APPENDIX F.3

Storm Water Quality Management Plan

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

Fairmount Fire Station

[Insert Permit Application Number]

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

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

Engineer of Work:

Will sign and stamp upon approval.

Bryan S. Redsun P.E. 85508

Provide Wet Signature and Stamp Above Line

Prepared For:

City of San Diego

9370 Chesapeake Drive Suite 100

San Diego, Ca 92123

619.235.1000

Prepared By:

RRM Design Group

32332 Camino Capistrano Suite 205

San Juan Capistrano, Ca 92672

949.361.7950

Date:

07.30.2019

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)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
- Attachment 5: Project's Drainage Report
- 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: Fairmount Avenue Fire Station
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.

Will sign and stamp upon approval.

Engineer of Work's Signature

85505

PE#

09/30/2020

Expiration Date

Bryan S. Redsun

Print Name

RRM Design Group

Company

07.30.2019

Date

Engineer's Stamp

Project Name: Fairmount Avenue Fire Station

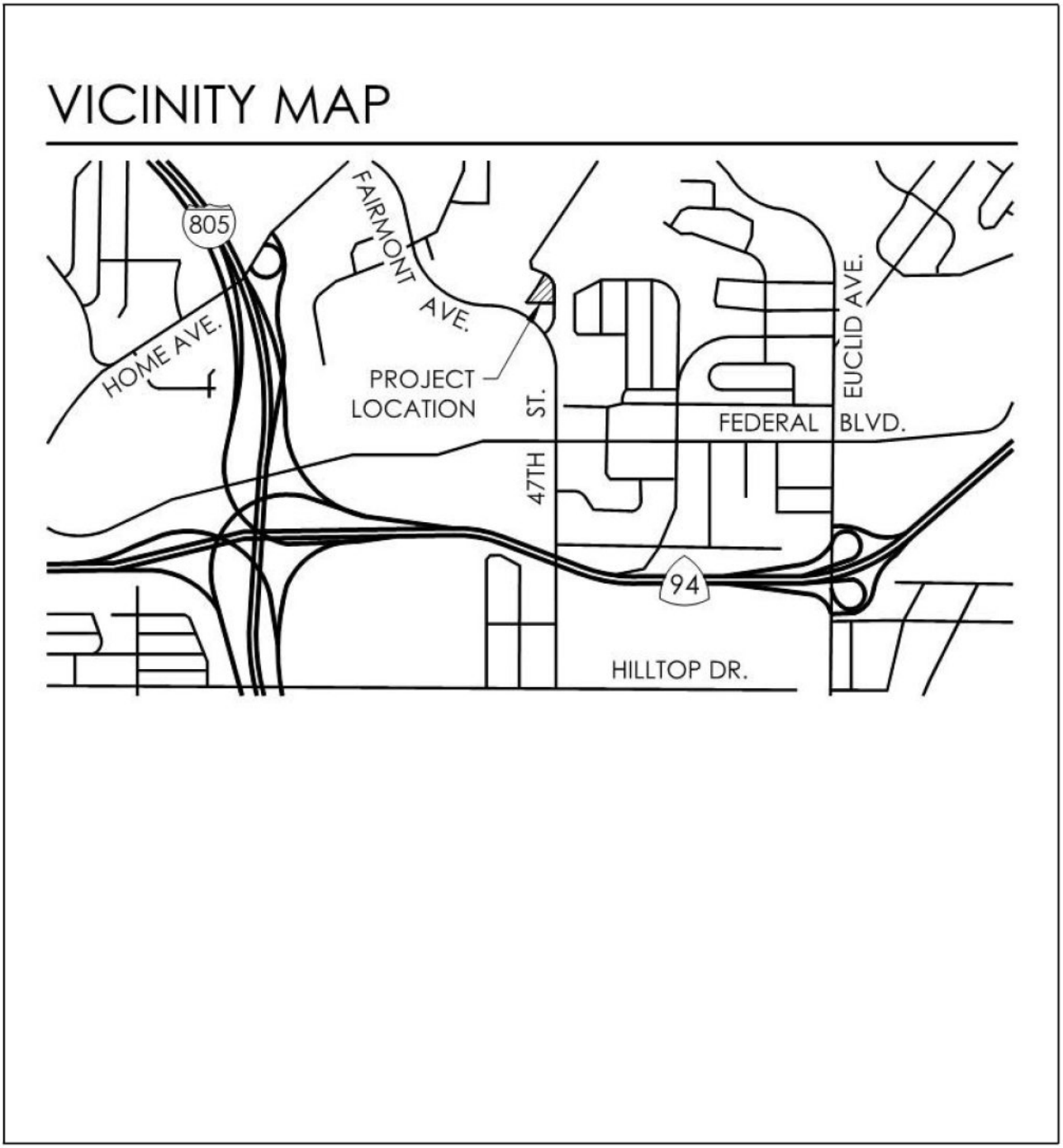
Submittal Record

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	07.30.2019	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Initial Submittal
2		☐ Preliminary Design/Planning/CEQA ☐ Final Design	
3		☐ Preliminary Design/Planning/CEQA ☐ Final Design	
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

Project Vicinity Map

Project Name: Fairmount Avenue Fire Station
Permit Application



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:	Project Number:

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

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

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

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Applicability of Permanent, Post-Construction Storm Water BMP Requirements	Form I-1

Project Identification

Project Name: Fairmount Avenue Fire Station	
Permit Application Number:	Date: 07.30.2019

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):

NA

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:

NA

Project Name: Fairmount Avenue Fire Station

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): NA		
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: According to the Potential Critical Coarse Sediment Yield Areas Exhibit Dated September 8, 2014. The Chollas Creek is not a potential critical coarse sediment yield area.		

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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Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Fairmount Avenue Fire Station
Project Address	NE Corner of Fairmount and 47th Street
Assessor's Parcel Number(s) (APN(s))	514-190-16
Permit Application Number	
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)	908.22
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	1.28 Acres (55,756.8 Square Feet)
Area to be disturbed by the project (Project Footprint)	0.44 Acres (19,344 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	0.38 Acres (16,391 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.06 Acres (2,953 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	30 %

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:

Existing Land Cover Includes (select all that apply):

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

Description / Additional Information:

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

The existing site slopes to the north west corner and runoff surface flows offsite to the Chollas Creek. The existing topography generally slopes from the southeast corner to the northwest corner of the site. Over 40% of the slopes onsite have grade over 25%. There are two existing storm drains from 47th Street, outlets at the bottoms of the hill at the north edge of the site and surface runoff continues to Chollas Creek.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

This site will be developed as a new fire station for the City of San Diego. The building will include a 2-bay fire-truck garage, dormitories, a kitchen, and gymnasium. The site will include a 16-stall parking lot for the fire fighters and 2 parking stalls for visitors.

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

1 building, 18-stall parking lot, and 60-ft driveway

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

There are proposed landscaped areas dispersed throughout the site. One of the landscaped areas will be considered self treating and the others will be used for bioretention facilities.

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

The proposed development includes disturbing a small portion of the overall site. Improvements will be constructed in the south east corner of the site near 47th Street.

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:

The proposed improvements will convey the storm water runoff into a bio-filtration system and then into an underground detention system. The underground detention system will discharge the collected storm water at pre-development rates

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

- [x] Onsite storm drain inlets
- [ ] Interior floor drains and elevator shaft sump pumps
- [x] 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
- [x] Refuse areas
- [ ] Industrial processes
- [x] Outdoor storage of equipment or materials
- [x] Vehicle and equipment cleaning
- [x] Vehicle/equipment repair and maintenance
- [ ] Fuel dispensing areas
- [ ] Loading docks
- [ ] Fire sprinkler test water
- [x] Miscellaneous drain or wash water
- [x] 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 proposed development will route all stormwater runoff into an on-site biofiltration system and then into an underground detention system. The underground detention system will discharge into an exhiting 18" storm drain pipe at pre-development flow rates. This existing 18" storm drain pipe eventually discharge into the Chollas Creek and then into the San Deigo Bay and Pacific Ocean
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations NA
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations NA
Provide distance from project outfall location to impaired or sensitive receiving waters NA
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 NA

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)
San Diego Bay	Copper, Diazinon, Indicator Bacteria, Lead, Phosphorus, Trash, Zinc	Copper and Zinc
San Diego Bay near Chollas Creek	Bethnic Community Effects, Sediment Toxicity	

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	☐	☑	☐

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

- [x] 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
- [x] No

Discussion / Additional Information:

Form I-3B Page 10 of 11

Flow Control for Post-Project Runoff*

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

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

An underground detention system with an orifice will be installed on-site in order to maintain predevelopment flows. Prior to runoff entering the detention system, drainage will flow through a biofiltration system for water quality purposes

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.

The site's zoning regulations do not allow for development of more than 30% of the site. Due to the zoning constraints and the steep topography, retaining walls are in the proposed design which do not allow for infiltration to be a feasible option.

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.

NA

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:			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.4 not implemented:			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.5 not implemented:			

Form I-4B Page 2 of 2			
Source Control Requirement	**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:			

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: Parking and building requirements as well as site constraints did not allow for the dispersion of impervious areas.			
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: Fairmount Avenue Fire Station

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: The site is too compact to use rain barrerls effectively for storm capture and irrigation purposes				
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:

LEGEND

- PROPERTY LINE
- DMA LIMITS
- BUILDING AREA (ROOF TOP)
- PARKING AREA (AC PAVEMENT)
- CONCRETE
- LANDSCAPE
- SD — STORM DRAIN LATERAL
- DETENTION SYSTEM

DMA TABLE

DMA NUMBER	AREA (ACRES)	IMPERVIOUS AREA (ACRES)	% IMPERVIOUS	HSG	WEIGHTED RUNOFF COEFFICIENT	DCV (CUBIC FEET)	TREATED BY (BMP ID)	POLLUTANT CONTROL TYPE
1	0.23	0.23	100%	TYPE D	1.0	751	BF-1	BIOFILTRATION
2	0.18	0.15	96%	TYPE D	0.85	500	BF-1	BIOFILTRATION
3	0.04	0	0%	TYPE D	0.1	13	BF-1	BIOFILTRATION
TOTALS	0.45	0.38	84%			1264		

0 20 40 60 feet
1" = 20'

NORTH

REGISTERED PROFESSIONAL ENGINEER BRYAN S. REDSUN No. C 85505 exp. 9/30/20 CIVIL STATE OF CALIFORNIA
NOT FOR CONSTRUCTION UNLESS SIGNED

BRYAN REDSUN R.C.E. NO. 85505 EXP. 09-30-20

07/12/2019
DATE

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STORM WATER QUALITY MANAGEMENT PLAN

FAIRMOUNT AVE FIRE STATION

CORNER OF FAIRMOUNT AVE AND 47TH ST.

CITY OF SAN DIEGO, CALIFORNIA

PROJECT NO. 300-92-0117

FOR CITY ENGINEER _____ DATE _____

V.T.M. _____

DESCRIPTION	BY	APPROVED	DATE	FILMED
AS-BUILTS				

NAD83 COORDINATES

LAMBERT COORDINATES

CONTRACTOR _____ DATE STARTED _____

INSPECTOR _____ DATE COMPLETED _____

C-5.0

Project Name: Fairmount Avenue Fire Station

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.

Storm water runoff will be conveyed into a bio-filtration system which will treat the runoff and then direct it into an underground storage system. The storage system will retain the runoff and be equipped with an orifice that will allow discharge into Chollas Creek at rates below pre-development flow rates

(Continue on page 2 as necessary.)

Form I-6 Page 1 of 2 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 1	
Construction Plan Sheet No. 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	City of San Diego
Who will be the final owner of this BMP?	City of San Diego
Who will maintain this BMP into perpetuity?	City of San Diego
What is the funding mechanism for maintenance?	City of San Diego

Form I-6 Page of 2 (Copy as many as needed)
Structural BMP ID No. 1
Construction Plan Sheet No. 1
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Form I-6 Page of 2 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. 2	
Construction Plan Sheet No. 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	City of San Diego
Who will be the final owner of this BMP?	City of San Diego
Who will maintain this BMP into perpetuity?	City of San Diego
What is the funding mechanism for maintenance?	Tax payer dollars

Form I-6 Page of 2 (Copy as many as needed)
Structural BMP ID No. 2
Construction Plan Sheet No. 1
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Will sign and stamp upon approval.

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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: Fairmount Avenue Fire Station

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)

LEGEND

- PROPERTY LINE
- DMA LIMITS
- BUILDING AREA (ROOF TOP)
- PARKING AREA (AC PAVEMENT)
- CONCRETE
- LANDSCAPE
- SD — STORM DRAIN LATERAL
- DETENTION SYSTEM

DMA TABLE

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2	0.18	0.15	96%	TYPE D	0.85	500	BF-1	BIOFILTRATION
3	0.04	0	0%	TYPE D	0.1	13	BF-1	BIOFILTRATION
TOTALS	0.45	0.38	84%			1264		

0 20 40 60 feet
1" = 20'

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STORM WATER QUALITY MANAGEMENT PLAN

FAIRMOUNT AVE FIRE STATION

CORNER OF FAIRMOUNT AVE AND 47TH ST.

CITY OF SAN DIEGO, CALIFORNIA

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DESCRIPTION	BY	APPROVED	DATE	FILMED
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CONTRACTOR _____ DATE STARTED _____

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C-5.0

Project Name: Fairmount Avenue Fire Station

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	0.23	0.23	100	D	1.0	751	1	Bio-filtration	1
DMA 2	0.18	0.17	96	D	0.85	500	1	Bio-filtration	1
DMA 3	0.04	0	0	D	0.1	13	Self-Treating	NA	NA

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	0.44	0.38	84		0.65	1264	0.4		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

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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:_____

NO

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]

NA

3. Calculate the DCV using worksheet B-2.1.

DCV = 1264 (cubic feet)

[Provide a summary of calculations here]

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.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]		Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
DMA 1 AND 2		
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[3]? ○ 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.	

[1] 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.

[2] 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.

[3] 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[2]
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.	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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[2]	
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[2]	
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.

The site's zoning regulations do not allow for development of more than 30% of the site. Due to the zoning constraints and the steep topography, retaining walls are in the proposed design which do not allow for infiltration to be a feasible option.

Part 1 Result – Full Infiltration Geotechnical Screening [4]	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

[4] 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[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
DMA 1 AND 2	
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).	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]

Summarize findings and basis; provide references to related reports or exhibits.

The site's zoning regulations do not allow for development of more than 30% of the site. Due to the zoning constraints and the steep topography, retaining walls are in the proposed design which do not allow for infiltration to be a feasible option.

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	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

[5] 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.

Factor of Safety and Design Infiltration Rate Worksheet			Worksheet D.5-1: Form I-9		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25		
		Predominant soil texture	0.25		
		Site soil variability	0.25		
		Depth to groundwater / impervious layer	0.25		
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$ [Minimum of 2 and Maximum of 9]					
Observed Infiltration Rate, inch/hr., $K_{observed}$ (corrected for test-specific bias) Note: This worksheet is only applicable when the observed infiltration rate is greater than or equal to 1 inch/hr.					
Design Infiltration Rate, in/hr., $K_{design} = K_{observed} / S_{total}$ Note: If the estimated design infiltration rate is less than or equal to 0.5 inch/hr. then the applicant may choose to implement partial infiltration BMPs.					
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					

Note: Worksheet D.5-1: Form I-9 is only applicable to design BMPs in "full infiltration condition". This form is not applicable for categorization of infiltration feasibility (Worksheet C.4-1: Form I-8) and/or for designing BMPs in "partial infiltration condition" or "no infiltration condition".

DMA 1

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=	0.60	inches
2	Area tributary to BMP (s)	A=	0.23	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	1.00	unitless
4	Street trees volume reduction	TCV=	0.00	cubic-feet
5	Rain barrels volume reduction (1 cubic foot=7.48 gallons)	RCV=	0.00	cubic-feet
6	Calculate DCV =(3630 x C x d x A) – TCV - RCV	DCV=	500.94	cubic-feet
Per County of San Diego BMP Design Manual, Biofiltration BMPS are to treat 1.5xDCV		1.5DCV=	751	cubic-feet

DMA 2

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=	0.60	inches
2	Area tributary to BMP (s)	A=	0.18	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.85	unitless
4	Street trees volume reduction	TCV=	0.00	cubic-feet
5	Rain barrels volume reduction (1 cubic foot=7.48 gallons)	RCV=	0.00	cubic-feet
6	Calculate DCV =(3630 x C x d x A) – TCV - RCV	DCV=	333.23	cubic-feet
Per County of San Diego BMP Design Manual, Biofiltration BMPS are to treat 1.5xDCV		1.5DCV=	500	cubic-feet

DMA 3

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=	0.60	inches
2	Area tributary to BMP (s)	A=	0.04	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.10	unitless
4	Street trees volume reduction	TCV=	0.00	cubic-feet
5	Rain barrels volume reduction (1 cubic foot=7.48 gallons)	RCV=	0.00	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	8.71	cubic-feet
Per County of San Diego BMP Design Manual, Biofiltration BMPS are to treat 1.5xDCV		1.5DCV=	13	cubic-feet

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: Fairmount Avenue Fire Station

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

Project Name: Fairmount Avenue Fire Station

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).

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LEGEND

- PROPERTY LINE
- DMA LIMITS
- BUILDING AREA (ROOF TOP)
- PARKING AREA (AC PAVEMENT)
- CONCRETE
- LANDSCAPE
- SD — STORM DRAIN LATERAL
- DETENTION SYSTEM

DMA TABLE

DMA NUMBER	AREA (ACRES)	IMPERVIOUS AREA (ACRES)	% IMPERVIOUS	HSG	WEIGHTED RUNOFF COEFFICIENT	DCV (CUBIC FEET)	TREATED BY (BMP ID)	POLLUTANT CONTROL TYPE
1	0.23	0.23	100%	TYPE D	1.0	751	BF-1	BIOFILTRATION
2	0.18	0.15	96%	TYPE D	0.85	500	BF-1	BIOFILTRATION
3	0.04	0	0%	TYPE D	0.1	13	BF-1	BIOFILTRATION
TOTALS	0.45	0.38	84%			1264		

0 20 40 60 feet
1" = 20'

NORTH

REGISTERED PROFESSIONAL ENGINEER BRYAN S. REDSUN No. C 85505 exp. 9/30/20 CIVIL STATE OF CALIFORNIA
NOT FOR CONSTRUCTION UNLESS SIGNED

BRYAN REDSUN R.C.E. NO. 85505 EXP. 09-30-20

07/12/2019
DATE

rrm design group
rrmdesign.com | (949) 361-7950
32332 Camino Capistrano, Suite 205
San Juan Capistrano, CA 92675

STORM WATER QUALITY MANAGEMENT PLAN

FAIRMOUNT AVE FIRE STATION

CORNER OF FAIRMOUNT AVE AND 47TH ST.

CITY OF SAN DIEGO, CALIFORNIA

PROJECT NO. 300-92-0117

FOR CITY ENGINEER _____ DATE _____

V.T.M. _____

DESCRIPTION	BY	APPROVED	DATE	FILMED
AS-BUILTS				

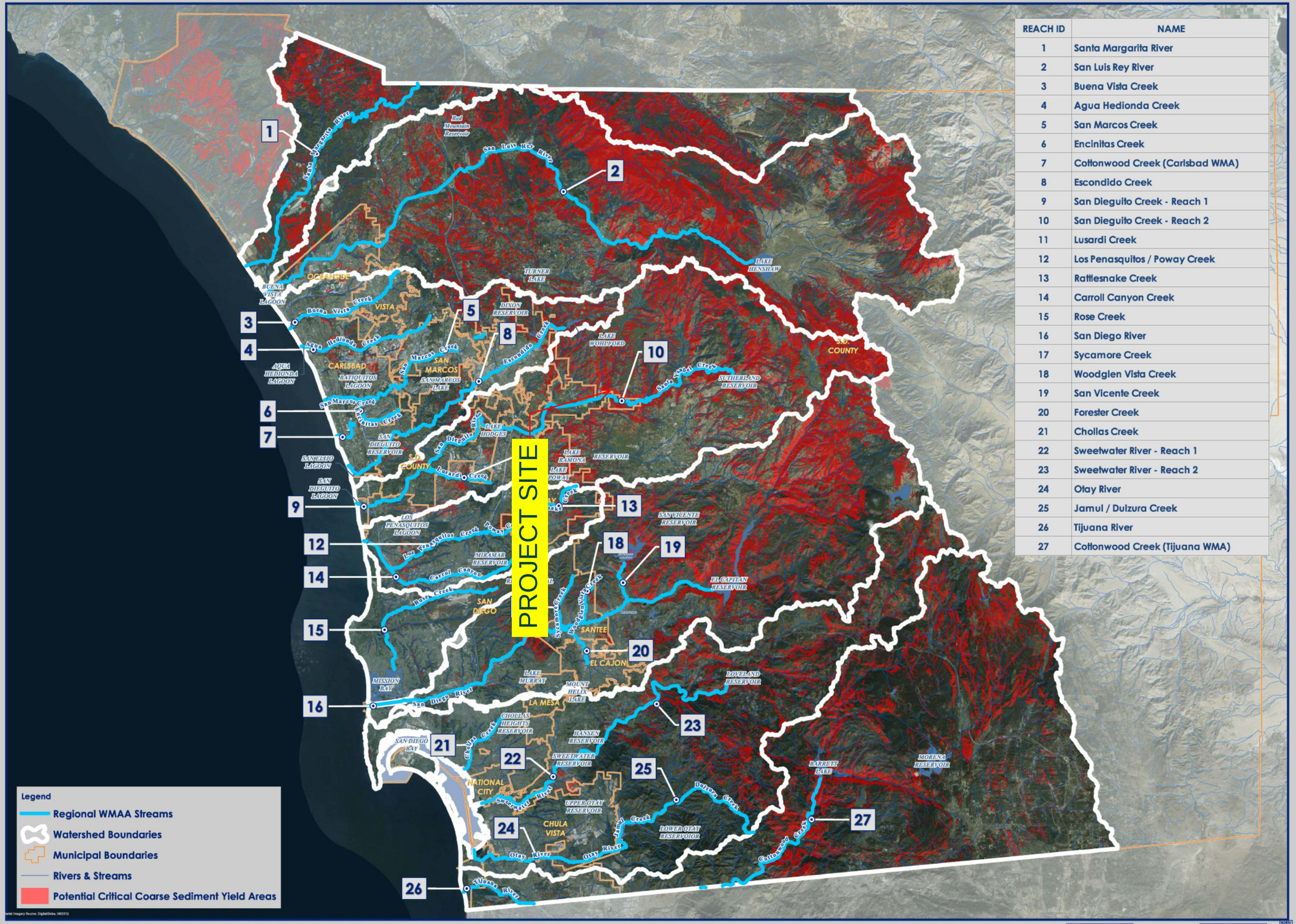
NAD83 COORDINATES

LAMBERT COORDINATES

CONTRACTOR _____ DATE STARTED _____

INSPECTOR _____ DATE COMPLETED _____

C-5.0



REACH ID	NAME
1	Santa Margarita River
2	San Luis Rey River
3	Buena Vista Creek
4	Agua Hedionda Creek
5	San Marcos Creek
6	Encinitas Creek
7	Cottonwood Creek (Carlsbad WMA)
8	Escondido Creek
9	San Dieguito Creek - Reach 1
10	San Dieguito Creek - Reach 2
11	Lusardi Creek
12	Los Penasquitos / Poway Creek
13	Rattlesnake Creek
14	Carroll Canyon Creek
15	Rose Creek
16	San Diego River
17	Sycamore Creek
18	Woodglen Vista Creek
19	San Vicente Creek
20	Forester Creek
21	Chollas Creek
22	Sweetwater River - Reach 1
23	Sweetwater River - Reach 2
24	Otay River
25	Jamul / Dulzura Creek
26	Tijuana River
27	Cottonwood Creek (Tijuana WMA)

Potential Critical Coarse Sediment Yield Areas

Regional San Diego County Watersheds

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

RICK ENGINEERING COMPANY

Time of Concentration Calculations

Using the "Urban Areas Overland Time of Flow Curves" from the City of San Diego Drainage Design Manual:

Where:

$T_C = Time\ of\ Concentration\ in\ minutes\ (min)$
$C = Runoff\ Coefficient\ (0.6\ assumed)$
$S = Effective\ Slope\ in\ percent\ (\%)$
$D = Distance\ in\ feet\ (ft)$

$$T_C = \frac{1.8 \times (1.1 - C)\sqrt{D}}{\sqrt[3]{S}}$$

BASIN	DISTANCE (FT)	C	SLOPE (%)	TIME OF CONCENTRATION (MIN)	PIPE TIME OF CONCENTRATION (MIN))	TOTAL TIME OF CONCENTRATION (MIN))
SITE	290	0.87	20	12	20	32
1	50	0.90	6	6.5	6.5	13
2	100	0.84	2	17	12	29
3	9	0.30	45	5.6	0	5.6

Flow Calculations

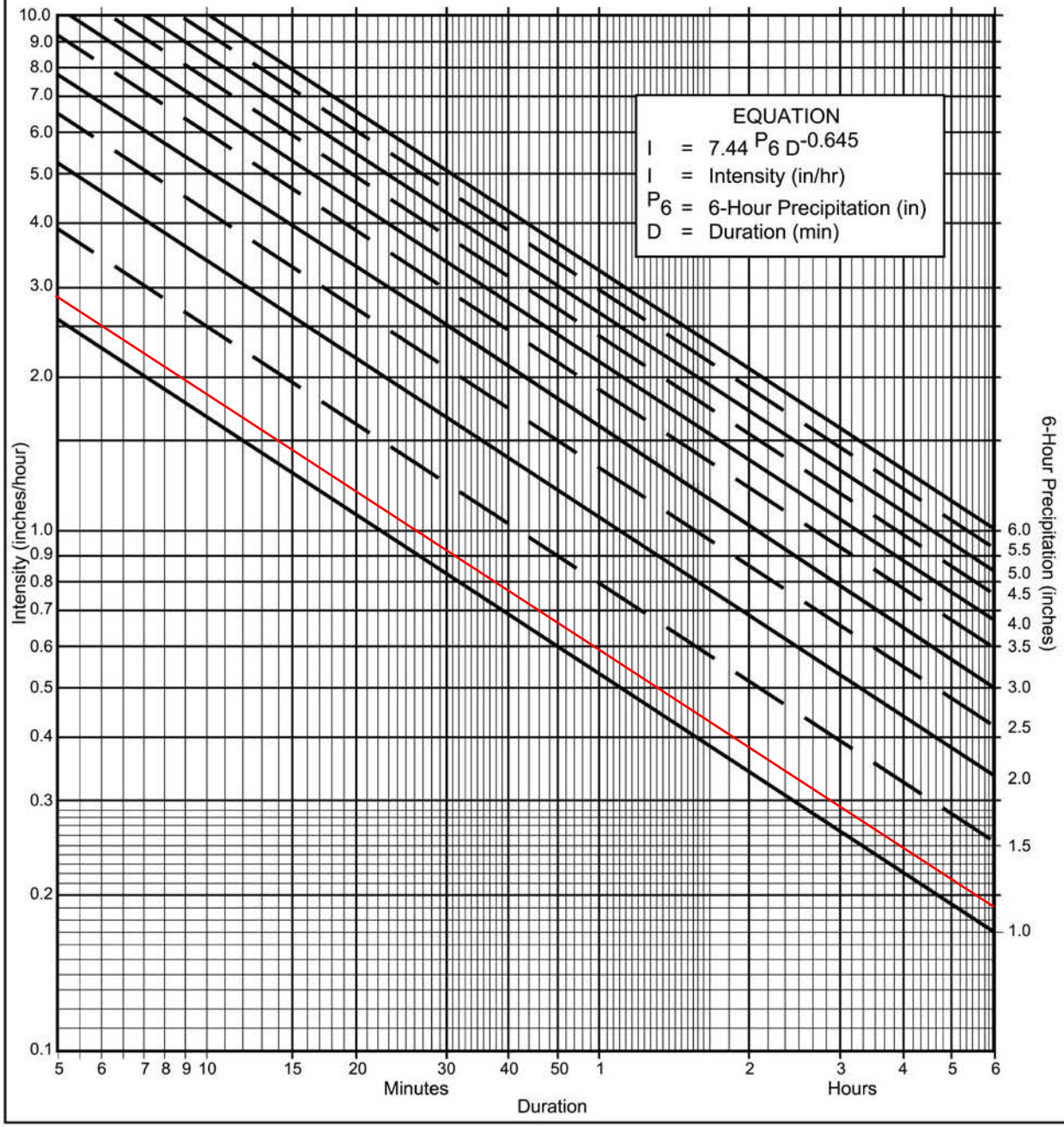
Using the City of San Diego Drainage Design Manual (Section 1-102.3:

Where:

$Q = Flow\ rate\ in\ cubic\ feet\ per\ second\ (cfs)$
$C = Runoff\ Coefficient$
$I = Rainfall\ Intensity\ in\ inches\ per\ hour\ (in/hr)$
$A = Basin\ Area\ in\ acres\ (ac)$

$$Q = C \times I \times A$$

BASIN	YEAR	C	I (IN/HR)	AREA (AC)	Q (CFS))
SITE	2	0.87	2.90	0.45	1.14
	10	0.87	4.45	0.45	1.74
	50	0.87	5.85	0.45	2.29
	100	0.87	6.76	0.45	2.65
1	2	0.90	2.90	0.23	0.60
	10	0.90	4.45	0.23	0.92
	50	0.90	5.85	0.23	1.21
	100	0.90	6.76	0.23	1.40
2	2	0.84	2.90	0.18	0.44
	10	0.84	4.45	0.18	0.67
	50	0.84	5.85	0.18	0.88
	100	0.84	6.76	0.18	1.02
3	2	0.30	2.90	0.04	0.04
	10	0.30	4.45	0.04	0.05
	50	0.30	5.85	0.04	0.07
	100	0.30	6.76	0.04	0.08



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 2 year

(b) P_6 = 1.22 in., P_{24} = 1.80, $\frac{P_6}{P_{24}}$ = 68 %(2)

(c) Adjusted P_6(2) = 1.22 in.

(d) t_x = 6.00 min.

(e) I = 2.90 in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
S.D. COUNTY
SD

Site
1.22 in

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Site
1.8 in

Orange County
Riverside County
Imperial County
Mexico
Pacific Ocean

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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SanGIS
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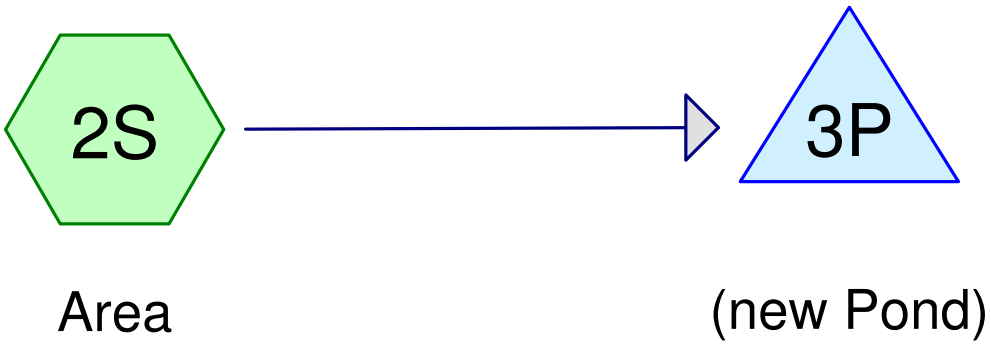
N W E S

3 0 3 Miles



Subcat Reach Pond Link

Routing Diagram for Post Dev
Prepared by {enter your company name here}, Printed 7/29/2019

Area Listing (all nodes)

Area (sq-ft)	C	Description (subcatchment-numbers)
10,019	1.00	(2S)
7,841	0.85	(2S)
1,742	0.10	(2S)
19,602	**0.86**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
19,602	Other	2S
19,602		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	0	0	0	19,602	19,602		2S
0	**0**	**0**	**0**	**19,602**	**19,602**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 2S: Area Runoff Area=0.450 ac 51.11% Impervious Runoff Depth>1.54"
Flow Length=100' Tc=10.0 min C=0.86 Runoff=0.03 cfs 2,520 cf

Pond 3P: (new Pond) Peak Elev=100.11' Storage=0.000 af Inflow=0.03 cfs 2,520 cf
Outflow=0.03 cfs 2,507 cf

Total Runoff Area = 19,602 sf Runoff Volume = 2,520 cf Average Runoff Depth = 1.54"
48.89% Pervious = 9,583 sf 51.11% Impervious = 10,019 sf

Summary for Subcatchment 2S: Area

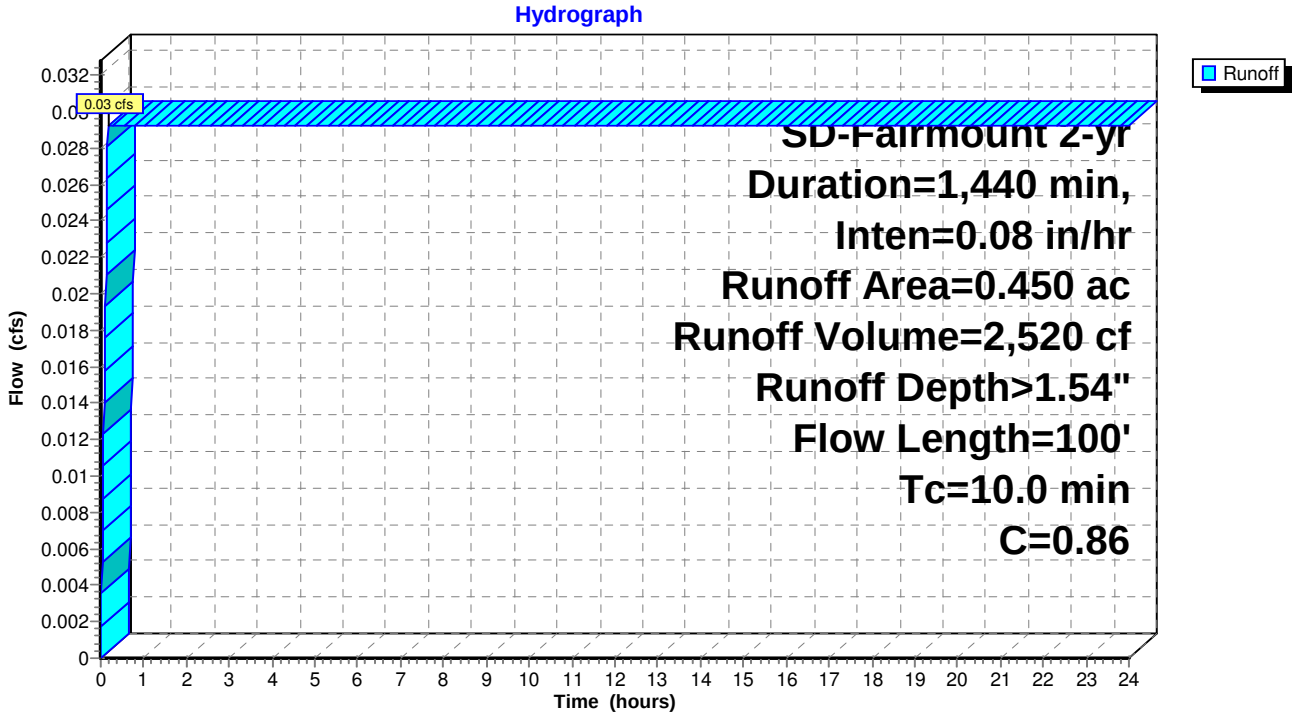
Runoff = 0.03 cfs @ 0.17 hrs, Volume= 2,520 cf, Depth> 1.54"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
SD-Fairmount 2-yr Duration=1,440 min, Inten=0.08 in/hr

Area (ac)	C	Description
0.230	1.00	
0.180	0.85	
0.040	0.10	
0.450	0.86	Weighted Average
0.220		48.89% Pervious Area
0.230		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100		0.17		**Direct Entry,**

Subcatchment 2S: Area



Hydrograph for Subcatchment 2S: Area

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	**0.00**	10.40	0.03	20.80	0.03
0.20	**0.03**	10.60	0.03	21.00	0.03
0.40	0.03	10.80	0.03	21.20	0.03
0.60	0.03	11.00	0.03	21.40	0.03
0.80	0.03	11.20	0.03	21.60	0.03
1.00	0.03	11.40	0.03	21.80	0.03
1.20	0.03	11.60	0.03	22.00	0.03
1.40	0.03	11.80	0.03	22.20	0.03
1.60	0.03	12.00	0.03	22.40	0.03
1.80	0.03	12.20	0.03	22.60	0.03
2.00	0.03	12.40	0.03	22.80	0.03
2.20	0.03	12.60	0.03	23.00	0.03
2.40	0.03	12.80	0.03	23.20	0.03
2.60	0.03	13.00	0.03	23.40	0.03
2.80	0.03	13.20	0.03	23.60	0.03
3.00	0.03	13.40	0.03	23.80	0.03
3.20	0.03	13.60	0.03	24.00	0.03
3.40	0.03	13.80	0.03		
3.60	0.03	14.00	0.03		
3.80	0.03	14.20	0.03		
4.00	0.03	14.40	0.03		
4.20	0.03	14.60	0.03		
4.40	0.03	14.80	0.03		
4.60	0.03	15.00	0.03		
4.80	0.03	15.20	0.03		
5.00	0.03	15.40	0.03		
5.20	0.03	15.60	0.03		
5.40	0.03	15.80	0.03		
5.60	0.03	16.00	0.03		
5.80	0.03	16.20	0.03		
6.00	0.03	16.40	0.03		
6.20	0.03	16.60	0.03		
6.40	0.03	16.80	0.03		
6.60	0.03	17.00	0.03		
6.80	0.03	17.20	0.03		
7.00	0.03	17.40	0.03		
7.20	0.03	17.60	0.03		
7.40	0.03	17.80	0.03		
7.60	0.03	18.00	0.03		
7.80	0.03	18.20	0.03		
8.00	0.03	18.40	0.03		
8.20	0.03	18.60	0.03		
8.40	0.03	18.80	0.03		
8.60	0.03	19.00	0.03		
8.80	0.03	19.20	0.03		
9.00	0.03	19.40	0.03		
9.20	0.03	19.60	0.03		
9.40	0.03	19.80	0.03		
9.60	0.03	20.00	0.03		
9.80	0.03	20.20	0.03		
10.00	0.03	20.40	0.03		
10.20	0.03	20.60	0.03		

Summary for Pond 3P: (new Pond)

Inflow Area = 19,602 sf, 51.11% Impervious, Inflow Depth > 1.54" for 2-yr event
Inflow = 0.03 cfs @ 0.17 hrs, Volume= 2,520 cf
Outflow = 0.03 cfs @ 2.44 hrs, Volume= 2,507 cf, Atten= 0%, Lag= 136.2 min
Primary = 0.03 cfs @ 2.44 hrs, Volume= 2,507 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 100.11' @ 2.10 hrs Surf.Area= 0.007 ac Storage= 0.000 af

Plug-Flow detention time= 7.8 min calculated for 2,507 cf (99% of inflow)
Center-of-Mass det. time= 3.9 min (726.5 - 722.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	0.007 af	**15.75'W x 19.57'L x 3.48'H Field A** 0.025 af Overall - 0.007 af Embedded = 0.017 af x 40.0% Voids
#2A	100.50'	0.007 af	**Prinsco HydroStor HS75** x 6 Inside #1 Effective Size= 45.3"W x 29.0"H => 6.55 sf x 7.08'L = 46.3 cf Overall Size= 51.0"W x 29.7"H x 7.26'L with 0.18' Overlap 3 Rows of 2 Chambers Cap Storage= +5.8 cf x 2 x 3 rows = 34.8 cf
		0.014 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.03 cfs @ 2.44 hrs HW=100.11' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.14 fps)

Pond 3P: (new Pond) - Chamber Wizard Field A

Chamber Model = Prinsco HydroStor HS75 (Prinsco HydroStor with Cap storage)
Effective Size= 45.3"W x 29.0"H => 6.55 sf x 7.08'L = 46.3 cf
Overall Size= 51.0"W x 29.7"H x 7.26'L with 0.18' Overlap
Cap Storage= +5.8 cf x 2 x 3 rows = 34.8 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

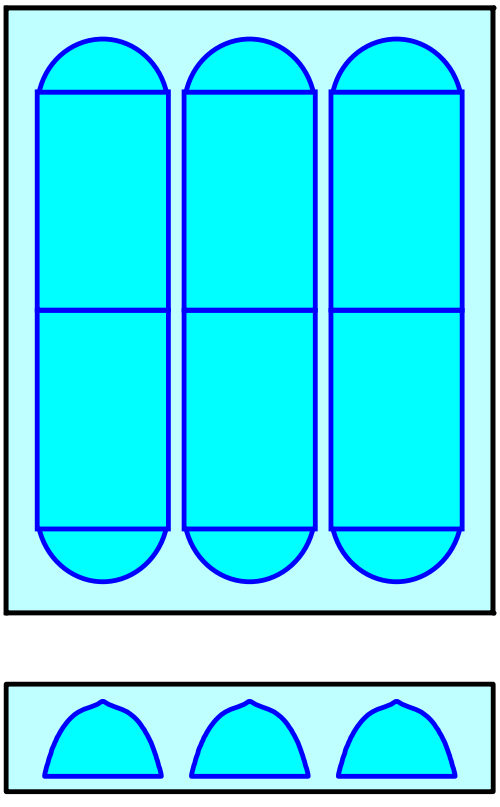
2 Chambers/Row x 7.08' Long +1.71' Cap Length x 2 = 17.57' Row Length +12.0" End Stone x 2 = 19.57' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Base + 29.7" Chamber Height + 6.0" Cover = 3.48' Field Height

6 Chambers x 46.3 cf + 5.8 cf Cap Volume x 2 x 3 Rows = 312.7 cf Chamber Storage

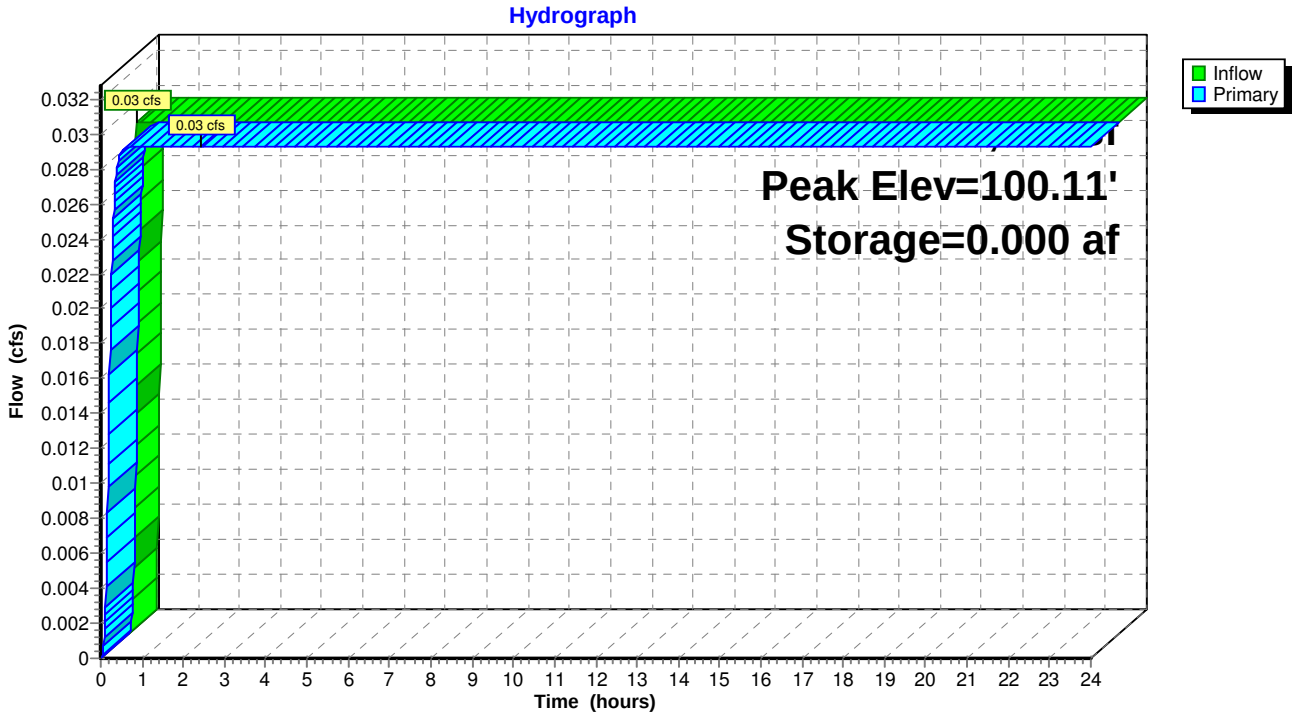
1,070.9 cf Field - 312.7 cf Chambers = 758.2 cf Stone x 40.0% Voids = 303.3 cf Stone Storage

Chamber Storage + Stone Storage = 616.0 cf = 0.014 af
Overall Storage Efficiency = 57.5%
Overall System Size = 19.57' x 15.75' x 3.48'

6 Chambers
39.7 cy Field
28.1 cy Stone



Pond 3P: (new Pond)



Hydrograph for Pond 3P: (new Pond)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	0.000	100.00	0.00
0.50	**0.03**	0.000	100.11	0.03
1.00	0.03	0.000	100.11	0.03
1.50	0.03	0.000	100.11	0.03
2.00	0.03	**0.000**	**100.11**	**0.03**
2.50	0.03	**0.000**	**100.11**	**0.03**
3.00	0.03	0.000	100.11	0.03
3.50	0.03	0.000	100.11	0.03
4.00	0.03	0.000	100.11	0.03
4.50	0.03	0.000	100.11	0.03
5.00	0.03	0.000	100.11	0.03
5.50	0.03	0.000	100.11	0.03
6.00	0.03	0.000	100.11	0.03
6.50	0.03	0.000	100.11	0.03
7.00	0.03	0.000	100.11	0.03
7.50	0.03	0.000	100.11	0.03
8.00	0.03	0.000	100.11	0.03
8.50	0.03	0.000	100.11	0.03
9.00	0.03	0.000	100.11	0.03
9.50	0.03	0.000	100.11	0.03
10.00	0.03	0.000	100.11	0.03
10.50	0.03	0.000	100.11	0.03
11.00	0.03	0.000	100.11	0.03
11.50	0.03	0.000	100.11	0.03
12.00	0.03	0.000	100.11	0.03
12.50	0.03	0.000	100.11	0.03
13.00	0.03	0.000	100.11	0.03
13.50	0.03	0.000	100.11	0.03
14.00	0.03	0.000	100.11	0.03
14.50	0.03	0.000	100.11	0.03
15.00	0.03	0.000	100.11	0.03
15.50	0.03	0.000	100.11	0.03
16.00	0.03	0.000	100.11	0.03
16.50	0.03	0.000	100.11	0.03
17.00	0.03	0.000	100.11	0.03
17.50	0.03	0.000	100.11	0.03
18.00	0.03	0.000	100.11	0.03
18.50	0.03	0.000	100.11	0.03
19.00	0.03	0.000	100.11	0.03
19.50	0.03	0.000	100.11	0.03
20.00	0.03	0.000	100.11	0.03
20.50	0.03	0.000	100.11	0.03
21.00	0.03	0.000	100.11	0.03
21.50	0.03	0.000	100.11	0.03
22.00	0.03	0.000	100.11	0.03
22.50	0.03	0.000	100.11	0.03
23.00	0.03	0.000	100.11	0.03
23.50	0.03	0.000	100.11	0.03
24.00	0.03	0.000	100.11	0.03

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 2S: Area Runoff Area=0.450 ac 51.11% Impervious Runoff Depth>2.41"
Flow Length=100' Tc=10.0 min C=0.86 Runoff=0.05 cfs 3,935 cf

Pond 3P: (new Pond) Peak Elev=100.14' Storage=0.000 af Inflow=0.05 cfs 3,935 cf
Outflow=0.05 cfs 3,917 cf

Total Runoff Area = 19,602 sf Runoff Volume = 3,935 cf Average Runoff Depth = 2.41"
48.89% Pervious = 9,583 sf 51.11% Impervious = 10,019 sf

Summary for Subcatchment 2S: Area

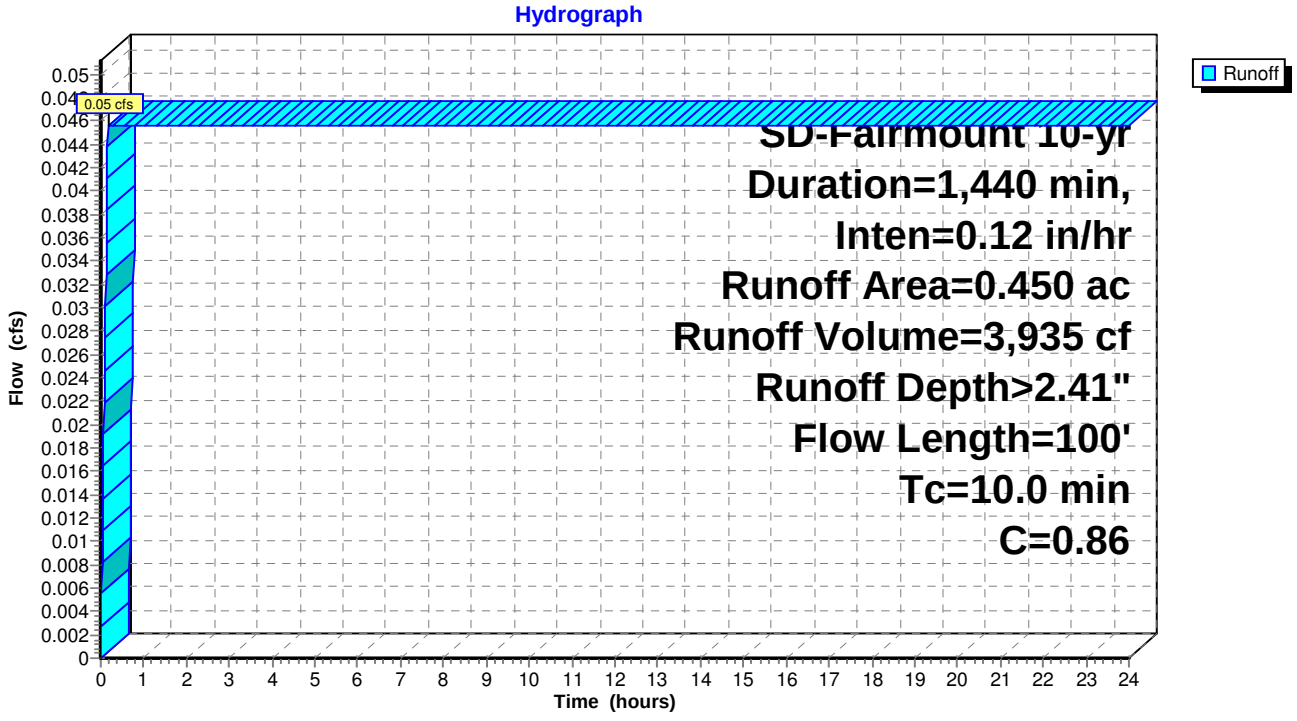
Runoff = 0.05 cfs @ 0.17 hrs, Volume= 3,935 cf, Depth> 2.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
SD-Fairmount 10-yr Duration=1,440 min, Inten=0.12 in/hr

Area (ac)	C	Description
0.230	1.00	
0.180	0.85	
0.040	0.10	
0.450	0.86	Weighted Average
0.220		48.89% Pervious Area
0.230		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100		0.17		**Direct Entry,**

Subcatchment 2S: Area



Hydrograph for Subcatchment 2S: Area

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	**0.00**	10.40	0.05	20.80	0.05
0.20	**0.05**	10.60	0.05	21.00	0.05
0.40	0.05	10.80	0.05	21.20	0.05
0.60	0.05	11.00	0.05	21.40	0.05
0.80	0.05	11.20	0.05	21.60	0.05
1.00	0.05	11.40	0.05	21.80	0.05
1.20	0.05	11.60	0.05	22.00	0.05
1.40	0.05	11.80	0.05	22.20	0.05
1.60	0.05	12.00	0.05	22.40	0.05
1.80	0.05	12.20	0.05	22.60	0.05
2.00	0.05	12.40	0.05	22.80	0.05
2.20	0.05	12.60	0.05	23.00	0.05
2.40	0.05	12.80	0.05	23.20	0.05
2.60	0.05	13.00	0.05	23.40	0.05
2.80	0.05	13.20	0.05	23.60	0.05
3.00	0.05	13.40	0.05	23.80	0.05
3.20	0.05	13.60	0.05	24.00	0.05
3.40	0.05	13.80	0.05		
3.60	0.05	14.00	0.05		
3.80	0.05	14.20	0.05		
4.00	0.05	14.40	0.05		
4.20	0.05	14.60	0.05		
4.40	0.05	14.80	0.05		
4.60	0.05	15.00	0.05		
4.80	0.05	15.20	0.05		
5.00	0.05	15.40	0.05		
5.20	0.05	15.60	0.05		
5.40	0.05	15.80	0.05		
5.60	0.05	16.00	0.05		
5.80	0.05	16.20	0.05		
6.00	0.05	16.40	0.05		
6.20	0.05	16.60	0.05		
6.40	0.05	16.80	0.05		
6.60	0.05	17.00	0.05		
6.80	0.05	17.20	0.05		
7.00	0.05	17.40	0.05		
7.20	0.05	17.60	0.05		
7.40	0.05	17.80	0.05		
7.60	0.05	18.00	0.05		
7.80	0.05	18.20	0.05		
8.00	0.05	18.40	0.05		
8.20	0.05	18.60	0.05		
8.40	0.05	18.80	0.05		
8.60	0.05	19.00	0.05		
8.80	0.05	19.20	0.05		
9.00	0.05	19.40	0.05		
9.20	0.05	19.60	0.05		
9.40	0.05	19.80	0.05		
9.60	0.05	20.00	0.05		
9.80	0.05	20.20	0.05		
10.00	0.05	20.40	0.05		
10.20	0.05	20.60	0.05		

Summary for Pond 3P: (new Pond)

Inflow Area = 19,602 sf, 51.11% Impervious, Inflow Depth > 2.41" for 10-yr event
Inflow = 0.05 cfs @ 0.17 hrs, Volume= 3,935 cf
Outflow = 0.05 cfs @ 2.07 hrs, Volume= 3,917 cf, Atten= 0%, Lag= 114.0 min
Primary = 0.05 cfs @ 2.07 hrs, Volume= 3,917 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 100.14' @ 1.80 hrs Surf.Area= 0.007 ac Storage= 0.000 af

Plug-Flow detention time= 6.4 min calculated for 3,917 cf (100% of inflow)
Center-of-Mass det. time= 3.2 min (725.8 - 722.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	0.007 af	**15.75'W x 19.57'L x 3.48'H Field A** 0.025 af Overall - 0.007 af Embedded = 0.017 af x 40.0% Voids
#2A	100.50'	0.007 af	**Prinsco HydroStor HS75** x 6 Inside #1 Effective Size= 45.3"W x 29.0"H => 6.55 sf x 7.08'L = 46.3 cf Overall Size= 51.0"W x 29.7"H x 7.26'L with 0.18' Overlap 3 Rows of 2 Chambers Cap Storage= +5.8 cf x 2 x 3 rows = 34.8 cf
		0.014 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.05 cfs @ 2.07 hrs HW=100.14' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 1.28 fps)

Pond 3P: (new Pond) - Chamber Wizard Field A

Chamber Model = Prinsco HydroStor HS75 (Prinsco HydroStor with Cap storage)
Effective Size= 45.3"W x 29.0"H => 6.55 sf x 7.08'L = 46.3 cf
Overall Size= 51.0"W x 29.7"H x 7.26'L with 0.18' Overlap
Cap Storage= +5.8 cf x 2 x 3 rows = 34.8 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

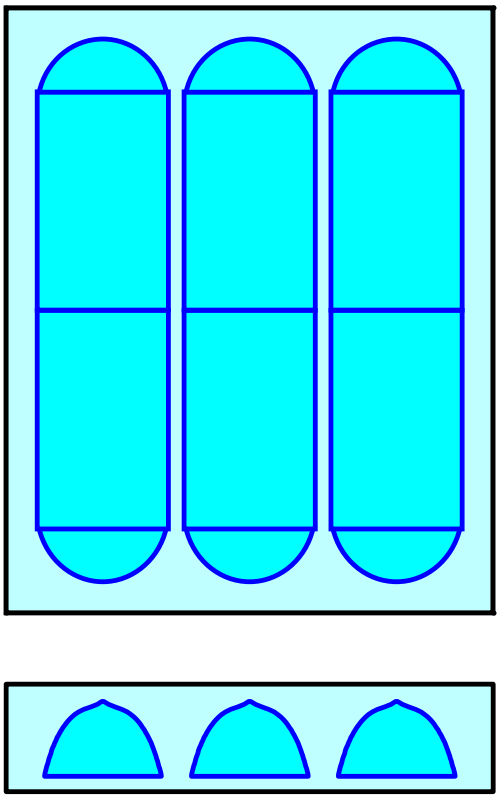
2 Chambers/Row x 7.08' Long +1.71' Cap Length x 2 = 17.57' Row Length +12.0" End Stone x 2 = 19.57' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Base + 29.7" Chamber Height + 6.0" Cover = 3.48' Field Height

6 Chambers x 46.3 cf + 5.8 cf Cap Volume x 2 x 3 Rows = 312.7 cf Chamber Storage

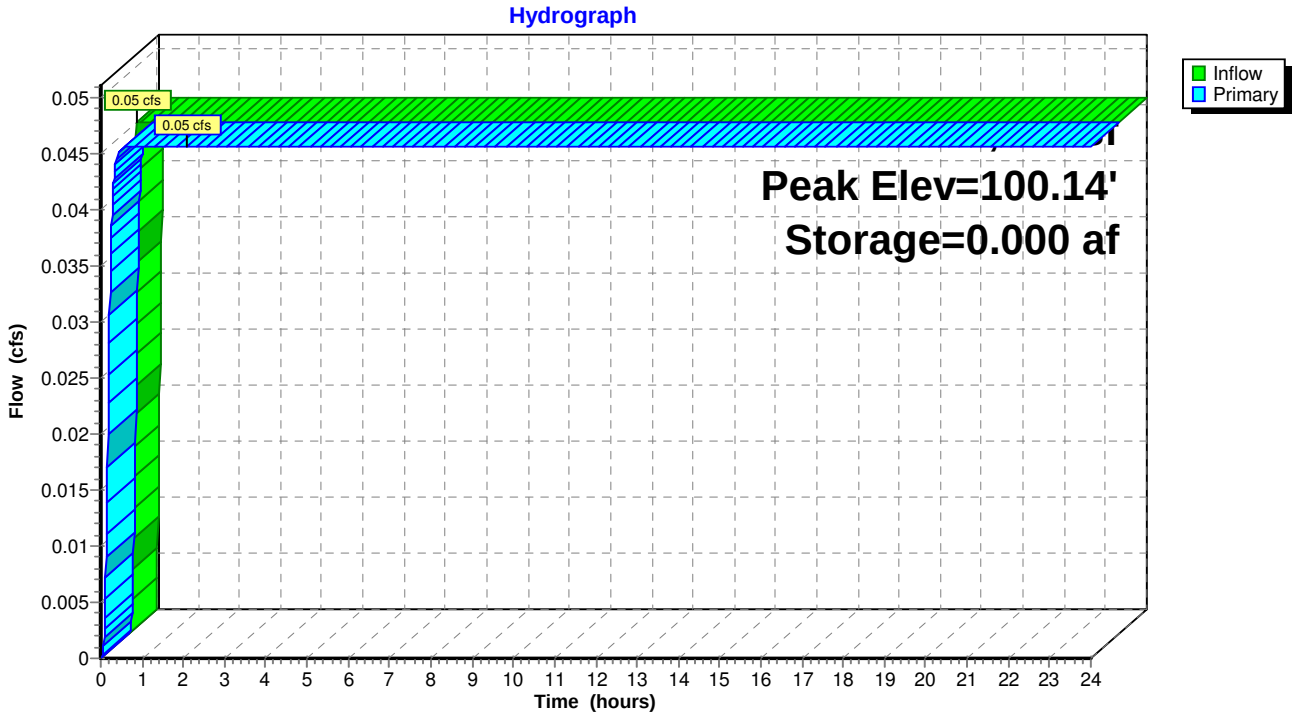
1,070.9 cf Field - 312.7 cf Chambers = 758.2 cf Stone x 40.0% Voids = 303.3 cf Stone Storage

Chamber Storage + Stone Storage = 616.0 cf = 0.014 af
Overall Storage Efficiency = 57.5%
Overall System Size = 19.57' x 15.75' x 3.48'

6 Chambers
39.7 cy Field
28.1 cy Stone



Pond 3P: (new Pond)



Hydrograph for Pond 3P: (new Pond)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	0.000	100.00	0.00
0.50	**0.05**	0.000	100.14	0.05
1.00	0.05	0.000	100.14	0.05
1.50	0.05	0.000	**100.14**	0.05
2.00	0.05	**0.000**	**100.14**	**0.05**
2.50	0.05	**0.000**	100.14	**0.05**
3.00	0.05	0.000	100.14	0.05
3.50	0.05	0.000	100.14	0.05
4.00	0.05	0.000	100.14	0.05
4.50	0.05	0.000	100.14	0.05
5.00	0.05	0.000	100.14	0.05
5.50	0.05	0.000	100.14	0.05
6.00	0.05	0.000	100.14	0.05
6.50	0.05	0.000	100.14	0.05
7.00	0.05	0.000	100.14	0.05
7.50	0.05	0.000	100.14	0.05
8.00	0.05	0.000	100.14	0.05
8.50	0.05	0.000	100.14	0.05
9.00	0.05	0.000	100.14	0.05
9.50	0.05	0.000	100.14	0.05
10.00	0.05	0.000	100.14	0.05
10.50	0.05	0.000	100.14	0.05
11.00	0.05	0.000	100.14	0.05
11.50	0.05	0.000	100.14	0.05
12.00	0.05	0.000	100.14	0.05
12.50	0.05	0.000	100.14	0.05
13.00	0.05	0.000	100.14	0.05
13.50	0.05	0.000	100.14	0.05
14.00	0.05	0.000	100.14	0.05
14.50	0.05	0.000	100.14	0.05
15.00	0.05	0.000	100.14	0.05
15.50	0.05	0.000	100.14	0.05
16.00	0.05	0.000	100.14	0.05
16.50	0.05	0.000	100.14	0.05
17.00	0.05	0.000	100.14	0.05
17.50	0.05	0.000	100.14	0.05
18.00	0.05	0.000	100.14	0.05
18.50	0.05	0.000	100.14	0.05
19.00	0.05	0.000	100.14	0.05
19.50	0.05	0.000	100.14	0.05
20.00	0.05	0.000	100.14	0.05
20.50	0.05	0.000	100.14	0.05
21.00	0.05	0.000	100.14	0.05
21.50	0.05	0.000	100.14	0.05
22.00	0.05	0.000	100.14	0.05
22.50	0.05	0.000	100.14	0.05
23.00	0.05	0.000	100.14	0.05
23.50	0.05	0.000	100.14	0.05
24.00	0.05	0.000	100.14	0.05

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 2S: Area Runoff Area=0.450 ac 51.11% Impervious Runoff Depth>3.31"
Flow Length=100' Tc=10.0 min C=0.86 Runoff=0.06 cfs 5,405 cf

Pond 3P: (new Pond) Peak Elev=100.17' Storage=0.000 af Inflow=0.06 cfs 5,405 cf
Outflow=0.06 cfs 5,384 cf

Total Runoff Area = 19,602 sf Runoff Volume = 5,405 cf Average Runoff Depth = 3.31"
48.89% Pervious = 9,583 sf 51.11% Impervious = 10,019 sf

Summary for Subcatchment 2S: Area

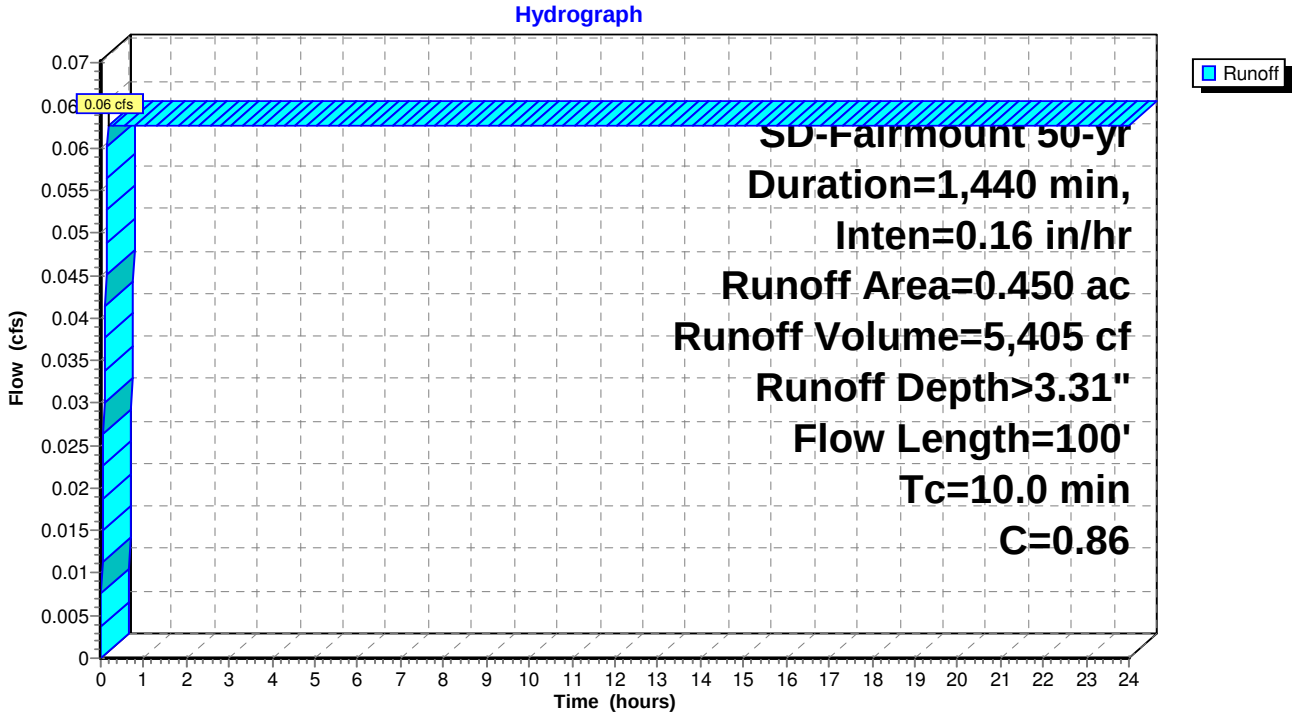
Runoff = 0.06 cfs @ 0.17 hrs, Volume= 5,405 cf, Depth> 3.31"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
SD-Fairmount 50-yr Duration=1,440 min, Inten=0.16 in/hr

Area (ac)	C	Description
0.230	1.00	
0.180	0.85	
0.040	0.10	
0.450	0.86	Weighted Average
0.220		48.89% Pervious Area
0.230		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100		0.17		**Direct Entry,**

Subcatchment 2S: Area



Hydrograph for Subcatchment 2S: Area

Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)	Time (hours)	Runoff (cfs)
0.00	**0.00**	10.40	0.06	20.80	0.06
0.20	**0.06**	10.60	0.06	21.00	0.06
0.40	0.06	10.80	0.06	21.20	0.06
0.60	0.06	11.00	0.06	21.40	0.06
0.80	0.06	11.20	0.06	21.60	0.06
1.00	0.06	11.40	0.06	21.80	0.06
1.20	0.06	11.60	0.06	22.00	0.06
1.40	0.06	11.80	0.06	22.20	0.06
1.60	0.06	12.00	0.06	22.40	0.06
1.80	0.06	12.20	0.06	22.60	0.06
2.00	0.06	12.40	0.06	22.80	0.06
2.20	0.06	12.60	0.06	23.00	0.06
2.40	0.06	12.80	0.06	23.20	0.06
2.60	0.06	13.00	0.06	23.40	0.06
2.80	0.06	13.20	0.06	23.60	0.06
3.00	0.06	13.40	0.06	23.80	0.06
3.20	0.06	13.60	0.06	24.00	0.06
3.40	0.06	13.80	0.06		
3.60	0.06	14.00	0.06		
3.80	0.06	14.20	0.06		
4.00	0.06	14.40	0.06		
4.20	0.06	14.60	0.06		
4.40	0.06	14.80	0.06		
4.60	0.06	15.00	0.06		
4.80	0.06	15.20	0.06		
5.00	0.06	15.40	0.06		
5.20	0.06	15.60	0.06		
5.40	0.06	15.80	0.06		
5.60	0.06	16.00	0.06		
5.80	0.06	16.20	0.06		
6.00	0.06	16.40	0.06		
6.20	0.06	16.60	0.06		
6.40	0.06	16.80	0.06		
6.60	0.06	17.00	0.06		
6.80	0.06	17.20	0.06		
7.00	0.06	17.40	0.06		
7.20	0.06	17.60	0.06		
7.40	0.06	17.80	0.06		
7.60	0.06	18.00	0.06		
7.80	0.06	18.20	0.06		
8.00	0.06	18.40	0.06		
8.20	0.06	18.60	0.06		
8.40	0.06	18.80	0.06		
8.60	0.06	19.00	0.06		
8.80	0.06	19.20	0.06		
9.00	0.06	19.40	0.06		
9.20	0.06	19.60	0.06		
9.40	0.06	19.80	0.06		
9.60	0.06	20.00	0.06		
9.80	0.06	20.20	0.06		
10.00	0.06	20.40	0.06		
10.20	0.06	20.60	0.06		

Summary for Pond 3P: (new Pond)

Inflow Area = 19,602 sf, 51.11% Impervious, Inflow Depth > 3.31" for 50-yr event
Inflow = 0.06 cfs @ 0.17 hrs, Volume= 5,405 cf
Outflow = 0.06 cfs @ 2.09 hrs, Volume= 5,384 cf, Atten= 0%, Lag= 115.2 min
Primary = 0.06 cfs @ 2.09 hrs, Volume= 5,384 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 100.17' @ 1.78 hrs Surf.Area= 0.007 ac Storage= 0.000 af

Plug-Flow detention time= 5.6 min calculated for 5,382 cf (100% of inflow)
Center-of-Mass det. time= 2.8 min (725.4 - 722.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.00'	0.007 af	**15.75'W x 19.57'L x 3.48'H Field A** 0.025 af Overall - 0.007 af Embedded = 0.017 af x 40.0% Voids
#2A	100.50'	0.007 af	**Prinsco HydroStor HS75** x 6 Inside #1 Effective Size= 45.3"W x 29.0"H => 6.55 sf x 7.08'L = 46.3 cf Overall Size= 51.0"W x 29.7"H x 7.26'L with 0.18' Overlap 3 Rows of 2 Chambers Cap Storage= +5.8 cf x 2 x 3 rows = 34.8 cf
		0.014 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**4.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.06 cfs @ 2.09 hrs HW=100.17' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.40 fps)

Pond 3P: (new Pond) - Chamber Wizard Field A

Chamber Model = Prinsco HydroStor HS75 (Prinsco HydroStor with Cap storage)
Effective Size= 45.3"W x 29.0"H => 6.55 sf x 7.08'L = 46.3 cf
Overall Size= 51.0"W x 29.7"H x 7.26'L with 0.18' Overlap
Cap Storage= +5.8 cf x 2 x 3 rows = 34.8 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

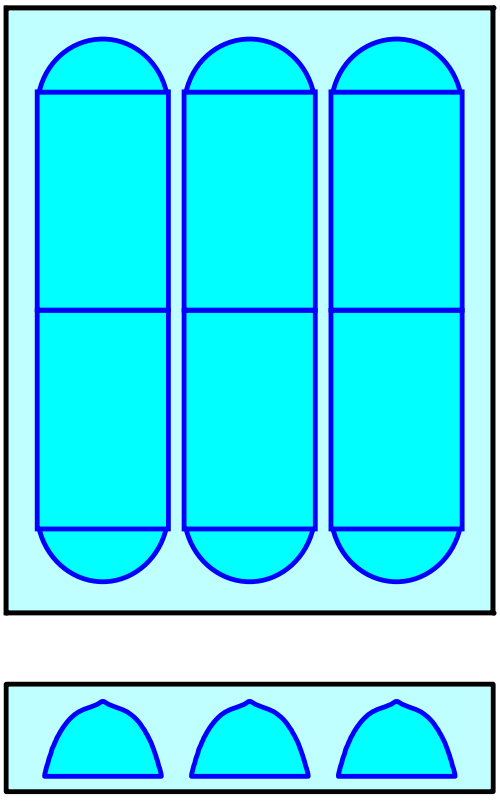
2 Chambers/Row x 7.08' Long +1.71' Cap Length x 2 = 17.57' Row Length +12.0" End Stone x 2 = 19.57' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
6.0" Base + 29.7" Chamber Height + 6.0" Cover = 3.48' Field Height

6 Chambers x 46.3 cf + 5.8 cf Cap Volume x 2 x 3 Rows = 312.7 cf Chamber Storage

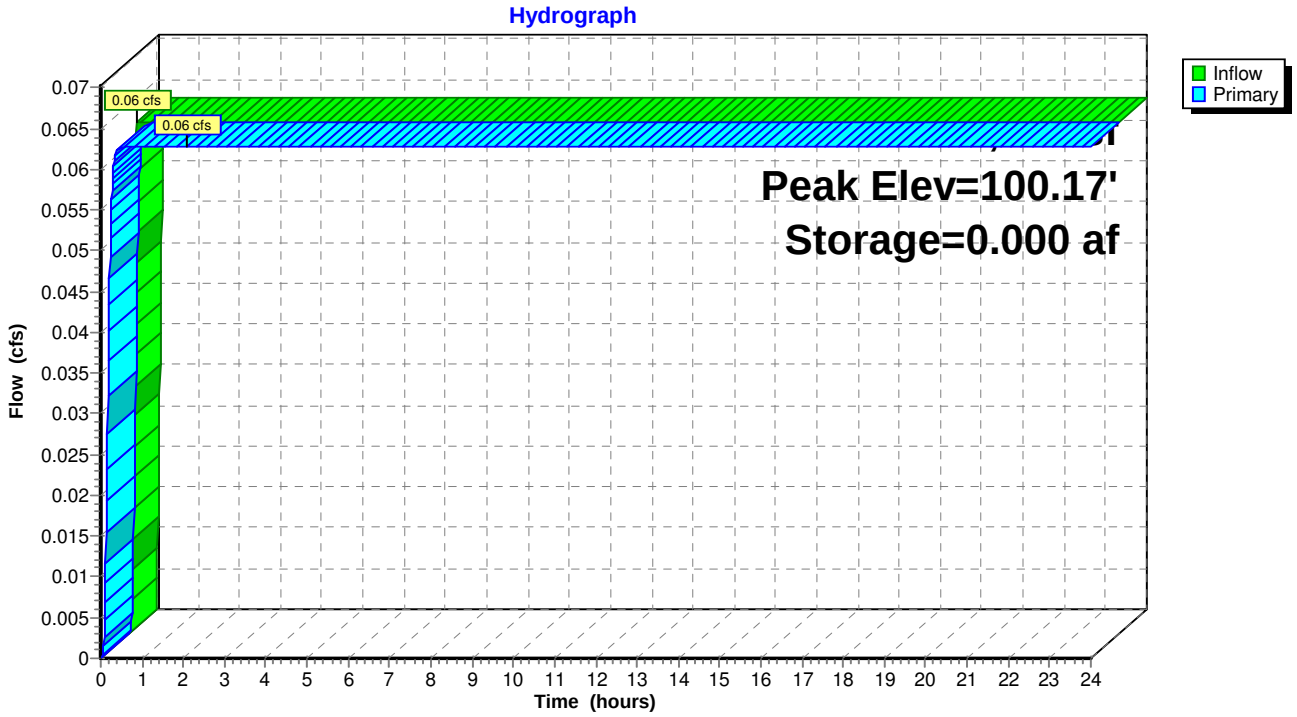
1,070.9 cf Field - 312.7 cf Chambers = 758.2 cf Stone x 40.0% Voids = 303.3 cf Stone Storage

Chamber Storage + Stone Storage = 616.0 cf = 0.014 af
Overall Storage Efficiency = 57.5%
Overall System Size = 19.57' x 15.75' x 3.48'

6 Chambers
39.7 cy Field
28.1 cy Stone



Pond 3P: (new Pond)



Hydrograph for Pond 3P: (new Pond)

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	0.000	100.00	0.00
0.50	**0.06**	0.000	100.17	0.06
1.00	0.06	0.000	100.17	0.06
1.50	0.06	0.000	**100.17**	0.06
2.00	0.06	**0.000**	**100.17**	**0.06**
2.50	0.06	**0.000**	100.17	**0.06**
3.00	0.06	0.000	100.17	0.06
3.50	0.06	0.000	100.17	0.06
4.00	0.06	0.000	100.17	0.06
4.50	0.06	0.000	100.17	0.06
5.00	0.06	0.000	100.17	0.06
5.50	0.06	0.000	100.17	0.06
6.00	0.06	0.000	100.17	0.06
6.50	0.06	0.000	100.17	0.06
7.00	0.06	0.000	100.17	0.06
7.50	0.06	0.000	100.17	0.06
8.00	0.06	0.000	100.17	0.06
8.50	0.06	0.000	100.17	0.06
9.00	0.06	0.000	100.17	0.06
9.50	0.06	0.000	100.17	0.06
10.00	0.06	0.000	100.17	0.06
10.50	0.06	0.000	100.17	0.06
11.00	0.06	0.000	100.17	0.06
11.50	0.06	0.000	100.17	0.06
12.00	0.06	0.000	100.17	0.06
12.50	0.06	0.000	100.17	0.06
13.00	0.06	0.000	100.17	0.06
13.50	0.06	0.000	100.17	0.06
14.00	0.06	0.000	100.17	0.06
14.50	0.06	0.000	100.17	0.06
15.00	0.06	0.000	100.17	0.06
15.50	0.06	0.000	100.17	0.06
16.00	0.06	0.000	100.17	0.06
16.50	0.06	0.000	100.17	0.06
17.00	0.06	0.000	100.17	0.06
17.50	0.06	0.000	100.17	0.06
18.00	0.06	0.000	100.17	0.06
18.50	0.06	0.000	100.17	0.06
19.00	0.06	0.000	100.17	0.06
19.50	0.06	0.000	100.17	0.06
20.00	0.06	0.000	100.17	0.06
20.50	0.06	0.000	100.17	0.06
21.00	0.06	0.000	100.17	0.06
21.50	0.06	0.000	100.17	0.06
22.00	0.06	0.000	100.17	0.06
22.50	0.06	0.000	100.17	0.06
23.00	0.06	0.000	100.17	0.06
23.50	0.06	0.000	100.17	0.06
24.00	0.06	0.000	100.17	0.06

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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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).

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Project Name: Fairmount Avenue Fire Station

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.

Attachment 5
Drainage Report

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

PRELIMINARY DRAINAGE STUDY

Fairmount Avenue Fire Station

APN 541-190-16
Parcel Map 283
47th Street
City of San Diego, CA 92105

July 22, 2019

Prepared By:

Bryan Redsun, P.E.

32332 Camino Capistrano, Suite 205
San Juan Capistrano, CA 92675
949.361.7950

1 TABLE OF CONTENTS

REFERENCES

City of San Diego Drainage Design Manual, January 2017
City of San Diego Stormwater Standards, August 2015

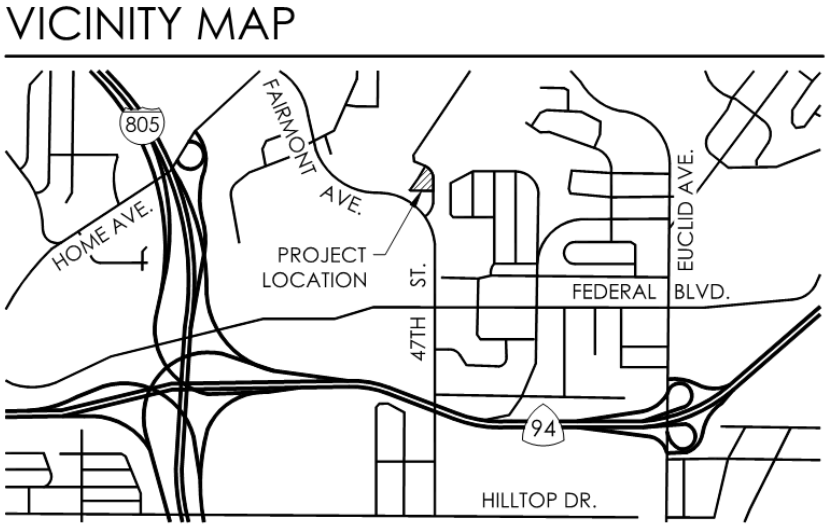
1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The project site is located off Fairmount Avenue on 47th Street in San Diego, California. The site is located between the confluence of Fairmount Avenue in the south, 47th Street in the east and north, and Chollas Creek in the west. The existing site is vacant, natural open space.

The project proposed is a 0.45-acre 4-story fire station. To minimize the land disturbance to 30, the site is confined by retaining walls. The fire station is loaded from a single driveway to the apparatus bay. The 17-stall parking lot under the building overhang is accessed from a separate driveway. The proposed fire station includes a 3-story station with 2 apparatus bays, exercise room, kitchen, and 10 bunk rooms. The station will also be serviced by a trash enclosure.

1.2 VICINITY MAP



2 WATERSHED DESCRIPTIONS

2.1 EXISTING

The project is located within the Chollas Creek watershed. The Chollas Creek Watershed is divided into the North Fork and South Fork of Chollas Creek. The North Fork of Chollas Creek crosses 300-ft northwest from the site under Fairmount Avenue. The project encroaches on the 100-year (Zone AE) and 500-year (Zone X) floodplains at the north corner of the site. Where encroachments occur, the proposed improvements will be filled to ensure that the building is above the 500-year (Zone X) floodplain.

The entire 1.28-acre site drains north to Chollas Creek. The existing topography is generally sloped from 194.0 in the southeast to 140.0 in the northwest. The existing site has an existing impervious area of 0%. Over 40% of the slopes onsite have a grade over 25%. An existing storm drain from 47th St. daylights at the bottom of the site slope at the north of the site and drains offsite towards Chollas Creek.

2.2 PROPOSED

In the proposed conditions, only 30% of the site will be disturbed. The topography for the other 70% of the site will remain unaltered. The topography of the area disturbed will be mostly flat with grades between 1% and 5%. The impervious areas will be increased due to the new building, parking, and hardscape areas. The impervious area of the disturbed area will be increase to 84%. Water quality detention is proposed for the Design Capture Volume (DCV) and hydromodification Management Plan (HMP) facilities will be implemented to mitigate retention requirements and the potential increase in stormwater runoff rates due to the proposed increase in impervious areas. Please see the Detention / Hydromodification Management section of this report for more details.

PROPOSED DRAINAGE MANAGEMENT AREA 1

Drainage Management Area (DMA) 1 will consist of the building footprint and the driveway apron. Runoff from DMA 1 area will be captured by a property-line trench drain at the bottom of the driveway and conveyed via underground storm drain to the biofiltration system. The treated runoff then is stored in the underground detention vault. The detention system will daylight the DCV volume and the HMP volume to Chollas Creek via the existing drainage path.

PROPOSED DRAINAGE MANAGEMENT AREA 2

Drainage Management Area (DMA) 2 will consist of the parking lot, trash enclosure, and lobby entrance. Runoff from DMA 2 area will be captured by curb cuts and a trench drain and conveyed to the biofiltration system. The treated runoff then is stored in the underground detention vault. The detention system will daylight the DCV volume and the HMP volume to Chollas Creek via the existing drainage path.

PROPOSED DRAINAGE MANAGEMENT AREA 3

Drainage Management Area (DMA) 3 will consist of the self-treating area between the building and the retaining wall. Runoff from DMA 3 area will be contained within the drainage area.

3 HYDROLOGY RESULTS

3.1 EXISTING CONDITIONS

Calculations were performed to determine the existing condition discharge during a storm event. The 50-year design storm was selected in accordance with the City of San Diego Drainage Design Manual, Section 1-102.2.3.B. The following table summaries the peak discharge at the major point of concentration. Please refer to the Existing Hydrology exhibit in the appendix.

TABLE 1: EXISTING HYDROLOGY SUMMARY

BASIN	POINT OF CONCENTRATION	AREA (AC)	AVERAGE RUNOFF COEFFICIENT	TIME OF CONCENTRATION (MIN)	Q_{50} (CFS)
SITE	POC 2	1.28	0.30	9.0	2.25

For detailed hydrology calculations please see Appendix A.

3.2 PROPOSED CONDITIONS

Calculations were performed to determine the proposed condition discharge during a storm event. The 50-year design storm was selected in accordance with the City of San Diego Drainage Design Manual, Section 1-102.2.3.B. See the Methodology section in this report for more details. The following table summarizes the peak discharge at the major points of concentration. Please refer to the Proposed Hydrology exhibit in Appendix B.

TABLE 2: PROPOSED HYDROLOGY SUMMARY

BASIN	POINT OF CONCENTRATION	AREA (AC)	AVERAGE RUNOFF COEFFICIENT	TIME OF CONCENTRATION (MIN)	Q_{50} (CFS) (UNDETAINED)	Q_{50} (CFS) (DETAINED)
SITE	POC 2	0.45	0.87	12	2.29	1.77
1	POC 1	0.23	0.90	6.5	1.21	0.90
2	POC 1	0.18	0.84	17	0.88	0.71
3	Self-Treating	0.04	0.30	5.6	0.07	0.02

As shown above, the proposed project would result in an undetained increase in peak runoff rates for all basins, if not properly mitigated. Therefore, a detention system will be implemented to provide hydromodification management and reduce the peak runoff rates for the design storm to match the existing conditions. For information on the detention system, please see the Detention / Hydromodification section in this report. For detailed hydrology calculations, please see Appendix B.

4 DETENTION AND HYDROMODIFICATION

The proposed project will result in an increase in impervious surfaces from existing conditions. This would potentially result in an increase in stormwater runoff rate and volume, if left unmitigated. The project will be required to detain the increase in runoff to minimize the impacts to public drainage facilities. In addition, the project will be required to comply with the Hydromodification Management Plan (HMP) requirements as described in the Stormwater Standards Manual.

To fulfill the HMP requirements, the project has been designed so that runoff rates and durations are controlled to maintain or reduce pre-project downstream erosion conditions and protect stream habitat. The project will mitigate the increase in runoff by implementing a series of stormwater Best

Management Practices (BMPs) and detention facilities, which have been specifically designed for hydromodification management.

Due to the preliminary nature of this study, the detention facilities have been assumed to be underground vaults, which are fully lined with concrete or an impermeable liner and are 4 to 12 feet deep. During final engineering, other types of detention facilities may be selected, and detailed final design of the detention systems will be performed. Types of detention facilities which may be selected during final design. Include cast-in-place concrete vaults, precast concrete vaults, large-diameter HDPE, PVC, or RCP pipes, arched detention chambers, or any proprietary products designed to facilitate underground detention. The outlet structures, including low-flow orifice opening and high-flow by-pass, will also undergo detailed design during final engineering.

5 CONCLUSION

The proposed project will be designed to minimize the effects of the development to downstream drainage facilities and drainage channels. The proposed project will increase the impervious areas from existing conditions due to the proposed building, parking, and hardscape areas. The increase in impervious areas would potentially result in an increase in stormwater runoff rates, if left unmitigated as shown in Table 2 of the Hydrology Results section. Therefore, detention and HMP facilities will be implemented to reduce runoff rates to match existing conditions for the HMP and 50-year design storm requirements. The calculations and conclusions prove compliance to Hydromodification Management Plan Controls.

The final design of HMP, Water Quality BMPs, and onsite storm drain facilities will be presented in subsequent reports during final engineering.

6 METHODOLOGY

6.1 RUNOFF CALCULATIONS

The design criteria, as found in the City of San Diego Drainage Design Manual Section 1-102.2, specifies the design runoff conditions be based on the 50-year storm frequency. Runoff was calculated using the Modified Rational Method as described in pages 80-89 of the Drainage Design Manual. The rational method equation is as follows:

$$Q = C \times I \times A$$

Where:
$Q = Flow\ rate\ in\ cubic\ feet\ per\ second\ (cfs)$
$C = Runoff\ coefficient$
$I = Rainfall\ intensity\ in\ inches\ per\ hour\ (^{in}/_{hr})$
$A = Drainage\ basin\ area\ in\ acres\ (ac)$

RUNOFF COEFFICIENT

An average runoff coefficient was used over each entire basin unless the sub-basin area differed significantly from the average. Soil Type D was assumed for the entire study per the City of San Diego Drainage Manual page 82. Average runoff coefficients were calculated in accordance with the Drainage Design Manual, page 82, by adjusting the tabulated impervious ratios to match the actual impervious ratios of the site as shown in the following sample calculation:

SAMPLE RUNOFF COEFFICIENT CALCULATION:

Actual Impervious Percentage = 100%
Tabulated Impervious Percentage = 90% (C=0.95)

$$Revised\ C = {}^{87}/_{90} \times 0.95 = 0.92$$

The runoff coefficients for each basin area summarized in the Appendix.

TIME OF CONCENTRATION

Time of concentration was calculated per page 81 of the Drainage Design Manual as follows:

$$T_c = T_i + T_f$$

Where T_i is in the inlet time, T_f is the travel time, and T_c is the time of concentration. The inlet time (T_i) was calculated according the Drainage Design Manual page 86, "Urban Areas Overland Time of Flow Curves." Additional travel time (T_f) was calculated by estimating velocity using Manning's formula for open channel flow. The travel time was calculated by dividing the flow length by the flow velocity as described on page 81 of the Drainage Design Manual.

RAINFALL INTENSITY

Rainfall intensity was calculated in accordance with the City of San Diego Drainage Design Manual. The intensity-duration chart on page 83 of the Drainage Design Manual was used to calculated corresponding intensities for each time of concentration. This data was input into the IDF Curve Table for the 2-year, 10-year, and 50-year design storm events. The time of concentration-intensity data pairs can be seen in the Appendix.

6.2 DETENTION CALCULATIONS

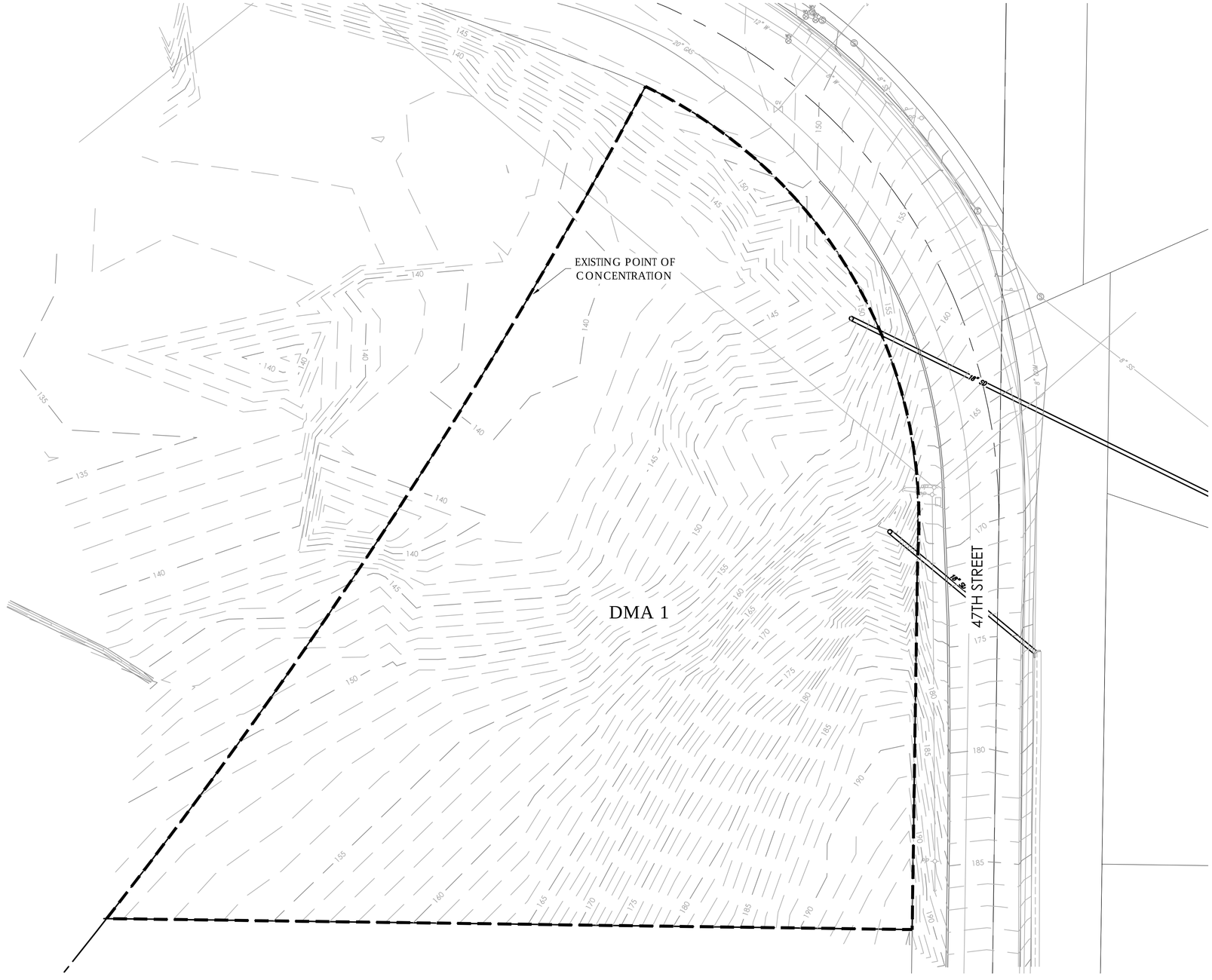
To design the proposed detention facilities, the 50-year, 6-hour storm was routed through the detention facility, and the detention volume and outlet configuration were iteratively sized until the proposed peak flow rate was 10% of the existing peak flow rate. This was done using the following procedures.

RUNOFF HYDROGRAPHS

Based on the proposed hydrology calculations, a runoff hydrograph was generated for the 50-year, 6-hour storm event. This was done using the Rational Method Hydrograph Program for use in San Diego County. Based on inputs including the time of concentration, 6-hour rainfall, basin area, runoff coefficient, and peak discharge, this program developed a runoff hydrograph with time steps corresponding to the time of concentration. Output from this program can be found in Appendix C.

APPENDIX

A. EXISTING HYDROLOGY MAP AND CALCULATIONS



LEGEND

- PROPERTY LINE
- DMA LIMITS
- SD STORM DRAIN LATERAL

DMA TABLE

DMA NUMBER	AREA (ACRES)	IMPERVIOUS AREA (ACRES)	% IMPERVIOUS	HSG	WEIGHTED RUNOFF COEFFICIENT
TOTAL	1.28	0.00	0%	TYPE D	0.30

EXISTING STORM WATER DRAINAGE PLAN

FAIRMOUNT AVE FIRE STATION

CORNER OF FAIRMOUNT AVE AND 47TH ST.

CITY OF SAN DIEGO, CALIFORNIA

PROJECT NO. 300-02-C117

FOR CITY ENGINEER _____ DATE _____

V.T.M. _____

DESCRIPTION	BY	APPROVED	DATE	FILMED
AS-BUILTS				

NAD83 COORDINATES

LAMBERT COORDINATES

CONTRACTOR _____ DATE STARTED _____

INSPECTOR _____ DATE COMPLETED _____

C–5.1

REGISTERED PROFESSIONAL ENGINEER
BRIAN S. REDSUN
No. C 85505
exp. 9/30/20
CIVIL
STATE OF CALIFORNIA

NOT FOR CONSTRUCTION

BRYAN REDSUN R.C.E. NO. 85505 EXP. 09-30-20

07/12/2019
DATE

rrm design group
rrmdesign.com | (949) 361-7950
32332 Camino Capistrano, Suite 205
San Juan Capistrano, CA 92675

0 20 40 60 feet
1" = 20'

NORTH

Time of Concentration Calculations

Using the "Urban Areas Overland Time of Flow Curves" from the City of San Diego Drainage Design Manual:

Where:

$T_C = Time\ of\ Concentration\ in\ minutes\ (min)$
$C = Runoff\ Coefficient\ (0.6\ assumed)$
$S = Effective\ Slope\ in\ percent\ (\%)$
$D = Distance\ in\ feet\ (ft)$

$$T_C = \frac{1.8 \times (1.1 - C)\sqrt{D}}{\sqrt[3]{S}}$$

BASIN	DISTANCE (FT)	C	SLOPE (%)	TIME OF CONCENTRATION (MIN)	PIPE TIME OF CONCENTRATION (MIN))	TOTAL TIME OF CONCENTRATION (MIN))
EX SITE	290	0.30	20	9.0	0	9.0

Flow Calculations

Using the City of San Diego Drainage Design Manual (Section 1-102.3:

Where:

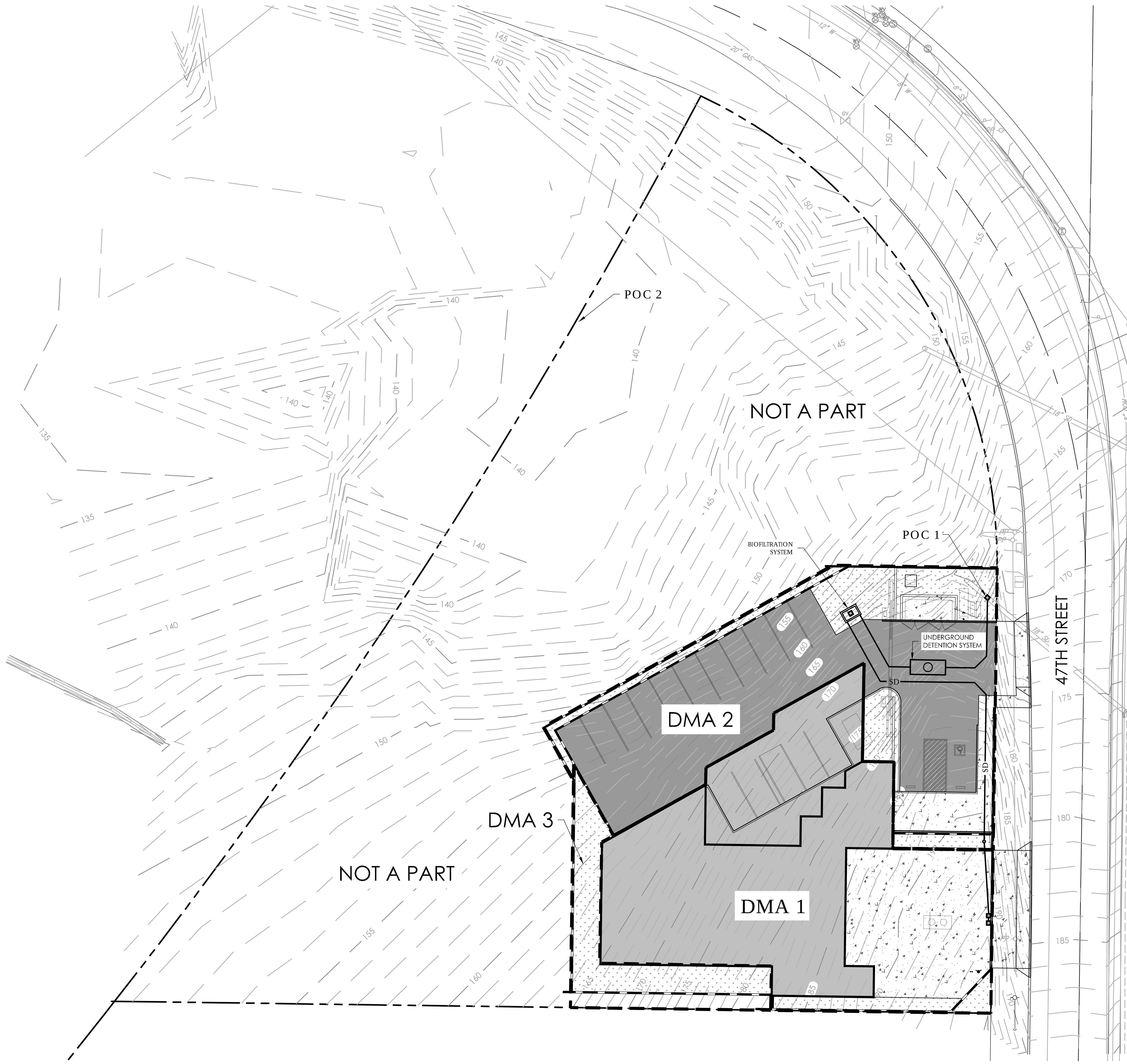
$Q = Flow\ rate\ in\ cubic\ feet\ per\ second\ (cfs)$
$C = Runoff\ Coefficient$
$I = Rainfall\ Intensity\ in\ inches\ per\ hour\ (in/hr)$
$A = Basin\ Area\ in\ acres\ (ac)$

$Q = C\ \times I \times A$

BASIN	YEAR	C	I (IN/HR)	AREA (AC)	Q (CFS))
EX SITE	2	0.30	2.90	1.28	1.11
	10	0.30	4.45	1.28	1.71
	50	0.30	5.85	1.28	2.25
	100	0.30	6.76	1.28	2.60

APPENDIX

B. PROPOSED HYDROLOGY MAP AND CALCULATIONS



LEGEND

- PROPERTY LINE
- DMA LIMITS
- BUILDING AREA (ROOF TOP)
- PARKING AREA (AC PAVEMENT)
- CONCRETE
- LANDSCAPE
- SD STORM DRAIN LATERAL
- DETENTION SYSTEM

DMA TABLE

DMA NUMBER	AREA (ACRES)	IMPERVIOUS AREA (ACRES)	% IMPERVIOUS	HSG	WEIGHTED RUNOFF COEFFICIENT	DCV (CUBIC FEET)	TREATED BY (BMP ID)	POLLUTANT CONTROL TYPE	DRAINS TO (POC ID)
TOTAL	0.45	0.38	84%	TYPE D	0.87	652.78	BF-1	BIOFILTRATION	POC 2
1	0.23	0.23	100%	TYPE D	0.90	380.93	BF-1	BIOFILTRATION	POC 1
2	0.18	0.15	96%	TYPE D	0.84	274.73	BF-1	BIOFILTRATION	POC 1
3	0.04	0	0%	TYPE D	0.30	274.73	BF-1	BIOFILTRATION	POC 1

BRYAN REDSUN R.C.E. NO. 85505 EXP. 09-30-20 07/12/2019 DATE

rrm design group

rrmdesign.com | (949) 361-7950
32332 Camino Capistrano, Suite 205
San Juan Capistrano, CA 92675

0 20 40 60 feet
1" = 20'

NORTH

STORM WATER QUALITY MANAGEMENT PLAN

FAIRMOUNT AVE FIRE STATION

CORNER OF FAIRMOUNT AVE AND 47TH ST.

CITY OF SAN DIEGO, CALIFORNIA

PROJECT NO. 300-02-CI17

FOR CITY ENGINEER — DATE

V.T.M.

DESCRIPTION	BY	APPROVED	DATE	FILMED
AS-BUILTS				

NAD83 COORDINATES

LAMBERT COORDINATES

CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

C–5.0

Time of Concentration Calculations

Using the "Urban Areas Overland Time of Flow Curves" from the City of San Diego Drainage Design Manual:

Where:

$T_C = Time\ of\ Concentration\ in\ minutes\ (min)$
$C = Runoff\ Coefficient\ (0.6\ assumed)$
$S = Effective\ Slope\ in\ percent\ (\%)$
$D = Distance\ in\ feet\ (ft)$

$$T_C = \frac{1.8 \times (1.1 - C)\sqrt{D}}{\sqrt[3]{S}}$$

BASIN	DISTANCE (FT)	C	SLOPE (%)	TIME OF CONCENTRATION (MIN)	PIPE TIME OF CONCENTRATION (MIN))	TOTAL TIME OF CONCENTRATION (MIN))
SITE	290	0.87	20	12	20	32
1	50	0.90	6	6.5	6.5	13
2	100	0.84	2	17	12	29
3	9	0.30	45	5.6	0	5.6

Flow Calculations

Using the City of San Diego Drainage Design Manual (Section 1-102.3:

Where:

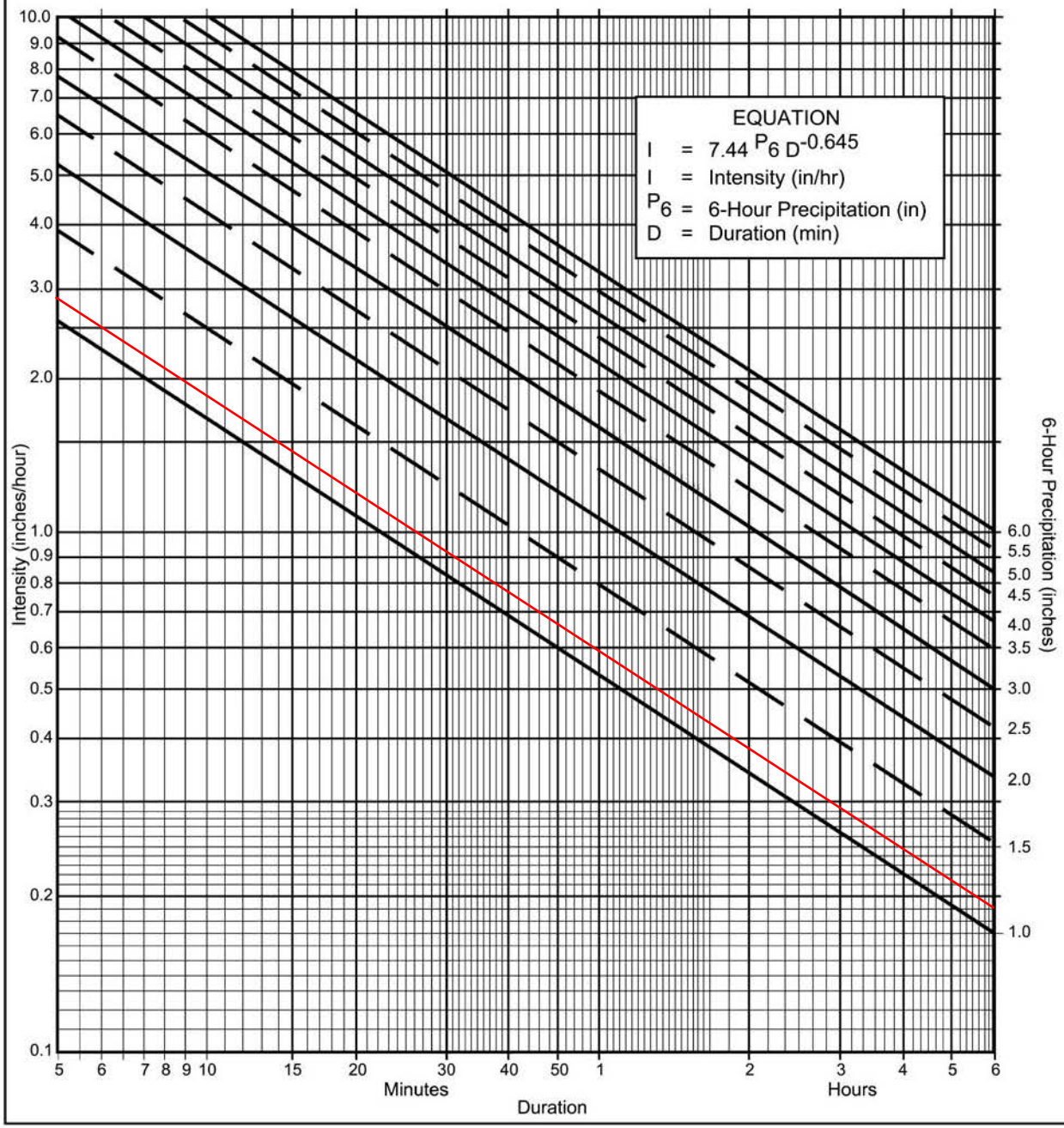
$Q = Flow\ rate\ in\ cubic\ feet\ per\ second\ (cfs)$
$C = Runoff\ Coefficient$
$I = Rainfall\ Intensity\ in\ inches\ per\ hour\ (in/hr)$
$A = Basin\ Area\ in\ acres\ (ac)$

$$Q = C\ \times I \times A$$

BASIN	YEAR	C	I (IN/HR)	AREA (AC)	Q (CFS))
SITE	2	0.87	2.90	0.45	1.14
	10	0.87	4.45	0.45	1.74
	50	0.87	5.85	0.45	2.29
	100	0.87	6.76	0.45	2.65
1	2	0.90	2.90	0.23	0.60
	10	0.90	4.45	0.23	0.92
	50	0.90	5.85	0.23	1.21
	100	0.90	6.76	0.23	1.40
2	2	0.84	2.90	0.18	0.44
	10	0.84	4.45	0.18	0.67
	50	0.84	5.85	0.18	0.88
	100	0.84	6.76	0.18	1.02
3	2	0.30	2.90	0.04	0.04
	10	0.30	4.45	0.04	0.05
	50	0.30	5.85	0.04	0.07
	100	0.30	6.76	0.04	0.08

APPENDIX

C. HYDROLOGY ANALYSIS AND MAPS



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 2 year

(b) P_6 = 1.22 in., P_{24} = 1.80, $\frac{P_6}{P_{24}}$ = 68 %(2)

(c) Adjusted P_6(2) = 1.22 in.

(d) t_x = 6.00 min.

(e) I = 2.90 in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
S.D. COUNTY
SD

Site
1.22 in

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Site
1.8 in

Orange County
Riverside County
Imperial County
Mexico
Pacific Ocean

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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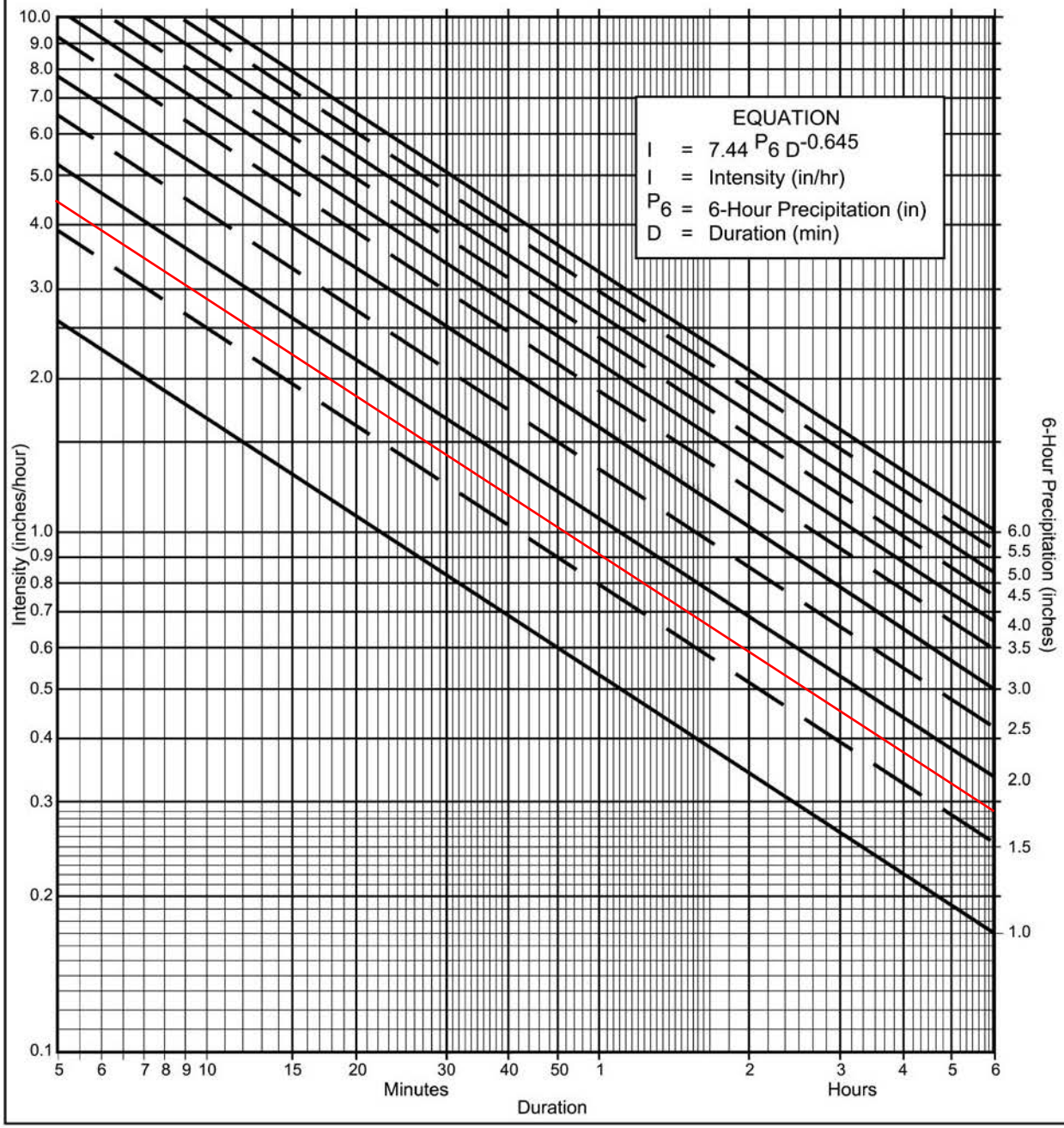
3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 10 year

(b) P_6 = 1.82 in., P_{24} = 2.90, $\frac{P_6}{P_{24}}$ = 63 %(2)

(c) Adjusted P_6(2) = 1.82 in.

(d) t_x = 5.74 min.

(e) I = 4.45 in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

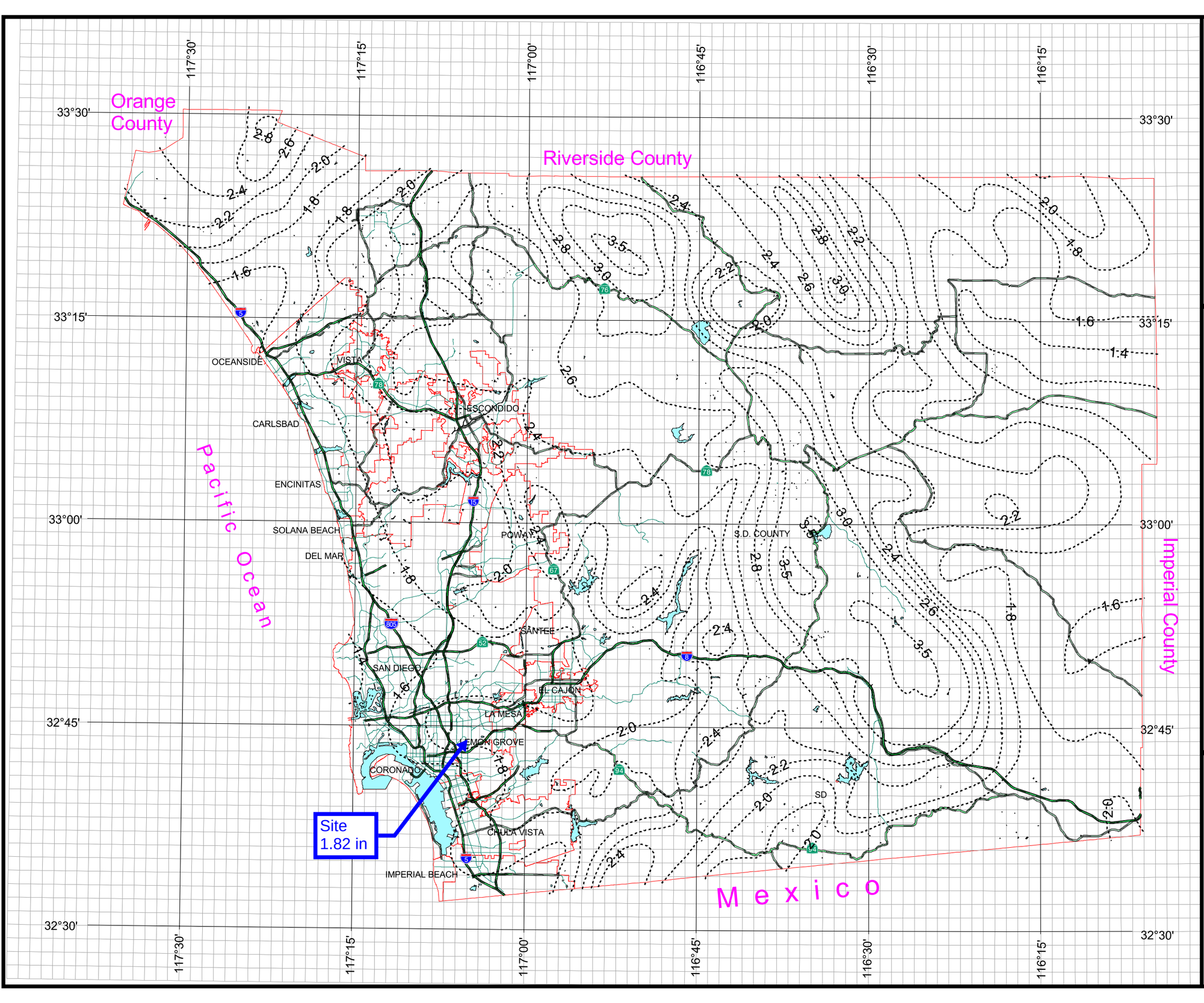
FIGURE 3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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W E
S

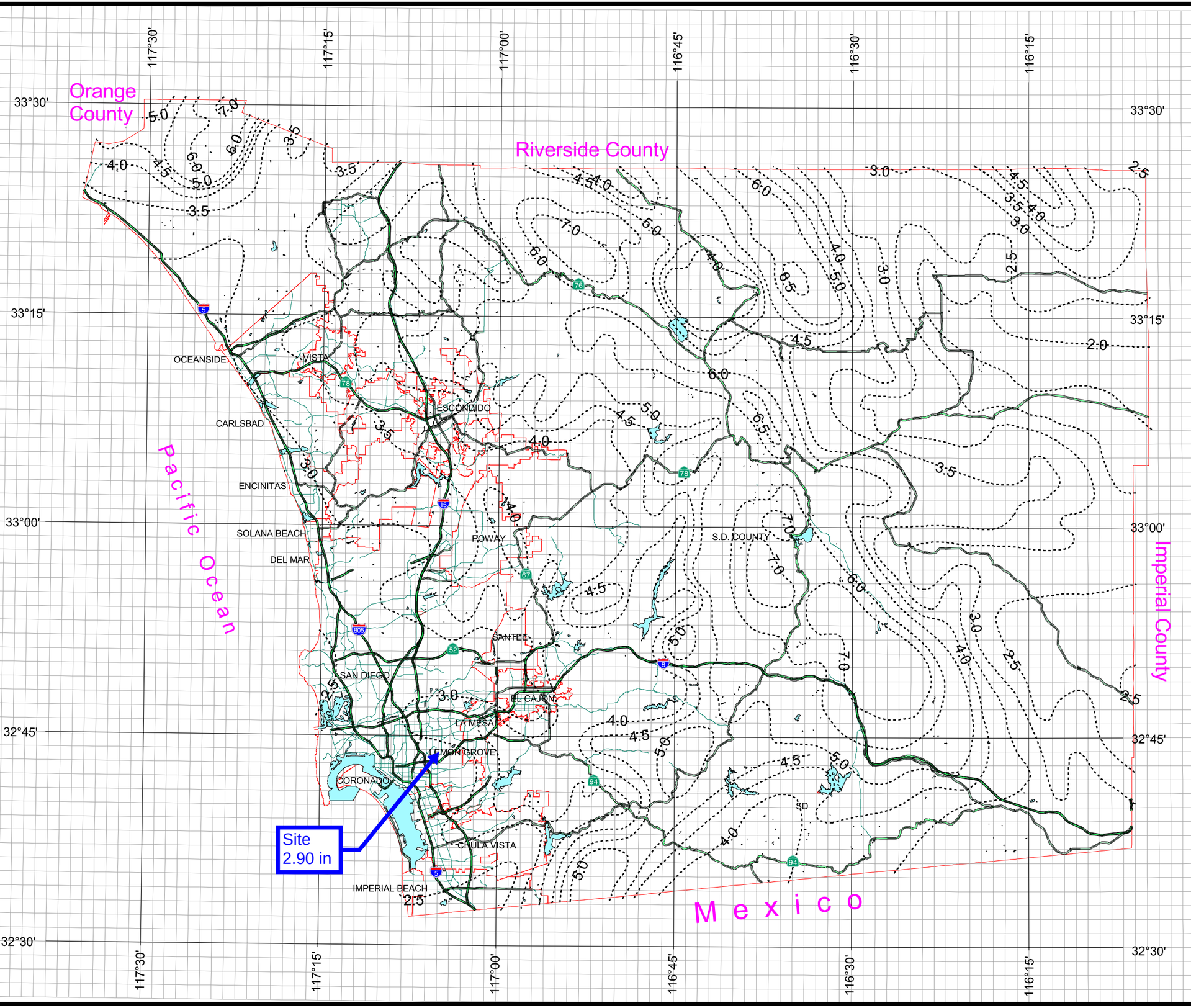
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

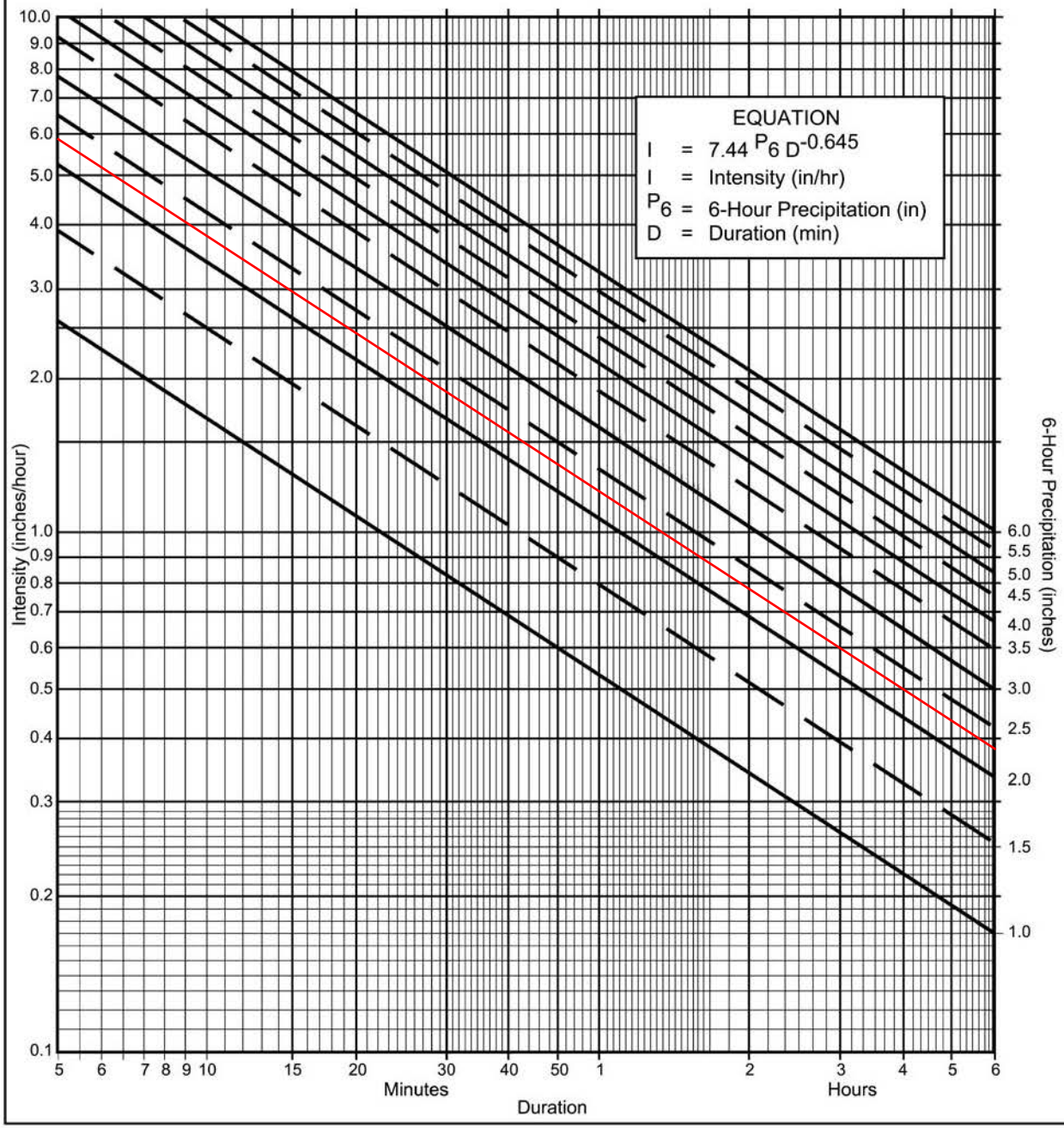
10 Year Rainfall Event - 24 Hours

Isopluvial (inches)



N W E S

3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 50 year

(b) P_6 = 2.25 in., P_{24} = 3.75, $\frac{P_6}{P_{24}}$ = 60 %(2)

(c) Adjusted P_6(2) = 2.25 in.

(d) t_x = 5.1 min.

(e) I = 5.85 in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

Site
2.25 in

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

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3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

Site
3.75 in

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

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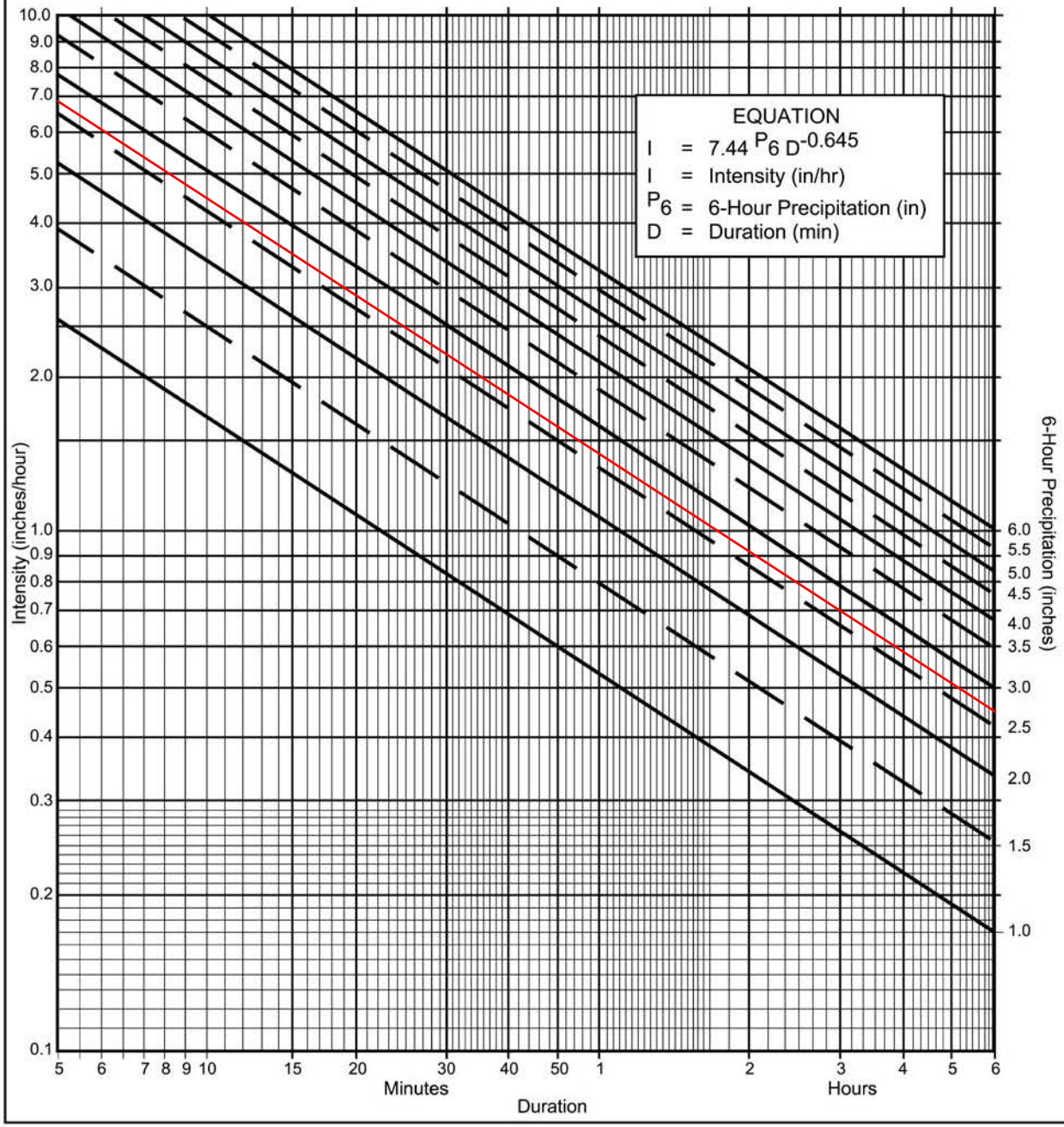
N W E S

3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.6 in., P_{24} = 4.25, $\frac{P_6}{P_{24}}$ = 61 %(2)

(c) Adjusted P_6(2) = 2.6 in.

(d) t_x = 5.1 min.

(e) I = 6.76 in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

Site
2.6 in

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

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N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

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SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

Site
4.25 in

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

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Department of Public Works
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3 0 3 Miles

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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.

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GEOTECHNICAL INVESTIGATION

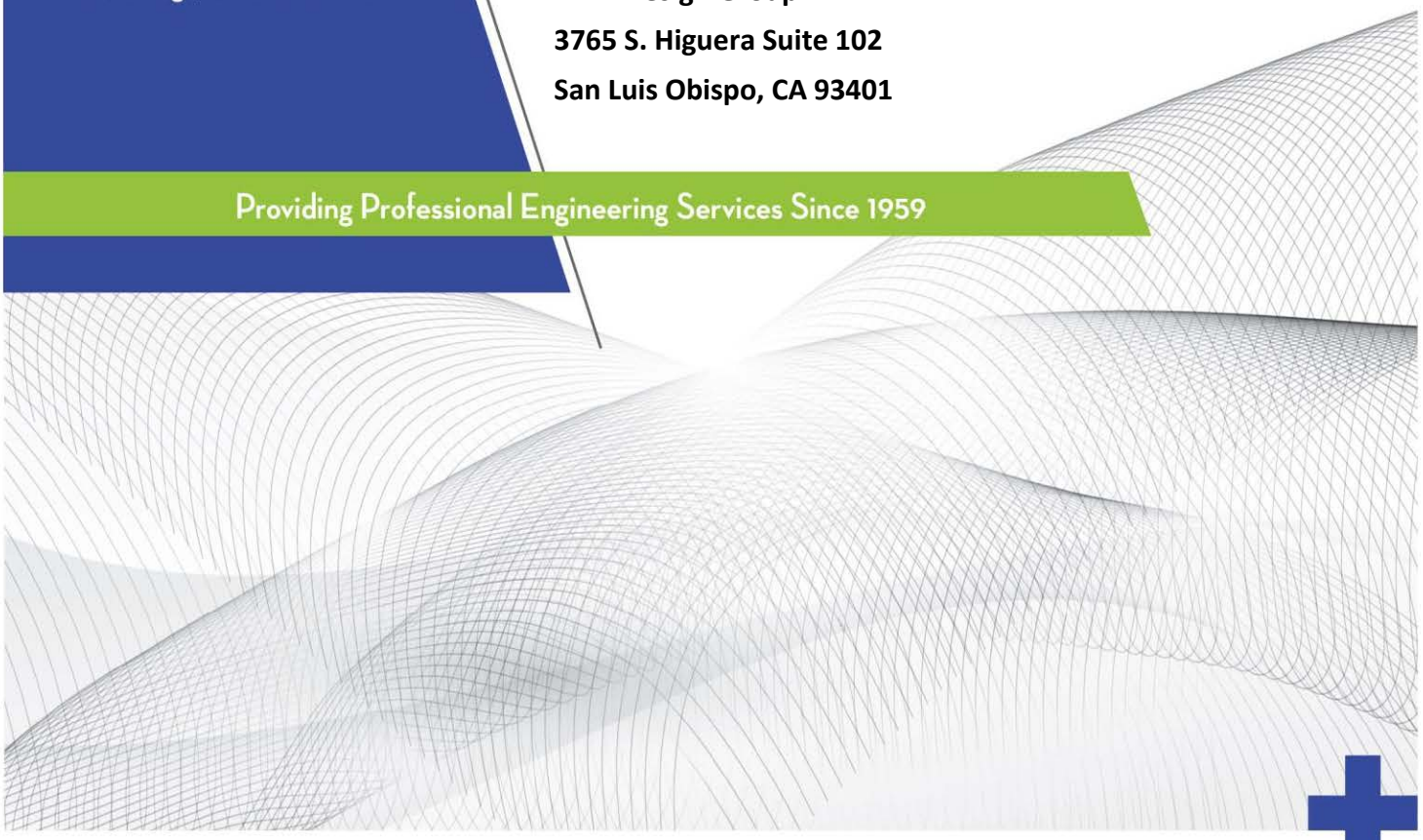
FAIRMOUNT AVENUE FIRE STATION

47th Street &
Fairmount Avenue
San Diego, California

Prepared By:
SCST, LLC
6280 Riverdale Street
San Diego, California 92120

Prepared For:
Michael Scott
RRM Design Group
3765 S. Higuera Suite 102
San Luis Obispo, CA 93401

Providing Professional Engineering Services Since 1959



March 15, 2019

SCST No. 170446P4.1
Report No. 1

Michael Scott
RRM Design Group
3765 S. Higuera Suite 102
San Luis Obispo, CA 93401

Subject: GEOTECHNICAL INVESTIGATION
FAIRMOUNT AVENUE FIRE STATION
47TH STREET AND FAIRMOUNT AVENUE
SAN DIEGO, CALIFORNIA

Dear Mr. Scott:

SCST, LLC (SCST) is pleased to present our report describing the geotechnical investigation performed for the construction of the new Fairmount Avenue Fire Station project. Based on the results of our investigation, we consider the planned construction feasible from a geotechnical standpoint provided the recommendations of this report are followed. If you have questions, please call us at (619) 280-4321.

Respectfully submitted,
SCST, LLC

Daniel J. Richardson, PE C89379
Project Engineer

Jonathan Goodmacher PG, CEG, CHG 2136
Principal Geologist

Gillian Carzzarella, PE C87787
Project Engineer

GC:DR:JG:ER:hu

(1) Addressee via email at MLScott@rrmdesign.com

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EXECUTIVE SUMMARY

This report presents the results of the geotechnical and fault trench rupture hazard investigation SCST, LLC (SCST) performed for the subject project. We understand that the project will consist of the construction of the new Fairmount Avenue Fire Station at the site. The planned construction will consist of a three-story building, retaining walls, and pavements for site access, drop-off, and parking. The purpose of our work is to provide conclusions and recommendations regarding the geotechnical aspects of the project and to assess the site for the potential presence of an active fault capable of surface rupture.

We explored the subsurface conditions by excavating five test pits to depths between about 6 and 12½ feet below the existing ground surface. An approximately 100-foot-long fault trench was also excavated across the site to a depth of 8 feet. The test pits and trenches were dug using a track-mounted excavator. An SCST engineer and geologist logged the test pits and fault trench and collected samples of the materials encountered for geotechnical laboratory testing. SCST tested select samples from the test pits and fault trench to evaluate pertinent soil classification and engineering properties and to assist in developing geotechnical conclusions and recommendations.

The materials encountered in the test pits and fault trench consisted of fill, alluvium, and San Diego Formation. The fill and alluvium extended to depths up to about 12½ feet below the existing ground surface. They consisted of a mix of sand, silt, and gravel with organics and are considered unacceptable in their current condition for support of structures or structural fill. The San Diego Formation consists of weakly to strongly cemented, silty sandstone and is considered acceptable for support of structures or structural fill. Groundwater was not encountered in the test pits.

The main geotechnical considerations affecting the planned development are the presence of potentially compressible material (fill and alluvium) and transitions between cut and fill areas. To reduce the potential for settlement, the existing fill and alluvium should be excavated below the planned structures, settlement sensitive improvements and new fill. Additionally, the planned buildings should not be underlain by cut/fill transitions or transitions from shallow fill to deep fill. Building footings and concrete slabs should be underlain by at least 2 feet of material with an expansion index of 20 or less. The planned buildings can be supported on shallow spread footings with bottom levels on compacted fill. The grading and foundation recommendations presented herein may need to be updated once final plans are developed.

1. INTRODUCTION

This report presents the results of the geotechnical and fault rupture hazard investigation SCST, LLC (SCST) performed for the subject project. We understand that the project will consist of the construction of the new Fairmount Avenue Fire Station at the site. The planned construction will consist of a three-story building, retaining walls, and pavements for site access, drop-off, and parking. The purpose of our work is to provide conclusions and recommendations regarding the geotechnical aspects of the project. Figure 1 is a site vicinity map.

2. SCOPE OF WORK

2.1 FIELD INVESTIGATIONS

Our field investigation was limited by environmental constraints. We explored the subsurface conditions by excavating five test pits to depths between about 6 and 12½ feet below the existing ground surface. An approximately 100-foot-long fault trench was also excavated across the site to a depth of 8 feet. The test pits and trenches were dug out using a track-mounted excavator. An SCST engineer and geologist logged the test pits and fault trench and collected samples of the materials encountered for geotechnical laboratory testing. SCST tested select samples from the test pits and fault trench to evaluate pertinent soil classification and engineering properties and to assist in developing geotechnical conclusions and recommendations. Figure 2 shows the approximate locations of explorations. Logs of the explorations are presented in Appendix I. Soils are classified according to the Unified Soil Classification System illustrated on Figure I-1.

2.2 GEOTECHNICAL LABORATORY TESTING

Selected samples obtained from the test pits and the fault trench were tested to evaluate pertinent soil classification and engineering properties and enable development of geotechnical conclusions and recommendations. The laboratory tests consisted of particle-size distribution, sand equivalent, maximum density, expansion index, corrosivity, direct shear, and organic matter. The results of the laboratory tests and brief explanations of the test procedures are presented in Appendix II.

The results of the field and laboratory tests were evaluated to develop conclusions and recommendations regarding:

- Subsurface conditions beneath the site
- Potential geologic hazards
- Criteria for seismic design in accordance with the 2016 California Building Code (CBC)
- Site preparation and grading

- Appropriate alternatives for foundation support along with geotechnical engineering criteria for design of the foundations
- Estimated foundation settlements
- Support for concrete slabs-on-grade
- Lateral pressures for the design of retaining walls
- Pavement sections
- Soil corrosivity

3. SITE DESCRIPTION

The site is located north of the intersection of Fairmount Avenue and 47th Street in San Diego, California. Chollas Creek is approximately 400 feet north of the proposed development. Currently, the site consists of vacant land covered in vegetation. Outcrops of the San Diego Formation are exposed at the eastern portion of the site, adjacent to 47th Street.

The southern portion of the site generally slopes downward towards the north and west. Site elevations range from about 150 feet at the northern portion of the site to about 200 feet at the southeastern portion of the site.

4. GEOLOGY AND SUBSURFACE CONDITIONS

The site is located within the Peninsular Ranges Geomorphic Province of California, which stretches from the Los Angeles basin to the tip of Baja California. This province is characterized as a series of northwest-trending mountain ranges separated by subparallel fault zones and a coastal plain of subdued landforms. The mountain ranges are underlain primarily by Mesozoic metamorphic rocks that were intruded by plutonic rocks of the southern California batholith, while the coastal plain is underlain by subsequently deposited marine and non-marine sedimentary formations.

The site is located in the coastal plain portion of the province and, per published mapping, is underlain by the Plio-Pleistocene-age San Diego Formation (Kennedy and Tan, 2008). However, based on our explorations, site soils consist of fill, alluvium, and Plio-Pleistocene-age San Diego Formation. Figure 3 presents a geologic cross section. Figure 4 presents the regional geology.

For purposes of this report, the fill and alluvium are described together and are shown undifferentiated on the logs. The fill and alluvium extended to depths up to about 12 feet below the existing ground surface. They consisted of a mix of sand, silt, and gravel with organics. The San Diego Formation consisted of weakly to strongly cemented, silty sandstone.

Groundwater was not encountered in our explorations; however, water seepage was encountered in TP-1 at a depth of about 5½ feet. The groundwater table is expected to be below a depth that will influence planned construction. However, groundwater levels may fluctuate in the future due to rainfall, irrigation, broken pipes, or changes in site drainage. Because groundwater rise or seepage is difficult to predict, such conditions are typically mitigated if and when they occur.

5. GEOLOGIC HAZARDS

5.1 CITY OF SAN DIEGO SEISMIC SAFETY MAP

Figure 5 shows the site location on the City of San Diego Seismic Safety Study map (2008). The site is located within or adjacent to areas designated by the city as having Geologic Hazard Categories 12, 32, and 52. Geologic Hazard Category 12 is defined as faults that are potentially active, presumed inactive, or activity unknown. Category 32 is defined as areas with a low liquefaction potential with fluctuating groundwater and minor drainages. Geologic Hazard Category 52 is defined as level or sloping areas with favorable geologic structure and low risk.

5.2 FAULTING AND SURFACE RUPTURE

Figure 6 shows the site in relation to known active faults in the region. The closest known active fault is the Newport-Inglewood Rose Canyon (Offshore) fault zone located about 3.9 miles (5.0 kilometers) west of the site. The site is not located in an Alquist-Priolo Earthquake Fault Zone. No active faults are known to underlie or project toward the site.

5.3 CBC SEISMIC DESIGN PARAMETERS

A geologic hazard likely to affect the project is ground shaking as a result of movement along an active fault zone in the vicinity of the subject site. A web-based application was used to develop the seismic design parameters (SEAOC/OSHPOD, 2019). The site coefficients and adjusted maximum considered earthquake spectral response accelerations in accordance with the 2016 CBC are presented below:

Site Coordinates: Latitude 32.72472°
Longitude -117.09388°
Site Class: D
Site Coefficients, F_a = 1.110
F_v = 1.640
Mapped Spectral Response Acceleration at Short Period, S_s = 0.999g
Mapped Spectral Response Acceleration at 1-Second Period, S_1 = 0.380g

Design Spectral Acceleration at Short Period, S_{DS} = 0.733g
Design Spectral Acceleration at 1-Second Period, S_{D1} = 0.415g
Site Peak Ground Acceleration, PGA_M = 0.452g

5.4 LANDSLIDES AND SLOPE STABILITY

Evidence of landslides or slope instabilities was not observed or shown on the referenced geologic map.

5.5 LIQUEFACTION AND DYNAMIC SETTLEMENT

Liquefaction occurs when loose, saturated, generally fine sands and silts are subjected to strong ground shaking. The soils lose shear strength and become liquid; potentially resulting in large total and differential ground surface settlements as well as possible lateral spreading during an earthquake. Provided the remedial grading recommendations of this report are followed, and given the relatively dense formational materials underlying the site and the lack of shallow groundwater, the potential for liquefaction and dynamic settlement to occur is considered low.

5.6 TSUNAMIS, SEICHES, AND FLOODING

The site is not located within a mapped area on the State of California Tsunami Inundation Maps (CalEMA, 2009); therefore, damage due to tsunamis is considered negligible. Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays, or reservoirs. The site is not located adjacent to lakes or confined bodies of water; therefore, the potential for a seiche to affect the site is low.

We reviewed the Flood Insurance Rate Maps via the Federal Emergency Management Agency (FEMA) Flood Hazard Map online database to determine if the subject site location is located within an area susceptible to flooding. A portion of the project site is mapped as being within a special flood hazard area designated as a Zone AE. Zone AE designates a regulatory floodway area. The mapped base flood elevation (BFE) of the site is approximately 138 feet MSL.

5.7 HYDRO-CONSOLIDATION

Hydro-consolidation can occur in recently deposited (less than 10,000 years old) sediments that were deposited in a semi-arid environment. Examples of such sediments are aeolian sands, alluvial fan deposits, and mudflow sediments deposited during flash floods. The pore space between particle grains can re-adjust when inundated by groundwater causing the material to consolidate. The alluvium at the project site is highly susceptible to hydro-

consolidation. However, the recommendations within this report mitigate this geologic hazard. The relatively dense formational materials underlying the site are not susceptible to hydro-consolidation.

6. CONCLUSIONS

The main geotechnical considerations affecting the proposed development are the presence of potentially compressible soils (fill and alluvium) and cut/fill transitions. Remedial grading will need to be performed to reduce the potential for adverse settlement and distress to the planned structures and improvements. Remedial grading recommendations are provided below. The planned buildings can be supported on shallow spread footings with bottom levels on compacted fill.

7. RECOMMENDATIONS

7.1 SITE PREPARATION AND GRADING

7.1.1 Site Preparation

Site preparation should begin with the removal of existing improvements, topsoil, vegetation, and debris. Subsurface improvements that are to be abandoned should be removed, and the resulting excavations should be backfilled and compacted in accordance with the recommendations of this report. Pipeline abandonment can consist of capping or rerouting at the project perimeter and removal within the project perimeter. If appropriate, abandoned pipelines can be filled with grout or slurry as recommended by and observed by the geotechnical consultant.

7.1.2 Compressible Soils

The existing fill and alluvium should be excavated beneath the planned structures, settlement-sensitive improvements, and new fills. Based on the initial site plan for improvements indicating finished pad elevations, excavations up to 25 feet deep are anticipated. Horizontally, the excavations should extend at least 10 feet outside the planned perimeter foundations, at least 2 feet outside the planned hardscape and pavements, or up to existing improvements, whichever is less. An SCST representative should observe conditions exposed in the bottom of excavations to determine if additional removals are required.

7.1.3 Cut/Fill Transitions

The planned buildings should not be underlain by cut/fill transitions or transitions from shallow fill to deep fill. Where such transitions are encountered, the San Diego

Formation should be over-excavated and replaced with compacted fill to provide a relatively uniform thickness of compacted fill beneath the building and reduce the potential for differential settlement. The over-excavation depth should be at least 3 feet below the planned finished pad elevation, at least 2 feet below the deepest planned footing bottom elevation, or to a depth of H/2, whichever is deeper, where H is the greatest depth of fill beneath the structure. Horizontally, the over-excavation should extend at least 10 feet outside the planned footing perimeter or up to existing improvements, whichever is less. Where practical, the bottom of excavations should be sloped toward the fill portion of the site and away from its center. An SCST representative should observe the conditions exposed in the bottom of excavations to evaluate if additional excavation is recommended.

7.1.4 Compacted Fill

Material with an expansion index of 20 or less determined in accordance with ASTM D4829 should be placed and compacted from 2 feet below the deepest planned footing bottom level to finished pad grade elevation. Concrete slabs should be underlain by at least 2 feet of material with an expansion index of 20 or less. Based on the limited geotechnical laboratory testing performed, we expect that the on-site materials may meet the expansion index criteria. Fill should be moisture conditioned to near optimum moisture content and compacted to at least 90% relative compaction. Fill should be placed in horizontal lifts at a thickness appropriate for the equipment spreading, mixing, and compacting the material, but generally should not exceed 8 inches in loose thickness. The maximum dry density and optimum moisture content for evaluating relative compaction should be determined in accordance with ASTM D 1557. Utility trench backfill beneath structures, pavements, and hardscape should be compacted to at least 90% relative compaction. The top 12 inches of subgrade beneath pavements should be compacted to at least 95%.

7.1.5 Imported Soil

Imported soil should consist of predominately granular soil free of organic matter and rocks greater than 6 inches. Imported soil should have an expansion index of 20 or less and should be inspected and, if appropriate, tested by SCST prior to transport to the site.

7.1.6 Excavation Characteristics

It is anticipated that excavations can be achieved with conventional earthwork equipment in good working order. However, difficult excavation should be anticipated within the alluvium due to the presence of cobbles and boulders, as well as in the

cemented San Diego Formation. Caving was encountered during our explorations and should be expected. Contract documents should specify that the contractor mobilize equipment capable of excavating and compacting oversized and strongly cemented materials.

7.1.7 Temporary Excavations

Temporary excavations 3 feet deep or less can be made vertically. Deeper temporary excavations in fill or alluvium should be laid back no steeper than 1:1 (horizontal:vertical) and in formational material no steeper than ¾:1 (horizontal:vertical). The faces of temporary slopes should be inspected daily by the contractor's Competent Person before personnel are allowed to enter the excavation. 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. Excavated soils should not be stockpiled behind temporary excavations within a distance equal to the depth of the excavation. SCST 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 the rainy season, berms are recommended along the tops of slopes to prevent runoff water from entering the excavation and eroding the slope faces. Slopes steeper than those described above will require shoring. Additionally, temporary excavations that extend below a plane inclined at 1½:1 (horizontal:vertical) downward from the outside bottom edge of existing structures or improvements will require shoring. A shoring system consisting of soldier piles and lagging can be used.

7.1.8 Temporary Shoring

For design of cantilevered shoring, an active soil pressure equal to a fluid weighing 40 pcf can be used for level retained ground or 65 pcf for 2:1 (horizontal:vertical) sloping ground. The surcharge loads on shoring from traffic and construction equipment adjacent to the excavation can be modeled by assuming an additional 2 feet of soil behind the shoring. For design of soldier piles, an allowable passive pressure of 350 psf per foot of embedment over twice the pile diameter up to a maximum of 5,000 psf can be used. Soldier piles should be spaced at least three pile diameters, center to center. Continuous lagging will be required throughout. The soldier piles should be designed for the full anticipated lateral pressure; however, the pressure on the lagging will be less due to arching in the soils. For design of lagging, the earth pressure can be limited to a maximum value of 400 psf.

7.1.9 Temporary Dewatering

Groundwater seepage was found in TP-1 at about 5½ feet and may occur locally due to broken pipes, local irrigation, or following heavy rain. Groundwater should be anticipated in the planned excavations.

7.1.10 Oversized Material

Excavations may generate oversized material. Oversized material is defined as rocks or cemented clasts greater than 6 inches in largest dimension. Oversized material should be broken down to no greater than 6 inches in largest dimension for use in fill, used as landscape material, or disposed offsite.

7.1.11 Slopes

Permanent slopes should be constructed no steeper than 2:1 (horizontal:vertical). Faces of fill slopes should be compacted either by rolling with a sheepsfoot roller or other suitable equipment or by overfilling and cutting back to design grade. Fills should be benched into sloping ground inclined steeper than 5:1 (horizontal:vertical). It is our opinion that cut slopes constructed no steeper than 2:1 (horizontal:vertical) will possess an adequate factor of safety against instability. An engineering geologist should observe cut slopes during grading to ascertain that no unforeseen adverse geologic conditions are encountered that need revised recommendations. Slopes are susceptible to surficial slope failure and erosion. Water should not be allowed to flow over the top of slope. Additionally, slopes should be planted with vegetation that will reduce the potential for erosion.

7.1.12 Surface Drainage

Final surface grades around structures should be designed to collect and direct surface water away from the structure and toward appropriate drainage facilities. The ground around the structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to the structure slope away at a gradient of at least 2%. Densely vegetated areas where runoff can be impaired should have a minimum gradient of at least 5% within the first 5 feet from the structure. Roof gutters with downspouts that discharge directly into a closed drainage system are recommended on structures. Drainage patterns established at the time of fine grading should be maintained throughout the life of the proposed structures. Site irrigation should be limited to the minimum necessary to sustain landscape growth.

Should excessive irrigation, impaired drainage, or unusually high rainfall occur, saturated zones of perched groundwater can develop.

7.1.13 Grading Plan Review

SCST should review the grading plans and earthwork specifications to ascertain whether the intent of the recommendations contained in this report have been implemented and that no revised recommendations are needed due to changes in the development scheme.

7.2 FOUNDATIONS

7.2.1 Shallow Spread Footings

The planned buildings can be supported on shallow spread footings with bottom levels on compacted fill. Footings should extend at least 18 inches below lowest adjacent finished grade. Continuous footings should be at least 12 inches wide. Isolated or retaining wall footings should be at least 24 inches wide. An allowable bearing capacity of 2,500 psf can be used. The bearing capacity can be increased by 500 psf for each foot of depth below the minimum and 250 psf for each foot of width beyond the minimum up to a maximum of 5,000 psf. The bearing value can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. Footings located adjacent to or within slopes should be extended to a depth such that a minimum horizontal distance of 7 feet exists between the lower outside footing edge and the face of the slope.

Lateral loads will be resisted by friction between the bottoms of footings and passive pressure on the faces of footings and other structural elements below grade. An allowable coefficient of friction of 0.35 can be used. Passive pressure can be computed using an allowable lateral pressure of 350 psf per foot of depth below the ground surface for level ground conditions. Reductions for sloping ground should be made. The passive pressure can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. The upper 1 foot of soil should not be relied on for passive support unless the ground is covered with pavements or slabs.

7.2.2 Settlement Characteristics

Total foundation settlements are estimated to be less than 1 inch. Differential settlements between adjacent columns and across continuous footings are estimated to be less than ¾ inch over a distance of 40 feet. Settlements should be completed shortly after structural loads are applied.

7.2.3 Foundation Plan Review

SCST should review the foundation plans to ascertain that the intent of the recommendations in this report has been implemented and that revised recommendations are not necessary as a result of changes after this report was completed.

7.2.4 Foundation Excavation Observations

A representative from SCST should observe the foundation excavations prior to forming or placing reinforcing steel.

7.3 SLABS-ON-GRADE

7.3.1 Interior Slabs-on-Grade

The project structural engineer should design the interior concrete slabs-on-grade floor. However, we recommend that building slabs be at least five inches thick and reinforced with at least No. 4 bars at 18 inches on center each way.

Special consideration should be given to interior slabs on grade which will be used for fire truck parking and/or heavy equipment storage. We recommend that these slabs be at least 7½ inches thick. Reinforcement details shall be designed by the project structural or civil engineer.

Moisture protection should be installed beneath slabs where moisture sensitive floor coverings will be used. The project architect should review the tolerable moisture transmission rate of the proposed floor covering and specify an appropriate moisture protection system. Typically, a plastic vapor barrier is used. Minimum 10-mil plastic is recommended. The plastic should comply with ASTM E1745. The vapor barrier installation should comply with ASTM E1643. Construction practice often includes placement of a 2-inch-thick sand cushion between the bottom of the concrete slab and the moisture vapor retarder/barrier. This cushion can provide some protection to the vapor retarder/barrier during construction and may assist in reducing the potential for edge curling in the slab during curing. However, the sand layer also provides a source of moisture to the underside of the slab that can increase the time required to reduce vapor emissions to limits acceptable for the type of floor covering placed on top of the slab. The slab can be placed directly on the vapor retarder/barrier.

7.3.2 Exterior Slabs-on-Grade

Exterior slabs should be at least 4 inches thick and reinforced with at least No. 3 bars at 18 inches on center each way. Slabs should be provided with weakened plane joints. Joints should be placed in accordance with the American Concrete Institute (ACI) guidelines. The project architect should select the final joint patterns. A 1-inch maximum size aggregate mix is recommended for concrete for exterior slabs. The corrosion potential of on-site soils with respect to reinforced concrete will need to be taken into account in concrete mix design. Coarse and fine aggregate in concrete should conform to the "Greenbook" Standard Specifications for Public Works Construction.

7.4 CONVENTIONAL RETAINING WALLS

7.4.1 Foundations

The recommendations provided in the foundation section of this report are also applicable to conventional retaining walls.

7.4.2 Lateral Earth Pressures

The active earth pressure for the design of unrestrained retaining walls with level backfill can be taken as equivalent to the pressure of a fluid weighing 40 pcf. The at-rest earth pressure for the design of restrained retaining walls with level backfills can be taken as equivalent to the pressure of a fluid weighing 60 pcf. These values assume a granular and drained backfill condition. Higher lateral earth pressures would apply if walls retain expansive clay soils. An additional 20 pcf should be added to these values for walls with a 2:1 (horizontal:vertical) sloping backfill. An increase in earth pressure equivalent to an additional 2 feet of retained soil can be used to account for surcharge loads from light traffic. The above values do not include a factor of safety. Appropriate factors of safety should be incorporated into the design. If other surcharge loads are anticipated, SCST should be contacted for the necessary increase in soil pressure.

Retaining walls should be designed to resist hydrostatic pressures or be provided with a backdrain to reduce the accumulation of hydrostatic pressures. Backdrains may consist of a 2-foot-wide zone of ¾-inch crushed rock. The backdrain should be separated from the adjacent soils using a non-woven filter fabric, such as Mirafi 140N or equivalent. Weep holes should be provided, or a perforated pipe should be installed at the base of the backdrain and sloped to discharge to a suitable storm drain facility. As an alternative, a geocomposite drainage system such as Miradrain 6000 or equivalent placed behind the wall and connected to a suitable storm drain facility can be used. The project

architect should provide waterproofing specifications and details. Figure 7 presents typical conventional retaining wall backdrain details.

7.4.3 Seismic Earth Pressure

If required, the seismic earth pressure can be taken as equivalent to the pressure of a fluid weighing 18 pcf. This value is for level backfill and does not include a factor of safety. Appropriate factors of safety should be incorporated into the design. This pressure is in addition to the un-factored, static active earth pressure. The passive pressure and bearing capacity can be increased by ⅓ in determining the seismic stability of the wall.

7.4.4 Backfill

Wall backfill should consist of granular, free-draining material. Expansive or clayey soil should not be used. Additionally, backfill within 3 feet from the back of the wall should not contain rocks greater than 3 inches in dimension. We anticipate that a portion of the on-site soils will be suitable for wall backfill. Backfill should be compacted to at least 90% relative compaction. Backfill should not be placed until walls have achieved adequate structural strength. Compaction of wall backfill will be necessary to minimize settlement of the backfill and overlying settlement sensitive improvements. However, some settlement should still be anticipated. Provisions should be made for some settlement of concrete slabs and pavements supported on backfill. Additionally, utilities supported on backfill should be designed to tolerate differential settlement.

7.5 MECHANICALLY STABILIZED EARTH RETAINING WALLS

The following soil parameters can be used for design of mechanically stabilized earth (MSE) retaining walls.

MSE Wall Design Parameters

Soil Parameter	Reinforced Soil	Retained Soil	Foundation Soil
Internal Friction Angle	30°	30°	30°
Cohesion	0	0	0
Moist Unit Weight	120 pcf	120 pcf	120 pcf

The reinforced soil should consist of granular, free-draining material with a sand equivalent of 20 or more. The bottom of MSE walls should extend to such a depth that a total of 5 feet exists between the bottom of the wall and the face of the slope. Figure 7 presents a typical retaining wall backdrain detail. MSE retaining walls may experience lateral movement over

time. The wall engineer should review the configuration of proposed improvements adjacent to the wall and provide measures to help reduce the potential for distress to these improvements from lateral movement.

7.6 PIPELINES

7.6.1 Thrust Blocks

For level ground conditions, a passive earth pressure of 350 psf per foot of depth below the lowest adjacent final grade can be used to compute allowable thrust block resistance. A value of 150 psf per foot should be used below groundwater level, if encountered.

7.6.2 Modulus of Soil Reaction

A modulus of soil reaction (E') of 1,400 psi can be used to evaluate the deflection of buried flexible pipelines. This value assumes that granular bedding material is placed adjacent to the pipe and is compacted to at least 90% relative compaction.

7.6.3 Pipe Bedding

Pipe bedding as specified in the "Greenbook" Standard Specifications for Public Works Construction can be used. Bedding material should consist of clean sand having a sand equivalent not less than 30 and should extend to at least 12 inches above the top of pipe. Alternative materials meeting the intent of the bedding specifications are also acceptable. Samples of materials proposed for use as bedding should be provided to the engineer for inspection and testing before the material is imported for use on the project. The on-site materials are not expected to meet "Greenbook" bedding specifications. The pipe bedding material should be placed over the full width of the trench. After placement of the pipe, the bedding should be brought up uniformly on both sides of the pipe to reduce the potential for unbalanced loads. No voids or uncompacted areas should be left beneath the pipe haunches. Ponding or jetting the pipe bedding should not be allowed.

7.6.4 Cutoff Walls

Where pipeline inclinations exceed 15 percent, cutoff walls may be necessary in trench excavations. Additionally, we do not recommend that open graded rock be used for pipe bedding or backfill because of the potential for piping erosion. The recommended bedding is clean sand having a sand equivalent not less than 30. Alternatively, 2-sack sand-cement slurry can be used for the pipe bedding. If sand-cement slurry is used for pipe bedding to at least 1 foot over the top of the pipe, cutoff walls are not considered

necessary. The need for cutoff walls should be further evaluated by the project civil engineer designing the pipeline.

7.6.5 Backfill

Excavated material free of organic debris and rocks greater than 6 inches in dimension are generally expected to be suitable for use as pipe backfill. Imported material should not contain rocks greater than 4 inches in dimension or organic debris. Imported material should have an expansion index of 20 or less. SCST should observe and, if appropriate, test proposed imported materials before they are delivered to the site. Backfill should be placed in lifts 8 inches or less in loose thickness, moisture conditioned to optimum moisture content or slightly above, and compacted to at least 90% relative compaction. The top 12 inches of soil beneath pavement subgrade should be compacted to at least 95% relative compaction.

7.7 PAVEMENT SECTION RECOMMENDATIONS

Due to anticipated grading and importing of materials at the project site, on-site soils were not evaluated for pavement support characteristics. An R-value of 30 was assumed for design of preliminary pavement sections. The actual R-value of the subgrade soils should be determined after grading and final pavement sections are provided. Based on an R-value of 30, the following pavement structural sections are recommended for the assumed Traffic Indices.

Flexible Pavement Sections

Traffic Type	Traffic Index	Asphalt Concrete (inches)	Aggregate Base (inches)
Parking Stalls	4.5	3	5
Drive Lanes	6.0	4	7
Fire Lanes	7.0	5	8

Portland Cement Concrete Pavement Sections

Traffic Type	Traffic Index	Full-Depth PCC Pavement (inches)
Parking Stalls	4.5	6
Drive Lanes	6.0	7½
Fire Lanes	7.0	7½

The top 12 inches of subgrade should be scarified, moisture conditioned to near optimum moisture content, and compacted to at least 95% relative compaction. All soft or yielding areas should be removed and replaced with compacted fill or aggregate base. Aggregate

base and asphalt concrete should conform to the Caltrans Standard Specifications or the "Greenbook" and should be compacted to at least 95% relative compaction. Aggregate base should have an R-value of not less than 78. All materials and methods of construction should conform to good engineering practices.

7.8 PERVIOUS PAVEMENT SECTION RECOMMENDATIONS

Pervious pavement section recommendations are based on Caltrans (2014) pavement structural design guidelines. The pavement sections below are based on the strength of the materials. However, the actual thickness of the sections may be controlled by the reservoir layer design, which the project civil engineer should determine.

Due to anticipated grading and importing of materials at the project site, on-site soils were not evaluated for pavement support characteristics. An R-value of 30 was assumed for design of preliminary pavement sections. The actual R-value of the subgrade soils should be determined after grading and final pavement sections are provided.

Pervious Asphalt Pavement

Traffic Type	Category	*Asphalt Treated Permeable Base (ATPB) (inches)	Class 4 Aggregate Base (inches)
Parking Stalls	B	6¾	6
Drive Lanes	B	8½	6

***1¼ inches of an open-graded friction course (OGFC) should be placed on top of the ATPB.**

Pervious Concrete Pavement

Traffic Type	Category	Pervious Concrete (inches)	Class 4 Aggregate Base (inches)
Parking Stalls	B	5½	6
Drive Lanes	B	6	6

Permeable Interlocking Concrete Pavers (PICP)

Traffic Type	Category	PICP (inches)	Class 3 Permeable (inches)	Class 4 Aggregate Base (inches)
Parking Stalls	B	3⅛	4¼	6
Drive Lanes	B	3⅛	4¼	8¾

The top 12 inches of subgrade should be scarified, moisture conditioned to near optimum moisture content, and compacted to at least 95% relative compaction. All soft or yielding subgrade areas should be removed and replaced with compacted fill or permeable base. All

materials and methods of construction should conform to good engineering practices and the minimum local standards.

We recommend installing deepened curbs or vertical cutoff membranes consisting of 30 mil HDPE or PVC at the edges of pervious pavements to reduce the potential for water-related distress to adjacent structures or improvements. The membrane should extend below the reservoir section. If infiltration is not used, the membrane should also be placed between the subgrade and pervious base, and a suitable subdrain system should be installed.

7.9 SOIL CORROSIVITY

Representative samples of the on-site soils were tested to evaluate corrosion potential. The test results are presented in Appendix II. The project design engineer can use the sulfate results in conjunction with ACI 318 to specify the water/cement ratio, compressive strength and cementitious material types for concrete exposed to soil. A corrosion engineer should be contacted to provide specific corrosion control recommendations.

7.10 PRELIMINARY INFILTRATION

Infiltration testing was not performed as part of our investigation. The infiltration rate of the actual soils that will be encountered at the bottom of stormwater retention basins could vary significantly subsequent to grading. Therefore, basin-specific testing is recommended for design purposes. An adequate safety factor should be applied to the infiltration rate during design of the proposed infiltration facilities. Site characteristics such as excessive slope of the drainage area, fine-grained soil types, and proximate location of the water table may preclude the use of an infiltration basin. Generally, infiltration basins are not suitable for areas with relatively impermeable soils containing clay and silt or in areas with fill. Further observation of the actual basin subgrade soils is recommended following grading. Additionally, infiltration basins will require periodic maintenance to function as intended.

8. GEOTECHNICAL ENGINEERING DURING CONSTRUCTION

The geotechnical engineer should review project plans and specifications prior to bidding and construction to check that the intent of the recommendations in this report has been incorporated. Observations and tests should be performed during construction. If the conditions encountered during construction differ from those anticipated based on the subsurface exploration program, the presence of the geotechnical engineer during construction will enable an evaluation of the exposed conditions and modifications of the recommendations in this report or development of additional recommendations in a timely manner.

9. CLOSURE

SCST should be advised of changes in the project scope so that the recommendations contained in this report can be evaluated with respect to the revised plans. Changes in recommendations will be verified in writing. The findings in this report are valid as of the date of this report. Changes in the condition of the site can, however, occur with the passage of time, whether they are due to natural processes or work on this or adjacent areas. In addition, changes in the standards of practice and government regulations can occur. Thus, the findings in this report may be invalidated wholly or in part by changes beyond our control. This report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations to site conditions at that time.

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the boring locations and that our data, interpretations, and recommendations are based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

10. REFERENCES

American Concrete Institute (ACI) (2014), Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary.

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Jennings, C.W., Bryant W.A., ESRI, HERE, Garmin, FAO, NOAA, USGS, EPA (2010), Fault Activity Map of California.

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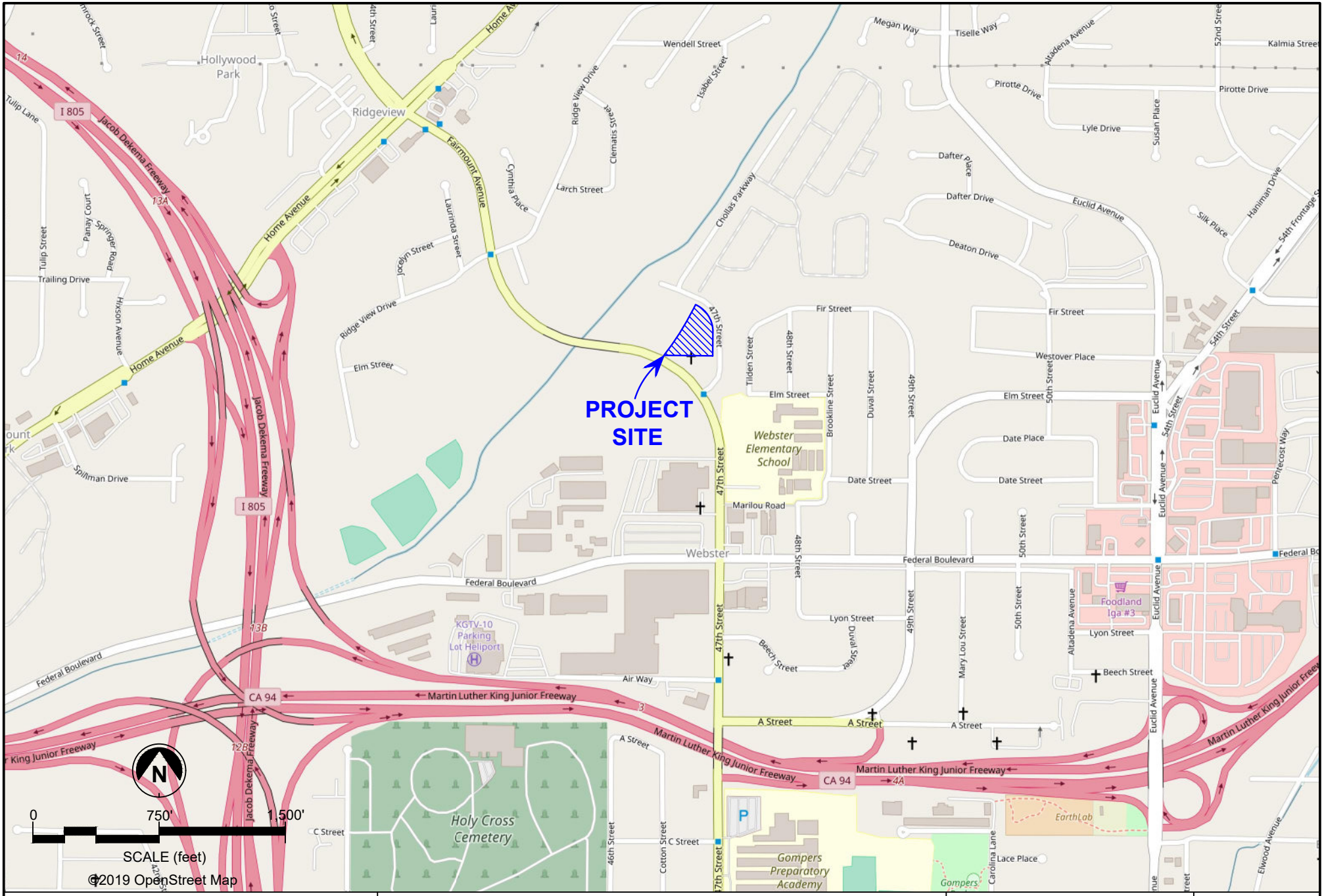
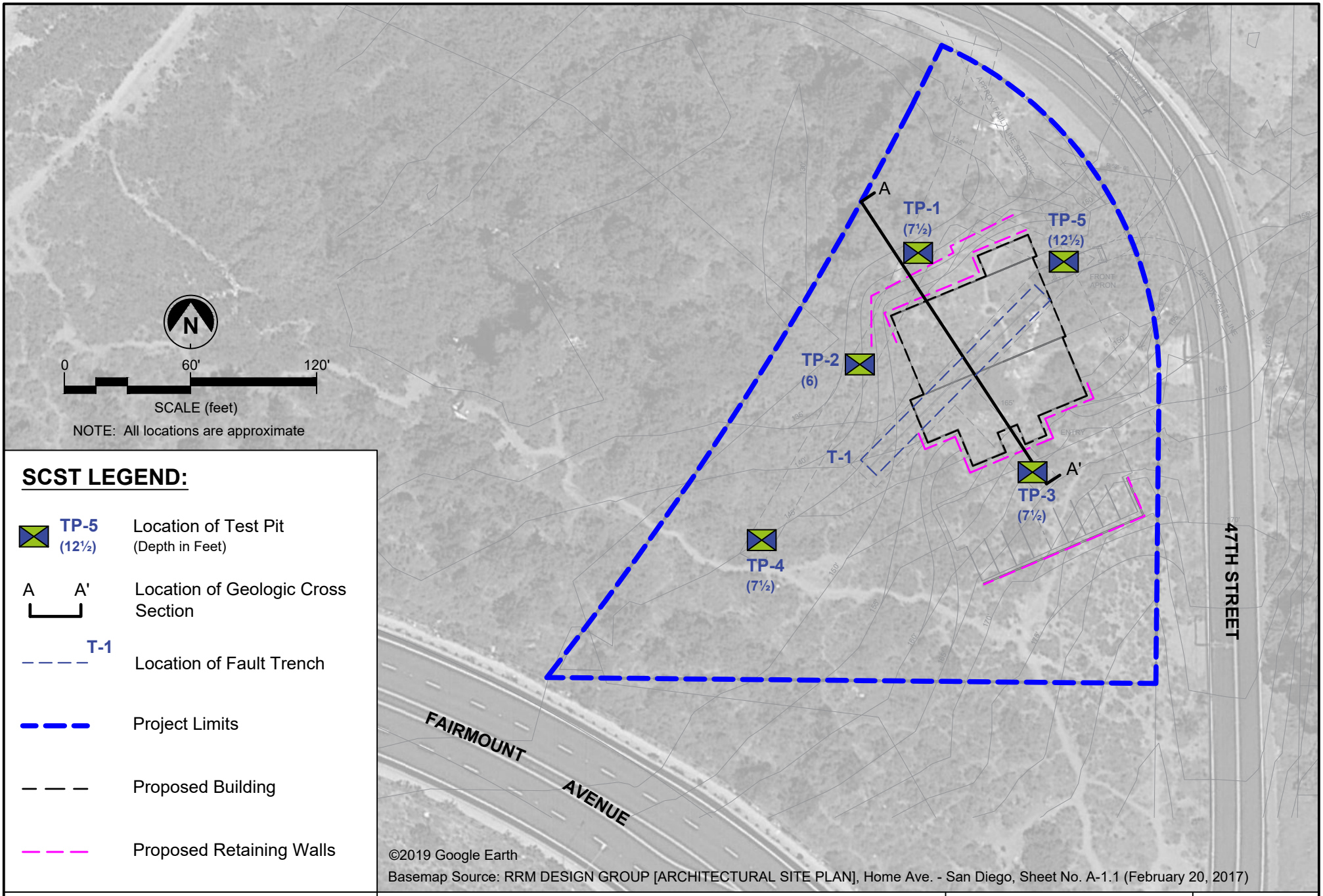


SCST, LLC	**SITE VICINITY MAP** Fairmount Avenue Fire Station San Diego, California	Date: March, 2019 By: NNW Job No.: 170446P4-1	Figure: 1



SCST LEGEND:

- TP-5 (12½) — Location of Test Pit (Depth in Feet)
- A A' — Location of Geologic Cross Section
- T-1 — Location of Fault Trench
- Project Limits
- Proposed Building
- Proposed Retaining Walls

Basemap Source: RRM DESIGN GROUP [ARCHITECTURAL SITE PLAN], Home Ave. - San Diego, Sheet No. A-1.1 (February 20, 2017)

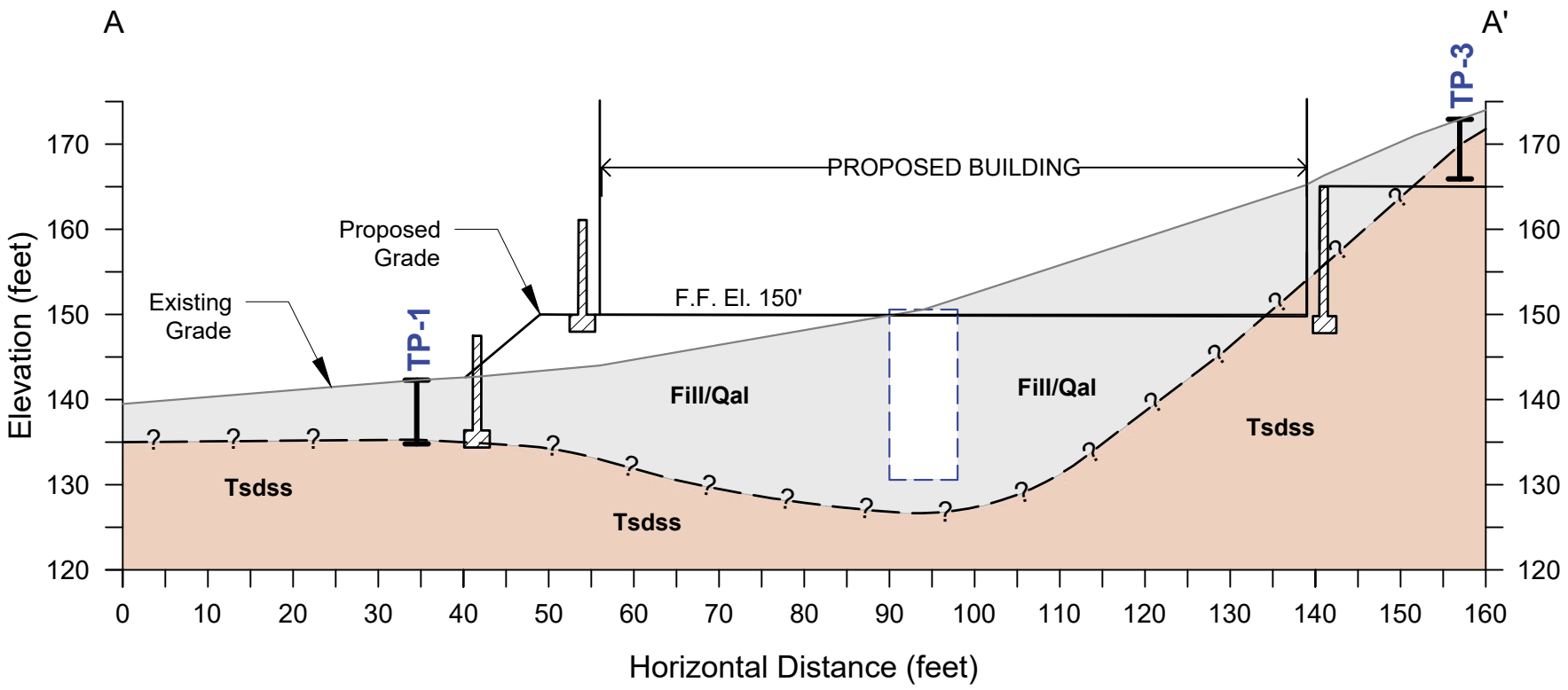
SCST, LLC

SUBSURFACE EXPLORATION MAP

Fairmount Avenue Fire Station
San Diego, California

Date: March, 2019
By: NNW
Job No.: 170446P4-1

Figure: 2



SCST LEGEND:

TP-3 — Location of Boring

Location of Proposed Retaining Wall

Fill/Qal — Fill/ alluvium

Tsdss — San Diego Formation, marine sandstone

Fault Trench

—?—?— Geologic Contact, Queried Where Uncertain

SCALE

AS SHOWN

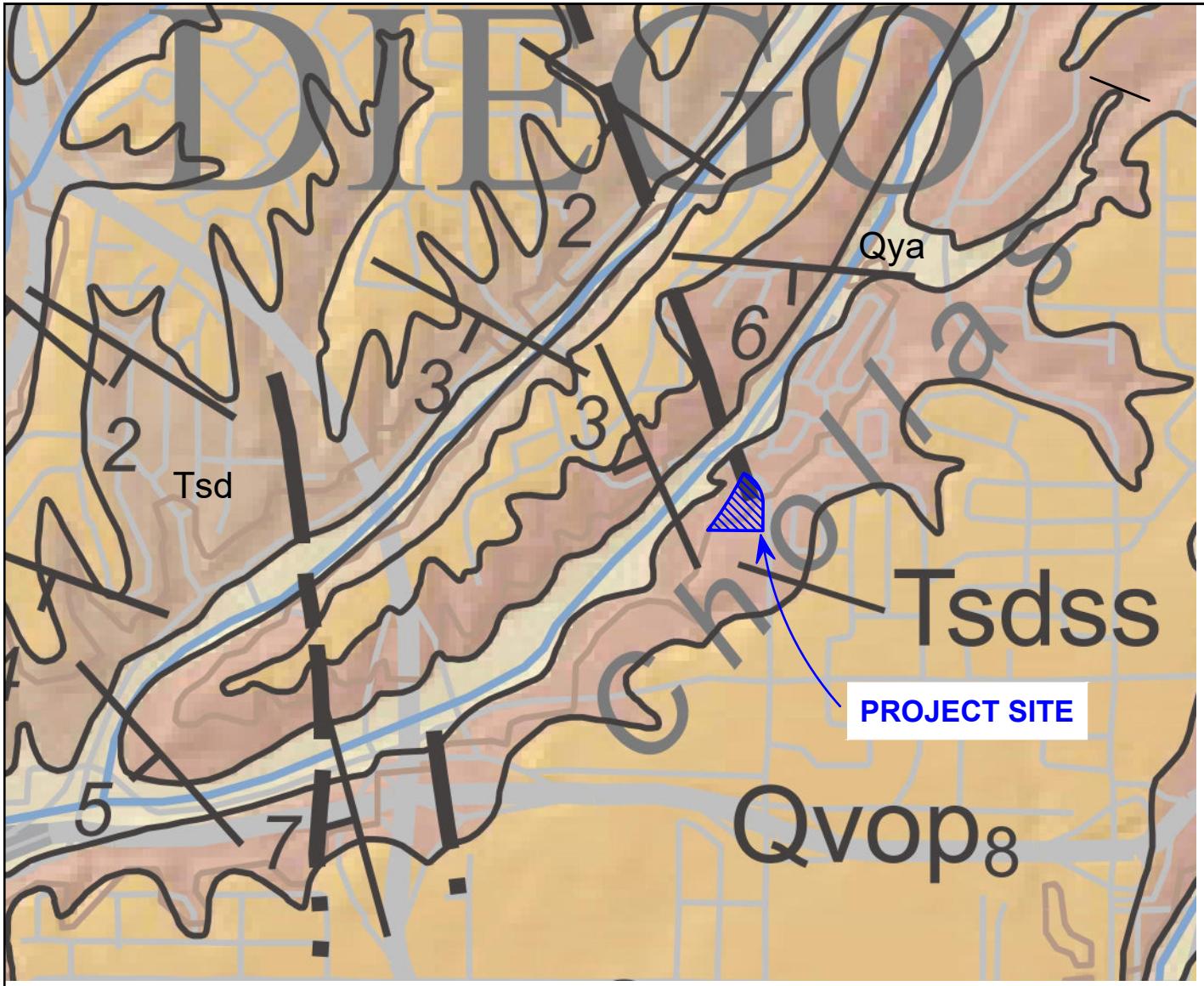
NOTE: All locations and depths are approximate.

SCST, LLC

GEOLOGIC CROSS SECTION
Fairmount Avenue Fire Station
San Diego, California

Date: March, 2019
By: MAW/NNW
Job No.: 170446P4-1

Figure: 3



EXPLANATION:

Qya	Young alluvial flood-plain deposits
$Qvop_8$	Very old paralic deposits, various
Tsd	San Diego Formation, undivided
Tsdss	San Diego Formation, marine sandstone

4 — **Strike** and **dip** of beds

70 U D — **Fault** - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.

N

0 2,000' 4,000'

SCALE (feet)

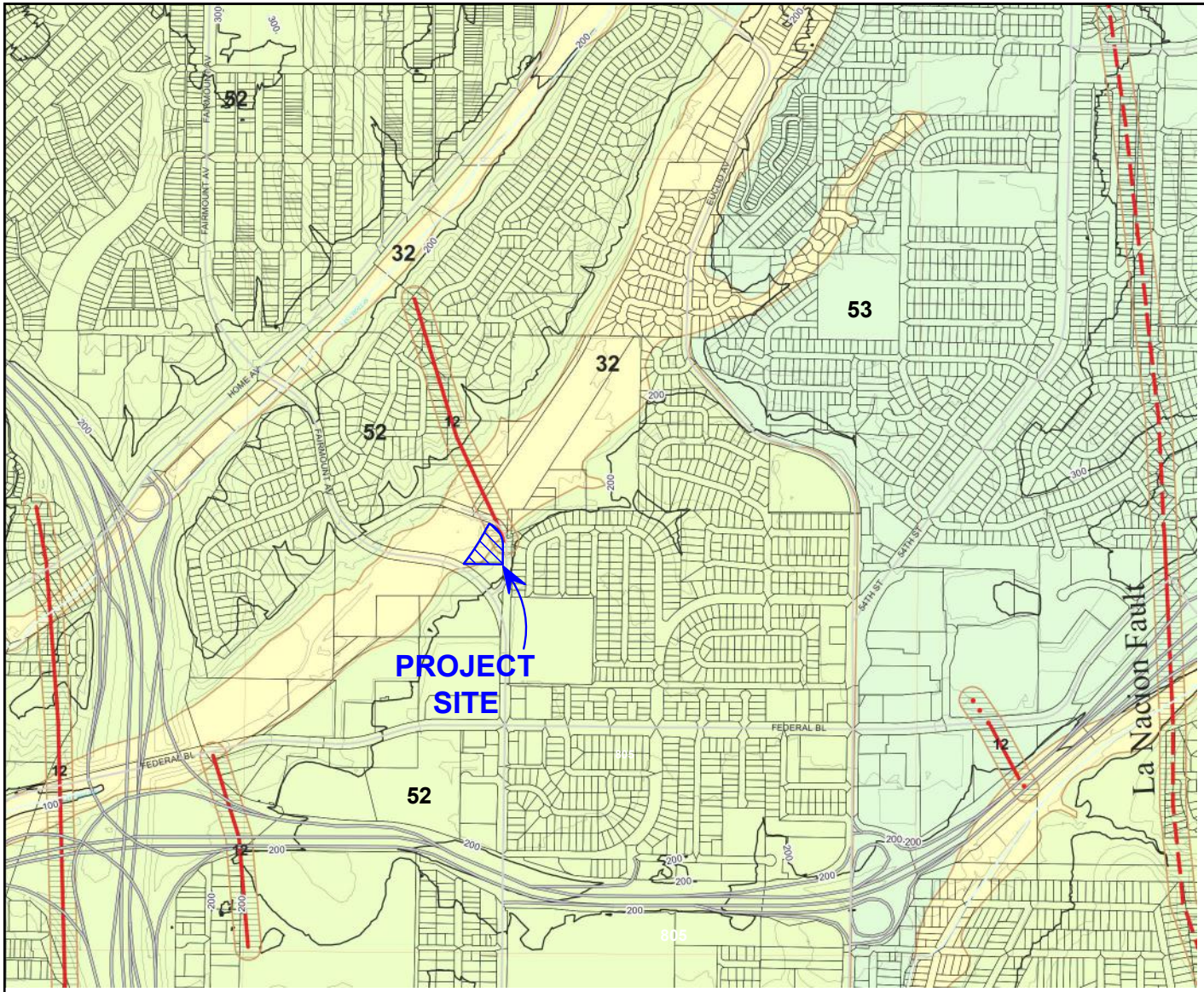
Reference:
Kennedy, M.P. and Tan, S.S. (2008), Geologic Map of the San Diego 30' x 60' Quadrangle, California, California Geological Survey, Scale 1:100,000

SCST, LLC

REGIONAL GEOLOGY MAP
Fairmount Avenue Fire Station
San Diego, California

Date: March, 2019
By: NDK/NNW
Job No.: 170446P4-1

Figure: 4



EXPLANATION:

FAULT ZONES

- 12 — Potentially Active, Inactive, Presumed Inactive, or Activity Unknown

SLIDE-PRONE FORMATIONS

- 27 — Otay, Sweetwater, and others

LIQUEFACTION

- 32 — Low Potential -- fluctuating groundwater; minor drainages

OTHER TERRAIN

- 52 — Other level areas, gently sloping to steep terrain, favorable geologic structure; Low risk
- 53 — Level or sloping terrain, unfavorable geologic structure; Low to moderate risk

FAULTS

- Fault
- Inferred Fault
- Concealed Fault
- Shear Zone

N

0 1,250' 2,500'

SCALE (feet)

Reference:
City of San Diego (2008), Seismic Safety Study, Geologic Hazards and Faults, Grid Tile: 18, Development Services Department, April 3, Scale 1:800.

SCST, LLC

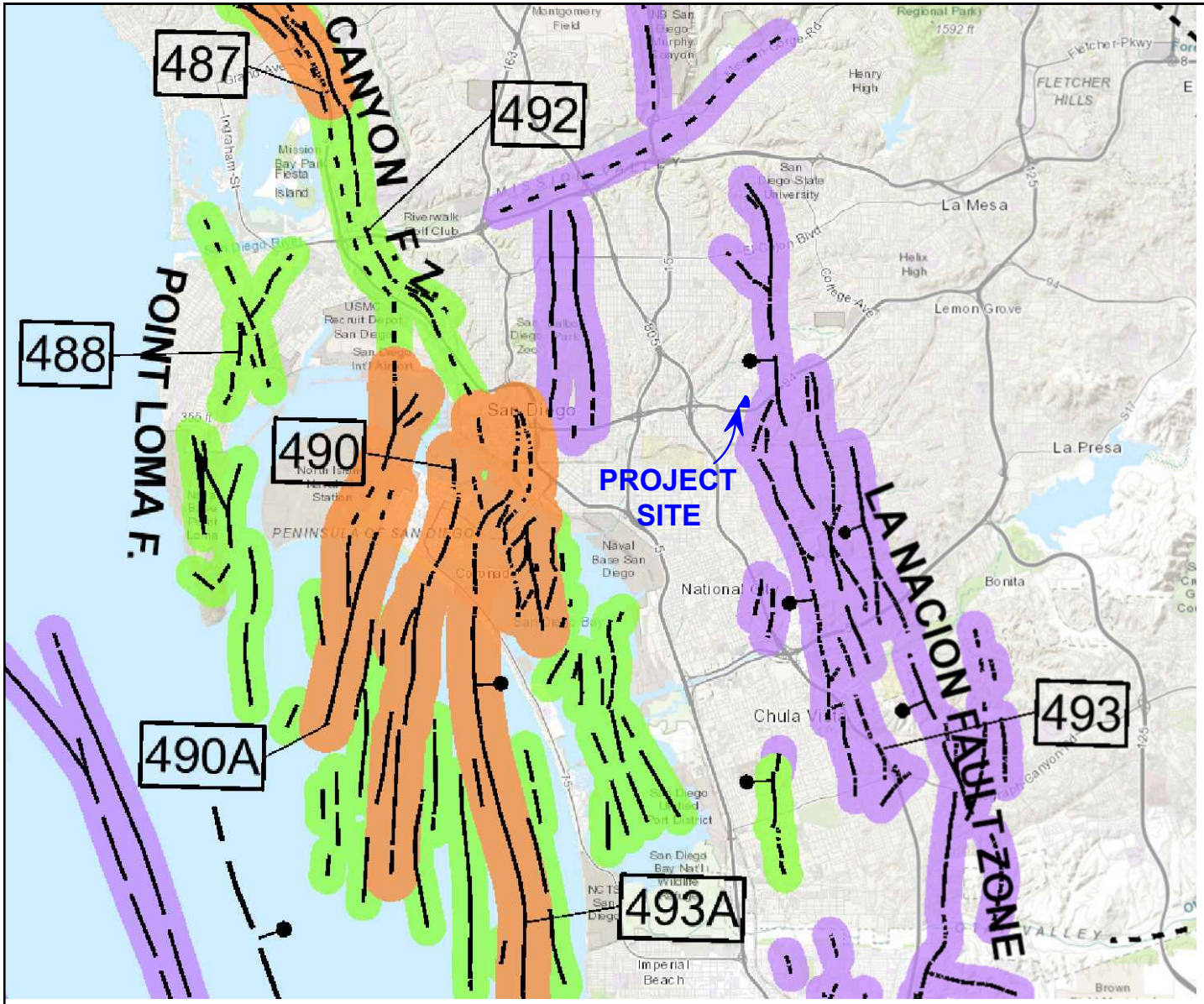
AN ATLAS COMPANY

CITY OF SAN DIEGO SEISMIC SAFETY MAP

Fairmount Avenue Fire Station
San Diego, California

Date: March, 2019
By: NDK/NNW
Job No.: 170446P4-1

Figure: 5



EXPLANATION:

Holocene fault displacement (during past 11,700 years) without historic record.

Late Quaternary fault displacement (during past 700,000 years).

Quaternary fault (age undifferentiated).

Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement.

Bar and ball on downthrown side (relative or apparent).

487	Mission Bay Fault (concealed)
488	Point Loma Fault (certain)
490	Coronado Fault (certain)
490A	Spanish Bight Fault (certain)
492	Old Town Fault (concealed)
493	Sweetwater Fault (approximately located)
493A	Silver Strand Fault (certain)

N

0 15,000' 30,000'

SCALE (feet)

Reference:
Jennings, C.W., Bryant W.A., Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, Fault Activity Map or California (2010)

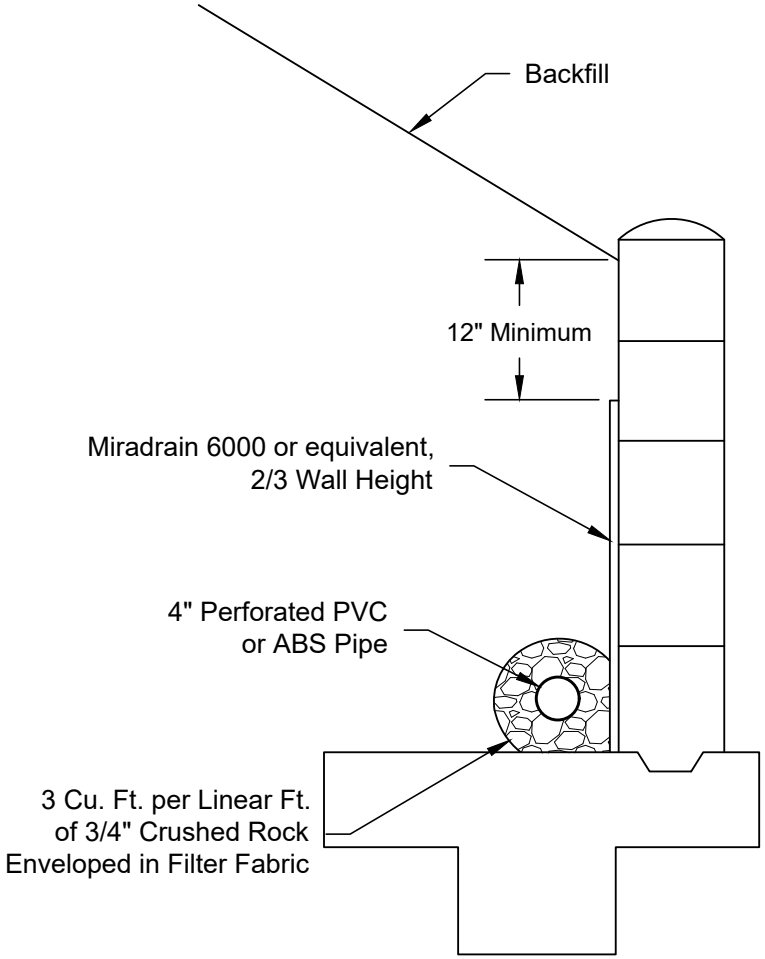
SCST, LLC

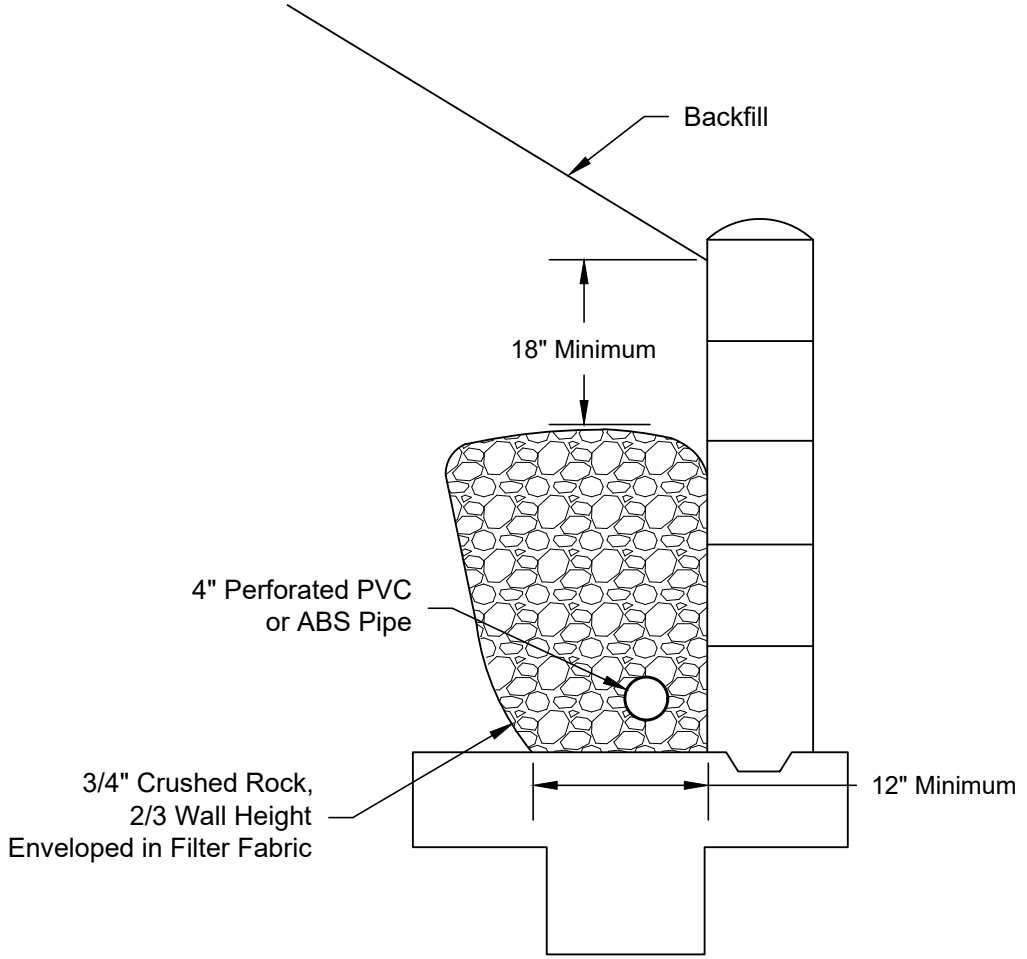
FAULT MAP

Fairmount Avenue Fire Station
San Diego, California

Date: March, 2019
By: NDK/NNW
Job No.: 170446P4-1

Figure: 6





NOT TO SCALE

NOTES:

1) Dampproof or waterproof back of wall following architect's specifications.
2) 4" minimum perforated pipe, SDR35 or equivalent, holes down, 1% fall to outlet. Provide solid outlet pipe at suitable locations.
3) Drain installation and outlet connection should be observed by the geotechnical consultant.

SCST, LLC	**TYPICAL RETAINING WALL BACKDRAIN DETAILS** Fairmount Avenue Fire Station San Diego, California	Date: March, 2019 By: NNW Job No.: 170446P4-1	Figure: 7

APPENDIX I
FIELD INVESTIGATION

The subsurface conditions were explored by excavating five test pits to depths between about 6 and 12½ feet below the existing ground surface. An approximately 100-foot-long fault trench was excavated across the site to a depth of 8 feet. An SCST engineer and geologist logged the test pits and fault trench and collected samples of the materials encountered for geotechnical laboratory testing. SCST tested select samples from the test pits and fault trench to evaluate pertinent soil classification and engineering properties and to assist in developing geotechnical conclusions and recommendations.

The soils are classified in accordance with the Unified Soil Classification System as illustrated on Figure I-1. Logs of the borings and test holes are presented on Figures I-2 through I-28.

SUBSURFACE EXPLORATION LEGEND

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION		GROUP SYMBOL	TYPICAL NAMES
I. COARSE GRAINED, more than 50% of material is larger than No. 200 sieve size.			
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		GC	Clayey gravels, poorly graded gravel-sand, clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines.
		SP	Poorly graded sands, gravelly sands, little or no fines.
		SM	Silty sands, poorly graded sand and silty mixtures.
		SC	Clayey sands, poorly graded sand and clay mixtures.
II. FINE GRAINED, more than 50% of material is smaller than No. 200 sieve size.			
	SILTS AND CLAYS (Liquid Limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays or low plasticity.
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity.
III. HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.

SAMPLE SYMBOLS

- ☒ - Bulk Sample
- CAL - Modified California Sampler
- CK - Undisturbed Chunk sample
- MS - Maximum Size of Particle
- ST - Shelby Tube
- SPT - Standard Penetration Test sampler

GROUNDWATER SYMBOLS

- ▽ - Water level at time of excavation or as indicated
- ≈ - Water seepage at time of excavation or as indicated

LABORATORY TEST SYMBOLS

- AL - Atterberg Limits
- CON - Consolidation
- COR - Corrosivity Tests (Resistivity, pH, Chloride, Sulfate)
- DS - Direct Shear
- EI - Expansion Index
- MAX - Maximum Density
- RV - R-Value
- SA - Sieve Analysis

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	PFL	Date:	March, 2019
Job Number:	170446N-1	Figure:	I-1

LOG OF BORING TP-1

Date Drilled: 1/29/2019 | Logged by: DJR
Equipment: Excavator | Reviewed by: JG
Elevation (ft): 142 | Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SM	**FILL (Qf) / ALLUVIUM (Qal):** SILTY SAND, loose, dark brown, moist, fine to medium grained.							
2		Light brown.							
3		Dark brown, organic rich, few coarse gravel.							
4	SP	**ALLUVIUM (Qal):** POORLY GRADED SAND, light brown, moist, fine to coarse grained.							
5									
6									
7		**SAN DIEGO FORMATION (Tsdss):** SILTY SANDSTONE, gray, moist to wet, strongly cemented.							
8		**TEST PIT TERMINATED AT 7½ FEET, SIDEWALLS COLLAPSED.**							
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	PFL	Date:	March, 2019
Job Number:	170446N-1	Figure:	I-2

LOG OF BORING TP-2

Date Drilled: 1/29/2019 | Logged by: DJR
Equipment: Excavator | Reviewed by: JG
Elevation (ft): 143 | Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SM	**FILL (Qf) / ALLUVIUM (Qal):** SILTY SAND with GRAVEL, loose, brown, moist, organics, fine to coarse grained, some cobble. Dark brown, mostly cobble.							
2									
3									
4		Medium dense, light brown.							
5									
6		**SAN DIEGO FORMATION (Tsdss):** SILTY SANDSTONE, light brown and gray, wet, moderately cemented. **TEST PIT TERMINATED AT 6 FEET.**							
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	PFL	Date:	March, 2019
Job Number:	170446N-1	Figure:	I-3

LOG OF BORING TP-3

Date Drilled: 1/29/2019 | Logged by: KH
Equipment: Excavator | Reviewed by: JG
Elevation (ft): 173 | Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf	LABORATORY TESTS
1	SC-SM	**FILL (Qf) / ALLUVIUM (Qal):** SILTY, CLAYEY SAND, loose, dark brown, moist, fine to coarse grained, organic rich, few cobbles.							
2	SM	SILTY SAND, loose, light brown, moist, fine to coarse grained.							
3		**SAN DIEGO FORMATION (Tsdss):** SILTY SANDSTONE, light brown, moist, fine to coarse grained, weakly cemented.							
4									
5		Moderately cemented.							
6		Few cobbles.							
7		Light gray.							
8		**TEST PIT TERMINATED AT 7½ FEET.**							
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	PFL	Date:	March, 2019
Job Number:	170446N-1	Figure:	I-4

LOG OF BORING TP-4

Date Drilled: 1/29/2019 | Logged by: KH
Equipment: Excavator | Reviewed by: JG
Elevation (ft): 154 | Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SM	**FILL(Qf) / ALLUVIUM (Qal):** SILTY SAND, loose, dark brown, moist, fine to coarse grained.							
2									
3	GM	SILTY GRAVEL with SAND, brown, moist, medium to coarse grained, some cobbles.							
4									
5									
6									
7		**SAN DIEGO FORMATION (Tsdss):** SILTY SANDSTONE, light brown and gray, moist, moderately cemented.							
8		**TEST PIT TERMINATED AT 7½ FEET.**							
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	PFL	Date:	March, 2019
Job Number:	170446N-1	Figure:	I-5

LOG OF BORING TP-5

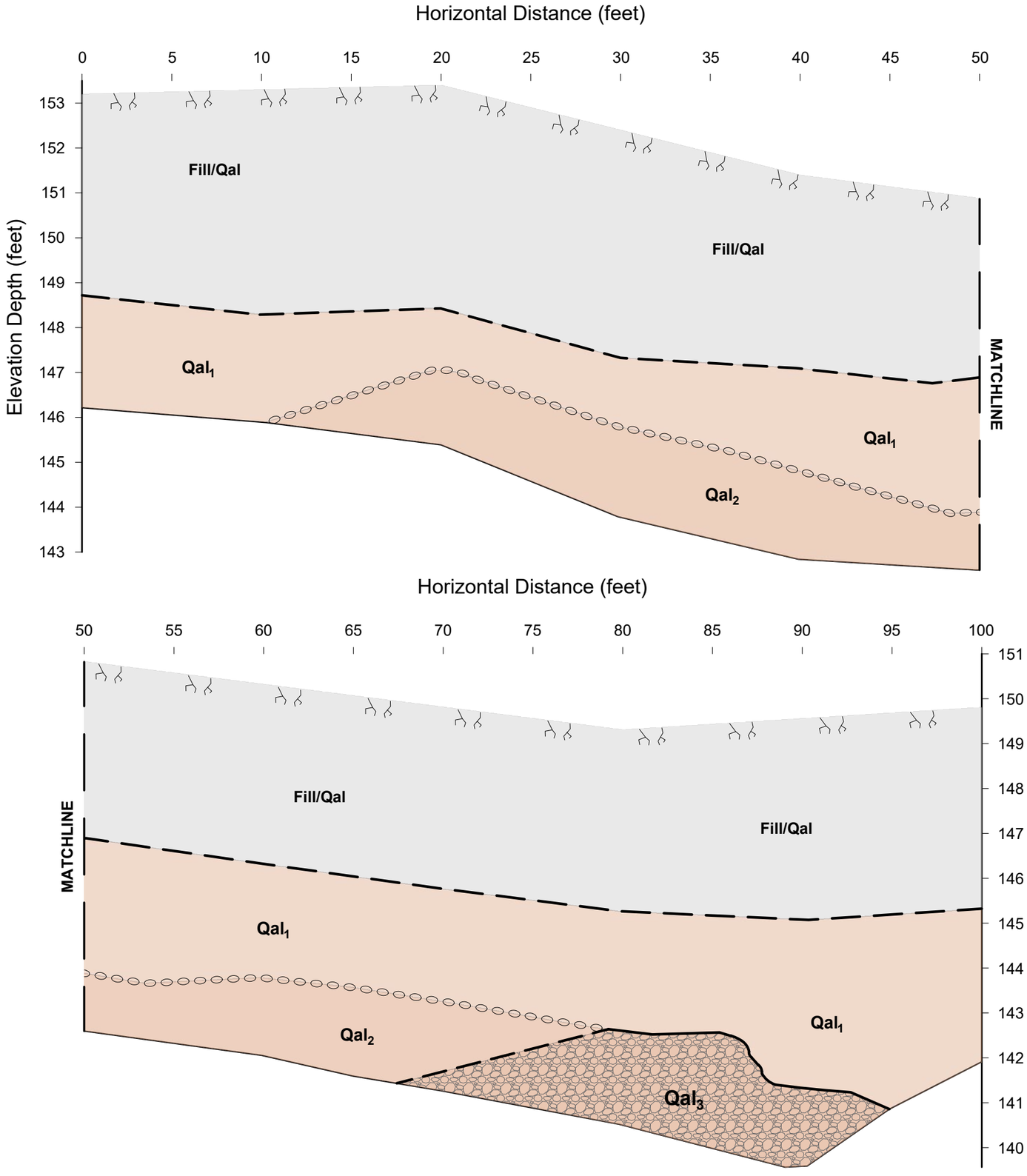
Date Drilled: 1/29/2019 | Logged by: DJR
Equipment: Excavator | Reviewed by: JG
Elevation (ft): 153 | Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVEN	SAMPLES: BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SM	**FILL (Qf):** SILTY SAND, loose, brown to light brown, moist, fine to medium grained, some roots (to 2 inches).							
2									
3		Loose to medium dense, dark brown, moist, medium grained, few organics.							
4									
5	GM	SILTY GRAVEL with SAND, loose, medium brown, moist, medium grained, mostly cobbles.							
6									
7									
8									
9									
10									
11									
12		**SAN DIEGO FORMATION (Tsdss):** SILTY SANDSTONE, light brown and gray, moist, moderately cemented.							
13		**TEST PIT TERMINATED AT 12½ FEET.**							
14									
15									
16									
17									
18									
19									
20									

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	PFL	Date:	March, 2019
Job Number:	170446N-1	Figure:	I-6



SCST LEGEND:

—?— Geologic Contact, Queried Where Uncertain

Cobbles or Boulders

Roots

Fill/Qal — SILTY SAND, loose, brown, moist, fine to coarse grained, abundant organics including roots, few debris (glass, trash, etc.). Locally abundant cobbles (as shown).

Qal_1 — SILTY SAND, loose to medium dense, dark brown, moist, fine to medium grained, fewer organics (roots), few coarse gravel

Qal_2 — SILTY SAND, medium dense, moist, light brown, moist, fine to medium grained.

Qal_3 — SILTY GRAVEL with SAND, medium dense, brown, moist, fine to coarse grained.

Date: March, 2019
By: NNW
Job No.: 170446P4-1

FAULT TRENCH LOG
Fairmount Avenue Fire Station
San Diego, California

SCST, LLC

SCALE
AS SHOWN

Figure:
I-7

APPENDIX II
LABORATORY TESTING

Laboratory tests were performed to provide geotechnical parameters for engineering analyses. The following tests were performed:

- **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.

- **PARTICLE-SIZE DISTRIBUTION:** The particle-size distribution was determined on four samples in accordance with ASTM D422.

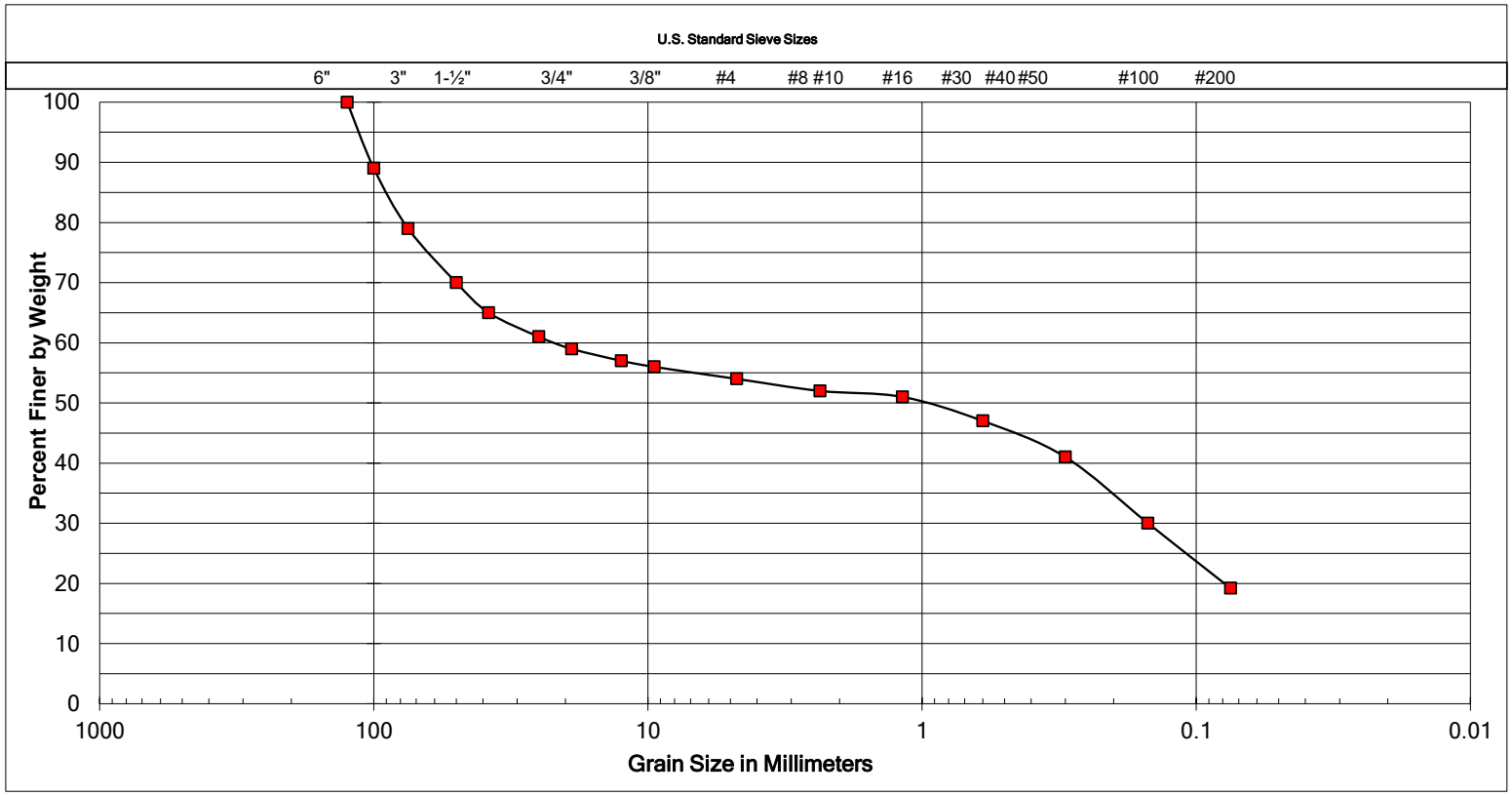
- **EXPANSION INDEX:** The expansion index was determined on one sample in accordance with ASTM D4829.

- **CORROSIVITY**: Corrosivity tests were performed on two samples. The pH and minimum resistivity were determined in general accordance with California Test 643. The soluble sulfate content was determined in accordance with California Test 417. The total chloride ion content was determined in accordance with California Test 422.

- **MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE**: The maximum dry density and optimum moisture content were determined on one soil sample in accordance with ASTM D1557.

- **DIRECT SHEAR:** Direct shear testing was performed on two samples in accordance with ASTM D3080. One was remolded to 90% relative compaction and the other was tested on a chunk sample. The shear stress was applied at a constant rate of strain of 0.003 inch per minute. Soil samples not tested are now stored in our laboratory for future reference and analysis, if needed.

Unless notified to the contrary, all samples will be disposed of 30 days.



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
FT at 80', 3' to 6' depth
SAMPLE NUMBER
37989

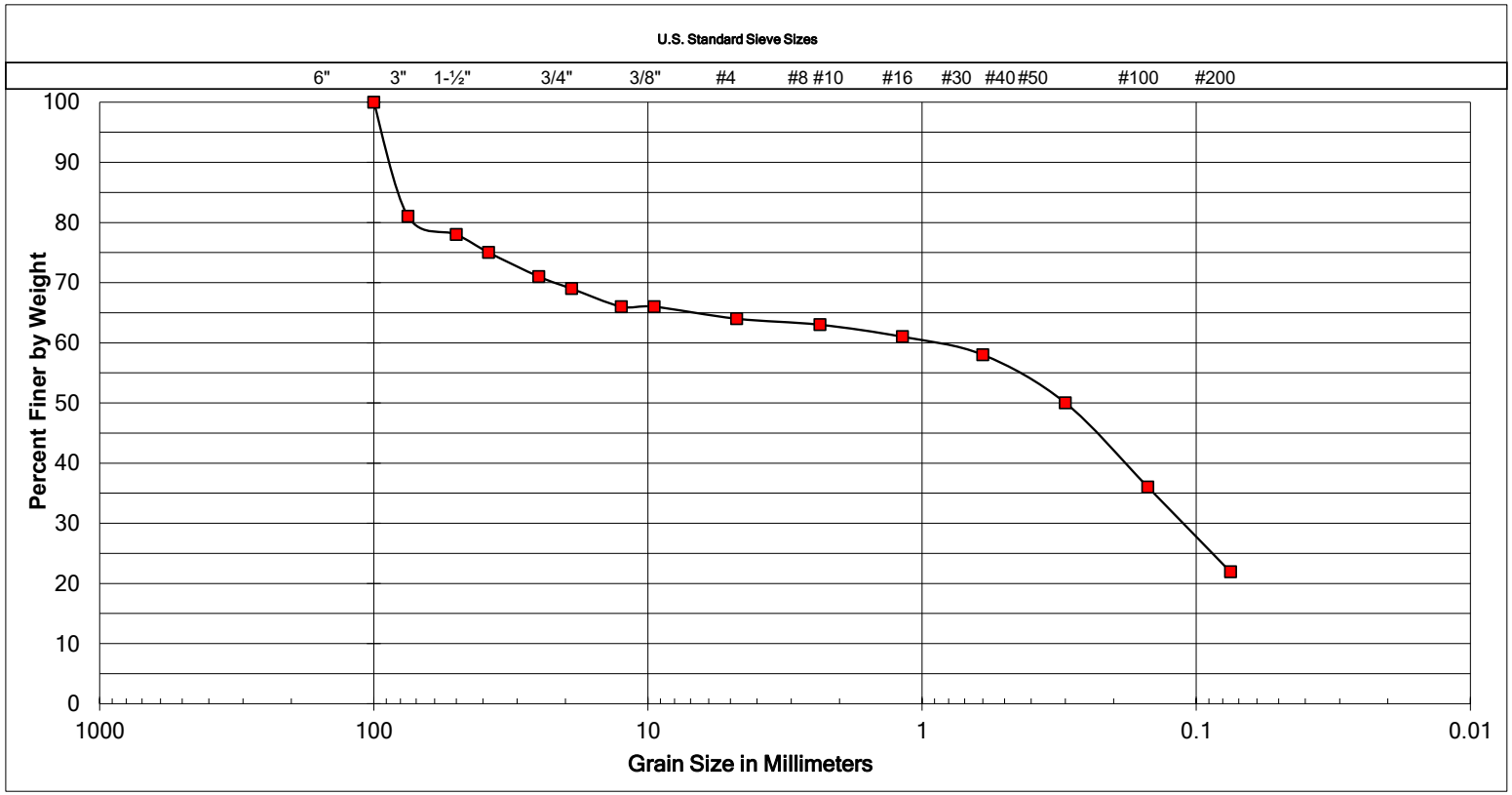
UNIFIED SOIL CLASSIFICATION:	GM
DESCRIPTION	SILTY GRAVEL

ATTERBERG LIMITS	
LIQUID LIMIT	--
PLASTIC LIMIT	--
PLASTICITY INDEX	--

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	CT	Date:	March, 2019
Job Number:	170446P4	Figure:	II-1



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
FT at various locations, at 0 to 2' depth
SAMPLE NUMBER
37990

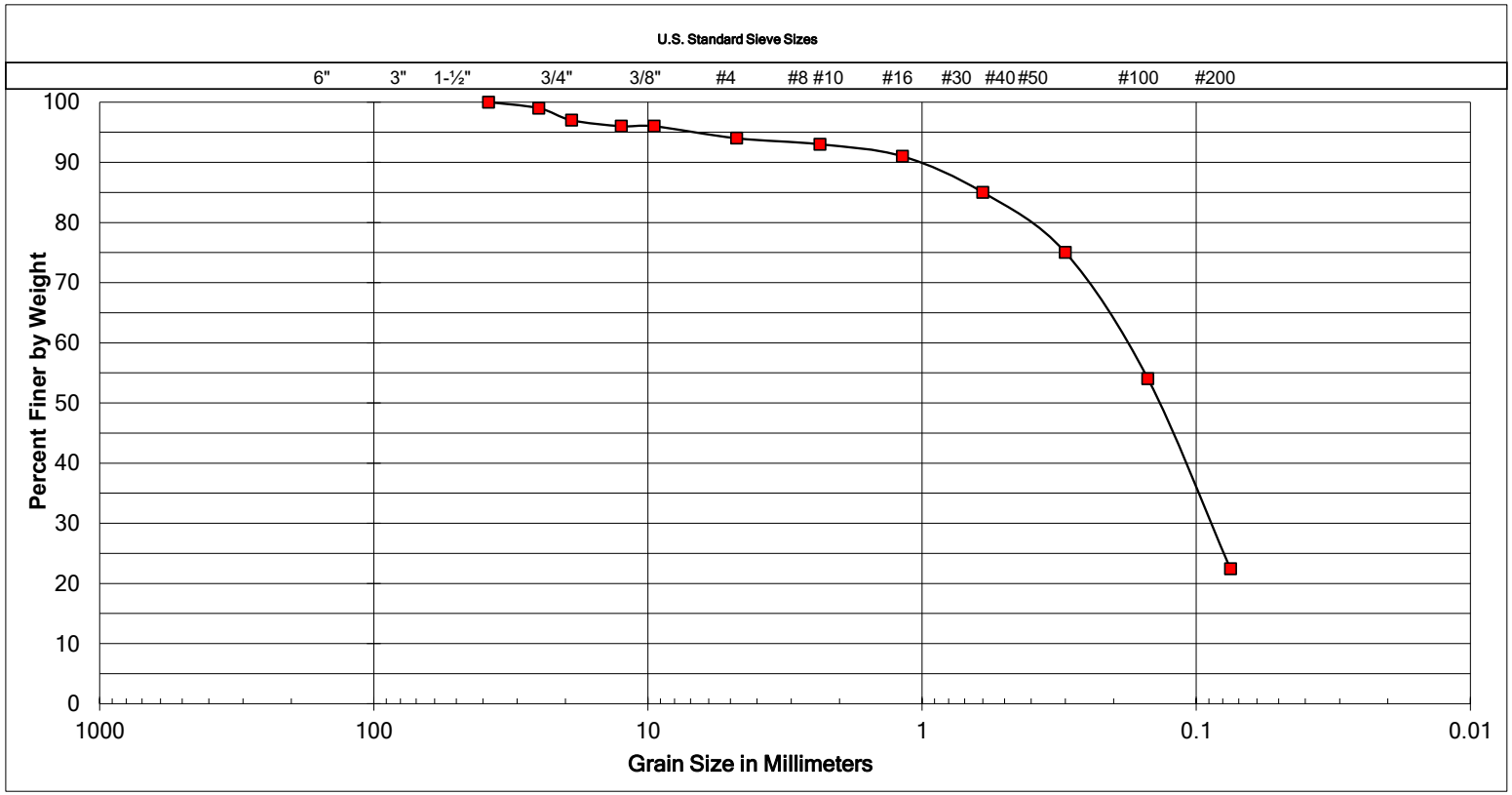
UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND with GRAVEL

ATTERBERG LIMITS	
LIQUID LIMIT	--
PLASTIC LIMIT	--
PLASTICITY INDEX	--

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	CT	Date:	March, 2019
Job Number:	170446P4	Figure:	II-2



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
FT at 38', 2' to 4' depth
SAMPLE NUMBER
37991

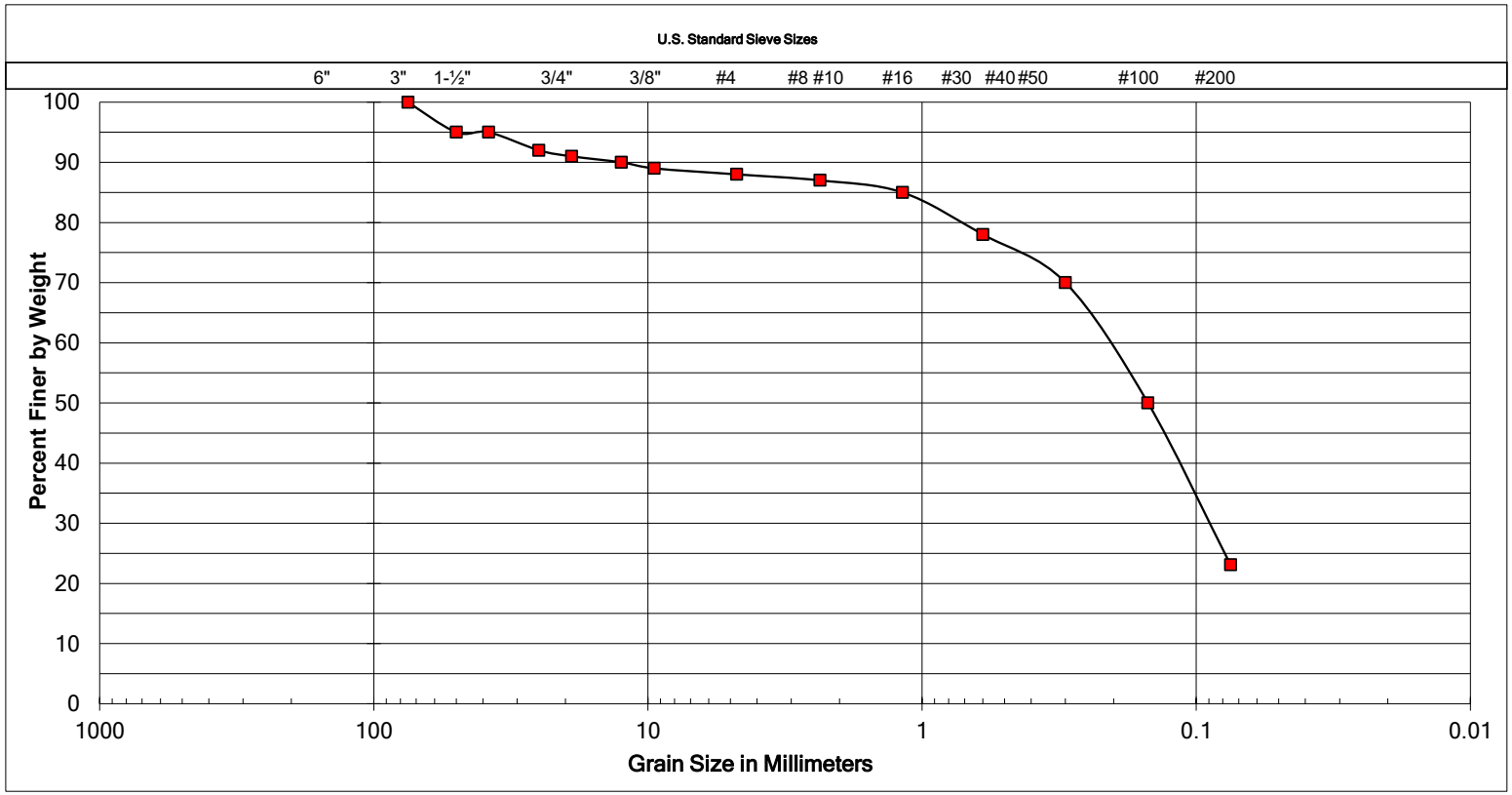
UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	--
PLASTIC LIMIT	--
PLASTICITY INDEX	--

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	CT	Date:	March, 2019
Job Number:	170446P4	Figure:	II-3



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
FT at 40', 4.5 to 5.5' depth
SAMPLE NUMBER
37992

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	--
PLASTIC LIMIT	--
PLASTICITY INDEX	--

SCST, LLC

Fairmount Avenue Fire Station
San Diego, California

By:	CT	Date:	March, 2019
Job Number:	170446P4	Figure:	II-4

EXPANSION INDEX

ASTM D2489

SAMPLE	DESCRIPTION	EI
FT at 38', 2' to 4' depth	SILTY SAND	16

Classification of Expansive Soil [1]

EXPANSIVE INDEX	POTENTIAL EXPANSION
1-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

1. ASTM - D4829

MAXIMUM DENSITY AND OPTIMUM MOISTURE

ASTM D1557

SAMPLE	DESCRIPTION	MAXIMUM DENSITY (pcf)	OPTIMUM MOISTURE (%)
FT at 38', 2' to 4' depth	SILTY SAND	123.7	10.9

SAND EQUIVALENT

ASTM D2419

SAMPLE	DESCRIPTION	SE VALUE
FT at 38', 2' to 4' depth	SILTY SAND	14
FT at various , 0' to 2' depth	SILTY SAND with GRAVEL	12

ORGANIC MATTER

ASTM D2974

SAMPLE	DESCRIPTION	Organic Matter (%)
TP-2 at 3½ to 5 feet	SILTY SAND with GRAVEL	2.3

RESISTIVITY, pH, SOLUBLE CHLORIDE and SOLUBLE SULFATE

pH & Resistivity (Cal 643, ASTM G51)

Soluble Chlorides (Cal 422)

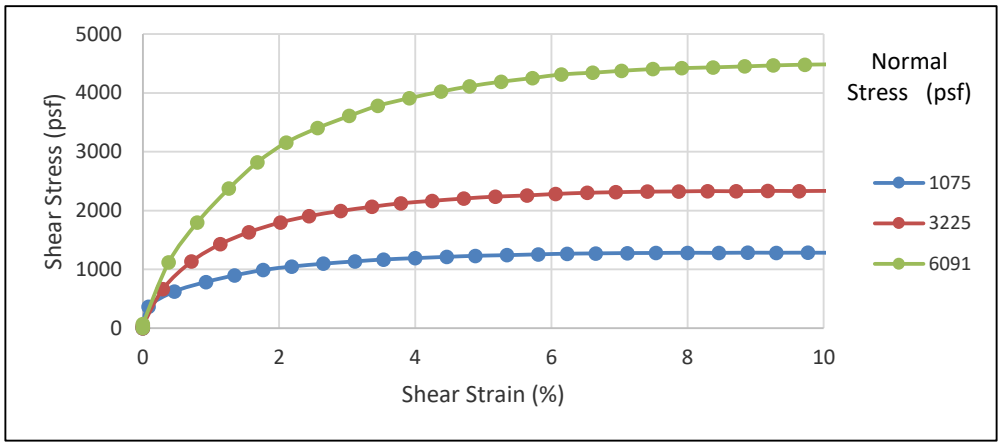
Soluble Sulfate (Cal 417)

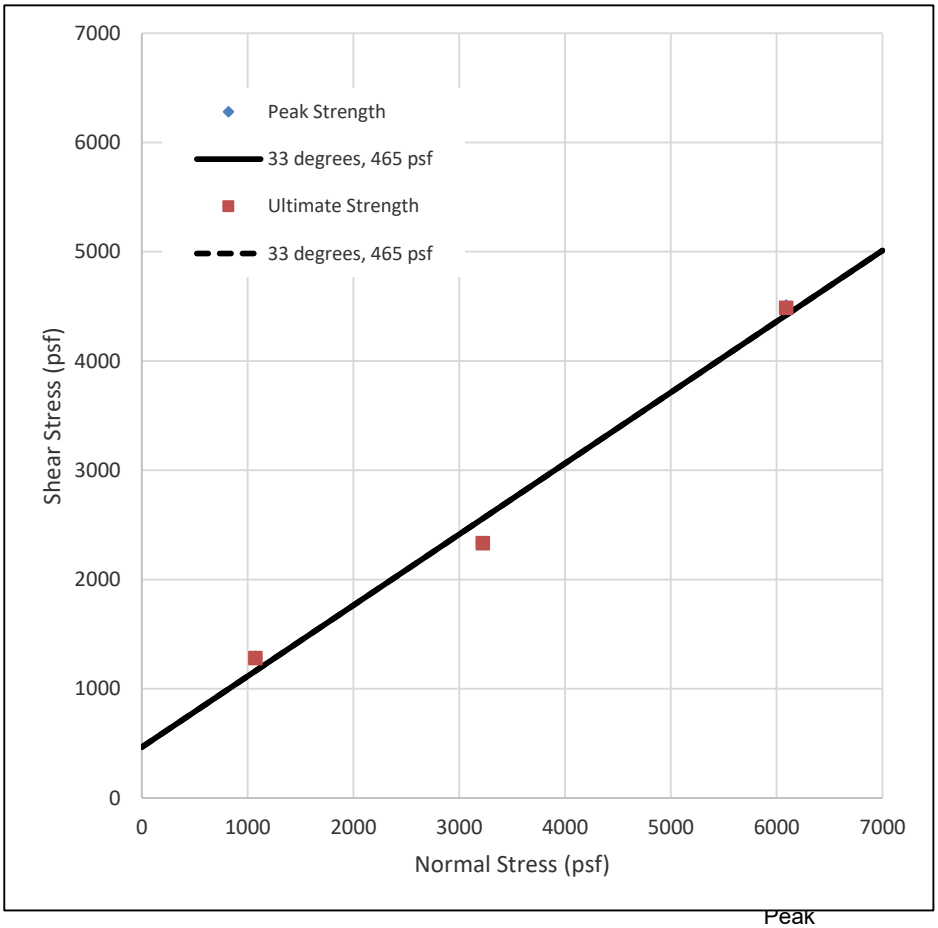
SAMPLE	RESISTIVITY (Ω-cm)	pH	CHLORIDE (%)	SULFATE (%)
FT at 38', 2' to 4' depth	1980	7.31	0.230	0.001

WATER-SOLUBLE SULFATE (SO_4^{2-}) EXPOSURE

Modified from ACI 318-14 Table 19.3.1.1 and Table 19.3.2.1

Water-soluble sulfate (SO_4^{2-}) in soil, percent by weight	Exposure Severity	Exposure Class	Cement Type (ASTM C150)	Max. w/cm	Min. f_c' (psi)
$SO_4^{2-} < 0.10$	Not applicable	S0	No type restriction	N/A	2,500
$0.10 \le SO_4^{2-} < 0.20$	Moderate	S1	II	0.50	4,000
$0.20 \le SO_4^{2-} < 2.00$	Severe	S2	V	0.45	4,500
$SO_4^{2-} > 2.00$	Very Severe	S3	V plus pozzolan or slag cement	0.45	4,500





SAMPLE ID: FT at 38', 2' to 4' depth

Silty Sand

NOTES: Remolded

Strain Rate: 0.003 in/min

Sample was consolidated and drained

	Peak	Ultimate
Φ	33 °	33 °
c	465 psf	465 psf
	Initial	Final
γ_d	111.4 pcf	111.4 pcf
w_c	11.2 %	16.5 %
Saturation	60 %	88 %

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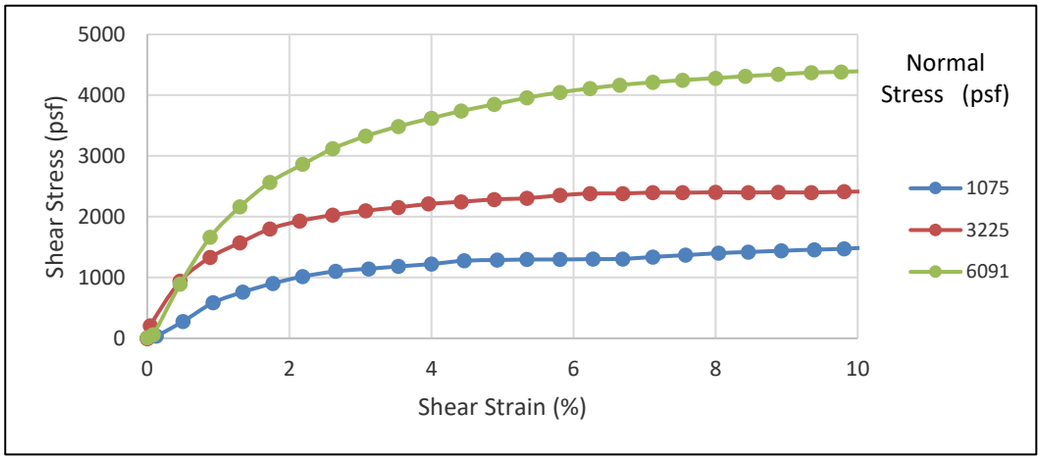
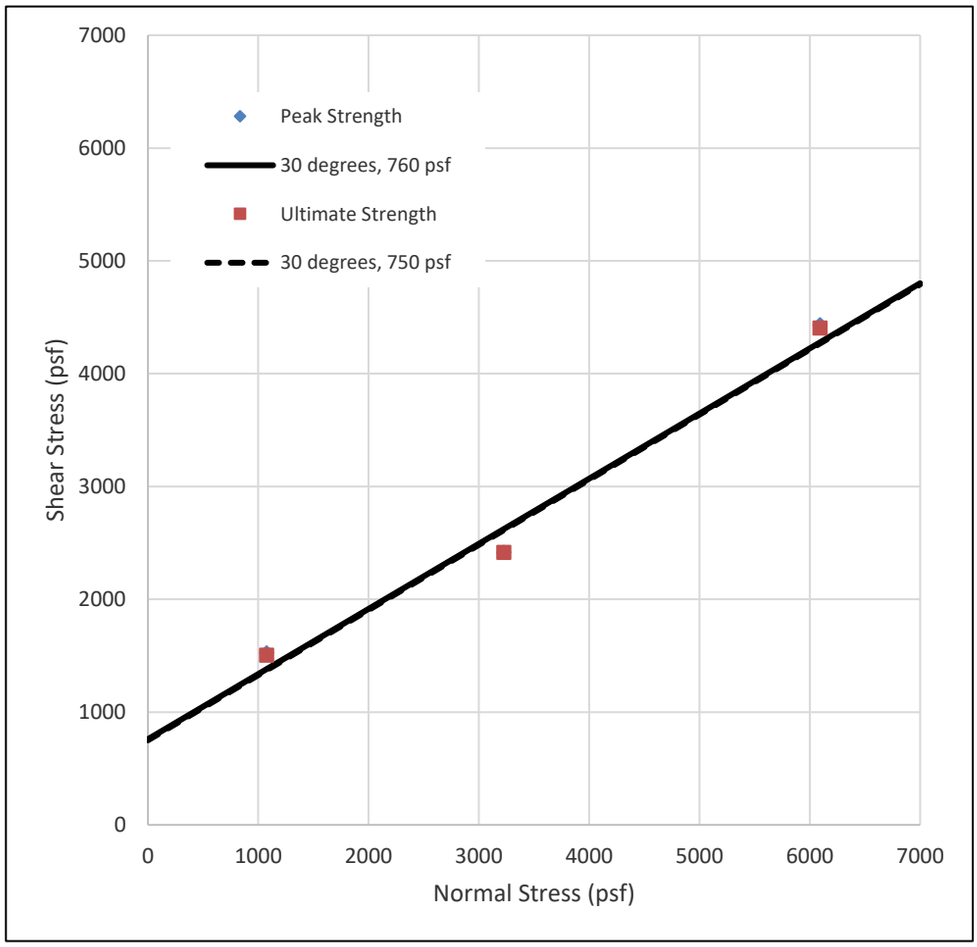
Fairmount Ave Fire Station
San Diego, California

By:	DRB	Date:	March, 2019
Job Number:	170446P4	Figure:	II-6





SAMPLE ID: TP-3 at 6 to 7½ feet

Silty Sandstone, San Diego Formation

NOTES: Remolded

Strain Rate: 0.003 in/min

Sample was consolidated and drained

	Peak	Ultimate
Φ	30 °	30 °
c	760 psf	750 psf

	Initial	Final
γ_d	107.8 pcf	107.8 pcf
w_c	9.3 %	17.5 %
Saturation	45 %	85 %

SCST LLC.

Fairmont Ave Fire Station
San Diego, California

By:	DRB	Date:	March, 2019
Job Number:	170446P4	Figure:	II-7