. 09-30-24 DATE

CONSTRUCTION STORM WATER PROTECTION NOTES

1. TOTAL SITE DISTURBANCE AREA (ACRES): 2.18
   WATERSHED: PUEBLO SAN DIEGO
   HYDRAULIC SUB AREA NAME AND NUMBER: CHOLLAS, 908.22

2. THE PROJECT SHALL COMPLY WITH THE REQUIREMENTS OF THE
   ☐ WPCP
   THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NUMBER R9-2013-0001 AND SUBSEQUENT AMENDMENTS..

   ☒ SWPPP
   THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NUMBER R9-2013-0001 AND CONSTRUCTION GENERAL PERMIT ORDER NUMBER 2009-0009-DWQ AS AMENDED BY ORDER 2010-0014 DWQ AND 2012-0006-DWQ

   TRADITIONAL: RISK LEVEL ☐ 1 ☒ 2 ☐ 3
   LUP: RISK LEVEL ☐ 1 ☐ 2 ☐ 3
   WDID NO:

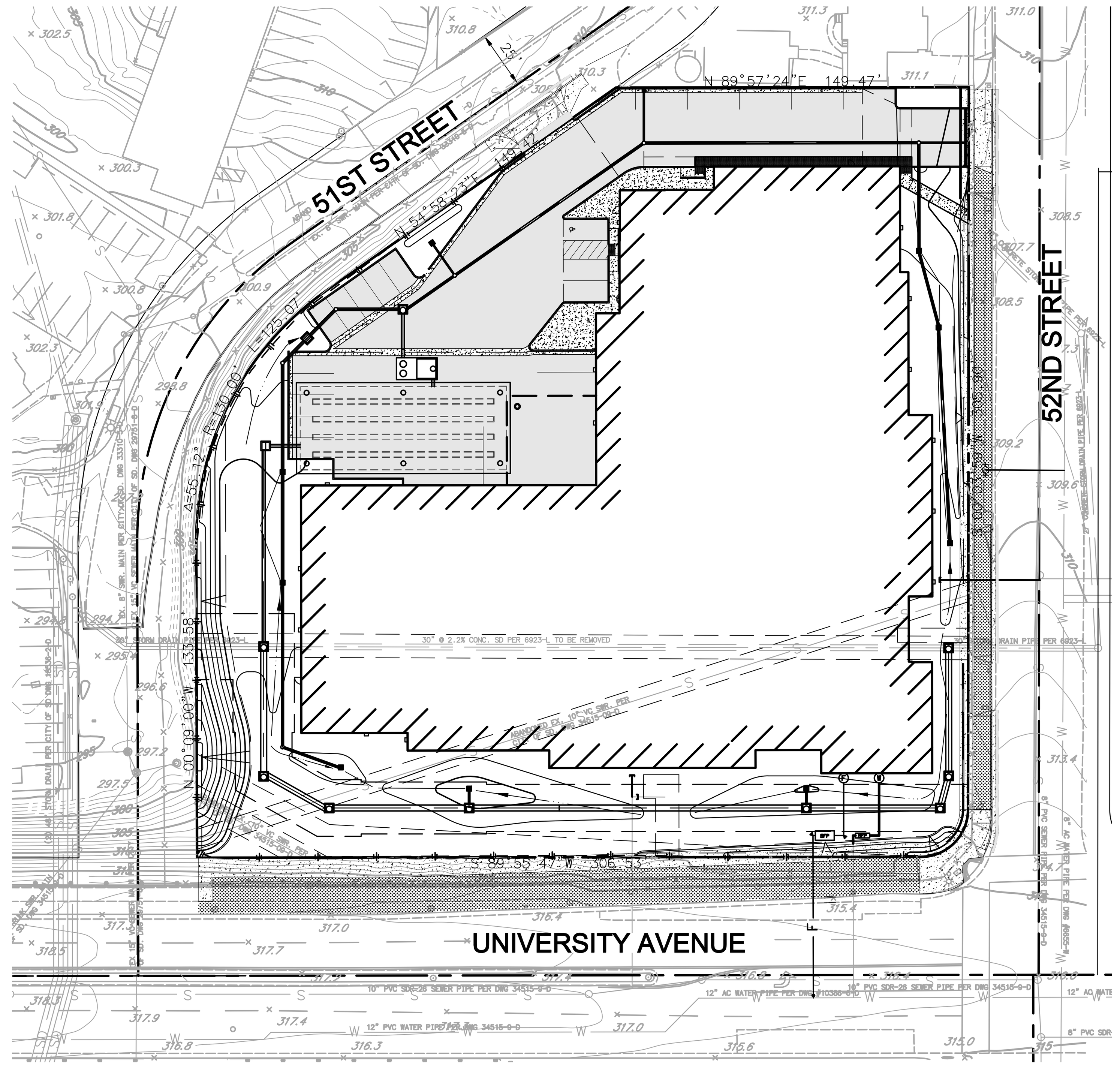
3. CONSTRUCTION SITE PRIORITY
   ☐ ASBS ☐ HIGH ☒ MEDIUM ☐ LOW

SEWER NOTES

1. SEWER LATERALS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THESE PLANS AND THE CURRENT CALIFORNIA PLUMBING CODE.

2. ONLY PVC (POLYVINYL CHLORIDE SDR35) SEWER MAINS AND LATERALS SHALL BE INSTALLED.

3. APPROVAL OF PLANS BY THE CITY DOES NOT CONSTITUTE RESPONSIBILITY FOR ACCURACY OF INFORMATION NOR LOCATIONS OF OTHER EXISTING FACILITIES.



KEY MAP

SCALE: 1"=40'

OWNER/APPLICANT

GEORGE HICKER
15260 VENTURA BLVD, SUITE 1120
SHERMAN OAKS, CA 91403

REFERENCE DRAWINGS

6923-L, 34515-09-D

SITE ADDRESS

5150 UNIVERSITY AVE, SAN DIEGO, CA
92105

TOPOGRAPHY SOURCE

AERIAL TOPOGRAPHY FOR THIS SURVEY IS BY: SAN-LO AERIAL SURVEYS.
JOB NO: 12861, DATED: SEPTEMBER 8, 2006.
AERIAL TOPOGRAPHY HAS BEEN SUPPLEMENTED BY NOVA ENGINEERING FIELD SURVEY ON 7-25-2019

BENCHMARK

SEBP 52ND ST. & UNIVERSITY AVE. ELEVATION 314.926 FEET M.S.L. DATUM

BASIS OF BEARINGS

THE SOUTHERLY LINE OF LOT 1 AS SHOWN ON MAP NO. 9415. I.E. N 87°23'26" E

ASSESSORS PARCEL NUMBER

472-383-04

EXISTING LEGAL DESCRIPTION

BLOCK E, LOTS 3, 4, 5 AND 6, OAK PARK, MAP 1732

SHEET INDEX

SHEET DESCRIPTION	SHEET #
TITLE SHEET	C1.0
EXISTING CONDITIONS AND SLOPE ANALYSIS	C2.0
EASEMENT VACATION AND DEDICATION	C3.0
GRADING AND DRAINAGE PLAN	C4.0
CROSS SECTIONS AND DETAILS	C5.0
POST CONSTRUCTION BMP PLAN	C6.0
STORM DRAIN PROFILE	C7.0
CURB UTILIZATION PLAN	C8.0
LANDSCAPE DEVELOPMENT PLAN	L-1 TO L-5

ZONING

ZONE: CC-5-4
OVERLAY ZONES: TRANSIT AREA OVERLAY ZONE, RESIDENTIAL TANDEM PARKING OVERLAY ZONE

AREAS

GROSS SITE AREA: 94,731 SQ. FT.
FLOOR AREA: 47,486 SQ. FT.
FLOOR AREA RATIO: 0.98

PARKING DATA

PARKING REQUIRED: 17 STALLS
PARKING PROVIDED: 16 STANDARD STALLS
+1 ACCESSIBLE STALL
17 TOTAL STALLS

PROJECT TEAM

CONTRACTOR:
RDS CONTRACTING, INC.
ROBERT STACKS
(619) 577-4010

ARCHITECT:
VALLI ARCHITECTURAL GROUP
ARIEL VALLI
(949) 349-1777

CIVIL ENGINEER:
NOVA ENGINEERING, INC.
MEL LANDY, RCE, PLS
(619) 296-1010

LANDSCAPE ARCHITECT:
AHLES LANDSCAPE ARCHITECTURE
STEVEN AHLES
(858) 756-8963

GEOTECHNICAL ENGINEER:
NOVA SERVICES
JOHN O'BRIEN, PE, GE
(619) 296-1010

PLUMBING ENGINEER:
WALSH ENGINEERS
DAVID PHELPS
(858) 541-0788

PROJECT SCOPE

- EXISTING CONDITIONS: VACANT PROPERTY WITH REMNANT PAVEMENT AREAS, LANDSCAPING, AND UTILITIES.
- PROPOSED DEVELOPMENT: APPROXIMATELY 141,000 SQ. FT. TWO STORY SELF STORAGE BUILDING WITH BASEMENT. DEVELOPMENT INCLUDES ASSOCIATED PAVEMENT, LANDSCAPING, AND UTILITIES
- PROPOSED VARIANCE: SETBACK VARIANCE FROM THE CC-5-4 ZONING REQUIREMENTS ARE PROPOSED ON 2 SIDES OF THE PROPERTY.
- EASEMENT VACATIONS: THREE EASEMENT VACATIONS ARE PROPOSED. SEE SHEET C3.0 FOR EASEMENT INFORMATION.
- DISCRETIONARY APPROVALS SOUGHT:
  - EASEMENT VACATION APPROVAL FOR THE EASEMENTS TO BE VACATED

OCCUPANCY TYPE/ CONSTRUCTION TYPE

PER THE CALIFORNIA BUILDING CODE, THE OCCUPANCY CLASS IS S-1 - STORAGE AND B - OFFICE. THE CONSTRUCTION TYPE IS II-B

USES

EXISTING USE: VACANT
PROPOSED USE: SELF-STORAGE BUILDING

DECLARATION OF RESPONSIBLE CHARGE

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

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

MELLOR R. LANDY R.C.E. NO. 81085 EXP. 09-30-25 DATE

REGISTERED PROFESSIONAL ENGINEER MELLOR R. LANDY No. 81085 Exp. 09-30-25 CIVIL STATE OF CALIFORNIA

ABBREVIATIONS

AC/ASPH	ASPHALT PAVING	LP	LOW POINT
APPX	APPROXIMATELY	MAX	MAXIMUM
BLDG	BUILDING	MH	MANHOLE
CB	CATCH BASIN	MIN	MINIMUM
CL	CENTERLINE	NTS	NOT TO SCALE
CO	CLEANOUT	NO	NUMBER
EL/ELEV	ELEVATION	PVT	PRIVATE
DI	DUCTILE IRON	R	RADIUS
FG	FINISHED GRADE	RIM	RIM
FS	FINISHED SURFACE	R/W	RIGHT OF WAY
FH	FIRE HYDRANT	SD	STORM DRAIN
FL	FLOW LINE	S	SEWER
GB	GRADE BREAK	SHT	SHEET
H	HEIGHT	TG	TOP OF GRATE
HP	HIGH POINT	TP	TOP OF PIPE
IE	INVERT ELEVATION	TYP	TYPICAL
L	LENGTH	W	WATER

EXISTING UTILITY DISCLAIMER

PRIVATE ENGINEER'S NOTE TO CONTRACTOR

THE EXISTENCE AND LOCATIONS OF UTILITY PIPES, CONDUITS, STRUCTURES, POLES, WIRES, OR ANY OTHER FACILITIES SHOWN ON THESE DRAWINGS WERE OBTAINED BY A SEARCH OF AVAILABLE RECORDS AND ARE INDICATED HEREON WITH THEIR APPROXIMATE LOCATION(S). THE ENGINEER OF WORK MAKES NO GUARANTEES OR WARRANTIES THAT THE UTILITIES SHOWN COMPRISE ALL UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF THE LOCATION OF ALL UTILITIES, WHETHER SHOWN ON THESE PLANS OR NOT, PRIOR TO START OF CONSTRUCTION AND NOTIFY THE ENGINEER OF WORK OF ANY DISCREPANCIES. THE CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SITE AND BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES AND/OR ANY ASSOCIATED APPURTENANCES RESULTING DIRECTLY OR INDIRECTLY FROM THEIR OPERATIONS, WHETHER OR NOT SUCH FACILITIES ARE SHOWN ON THESE PLANS.

THE CONTRACTOR, BY ACCEPTING THESE PLANS AND/OR PROCEEDING WITH THE IMPROVEMENTS HEREON, AGREES TO ASSUME SOLE LIABILITY AND HOLD THE ENGINEER OF WORK HARMLESS FOR ANY DAMAGES RESULTING FROM OR TO THE EXISTING UTILITIES.

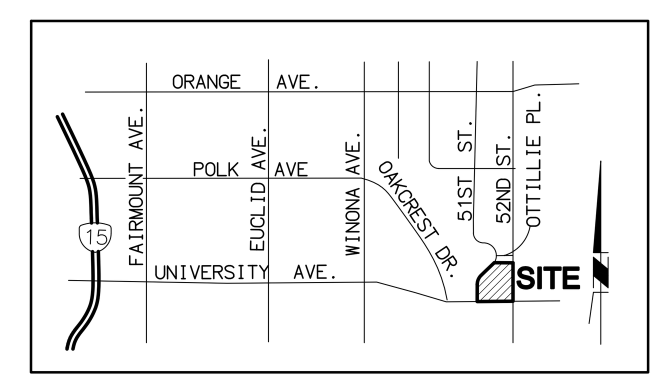
"DIG ALERT NOTICE"
SECTION 4216 OF THE CALIFORNIA GOVERNMENT CODE REQUIRES THAT A DIG ALERT IDENTIFICATION NUMBER BE ISSUED BEFORE A "PERMIT TO EXCAVATE" WILL BE VALID. FOR YOUR DIG ALERT I.D. NUMBER, CALL UNDERGROUND SERVICE ALERT AT 8-1-1 AT LEAST TWO WORKING DAYS BEFORE YOU DIG.

COORDINATION NOTE

1. ALL GRADING REQUIREMENTS ARE ADDRESSED UNDER PTS 668875, DWG NO. 42015-6-D.
2. ALL PUBLIC IMPROVEMENT REQUIREMENTS ARE ADDRESSED UNDER PTS 668875, APPROVAL NUMBER 2442765.
3. ALL CONSTRUCTION BMP REQUIREMENTS ARE ADDRESSED UNDER PTS 668875, WDID NO. XXXXX.
4. ALL POST-CONSTRUCTION BMP'S ARE ADDRESSED UNDER PTS 668875, SWMDCMA APPROVAL NO. XXXXX.

AREA CALCULATIONS

TOTAL DISTURBANCE AREA: 94,731 SF
EXISTING AMOUNT OF IMPERVIOUS AREA: 89,507 SF
PROPOSED AMOUNT OF "CREATED" IMPERVIOUS AREA: 903 SF
PROPOSED AMOUNT OF "REPLACED" IMPERVIOUS AREA: 66,698 SF
TOTAL PROPOSED IMPERVIOUS AREA: 67,601 SF



VICINITY MAP

N.T.S

MELLOR R. LANDY R.C.E. NO. 81085 EXP. 09-30-25 DATE

REGISTERED PROFESSIONAL ENGINEER MELLOR R. LANDY No. 81085 Exp. 09-30-25 CIVIL STATE OF CALIFORNIA

NOVA
NOVA ENGINEERING, INC.
4373 VIEWRIDGE AVE
SUITE A
SAN DIEGO, CA 92123
PHONE: (619) 296-1010

CLIENT
UNIVERSITY LLC

PROJECT TITLE
UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
CIVIL NOTES

DELTA	REVISION	DATE
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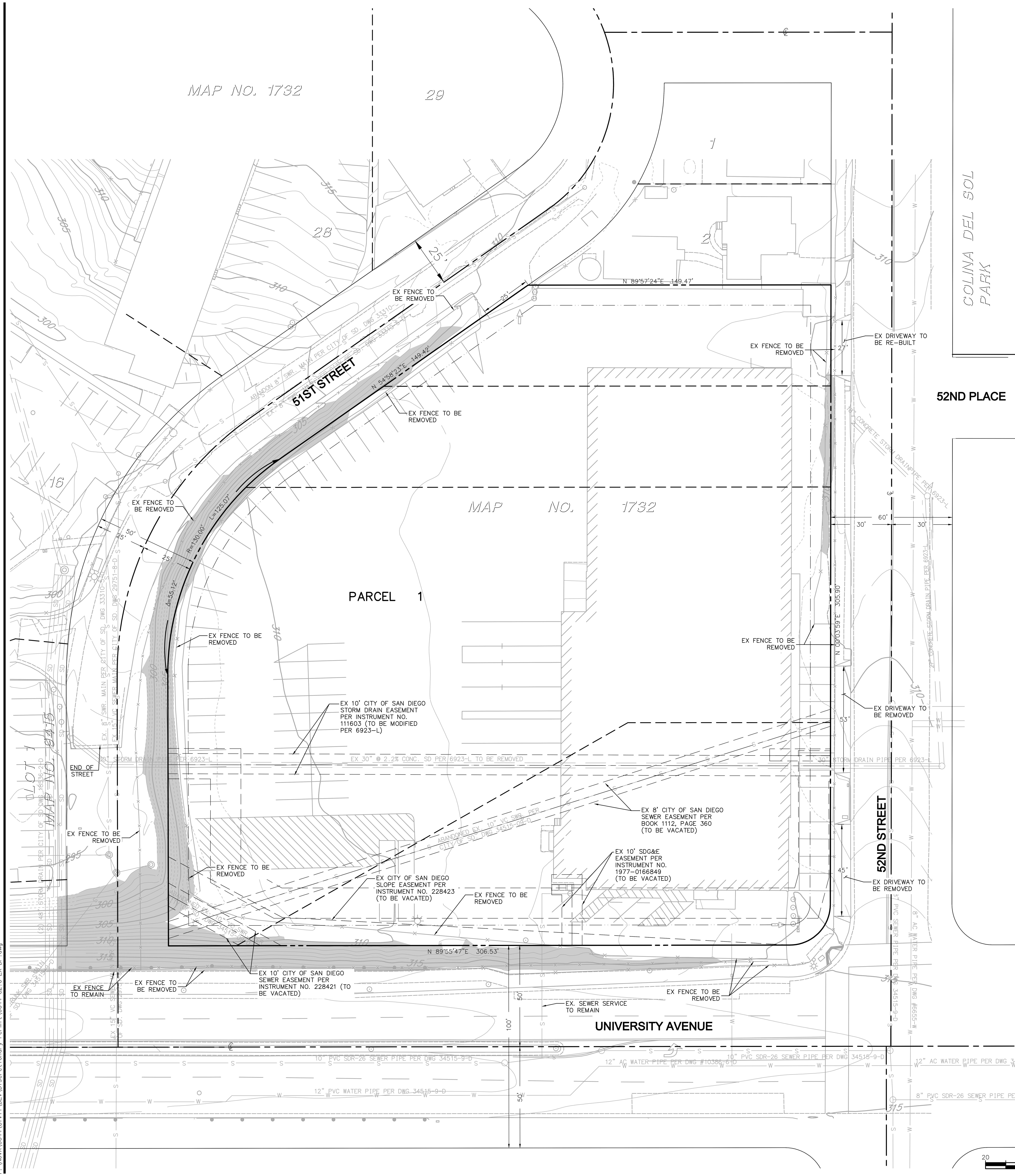
DRAWN/CHK BY:

DATE: 07/28/2023

JOB NO.:

C-1.0



LEGEND

EXISTING IMPROVEMENTS — SYMBOL

- EX WATER — W
- EX SEWER — S
- EX STORM DRAIN — SD
- EX GAS — G
- EX COMMUNICATION — COMM
- EX FENCE
- EX GUARDRAIL
- EX CABLE/TELEVISION — CATV
- EX CONTOUR — 340
- EX BUILDING
- EX SPOT ELEVATION — x (344.7±)
- PROPERTY/RIGHT-OF-WAY LINE
- SETBACK
- EASEMENT
- EX LOT LINES
- EX ROAD CENTERLINE
- SLOPE OVER 25% (4H:1V)
- DEMOLISH EX FENCE

GENERAL NOTES

1. THE AREA WITHIN THIS SURVEY : PARCEL 1 = 94,732 S.F. (2.145 AC.)
2. THE BENCHMARK FOR THIS SURVEY IS: SEBP 52ND ST. & UNIVERSITY AVE. ELEVATION 314.926 FEET M.S.L. DATUM
3. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE SOUTHERLY LINE OF LOT 1 AS SHOWN ON MAP NO. 9415. I.E. N 87°23'26"E
4. AERIAL TOPOGRAPHY FOR THIS SURVEY IS BY: SAN-LO AERIAL SURVEYS JOB NO.: 12861 DATED: SEPTEMBER 8, 2006 AERIAL TOPOGRAPHY HAS BEEN SUPPLEMENTED BY NOVA ENGINEERING FIELD SURVEY ON 7-25-2019, AND 10-29-2020.
5. THE PROPERTY LIES WITHIN FEMA FLOOD ZONE X (AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN) PER FIRM COMMUNITY PANEL NO. 06073C1902G, EFFECTIVE MAY 16, 2012.

STEEP SLOPES ANALYSIS

NO SLOPES WITHIN OR ADJACENT TO THE DISTURBANCE AREA MEET THE CRITERIA TO BE CONSIDERED STEEP SLOPES.

DRAINAGE CONVEYANCE NOTE

1. EXISTING SITE DRAINAGE PRIMARILY CONSISTS OF SHEET FLOW ACROSS EXISTING IMPERVIOUS SURFACES TOWARDS 51ST STREET (SITE FLOWS FROM EAST TO WEST)

NOVA

NOVA ENGINEERING, INC.
4373 VIEWRIDGE AVE
SUITE A
SAN DIEGO, CA 92123
PHONE: (619) 296-1010

CLIENT
UNIVERSITY LLC

PROJECT TITLE
UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
EXISTING CONDITIONS, DEMOLITION PLAN AND SLOPE ANALYSIS

DELTA	REVISION	DATE

DRAWN/CHK BY:

DATE: 07/28/2023

JOB NO.:

C-2.0

MELLOR R. LANDY — R.C.E. NO. 81085 — EXP. 09-30-25 — DATE

REGISTERED PROFESSIONAL ENGINEER — MELLOR R. LANDY — No. 81085 — Exp. 09-30-25 — CIVIL — STATE OF CALIFORNIA

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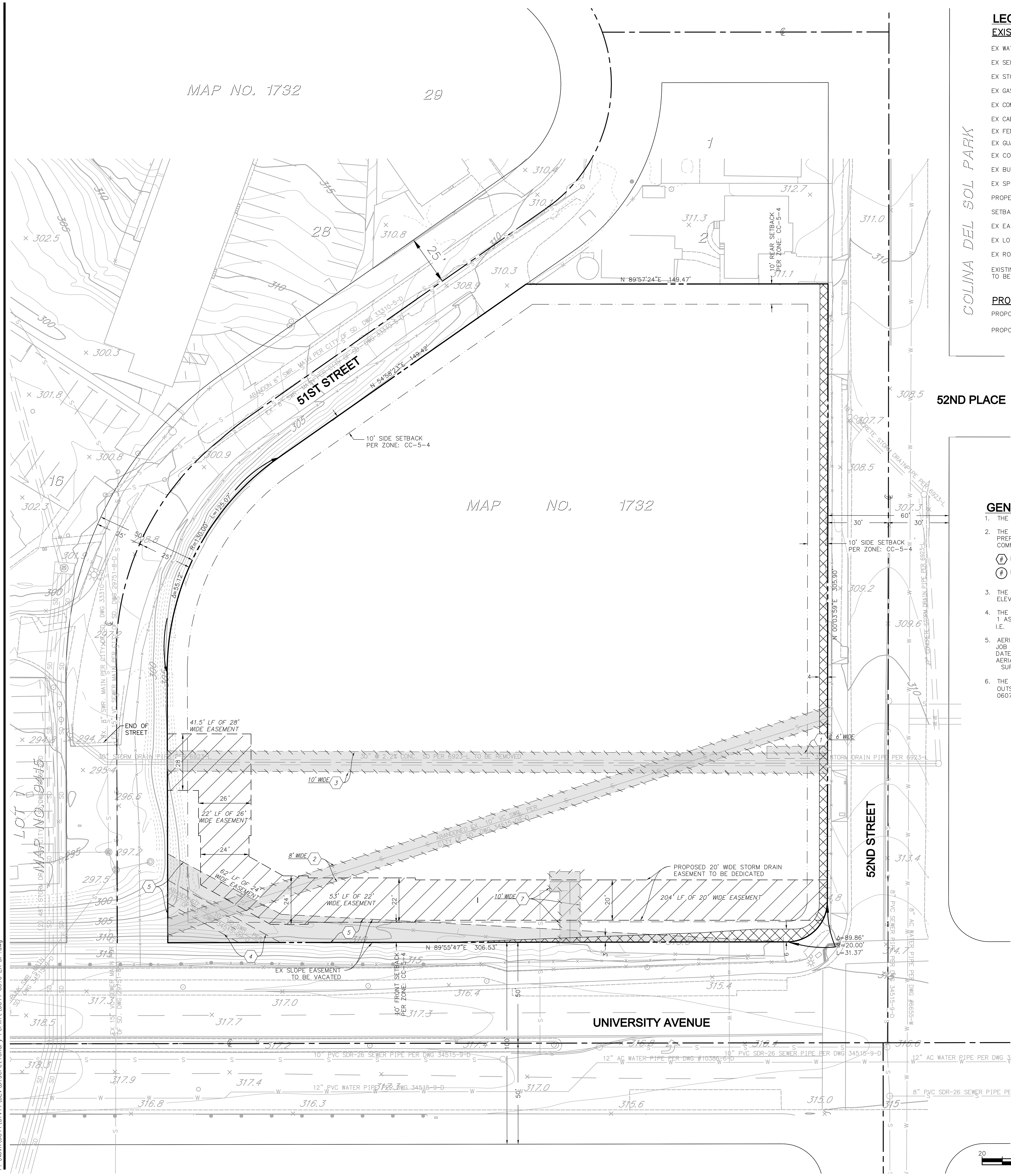

LEGEND

EXISTING IMPROVEMENTS

	SYMBOL
EX WATER	W
EX SEWER	S
EX STORM DRAIN	SD
EX GAS	G
EX COMMUNICATION	COMM
EX CABLE/TELEVISION	CATV
EX FENCE	
EX GUARDRAIL	
EX CONTOUR	340
EX BUILDING	
EX SPOT ELEVATION	(344.75)
PROPERTY/RIGHT-OF-WAY LINE	
SETBACK	
EX EASEMENT	
EX LOT LINES	
EX ROAD CENTERLINE	
EXISTING EASEMENT TO BE VACATED	

PROPOSED IMPROVEMENTS

PROPOSED DEDICATION	
PROPOSED EASEMENT	

GENERAL NOTES

1. THE AREA WITHIN THIS SURVEY : PARCEL 1 = 94,732 S.F. (2.145 AC.)
2. THE FOLLOWING COMMITMENT FOR TITLE INSURANCE WAS USED IN PREPARATION OF THIS PLAN: FIRST AMERICAN TITLE INSURANCE COMPANY COMMITMENT NO. NCS-1030735-CHI2, EFFECTIVE DATE SEPTEMBER 18 2020

   ⟨#⟩ REFERS TO THE PLOTTED ITEM NUMBERS IN SAID COMMITMENT REPORT.

   (#) REFERS TO THE NON-PLOTTABLE ITEM NUMBERS IN SAID COMMITMENT REPORT.
3. THE BENCHMARK FOR THIS SURVEY IS: SEBP 52ND ST. & UNIVERSITY AVE. ELEVATION 314.926 FEET M.S.L. DATUM
4. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE SOUTHERLY LINE OF LOT 1 AS SHOWN ON MAP NO. 9415. I.E. N 87°23'26"E
5. AERIAL TOPOGRAPHY FOR THIS SURVEY IS BY: SAN-LO AERIAL SURVEYS
   JOB NO.: 12861
   DATED: SEPTEMBER 8, 2006
   AERIAL TOPOGRAPHY HAS BEEN SUPPLEMENTED BY NOVA ENGINEERING FIELD SURVEY ON 7-25-2019, AND 10-29-2020.
6. THE PROPERTY LIES WITHIN FEMA FLOOD ZONE X (AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN) PER FIRM COMMUNITY PANEL NO. 06073C1902G, EFFECTIVE MAY 16, 2012.

LEGAL DESCRIPTION

PARCEL 1:
LOTS 3, 4, 5 AND 6, BLOCK E OF OAK PARK, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 1732, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, JUNE 22, 1922.

EXCEPTING THEREFROM THAT PORTION OF SAID LAND WHICH LIES SOUTHERLY OF A LINE DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE EASTERLY LINE OF SAID LOT 6, DISTANT THEREON NORTH 00 ° 00'30"WEST, 40.01 FEET FROM THE SOUTHEASTERLY CORNER OF SAID LOT 6, SAID POINT ALSO BEING THE BEGINNING OF A TANGENT 20.00 FOOT RADIUS CURVE, CONCAVE NORTHWESTERLY A RADIAL OF WHICH SAID CURVE BEARS NORTH 89°59'30" EAST TO SAID POINT; THENCE SOUTHERLY, SOUTHWESTERLY AND WESTERLY, ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 90°02'00", A DISTANCE OF 31.43 FEET; THENCE NORTH 89°58'30"WEST, 306.06 FEET TO A TERMINUS IN AN INTERSECTION WITH THE WESTERLY LINE OF SAID LOT 5.

ASSESSOR'S PARCEL NO.: 472-383-04-00

ADDRESS: 5150 UNIVERSITY AVENUE, SAN DIEGO, CA

PLOTTABLE ITEMS:

⟨1.⟩ AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT

GRANTED TO: CITY OF SAN DIEGO
PURPOSE: DRAIN PIPE OR CULVERT
RECORDED: JULY 11, 1929 IN BOOK 1658, OF DEEDS, PAGE 217

AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

⟨2.⟩ AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT

GRANTED TO: CITY OF SAN DIEGO
PURPOSE: PUBLIC SEWER
RECORDED: JANUARY 13, 1941 IN BOOK 1112, PAGE 360 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

⟨3.⟩ AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT

GRANTED TO: CITY OF SAN DIEGO
PURPOSE: STORM DRAIN OR DRAINS
RECORDED: JUNE 29, 1961 AS INSTRUMENT NO. 111603 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

⟨4.⟩ AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT

GRANTED TO: CITY OF SAN DIEGO
PURPOSE: A PUBLIC SEWER OR SEWERS
RECORDED: DECEMBER 24, 1963 AS INSTRUMENT NO. 228421 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

⟨5.⟩ AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT

GRANTED TO: CITY OF SAN DIEGO
PURPOSE: A RIGHT OF WAY FOR AN EARTH EXCAVATION OR EMBANKMENT, SLOPES OR SLOPES
RECORDED: DECEMBER 24, 1963 AS INSTRUMENT NO. 228423 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

⟨7.⟩ AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT

GRANTED TO: SAN DIEGO GAS & ELECTRIC COMPANY
PURPOSE: PUBLIC UTILITIES, INGRESS AND EGRESS
RECORDED: MAY 3, 1977 AS INSTRUMENT NO. 1977-0166849 OF OFFICIAL RECORDS
AFFECTS: SAID LAND MORE PARTICULARLY DESCRIBED THEREIN.

NON-PLOTTABLE ITEMS:

(6.) MATTERS CONTAINED IN THAT CERTAIN DOCUMENT
ENTITLED: A RESOLUTION NO. 217940 ESTABLISHING AN UNDERGROUND UTILITY DISTRICT TO BE KNOWN AND DENOMINATED AS THE UNIVERSITY AVENUE (54TH STREET TO WINONA AVENUE) UNDERGROUND UTILITY DISTRICT

RECORDING DATE: MARCH 25, 1977
RECORDING NO: 1977-0110526 OF OFFICIAL RECORDS

(8.) THE LAND DESCRIBED HEREIN IS INCLUDED WITHIN A PROJECT AREA OF THE REDEVELOPMENT AGENCY SHOWN BELOW, AND THAT PROCEEDINGS FOR THE REDEVELOPMENT OF SAID PROJECT HAVE BEEN INSTITUTED UNDER THE REDEVELOPMENT LAW (SUCH REDEVELOPMENT TO PROCEED ONLY AFTER THE ADOPTION OF THE REDEVELOPMENT PLAN) AS DISCLOSED BY A DOCUMENT.

REDEVELOPMENT AGENCY: THE REDEVELOPMENT AGENCY OF THE CITY OF SAN DIEGO
RECORDING DATE: MAY 22, 1992
RECORDING NO: 1992-0314187 OF OFFICIAL RECORDS

AND RECORDING DATE: APRIL 29, 1996
AND RECORDING NO: 1996-0211859 OF OFFICIAL RECORDS

AND RECORDING DATE: JULY 16, 2007
AND RECORDING NO: 2007-0474324 OF OFFICIAL RECORDS

(9.) DISCREPANCIES, CONFLICTS IN BOUNDARY LINES, SHORTAGE IN AREA, ENCROACHMENTS, OR ANY OTHER MATTERS SHOWN ON

MAP: RECORD OF SURVEY NO. 19654

(10.) MATTERS CONTAINED IN THAT CERTAIN DOCUMENT
ENTITLED: AGREEMENT BETWEEN THE CITY AND THE PRIVATE PROPERTY OWNER
TO PROVIDE CONSTRUCTION OF PRIVATE SEWER LATERAL

RECORDING DATE: JANUARY 25, 2011
RECORDING NO: 2011-0046269 OF OFFICIAL RECORDS

NOVA
ENGINEERING, INC.
4373 VIEWRIDGE AVE
SUITE A
SAN DIEGO, CA 92123
PHONE: (619) 296-1010

CLIENT
UNIVERSITY LLC

PROJECT TITLE
UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
EASEMENT VACATION AND DEDICATION

DELTA	REVISION	DATE:
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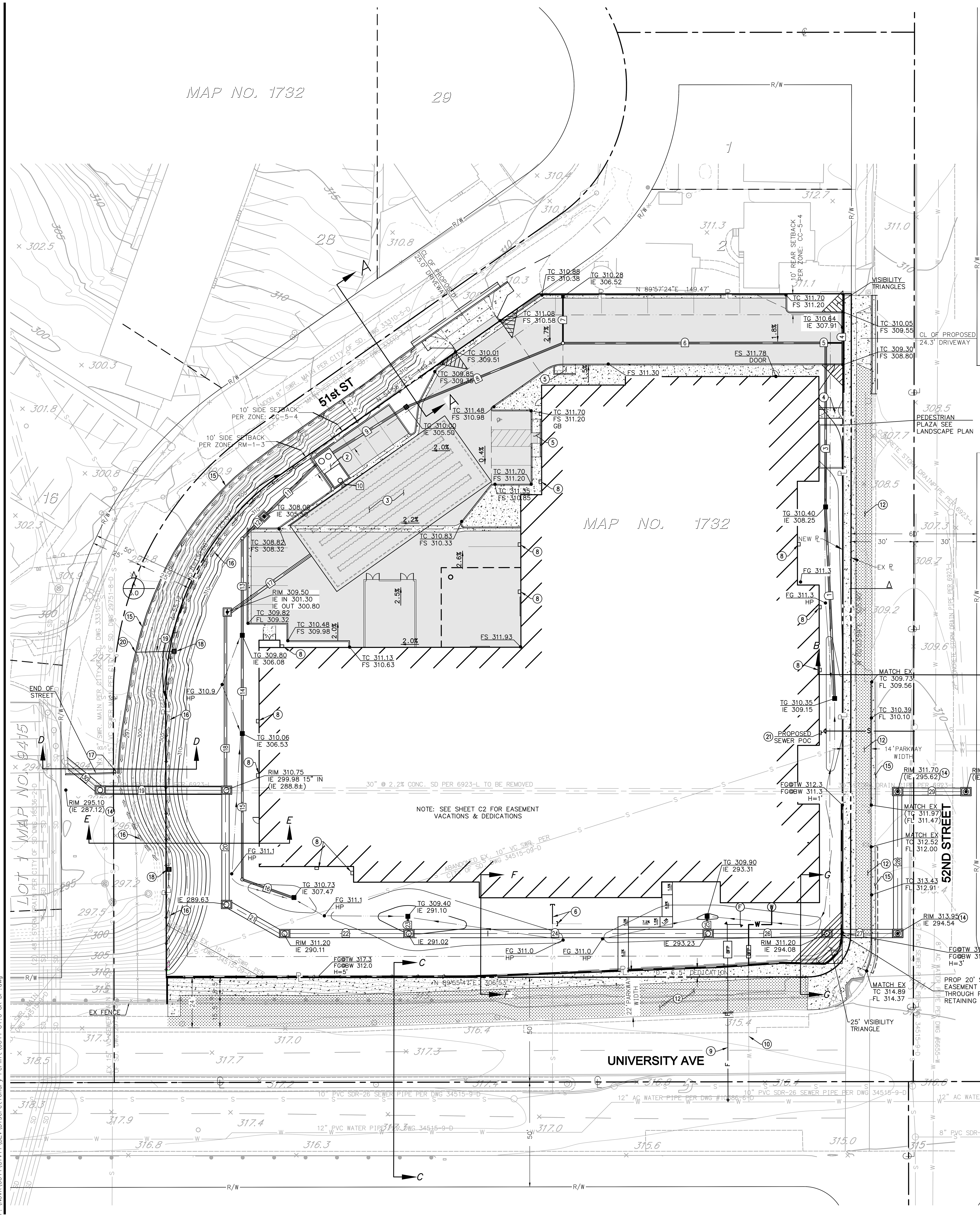
DRAWN/CHK BY:
DATE: 07/28/2023
JOB NO.:

C-3.0

MELLOR R. LANDY R.C.E. NO. 81085 EXP. 09-30-25 DATE



LEGEND

EXISTING IMPROVEMENTS

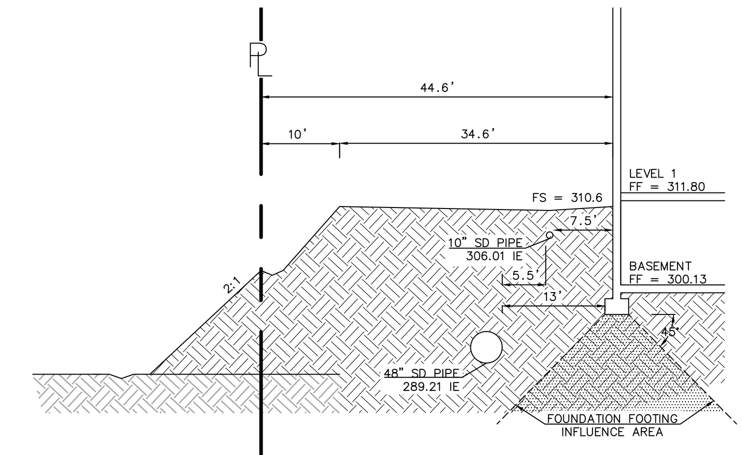
	Symbol
EX WATER	W
EX SEWER	S
EX STORM DRAIN	SD
EX GAS	G
EX COMMUNICATION	COMM
EX CABLE/TELEVISION	CATV
EX FENCE	
EX GUARDRAIL	
EX CONTOUR	340
EX BUILDING	
EX SPOT ELEVATION	(344.7±)
PROPERTY/RIGHT-OF-WAY LINE	
SETBACKS	

PROPOSED IMPROVEMENTS

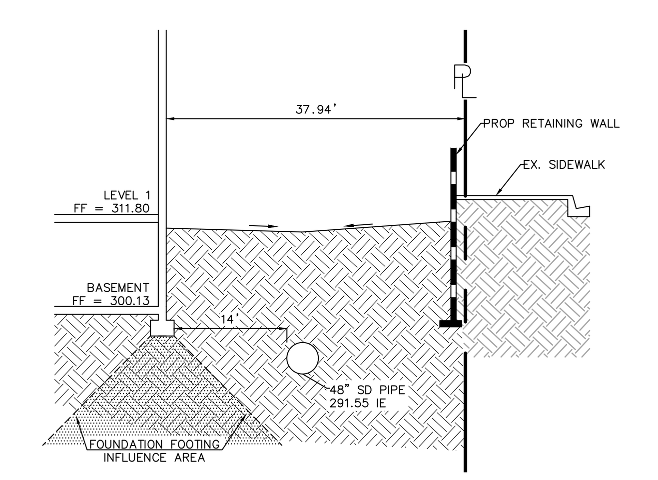
IMPROVEMENT	REFERENCE	SYMBOL
PROP BUILDING		
FINISH SPOT ELEVATION		FS 310.30
MATCH EXISTING SPOT ELEVATION		(FS 308.80)
FINISH MINOR CONTOUR		311
FINISH MAJOR CONTOUR		310
GRADE BREAK		GB
LIMITS OF GRADING (DAYLIGHT LINE)		
ACCESSIBLE PATH OF TRAVEL		
PROPOSED EASEMENT		
PROP CONCRETE PAVING	SDG-155	
PROP AC PAVING		
PROP TRUNCATED DOMES	SDG-130	
PROP CURB		
PROP CURB AND GUTTER		
PROP RETAINING WALL		
PROP EARTHEN SWALE		
PROP FLOW ARROW		
PROP TYPE A-4 CLEANOUT	D-09	
PROP CATCH BASIN		
PROP STORM DRAIN CLEANOUT		
PROP STORM DRAIN		
PROP TRENCH DRAIN		
PROP WEIR STRUCTURE	PER SEPARATE GRADING PERMIT	
PROP MODULAR WETLAND SYSTEM	PER SEPARATE GRADING PERMIT	

WATER FLOW DATA

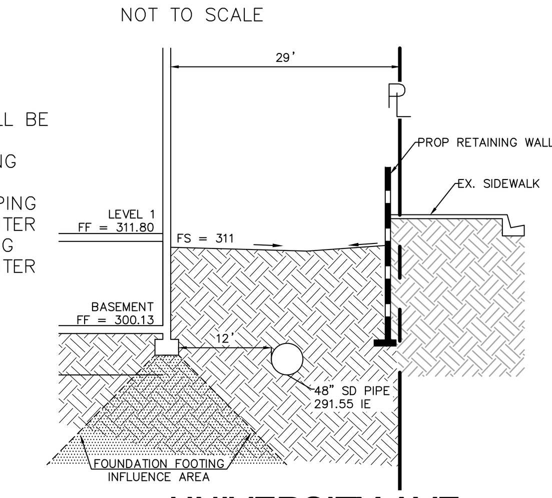
STATIC:	84.0 PSI
RESIDUAL:	73.0 PSI
FLOW:	1329 GPM
DATE:	03/27/2020
BY:	CITY OF SAN DIEGO DEVELOPMENT SERVICES



51ST STREET SECTION E-E
NOT TO SCALE



UNIVERSITY AVE SECTION F-F
NOT TO SCALE



UNIVERSITY AVE SECTION G-G
NOT TO SCALE

EMRA NOTE

THE FOLLOWING ITEMS SHALL BE INCLUDED IN AN EMRA.

- PVT STORM DRAIN PIPING AND CONNECTIONS.
- PVT WATER SERVICE PIPING AND BACKFLOW PREVENTER
- PVT FIRE SERVICE PIPING AND BACKFLOW PREVENTER
- PVT RAMP
- PVT DOOR

SCALE: 1"=20' (20 0 20 40 60)

GRADING AND DRAINAGE NOTES

1. NOT USED
2. PROPOSED MODULAR WETLAND SYSTEM MWS-L-8-16-6'-6"-V-UG UNIT PER DETAIL C ON SHEET 5.0
3. PROPOSED IMP-2 48" UNDERGROUND STORAGE SYSTEM (V=8767 CF) PER DETAIL D ON SHEET 5.0
4. PROPOSED ACCESSIBLE PATH OF TRAVEL FROM THE BUILDING TO THE RIGHT-OF-WAY (52ND STREET)
5. INSTALL MODIFIED TYPE C-1 CURB RAMP PER CITY OF SAN DIEGO STANDARD DRAWING SDG-135
6. CAP EXISTING SEWER LATERAL
7. PROPOSED SPLASH PAD UNDERNEATH ROOF DRAIN
8. PROPOSED ROOF DRAIN
9. PROPOSED 6" PVC FIRE SERVICE
10. EXISTING 1" PVC DOMESTIC SERVICE AND EXISTING WATER METER TO REMAIN
12. PROPOSED LANDSCAPE PER PARKWAY REQUIREMENTS
13. EXISTING 10' STORM DRAIN EASEMENT TO BE REMOVED
14. PROPOSED TYPE B5 MANHOLE PER D-10
15. PROPOSED CURB AND GUTTER PER SDG-150
16. PROPOSED BROW DITCH PER SDD-106. TYPE 'B'
17. PROPOSED 1' WIDE CURB OPENING
18. PROPOSED 8" X 8" DRAIN INLET
19. PROPOSED 3" PVC STORM DRAIN PIPE
20. PROPOSED 3" DIAMETER CURB CORE
21. PROPOSED PVT SEWER LATERAL PER EMRA

STORM DRAIN DATA TABLE

NO	BEARING/DELTA	LENGTH	SLOPE	NOTE
1	N03°04'54"W	90.20'	1.0%	10" PVC
3	N00°03'35"E	77.49'	1.0%	10" PVC
4	N00°04'00"E	24.30'	--	6" WIDE TRENCH DRAIN
5	N89°57'48"W	19.65'	1.0%	6" PVC
6	N89°55'47"E	116.45'	1.0%	10" PVC
7	N00°00'00"W	22.19'	1.0%	6" PVC
8	N67°50'06"E	79.68'	1.0%	12" PVC
9	N57°55'52"E	40.30'	1.0%	6" PVC
10	N35°01'41"W	2.5'	1.0%	15" PVC
11	N45°14'49"E	34.00'	1.0%	15" PVC
12	N44°43'21"E	13.30'	1.0%	15" PVC
13	N00°00'00"E	45.63'	1.0%	12" PVC
14	N00°00'00"E	45.73'	1.0%	12" PVC
15	N00°00'00"E	69.05'	1.0%	10" PVC
16	N70°12'40"W	25.43'	1.0%	10" PVC
17	N00°00'00"E	81.94'	1.0%	15" PVC
18	N90°00'00"E	26.94'	1.0%	12" PVC
19	N89°53'34"W	57.83'	1.5%	48" RCP PUB.
20	N00°00'00"W	50.80'	1.5%	48" RCP PUB.
21	N60°28'22"W	29.60'	1.5%	48" RCP PUB.
22	N89°59'57"E	55.22'	1.5%	48" RCP PUB.
23	N00°00'02"W	5.19'	1.0%	6" PVC
24	N89°59'57"E	138.80'	1.5%	48" RCP PUB.
25	N00°00'02"W	5.20'	1.0%	6" PVC
26	N89°59'58"E	52.69'	1.5%	48" RCP PUB.
27	N89°59'58"E	29.75'	1.5%	48" RCP PUB.
28	N00°00'00"E	63.75'	1.6%	48" RCP PUB.
29	N89°53'31"W	27.62'	3.3%	48" RCP PUB.
30	N50°27'05"W	20.17'	1.6%	48" RCP PUB.

GENERAL NOTES

1. THE AREA WITHIN THIS SURVEY : PARCEL 1 = 94,732 S.F. (2.145 AC.)
2. THE BENCHMARK FOR THIS SURVEY IS: SEBP 52ND ST. & UNIVERSITY AVE. ELEVATION 314.926 FEET M.S.L. DATUM
3. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE SOUTHERLY LINE OF LOT 1 AS SHOWN ON MAP NO. 9415. I.E. N 87°23'26"E
4. AERIAL TOPOGRAPHY FOR THIS SURVEY IS BY: SAN-LO AERIAL SURVEYS JOB NO.: 12861 DATED: SEPTEMBER 8, 2006 AERIAL TOPOGRAPHY HAS BEEN SUPPLEMENTED BY NOVA ENGINEERING FIELD SURVEY ON 7-25-2019, AND 10-29-2020.
5. NO OBSTRUCTION INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PER SDMC SECTION 142.0409 (B)(2), PLANT MATERIAL, OTHER THAN TREES, LOCATED WITHIN VISIBILITY AREAS OR THE ADJACENT PUBLIC RIGHT-OF-WAY SHALL NOT EXCEED 36 INCHES IN HEIGHT, MEASURED FROM THE LOWEST GRADE ABUTTING
6. THE PROPERTY LIES WITHIN FEMA FLOOD ZONE X (AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN) PER FIRM COMMUNITY PANEL NO. 06073C1902G, EFFECTIVE MAY 16, 2012.
7. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER.PERMITTEE SHALL ENTER INTO A MAINTENACE AGREEMENT FOR THE ONGIONG PERMANENT BMP MAINTENACE, SATISFACTORY TO THE CITY ENGINEER.
8. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICESNECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
9. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT THE OWNER/PERMITTEESHALL SUBMIT A WATER POLLUTION CONTROL PLAN (WPCP) THE WPCP. THE WPCP SHALL BE PREPARED IN ACCORDANCE WITH TEH GUIDELINES IN PART 2 CONSTRUCTION BMP STANDARDS CHAPTER 4 OF THE CITY'S STORM WATER STANDARDS.
10. IF A 3" OR LARGER METER IS REQUIRED FOR THIS PROJECT, THE OWNER/PERMITTEE SHALL CONSTRUCT THE NEW METER AND PRIVATE BACKFLOW DEVICE ON SITE, ABOVE GROUND, WITHIN AN ADEQUATELY SIZED WATER EASEMENT, IN A MANNER SATISFACTORY TO THE PUBLIC UTILITIES DIRECTOR AND THE CITY ENGINEER.
11. UTILIZATION OF EXISTING SEWER LATERALS IS AT THE SOLE RISK AND RESPONSIBILITY OF THE DEVELOPER TO ENSURE THE LATERALS ARE FUNCTIONAL AND CONNECTED TO A PUBLIC SEWER FACILITY. PRIOR TO CONNECTING TO ANY EXISTING SEWER LATERAL, THE LATERAL SHALL BE INSPECTED USING A CLOSED-CIRCUIT TELEVISION (CCTV) BY A CALIFORNIA LICENSED PLUMBING CONTRACTOR TO VERIFY THE LATERAL IS IN GOOD WORKING CONDITION AND FREE OF ALL DEBRIS.
12. REFER TO SHEET C3 FOR EASEMENT VACATION AND DEDICATIONS INFORMATION.

GRADING QUANTITIES

GRADED AREA:	2.17 ACRES	MAX. CUT DEPTH:	15 FT
CUT QUANTITIES:	29,200 CYD	MAX CUT SLOPE RATIO:	1:1 MAX
FILL QUANTITIES:	105 CYD	MAX. FILL DEPTH:	1 FT
EXPORT:	29,095 CYD	MAX FILL SLOPE RATIO:	2:1 MAX

*THIS PROJECT PROPOSES TO EXPORT 29,095 CUBIC YARDS OF MATERIAL FROM THIS SITE. ALL EXPORT MATERIAL SHALL BE DISCHARGED TO A LEGAL DISPOSAL SITE. THE APPROVAL OF THIS PROJECT DOES NOT ALLOW PROCESSING AND SALE OF THE MATERIAL. ALL SUCH ACTIVITIES REQUIRE A SEPARATE CONDITIONAL USE PERMIT.

*NO UNDOCUMENTED FILL IS TO REMAIN ONSITE UPON COMPLETION OF GRADING.

MELLOR R. LANDY   R.C.E. NO. 81085   EXP. 09-30-25   DATE

REGISTERED PROFESSIONAL ENGINEER · MELLOR R. LANDY · No. 81085 · Exp. 09-30-25 · CIVIL · STATE OF CALIFORNIA

NOVA
NOVA ENGINEERING, INC.
4373 VIEWRIDGE AVE
SUITE A
SAN DIEGO, CA 92123
PHONE: (619) 296-1010

CLIENT
UNIVERSITY LLC

PROJECT TITLE
UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
GRADING AND DRAINAGE PLAN

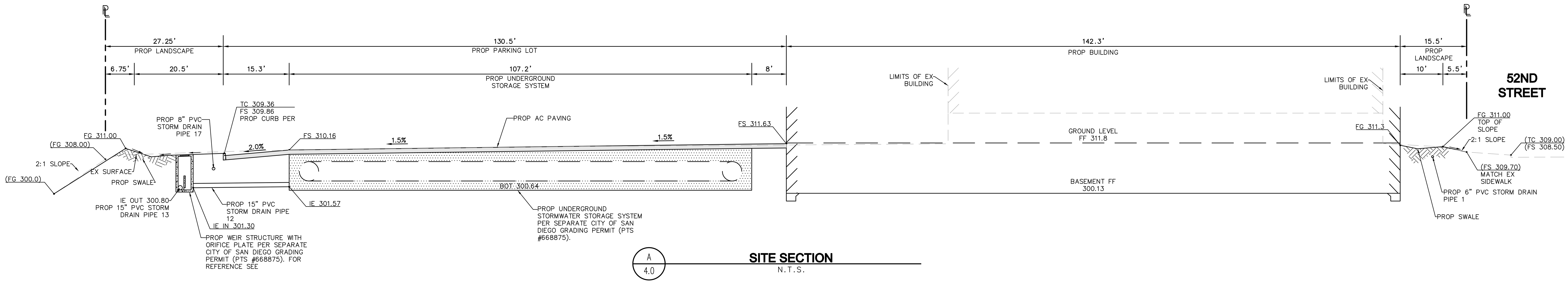
DELTA	REVISION	DATE

DRAWN/CHK BY:

DATE: 07/28/2023

JOB NO.:

C-4.0



A
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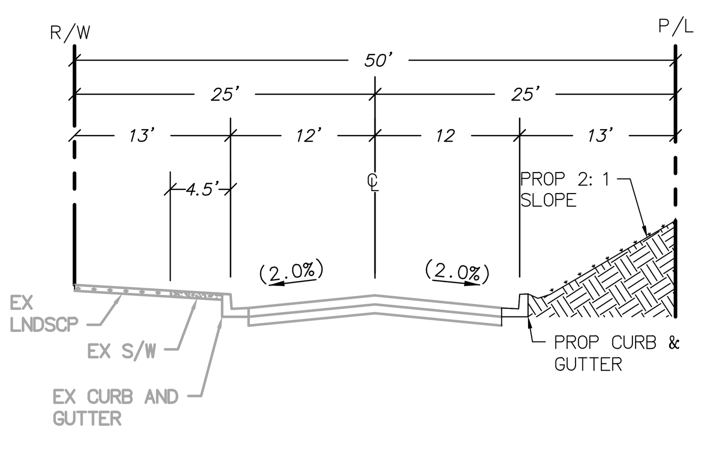
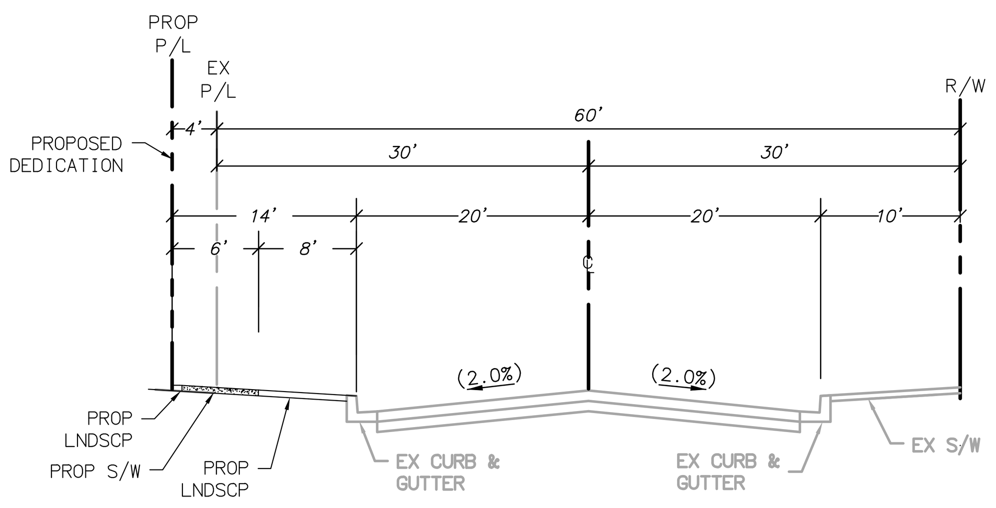
SITE SECTION

N.T.S.



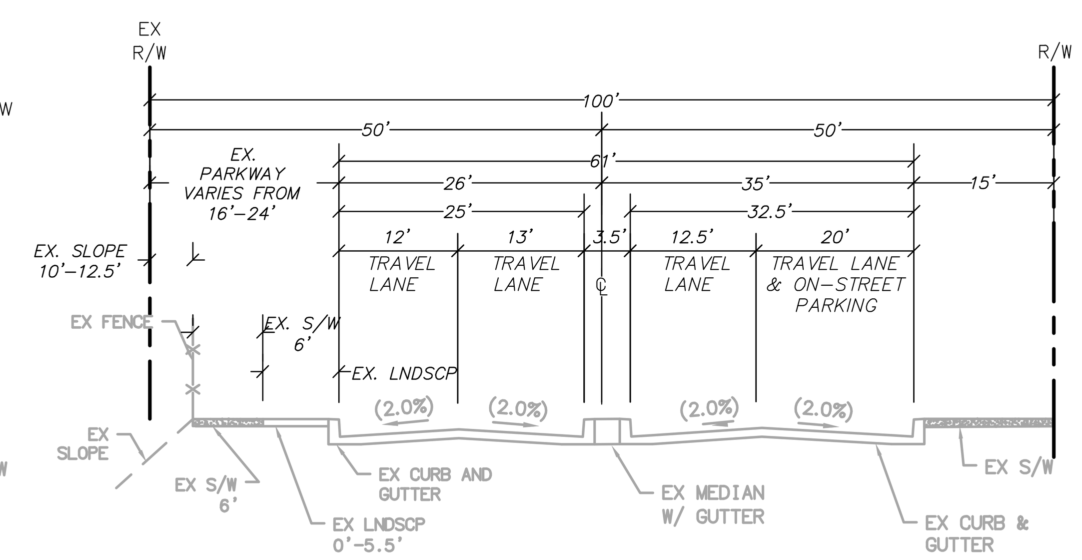
51ST STREET
SECTION A-A

NOT TO SCALE



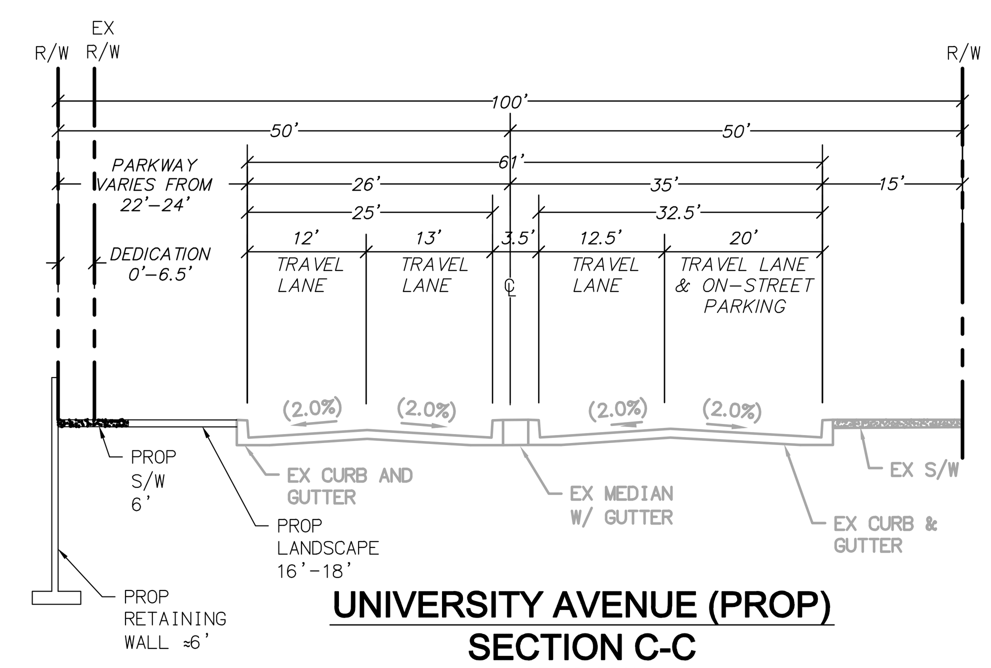
52ND STREET
SECTION B-B

NOT TO SCALE



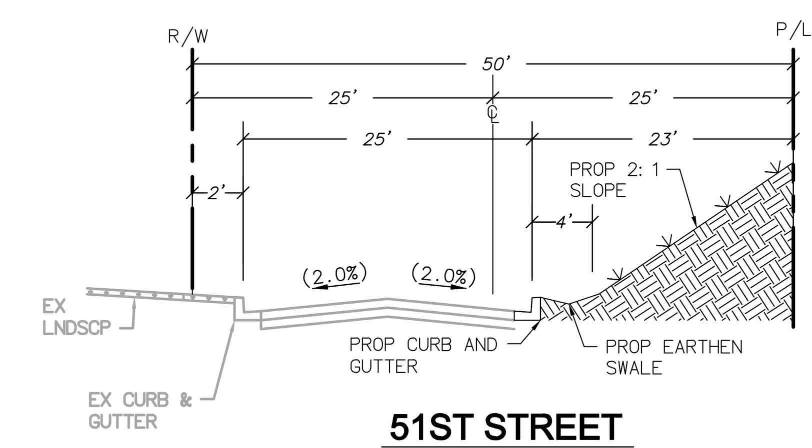
UNIVERSITY AVENUE (EXISTING)
SECTION C-C

NOT TO SCALE



UNIVERSITY AVENUE (PROP)
SECTION C-C

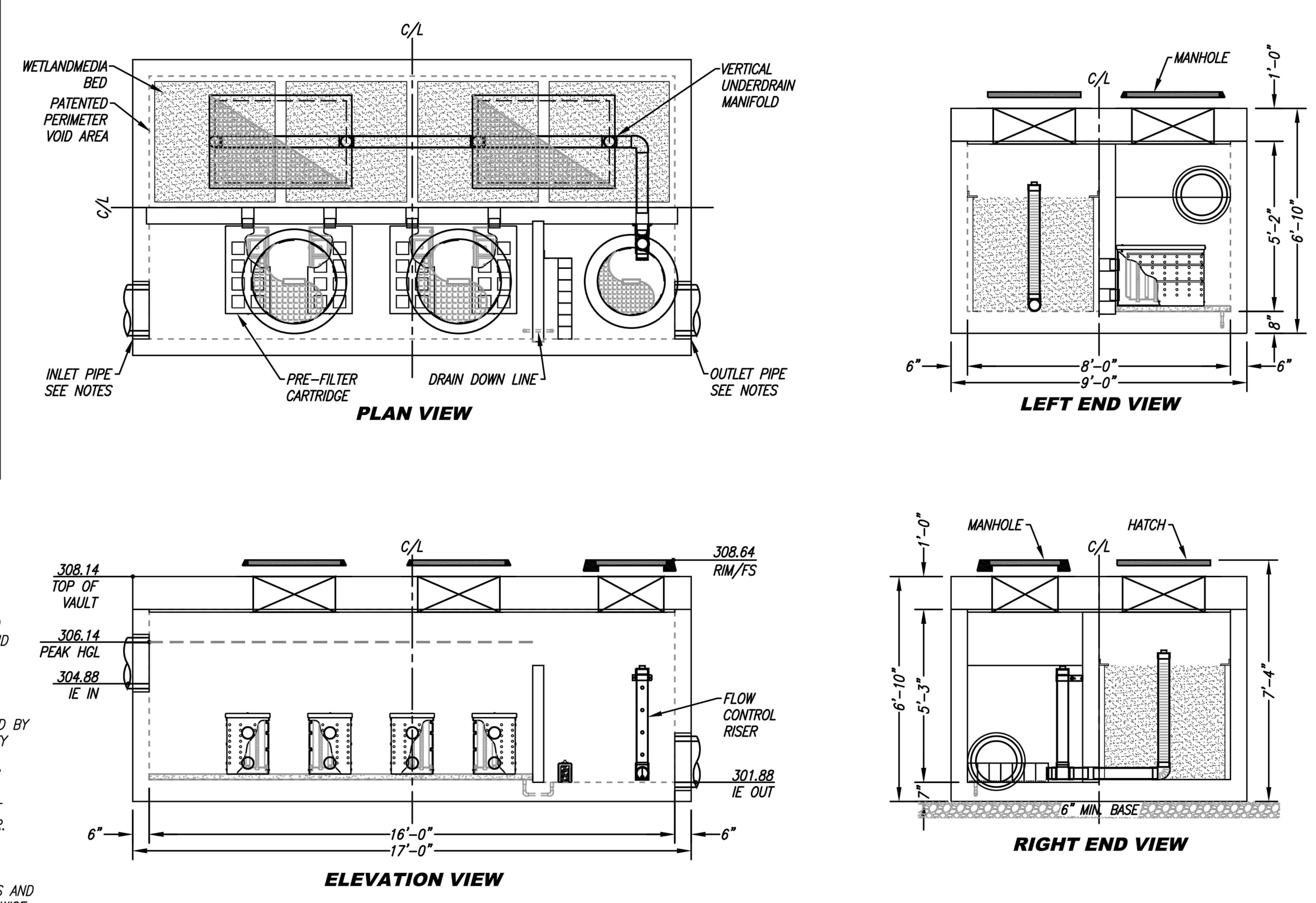
NOT TO SCALE



51ST STREET
SECTION D-D

NOT TO SCALE

SITE SPECIFIC DATA			
PROJECT NUMBER		10978	
PROJECT NAME		UNIVERSITY SELF STORAGE	
PROJECT LOCATION		SAN DIEGO, CA	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
		0.437	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			7.15
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	304.88	PVC	15"
OUTLET PIPE	301.88	PVC	15"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	308.64	308.64	308.64
SURFACE LOAD	LOAD LEVEL 5 PER ASTM C1802		
FRAME & COVER	2EA ø30"	2EA 30" X 48"	ø24"
WETLANDMEDIA VOLUME (CY)			6.92
ORIFICE SIZE (DIA. INCHES)			5 EA ø1.67"
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

6/4/20JCHIANG

INTERNAL BYPASS DISCLOSURE:

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

TREATMENT FLOW (CFS)	0.462
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

Bio Clean
A Forterra Company

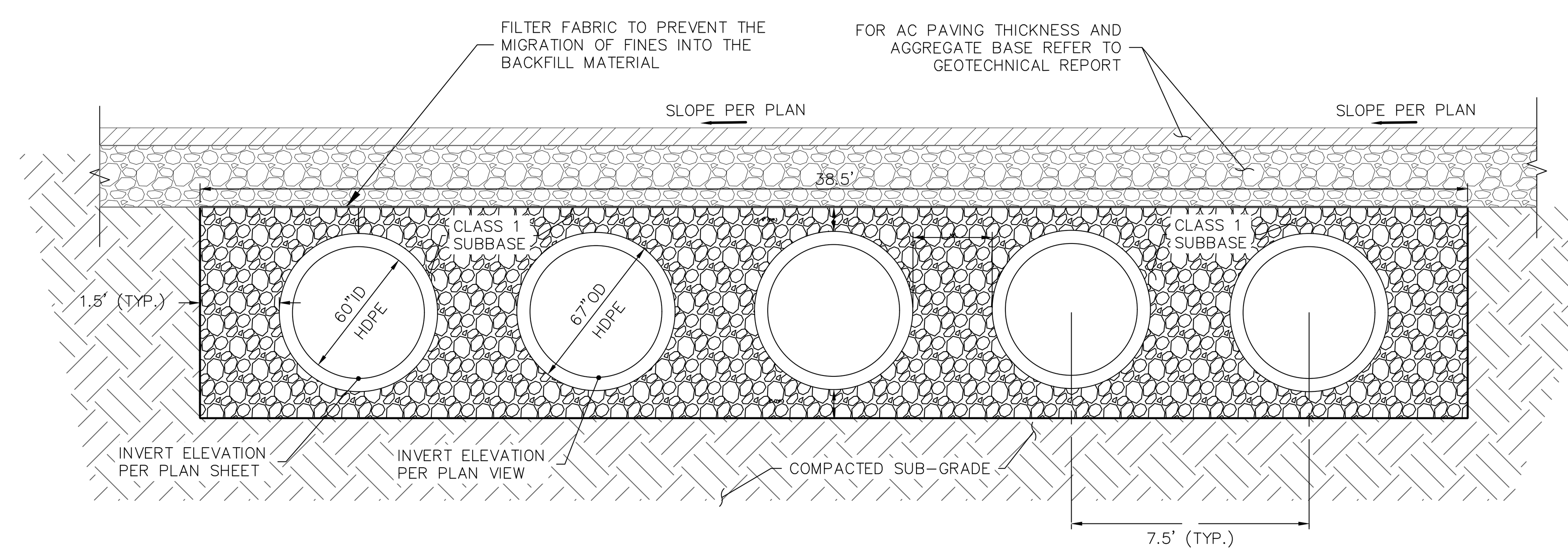
MWS-L-8-16-5'-2"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

**NOTE: ALL INVERT/RIM ELEVATIONS SHOWN ARE PER THE FINAL CONDITION SHOWN ON THE SEPARATE CITY OF SAN DIEGO BUILDING PERMIT PLAN SET (PTS #6677549)

C
4.0

DETAIL
MODULAR WETLAND SYSTEM

N.T.S.



**NOTE: ALL INVERT/RIM ELEVATIONS SHOWN ARE PER THE FINAL CONDITION SHOWN ON THE SEPARATE CITY OF SAN DIEGO BUILDING PERMIT PLAN SET (PTS #6677549)

B
4.0

DETAIL
UNDERGROUND STORMWATER STORAGE SYSTEM

N.T.S.

JOINT PERFORMANCE:
1. WATERTIGHT (WTIB): WTIB PIPE SHALL BE JOINED USING A BELL AND SPIGOT JOINT. THE JOINT SHALL BE WATERTIGHT ACCORDING TO THE REQUIREMENTS OF ASTM D3212.GASKETS SHALL MEET THE REQUIREMENTS OF ASTM F477. 12–60 INCH (300–1500 MM) DIAMETERS SHALL HAVE A BELL REINFORCED WITH A POLYMERCOMPOSITE BAND. THE BELL TOLERANCE DEVICE SHALL BE INSTALLED BY THE MANUFACTURER.
2. PIPE AND FITTING CONNECTIONS SHALL BE WITH A BELL AND SPIGOT CONNECTION UTILIZING A SPUN–ON OR WELDED BELL AND VALLEY OR SADDLE GASKET. THE JOINT SHALL MEET THE WATERTIGHT REQUIREMENTS OF ASTM D3212, AND GASKETS SHALL MEET THE REQUIREMENTS OF ASTM F477.

FILTER FABRIC:
3. A GEOTEXTILE FABRIC SHALL BE USED AS SPECIFIED BY THE ENGINEER TO PREVENT THE MIGRATION OF FINES FROM THE NATIVE SOIL INTO THE SELECT BACKFILL MATERIAL.

FOUNDATION:
4. WHERE THE TRENCH BOTTOM IS UNSTABLE. THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE GEOTECHNICAL ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE GEOTECHNICAL ENGINEER.

BEDDING:
5. SUITABLE MATERIAL SHALL BE CLASS I OR II. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 6" FOR 48 INCH DIAMETER PIPES.

INITIAL BACKFILL:
6. SUITABLE MATERIAL SHALL BE CLASS I OR II IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" (152 MM) ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321,LATEST EDITION.

COVER:
7. FOR TRAFFIC APPLICATIONS, MINIMUM COVER IS 24" FOR 48"DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT. MAXIMUM FILL HEIGHT LIMITED TO 8 FT OVER FITTINGS FOR STANDARD INSTALLATIONS. CONTACT GEOTECHNICAL ENGINEER FOR ADDITIONAL INFORMATION AND GUIDANCE.

MELLOR R. LANDY | R.C.E. NO. 81085 | EXP. 09-30-25 | DATE

REGISTERED PROFESSIONAL ENGINEER
MELLOR R. LANDY
No. 81085
Exp. 09-30-25
CIVIL
STATE OF CALIFORNIA

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NOVA
NOVA ENGINEERING, INC.
4373 VIEWRIDGE AVE
SUITE A
SAN DIEGO, CA 92123
PHONE: (619) 296-1010

CLIENT
UNIVERSITY LLC

PROJECT TITLE
UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
CROSS SECTIONS AND DETAILS

DELTA	REVISION	DATE:
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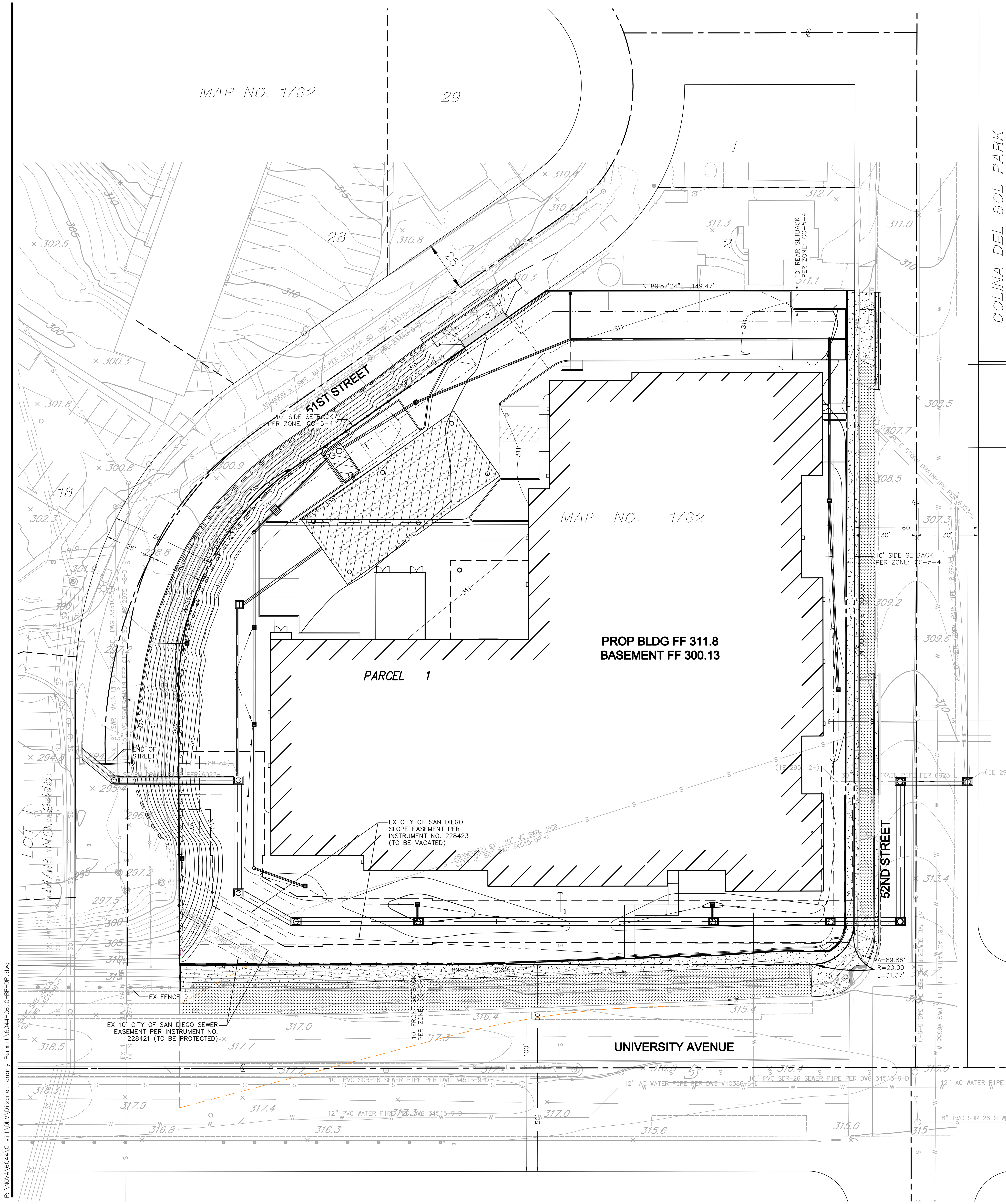
DRAWN/CHK BY:

DATE: 07/28/2023

JOB NO.:

C-5.0



LEGEND

EXISTING IMPROVEMENTS

	SYMBOL
EX WATER	W
EX SEWER	S
EX STORM DRAIN	SD
EX COMMUNICATION	COMM
EX CABLE/TELEVISION	CATV
EX FENCE	
EX GUARDRAIL	
EX CONTOUR	340
EX BUILDING	
EX SPOT ELEVATION	X (344.7±)
PROPERTY/RIGHT-OF-WAY LINE	
SETBACKS	

PROPOSED IMPROVEMENTS

IMPROVEMENT	REFERENCE	SYMBOL
PROP BUILDING		
FINISH SPOT ELEVATION		FS 310.30
MATCH EXISTING SPOT ELEVATION		(FS 308.80)
FINISH MINOR CONTOUR		311
FINISH MAJOR CONTOUR		310
GRADE BREAK		GB
LIMITS OF GRADING (DAYLIGHT LINE)		
PROPOSED EASEMENT		
PROP CONCRETE PAVING		
PROP AC PAVING		
PROP TRUNCATED DOMES	SDG-130	
PROP CURB		
PROP CURB AND GUTTER		
PROP RETAINING WALL		
PROP EARTHEN SWALE		
PROP FLOW ARROW		
PROP TYPE A-4 CLEANOUT	D-09	
PROP CATCH BASIN		
PROP STORM DRAIN CLEANOUT		
PROP STORM DRAIN		
PROP TRENCH DRAIN		
PROP WEIR STRUCTURE	PER SEPARATE GRADING PERMIT	
PROP MODULAR WETLAND SYSTEM	PER SEPARATE GRADING PERMIT	

GENERAL NOTES

1. THE AREA WITHIN THIS SURVEY : PARCEL 1 = 94,732 S.F. (2.145 AC.
2. THE BENCHMARK FOR THIS SURVEY IS: SEBP 52ND ST. & UNIVERSITY AVE. ELEVATION 314.926 FEET M.S.L. DATUM
3. THE BASIS OF BEARINGS FOR THIS SURVEY IS THE SOUTHERLY LINE OF LOT 1 AS SHOWN ON MAP NO. 9415.
   I.E. N 87°23'26"E
4. AERIAL TOPOGRAPHY FOR THIS SURVEY IS BY: SAN-LO AERIAL SURVEYS
   JOB NO.: 12861
   DATED: SEPTEMBER 8, 2006
   AERIAL TOPOGRAPHY HAS BEEN SUPPLEMENTED BY NOVA ENGINEERING FIELD SURVEY ON 7-25-2019, AND 10-29-2020.
5. THE PROPERTY LIES WITHIN FEMA FLOOD ZONE X (AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN) PER FIRM COMMUNITY PANEL NO. 06073C1902G, EFFECTIVE MAY 16, 2012.

EARTHWORK

AMOUNT OF SITE TO BE GRADED: 2.17 ACRES

PERCENT OF TOTAL SITE: 100%

CUT: 29,200 CY, MAX DEPTH OF CUT: 15 FT,

FILL: 105 CY, MAX HEIGHT OF FILL: 1 FT

IMPORT / EXPORT: 29,095 CY

WALL LENGTH: 78.3 FT, MAX HEIGHT: 3.3 FT

PROJECT INFORMATION

PROJECT NAME: UNIVERSITY SELF-STORAGE

PROJECT ADDRESS: 5150 UNIVERSITY AVE, SAN DIEGO, CA 92105

PROJECT SIZE: 2.26 ACRES

PROJECT PRIORITY: PRIORITY DEVELOPMENT PROJECT (PDP)

SUBJECT TO HMP REQUIREMENTS: YES

UNDERLYING HYDROLOGIC SOIL GROUP: SOIL TYPE 'D'

INFILTRATION CONDITION: 'NO INFILTRATION' CONDITION

DEPTH TO GROUNDWATER: ≈26 FT

EXISTING NATURAL HYDROLOGIC FEATURES: N/A

CRITICAL COURSE SEDIMENT YIELD AREAS: N/A

PROPOSED POLLUTANT TREATMENT CONTROL BMPs:

SOURCE CONTROL BMPs

EC-1	WE-1	WM-1
EC-2		WM-2
EC-3	NS-1	WM-3
EC-5	NS-3	WM-4
	NS-6	WM-5
SE-5	NS-7	WM-6
SE-6	NS-12	WM-8
SE-7	NS-13	WM-9
SE-10		WM-10

STORM WATER NOTE

THE PROJECT RESULTS ON MORE THAN 50% REDEVELOPMENT, THEREFORE THE ENTIRE PARCEL MUST BE TREATED.

[THE PROJECT PROPOSES NO INFILTRATION]

THE PROJECT SITE HAS BEEN NOT DEEMED HYDROMODIFICATION EXEMPT STORM WATER FLOWS OFF SITE VIA EXISTING STORM DRAIN. THE STORM DRAIN DISCHARGES WESTERLY DOWN A HARDLINED CONVEYANCE IN THE SAN DIEGO RIVER

DISTURBANCE AREA

GRADED AREA:	2.17 ACRES	MAX. CUT DEPTH:	15 FT
CUT QUANTITIES:	29,200 CYD	MAX CUT SLOPE RATIO:	1:1 MAX
FILL QUANTITIES:	105 CYD	MAX. FILL DEPTH:	1 FT
EXPORT:	29,095 CYD	MAX FILL SLOPE RATIO:	2:1 MAX

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PHONE: (619) 296-1010

CLIENT
UNIVERSITY LLC

PROJECT TITLE
UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
POST CONSTRUCTION BMP PLAN

DELTA	REVISION	DATE:

DRAWN/CHK BY:

DATE: 07/28/2023

JOB NO.:

C-6.0

MELLOR R. LANDY R.C.E. NO. 81085 EXP. 09-30-25 DATE

REGISTERED PROFESSIONAL ENGINEER MELLOR R. LANDY No. 81085 Exp. 09-30-25 CIVIL STATE OF CALIFORNIA

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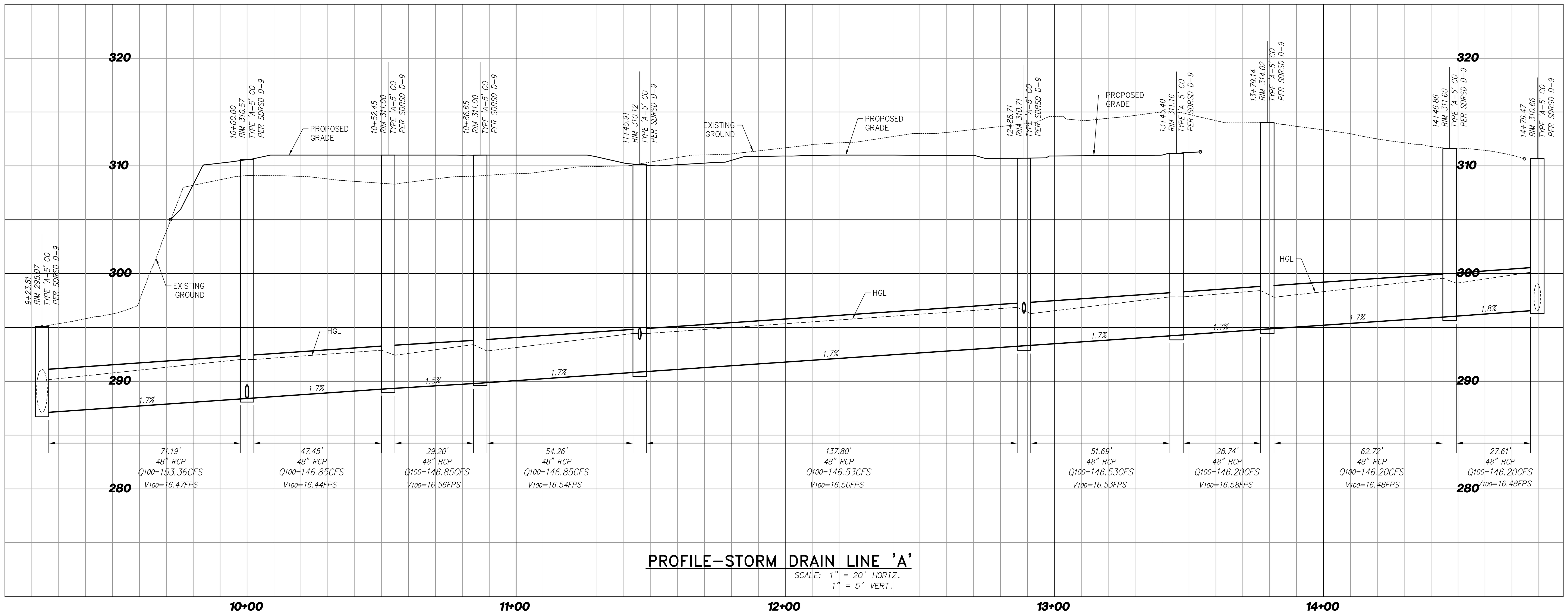

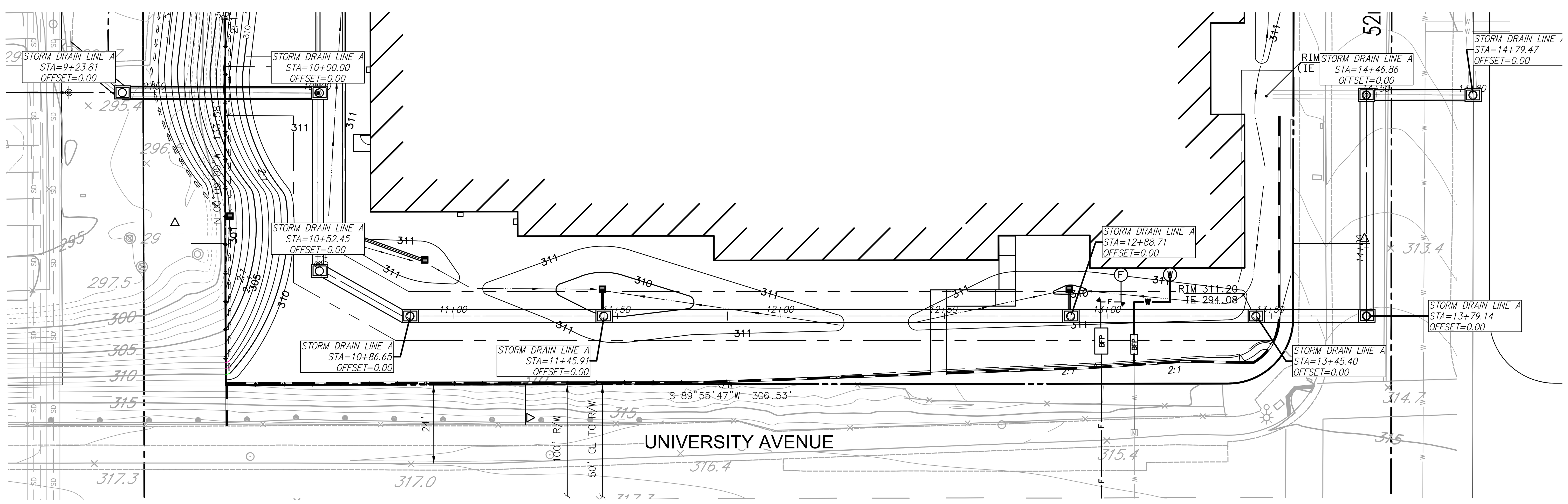

SCALE: 1"=20'

20 0 20 40 60

SCALE: 1"=20'

MELLOR R. LANDY R.C.E. NO. 81085 EXP. 09-30-25 DATE

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CLIENT
UNIVERSITY LLC

PROJECT TITLE
UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
STORM DRAIN PLAN AND PROFILE

DELTA	REVISION	DATE:

DRAWN/CHK BY:

DATE: 07/28/2023

JOB NO.:

C-7.0

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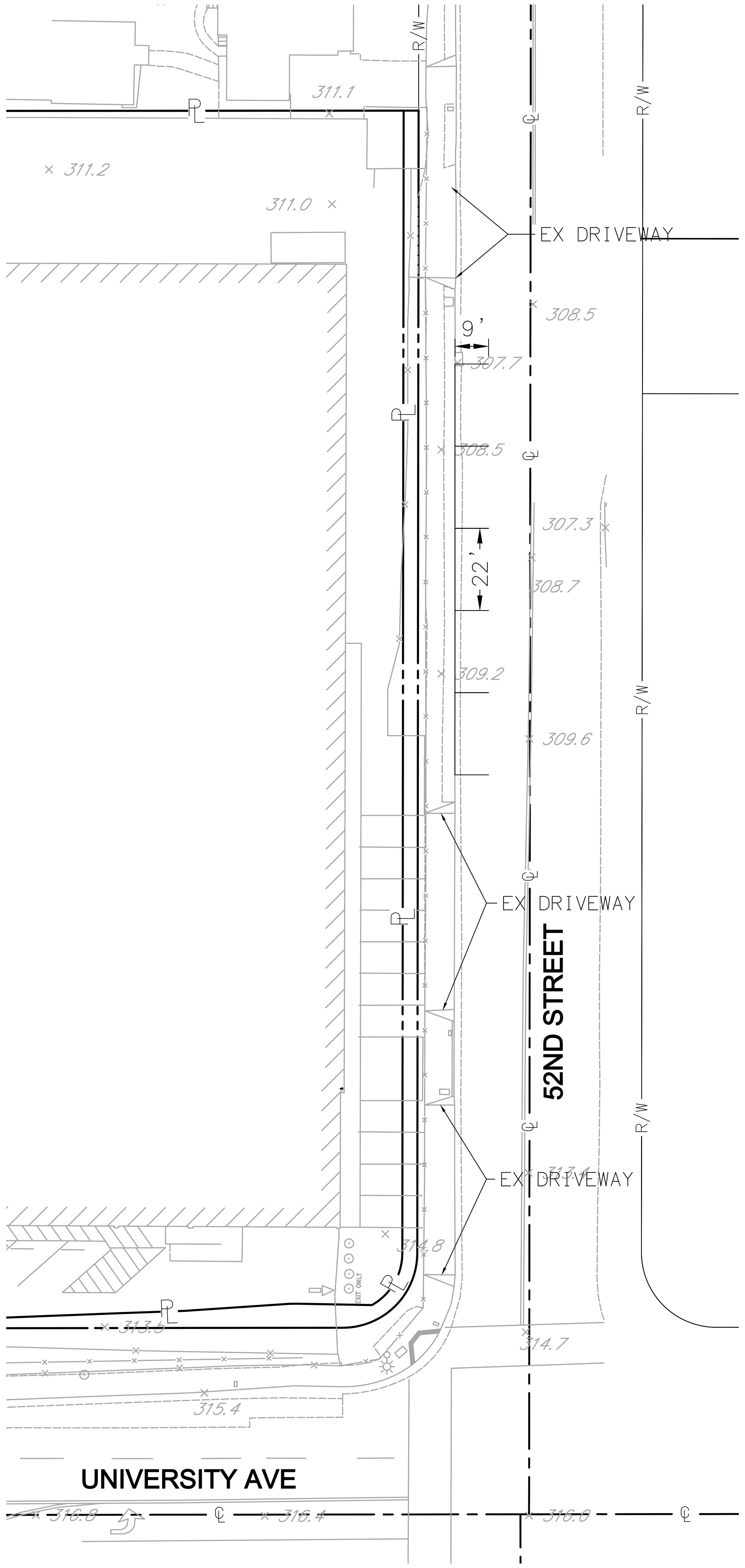
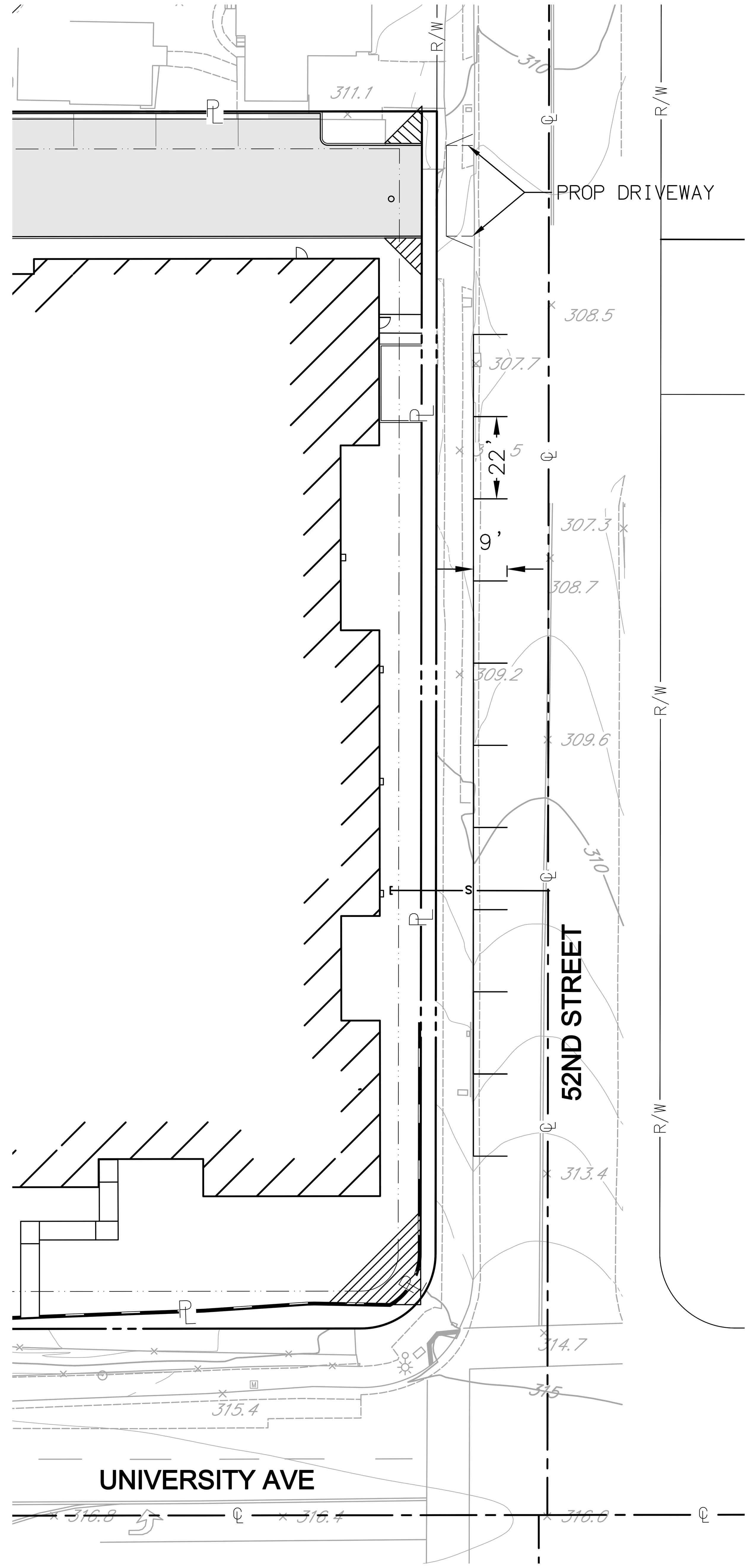


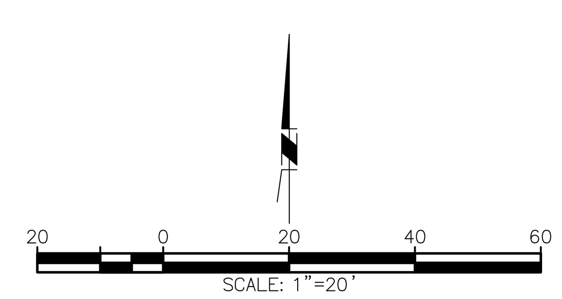
EXISTING CURB UTILIZATION
SCALE 1"= 20'



PROPOSED CURB UTILIZATION PLAN
SCALE 1" = 20'

ON-STREET PARKING			
	EXISTING	PROPOSED	TYPE
52ND STREET	5 SPACES	10 SPACES	PARALLEL

*NO EXISTING/PROPOSED ON-STREET PARKING ON UNIVERSITY AVE AND 51ST STREET



MELLOR R. LANDY R.C.E. NO. 81085 EXP. 09-30-25 DATE

NOVA
NOVA
ENGINEERING, INC.
4373 VIEWRIDGE AVE
SUITE A
SAN DIEGO, CA 92123
PHONE: (619) 296-1010

CLIENT
UNIVERSITY
LLC

PROJECT TITLE
UNIVERSITY
SELF STORAGE

5150 UNIVERSITY AVE
SAN DIEGO, CA

SHEET NAME
CURB UTILIZATION
PLAN

DELTA	REVISION	DATE:
	....	
	....	
	....	
	....	
	....	
	....	
	....	
	....	
	....	
	....	

DRAWN/CHK BY:
DATE: 07/28/2023
JOB NO.:

REGISTERED PROFESSIONAL ENGINEER MELLOR R. LANDY No. 81085 Exp. 09-30-25 CIVIL STATE OF CALIFORNIA

C-8.0

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Attachment 5
Drainage Report

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

PRELIMINARY DRAINAGE ANALYSIS FOR

University Self Storage

5150 University Avenue

San Diego, CA 92105

PREPARED FOR:

Mr. Robert Stacks, RDS Contracting Inc.
2064 Woodside Avenue, Suite 102
Lakeside, CA 92040

PREPARED BY:

NOVA Engineering

Civil Engineering/Surveying/Planning/Stormwater

4373 Viewridge Avenue, Suite A
San Diego, CA 92123
JOB NO. 6044

Mellor R. Landy, RCE 81085

June 5, 2020

CERTIFICATION

This Drainage Study has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer (Engineer) attests to the technical information contained herein and engineering data upon which the following design, recommendation, conclusion and decisions are based.

	81085	9.30.2023
Mellor R. Landy Engineer of Work's Signature	RCE Number	Expiration Date

Date

Civil Engineering/Surveying/Planning/Stormwater

4373 Viewridge Avenue, Suite A
San Diego, CA 92123
JOB NO. 6044

REGISTERED PROFESSIONAL ENGINEER
MELLOR R. LANDY
No. 81085
Exp. 09-30-23
CIVIL
STATE OF CALIFORNIA

TABLE OF CONTENTS

SECTION **PAGE**

APPENDICES

ATTACHMENTS

1. Introduction

The project site is located at 5150 University Avenue in the City of San Diego, California. The project site is bounded by 51st street to the west and northwest, Residential homes to the north, 52nd street to the east, and University Avenue to the south. The project site currently contains an existing commercial building and an associated paved parking lot.

The project proposes the construction of a single multi-story commercial storage facility that features a basement level. Additional proposed improvements include an asphalt parking lot, accessible concrete walkways, landscaping (for both aesthetic and volume reduction purposes), and two points of driveway access located on 51st street and 52nd Street.

2. Project Information

Project Name: University Self Storage
Project Address: 5150 University Avenue, San Diego, CA 92105
Priority Development Project: Yes
Subject to Hydromodification: Yes
Total Size of Project: 2.26 Acres = 2.18 Acres (Project parcel size) + 0.08 Acres (Offsite Run-on)
Offsite Run-on: Yes (0.08 acres)
FEMA: Per Panel 1902 of 2375 of FEMA Map Number 06073C1902G dated May 16, 2012 the project site is located within Zone X. Zone X are areas determined to be outside the 0.2% annual chance floodplain.

3. Existing Drainage Description

The existing project site run-off drains westerly to 51st Street and easterly to 52nd Street. No onsite private storm drain system exists and it is understood the project site runoff sheet flows to public storm drain conveyances. The existing site sheet flows from East to West, down an existing natural slope (without a concentrated point of flow), and into an existing curb inlet that is located at the Southeast corner of 52nd Street. The existing condition also features a 30" RCP public storm drain that runs through the middle of the project site and ties into the above mentioned 52nd Street curb inlet on the East side, and into a public curb inlet on 51st Street on the West side.

The confluence of the project site's runoff is routed through a series of public storm water culverts southerly under University Avenue where it discharges into an existing varying concrete lined and natural earthen drainage channel known as the Home Avenue Channel. The Home Avenue Channel confluences with the earthen Chollas Creek where the eventual project site storm water run-off discharges into the San Diego Bay (Pacific Ocean) at the mouth of Chollas Creek.

4. Proposed Drainage Description

The proposed onsite private storm drain system will direct the captured storm water to a proposed proprietary Biofiltration device for stormwater treatment, and will then be routed to a sub-surface solid pipe storage system for detention. Roof drains will splash at grade and earthen swales will direct the runoff to storm drain catch basins to ensure that all stormwater is conveyed into the proposed storm drain system. Concrete ribbon gutters and trench drains will be constructed within the proposed AC pavement parking lot and at driveways to contain all runoff onsite to be routed for treatment and detention. Prior to discharge into the public storm drain system, a proposed concrete box with weir wall and orifice will mitigate the flow leaving the site's private storm system up to the 100-year storm.

The existing public storm drain system crosses the entire project site and the proposed building will interfere with the existing pipe. As such, the project proposes to sever and remove the majority of the existing 30-inch RCP storm drain pipe and re-route the public storm drain along the south side of the proposed building. There will be a re-dedication of the public storm drain easement occurring as part of this effort.

The confluence of the project sites runoff is routed through a series of public storm water culverts southerly under University Avenue where it discharges into an existing varying concrete lined and natural earthen drainage channel known as the Home Avenue Channel. The Home Avenue Channel confluences with the earthen Chollas Creek where the eventual project site storm water run-off discharges into the San Diego Bay (Pacific Ocean) at the mouth of Chollas Creek.

5. Calculation Methodology

Runoff Calculations:

Runoff calculations were performed in conformance with the City of San Diego *"Drainage Design Manual"*. The District's accepted software Hydrosoft Advanced Engineering Software (AES) has been used. Calculations/AES Printouts can be found in Appendices C and D of this report. A soil type D has been used for the entire site.

Storm Events	100-Year
Rational Method Equation:	Q = CIA Where: Q = the peak discharge in cubic feet per second (cfs) C = a runoff coefficient representing the ratio of runoff depth to rainfall depth (dimensionless) I = the time-averaged rainfall intensity for a storm duration equal to the time of concentration (inches/hour) A = drainage area (acres)
Time of Concentration, Tc	The time of concentration (Tc) is defined as the interval of time (in minutes) required for the flow at a given point to become a maximum under a uniform rainfall intensity. Often this occurs when all effective parts of the drainage area are contributing to the flow. Generally, the time of concentration is the interval of time from the beginning of rainfall for water from the hydraulically most remote portion of the drainage area to reach the point of concentration; e.g., the inlet of the drainage structure.
Rainfall Intensity, I	Rainfall Intensity "I" is obtained from the City of San Diego Intensity-Duration-Design Chart.
Runoff Coefficient, C	1) Type D to be used for all areas 2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80%, the values given for coefficient C, may be revised by multiplying 80% by the ratio of actual imperviousness to the tabulated imperviousness. however, in no case shall the final coefficient be less than 0.50. Example: Actual Imperviousness =50% Tabulated Imperviousness =80% Revised C = (50/80) x 0.85 =0.53

6. Summary of Drainage Calculations (Existing Conditions)

The City's accepted software Hydrosoft Advanced Engineering Software (AES) has been used for analyzing runoff generated for the 100-Year storm event. A soil type D has been used for the entire site. Calculations/AES Printouts can be found in Appendix C of this report.

Table 6.1: Existing Drainage Conditions		
Drainage Basin	**Node #**	**100-Year Storm, Q**
E1, E2 (OFFSITE RUN-ON)	Node #5 to Node #15	Q_{100}=6.31 cfs
E-3	Node #20 to Node #30	Q_{100}=2.02 cfs
	Total	**Q_{100}=8.33 cfs**

See Existing Drainage Conditions Exhibit located in pocket.

7. Summary of Drainage Calculations (Proposed Conditions)

The District's accepted software Hydrosoft Advanced Engineering Software (AES) has been used for analyzing runoff generated for the 100-Year storm event. A soil type D has been used for the entire site. Calculations/AES Printouts can be found in Appendix D of this report.

Table 7.1: Proposed Drainage Conditions		
Drainage Basin	**Node #**	**100-Year Storm, Q**
P-1 Through P-19	Node #210	Q_{100}=7.15 cfs
	Total	**Q_{100}=7.15 cfs**

See Proposed Drainage Conditions Exhibit located in pocket.

8. Conclusion

Local jurisdictional requirements have been complied with and incorporated in the site design and hydrology calculations. All potential sources of future incoming flow tributary to conveyance systems have been identified and accounted for in the storm drain facilities sizing.

By design, runoff from the proposed project will continue to flow to the existing public storm drain system. Runoff generated from the 100-year storm event has been reduced from 8.49 cfs from existing development conditions to 6.76 cfs for proposed development conditions. The decrease is attributed to the amount of proposed pervious area whereas the existing project site is vastly impervious.

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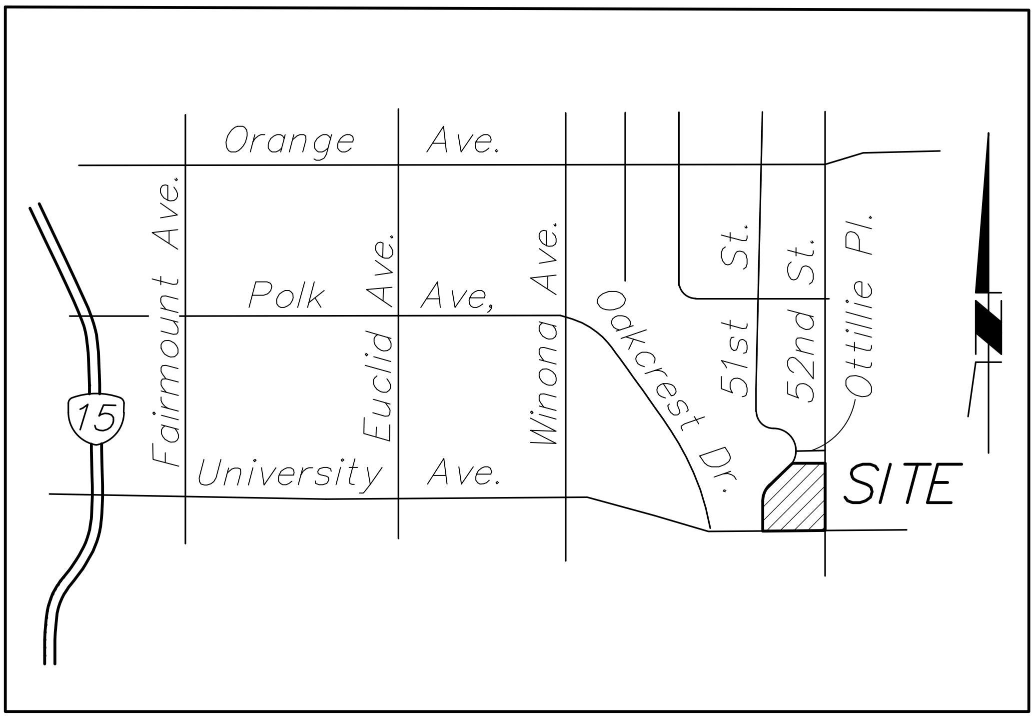
APPENDIX A

VICINITY MAP



VICINITY MAP

NO SCALE

APPENDIX B

CITY OF SAN DIEGO HYDROLOGY REQUIREMENTS

THE CITY OF SAN DIEGO

Transportation & Storm Water Design Manuals

Drainage Design Manual

January 2017 Edition

Chapter 2

Hydrology

The design discharge depends upon many variables. Some of the more important variables are duration and intensity of rainfall; storm frequency; ground cover; and the size, imperviousness, slope, and shape of the drainage area.

2.1. Discharge Flow Methods

The designer should check with Drainage and Flood Plain Management Section, Public Works Department, to determine if there are established storm discharge flows.

If the project involves a watershed of major size or importance, flood flows may already be established through one or more of the following activities:

1. Master Plan Developments in the City and/or County
2. Studies for Development and Road Projects near the proposed project
3. Flood Insurance Studies prepared by FEMA based on existing land use at the time the study was completed. Urbanization may have caused increased flows. FEMA maps can be viewed at the SanGIS web site (www.sangis.org).
4. Recorded flows may be available from the United States Geological Survey (USGS) or the County of San Diego

If no established storm discharge flows are available, the applicable methods are:

1. Rational Method for watersheds less than 0.5 square miles – See Appendix A
2. Modified Rational Method for watersheds between 0.5 and 1.0 square miles – See Appendix A; or,
3. Natural Resources Conservation Service (NRCS) Method (formally called Soil Conservation Service (SCS) Method) for watersheds greater than 1.0 square miles – See Appendix B; or
4. Hydrologic Engineering Center (HEC) computer method.

2.2. Design Storm Frequency

Design storm frequency shall be based upon the following criteria:

1. Within floodplain and floodplain fringe areas as defined by FEMA, the runoff criteria shall be based upon a 100-year frequency storm.

2. For all drainage channels and storm water conveyance systems, which will convey drainage from a tributary area equal to or greater than one (1) square mile, the runoff criteria, shall be based upon a 100-year frequency storm.
3. For tributary areas under one (1) square mile:
    a. The storm water conveyance system shall be designed so that the combination of storm drain system capacity and overflow (streets and gutter) will be able to carry the 100-year frequency storm without damage to or flooding of adjacent existing buildings or potential building sites.
    b. The runoff criteria for the underground storm drain system shall be based upon a 50-year frequency storm.

2.3. Soil Type

For storm drain, culverts, channels, and all associated structures, Type D soil shall be used for all areas.

2.4. Other Requirements

1. Design runoff for drainage and flood control facilities within the City shall be based upon full development of the watershed area in accordance with the land uses shown on the City of San Diego, Progress Guide and General Plan.
2. When determining criteria for floodplain management and flood proofing, design runoff within the City shall be based upon existing conditions in accordance with the City Floodplain Management Requirements and FEMA Regulations.
3. Under City requirements, the minimum elevation of the finished, first floor elevation of any building is 2 feet above the 100-year frequency flood elevation.

2.5. Water Quality Considerations

Requirements for hydrologic studies specific to the design of pollution prevention controls and hydromodification management controls are detailed in the Storm Water Standards. Where the Storm Water Standards specify modifications to the guidelines stated herein on discharge flow methods, design storm frequency, or soil type, the modifications shall supersede these but only for the purposes stated in the Storm Water Standards. Where the Storm Water Standards does not specify a modification, the guidance found here in Chapter 2 shall apply.

Appendix A

Rational Method and Modified Rational Method

A.1. Rational Method (RM)

The Rational Method (RM) is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and drainage structures. The RM is recommended for analyzing the runoff response from drainage areas for watersheds less than 0.5 square miles. It should not be used in instances where there is a junction of independent drainage systems or for drainage areas greater than approximately 0.5 square mile in size. In these instances, the Modified Rational Method (MRM) should be used for junctions of independent drainage systems in watersheds up to approximately 1 square mile in size (see Section A.2); or the NRCS Hydrologic Method should be used for watersheds greater than approximately 1 square mile in size (see Appendix B).

A.1.1. Rational Method Formula

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (T_c), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed in Equation A-1.

Equation A-1. RM Formula Expression

$$Q = C\ I\ A$$

where:

Q	=	peak discharge, in cubic feet per second (cfs)
C	=	runoff coefficient expressed as that percentage of rainfall which becomes surface runoff (no units); Refer to Appendix A.1.2
I	=	average rainfall intensity for a storm duration equal to the time of concetrnatation (T_c) of the contributing draiange area, in inches per hour; Refer to Appendix A.1.3 and Appendix A.1.4
A	=	drainage area contributing to the design location, in acres

Combining the units for the expression CIA yields:

$$\left(\frac{1\,\text{acre}\times\text{inch}}{\text{hour}}\right)\left(\frac{43{,}560\,\text{ft}^2}{\text{acre}}\right)\left(\frac{1\,\text{foot}}{12\,\text{inches}}\right)\left(\frac{1\,\text{hour}}{3{,}600\,\text{seconds}}\right)\Rightarrow 1.008\,\text{cfs}$$

For practical purposes, the unit conversion coefficient difference of 0.8% can be ignored.

The RM formula is based on the assumption that for constant rainfall intensity, the peak discharge rate at a point will occur when the raindrop that falls at the most upstream point in the tributary drainage basin arrives at the point of interest.

Unlike the MRM (discussed in Appendix A.2) or the NRCS hydrologic method (discussed in Appendix B), the RM does not create hydrographs and therefore does not add separate subarea hydrographs at collection points. Instead, the RM develops peak discharges in the main line by increasing the T_c as flow travels downstream.

Characteristics of, or assumptions inherent to, the RM are listed below:

1. The discharge resulting from any I is maximum when the I lasts as long as or longer than the T_c.
2. The storm frequency of peak discharges is the same as that of I for the given T_c.
3. The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in the NRCS method).
4. The peak rate of runoff is the only information produced by using the RM.

A.1.2. Runoff Coefficient

The runoff coefficients are based on land use (see Table A–1). Soil type "D" is used throughout the City of San Diego for storm drain conveyance design. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient (Σ[CA]). Good engineering judgment should be used when applying the values presented in Table A–1, as adjustments to these values may be appropriate based on site-specific characteristics.

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	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:
(1) Type D soil to be used for all areas.
(2) 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.

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_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

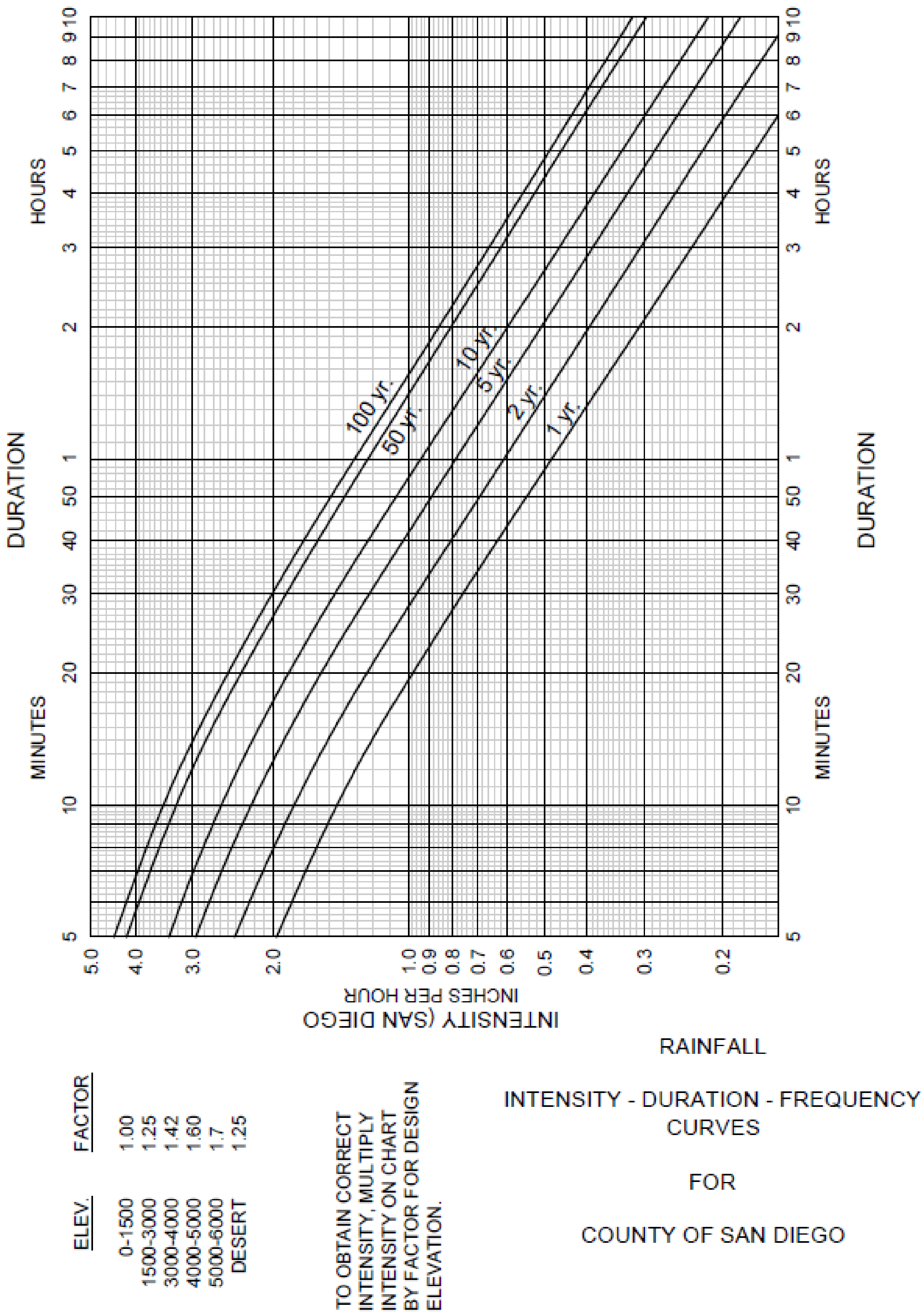


Figure A-1. Intensity-Duration-Frequency Design Chart

A.1.4. Time of Concentration

The Time of Concentration (T_c) is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration.

Methods of calculation differ for natural watersheds (non-urbanized) and for urban drainage systems. Also, when designing storm drain systems, the designer must consider the possibility that an existing natural watershed may become urbanized during the useful life of the storm drain system. Future land uses must be used for Tc and runoff calculations, and can be determined from the Community Plans.

a. Natural watersheds: Obtain Tc from Figures A.2 and A.3

b. Urban drainage systems: In the case of urban drainage systems, the time of concentration at any point within the drainage area is given by:

   $T_c = T_i + T_t$ where

   T_i is the inlet time or the time required for the storm water to flow to the first inlet in the system. It is the sum of time in overland flow across lots and in the street gutter.

   T_t is the travel time or the time required for the storm water to flow in the storm drain from the most upstream inlet to the point in question.

   Travel Time, T_t is computed by dividing the length of storm drain by the computed flow velocity. Since the velocity normally changes at each inlet because of changes in flow rate or slope, total travel time must be computed as the sum of the travel times for each section of the storm drain.

   The overland flow component of inlet time, T_i, may be estimated by the use of the chart shown in Figure A-4. Use Figure A-5 to estimate time of travel for street gutter flow.

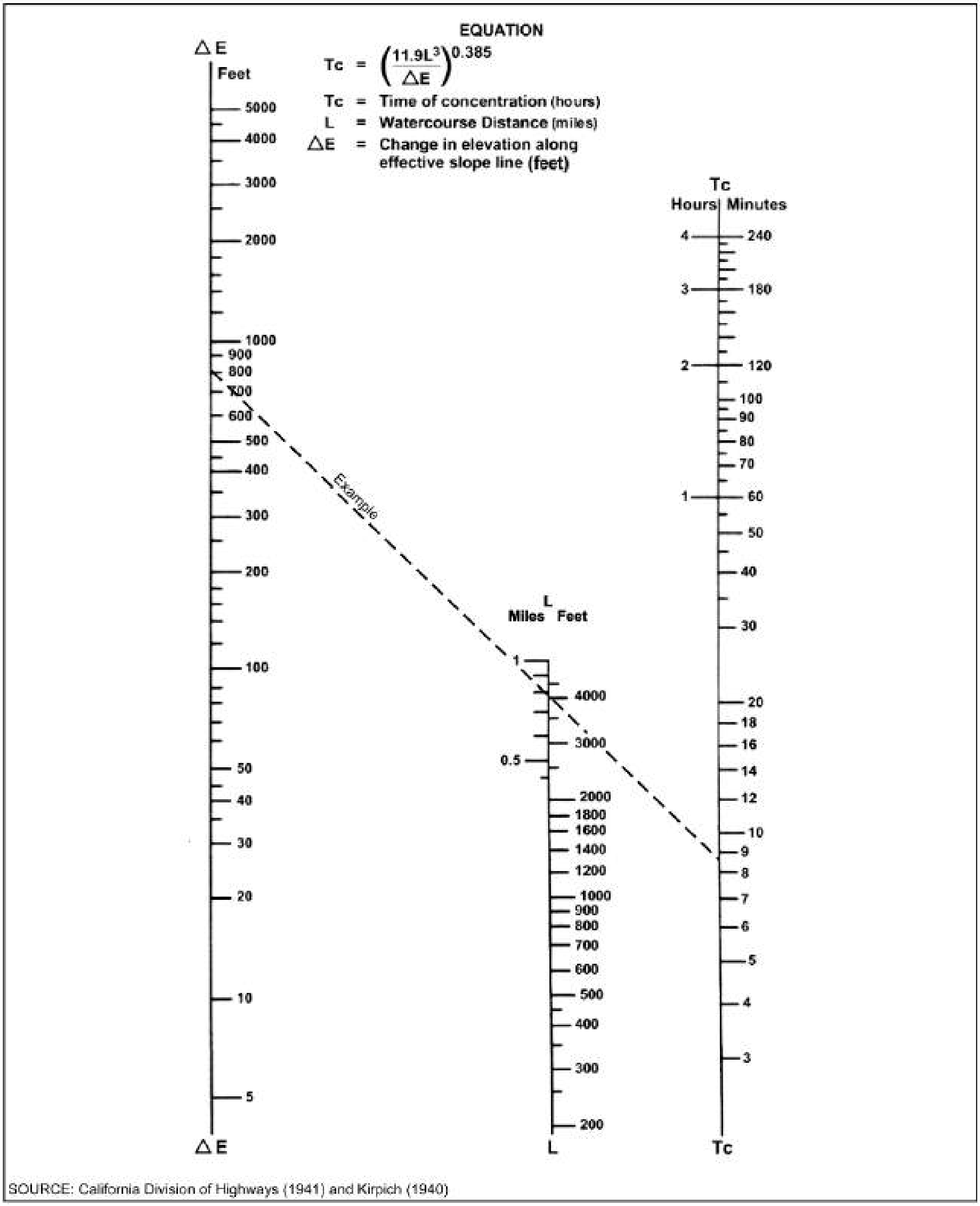
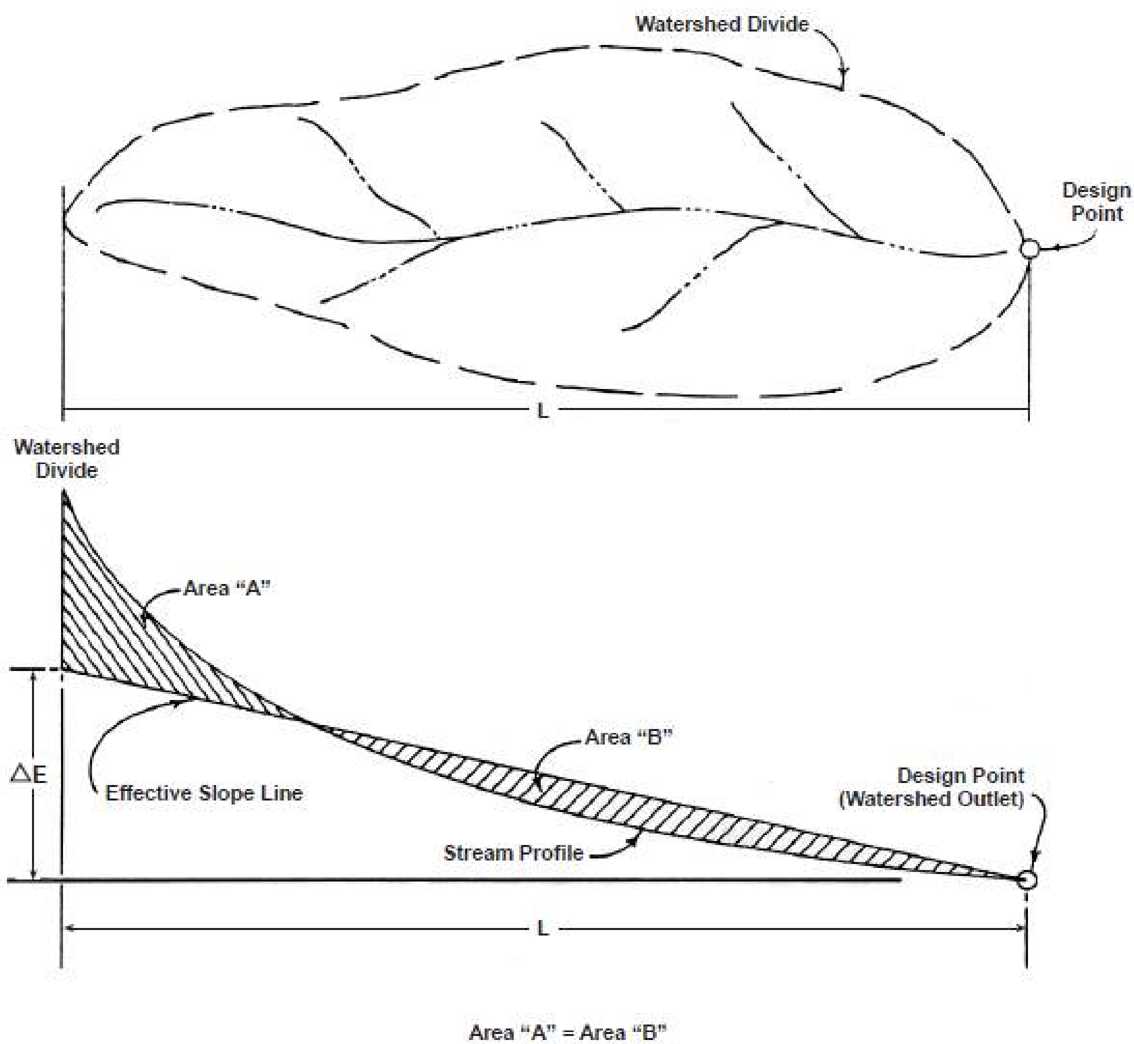


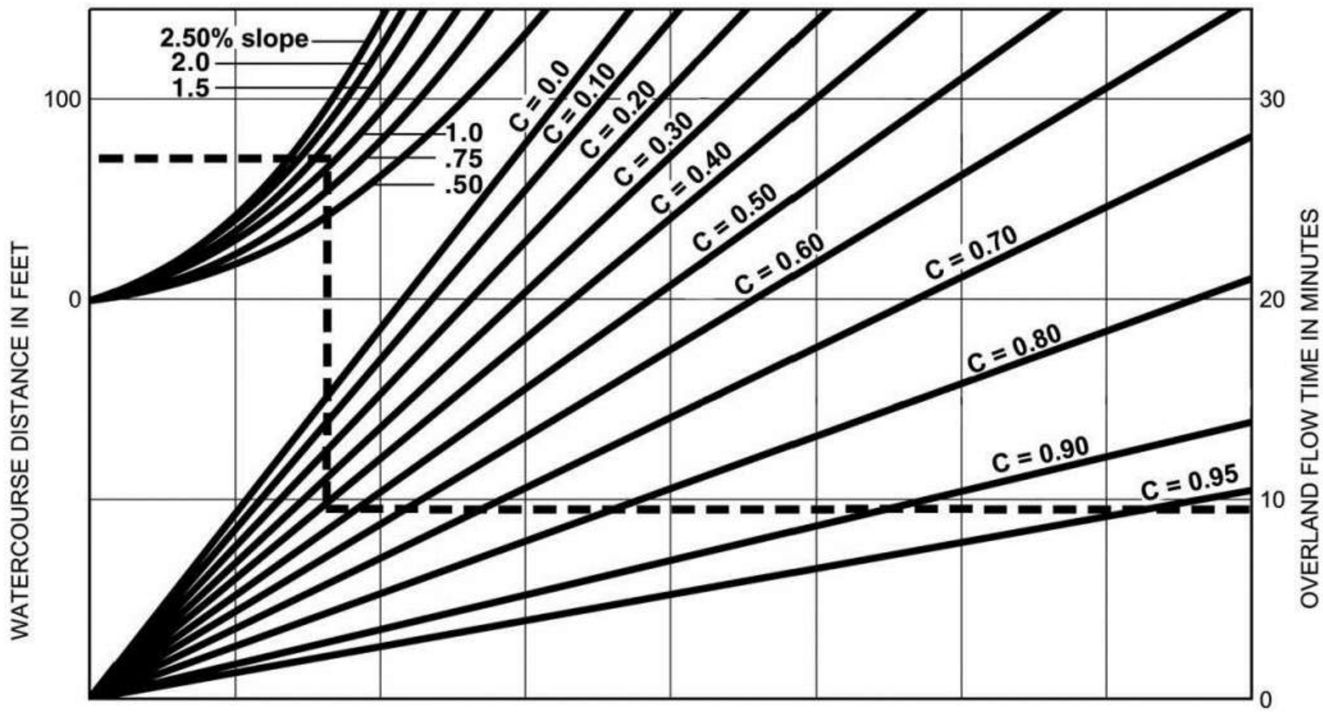
Figure A-2. Nomograph for Determination of T_c for Natural Watersheds

__Note__: Add ten minutes to the computed time of concentration from Figure A-2.



SOURCE: California Division of Highways (1941) and Kirpich (1940)

Figure A-3. Computation of Effective Slope for Natural Watersheds



EXAMPLE:

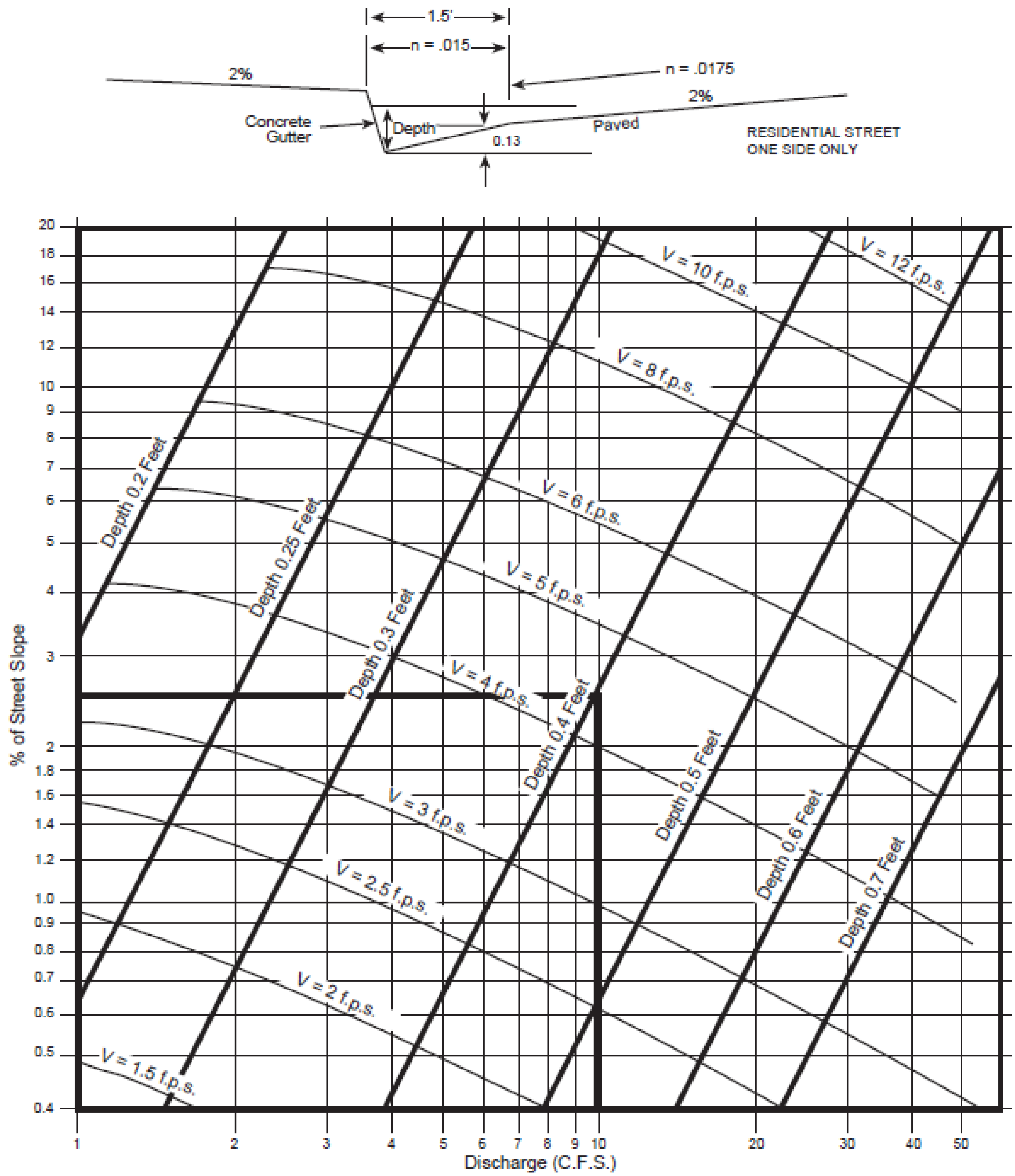
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Figure A-4. Rational Formula – Overland Time of Flow Nomograph

<u>Note</u>: Use formula for watercourse distances in excess of 100 feet.



EXAMPLE:

Given: Q = 10 S = 2.5%

Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

Figure A-5. Gutter and Roadway Discharge – Velocity Chart

APPENDIX C

RUNOFF COEFFICIENT CALCULATIONS &

AES 100-YEAR STORM EVENT CALCULATIONS

EXISTING DRAINAGE CONDITIONS

UNIVERSITY SELF STORAGE
EXISTING ONSITE DRAINAGE CONDITIONS

Drainage Area #	Surface Type	Area sf	Area ac	Pervious [sf]	Pervious [ac]	Pervious Percentage [%]	Impervious [sf]	Impervious [ac]	Impervious Percentage [%]	Table A-1 Commercial Imperviousness [%] per City of San Diego Drainage Design Manual	Table A-1 Runoff Coeffficient for Commercial Development per City of San Diego Drainage Design Manual	Weighted Runoff Coefficient "C"	Adjusted Runoff Coefficient, C 0.50 < C < 0.85
E-1	AC Pvmt, PCC, Landscape, Roof	71,272	1.64	3,982	0.09	5.6	67,290	1.54	94.4	80	0.85	1.00	0.85
E-2	Landscape, AC PVMT (OFFSITE RUN-ON)	3,687	0.08	3,151	0.07	85.5	536	0.01	14.5	80	0.85	0.15	0.50
E-3	AC Pvmt, PCC, Landscape, Roof	23,460	0.54	1,506	0.03	6.4	21,953	0.50	93.6	80	0.85	0.99	0.85
	Total	**98,418**	**2.26**	**8,640**	**0.20**	**8.78**	**89,779**	**2.06**	**91.2**				

Runoff Coefficent C (Rational Method)*
(1) Type D to be used for all areas

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80%, the values given for coefficient C, may be revised by multiplying 80% by the ratio of actual imperviousness to the tabulated imperviousness. however, in no case shall the final coefficient be less than 0.50.

Example:
Actual Imperviousness = 50%
Tabulated Imperviousness = 80%

Revised C = (50/80) x 0.85 = 0.53

* Per Table A-1 *Runoff Coefficients (Rational Method)* of City of San Diego Drainge Design Manual, dated January 2017

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2007 Advanced Engineering Software (aes)
             Ver. 13.9 Release Date: 04/04/2008  License ID 1402

                           Analysis prepared by:

                             Stuart Engineering
                     7525 Metropolitan Drive, Suite 308
                        San Diego, California 92108
                  (619) 296-1010  se@stuartengineering.com

 ************************** DESCRIPTION OF STUDY **************************
* 100-Year Existing Conditions                                             *
*                                                                          *
*                                                                          *
 **************************************************************************

  FILE NAME: 6044E100.DAT
  TIME/DATE OF STUDY: 14:48 05/27/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 10
   1)   5.000;  4.400
   2)  10.000;  3.300
   3)  15.000;  2.900
   4)  20.000;  2.400
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  45.000;  1.550
   8)  60.000;  1.300
   9) 100.000;  0.950
  10) 600.000;  0.330
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)    (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   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      5.00 TO NODE     15.00 IS CODE =  22     E-1
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
================================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      6.13
  TOTAL AREA(ACRES) =      1.64   TOTAL RUNOFF(CFS) =      6.13

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     15.00 IS CODE =  81     E-2
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.18
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       6.31
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  22     E-3
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      2.02
  TOTAL AREA(ACRES) =      0.54   TOTAL RUNOFF(CFS) =      2.02
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =      5.00
  PEAK FLOW RATE(CFS)   =       2.02
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
```

APPENDIX D

RUNOFF COEFFICIENT CALCULATIONS &

AES 100-YEAR STORM EVENT CALCULATIONS

PROPOSED DRAINAGE CONDITIONS

51ST & UNIVERSITY AVENUE PROPOSED ONSITE DRAINAGE CONDITIONS													
Drainage Area #	Surface Type	Area sf	Area ac	Pervious [sf]	Pervious [ac]	Pervious Percentage [%]	Impervious [sf]	Impervious [ac]	Impervious Percentage [%]	Commercial [%] per City of San Diego Drainage Design Manual	Commercial Development per City of San Diego Drainage Design Manual	Weighted Runoff Coefficient "C"	Adjusted Runoff Coefficient, C 0.50 < C < 0.85
SYSTEM 1													
P-1	Roof	8,560	0.20	0	0.00	0.0	8,560	0.20	100.0	80	0.85	1.06	0.85
P-2	Landscape	2,021	0.05	2,021	0.05	100.0	0	0.00	0.0	80	0.85	0.00	0.50
P-3	Roof	7,008	0.16	0	0.00	0.0	7,008	0.16	100.0	80	0.85	1.06	0.85
P-4	Landscape	1,565	0.04	1,565	0.04	100.0	0	0.00	0.0	80	0.85	0.00	0.50
P-5	Roof	3,329	0.08	0	0.00	0.0	3,329	0.08	100.0	80	0.85	1.06	0.85
P-6	Landscape	1,414	0.03	1,414	0.03	100.0	0	0.00	0.0	80	0.85	0.00	0.50
P-7	AC PVMT, Landscape	1,508	0.03	262	0.01	17.4	1,245	0.03	82.6	80	0.85	0.88	0.85
P-8	AC PVMT, PCC Concrete	4,150	0.10	0	0.00	0.0	4,150	0.10	100.0	80	0.85	1.06	0.85
P-9	Roof	2,828	0.06	0	0.00	0.0	2,828	0.06	100.0	80	0.85	1.06	0.85
P-10	AC PVMT, PCC Concrete, Landscape	4,780	0.11	568	0.01	11.9	4,211	0.10	88.1	80	0.85	0.94	0.85
P-11	Roof	4,500	0.10	0	0.00	0.0	4,500	0.10	100.0	80	0.85	1.06	0.85
P-12	AC PVMT, PCC Concrete, Landscape	11,921	0.27	1,504	0.03	12.6	10,417	0.24	87.4	80	0.85	0.93	0.85
SYSTEM 2													
P-13	Roof	11,455	0.26	0	0.00	0.0	11,455	0.26	100.0	80	0.85	1.06	0.85
P-14	Landscape	5,003	0.11	5,003	0.11	100.0	0	0.00	0.0	80	0.85	0.00	0.50
P-15	Roof	9,795	0.22	0	0.00	0.0	9,795	0.22	100.0	80	0.85	1.06	0.85
P-16	Landscape	3,978	0.09	3,978	0.09	100.0	0	0.00	0.0	80	0.85	0.00	0.50
P-17	Landscape	1,443	0.03	1,443	0.03	100.0	0	0.00	0.0	80	0.85	0.00	0.50
SYSTEM 3													
P-18	Landscape	6,497	0.15	6,497	0.15	100.0	0	0.00	0.0	80	0.85	0.00	0.50
P-19	Landscape	6,664	0.15	6,664	0.15	100.0	0	0.00	0.0	80	0.85	0.00	0.50
	Total	**98,418**	**2.26**	**31,763**	**0.73**	**32.3**	**66,703**	**1.53**	**67.8**				

Runoff Coefficent C (Rational Method)*

(1) Type D to be used for all areas

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80%, the values given for coefficient C, may be revised by multiplying 80% by the ratio of actual imperviousness to the tabulated imperviousness. however, in no case shall the final coefficient be less than 0.50.

Example:

Actual Imperviousness = 50%

Tabulated Imperviousness = 80%

Revised C = (50/80) x 0.85 = 0.53

* Per Table A-1 *Runoff Coefficients (Rational Method)* of City of San Diego Drainge Design Manual, dated January 2017

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

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2007 Advanced Engineering Software (aes)
              Ver. 13.9 Release Date: 04/04/2008  License ID 1402

                           Analysis prepared by:

                             Stuart Engineering
                     7525 Metropolitan Drive, Suite 308
                        San Diego, California 92108
                  (619) 296-1010  se@stuartengineering.com

 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR PROPOSED CONDITIONS                                             *
*                                                                          *
*                                                                          *
 **************************************************************************

  FILE NAME: 6044P100.DAT
  TIME/DATE OF STUDY: 11:07 06/04/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 10
   1)   5.000;  4.400
   2)  10.000;  3.300
   3)  15.000;  2.900
   4)  20.000;  2.400
   5)  25.000;  2.200
   6)  30.000;  2.000
   7)  45.000;  1.550
   8)  60.000;  1.300
   9) 100.000;  0.950
  10) 600.000;  0.330
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   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      4.00 TO NODE      5.00 IS CODE =  22     P-1
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
================================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      0.75
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.75

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      5.00 IS CODE =  81    P-2
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.11
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.86
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE     10.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   309.15  DOWNSTREAM(FEET) =   308.25
  FLOW LENGTH(FEET) =    90.20   MANNING'S N =  0.010
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.52
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.86
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    5.33
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE     10.00 =      90.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  81    P-3
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.327
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.16   SUBAREA RUNOFF(CFS) =    0.59
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.45
  TC(MIN.) =    5.33

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 IS CODE =  81    P-4
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.327
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.04   SUBAREA RUNOFF(CFS) =    0.09
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.53
  TC(MIN.) =    5.33
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   308.25  DOWNSTREAM(FEET) =   307.91
  FLOW LENGTH(FEET) =    32.24   MANNING'S N =  0.010
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.28
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.53
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.43
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE     15.00 =     122.44 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  81     P-5
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.305
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.29
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       1.83
  TC(MIN.) =    5.43

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81     P-6
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.305
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.06
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.89
  TC(MIN.) =    5.43

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   307.91  DOWNSTREAM(FEET) =   307.46
  FLOW LENGTH(FEET) =    45.21   MANNING'S N =  0.010
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.37
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.89
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    5.57
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE     25.00 =     167.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

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

```
  FLOW PROCESS FROM NODE     20.00 TO NODE     22.00 IS CODE =  22
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      0.11
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   307.66  DOWNSTREAM(FEET) =   307.46
  FLOW LENGTH(FEET) =    19.65   MANNING'S N =  0.010
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  6.000
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.60
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.11
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.13
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    9039.65 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.11     5.13       4.372        0.03
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    9039.65 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.89     5.57       4.274        0.56
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE     25.00 =     167.65 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       1.96       5.13        4.372
      2       2.00       5.57        4.274

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.00   Tc(MIN.) =    5.57
  TOTAL AREA(ACRES) =        0.6

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

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

```
  FLOW PROCESS FROM NODE     25.00 TO NODE     35.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   307.46  DOWNSTREAM(FEET) =   306.30
  FLOW LENGTH(FEET) =   116.45   MANNING'S N =  0.010
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.38
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.00
  PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    5.94
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     35.00 =    9156.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     29.00 TO NODE     30.00 IS CODE =  22    P-8
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     35.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   306.52  DOWNSTREAM(FEET) =   306.30
  FLOW LENGTH(FEET) =    22.19   MANNING'S N =  0.010
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.63
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    5.10
  LONGEST FLOWPATH FROM NODE     29.00 TO NODE     35.00 =      41.84 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.37     5.10       4.378        0.10
  LONGEST FLOWPATH FROM NODE     29.00 TO NODE     35.00 =      41.84 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
```

```
     1        2.00     5.94       4.194        0.59
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     35.00 =    9156.10 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF      Tc      INTENSITY
  NUMBER     (CFS)    (MIN.)   (INCH/HOUR)
     1       2.29      5.10        4.378
     2       2.36      5.94        4.194

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.36   Tc(MIN.) =    5.94
  TOTAL AREA(ACRES) =        0.7

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     35.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     45.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   306.30  DOWNSTREAM(FEET) =   305.32
  FLOW LENGTH(FEET) =    97.79   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.81
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.36
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.22
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     45.00 =    9253.89 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     40.00 IS CODE =  22    P-9
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      0.22
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81    P-10
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.41
```

```
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.64
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     45.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   305.49  DOWNSTREAM(FEET) =   305.32
  FLOW LENGTH(FEET) =    16.22   MANNING'S N =  0.010
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.18
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        0.64
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.06
  LONGEST FLOWPATH FROM NODE     39.00 TO NODE     45.00 =    1981.22 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1         0.64     5.06       4.386        0.17
  LONGEST FLOWPATH FROM NODE     39.00 TO NODE     45.00 =    1981.22 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1         2.36     6.22       4.133        0.69
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     45.00 =    9253.89 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1        2.86       5.06        4.386
     2        2.96       6.22        4.133

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.96   Tc(MIN.) =    6.22
  TOTAL AREA(ACRES) =        0.9

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE     45.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     45.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   305.32  DOWNSTREAM(FEET) =   305.07
  FLOW LENGTH(FEET) =    24.96   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.14
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       2.96
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    6.28
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    9278.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     60.00 IS CODE =  22   P-13
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      0.97
  TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.97

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     60.00 IS CODE =  81   P-14
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.24
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.21
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   307.47  DOWNSTREAM(FEET) =   306.53
  FLOW LENGTH(FEET) =    94.48   MANNING'S N =  0.010
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.21
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    5.32
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     65.00 =     119.44 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     65.00 IS CODE =  81   P-15
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.330
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.22   SUBAREA RUNOFF(CFS) =    0.81
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.02
  TC(MIN.) =    5.32
```

```
************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81   P-16
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.330
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.19
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       2.22
  TC(MIN.) =    5.32

************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     70.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   306.53  DOWNSTREAM(FEET) =   306.08
  FLOW LENGTH(FEET) =    45.73   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.69
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.22
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    5.45
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     70.00 =     165.17 FEET.

************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  81   P-17
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.300
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.06
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       2.28
  TC(MIN.) =    5.45

************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     75.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   306.08  DOWNSTREAM(FEET) =   305.50
  FLOW LENGTH(FEET) =    91.36   MANNING'S N =  0.010
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.85
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.28
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =    5.77
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     75.00 =     256.53 FEET.

************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  81   P-12
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.231
```

```
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.97
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       3.25
  TC(MIN.) =    5.77

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     75.00 IS CODE =  22   P-11
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8500
  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) =      0.37
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        0.37     5.00       4.400        0.10
  LONGEST FLOWPATH FROM NODE     74.00 TO NODE     75.00 =       0.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        3.25     5.77       4.231        0.98
  LONGEST FLOWPATH FROM NODE     59.00 TO NODE     75.00 =     256.53 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       3.50       5.00        4.400
     2       3.61       5.77        4.231

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.61   Tc(MIN.) =    5.77
  TOTAL AREA(ACRES) =        1.1

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     75.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   305.50  DOWNSTREAM(FEET) =   305.07
 FLOW LENGTH(FEET) =    42.66   MANNING'S N =  0.010
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.41
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        3.61
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    5.88
 LONGEST FLOWPATH FROM NODE     59.00 TO NODE    100.00 =     299.19 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1         3.61     5.88       4.207        1.08
 LONGEST FLOWPATH FROM NODE     59.00 TO NODE    100.00 =     299.19 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1         2.96     6.28       4.118        0.86
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE    100.00 =    9278.85 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
    1       6.51       5.88        4.207
    2       6.49       6.28        4.118

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       6.51   Tc(MIN.) =    5.88
 TOTAL AREA(ACRES) =        1.9

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   305.07  DOWNSTREAM(FEET) =   304.88
 FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.010
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.40
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        6.51
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.92
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE    105.00 =    9297.85 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    110.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   301.88  DOWNSTREAM(FEET) =   301.85
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.40
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.51
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    5.93
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    110.00 =    9300.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    115.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   301.41  DOWNSTREAM(FEET) =   301.30
  FLOW LENGTH(FEET) =    11.00   MANNING'S N =  0.010
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.40
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.51
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.95
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    115.00 =    9311.85 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    210.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   300.80  DOWNSTREAM(FEET) =   299.98
  FLOW LENGTH(FEET) =    81.90   MANNING'S N =  0.010
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.40
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.51
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    6.14
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE    210.00 =    9393.75 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  22   P-18
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT 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) =      0.33
  TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.33

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

```
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   293.31  DOWNSTREAM(FEET) =   293.23
  FLOW LENGTH(FEET) =     8.21   MANNING'S N =  0.010
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.50
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.33
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.04
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    201.00 =       8.21 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    206.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   293.23  DOWNSTREAM(FEET) =   291.02
  FLOW LENGTH(FEET) =   142.80   MANNING'S N =  0.010
  DEPTH OF FLOW IN  30.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.44
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.33
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =    5.73
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     151.01 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  81   P-19
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.239
  *USER SPECIFIED(SUBAREA):
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.32
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.65
  TC(MIN.) =    5.73

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    210.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   291.02  DOWNSTREAM(FEET) =   288.80
  FLOW LENGTH(FEET) =   141.16   MANNING'S N =  0.010
  DEPTH OF FLOW IN  30.0 INCH PIPE IS   2.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.25
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.65
  PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =    6.28
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    210.00 =     292.17 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    210.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
```

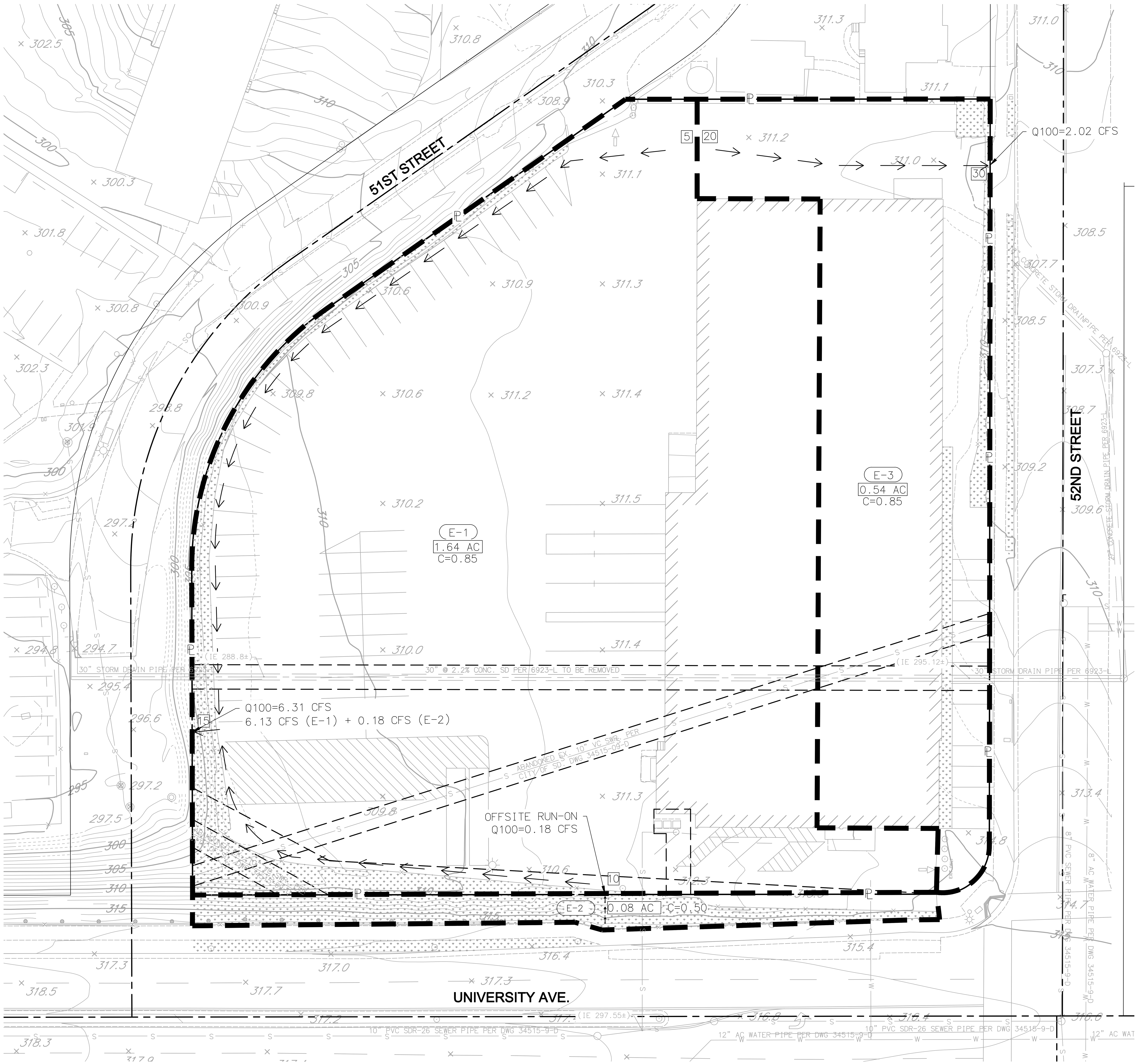
```
** MAIN STREAM CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1        0.65     6.28       4.118        0.30
LONGEST FLOWPATH FROM NODE    200.00 TO NODE    210.00 =     292.17 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1        6.51     6.14       4.150        1.94
LONGEST FLOWPATH FROM NODE     20.00 TO NODE    210.00 =    9393.75 FEET.

** PEAK FLOW RATE TABLE **
STREAM    RUNOFF       Tc      INTENSITY
NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
    1       7.15       6.14        4.150
    2       7.11       6.28        4.118

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       7.15   Tc(MIN.) =    6.14
TOTAL AREA(ACRES) =        2.2
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.2  TC(MIN.) =      6.14
  PEAK FLOW RATE(CFS)   =       7.15
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
```

EXHIBITS

EXISTING DRAINAGE CONDITIONS EXHIBIT

PROPOSED DRAINAGE CONDITIONS EXHIBIT

FEMA FLOOD INSURANCE RATE MAP (FIRM)



LEGEND

	SYMBOL
RATIONAL METHOD NODE NUMBER	1
EXISTING DRAINAGE BASIN BOUNDARY	
DRAINAGE BASIN DESIGNATOR	E-1
RUNOFF COEFFICIENT ASSOCIATED WITH DRAINAGE BASIN	C=0.85
HYDROLENGTH	→ →

EXISTING IMPROVEMENT LEGEND

EX WATER	W
EX SEWER	S
EX STORM DRAIN	
EX GAS	G
EX COMMUNICATION	COMM
EX CABLE/TELEVISION	CATV
EX CONTOUR	310
EX BUILDING	
EX SPOT ELEVATION	(344.7±)
EX LANDSCAPE	
PROPERTY/RIGHT-OF-WAY LINE	
STREET CENTER LINE	
EASEMENT LINE	

ABBERVIATION

PROPERTY LINE	ℙ
CUBIC FEET PER SECOND	CFS
Q100	100-YEAR STORM EVENT
AC	ACRES

C-VALUE NOTE:

(1) TYPE D TO BE USED FOR ALL AREAS

(2) LAND USE FOR DEVELOPED AREAS: COMMERCIAL (80% IMPERVIOUS);
ASSOCIATED COEFFICIENT, C: 0.85 PER TABLE A-1 'RUNOFF COEFFICIENTS FOR RATIONAL METHOD OF CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL.

(3) WHERE ACTUAL CONDITIONS DEVIATE SIGNIFICANTLY FROM THE TABULATED IMPERVIOUSNESS VALUE OF 80%, THE VALUE GIVEN FOR COEFFICIENT C, MAY BE REVISED BY MULTIPLYING 80% BY THE RATIO OF ACTUAL IMPERVIOUSNESS TO THE TABULATED IMPERVIOUSNESS. HOWEVER, IN NO CASE SHALL THE FINAL COEFFICIENT BE LESS THAN 0.50.

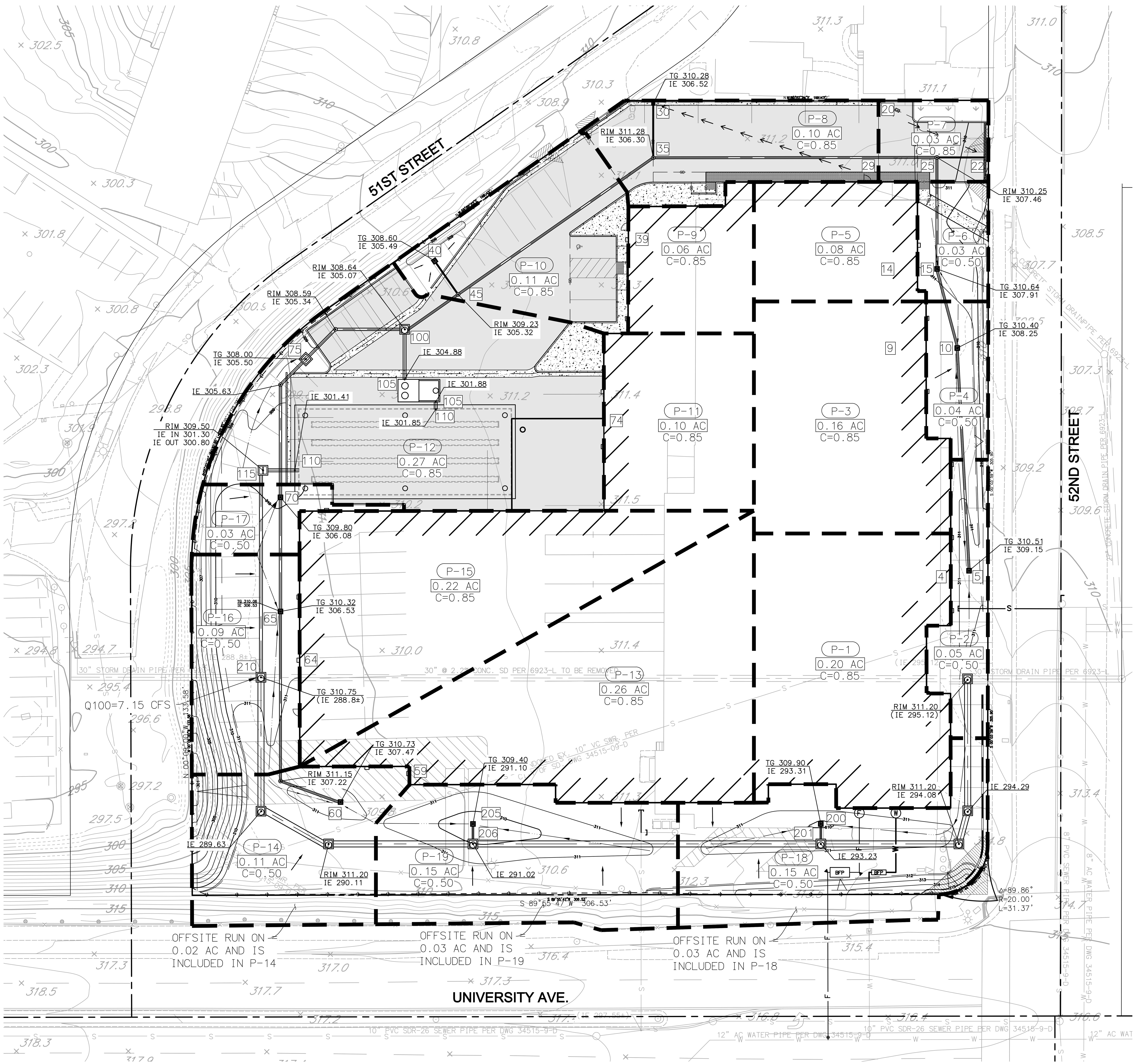
SCALE: 1"=20'

REGISTERED PROFESSIONAL ENGINEER SEAN ULRICH GIERLICHS No. 83931 Exp. 9-30-21 CIVIL STATE OF CALIFORNIA

DRAINAGE STUDY
EXISTING CONDITIONS EXHIBIT
FOR UNIVERSITY SELF STORAGE

NOVA ENGINEERING
4373 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123 (619) 296-1010
FAX (619) 296-9276 EMAIL:Sgierlichs@nova-eng.com

DESIGNER: M.D.D
DRAWN: M.D.D
DATE: 1/28/2021
JOB NO.: 6044



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LEGEND

IMPROVEMENT	REFERENCE	SYMBOL
RATIONAL METHOD NODE NUMBER		1
PROPOSED DRAINAGE BASIN BOUNDARY		
DRAINAGE BASIN DESIGNATOR		P-1
HYDROLENGTH		
PROP BUILDING		
FINISH SPOT ELEVATION		FS 310.30
MATCH EXISTING SPOT ELEVATION		(FS 308.80)
FINISH MINOR CONTOUR		311
FINISH MAJOR CONTOUR		310
GRADE BREAK		GB
LIMITS OF GRADING (DAYLIGHT LINE)		
PROP CONCRETE PAVING	1/C2.0	
PROP AC PAVING	2/C2.0	
PROP CURB	3/C2.0	
PROP CURB AND GUTTER	4/C2.0	
PROP EARTHEN SWALE	6/C2.0	
PROP TYPE A-4 CLEANOUT	D-09	
PROP CATCH BASIN	7/C2.0	
PROP STORM DRAIN CLEANOUT	8/C2.0	
PROP STORM DRAIN		
PROP TRENCH DRAIN	9/C2.0	
PROP WEIR STRUCTURE	10,11/C2.0	
PROP MODULAR WETLAND SYSTEM	14/C2.1	

EXISTING IMPROVEMENT LEGEND

EX WATER	W
EX SEWER	S
EX STORM DRAIN	
EX GAS	G
EX COMMUNICATION	COMM
EX CABLE/TELEVISION	CATV
EX CONTOUR	310
EX BUILDING	
EX SPOT ELEVATION	(344.7±)
EX LANDSCAPE	
PROPERTY/RIGHT-OF-WAY LINE	
STREET CENTER LINE	

DRAINAGE STUDY PROPOSED CONDITIONS EXHIBIT FOR UNIVERSITY SELF STORAGE

NOVA ENGINEERING
4373 VIEWRIDGE AVENUE, SUITE A
SAN DIEGO, CA 92123 (619) 296-1010
EMAIL: Sgierlichs@nova-eng.com

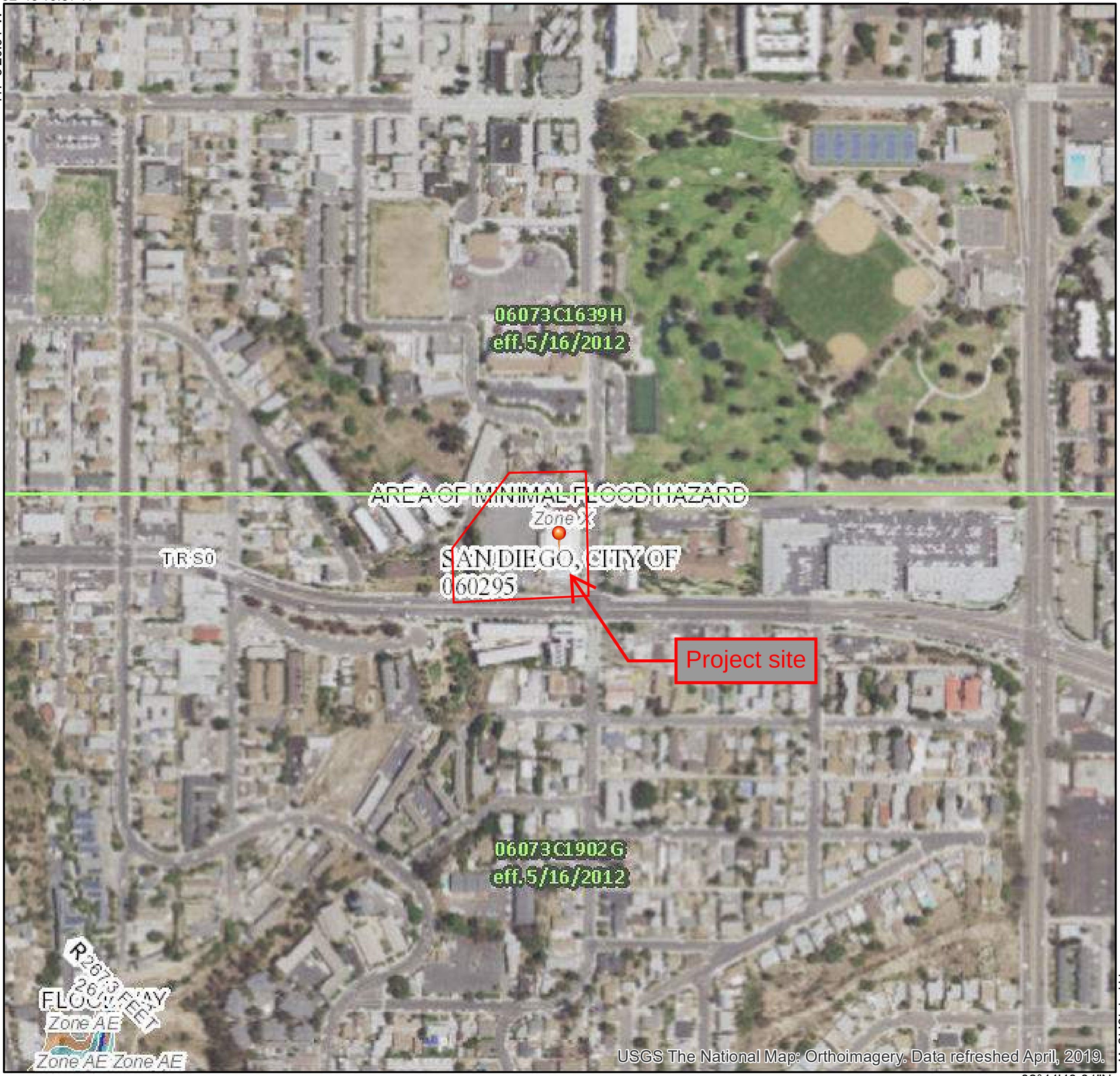
DESIGNER:	M.D.D
DRAWN:	M.D.D
DATE:	1/28/2021
JOB NO.:	6044

National Flood Hazard Layer FIRMette

FEMA

32°45'13.87"N

117°5'20.91"W



117°4'43.45"W

32°44'43.61"N

Feet 0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/22/2020 at 12:18:29 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-877-FEMA MAP (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

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The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A —— A	Cross section line
23 - - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1902G

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1902 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LEMON GROVE, CITY OF	060723	1902	G
SAN DIEGO COUNTY	060284	1902	G
SAN DIEGO, CITY OF	060295	1902	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1902G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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LEGEND

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0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
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23 — 23 Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 11

6000000 FT — 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

● M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 16, 1999

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MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1639H

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1639 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1639	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1639H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

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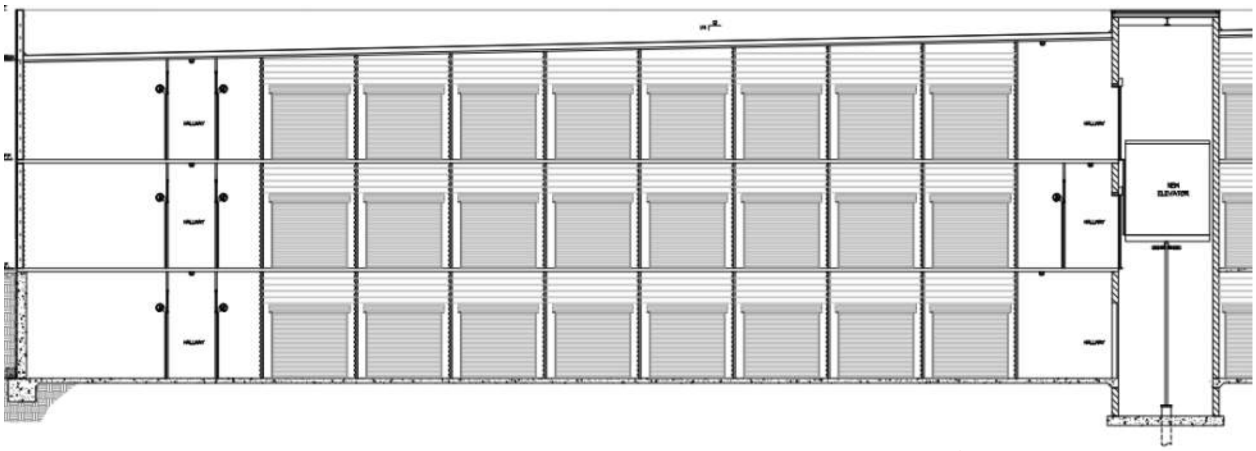
Attachment 6
Geotechnical and Groundwater Investigation Report

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

Report
Update Geotechnical Investigation

Proposed University Self Storage
5150 University Avenue, San Diego



Cardinal Industrial
15260 Ventura Boulevard, Suite 1120
Sherman Oaks, CA 91403

CARDINAL INDUSTRIAL

NOVA Project 2020062
May 20, 2020

NOVA

4373 Viewridge Avenue, Suite B
San Diego, California 92123
858.292.7575

944 Calle Amanecer, Suite F
San Clemente, CA 92673
949.388.7710

www.usa-nova.com

Cardinal Industrial
15260 Ventura Boulevard, Suite 1120
Sherman Oaks, CA 91403

May 20, 2020
NOVA Project 2020057

Attention: Mr. Robb Wenrich

Subject: Report
Update Geotechnical Investigation
Proposed University Self Storage
5150 University Avenue, San Diego, California

Dear Mr. Wenrich:

NOVA Services, Inc. (NOVA) is pleased to present herewith its report of an Update Geotechnical Investigation for the subject property. The work reported herein was completed by NOVA for Cardinal Industrial in accordance with NOVA's proposal dated March 23, 2020.

This report is an update to a 2020 investigation by others, providing additional subsurface exploration and percolation testing. The recommendations provided herein update and supersede those provided in the report by others.

NOVA appreciates the opportunity to be of service on this most interesting project. Should you have any questions regarding this report or other matters, please contact the undersigned at 858.292.7570.

Sincerely,
NOVA Services, Inc.

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Report
Geotechnical Investigation

Proposed University Self Storage
5150 University Avenue, San Diego, California

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1.0 INTRODUCTION

1.1 Terms of Reference

This report presents the findings of a geotechnical investigation for a project known to NOVA Services, Inc. (NOVA) as 'University Self Storage.' Work related to this report was completed by NOVA for Cardinal Industrial in accordance with the scope of work detailed in NOVA's March 23, 2020 proposal.

The report presents the findings of a geotechnical investigation for a three-level self-storage facility to be located at 5150 University Avenue in San Diego, California. Figure 1-1 provides a graphic that depicts the site vicinity.

Figure 1-1. Vicinity Map

1.2 Update Geotechnical Reporting

This report is the second geotechnical assessment completed for this site. This Update has been provided at the Client's request, subsequent to the redesign and reconfiguration of the proposed self-storage facility. This report also includes percolation testing per the City of San Diego, which was not previously performed. The findings of a prior report are provided in *Geotechnical Investigation, University Self Storage Development, 5150 University Avenue, San Diego, California,* Leighton Consulting Inc., Project No. 12479.001, January 16, 2020 (hereinafter, 'Leighton 2020').

This report is an update to Leighton 2020 providing additional subsurface exploration and percolation testing. The recommendations provided herein update and supersede those provided in Leighton 2020.

1.3 Objective, Scope, and Limitations of This Work

1.3.1 Objective

The objective of the work proposed herein is to update the findings of prior geotechnical reporting and recommendations, including development of infiltration and subsurface information.

1.3.2 Scope

To accomplish the above objectives, NOVA undertook the task-based scope of work described below.

1. Task 1, Pre-Mobilization Activities. Prior to initiating any fieldwork, NOVA undertook the series of subtasks described below.
    a. *Subtask 1-1, Reconnaissance and Utility Clearance*. A NOVA geologist completed a detailed reconnaissance of the site, identifying and marking prospective locations for subsurface exploration. NOVA contacted underground service alert (USA) and a private utility locator to identify any underground utilities at exploration locations.
    b. *Subtask 1-2, Subcontracting and Permitting.* NOVA retained a specialty contractor to conduct the drilling required for borings and infiltration testing. Borings were permitted in accordance with San Diego County DEH requirements prior to drilling.
2. Task 2, Subsurface Exploration. A NOVA geologist directed a geotechnical and infiltration-focused subsurface exploration that included the subtasks listed below.
    a. *Subtask 2-1, Percolation Testing*. Two (2) percolation test borings were drilled in prospective DMA areas. Percolation test borings were converted to percolation test wells, then tested in accordance with the requirements of the City of San Diego.
    b. *Subtask 2-2, Engineering Borings.* Three (3) borings were drilled for additional evaluation of subsurface conditions. The borings were sampled in accordance with ASTM methods.
    c. *Subtask 2-3, Closure*. On completion, each boring was backfilled with cuttings in accordance with County DEH requirements. Asphalt pavement was patched with cold patch.
3. Task 3, Laboratory Testing. Samples retrieved from the engineering borings were tested and to supplement geotechnical information provided by Leighton 2020. Laboratory testing addressed index soil characteristics that may be used to estimate soil mechanical characteristics.
4. Task 4, Engineering Evaluations. The findings of Tasks 1 through 3 were utilized to (i) support an update of Leighton 2020, and (ii) determination of design requirements for development of stormwater infiltration DMAs.

5. Task 5, Reporting. Submittal of this report concludes NOVA's scope of services. The report provides a record of all work, as well as (i) an update of Leighton 2020, addressing design parameters for foundations and earthwork; and, (ii) design requirements for development of stormwater infiltration DMAs.

1.3.3 Limitations

Assessment of the subsurface in geological and geotechnical engineering is characterized by uncertainty. Opinions relating to environmental, geologic, and geotechnical conditions are based on limited data, such that actual conditions may vary from those encountered at the times and locations where the data are obtained, despite the use of due professional care.

The judgments provided in this report are based upon NOVA's understanding of the planned construction, its experience with similar work, and its judgments regarding subsurface conditions indicated by the methods of subsurface exploration described in the report.

Conditions exposed by construction may vary from those disclosed by the borings. NOVA should be retained for design review and for surveillance to observe subsurface conditions revealed during construction. NOVA cannot assume responsibility for the recommendations of this report if NOVA does not perform construction observation. Section 9 of this report addresses this consideration in more detail.

This report addresses geotechnical considerations only. The report does not provide any environmental assessment or investigation of the presence or absence of hazardous or toxic materials in the soil, soil gas, groundwater, or surface water within or beyond the site.

Appendix A to this report provides important additional guidance regarding the use and limitations of this report. This information should be reviewed by all users of the report.

1.4 Understood Use of This Report

NOVA expects that the findings and recommendations provided herein will be utilized by Cardinal Industrial and its Design Team in decision-making regarding design and construction of the planned self-storage facility.

NOVA's recommendations are based on our current understanding and assumptions regarding project development. Effective use of this report by the Design Team should include review by NOVA of the final design. Such review is important for both (i) conformance with the recommendations provided herein, and (ii) consistency with NOVA's understanding of the planned development.

1.5 Report Organization

The remainder of this report is organized as abstracted below.

- Section 2 reviews available project information.
- Section 3 describes the field investigation and laboratory testing.
- Section 4 describes the surface and subsurface conditions.
- Section 5 reviews geologic, soil and siting hazards common to civil works in this region, considering each for its potential to affect this development.

- Section 6 provides recommendations for earthwork and foundation design.
- Section 7 provides guidance for development of stormwater infiltration BMPs.
- Section 8 addresses pavement design.
- Section 9 provides recommendations for geotechnical observation during construction.
- Section 10 cites prominent references used in preparation of the report.

Figures and tables intended to amplify the discussions in the text are embedded therein. Plates providing large-scale presentations of certain graphics are provided immediately following the text of the report.

The report is supported by four appendices.

- Appendix A presents guidance regarding use of this report.
- Appendix B provides logs of the engineering and percolation test borings by NOVA.
- Appendix C provides records of geotechnical laboratory testing.
- Appendix D provides infiltration feasibility documents.

2.0 PROJECT INFORMATION

2.1 Site Description

2.1.1 Location

Cardinal Industrial will develop University Self-Storage on a 2.2-acre parcel at 5150 University Avenue, APN 472-383-04 (hereinafter, also referenced as 'the site').

The site is bounded on the south by University Avenue, on the north by single-family residences, on the west by 51st Street, and on the east by 52nd Street. Figure 2-1 depicts the location, limits, and properties surrounding the site.

Figure 2-1. Site Location and Approximate Limits

2.1.2 Current and Historic Site Use

As may be seen by review of Figure 2-1, the site is currently developed with a commercial warehouse structure and asphalt surfacing for parking. The structure is at least 30 years old.

Review of the 1942 topographic map, which was surveyed prior to grading of the present-day site configuration, indicates the presence of a pre-existing erosional drainage feature that provided drainage from both the northwest portion of the site, and the central eastern portion of the site, down through the southwest corner, where it continued to flow offsite. This drainage appears to be part of a much larger south to southwest-trending canyon drainage system, which is characteristic of this area of San Diego. Figure 2-2 (following page) locates this feature in proximity to the site.

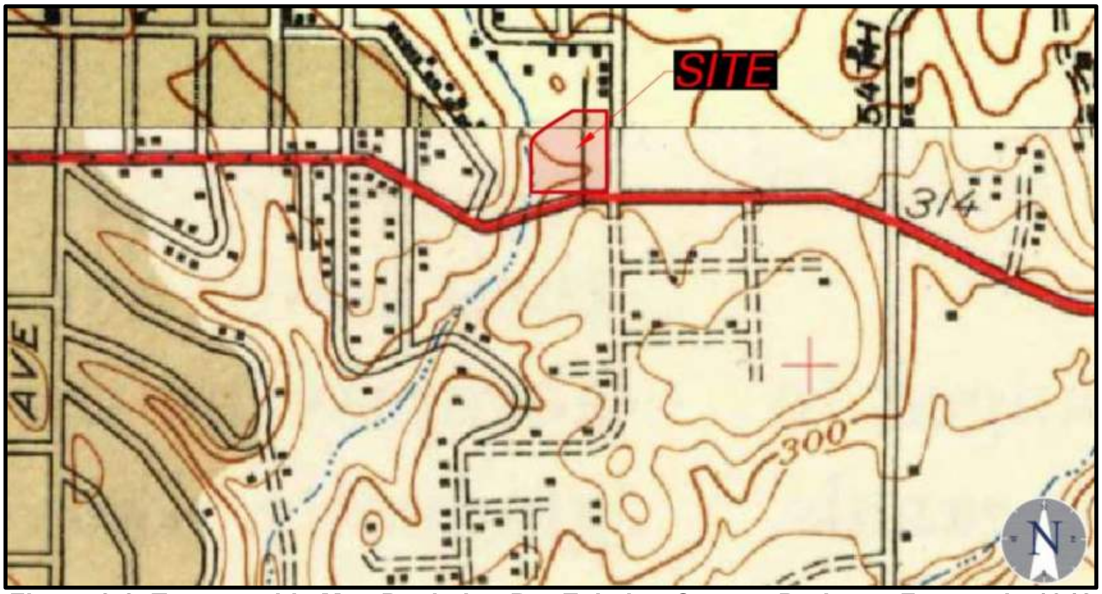

Figure 2-2. Topographic Map Depicting Pre-Existing Canyon Drainage Feature in 1942

Review of historical aerial photography indicates that the site has been developed since at least 1953. Figure 2-3 depicts the site as it appeared that year.

Figure 2-3. 1953 Aerial Photo Depicting Site Grading in 1953

2.2 Planned Development

2.2.1 Design Basis Documentation

NOVA's understanding of planning for development of University Self-Storage is based upon review of the documentation listed below.

- Valli 2020. *University Self Storage, 5150 University Ave., San Diego, CA,* Sheet A1.0 through Sheet A5.3, Valli Architectural Group, March 20, 2020.

- NOVA 2019*. ALTA/ACSM Survey, Lots 3, 4, 5 and 6, Block E of Oak Park*, 3 Sheets, NOVA Engineering, Inc., Job No. 451-06-00, July 29, 2019.

- NOVA 2020*. Excavation Exhibit, 5150 University Ave. Storage Facility*, NOVA Engineering, Inc., April 15, 2020.

2.2.2 Architectural

Valli 2020 indicates that the self-storage structure will be developed on three levels, to include a single level of below grade storage space. The finished floor level of the lowest level will be set approximately 12 feet below surrounding ground. The two above grade levels will rise an aggregate of approximately 29 feet above ground.

Figure 2-4 reproduces a representative section of the planned storage structure. As may be seen by review of this graphic, a central elevator will extend about 5 feet below the base of the structure. Figure 2-5 (following page) depicts the planned limits of the structure.

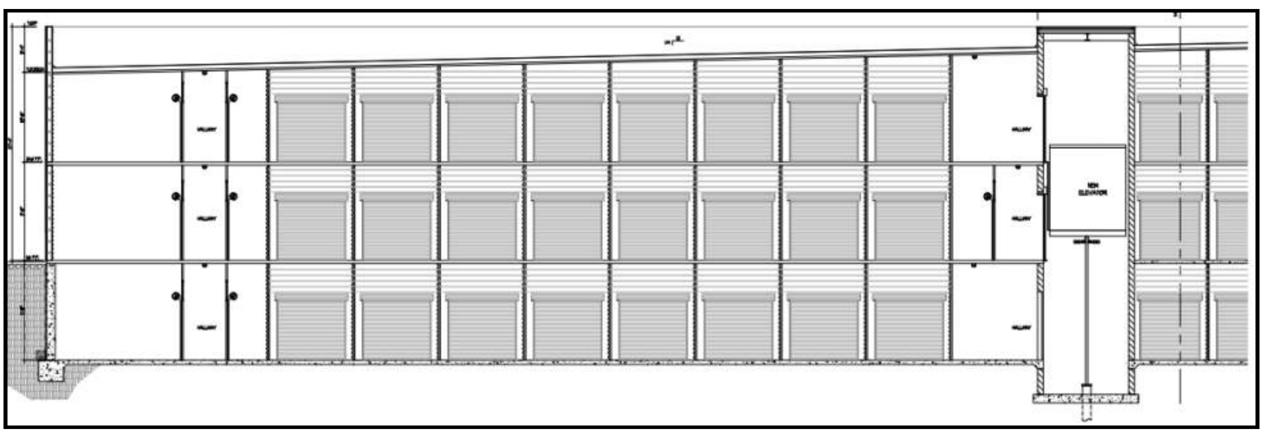

Figure 2-4. Representative Elevation View
(source: Valli 2020)

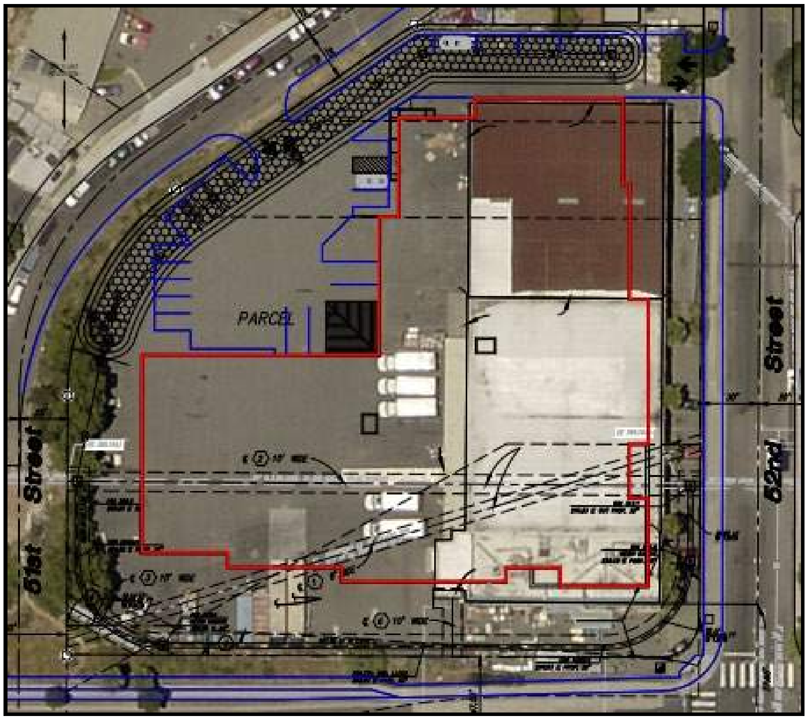

Figure 2-5. Plan View of the Limits of the Structure
(source: NOVA 2019)

2.2.3 Structural

No structural information is available. However, based on review of Valli 2020 it appears that loads to foundations will be relatively light. Interior column loads (DL+LL) will be on the order of 200 kips to 400 kips, with exterior walls loaded to about 3.5 kips/lineal foot. A retaining wall will be located at the southeast corner of the property.

2.2.4 Stormwater

Review of the Site Drainage Plan provided in NOVA 2020 indicates that permanent stormwater infiltration Best Management Practices ('stormwater BMPs') will be nested in the northwest corner of the structure, utilizing a modular wetland for primary stormwater treatment, then detention in a vault. Stormwater will drain by gravity to release at the southeast of the site.

Figure 2-6 (following page) depicts the location of the proposed stormwater system at the site.

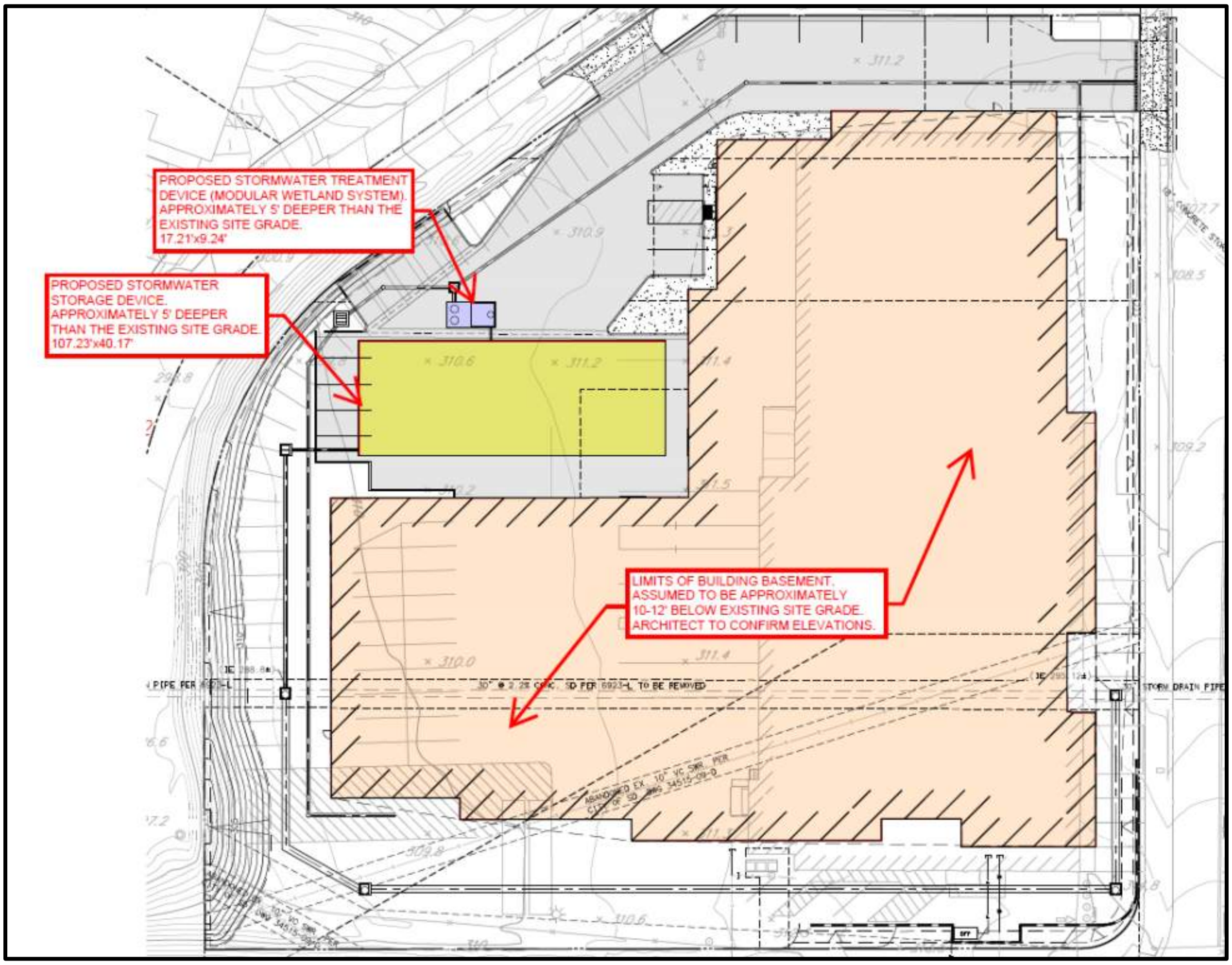

Figure 2-6. Stormwater Treatment and Detention
(source: NOVA 2020)

2.2.5 Potential for Earthwork

Development of the site will involve demolition of the existing warehouse building and parking area, and removal or relocation of existing utilities.

The existing ground level averages about Elevation +313 feet msl. The finished floor of the lowest level will be about +301 feet msl, requiring removal of about 14 feet of soil across much of the site. No excavation bracing is planned, requiring that temporary slopes be laid back per OSHA requirements discussed in detail within Section 6.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Overview

A NOVA geologist directed drilling and sampling of three (3) engineering borings (B-1 through B-3) to depths of between 27 feet and 32 feet below ground surface (bgs) on April 23, 2020. Percolation testing in two (2) wells (P-1 and P-2) was completed on April 24. The foregoing supplements a site exploration by seven (7) engineering borings that is reported in Leighton 2020.

Figure 3-1 presents a plan view of the site indicating the location of the engineering borings and percolation test borings. Plate 1 (provided following the report text) depicts this work in larger scale.

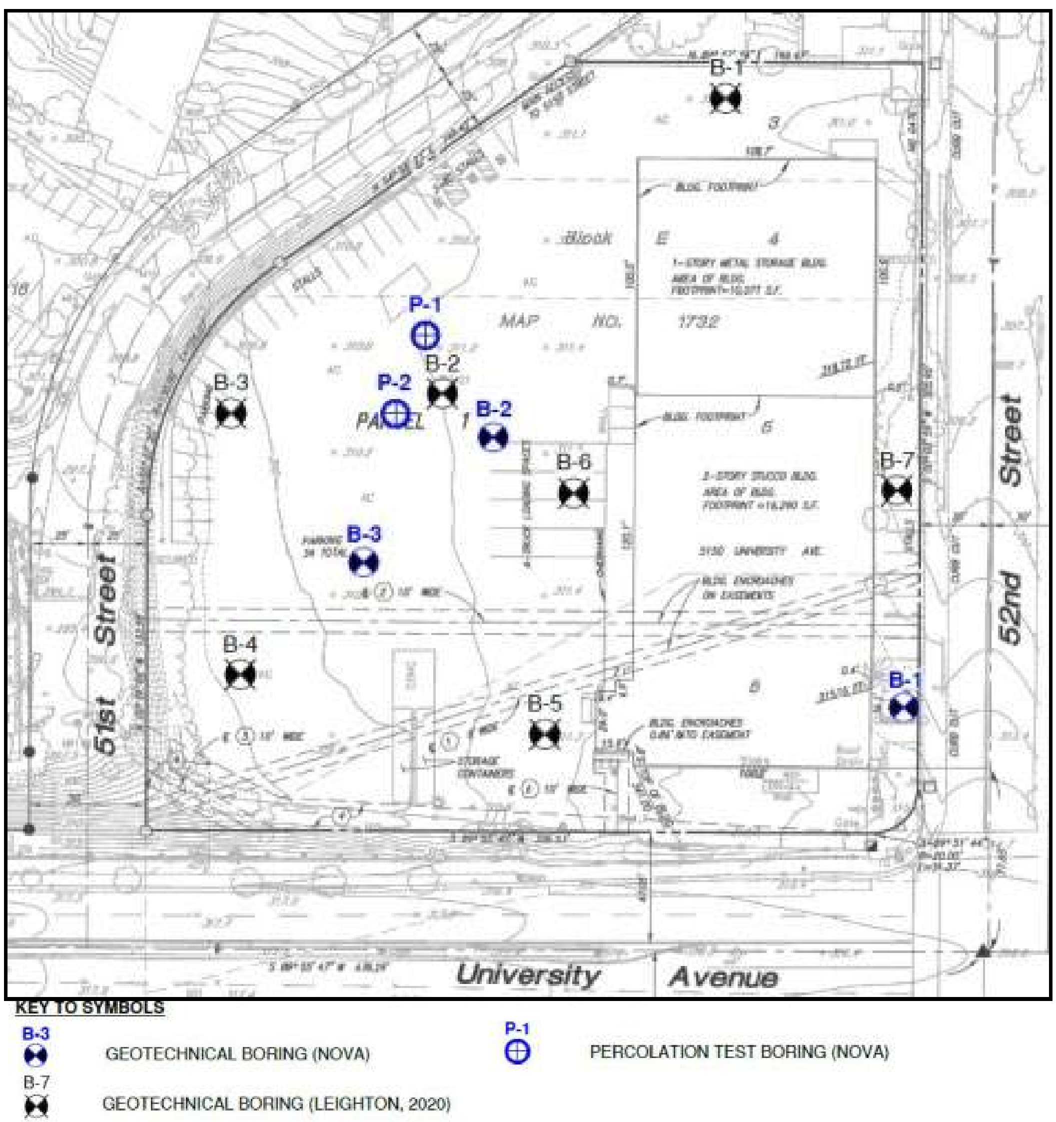

Figure 3-1. Locations of the Engineering and Percolation Test Borings

3.2 Engineering Borings by NOVA

3.2.1 Drilling

The engineering and percolation test borings were completed by a specialty subcontractor retained by NOVA. All work was completed under the continuous supervision of a NOVA geologist.

The engineering borings were advanced by a truck-mounted drilling rig utilizing hollow-stem auger drilling techniques. Boring locations were determined by the geologist based on the proposed building configuration. Table 3-1 provides an abstract of the engineering borings.

Table 3-1. Abstract of the Engineering Borings by NOVA

Boring Reference	Approx. Ground Surface Elev. (feet, msl)	Total Depth Below Ground Surface (feet)	Elevation at Completion (feet, msl)	Approx. Depth to Formation (feet)	Approx. Elev. of Top of Formation (feet, msl)
B-1	+312	26.5	+285.5	20	+292
B-2	+311.5	31.5	+280.0	5	+306
B-3	+310	31.5	+278.5	25	+285

Note 1: no groundwater was encountered in any boring
Note 2: the referenced geologic unit is Mission Valley Formation (Tmv)

3.2.2 Logging and Sampling

The geologist directed sampling and maintained a log of the soils that were encountered. Both disturbed and relatively undisturbed samples were recovered from the borings. Samples were delivered to NOVA's materials laboratory for analysis. Sampling of and *in situ* testing are described below.

1. The Modified California sampler ('ring sampler', after ASTM D 3550) was driven using a 140-pound hammer falling for 30 inches with a total penetration of 18 inches, recording blow counts for each 6 inches of penetration.

2. The Standard Penetration Test sampler ('SPT', after ASTM D 1586) was driven in the same manner as the ring sampler, recording blow counts in the same fashion. SPT blow counts for the final 12 inches of penetration comprise the SPT 'N' value, an index of soil strength and compressibility.

3. Bulk samples representative of the subsurface materials encountered during the investigation were collected for testing.

Soil samples recovered from the engineering borings were transferred to NOVA's geotechnical laboratory where a geotechnical engineer reviewed the soil samples and the field logs.

3.2.3 Closure

On completion, the borings were backfilled with cuttings. The area was cleaned and left as close to the original condition as practical.

Figure 3-2. Drilling Operations, April 23, 2020

3.3 Engineering Borings by Leighton 2020

The engineering borings were advanced by a truck-mounted drilling rig utilizing hollow-stem auger drilling techniques. Table 3-2 (following page) provides an abstract of the borings reported by Leighton.

The soil sampling reported in Leighton 2020 was completed in the same fashion as that undertaken by NOVA, (i) recovering relatively undisturbed samples by means of the Modified California; and, (ii) completing *in situ* testing and recovering disturbed samples by means of the SPT.

3.4 Percolation Testing

3.4.1 General

NOVA directed the excavation and construction of two (2) percolation test well borings (P-1 and P-2), following the recommendations for percolation testing presented in the *City of San Diego BMP Design Manual*, October 2018 edition (hereinafter, 'the BMP Manual').

The locations of these borings are shown in Figure 3-1.

Table 3-2. Abstract of the Engineering Borings Reported in Leighton 2020

Boring Reference	Approx. Ground Surface Elev. (feet, msl)	Total Depth Below Ground Surface (feet)	Elevation at Completion (feet, msl)	Approx. Depth to Formation (feet) [2]	Approx. Elev. of Top of Formation (feet, msl)
B-1	+314	21.5	+292.5	1	+291
B-2[3]	+313	26.5	+286.5	1	+312
B-3	+312	31.5	+380.5	20	+292
B-4	+312	25	+287	20	+292
B-5	+313	41.5	+271.5	25	+288
B-6	+314	21.5	+292.5	5	+309
B-7	+313	16.5	+296.5	5	+308

Note 1: no groundwater was encountered in any boring
Note 2: the referenced geologic units are Mission Valley Formation (Tmv) and very old paralic deposits (Qvop)
Note 3: findings of this boring are inconsistent with NOVA findings and inconsistent with Leighton 2020 geologic mapping

3.4.2 Drilling

The borings for the wells were each drilled with an 8-inch hollow-stem auger to depths of 5 feet and 6 feet below ground surface (bgs). Field measurements were taken to confirm that the borings were excavated to approximately 8 inches in diameter. The borings were logged by a NOVA geologist, who observed and recorded exposed soil cuttings and the boring conditions.

3.4.3 Conversion to Percolation Well

Once the borings were drilled to the desired depths, the borings were converted to percolation test wells by placing an approximately 2-inch layer of ¾-inch gravel on the bottom, then extending 3-inch diameter Schedule 40 perforated PVC pipe to the ground surface. The ¾-inch gravel was used to partially fill the annular space around the perforated pipe below the existing finish grade to minimize the potential of soil caving.

3.4.4 Percolation Testing

The percolation test wells were pre-soaked by filling the holes with water to the ground surface level and testing commenced within a 26-hour window. On the day of testing, two 25-minute trials were conducted in each well.

In the percolation borings, the pre-soak water did not percolate at least 6 inches into the soil unit within 25 minutes. Based on the results of the trials, water levels were recorded every 30 minutes for six hours. At the beginning of each test interval, the water level was raised to approximately the same level as the previous tests, in order to maintain a near-constant head during all test periods.

Table 3-3 (following page) abstracts the indications of the percolation testing. Note that percolation rates are not the same as infiltration rates. Infiltration rates are discussed and presented in Section 7.

Table 3-3. Abstract of the Percolation Testing

Boring Reference	Approximate Elevation (feet, msl)	Total Depth (feet)	Approximate Percolation Test Elevation (feet, msl)	Percolation Rate (inches/hours)[2]	Subsurface Unit Tested[1]
P-1	+311	5	+306	0.24	Tmv
P-2	+310.5	6	+305.5	0.24	Tmv

Note 1: The referenced geologic unit is Mission Valley Formation (Tmv).
Note 2: Section 7 addresses infiltration rates (I) determined from percolation rates.

3.4.5 Closure

At the conclusion of the percolation testing, the PVC pipes were removed and the resulting holes backfilled with soil cuttings and patched to match the existing surfacing.

3.5 Laboratory Testing

3.5.1 General

Soil samples recovered from the engineering borings were transferred to NOVA's geotechnical laboratory where a geotechnical engineer reviewed the soil samples and the field logs. Representative soil samples were selected and tested in NOVA's materials laboratory to check visual classifications and to determine pertinent engineering properties.

The laboratory program included visual classifications of all soil samples as well as index testing in general accordance with ASTM standards. Records of the geotechnical laboratory testing are provided in Appendix C.

3.5.2 Soil Gradation

The visual classifications were further evaluated by grain size testing. Table 3-4 provides an abstract of this testing, with soil classification by the Unified Soil Classification System.

Table 3-4. Abstract of the Soil Gradation Testing

Sample Ref		Percent Passing the #200 Sieve	Classification after ASTM D2488
Boring	Depth (feet)		
B-1	2 – 3.5	42	SC
B-1	5 – 6.5	21	SM
B-1	10 – 15	26	SC
B-1	15 – 20	41	SC
B-2	5 – 10	11	SP-SM
B-3	2.5 – 4	25	SM
B-3	5 – 6.5	23	SM

Note:
'Passing #200 Sieve' is the percent by weight passing the U.S. # 200 sieve (0.074 mm), after ASTM D6913

3.5.3 Plasticity and Expansion Potential

Atterberg limits testing after ASTM D4318 of a sample at B-1 from 15 to 20 feet indicated a liquid limit (LL) of LL = 33 and a plasticity index (PI) of PI = 17. This sample was also tested to determine expansion index (EI), after ASTM D4829. The sample indicated EI = 2, characteristic of a soil with Very Low expansion potential. This consideration is discussed in more detail in Section 5.3.

3.5.4 Chemical Testing

Resistivity, pH, soluble sulfates, and chloride contents were determined as a basis for estimating the potential for the soils to corrode embedded metals and for sulfate attack to embedded concrete.

Section 6.3 provides discussion regarding the corrosion potential for metals and concrete embedded in the site soils. Records of the corrosivity testing are provided in Appendix C. Table 3-5 abstracts the testing.

Table 3-5. Abstract of Chemical Testing

Sample Ref		pH	Resistivity (Ω-cm)	Sulfates		Chlorides	
Boring	Depth (feet)			ppm	%	ppm	%
B-1	10 – 15	7.9	500	250	0.025	210	0.021

4.0 SITE CONDITIONS

4.1 Geologic Setting

4.1.1 Regional

The project area is located in the coastal portion of the Peninsular Range geomorphic province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California. The province varies in width from approximately 30 to 100 miles.

This area of the Province has undergone several episodes of marine inundation and subsequent marine regression (coastline changes) throughout the last 54 million years. These events have resulted in the deposition of a thick sequence of marine and nonmarine sedimentary rocks on the basement igneous rocks of the Southern California Batholith and metamorphic rocks.

Gradual emergence of the region from the sea occurred in Pleistocene time, and numerous wave-cut platforms, most of which were covered by relatively thin marine and nonmarine terrace deposits, formed as the sea receded from the land. Accelerated fluvial erosion during periods of heavy rainfall, along with the lowering of base sea level during Quaternary times, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms in western San Diego County.

4.1.2 Site Specific

Figure 4-1 (following page) reproduces mapping of the near-surface the geology of the site area. Geologic units encountered during the subsurface investigation include sandy artificial fill (Qaf), Quaternary-aged very old paralic deposits (Qvop8), and sandstone of the Mission Valley Formation. (Tmv).

The very old paralic deposits consist of shallow marine and nonmarine terrace deposits of early Pleistocene age. Differently numbered deposits (evident in Figure 4-1) designate different ages and elevations of abrasion platforms. Soils of this unit are typically consolidated, light brown to reddish brown, clean to silty, medium-to-coarse grained sand and gravels with localized interbeds of clayey sand and sandy clay (i.e., localized back-beach lagoonal deposits). These paralic deposits occur widely, found from the International Border extending up into northern San Diego County, and comprising the dominant near-surface geologic formation in much of San Diego.

The site is underlain by well-cemented sandstones of the Mission Valley Formation. This Tertiary-aged formation is typically a light gray marine and non-marine sandstone containing lenses of cobble conglomerate. These sandstones are known to extend well-below the interval explored by the borings for the site.

4.2 Surface, Subsurface and Groundwater

4.2.1 Surface

The site is currently occupied by abandoned commercial buildings located on the eastern side of the property, with the western side supporting an asphalt parking lot. Site elevations range from about +308 feet mean sea level (msl) to about +312 feet msl. Figure 4-2 provides a view of the surface conditions at the site, as viewed from the north.

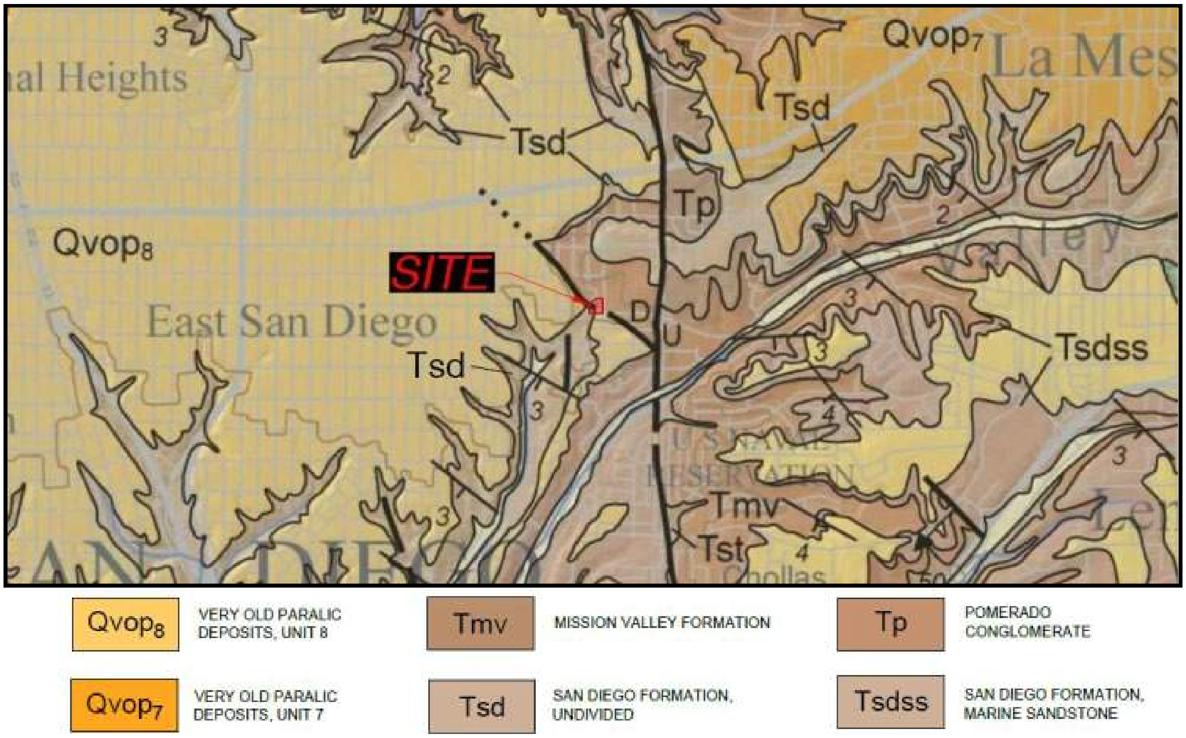

Figure 4-1. Geologic Mapping of the Site Vicinity

Figure 4-2. Site Surface Conditions, Viewed from the North

4.2.2 Subsurface

As encountered during this investigation and Leighton 2020, the subsurface may be generalized to occur as the sequence of soil and rock described below.

1. Unit 1, Fill (Qaf). The site is covered by artificial fill that ranges from about 1 foot to 25 feet in thickness. The fill is predominantly sandy, with varying amounts of silt and clay. Figure 4-3 (following page) depicts this unit.

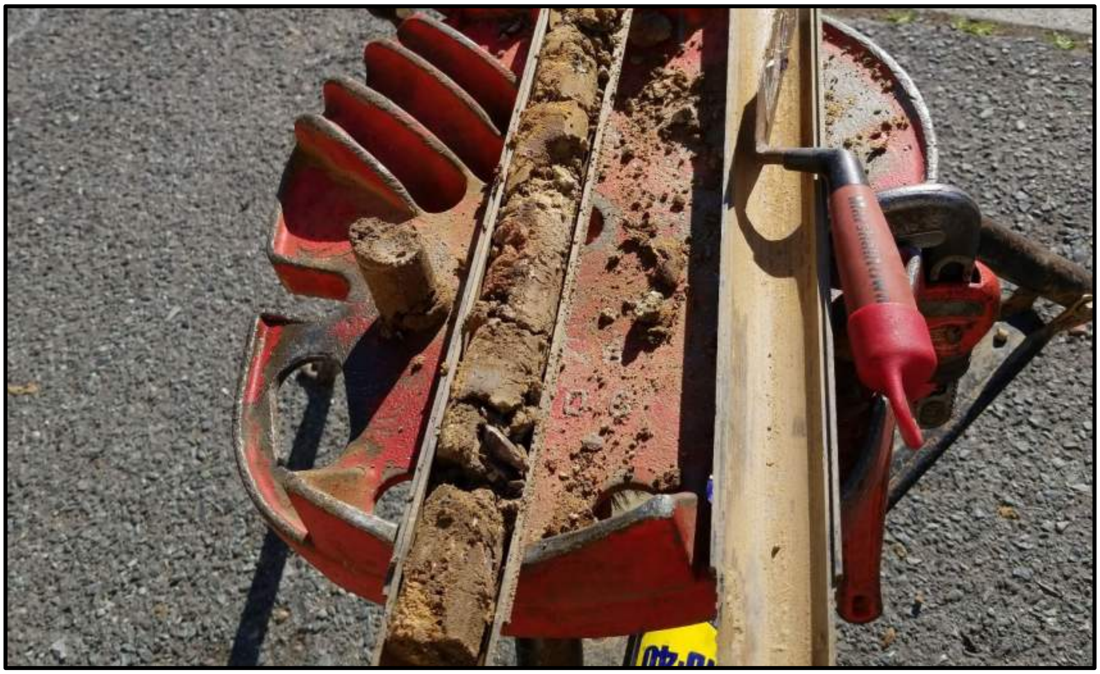

Figure 4-3. Unit 1, Fill

Records regarding placement of the fill are not available. As such, absent other information, the fill is considered 'undocumented' at risk for wide variations in quality and consistency. However, it is the judgment of NOVA that findings from the ten (10) borings completed over the course of this work and the work reported in Leighton 2020, reliably establish the quality of the fill.

The upper approximately 5 to 7 feet of this unit is predominantly clayey sand of medium dense consistency. The interval is characterized by SPT blow counts ('N', blows/foot) on the order of N = 13 to N = 30. Below this level, the fill decreases in content of fines, and displays increasing density. SPT blow counts in this interval on the order of N = 20 to N = 60.

As encountered within the borings, the zones of deepest fill correspond to the areas within the pre-existing canyon drainage feature observed in the historical topographic maps discussed in Section 2.

2. Unit 2, Quaternary Very Old Paralic Deposits ($Qvop_8$). As reported in Leighton 2020, the northeast portion of site is underlain by very old paralic deposits. As reported in their logs, this unit is comprised of silty fine-grained sands of medium dense to very dense consistency. NOVA did not encounter this unit during the subsurface investigation.

3. Unit 3, Mission Valley Formation (Tmv). The site is underlain by silty sandstone that is both well-cemented and of characteristically dense consistency. Figure 4-4 (following page) depicts this unit.

   The sandstones of this unit are characterized by SPT blow counts on the order of N = 50 to N > 100. The sandstones will be incompressible under loads from the planned structure.

Figure 4-4. Unit 3, Mission Valley Formation

4.2.3 Groundwater

Static

No groundwater was encountered in the borings above the maximum depth explored. As such, groundwater is expected to first occur below a depth of about 35 feet, below about El +275 feet msl. Groundwater should not affect construction or design.

Perched

Infiltrating storm water from prolonged wet periods can 'perch' atop localized zones of lower permeability soil that exist above the static groundwater level. In particular, the Unit 2 paralic deposits and Unit 3 Mission Valley Formation can impede infiltrating groundwater. Localized perched groundwater conditions may also develop once site development is complete and landscape irrigation commences.

No perched groundwater was observed during drilling of the engineering borings.

4.2.4 Surface Water

No surface water was evident on the site at the time of NOVA's work. NOVA did not observe any visual evidence of seeps, springs, erosion, staining, discoloration, etc. that would indicate recent problems with surface water.

4.3 Subsurface Profile

As is tabulated in Section 3 and discussed previously in this section, the thickness of fill across the site varies from about 1 to 25 feet. Figure 4-5 and Figure 4-6 provide subsurface profiles beneath the planned structure from east to west and north to south, respectively.

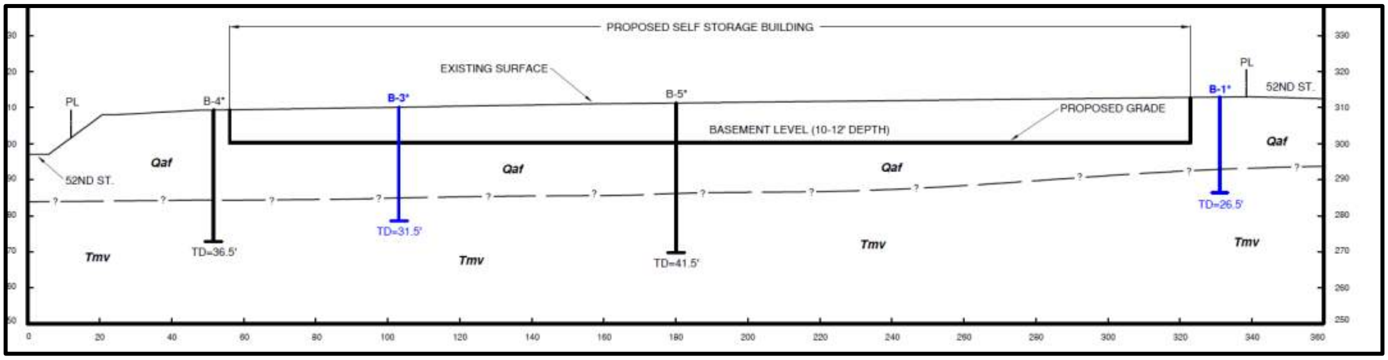

Figure 4-5. East-West Profile Beneath the Planned Structure
(Qaf indicates 'artificial fill'; Tmv indicates 'Mission Valley Formation')

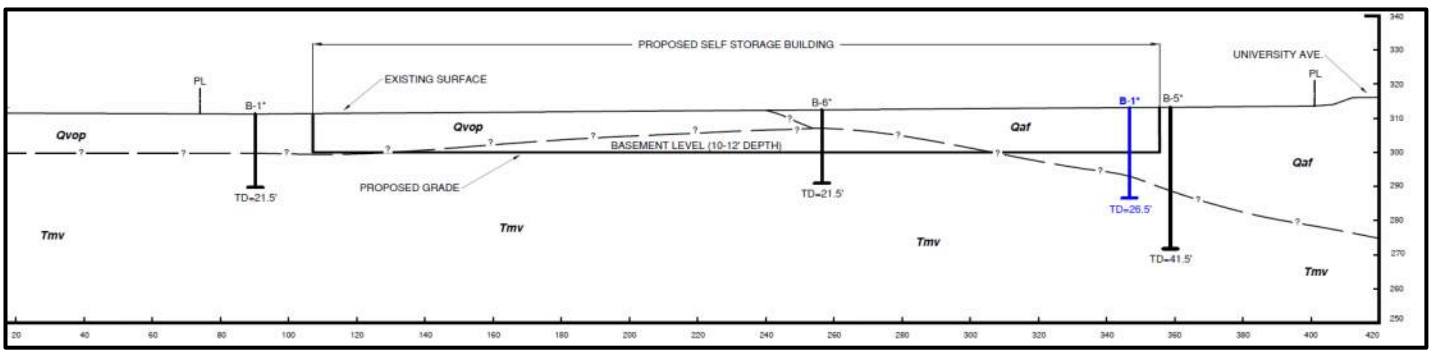

Figure 4-6. North-South Profile Beneath the Planned Structure
(Qaf indicates 'artificial fill'; Qvop indicates Very Old Paralics; Tmv indicates 'Mission Valley Formation')

Review of Figure 4-6 indicates that Unit 3 Mission Valley Formation will be encountered at or near basement level on the north side of the building, rising up to about 6 feet above the basement level toward the center of the structure. These cross-sections are presented in larger scale on Plate 2 following the text of the report.

The condition of shallow bedrock supporting some portions of the building while deep fill supports other portions, creates a "transition condition". Absent care in this regard, the behaviors of the incompressible rock and the more compressible fill will present a risk to the structure caused by damaging differential settlement of the supporting foundations. Earthwork for mitigation of this risk is discussed in detail in Section 6.

5.0 REVIEW OF GEOLOGIC, SOIL, AND SITING HAZARDS

5.1 Overview

This section provides a review of geologic, soil, and siting-related hazards common to this region of California, considering each for its potential to affect the planned development.

The primary hazard identified by this review is that site is at risk for moderate-to-severe ground shaking in response to large-magnitude earthquakes during the lifetime of the planned development. This circumstance is common to all civil works in this area of California. While strong ground motion will affect the site, there is no risk of liquefaction or related seismic phenomena. Section 6.2 provides seismic design parameters.

The following subsections describe NOVA's review of geologic, soil, and siting-related hazards.

5.2 Geologic Hazards

5.2.1 Strong Ground Motion

The site is located in a seismically active area, as is the majority of southern California, and as such, the potential for strong ground motion is considered significant during the design life of the proposed structure. Major known active faults in the region include the San Andreas, Elsinore, and San Jacinto faults located east of the site; and, the Rose Canyon, San Clemente, San Diego Trough, and Agua Blanca-Coronado Bank faults located to the west of the site.

The Rose Canyon fault zone (RCFZ) is the most prominent and active fault zone within San Diego, and it has the most potential to affect this site. The RCFZ is located approximately 5.1 miles west of the site, and can generate an earthquake with a moment magnitude (MW) of up to MW = 6.9. A web-based analytical tool provided by the OSHPD and SEAOC was used to estimate a corresponding site modified Peak Ground Acceleration (PGA_M) of PGA_M ~ 0.53 g.

5.2.2 Fault Rupture

<u>Alquist-Priolo Earthquake Fault Zones</u>

The site is not located within a State-designated Alquist Priolo Earthquake Fault Zone. No evidence of active faulting was observed during NOVA's investigation at the site. Because of the lack of known active faults on the site, the potential for surface rupture at the site is considered low. Shallow ground rupture due to shaking from distant seismic events is not considered a significant hazard, although it is a possibility at any site.

Figure 5-1 (following page) presents faults in the site vicinity.

<u>City of San Diego Seismic Safety Study</u>

Review of the City of San Diego Seismic Safety Study (City of San Diego, 2008) indicates the site is located within 'Category 52,' an area considered to be of lower seismic or geologic risk.

Figure 5-1. Regional Faulting

The site is located within the vicinity of the La Nacion fault zone. By virtue of the age and lack of evident movement in recent geologic time, this fault zone is considered 'potentially active', with no movement observed on the fault within the last 11,700 years.

Figure 5-2 reproduces the City of San Diego *Seismic Safety Study* earthquake hazard mapping within the site vicinity. The site is not located within a City-designated fault zone.

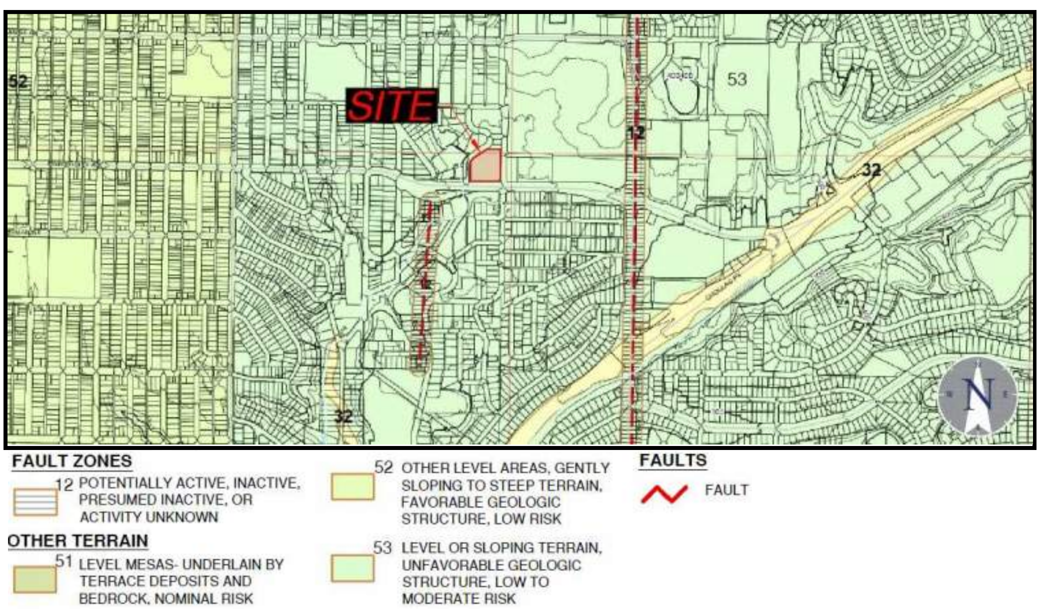

Figure 5-2. Seismic Hazard Mapping in the Site Area

5.2.3 Landslide

As used herein, 'landslide' describes downslope displacement of a mass of rock, soil, and/or debris by sliding, flowing, or falling. Such mass earth movements are greater than about 10 feet thick and larger than 300 feet across. Landslides typically include cohesive block glides and disrupted slumps that are formed by translation or rotation of the slope materials along one or more slip surfaces. These mass displacements can also include similarly larger-scale, but more narrowly confined modes of mass wasting such as 'mud flows' and 'debris flows'.

The causes of classic landslides start with a preexisting condition - characteristically, a plane of weak soil or rock - inherent within the rock or soil mass. Thereafter, movement may be precipitated by earthquakes, wet weather, and changes to the structure or loading conditions on a slope (e.g., by erosion, cutting, filling, release of water from broken pipes, etc.).

In consideration of the level ground and geologic structure around the site, NOVA considers the landslide hazard at the site to be 'negligible' for the site and the surrounding area.

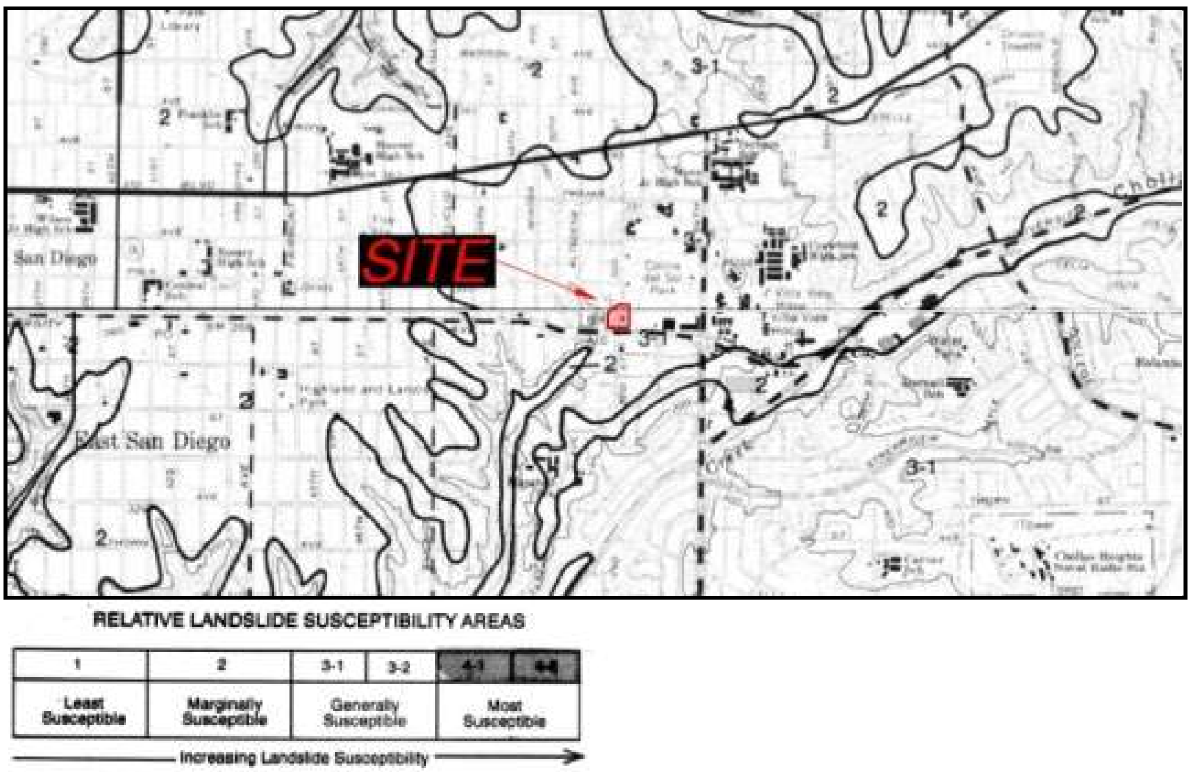

Figure 5-3. Landslide Susceptibility Mapping

5.3 Soil Hazards

5.3.1 Embankment Stability

As used herein, 'embankment stability' is intended to mean the safety of localized natural or man-made embankments against failure. Unlike landslides described above, embankment stability can include smaller scale slope failures such as erosion-related washouts and more subtle, less evident processes such as soil creep.

No permanent new slopes are planned as part of the future site development and there are no existing slopes on the site, such that there is no concern regarding embankment stability at this site.

5.3.2 Seismic

Liquefaction

'Liquefaction' refers to the loss of soil strength during a seismic event. The phenomenon is observed in areas that include geologically 'younger' soils (i.e., soils of Holocene age), shallow water table (less than about 60 feet depth), and cohesionless (i.e., sandy and silty) soils of looser consistency. The seismic ground motions increase soil water pressures, decreasing grain-to-grain contact among the soil particles, which causes the soils to lose strength.

Resistance of a soil mass to liquefaction increases with increasing density, plasticity (associated with clay-sized particles), geologic age, cementation, and stress history. The very dense, cemented and geologically 'older' subsurface units at this site have no potential for liquefaction.

Seismically Induced Settlement

Apart from liquefaction, a strong seismic event can induce settlement within loose to moderately dense, unsaturated granular soils. The development will be founded on dense fill and naturally occurring deposits that will not be susceptible to seismically induced settlement.

Lateral Spreading

Lateral spreading is a phenomenon in which large blocks of intact, non-liquefied soil move downslope on a liquefied soil layer. Due to the absence of a potential for liquefaction and relatively flat surrounding topography, there is no potential for lateral spreading.

5.3.3 Expansive Soil

Expansive soils are characterized by their ability to undergo significant volume changes (shrinking or swelling) due to variations in moisture content, the magnitude of which is related to both clay content and plasticity index. These volume changes can be damaging to structures. Nationally, the annual value of real estate damage caused by expansive soils is exceeded only by that caused by termites.

A sample of the clayey sand material encountered near the proposed basement foundation elevation was tested for expansion potential. Results indicate that onsite soils have a 'very low' expansion potential.

5.3.4 Hydro-Collapsible Soils

Hydro-collapsible soils are common in the arid climates of the western United States in specific depositional environments - principally, in areas of young alluvial fans, debris flow sediments, and loess (wind-blown sediment) deposits. These soils are characterized by low *in situ* density, low moisture contents, and relatively high unwetted strength.

The soil grains of hydro-collapsible soils were initially deposited in a loose state (i.e., high initial 'void ratio') and thereafter lightly bonded by water sensitive binding agents (e.g., clay particles, low-grade cementation, etc.). While relatively strong in a dry state, the introduction of water into these soils causes the binding agents to fail. Destruction of the bonds/binding causes relatively rapid densification and volume loss (collapse) of the soil. This change is manifested at the ground surface as subsidence or settlement. Ground settlements from the wetting can be damaging to structures and civil works. Human activities that can facilitate soil collapse include irrigation, water impoundment, changes to the natural drainage, disposal of wastewater, etc.

The consistency of the Unit 1 fill is such that these soils are not potentially hydro-collapsible.

5.3.5 Undocumented Fill

As is discussed in detail in Section 4, much of the site is covered by fill up to about 25 feet in thickness. Records regarding placement of this fill are not available, such that, absent other information, the fill is considered 'undocumented,' subject to wide variations in quality. The 2.2-acre site has been thoroughly explored by ten (10) engineering borings, establishing a base of *in situ* testing sufficient to assess strength and compressibility of the fill. Data from the engineering borings indicate that the upper 5 to 7 feet of the predominantly sandy fill is of medium dense consistency, below which the fill becomes dense.

As is discussed in Section 2, the site will be developed with a single level below grade. This design will embed the structure to a depth of about 12 feet below ground, well into dense fill.

With the foregoing considerations, it is the judgment of NOVA that the proposed development will not be at risk for settlement resulting from compressible soils associated with an undocumented fill.

5.3.6 Corrosivity

The near surface soils were tested to show low levels of sulfates and chlorides. The potential for sulfate attack to embedded concrete is negligible. The potential for corrosion of embedded metals is relatively low. The indications of this testing are discussed in more detail in Section 6.

5.4 Other Hazards

5.4.1 Effect on Adjacent Properties

The proposed project will not affect the structural integrity of adjacent properties or existing public improvements and street right-of-ways located adjacent to the site if the recommendations of this report are incorporated into project design.

5.4.2 Flood

The site is not located within a FEMA-designated flood zone. Mapped by FIRM Panel No06073C1902G, effective on 05/16/2012, the site is located 'Zone X', an area of minimal risk for flooding.

Figure 5-4 (following page) reproduces the flood mapping by FEMA.

Figure 5-4. Flood Hazard Mapping of the Site Area
(source: adapted from FIRM Panel 06073C1902G, effective 5/16/2012)

5.4.3 Tsunami

Tsunami is a term that describes a series of fast-moving, long period ocean waves caused by earthquakes or volcanic eruptions. The altitude and distance of the site from the ocean preclude this threat.

5.4.4 Seiche

Seiches are standing waves that develop in an enclosed or partially enclosed body of water such as lakes or reservoirs. Harbors or inlets can also develop seiches. Most commonly caused by strong winds and rapid atmospheric pressure changes, seiches can also be effected by seismic events and tsunamis.

The site is not located near a body of water that could generate a seiche.

6.0 EARTHWORK AND FOUNDATIONS

6.1 Overview

6.1.1 Review of Soil and Geologic Hazards

Section 5 provides a review of soil, geologic and siting hazards common to development of civil works in the project area. The primary hazard identified by this review is that the site is at risk for moderate-to-severe ground shaking in response to a large-magnitude earthquake during the lifetime of the planned development. This circumstance is common to all civil works in this area of California.

While strong ground motion could affect the site, there is no risk of liquefaction or related seismic phenomena. Section 6.2 provides seismic design parameters.

6.1.2 Site Suitability.

Based upon the indications of the subsurface and laboratory data developed for this investigation, as well as review of previously developed subsurface information, it is the opinion of NOVA that the site is suitable for development of the planned structure on shallow foundations, provided the geotechnical recommendations described herein are followed.

Development of the warehouse as presently envisioned will not affect the structural integrity of adjacent properties or existing public improvements and street right-of-ways located adjacent to the site if the recommendations of this report are incorporated into project design.

6.1.3 Review and Surveillance

The subsections following provide geotechnical recommendations for the planned development as it is now understood. It is intended that these recommendations provide sufficient geotechnical information to develop the project in general accordance with the requirements of the 2016 California Building Code (CBC) and the San Diego Municipal Code.

NOVA should review the grading plan, foundation plan, and geotechnical-related specifications as they become available to confirm that the recommendations presented in this report have been incorporated into the plans prepared for the project. All earthwork related to site and foundation preparation should be completed under the observation of NOVA.

6.2 Seismic Design Parameters

6.2.1 Site Class

The site-specific data used to determine the Site Class typically includes borings drilled to refusal materials to determine Standard Penetration resistances (N-values). The thick fill that covers much of the site is known to be underlain by dense sandstones to great depth. The site is classified as Site Class D per ASCE 7-16 (Table 20.3-1).

6.2.2 Seismic Design Parameters

Table 6-1 provides seismic design parameters for the site in accordance with 2019 CBC and mapped spectral acceleration parameters.

Table 6-1. Seismic Design Parameters, ASCE 7-16

Parameter	Value
Site Soil Class	D
Site Latitude (decimal degrees)	32.74956
Site Longitude (decimal degrees)	-117.084279
Site Coefficient, F_a	1.097
Site Coefficient, F_v	1.949
Mapped Short Period Spectral Acceleration, S_S	1.008
Mapped One-Second Period Spectral Acceleration, S_1	0.351
Short Period Spectral Acceleration Adjusted For Site Class, S_{MS}	1.105
One-Second Period Spectral Acceleration Adjusted For Site	0.684
Design Short Period Spectral Acceleration, S_{DS}	0.737
Design One-Second Period Spectral Acceleration, S_{D1}	0.456

Source: OSHPD/SEAOC www.Seismicmaps.org

6.3 Corrosivity and Sulfates

6.3.1 General

Electrical resistivity, chloride content, and pH level are all indicators of the soil's tendency to corrode ferrous metals. Levels of water-soluble sulfates are correlated with the potential for sulfate attack to embedded concrete. These chemical tests were performed on a representative sample of the proposed foundation elevation soils. The results of the testing are tabulated in Table 6-2.

Table 6-2. Summary of Chemical Testing

Sample Ref		pH	Resistivity (Ω-cm)	Sulfates		Chlorides	
Boring	Depth (feet)			ppm	%	ppm	%
B-1	10 – 15	7.9	500	250	0.025	210	0.021

6.3.2 Metals

Caltrans considers a soil to be corrosive if one or more of the following conditions exist for representative soil and/or water samples taken at the site:

- chloride concentration is 500 parts per million (ppm) or greater,
- sulfate concentration is 2,000 ppm (0.2%) or greater, or
- the pH is 5.5 or less.

Based on the Caltrans criteria, the on-site soils would not be considered 'corrosive' to buried metals. Appendix D provides records of the chemical testing that include estimates of the life expectancy of buried metal culverts of varying gauge.

In addition to the above parameters, the risk of soil corrosivity buried metals is considered by determination of electrical resistivity (ρ). Soil resistivity may be used to express the corrosivity of soil only in unsaturated soils. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of DC electrical current from the metal into the soil. As the resistivity of the soil decreases, the corrosivity generally increases. A common qualitative correlation (cited in Romanoff 1989, NACE 2007) between soil resistivity and corrosivity to ferrous metals is tabulated below.

Table 6-3. Soil Resistivity and Corrosion Potential

Minimum Soil Resistivity (Ω-cm)	**Qualitative Corrosion Potential**
0 to 2,000	Severe
2,000 to 10,000	Moderate
10,000 to 30,000	Mild
Over 30,000	Not Likely

The resistivity testing suggests that design should consider that the soils may be corrosive to embedded ferrous metals such as alloy steel, carbon steel, cast iron, and wrought iron.

Typical recommendations for mitigation of such corrosion potential in embedded ferrous metals include:

- a high-quality protective coating such as an 18-mil plastic tape, extruded polyethylene, coal tar enamel, or Portland cement mortar;
- electrical isolation from above grade ferrous metals and other dissimilar metals by means of dielectric fittings in utilities and exposed metal structures breaking grade; and,
- steel and wire reinforcement within concrete having contact with the site soils should have at least 2 inches of concrete cover.

If extremely sensitive ferrous metals are expected to be placed in contact with the site soils, it may be desirable to consult a corrosion specialist regarding choosing the construction materials and/or protection design for the objects of concern.

6.3.3 Sulfates

As shown in Table 6-2, the soil sample tested indicated water-soluble sulfate (SO_4) content of 250 parts per million (‘ppm,’ 0.025% by weight). With SO_4 < 0.10 percent by weight, the American Concrete Institute (ACI) 318-08 considers a soil to have no potential (S0) for sulfate attack.

Table 6-4 reproduces the Exposure Categories considered by ACI.

Table 6-4. Exposure Categories and Requirements for Water-Soluble Sulfates

Exposure Category	Class	Water-Soluble Sulfate (SO_4) In Soil	Cement Type (ASTM C150)	Max Water-Cement Ratio	Min. f'_c (psi)
Not Applicable	S0	$SO_4 < 0.10$	-	-	-
Moderate	S1	$0.10 \leq SO_4 < 0.20$	II	0.50	4,000
Severe	S2	$0.20 \leq SO_4 \leq 2.00$	V	0.45	4,500
Very severe	S3	$SO_4 > 2.0$	V + pozzolan	0.45	4,500

Adapted from: ACI 318-08, Building Code Requirements for Structural Concrete

6.3.4 Limitations

Testing to determine several chemical parameters that indicate a potential for soils to be corrosive to construction materials are traditionally completed by the Geotechnical Engineer, comparing test results with a variety of indices regarding corrosion potential.

Like most geotechnical consultants, NOVA does not practice in the field of corrosion protection, since this is not specifically a geotechnical issue. Should you require more information, a specialty corrosion consultant should be retained to address these issues.

6.4 Earthwork

6.4.1 General

As is noted in Section 2, based on the known condition of the site and the design concept that is currently considered, NOVA expects that earthwork could be considerable in excavations for the below grade level, plus earthwork for foundations and utilities.

Earthwork should be performed in accordance with Section 300 of the most recent approved edition of the "*Standard Specifications for Public Works Construction*" and "*Regional Supplement Amendments*."

6.4.2 Demolition and Clearing

Prior to the start of earthwork, the existing structures should be completely removed. Site should be cleared of utilities. Any existing utilities which are to be abandoned should either be (i) excavated and the trenches backfilled, or (ii) the lines completely filled with sand-cement slurry. Deleterious materials should be disposed of in approved off-site locations.

6.4.3 Site Preparation

At the outset of earthwork, the Contractor should establish construction Best Management Practices ('BMPs') to prevent erosion of graded/excavated areas until such time as permanent drainage and erosion control measures have been installed.

6.4.4 Excavation Characteristics

The Unit 1 fill and upper weathered portions of the Unit 2 paralic deposits and Unit 3 Mission Valley Formation will be readily excavated by earthwork equipment usual for construction of this nature.

6.4.5 Select Fill

<u>Materials</u>

All fill should be Select Fill, a mineral soil free of organics, regulated chemicals, or otherwise toxic constituents, with the characteristics listed below:

- at least 40% by weight finer than ¼ inches in size,
- maximum particle size of 4 inches, and
- expansion index (EI) of less than 50 (i.e., EI < 50, after ASTM D 4829).

The sandy portions of the Unit 1 fill now in place will conform to the above criteria. The Unit 1 fill, Unit 2 paralic deposits and Unit 3 Mission Valley Formation may contain gravel and cobbles that may require screening to meet the Select Fill criteria.

<u>Placement</u>

Select Fill should be densified/compacted to a minimum of 90% relative compaction after ASTM D1557 (the 'modified Proctor') following moisture conditioning to at least 2% above the optimum moisture content.

Select Fill should be placed in loose lifts no thicker than the ability of the compaction equipment to thoroughly densify the lift. For most self-propelled construction equipment adaptable to this site, this criterion will limit loose lifts to on the order of 8 inches or less. Lift thickness for hand-operated equipment (tampers, walked behind compactors, etc.) will be limited to on the order of 3 inches or less.

6.4.6 Foundation Preparation

Excavation for the lowest level of the structure will extend to a depth of about 12 feet. Excavations for building foundations will expose a cut and fill transition between Unit 1 fill and Unit 2 Mission Valley Formation. As such, foundations for the self-storage building should be set atop a minimum of 3 feet of compacted fill. This will address the cut and fill transition as well as the undocumented fill condition below the building slab. The upper 3 feet below bottom of planned building foundations should be removed and replaced as compacted fill. The fill should meet the Select Fill criteria and be densified to a minimum of 90% relative compaction after ASTM D1557 (the 'modified Proctor') following moisture conditioning to at least 2% above the optimum moisture content.

Prior to fill replacement, the soil exposed at the bottom of the removals for foundations and in the area to support the on-grade slab should be re-densified to at least 90% relative compaction after ASTM D 1557. Any soft areas encountered at the bottom of removals should be excavated and replaced with properly compacted soil. The bottom of removals should be approved by NOVA.

6.4.7 Trenching and Backfilling for Utilities

Excavation for utility trenches must be performed in conformance with OSHA regulations contained in 29 CFR Part 1926.

Utility trench excavations have the potential to degrade the properties of the adjacent soils. Utility trench walls that are allowed to move laterally will reduce the bearing capacity and increase settlement of adjacent footings, overlying slabs, and pavements.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Backfill for utility trenches must be placed to meet the project specifications for the Select Fill.

Unless otherwise specified, the backfill for the utility trenches should be placed in 4 to 6-inch loose lifts and compacted to a minimum of 90% relative compaction after ASTM D 1557 (the 'modified Proctor') at soil moisture +2% of the optimum moisture content. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to 90% relative compaction with respect to the Modified Proctor.

6.5 Shallow Foundations

6.5.1 General

The proposed structure can be supported on shallow foundations established in Unit 1 fill prepared as described in Section 6.4. The following subsections provide recommendations for shallow foundations.

6.5.2 Ground Supported Slabs

The below grade slab for the storage building may be a conventional on-grade slab.

1. Minimum Thickness. The concrete floor slab should be a minimum of 5 inches thick. Actual slab thickness and reinforcement may be designed by the project structural engineer using a modulus of subgrade reaction (k) of k = 150 pci.

2. Reinforcement. Minimum reinforcement should consist of #4 bars placed at 18 inches on center each way within the middle third of the slab. This level may be controlled during construction by supporting the steel on chairs or concrete blocks ("dobies").

3. Contraction/Control Jointing. Contraction joints should be placed to produce panels that are as square as possible and never exceeding a length to width ratio of 1.5 to 1. Proper joint spacing and depth are essential to effective control of random cracking. Joints are commonly spaced at distances equal to 24 to 30 times the slab thickness. Joint spacing that is greater than 15 feet should include the use of load transfer devices (dowels or diamond plates). Contraction/control joints should be established to a minimum depth of ¼ the slab thickness as depicted in Figure 6-1.

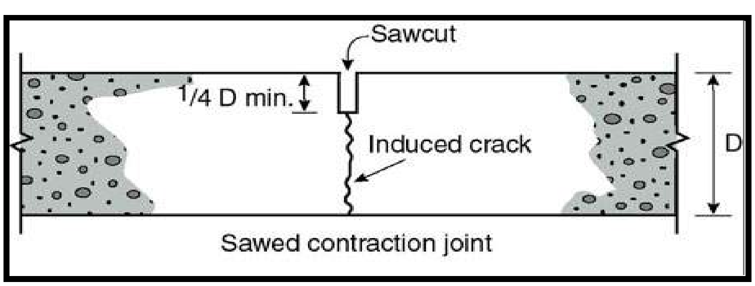

Figure 6-1. Sawed Contraction Joint

4. Capillary Break. The requirements for a capillary break ('sand layer') be determined in accordance with ACI Publication 302 "*Guide for Concrete Floor and Slab Construction*." A "capillary break" may consist of a 4-inch thick layer of compacted, well-graded sand should be placed below the floor slab. This porous fill should be clean coarse sand or sound, durable gravel with not more than 5% coarser than the 1-inch sieve or more than 10% finer than the No. 4 sieve, such as AASHTO Coarse Aggregate No. 57.

5. Vapor Barrier. 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).

   NOVA recommends that a minimum 15-mil low permeance vapor membrane.

Recommendation for moisture barriers are traditionally included with geotechnical foundation recommendations, though these requirements are primarily the responsibility of the Structural Engineer or Architect.

If there is particular concern regarding moisture sensitive materials or equipment to be placed above the slab-on-grade, a qualified person (for example, such as the flooring subcontractor and/or Structural Engineer) should be consulted to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. NOVA does not practice in the field of moisture vapor transmission evaluation since this is not specifically a geotechnical issue.

6.5.3 Isolated and Continuous Foundations

General

The bearing surface of footings adjacent to utility trenches should be either embedded or set back such that the utility trench is outside of an imaginary 1.5H: to 1V plane projected upward from the base of the utility trench.

All foundation elements, including any grade beams, should be reinforced top and bottom. The actual reinforcement should be designed by the Structural Engineer.

Isolated Foundations

Isolated foundations may be designed for an allowable contact stress of 3,500 psf. This value may be increased by ⅓ for transient loads such as wind and seismic. These foundation units should have a minimum width of 30 inches, embedded a minimum of 24 inches below lowest adjacent grade.

Continuous Foundations

Continuous foundations may be designed for an allowable contact stress of 3,500 psf, with a minimum of 18 inches in width and embedded 24 inches below lowest adjacent grade. This bearing value may be increased by one-third for transient loads such as wind and seismic.

Resistance to Lateral Loads

Lateral loads to shallow foundations may be resisted by passive earth pressure against the face of the footing, calculated as a fluid density of 350 psf per foot of depth. A coefficient of interface friction of 0.35 between the soil and the concrete footing may be used with dead loads.

Settlement

Foundations designed as recommended above will settle on the order of 0.5-inch or less. This movement will occur elastically, as dead load (DL) and permanent live loads (LL) are applied. About 70% of this settlement will occur during the construction period. Angular distortion due to differential settlement of adjacent, unevenly loaded footings should be less than 0.5-inch in 30 feet (i.e., Δ/L less than 1:700).

6.6 Permanent Below Grade Walls

6.6.1 Lateral Pressures

Lateral earth pressures to permanent below-grade walls are related to the type of backfill, drainage conditions, slope of the backfill surface, and the allowable rotation of the wall.

The below-grade walls will be above the design groundwater elevation (which is greater than 50 feet below ground surface). Table 6-5 provides lateral soil and groundwater wall loading to below-grade walls with level backfill.

Table 6-5. Lateral Earth Pressures to Below Grade Walls

Condition	Equivalent Fluid Pressure (psf/foot) for Level Backfill	Equivalent Fluid Pressure (psf/foot) for Backfill Sloped 2:1
Active	35	55
At Rest	55	75
Passive	350	350

Note: assumes wall includes appropriate drainage and no hydrostatic pressure.

It is expected that the below grade walls will be part of the structure, fixed against rotation. As such, ‘at rest’ pressures should be used in wall design.

6.6.2 Surcharges to Walls

If footings or other surcharge loads are located a short distance outside the wall, these influences should be added to the lateral stress considered in the design of the wall.

Surcharge loading should consider wall loads that may develop from adjacent streets and sidewalks. To account for such potential loads, a surcharge pressure of 75 psf can be applied uniformly over the height of the below grade wall.

6.6.3 Seismic Increment

The seismic load increment to non-yielding below grade walls should be calculated as a uniform 13.5H psf (where H is the wall height in feet).

6.6.4 Wall Drainage

Design for permanent walls should include drainage to limit accumulation of water behind the wall. Figure 6-2 provides guidance for such design. Note that the guidance provided on Figure 6-2 is conceptual. A variety of options are available to drain permanent below-grade walls.

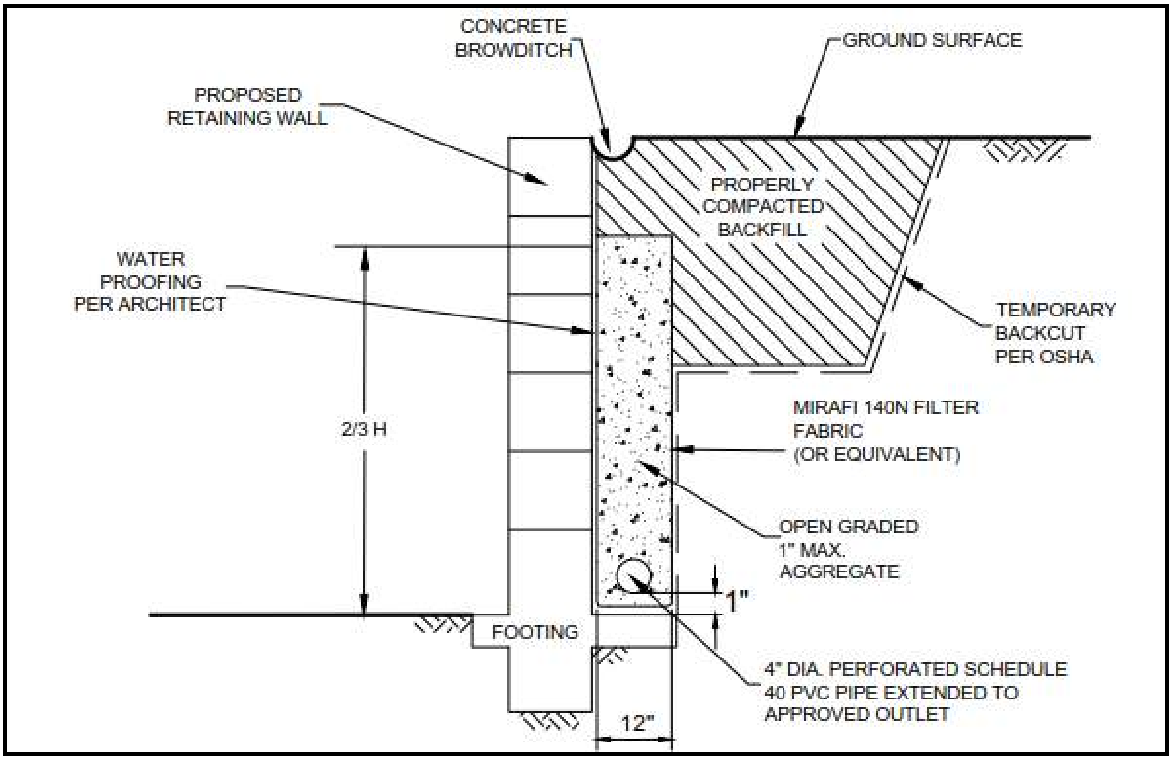

Figure 6-2. Conceptual Design for Wall Drainage

6.7 Elevator Pits

An elevator(s) may extend to the basement level and may require pits that extend below the lowest slab level. An elevator pit slab and related retaining wall footings will derive suitable support from the Unit 1 fill around it. Design for the elevator pit walls should consider the circumstances and conditions described below.

1. Wall Yield. NOVA expects that proper function of the elevator pit should not allow yielding of the elevator pit walls. As such, walls should be designed to resist 'at rest' lateral soil pressures and seismic pressures provided above, also allowing for any structural surcharge.

2. Construction. Design of the elevator pit walls should include consideration for surcharge conditions that will occur during and after construction.

6.8 Flatwork

Prior to casting exterior flatwork, the upper 12 inches of subgrade soils should be recompacted to a minimum of 90% relative compaction after ASTM D1557 following moisture conditioning to at least 2% above the optimum moisture content. The subgrade soils should be kept moist prior to casting exterior flatwork.

Exterior concrete slabs for pedestrian traffic or landscape should be at least 4 inches thick. Weakened plane joints should be located at intervals of about 6 feet. Control of the water/cement ratio can limit shrinkage cracking due to excess water or poor concrete finishing or curing.

6.9 Temporary Slopes

6.9.1 Conformance with OSHA and Cal/OSHA

Temporary slopes will be required for excavations during construction. All temporary excavations should comply with federal, state and local safety ordinances. The safety of all excavations is the sole responsibility of the Contractor and should be evaluated during construction as the excavation progresses.

Based on the data interpreted from the borings, the design of temporary slopes in the Unit 2 sandstones may assume California Occupational Safety and Health Administration (Cal/OSHA) Soil Type B for planning purposes. The Unit 1 fill may be assumed to be Type C.

6.9.2 Excavation Planning and Control

The face of temporary excavations in the Unit 1 fill should not be steeper than 1:1 (horizontal: vertical). Temporary excavations in Unit 2 sandstones should not be steeper than ¾:1.

Surcharge loads to temporary slopes should not be permitted within a distance equal to the height of the excavation measured from the top of the excavation. The top of the excavation should be a minimum of 15 feet to the edge of existing improvements. Excavations steeper than those recommended should be shored in accordance with applicable OSHA regulations and codes.

The faces of temporary slopes should be inspected daily by the Contractor's Competent Person. Any zones of potential instability, sloughing or raveling should be brought to the attention of the Engineer and corrective action implemented before personnel begin working in the excavation.

The GEOR should be notified if other surcharge loads are anticipated so that lateral load criteria can be developed for the specific situation. If temporary slopes are to be maintained during a wet period, berms are recommended along the tops of the slopes to prevent runoff water from entering the excavation and eroding the slope faces. Slopes steeper than those described above or temporary excavations that extend below a plane inclined at 1½:1 (horizontal: vertical) downward from the outside bottom edge of existing structures require shoring.

7.0 STORMWATER INFILTRATION

7.1 Overview

Locations for permanent stormwater infiltration Best Management Practices ('stormwater BMPs') are designed to be nested in the northwest corner of the structure, utilizing a modular wetland for primary stormwater treatment, then detention in a vault. Stormwater will drain by gravity to release at the southeast of the site.

Based upon the indications of the field exploration and laboratory testing reported herein, NOVA has evaluated the site as abstracted below after guidance contained in the latest edition of the *The City of San Diego Storm Water Standards Manual* (hereafter, 'the BMP Manual').

Section 3.4 provides a description of the field work undertaken to complete the testing. Figure 3-1 depicts the location of the testing. This section provides the results of that testing and related recommendations for management of stormwater in conformance with the BMP Manual.

As is well-established by the BMP Manual, the feasibility of stormwater infiltration is principally dependent on geotechnical and hydrogeologic conditions at the project site. In consideration of these factors, NOVA concludes that the site is not feasible for development of permanent stormwater infiltration BMPs.

This section provides NOVA's assessment of the feasibility of stormwater infiltration BMPs utilizing the information developed by the percolation testing described in Section 3.4, as well as other elements of the subsurface exploration.

7.2 Infiltration Rates

The percolation rate of a soil profile is not the same as its infiltration rate ('I'). Therefore, the measured/calculated field percolation rate was converted to an estimated infiltration rate utilizing the Porchet Method in accordance with guidance contained in the BMP Manual. Table 7-1 provides a summary of the infiltration rates determined by the percolation testing.

Table 7-1. Infiltration Rates Determined by Percolation Testing

Boring	Approximate Ground Elevation	Depth of Test	Approximate Test Elevation (feet, msl)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour,
P-1	+311	5	+306	0.01	0.01
P-2	+310.5	6	+305.5	0.01	0.01

Notes: (1) 'F' indicates 'Factor of Safety' (2) elevations are approximate and should be reviewed

As may be seen by review of Table 7-1, a factor of safety (F) is applied to the infiltration rate (I) determined by the percolation testing. This factor of safety, at least F = 2 in local practice, considers the nature and variability of subsurface materials, as well as the natural tendency of infiltration structures to become less efficient with time. The calculated infiltration rate after applying F = 2 is I = 0.01 inches per hour. Full and partial BMP's are not required on sites with infiltration rates of less than 0.05 inches per hour.

7.3 Review of Geotechnical Feasibility Criteria

7.3.1 Overview

Section C.2.1 of Appendix C of the BMP Manual provides seven factors that should be considered by the project geotechnical professional while assessing the feasibility of infiltration related to geotechnical conditions. These factors are listed below

- C.2.1.1: Soil and Geologic Conditions
- C.2.1.2: Settlement and Volume Change
- C.2.1.3: Slope Stability
- C.2.1.4: Utility Considerations
- C.2.1.5: Groundwater Mounding
- C.2.1.6: Retaining Walls and Foundations
- C.2.1.7: Other Factors

The above geotechnical feasibility criteria are reviewed in the following subsections.

7.3.2 Soil and Geologic Conditions

The soil borings and percolation tests borings completed for this assessment disclose the sequence of soil units described below.

1. Unit 1, Fill (Qaf). The site is covered by artificial fill that ranges from about 1 foot to 25 feet in thickness. The fill is predominantly sandy, with varying amounts of silt and clay.
2. Unit 2, Quaternary Very Old Paralic Deposits ($Qvop_8$). As reported in Leighton 2020, the northeast portion of site is underlain by Quaternary-aged very old paralic deposits. This unit is comprised of silty fine-grained sands of medium dense to very dense consistency.
3. Unit 3, Mission Valley Formation (Tmv). Beneath the fill and paralic deposits, the site is underlain by Tertiary-aged Mission Valley Formation. The unit is comprised of silty sandstones that have dense consistency.

7.3.3 Settlement and Volume Change

Testing for expansion potential after ASTM D4829 of the clayey fraction of the Unit 1 fill resulted in ‘very low’ expansion indexes. Volume change is not considered a constraint to onsite BMPs.

7.3.4 Slope Stability

There are no slopes on-site, nor are any soil embankments planned for the new development. As a consequence, embankment stability is not a constraint to BMPs.

7.3.5 Utilities

Stormwater infiltration BMPs should not be sited within 10 feet of underground utilities.

7.3.6 Groundwater Mounding

In consideration of the low measured percolation rates, it is likely that groundwater mounding will occur if stormwater infiltration is attempted in any scale. Groundwater mounding will likely result in damaging groundwater mounding during wet periods, affecting utilities, pavements, flat work, and foundations.

7.3.7 Retaining Walls and Foundations

Stormwater infiltration BMPs should not be sited within 10 feet from retaining walls and foundations.

7.3.8 Other Factors

Full and partial BMPs should not be placed within existing fill materials greater than 5 feet thick. The fill on site is as deep as 25 feet bgs. This condition is unsuitable for stormwater infiltration.

7.4 Suitability of the Site for Stormwater Infiltration

It is NOVA's judgment that the site is not suitable for development of stormwater infiltration BMPs.

This judgment is based upon consideration of the variety of factors detailed above, most significantly: (i) the low design infiltration rate (I) of I = 0.01 inches per hour and related potential for groundwater mounding, and (ii) the potential for mounding groundwater to add loads to structural walls at the foundation level.

Worksheets in Appendix D detail the combination of hydrogeologic and geotechnical reasons infiltration is considered infeasible for the proposed DMA locations.

8.0 PAVEMENTS

8.1 Design Basis

The structural design of pavement sections depends primarily on anticipated traffic conditions, subgrade soils, and construction materials. NOVA has assumed a Traffic Index (TI) of 5.0 for passenger car parking, and 6.0 for the driveways. These traffic indices should be confirmed by the Civil Engineer prior to final design.

8.2 Drainage and Moisture Control

Similar to the requirements for control of moisture beneath floor slabs and flatwork, control of surface drainage is important to the design and construction of pavements for this site.

Moisture must be controlled around and beneath pavements. Moreover, where standing water develops either on the pavement surface or within the base course - softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the risk of the subgrade materials becoming saturated and weakened over a long period of time.

The following should be considered to limit the amount of excess moisture which can reach the subgrade soils:

- maintain surface gradients at a minimum 2% grade away from the pavements;
- seal all landscaped areas in or adjacent to pavements to minimize or prevent moisture migration to subgrade soils;
- planters should not be located next to pavements (otherwise, subdrains should be used to drain the planter to appropriate outlets);
- place compacted backfill against the exterior side of curb and gutter; and
- concrete curbs bordering landscaped areas should have a deepened edge to provide a cutoff for moisture flow beneath pavements (generally, the edge of the curb can be extended an additional 12 inches below the base of the curb).

8.3 Preventative Maintenance

Preventative maintenance should be planned and provided for. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment.

A plan for preventative maintenance should be comprised of both localized maintenance (e.g., crack sealing and patching) and global maintenance (e.g., surface sealing).

8.4 Subgrade Preparation

8.4.1 General

Preparation of subgrades for paved areas should include: (i) removing existing pavements or structures, (ii) excavation and staging of the upper 1-foot of Unit 1 fill below the pavement subgrade, (iii) compacting the bottom of removals to at least 90% relative compaction, and (iv) replacement of the removed soil as fill compacted to at least 95% relative compaction.

8.4.2 Proof-Rolling

After the completion of compaction/densification, areas to receive pavements should be proof-rolled. A loaded dump truck or similar should be used to aid in identifying localized soft or unsuitable material.

Any soft or unsuitable materials encountered during this proof-rolling should be removed, replaced with an approved backfill, and compacted.

The Geotechnical Engineer can provide alternative options such as using geogrid and/or geotextile to stabilize the subgrade at the time of construction, if necessary.

8.4.3 Timely Base Course Construction

Construction should be managed such that preparation of the subgrade immediately precedes placement of the base course. Proper drainage of the paved areas should be provided to reduce moisture infiltration to the subgrade.

8.5 Flexible Pavements

The structural design of flexible pavement depends primarily on anticipated traffic conditions, subgrade soils, and construction materials. Table 8-1 provides preliminary flexible pavement sections using an R-value of 14. An R-Value test should be performed after completion of subgrade preparation to determine the final pavement section.

Table 8-1. Preliminary Recommendations for Flexible Pavements

Area	Subgrade R-Value	Traffic Index	Asphalt Thickness (in)	Base Course Thickness (in)
Auto Parking	14	5	4.0	7.0
Roadways/Fire Lane	14	6	4.0	10.0

The above sections assume properly prepared subgrade consisting of at least 12 inches of Select Fill (Section 6.4.5) compacted to a minimum of 95% relative compaction. The aggregate base course should also be placed at a minimum of 95% relative compaction. Construction materials (asphalt and aggregate base) should conform to the current "*Standard Specifications for Public Works Construction"* ('Green Book').

8.6 Rigid Pavements

8.6.1 General

Concrete pavement sections should be developed in the same manner as undertaken for all other slabs and pavements: removal of the upper 12 inches of the Unit 1 fill and replacement of that material in an engineered manner as described in Section 8.4.1.

Concrete pavement sections consisting of 7 inches of Portland cement concrete over a base course of 6 inches and a properly prepared subgrade support a wide range of traffic indices.

Where rigid pavements are used, the concrete should be obtained from an approved mix design with the minimum properties of Table 8-2 (following page).

Table 8-2. Concrete Requirements for Pavements

Property	Recommended Requirement
Compressive Strength @ 28 days	3,250 psi minimum
Strength Requirements	ASTM C 94
Minimum Cement Content	5.5 sacks/cubic yards
Cement Type	Type I Portland
Concrete Aggregate	ASTM C 33 and Caltrans Section 703
Aggregate Size	1-inch maximum
Maximum Water Content	0.50 lb/lb of cement
Maximum Allowable Slump	4 inches

8.6.2 Jointing and Reinforcement

Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. Sawed joints should be cut within 24-hours of concrete placement and should be a minimum of 25% of slab thickness plus ¼-inch. All joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer.

Load transfer devices, such as dowels or keys are recommended at joints in the paving to reduce possible offsets. Where dowels cannot be used at joints accessible to wheel loads, pavement thickness should be increased by 25% at the joints and tapered to regular thickness in 5 feet.

9.0 GEOTECHNICAL REVIEW, OBSERVATION AND TESTING

9.1 Overview

As is discussed in Section 1, the recommendations contained in this report are based upon a limited number of borings and reliance, tempered with judgment, upon the continuity of subsurface conditions between borings.

The recommendations provided in both NOVA's proposal for this work and this report assume that NOVA will be retained to provide consultation and review during the design phase, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

9.2 Design Phase Review

NOVA should be retained to provide review of final grading and foundation plans. This review is provided for in NOVA's proposal for this work.

9.3 Preconstruction Conference

A preconstruction conference among representatives of the Owner, Contractor and/or Construction Manager, and Geotechnical Engineer is recommended to discuss the planned construction procedures and quality control requirements.

9.4 Construction Observation and Testing

9.4.1 General

Special inspections should be provided per Section 1705 of the California Building Code. The soils special inspector should be a representative of NOVA as the Geotechnical Engineer-of-Record (GEOR).

NOVA should be retained to provide construction-related services abstracted below.

- Surveillance during site preparation, grading, and foundation excavation.
- Inspection of soil densification/compaction during grading.
- Soil special inspection during grading.

A program of quality control should be developed prior to the beginning of earthwork. It is the responsibility of the Owner, Contractor, and/or Construction Manager to determine any additional inspection items required by the Architect/Engineer or the governing jurisdiction.

9.4.2 Continuous Soils Special Inspection

The earthwork operations listed below should be the object of continuous soils special inspection.

- Over-excavation for remedial grading, including scarification and re-compaction.
- Fill placement and compaction.
- Pavement subgrade preparation and base course compaction.

9.4.3 Periodic Soils Special Inspection

The earthwork operations listed below should be the object of periodic soils special inspection, subject to approval by the Building Official.

- Site preparation and removal of existing development features.
- Placement and compaction of utility trench backfill.
- Observation of foundation excavations.
- Building pad moisture conditioning.

9.4.4 Testing During Inspections

The locations and frequencies of compaction test should be determined by the geotechnical engineer at the time of construction. Test locations and frequencies may be subject to modification by the geotechnical engineer based upon soil and moisture conditions encountered, the size and type of compaction equipment used by the Contractor, the general trend of compaction test results, and other factors.

Of particular concern to NOVA during earthwork operations will be good practices in moisture conditioning, loose soil placement and soil compaction. In particular, NOVA will be vigilant with regard to the use compaction equipment appropriate to the full lift thickness of the type of soil being compacted. Reliance on construction traffic (for example, loaders or dump trucks) to achieve compaction will not be approved.

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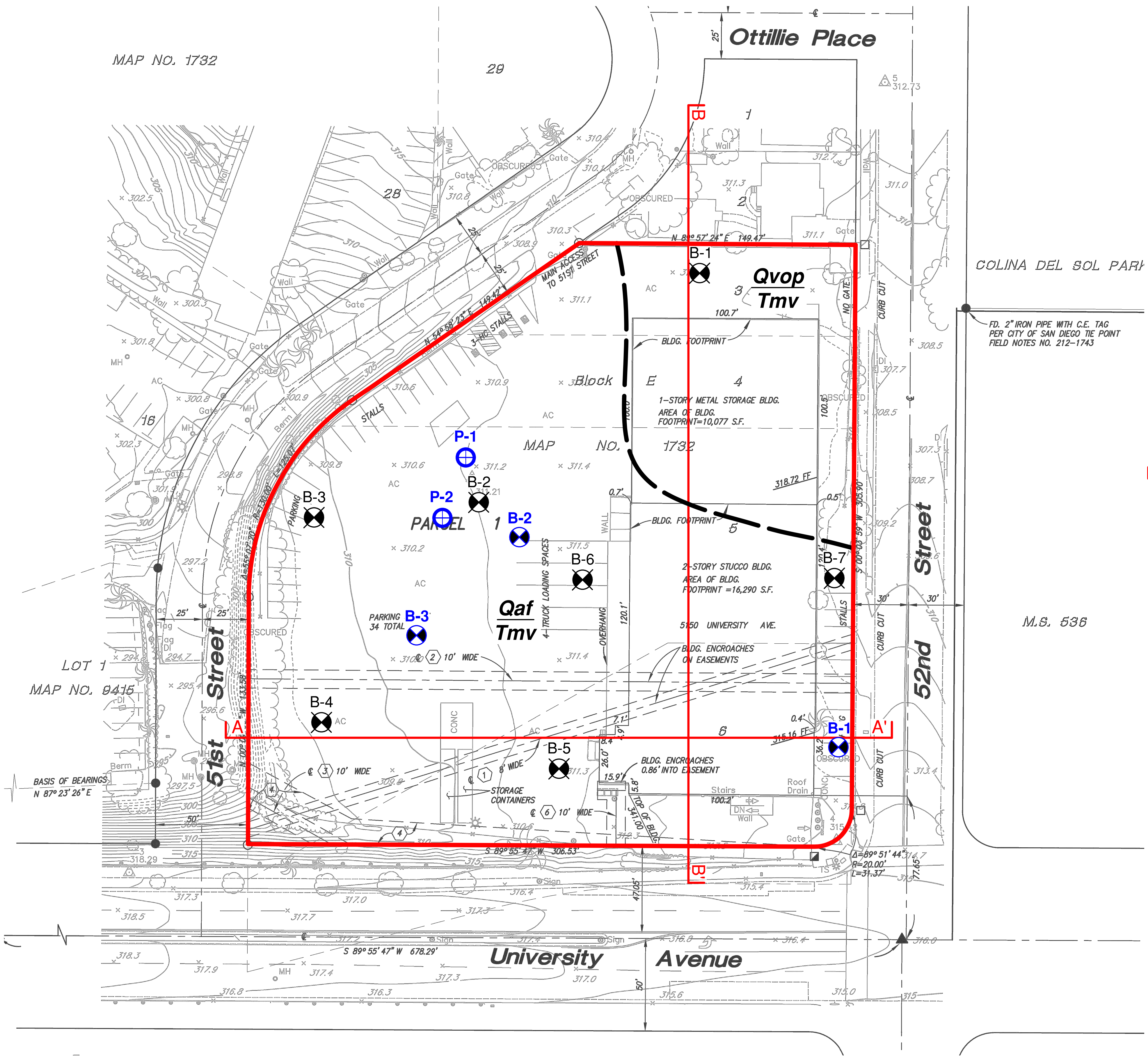
PLATES



KEY TO SYMBOLS

Qaf	FILL
Qvop	VERY OLD PARALIC DEPOSITS
Tmv	MISSION VALLEY FORMATION
B-3	GEOTECHNICAL BORING (NOVA)
B-7	GEOTECHNICAL BORING (LEIGHTON, 2020)
P-1	PERCOLATION TEST BORING (NOVA)
B B'	GEOLOGIC CROSS-SECTION
	GEOLOGIC CONTACT
	LIMITS OF ANTICIPATED REMEDIAL GRADING

0 60' 120'

A.L.T.A./A.C.S.M. SURVEY OF

LOTS 3, 4, 5 AND 6, BLOCK E OF OAK PARK, IN THE CITY OF SAN DIEGO, COUNTY OF AN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 1732, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, JUNE 22, 1922.

NOVA ENGINEERING, INC

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UNIVERSITY SELF STORAGE

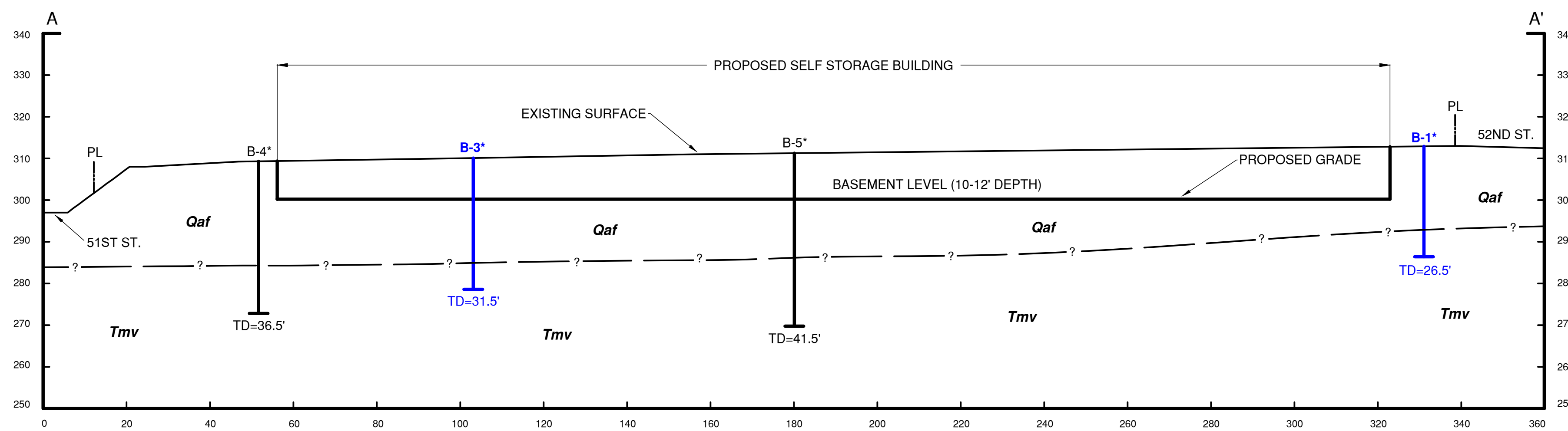
5150 UNIVERSITY AVE
SAN DIEGO, CA

PROJECT NO.:	2020057
DATE:	MAY 2020
DRAWN BY:	DTW
REVIEWED BY:	MS
SCALE:	1"=60'
DRAWING TITLE:	

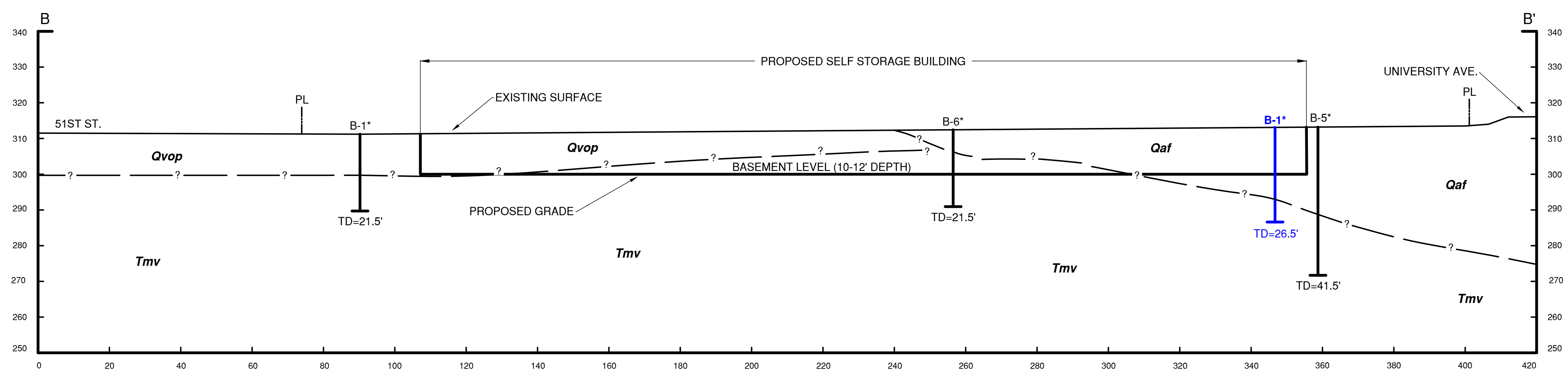
SUBSURFACE INVESTIGATION MAP

PLATE NO. 1 OF 2

GEOLOGIC CROSS-SECTION AA'



GEOLOGIC CROSS-SECTION BB'



KEY TO SYMBOLS

Qaf	FILL	B-3	GEOTECHNICAL BORING (NOVA) *PROJECTED
Qvop	VERY OLD PARALIC DEPOSITS	B-6	GEOTECHNICAL BORING (LEIGHTON, 2020) *PROJECTED
Tmv	MISSION VALLEY FORMATION	?	GEOLOGIC CONTACT

0 40' 80'

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PROJECT NO.:	2020057
DATE:	MAY 2020
DRAWN BY:	DTW
REVIEWED BY:	MS
SCALE:	1"=40'
DRAWING TITLE:	

GEOLOGIC
CROSS-SECTIONS
AA' & BB'

PLATE NO. 2 OF 2

APPENDIX A

USE OF THE GEOTECHNICAL REPORT

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

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IIGER06045.0M

APPENDIX B

LOGS OF BORINGS

BORING LOG B-1

DATE EXCAVATED:	APRIL 23, 2020	**EQUIPMENT:**	CME 75
EXCAVATION DESCRIPTION:	8-INCH HOLLOW-STEM AUGER	**GPS COORD.:**	N/A
GROUNDWATER DEPTH:	GROUNDWATER NOT ENCOUNTERED	**ELEVATION:**	± 312 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	**SOIL DESCRIPTION** *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0			*5" OF ASPHALT*		
	SC	18	**FILL (Qaf):** *CLAYEY SAND; LIGHT BROWN, MOIST, MEDIUM DENSE, FINE TO MEDIUM GRAINED, SCATTERED GRAVEL $\frac{1}{2}$"-$\frac{3}{4}$"*		*ROCK INSIDE SHOE*
		22		SA	
5	SM	55	*SILTY SAND; LIGHT BROWN, DAMP TO MOIST, DENSE, FINE TO MEDIUM GRAINED*	SA	*1" ROCK FRAGMENTS INSIDE SHOE*
			ABUNDANT GRAVEL AND ROCK FRAGMENTS $\frac{1}{4}$"		
		18	*ROCKS AND ROCK FRAGMENTS 1", GRAVEL AND PEBBLES $\frac{1}{4}$"*		
10	SC	13	*CLAYEY SAND WITH SILT; DARK BROWN, MOIST, MEDIUM DENSE, FINE TO MEDIUM GRAINED*	SA	*GLASS FRAGMENTS INSIDE SAMPLE*
15		44	*DENSE*		
				MD	*3.3% MOISTURE*
				SA	
				AL	
				EI	*2 VERY LOW*
				CR	
20	SM-SC	60	**MISSION VALLEY FORMATION (Tmv):** *SILTY SANDSTONE-CLAYEY SANDSTONE; OLIVE GRAY, MOIST, VERY DENSE, FINE TO MEDIUM GRAINED*		*ROCK INSIDE SHOE*
25		39	*DENSE*		
	SP		*POORLY GRADED SANDSTONE, LIGHT BROWN, MOIST, DENSE, MEDIUM TO COARSE GRAINED*		
			BORING TERMINATED AT 26.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.		
30					

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOWCOUNT
⊠	BULK SAMPLE	*	NO SAMPLE RECOVERY
⧄	SPT SAMPLE (ASTM D1586)	——	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	– – –	SOIL TYPE CHANGE

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APPENDIX B.1

LOGGED BY:	GAN	DATE:	MAY 2020
REVIEWED BY:	MS	PROJECT NO.: 2020057	

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BORING LOG B-2

DATE EXCAVATED: APRIL 23, 2020 **EQUIPMENT:** CME 75

EXCAVATION DESCRIPTION: 8-INCH HOLLOW-STEM AUGER **GPS COORD.:** N/A

GROUNDWATER DEPTH: GROUNDWATER NOT ENCOUNTERED **ELEVATION:** ± 311.5 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						*5" OF ASPHALT OVER 7" OF BASE*		
		X	SPT	SC	24	**FILL (Qaf):** *CLAYEY SAND; LIGHT BROWN, MOIST, MEDIUM DENSE, FINE TO MEDIUM GRAINED*		
		X	SPT	SM	24	*SILTY SAND; LIGHT BROWN, MOIST, MEDIUM DENSE, FINE TO MEDIUM GRAINED*	RV	
5		X	SPT	SP-SM	50/3"	**MISSION VALLEY FORMATION (Tmv):** *POORLY GRADED SANDSTONE WITH SILT; LIGHT BROWN, MOIST, VERY DENSE, FINE TO MEDIUM GRAINED*		
		X	SPT		49	*DENSE*	SA	*1-1½" ROCK FRAGMENTS INSIDE SHOE*
10			SPT		50/2" *	*VERY DENSE* *ABUNDANT GRAVEL ¾"*		
			CAL		50/0" *			
15			SPT			*DENSE*		
				SP	35	*POORLY GRADED SANDSTONE; LIGHT BROWN, DAMP, DENSE, MEDIUM GRAINED*		
		X		SM-SC		*SILTY SANDSTONE-CLAYEY SANDSTONE; OLIVE BROWN, DAMP, FINE TO MEDIUM GRAINED* *ABUNDANT GRAVEL ¾"*		
20		X	CAL		50/3" *			
25			SPT		50/5"	*VERY DENSE*		*1-2" ROCK INSIDE SAMPLE*
						ABUNDANT GRAVEL ¾"		
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOWCOUNT
⊠	BULK SAMPLE	*	NO SAMPLE RECOVERY
◩	SPT SAMPLE (ASTM D1586)	——	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	– – –	SOIL TYPE CHANGE

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APPENDIX B.2

LOGGED BY:	GAN	DATE:	MAY 2020
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CONTINUED BORING LOG B-2

DATE EXCAVATED: APRIL 23, 2020 **EQUIPMENT:** CME 75

EXCAVATION DESCRIPTION: 8-INCH HOLLOW-STEM AUGER **GPS COORD.:** N/A

GROUNDWATER DEPTH: GROUNDWATER NOT ENCOUNTERED **ELEVATION:** ± 311.5 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
30				SP	78	**MISSION VALLEY FORMATION (Tmv):** *(CONTINUED) POORLY GRADED SANDSTONE; LIGHT BROWN, DAMP, VERY DENSE, FINE TO MEDIUM GRAINED*		
						BORING TERMINATED AT 31.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.		
35								
40								
45								
50								
55								
60								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOWCOUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
◪	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

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APPENDIX B.3

LOGGED BY:	GAN	DATE:	MAY 2020
REVIEWED BY:	MS	PROJECT NO.: 2020057	

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BORING LOG B-3

DATE EXCAVATED:	APRIL 23, 2020	**EQUIPMENT:**	CME 75
EXCAVATION DESCRIPTION:	8-INCH HOLLOW-STEM AUGER	**GPS COORD.:**	N/A
GROUNDWATER DEPTH:	GROUNDWATER NOT ENCOUNTERED	**ELEVATION:**	± 310 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						*5" OF ASPHALT OVER 7" OF BASE*		
				SM	13	**FILL (Qaf):** *SILTY SAND; LIGHT ORANGE BROWN, DAMP TO MOIST, MEDIUM DENSE, FINE TO MEDIUM GRAINED*		
					18		SA	
						SCATTERED GRAVEL AND PEBBLES 1"		
5					9	*DAMP, LOOSE, FINE GRAINED*	SA	*1" PEBBLE AND BROKEN ROCK FRAGMENTS INSIDE SAMPLE*
						DENSE		
					36			*1-1½" ROCK FRAGMENTS INSIDE SHOE*
10				SC	50/6" *	*CLAYEY SAND; LIGHT BROWN, MOIST, VERY DENSE, FINE TO MEDIUM GRAINED* *SCATTERED GRAVEL AND PEBBLES 1"*		
15				SM	43	*SILTY SAND; BROWN, DAMP, DENSE, FINE TO MEDIUM GRAINED*		*ROCK INSIDE SAMPLE*
20					18	*DARK BROWN, DAMP, MEDIUM DENSE, ABUNDANT GRAVEL AND COBBLES <1"*		
25				SM	50/9"	**MISSION VALLEY FORMATION (Tmv):** *SILTY SANDSTONE; LIGHT BROWN, DRY TO DAMP, VERY DENSE, FINE TO MEDIUM GRAINED, ABUNDANT GRAVEL <¾"*		*1-2" ROCK INSIDE SAMPLE*
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOWCOUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
◪	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

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APPENDIX B.4

LOGGED BY:	GAN	DATE:	MAY 2020
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CONTINUED BORING LOG B-3

DATE EXCAVATED:	APRIL 23, 2020	**EQUIPMENT:**	CME 75
EXCAVATION DESCRIPTION:	8-INCH HOLLOW-STEM AUGER	**GPS COORD.:**	N/A
GROUNDWATER DEPTH:	GROUNDWATER NOT ENCOUNTERED	**ELEVATION:**	± 310 FT MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
30			SPT	SM	59	**MISSION VALLEY FORMATION (Tmv):** *(CONTINUED) SILTY SANDSTONE; LIGHT BROWN, DRY TO DAMP, VERY DENSE, FINE TO MEDIUM GRAINED, MICACEOUS*		
						BORING TERMINATED AT 31.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING.		
35								
40								
45								
50								
55								
60								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOWCOUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
◸	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

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APPENDIX B.5

LOGGED BY:	GAN	DATE:	MAY 2020
REVIEWED BY:	MS	PROJECT NO.:	2020057

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PERCOLATION BORING LOG P-1

DATE EXCAVATED: APRIL 23, 2020
EQUIPMENT: CME 75
EXCAVATION DESCRIPTION: 8-INCH HOLLOW-STEM AUGER
GPS COORD.: N/A
GROUNDWATER DEPTH: GROUNDWATER NOT ENCOUNTERED
ELEVATION: ± 311 MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						*5" OF ASPHALT*		
				SC		**FILL (Qaf):** *CLAYEY SAND, BROWN, MOIST, MEDIUM DENSE, FINE TO MEDIUM GRAINED*		
				SM-SC		**MISSION VALLEY FORMATION (Tmv):** *SILTY SANDSTONE-CLAYEY SANDSTONE; LIGHT BROWN, MOIST, VERY DENSE, FINE TO MEDIUM*		
5						*BORING TERMINATED AT 5 FT AND CONVERTED TO A PERCOLATION WELL.*		
10								
15								
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOWCOUNT
⊠	BULK SAMPLE	*	NO SAMPLE RECOVERY
⧄	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

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APPENDIX B.6

LOGGED BY:	GAN	DATE:	MAY 2020
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PERCOLATION BORING LOG P-2

DATE EXCAVATED: APRIL 23, 2020 **EQUIPMENT:** CME 75

EXCAVATION DESCRIPTION: 8-INCH HOLLOW-STEM AUGER **GPS COORD.:** N/A

GROUNDWATER DEPTH: GROUNDWATER NOT ENCOUNTERED **ELEVATION:** ± 310.5 MSL

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)	LABORATORY	REMARKS
0						*5" OF ASPHALT*		
				SC		**FILL (Qaf):** *CLAYEY SAND, BROWN, MOIST, MEDIUM DENSE, FINE TO MEDIUM GRAINED*		
5								
						BORING TERMINATED AT 6 FT AND CONVERTED TO A PERCOLATION WELL.		
10								
15								
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOWCOUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⧄	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— — —	SOIL TYPE CHANGE

UNIVERSITY SELF STORAGE

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APPENDIX B.7

LOGGED BY:	GAN	DATE:	MAY 2020
REVIEWED BY:	MS	PROJECT NO.: 2020057	

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APPENDIX C

RECORDS OF LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

- **CLASSIFICATION:** *Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soils Classification System and are presented on the exploration logs in Appendix B.*
- **MOISTURE CONTENT (ASTM D2216):** *Tests were performed on selected represenative soil samples to evaluate the water (moisture) content by mass of soil, rock, and similar materials where the reduction in mass by drying is due to loss of water. Test sample is dried in an oven at a temperature of 110° ± 5°C to a constant mass. The loss of mass due to drying is considered to be water. The water (moisture) content were determined in general accordance with ASTM D2216*
- **MAXIMUM DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557 METHOD A,B,C):** *The maximum dry density and optimum moisture contet of typical soils were determined in the laboratory in accordance with ASTM Standard Test D1557, Method A, Method B, Method C.*
- **ATTERBERG LIMITS (ASTM D 4318):** *Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System.*
- **R-VALUE (ASTM D 2844):** *The resistance Value, or R-Value, for near-surface site soils were evaluated in general accordance with California Test (CT) 301 and ASTM D 2844. Samples were prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results.*
- **EXPANSION INDEX (ASTM D 4829):** *The expansion index of selected materials was evaluated in general accordance with ASTM D 4829. Specimens were molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thich by 4-inch diameter specimens were loaded with a surcharge of 144 pounds per square foot and were inundated with tap water. Readings of volumetric swell were made for a period of 24 hours.*
- **CORROSIVITY TEST (CAL. TEST METHOD 417, 422, 643):** *Soil PH, and minimum resistivity tests were performed on a representative soil sample in general accordance with test method CT 643. The sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively.*
- **GRADATION ANALYSIS (ASTM C 136 and/or ASTM D422):** *Tests were performed on selected representative soil samples in general accordance with ASTM D422. The grain size distributions of selected samples were determined in accordance with ASTM C 136 and/or ASTM D422. The results of the tests are summarized on Appendix C.3 through Appendix C.9.*

Moisture Content Test (ASTM D2216)

Sample Location	Sample Depth (ft)	Soil Description	Moisture (%)
B-1	15 - 20	Dark Brown Clayey Sand with Silt	3.3

Maximum Dry Density and Optimum Moisture Content (ASTM D1557)

Sample Location	Sample Depth (ft)	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-1	15 - 20	Dark Brown Clayey Sand with Silt	128.4	10.1

Atterberg Limits (ASTM D4318)

Sample Location	Sample Depth (ft)	Liquid Limit, LL	Plastic Limit, PL	Plasticity Index, PI	USCS
B-1	15 - 20	33	16	17	CL

Resistance Value (Cal. Test Method 301 & ASTM D2844)

Sample Location	Sample Depth (ft)	Soil Description	R-Value
B-2	0 - 5	Light Brown Clayey Silty Sand	14

Expansion Index (ASTM D4829)

Sample Location	Sample Depth (ft)	Expansion Index	Expansion Potential
B-1	15 - 20	2	Very Low

Corrosivity (Cal. Test Method 417,422,643)

Sample Location	Sample Depth (ft)	pH	Resistivity (Ohm-cm)	Sulfate Content (ppm)	Sulfate Content (%)	Chloride Content (ppm)	Chloride Content (%)
B-1	15 - 20	7.9	500	250	0.025	210	0.021

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LAB TEST RESULTS

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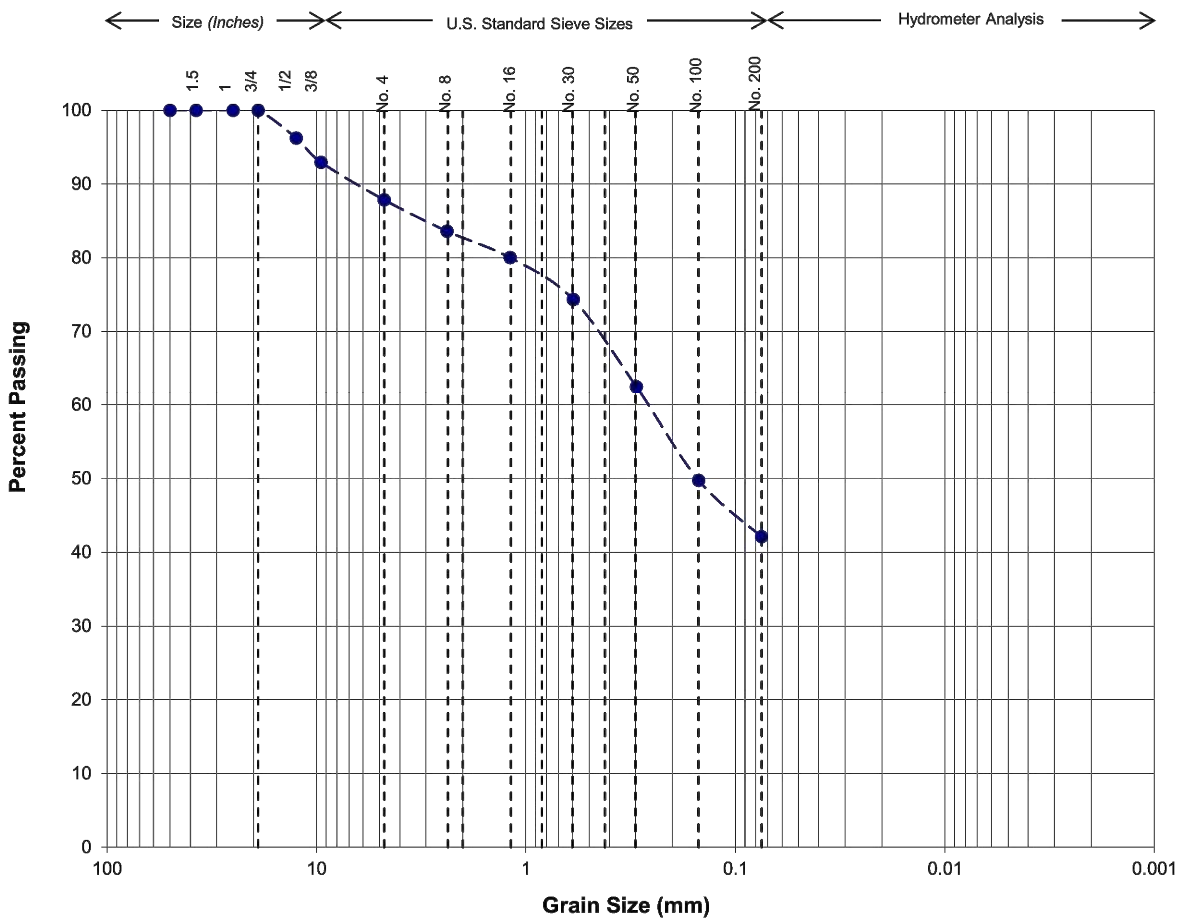
BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.2



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-1

Depth (ft): 2 - 3.5

USCS Soil Type: SC

Passing No. 200 (%): 42

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GRADATION ANALYSIS TEST RESULTS

UNIVERSITY SELF STORAGE

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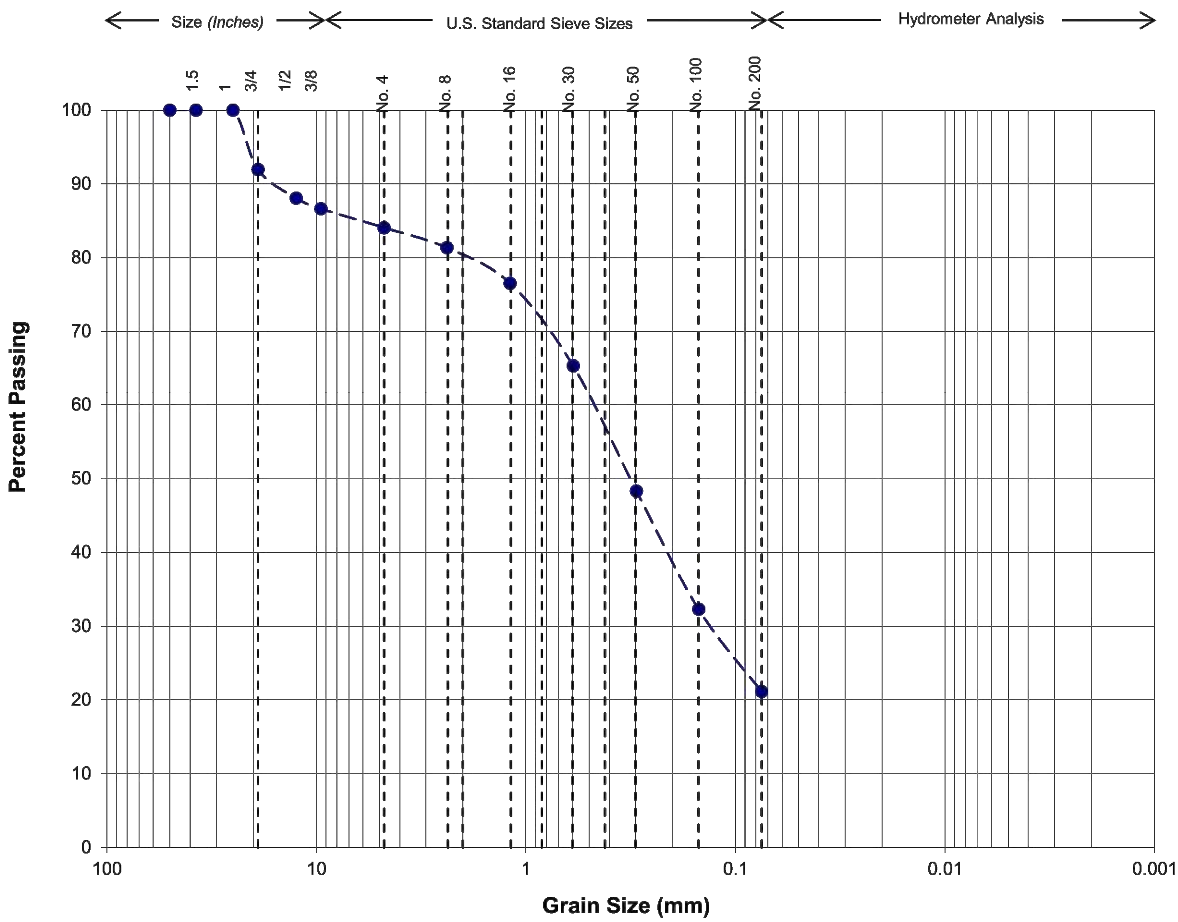
SAN DIEGO, CA

BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.3



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-1

Depth (ft): 5 - 6.5

USCS Soil Type: SM

Passing No. 200 (%): 21

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GRADATION ANALYSIS TEST RESULTS

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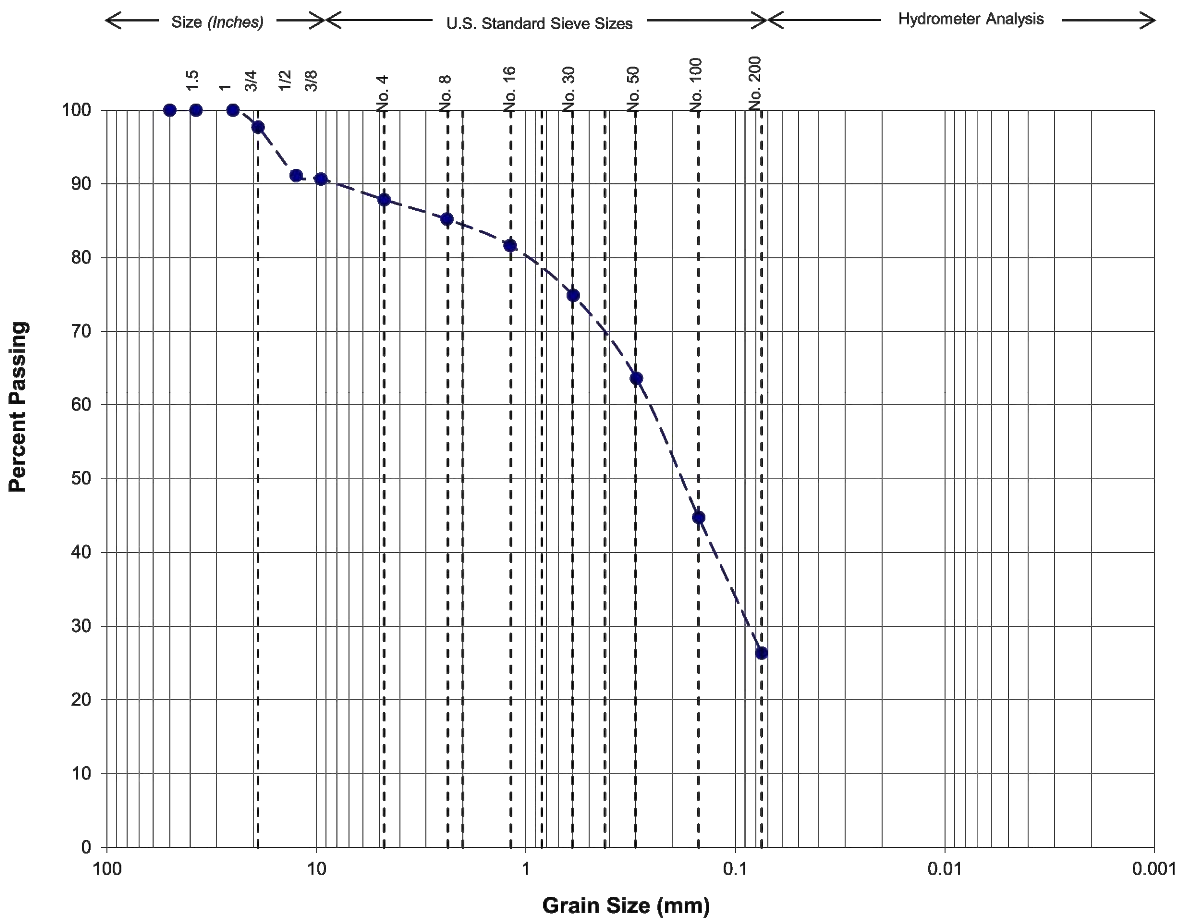
BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.4



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-1

Depth (ft): 10 - 11.5

USCS Soil Type: SC

Passing No. 200 (%): 26

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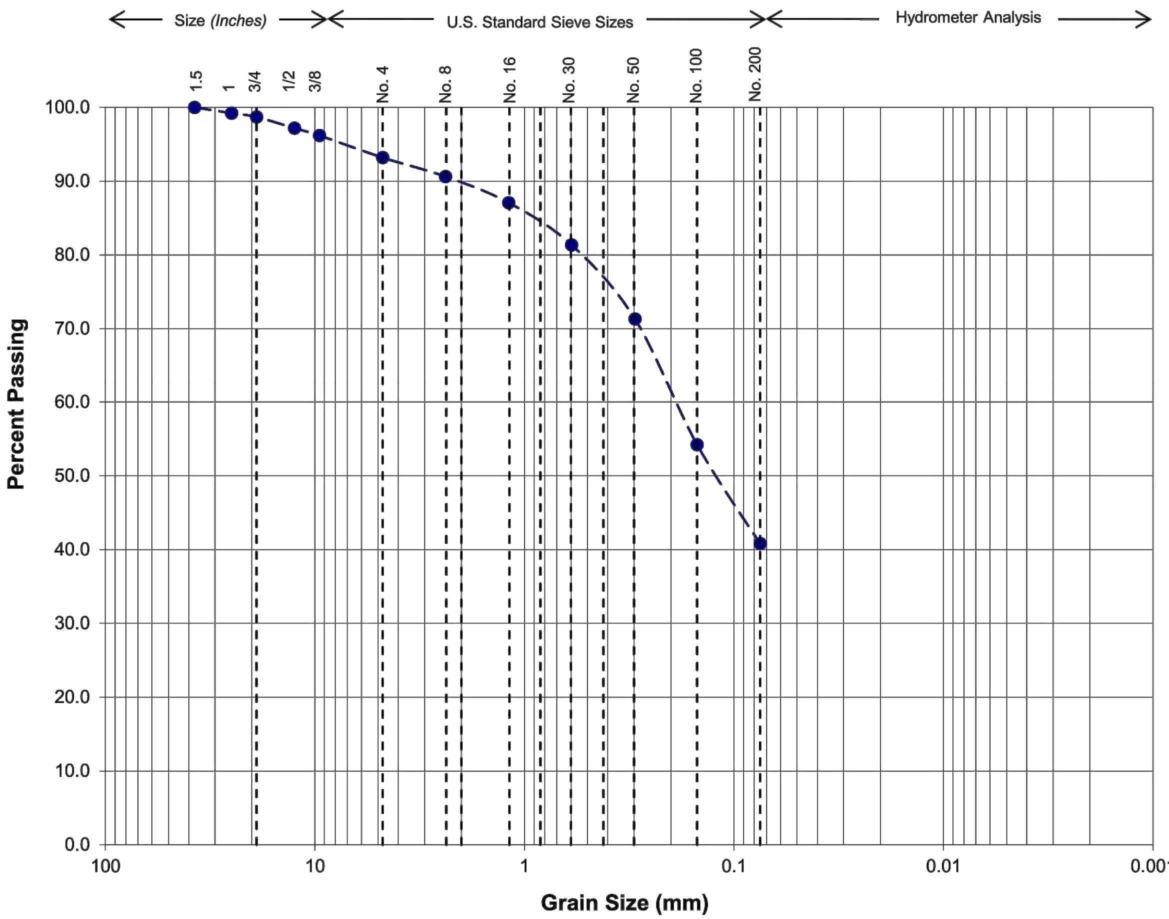
GRADATION ANALYSIS TEST RESULTS

UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE

SAN DIEGO, CA

BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.5



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-1

Depth (ft): 15 - 20

USCS Soil Type: SC

Passing No. 200 (%): 41

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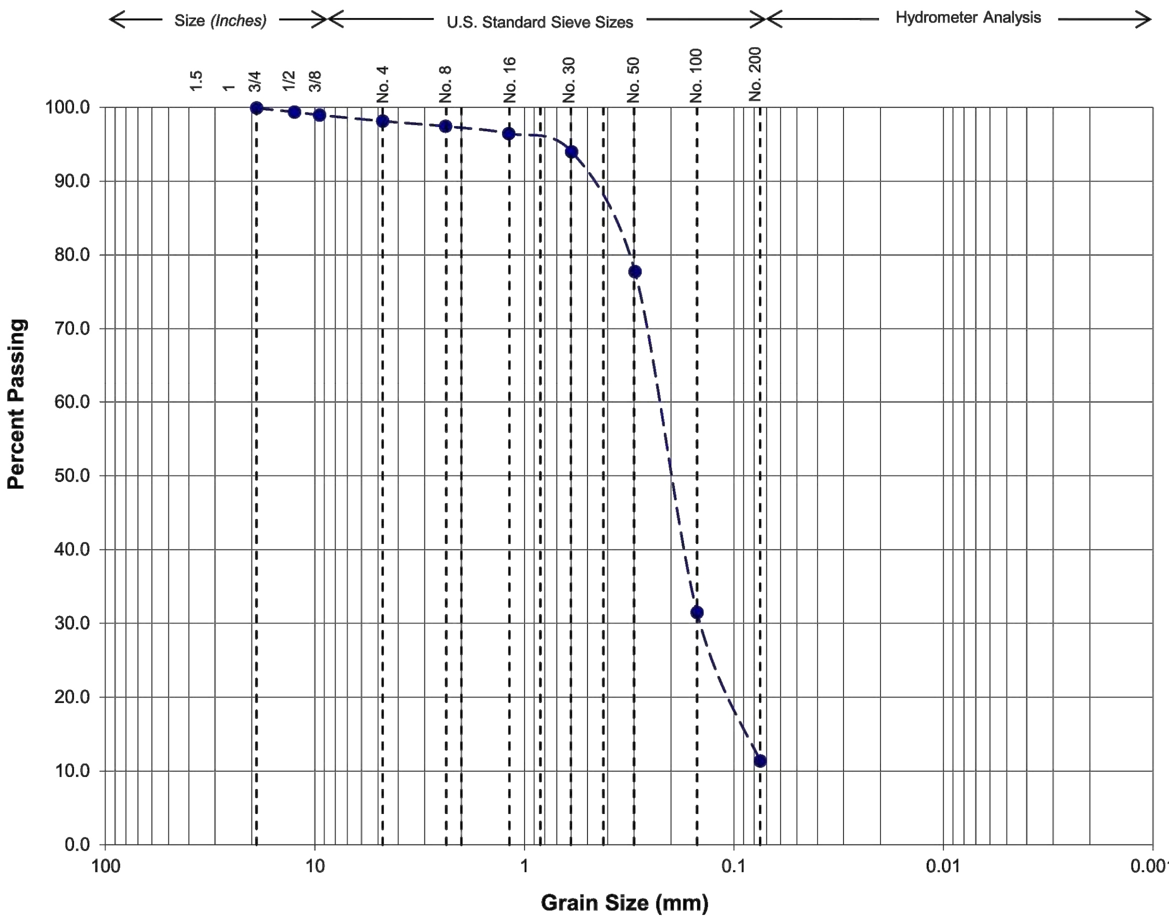
GRADATION ANALYSIS TEST RESULTS

UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE

SAN DIEGO, CA

BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.6



<table>
<tr><th colspan="2">Gravel</th><th colspan="3">Sand</th><th rowspan="2">Silt or Clay</th></tr>
<tr><td>Coarse</td><td>Fine</td><td>Coarse</td><td>Medium</td><td>Fine</td></tr>
</table>

Sample Location: B-2

Depth (ft): 5 - 10

USCS Soil Type: SP-SM

Passing No. 200 (%): 11

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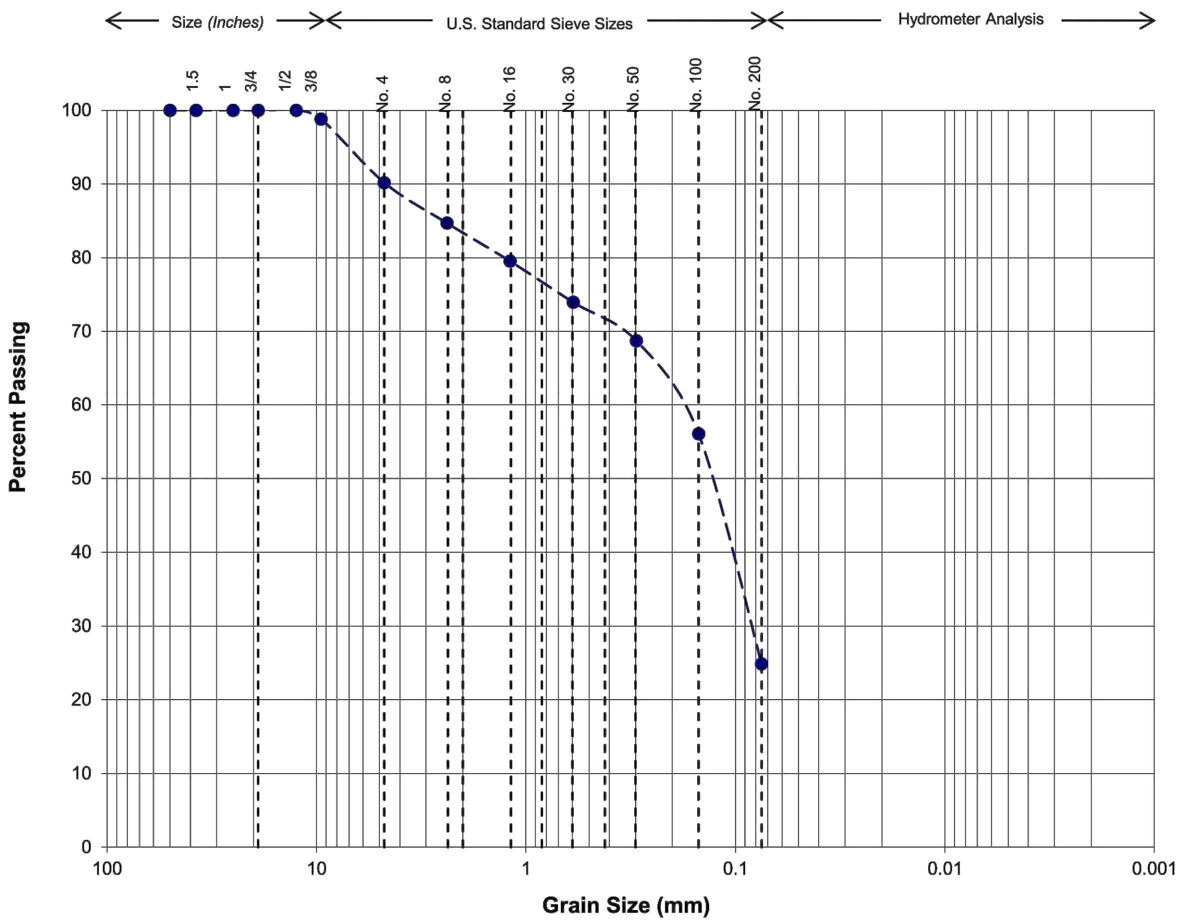
GRADATION ANALYSIS TEST RESULTS

UNIVERSITY SELF STORAGE

5150 UNIVERSITY AVE

SAN DIEGO, CA

BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.7



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-3

Depth (ft): 2.5 - 4

USCS Soil Type: SM

Passing No. 200 (%): 25

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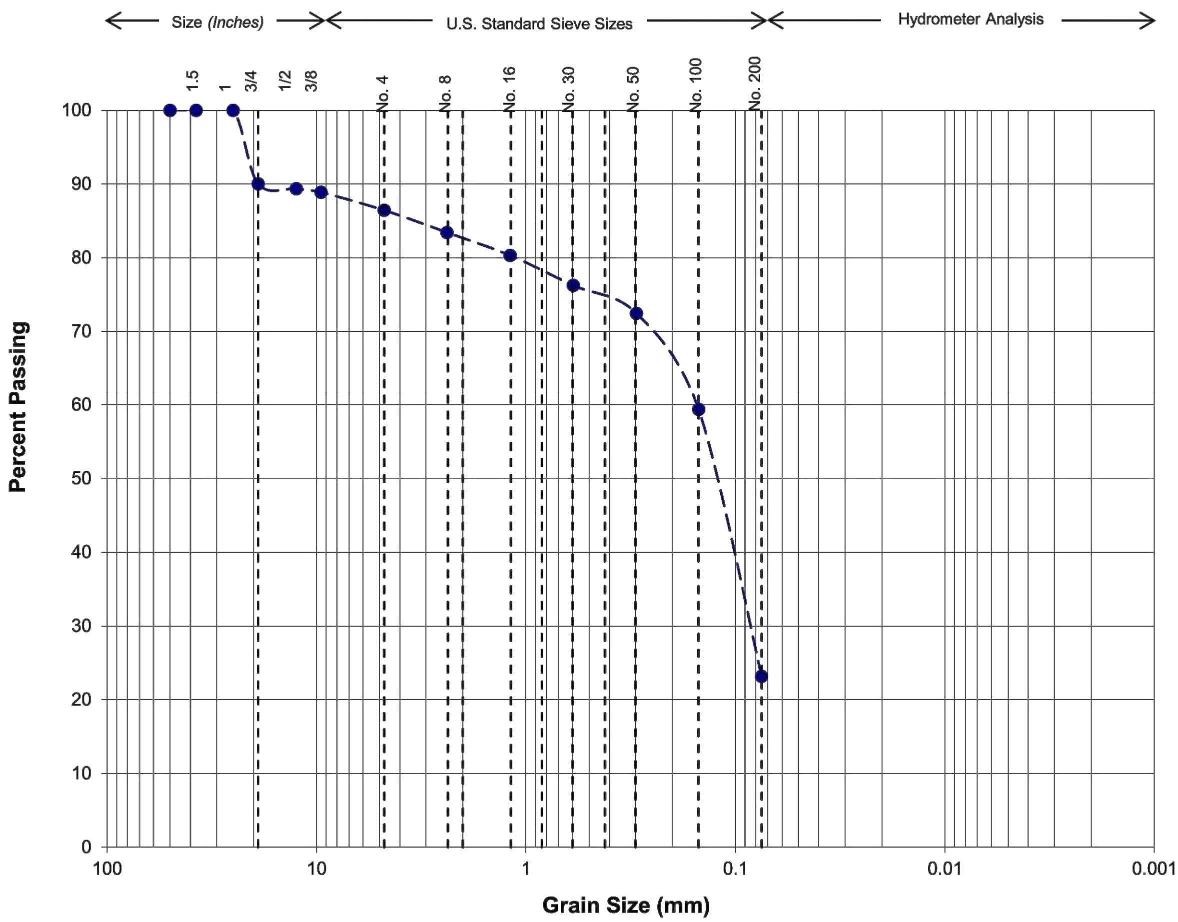
GRADATION ANALYSIS TEST RESULTS

UNIVERSITY SELF STORAGE
5150 UNIVERSITY AVE
SAN DIEGO, CA

BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.8



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-3

Depth (ft): 5 - 6.5

USCS Soil Type: SM

Passing No. 200 (%): 23

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GRADATION ANALYSIS TEST RESULTS

UNIVERSITY SELF STORAGE

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SAN DIEGO, CA

BY: CLS	DATE: MAY 2020	PROJECT: 2020057	APPENDIX: C.9

APPENDIX D

INFILTRATION FEASIBILTY WORKSHEET C.4-1: FORM I-8A

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Location at P-1 and P-2		Design Phase
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☒ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☐ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☐ No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.	

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

The findings of this geotechnical investigation and infiltration assessment are detailed in NOVA 2020.

A qualified representative of NOVA Services directed the drilling of two percolation test borings to depths of approximately 5 ft at P-1 to 6 ft at P-2 below ground surface (bgs) with a continuously sampled exploratory boring to accompany each test to 31.5 ft bgs.

The tests were conducted in compliance with the Borehole Percolation Tests method (D.3.3.2) of the BMP Manual. The percolation rates were converted to infiltration rates by the Porchet Method. Percolation testing indicated infiltration rates of 0.01-inches per hour, utilizing a factor of safety of F=2.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☒ Complete Part 2

[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Joint-Use Turf Field		Design Phase
Criteria 3 : Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☒ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☒ No: Skip to Part 2 Result.	
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Percolation test methods and infiltration results are detailed in a geotechnical investigation report (NOVA 2020). Percolation testing indicated infiltration rates of 0.01-inches per hour, utilizing a factor of safety of F=2. Full and partial BMPs are not required on sites with infiltration rates less than 0.05 inches per hour.		

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits. See geotechnical investigation NOVA 2020.			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

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