La Jolla View Reservoir Project
Environmental Impact Report

SCH No. 2018041020 - Project No. 331101

Appendix H2

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

February 2020

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

La Jolla View Reservoir

[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:

REGISTERED PROFESSIONAL ENGINEER
ROMI T. IIDA
No. C72665
Exp. 6-30-2020
CIVIL
STATE OF CALIFORNIA

[Insert Civil Engineer's Name and PE Number]

Provide Wet Signature and Stamp Above Line

Prepared For:

City of San Diego

525 B Street, Suite 750

San Diego, CA 92101

619-533-4207

Prepared By:

Infrastructure Engineering Corporation
14271 Danielson St
Poway, CA 92064
858-413-2400

Date:

April 11, 2019

Approved by: City of San Diego Date

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Project Name: La Jolla View Reservoir

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Acronyms

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	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:
Permit Application

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

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

Engineer of Work's Signature

72665

PE#

6-30-2020

Expiration Date

Romi T. Iida

Print Name

Infrastructure Engineering Corporation

Company

April 11, 2019

Date

Engineer's Stamp

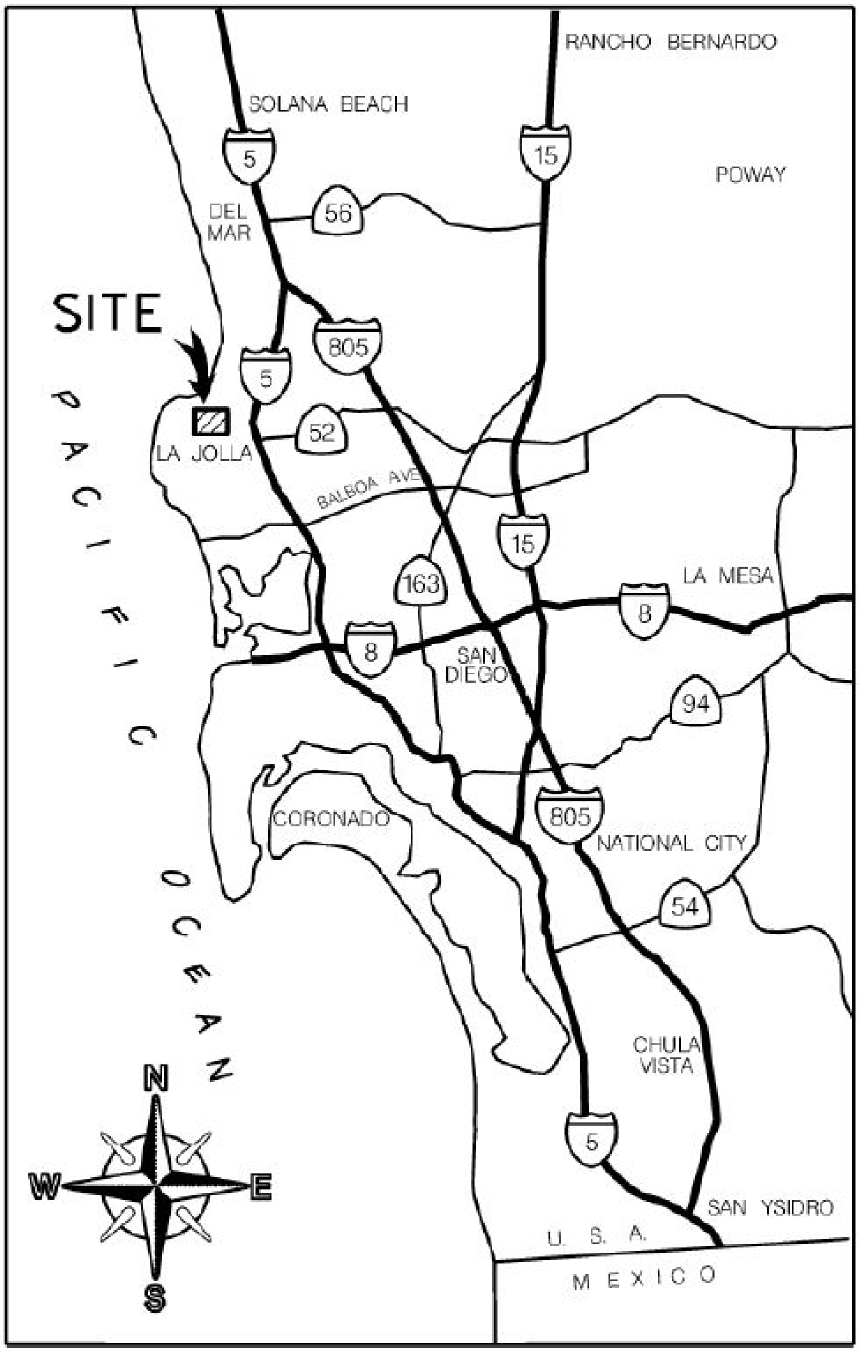
Submittal Record

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

Submittal Number	Date	Project Status	Changes
1	11/14/2018	☑ **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: La Jolla View Reservoir
Permit Application



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

Attach DS-560 form.

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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
OCTOBER 2016

Project Address: 7350 Encelia Dr. La Jolla, CA 92037: P#331101	Project Number *(for City Use Only)*:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the 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 Water Resources Control Board.

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

PART A: Determine Construction Phase Storm Water Requirements.

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 contact with storm water runoff?

☐ Yes; WPCP required, skip 3-4 ☐ No; next question

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

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

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

- 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 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.
   b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ **Medium Priority**
   a. Projects 1 acre or more but not subject to an ASBS or high priority designation.
   b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**
   a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

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	☒

Anders Egense, PE	Sr. Project Manager, Infrastructure Engineering Corp.
Name of Owner or Agent *(Please Print)*	Title
[signature]	04/11/2019
Signature	Date

Applicability of Permanent, Post-Construction Storm Water BMP Requirements			Form I-1
Project Identification			
Project Name: La Jolla View Reservoir			
Permit Application Number:			Date: 11/14/18
Determination of Requirements			
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.			
Step	**Answer**	**Progression**	
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.	
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.	
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):			
Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply	
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.	
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.	
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:			

Project Name: La Jolla View Reservoir

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 (<u>not required if prior lawful approval does not apply</u>):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to **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 <u>not</u> apply: Project's DMAs are classified as Self-mitigating and drainage report demonstrates that proposed condition peak design flow is less than existing condition peak flow at the points of compliance; thus project does not require an energy dissipation system to mitigate outlet discharge velocity and the project is exempt from Hydromodification Management requirements per Section 6.1 of the manual.		
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 <u>not</u> apply: Protection of critical course sediment yield areas is not applicable for a project that is exempt from Hydromodification Management requirements. Please see discussion described in Step 4 above for Hydromodification Management exemption.		

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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HMP Exemption Exhibit – N/A

The Project's DMAs are classified as Self-mitigating. The proposed added and replaced impervious area for each DMA is less than 5% of the total area of each DMA. The Drainage Report demonstrates that the proposed condition peak design flow is less than existing condition peak flow at the points of compliance; thus project does not require an energy dissipation system to mitigate outlet discharge velocity and the project is exempt from Hydromodification Management requirements per Section 6.1 of the Storm Water Standards Manual.

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	La Jolla View Reservoir
Project Address	La Jolla View Reservoir - 7350 Encelia Drive, La Jolla, CA 92037 Exchange Place Reservoir - 7625-7639 Country Club Drive, La Jolla, CA 92037
Assessor's Parcel Number(s) (APN(s))	350-680-05, 350-512-06
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)	Scripps HA (906.30)
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	43.5 Acres (1,894,900 Square Feet)
Area to be disturbed by the project (Project Footprint)	7.7 Acres (335412 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	0.17 Acres (7,500 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	7.53 Acres (328,000 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	-290 %

Project Name: La Jolla View Reservoir

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: Project consists of two sites: La Jolla View Reservoir and Exchange Place Reservoir. The La Jolla View Reservoir consist of an existing reservoir tank, valve vault, and paved access road, as well as areas of mostly steep and undeveloped vegetated open space. The Exchange Place Reservoir site consists of an existing reservoir tank, pump station building, valve vaults, and paved access road.
Existing Land Cover Includes (select all that apply): ☑Vegetative Cover ☐Non-Vegetated Pervious Areas ☑Impervious Areas Description / Additional Information: Impervious areas of the La Jolla View Reservoir site include a reservoir tank, valve vault and paved access road. Open space area includes vegetative cover. Impervious areas of the Exchange Place Reservoir site includes an existing reservoir tank, pump station building, valve vaults and paved access road. Vegetative cover of the Exchange Place Reservoir include the perimeter slopes of the site.
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐NRCS Type A ☐NRCS Type B ☑NRCS Type C ☑NRCS Type D
Approximate Depth to Groundwater: ☐Groundwater Depth < 5 feet ☐5 feet < Groundwater Depth < 10 feet ☐10 feet < Groundwater Depth < 20 feet ☑Groundwater Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☐Watercourses ☐Seeps ☐Springs ☐Wetlands ☑None Description / Additional Information: La Jolla View Reservoir site - natural gullies and ravines Exchange Place Reservoir site - none

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 project consists of two sites - La Jolla View Reservoir (APN 350-680-05) and Exchange Place Reservoir (APN 350-512-06). See Attachment 1A, G-3 for the two site locations.

The existing La Jolla View Reservoir site includes an above ground reservoir tank and paved access road. The remaining site is primarily open space with some residential areas around the perimeter of the drainage boundaries.

There is limited run-on from the adjacent properties or streets, as the majority of offsite flow is conveyed around the project's drainage boundaries by Brodiaea Way, Romero Drive, and Country Club Drive.

Existing on-site drainage includes sheet flow on undeveloped slopes which confluences into several small gullies and ravines. The project is divided into two drainage basins with a combined area of 13.5 acres and are denoted as Basin 100 (3.6 acres) and Basin 200 (9.9 acres). Associated flows (including minor run-on from off-site areas) move generally west to two existing outlet (Point of Compliance [POC]) sites at the west ends of the noted basins (POC-1 and POC-2 as depicted on the Existing Condition Hydrology Map in Appendix C of Walker 2018a). After leaving the site, existing flows continue generally north and west for approximately 0.3 mile to the coast via existing City of San Diego storm drain structures.

Current peak 100-year storm flows from the La Jolla View site total approximately 21.1 cubic feet per second (cfs), including 5.1 cfs from Basin 100 (POC-1) and 16 cfs from Basin 200 (POC-2, refer to Table 1 in Walker 2018a).

The existing Exchange Place Reservoir site includes a reservoir tank, pump station building, valve vaults and paved access road. The existing improvements are elevated above street level and surrounded by vegetated slopes. Minimal run-on is anticipated from the adjacent south-easterly vegetated slopes. The existing site drainage sheet flows down to the adjacent streets, Al Bahr Drive and Country Club Drive. Proposed work at the Exchange Place Reservoir consists of demolition only. No impervious improvements will be added or replaced at the site. The project will remove the existing reservoir tank, pump station building and valve vaults. Disturbed areas will be stabilized and vegetated. A drainage report was not prepared for the Exchange Place Reservoir site because the proposed condition will have significantly less impervious area than the existing condition and drainage patterns will remain unchanged. Furthermore, the remainder of this SWQMP will focus only on the La Jolla View Reservoir site.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

Proposed site development at the La Jolla View Reservoir includes construction of a buried reservoir tank and paved access road. Project also includes removal of more than half the existing paved access road and the above grade reservoir tank; ultimately, the total impervious area will be less than existing conditions. All regraded pervious areas will be vegetated with Southern Maritime Chaparral per the project's landscape restoration plan. Site drainage patterns will not substantially alter the existing drainage pattern because the intent of the proposed grading is to restore the area to existing grades. Runoff from the proposed impervious access road will be conveyed via swale and discharge to the landscaped areas. No other stormwater drainage infrastructure is proposed onsite.

The total project site drainage area increases by approximately 0.5 acres in proposed conditions as a result of regrading along the redeveloped portion of the access road, which diverts a relatively small amount of area away from the ravine that is northeast of the site. The area diversion is inconsequential because it represents less than 4% of the total existing condition drainage area, and the total impervious area is reduced in proposed conditions.

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

Impervious features of the La Jolla View Reservoir site includes asphalt concrete paved access roads, concrete pads around two access hatches of the buried reservoir tank and concrete pads for electrical and instrumentation equipment associated with the reservoir tank.

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

All areas disturbed and not designated as impervious as described above will be revegetated

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

Grades will generally be restored to existing conditions except for the area at the proposed reservoir tank and the area at the existing reservoir tank. Elevation of finished grade at the proposed reservoir tank is lower than existing condition in order to minimize soil loads on the buried reservoir tank. Regrading of access road is required to meet the lower finished elevation above the proposed buried reservoir tank. The existing reservoir tank will be graded (i.e. filled) to pre-development elevations. Proposed grading will not substantially alter the existing drainage pattern. Runoff will continue to sheet flow in the westerly direction and the points of compliance will remain unchanged.

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: Only change to site drainage is the addition of a new swale at the bottom of the access road which will discharge to the vegetated open space. The proposed project will not substantially alter the existing drainage pattern. In general, grading will be restored to existing conditions and runoff will discharge at existing points of compliance. Peak flow rates will not increase from pre- to post-project condition; therefore runoff from the proposed project will not exceed the capacity of the downstream storm drain system. See Attachment 5 for peak flow rate calculations.

Form I-3B Page 6 of 11

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

- ☐ Onsite storm drain inlets
- ☐ Interior floor drains and elevator shaft sump pumps
- ☐ Interior parking garages
- ☐ Need for future indoor & structural pest control
- ☐ Landscape/outdoor pesticide use
- ☐ Pools, spas, ponds, decorative fountains, and other water features
- ☐ Food service
- ☐ Refuse areas
- ☐ Industrial processes
- ☐ Outdoor storage of equipment or materials
- ☐ Vehicle and equipment cleaning
- ☐ Vehicle/equipment repair and maintenance
- ☐ Fuel dispensing areas
- ☐ Loading docks
- ☐ Fire sprinkler test water
- ☑ Miscellaneous drain or wash water
- ☐ Plazas, sidewalks, and parking lots

Description/Additional Information:

The buried reservoir tank is equipped with an emergency overflow that outlets to a concrete energy dissipater within the open space area. Please note the overflow is an unplanned, emergency event that will occur only if the reservoir is full and the water system (including altitude valve, tank level indicators, system controls, and other operational mechanisms) fails to stop water from entering the reservoir. The excess water would exit the reservoir via the overflow discharge system. While the occurrence of an overflow discharge is highly unlikely given the redundant control mechanisms, the overflow system is a standard component of any water reservoir and is an important safety feature to avoid damage to the tank in the event of an emergency.

The buried reservoir tank is also equipped with perimeter drains and underdrains. Both drains are standard components of any water reservoir and important safety features and outlet to the same structure as the overflow system. The perimeter drains are installed to alleviate any buildup of water pressure in the soils surrounding the outside of the tank. Given the depth of these pipes below finished grade (approximately 60 ft) and the low probability of groundwater (per the geotechnical investigation, see Attachment 5), any discharges from these pipes are expected to be very low or nil. Underdrains are installed to monitor for any leakage of the reservoir tank structure itself. If the tank is in good condition, very little to no discharge is expected. If any significant discharges are observed, the City operators would be prompted to shut down the tank for inspection and possible repairs.

Project Name: La Jolla View Reservoir

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) After leaving the site, existing flows continue generally north and west for approximately 0.3 mile to the Pacific Ocean via existing City of San Diego storm drain structures.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations • Surface Waters (Unnamed Intermittent Coastal Streams). Contact and non contact water recreation (REC 1 and REC 2), warm freshwater habitat (WARM), and wildlife habitat (WILD). • Coastal Waters (Pacific Ocean Shoreline). Industrial service supply (IND); navigation (NAV); REC 1 and REC 2; commercial and sport fishing (COMM); preservation of biological habitats of special significance (BIOL); WILD; rare, threatened or endangered species (RARE); marine habitat (MAR); aquaculture (AQUA); migration of aquatic organisms (MIGR); spawning, reproduction and/or early development (SPWN); and shellfish harvesting (SHELL). • Groundwater. None.
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations The project site is within the La Jolla SHores Watershed Boundary and draining to an ASBS area.
Provide distance from project outfall location to impaired or sensitive receiving waters 0.3 miles
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands No post construction storm water BMPs

Project Name: La Jolla View Reservoir

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)
Coastal and Bay Shoreline	Bacteria	Indicator Bacteria

Identification of Project Site Pollutants*			
*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated) Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see 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)? ☐ 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): Not applicable - the project's DMAs are classified as self-mitigating and drainage report demonstrates that proposed condition peak design flow is less than existing condition peak flow at the points of compliance; thus the project does not require an energy dissipation system to mitigate outlet discharge velocity and the project is exempt from Hydromodification Management requirements per Section 6.1 of the manual. Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.
Critical Coarse Sediment Yield Areas* ***This Section only required if hydromodification management requirements apply**
Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint? ☐ Yes ☑ No Discussion / Additional Information: Not applicable for hydromodification management exemption

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

Project Name: La Jolla View Reservoir

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: No storm drain inlets within project site			
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: No outdoor materials storage areas within project site			
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: No materials stored in outdoor work areas within project site			
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: No trash storage areas within project site			

Project Name: La Jolla View Reservoir

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 <u>all</u> "No" answers shown above.			

Miscellaneous drains include reservoir overflow, perimeter drains and underdrains - all are standard components of any water reservoir tank and are important safety features. The overflow drainage system is equipped with numerous and redundant safety features (including altitude valve, tank level indicators, system controls, and other operational mechanisms) which would all need to fail for overflow discharge to occur. Discharge from any of the drains is anticipated to be very low or nil and if any, will discharge onto vegetated areas. Please see Form I-3B Page 6 of 11 for more description of the miscellaneous drains.

Project Name: La Jolla View Reservoir

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:			

Project Name: La Jolla View Reservoir

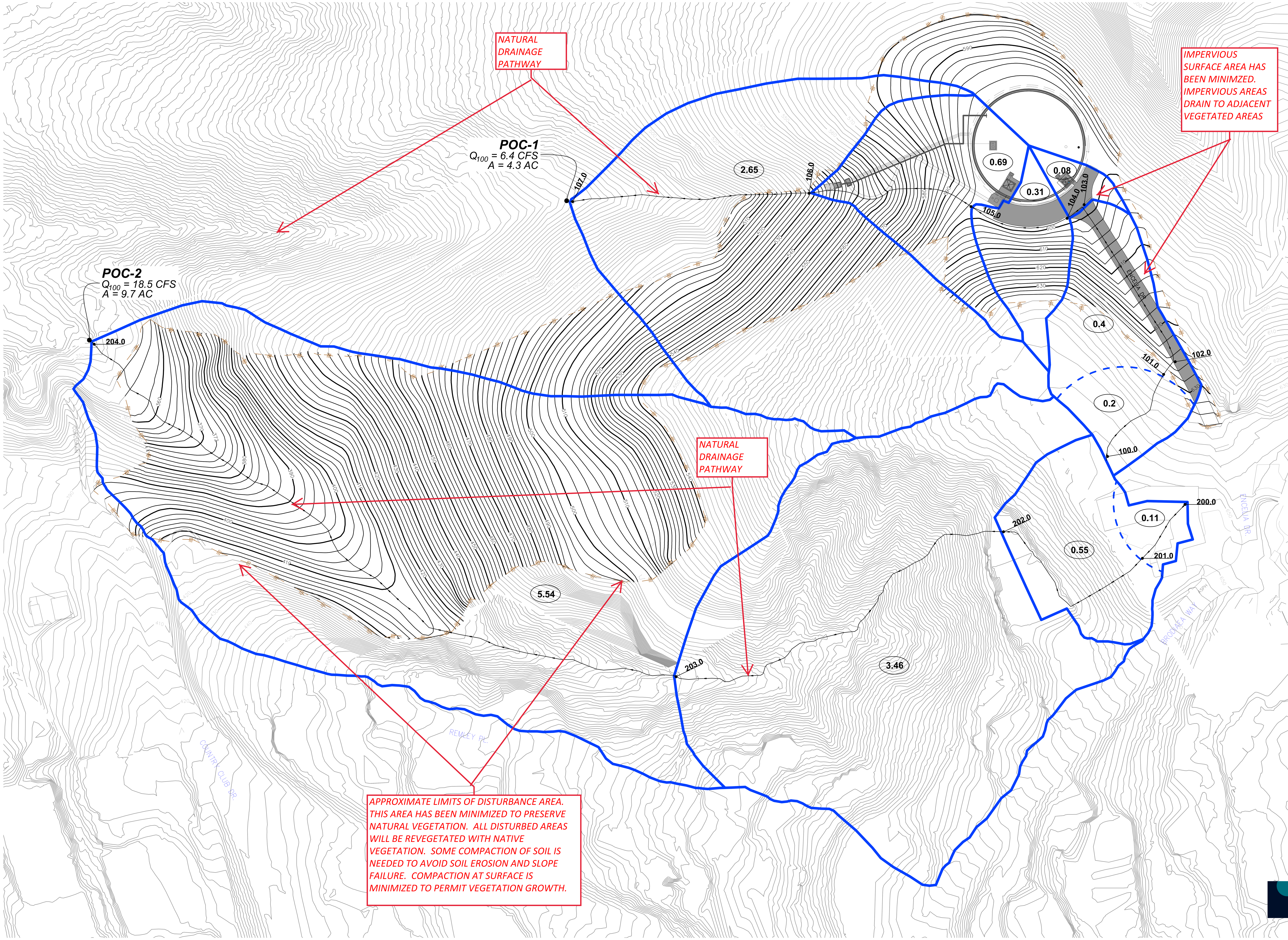
Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented:			
4.3.4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented: Some soil compaction is needed to avoid soil erosion and slope failure. Soil compaction will be limited at ground surface to allow for vegetation growth.			
4.3.5 Impervious Area Dispersion	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented:			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☑ 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: La Jolla View Reservoir

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: No infrastructure proposed to collect runoff. Above-grade improvements only include reservoir tank access hatches, equipment pads, and paved access road. Pervious areas disturbed will be revegetated to maintain existing open space condition. Pervious pavement is not ideal for steep grade of proposed access road.			
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	☐ 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: No infrastructure proposed to harvest precipitation. Above-grade improvements only include reservoir tank access hatches, equipment pads, and paved access road. Pervious areas disturbed will be revegetated to maintain existing open space condition.			
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

Project Name: La Jolla View Reservoir

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



LEGEND

- SUBAREA BASIN BOUNDARY
- INITIAL AREA BOUNDARY
- FLOW DIRECTION
- 100.0 RATIONAL METHOD NODE
- 0.08 AREA (AC)
- LIMIT OF GRADING
- PROPOSED IMPERVIOUS AREA
- 610 PROPOSED CONTOUR
- 610 EXISTING CONTOUR

NOTE:
PROPOSED IMPERVIOUS AREAS ARE SHOWN ON THIS EXHIBIT (SEE LEGEND). ALL OTHER AREAS WITHIN LIMIT OF GRADING ARE VEGETATED WITH SOUTHERN MARITIME CHAPARRAL (SEE LANDSCAPE RESTORATION PLAN FOR DETAIL).

ALL DRAINAGE MANAGEMENT AREAS ON THE PROPOSED PROJECT ARE SELF-MITIGATING.

Infrastructure ENGINEERING CORPORATION

N W E S

0 50 100 Feet

FIGURE PREPARED BY, AND USED WITH PERMISSION FROM:

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 · 760-414-9212

SWQMP FORM 1-5B SITE MAP
LA JOLLA VIEW RESERVOIR

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Project Name: La Jolla View Reservoir

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. No structural BMPs proposed for project. DMAs are classified as self-mitigating and hydromodication management requirements are not applicable. (Continue on page 2 as necessary.)	

Project Name: La Jolla View Reservoir

Form I-6 Page 2 of 0
(Continued from page 1)

Project Name: La Jolla View Reservoir

Form I-6 Page 0 of 0 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. N/A	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	
Who will be the final owner of this BMP?	
Who will maintain this BMP into perpetuity?	
What is the funding mechanism for maintenance?	

Project Name: La Jolla View Reservoir

Form I-6 Page 0 of 0 (Copy as many as needed)
Structural BMP ID No. N/A
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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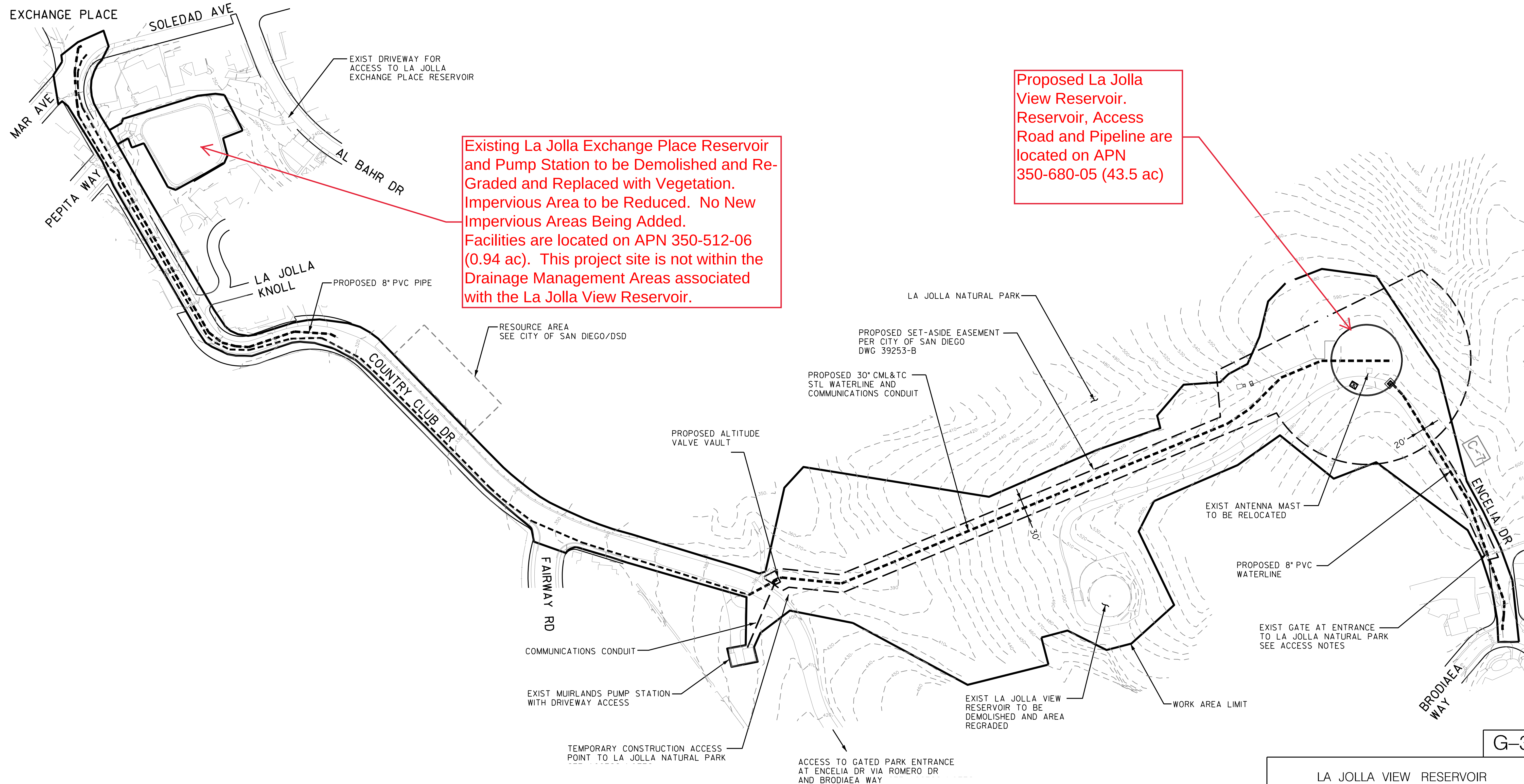
Project Name: La Jolla View Reservoir

Indicate which Items are Included:

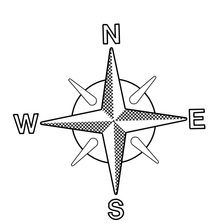
Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☑ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	V Included 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.
		L-?
		☐ 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 N/A



G–3



LEGEND:

— — —	PROPOSED WATER
———	WORK AREA LIMIT
— — —	PROPOSED EASEMENT

0 80 160 240

SCALE 1"=80'

LA JOLLA VIEW RESERVOIR

KEY MAP AND SITE ACCESS

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 3 OF 86 SHEETS

WATER WBS S-15027
SEWER WBS NONE

CONSULTANT

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Exp. 3-31-2015
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STATE OF CALIFORNIA
PRELIMINARY

APPROVED:
FOR CITY ENGINEER DATE
ALEX GARCIA
PRINT NAME RCE#

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	XX/XX			

SUBMITTED BY:
ED FORDAN
PROJECT MANAGER

CHECKED BY:
ART ARVIZU
PROJECT ENGINEER

SEE SHEETS
CCS27 COORDINATE

SEE SHEETS
CCS83 COORDINATE

CONTRACTOR DATE STARTED
INSPECTOR DATE COMPLETED

38056–03–D

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DRAINAGE ANALYSIS PREPARED BY, AND USED WITH PERMISSION FROM:

TORY R. WALKER ENGINEERING

RELIABLE SOLUTIONS IN WATER RESOURCES

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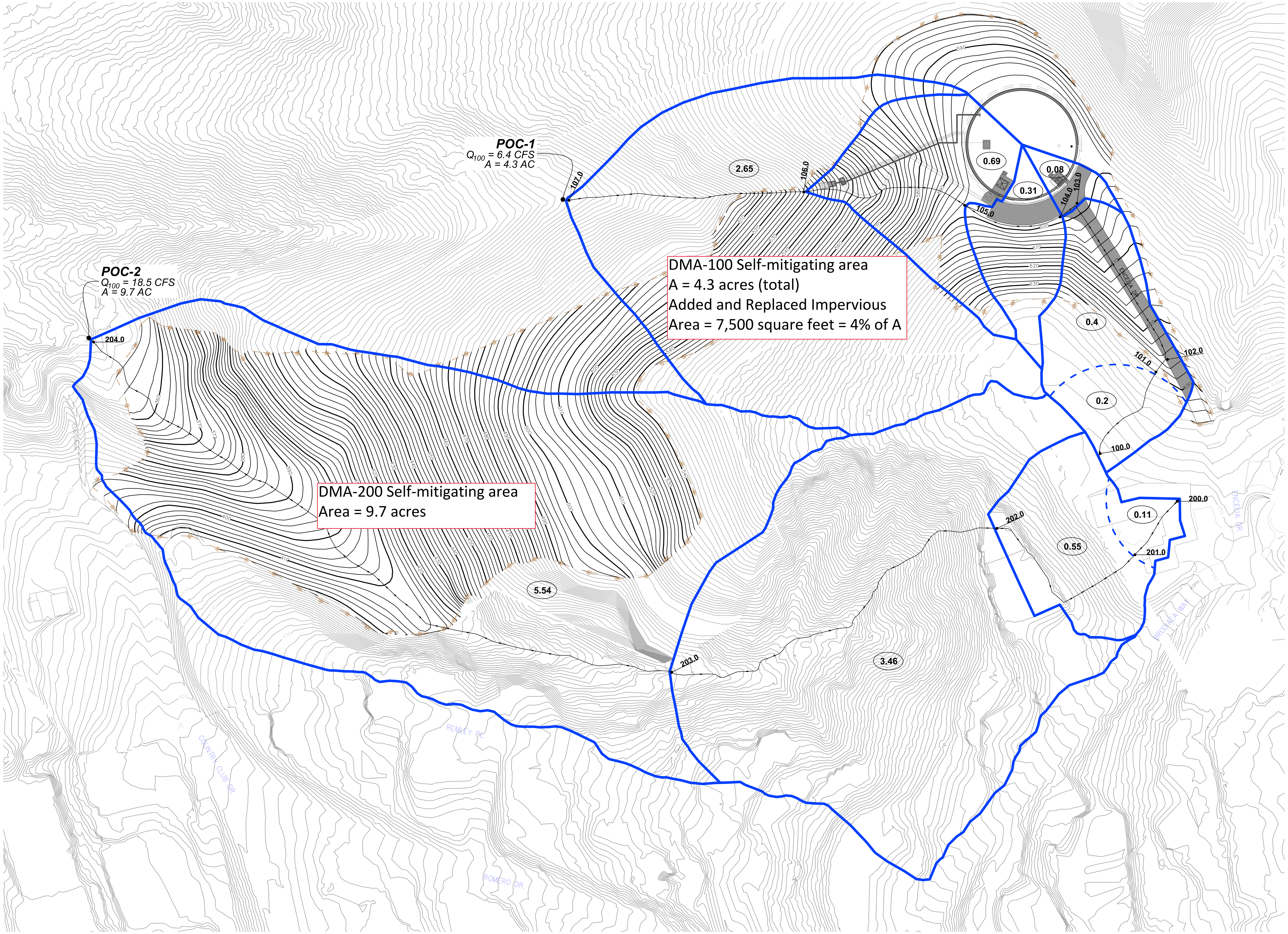
ATTACHMENT 1A:
LA JOLLA VIEW RESERVOIR
DMA EXHIBIT 1
EXISTING HYDROLOGY CONDITION MAP



LEGEND

- SUBAREA BASIN BOUNDARY
- INITIAL AREA BOUNDARY
- FLOW DIRECTION
- 100.0 RATIONAL METHOD NODE
- 0.08 AREA (AC)
- LIMIT OF GRADING
- PROPOSED IMPERVIOUS AREA
- 610 PROPOSED CONTOUR
- 610 EXISTING CONTOUR

NOTE:
PROPOSED IMPERVIOUS AREAS ARE SHOWN ON THIS EXHIBIT (SEE LEGEND). ALL OTHER AREAS WITHIN LIMIT OF GRADING ARE VEGETATED WITH SOUTHERN MARITIME CHAPARRAL (SEE LANDSCAPE RESTORATION PLAN FOR DETAIL).

STATIC GROUNDWATER IS LIKELY TO BE ENCOUNTERED AT DEPTHS GREATER THAN 85 FEET BELOW THE PROPOSED RESERVOIR SITE. STATIC GROUNDWATER MAY BE ENCOUNTERED AT SHALLOWER DEPTHS WITHIN THE RAVINES. GROUNDWATER SEEPAGE AT OTHER ELEVATIONS MAY BE ENCOUNTERED AND FLUCTUATIONS IN THE GROUNDWATER LEVEL MAY OCCUR DUE TO VARIATIONS IN GROUND SURFACE TOPOGRAPHY, SUBSURFACE GEOLOGIC CONDITIONS AND STRUCTURE, RAINFALL, IRRIGATION, AND OTHER FACTORS. (NINYO & MOORE, 2014)

ALL DRAINAGE MANAGEMENT AREAS ON THE PROPOSED PROJECT ARE SELF-MITIGATING.

N
W E
S
0 50 100 Feet

DRAINAGE ANALYSIS PREPARED BY, AND USED WITH PERMISSION FROM:

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 · 760-414-9212

ATTACHMENT 1A:
LA JOLLA VIEW RESERVOIR
DMA EXHIBIT 2
PROPOSED HYDROLOGY CONDITION MAP

X:\Projects\2022 (Helix Environmental Planning, Inc)\11 (SD PWD Enviro Planning)\01 La Jolla View Reservoir\04 ACAD\hydrology-map-prop_LVR.dwg

Project Name: La Jolla View Reservoir

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

The DMA Exhibit must identify:

- [x] Underlying hydrologic soil group
- [x] Approximate depth to groundwater
- [x] Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- [ ] Critical coarse sediment yield areas to be protected
- [x] Existing topography and impervious areas
- [x] Existing and proposed site drainage network and connections to drainage offsite
- [x] Proposed grading
- [x] Proposed impervious features
- [ ] Proposed design features and surface treatments used to minimize imperviousness
- [x] 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)
- [x] 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)

Project Name: La Jolla View Reservoir N/A

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)
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

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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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: La Jolla View Reservoir

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: La Jolla View Reservoir

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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N/A

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: La Jolla View Reservoir

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.

Not included since it is not applicable.

Project Name: La Jolla View Reservoir

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.

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CEQA-Level Preliminary Drainage Study
for
La Jolla View Reservoir
San Diego, California

Prepared for:

HELIX Environmental Planning, Inc.
7578 El Cajon Boulevard
La Mesa, CA 91942

March 1, 2018. Revised July 11, 2018. Revised November 14, 2018. Revised April 10, 2019.

Tory R. Walker, R.C.E. 45005
President

REGISTERED PROFESSIONAL ENGINEER
TORY R WALKER
No. 45005
Exp. 3-31-2020
CIVIL
STATE OF CALIFORNIA

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 · 760-414-9212

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5. **Declaration of Responsible Charge** 5

Appendices

A. **City of San Diego Figures and Nomographs**

B. **Rational Method Calculations (Q100)**

C. **Project Maps**

- **Existing Condition Hydrology Map**
- **Developed Condition Hydrology Map**

1. Introduction

This drainage report has been prepared in support of the proposed planning-level processing for the La Jolla View Reservoir (LJVR) project, and in conjunction with the project stormwater requirements. City of San Diego development requirements require hydrology calculations at this project stage, with an analysis of existing and developed conditions. An overall decrease in runoff is anticipated for the project since the total impervious area will be less in developed conditions and since drainage patterns will remain essentially unchanged. Therefore, a detention routing analysis is not necessary to demonstrate that the developed condition 100-year peak flow is below the existing condition level.

2. Project Description

The La Jolla View Reservoir project is located along the northwest end of Encelia Drive in the City of San Diego, California (see Figure 1 below for project location). The project proposes to demolish the existing 0.7 million gallon (MG) reservoir tank and access road (Encelia Drive), and construct a new underground 3.1 MG reservoir tank and access road (Encelia Drive). New water and electrical utilities are also included as part of the project. The proposed site will be regraded to match existing topography and all pervious areas will be restored to native vegetation.

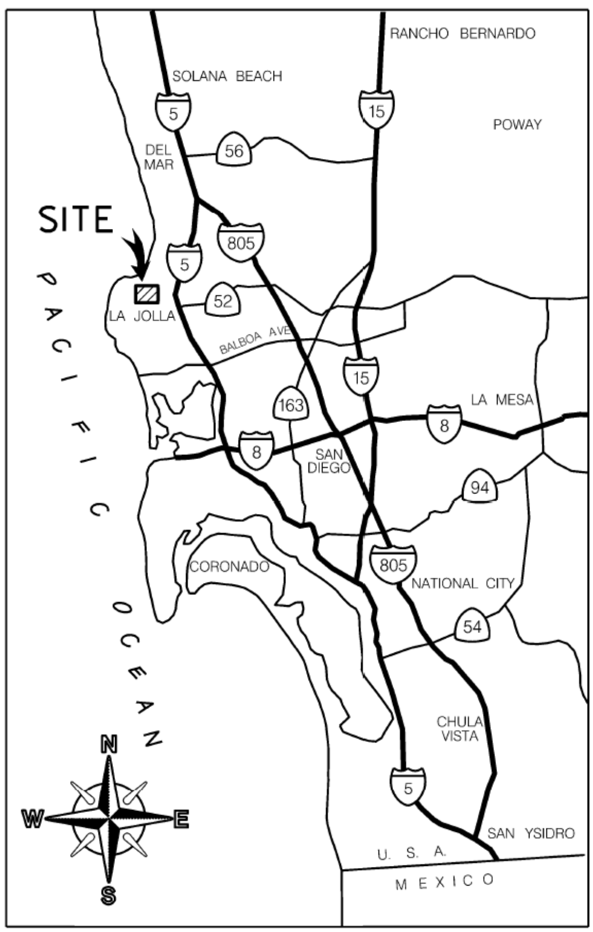

Figure 1: Vicinity Map

3. Drainage Patterns and Hydrologic Methodology

The existing site consists of the above ground reservoir tank and paved access road (Encelia Drive). The remaining area is primarily natural open space with some residential area around the perimeter of the drainage boundaries (see Appendix C Existing Condition Hydrology Map). There is limited run-on from the adjacent properties or streets, as the majority of offsite flow is conveyed around the project's drainage boundaries by Brodiaea Way, Romero Drive, and Country Club Drive. The project site was divided into two basins, Basin 100 (denoted by the 100 series nodes) and Basin 200 (denoted by the 200 series nodes). Runoff from both basins generally sheet flows west and is concentrated into a system of small gullies and ravines. There is no other drainage infrastructure onsite. The natural channels that leave Basin 100 and Basin 200 eventually confluence to the west of the project site and drain to the culvert under Soledad Avenue. From Soledad Avenue, flow is conveyed via open channel and pipe to Torrey Pines Road, where it passes underneath the road in a culvert before eventually discharging into the ocean.

In proposed conditions, site drainage patterns will remain generally unchanged because the intent of the proposed grading is to restore the area to existing grades. After removal of more than half the access road and the reservoir tank, the total impervious area will be less than existing conditions. All regraded pervious areas will be vegetated with Southern Maritime Chaparral per the project's landscape restoration plan. Runoff from the proposed impervious access road will be conveyed via swales and/or gutters. No other stormwater drainage infrastructure is proposed onsite.

Rational Method hydrologic calculations are provided for the existing and proposed condition using the City of San Diego Drainage Design Manual. 100-year flows were calculated using the AES Rational Method software based on the design storm rainfall and estimated runoff coefficients (see Appendices A and B). The Rational Method calculations are reflected on the hydrology maps in Appendix C, with corresponding drainage boundaries, initial subareas, and discharge points illustrated.

4. Summary and Conclusions

The proposed La Jolla View Reservoir project, as designed, will not substantially alter the existing drainage pattern. The total overall peak flowrate will not increase from pre- to post-project condition; therefore runoff from the proposed project will not exceed the capacity of the downstream storm drain system. A summary of existing and proposed conditions runoff is provided in Table 1 and Table 2. The total project site drainage area increases by approximately 0.5 acres in proposed conditions as a result of regrading along the redeveloped portion of Encelia Drive, which diverts a relatively small amount of area away from the ravine that is northeast of the project site. The area diversion is inconsequential because it represents less than 4% of the total existing condition drainage area, and the total impervious area is reduced in proposed conditions.

Table 1: Existing Condition Runoff Table

Location	Area (ac) [1]	Runoff Coeff. C[2]	Tc[3] (min)	Intensity I[4] (in/hr)	Q_{100}[5] (cfs)
POC-1 (Basin 100)	3.6	0.45	7.7	3.8	6.1
POC-2 (Basin 200)	9.9	0.46	6.0	4.2	18.9
TOTAL	13.5				25.0

Table 2: Proposed Condition Runoff Table

Location	Area (ac) [1]	Runoff Coeff. C[2]	Tc[3] (min)	Intensity I[4] (in/hr)	Q_{100}[5] (cfs)
POC-1 (Basin 100)	4.3	0.45	11.2	3.3	6.4
POC-2 (Basin 200)	9.7	0.46	6.0	4.2	18.5
TOTAL	14.0				24.9

[1] Total tributary area to Point of Compliance (POC).
[2] Area-average runoff coefficient (see AES Rational Method output in Appendix B).
[3] Rational Method Time of Concentration, calculated per the City of San Diego Drainage Design Manual, Appendix A (for supporting calculations see AES Rational Method output provided in Appendix B of this study).
[4] Rational Method peak rainfall intensity in inches/hour (see AES Rational Method output in Appendix B).
[5] Rational Method 100-year Peak Flow at POC (see AES Rational Method output in Appendix B).

Additional impacts to streams or rivers are not anticipated for this project. This is because there are no streams or rivers running through or immediately around the project site, and proposed onsite runoff is less than existing levels. Therefore, the project will not result in any on- or off-site erosion, siltation, or flooding.

Based on topography, FEMA, and County of San Diego floodplain maps, the project site is not located near a 100-year flood hazard area boundary. No housing is proposed within a 100-year flood hazard area, and no structures are proposed within a 100-year flood hazard area which would impede or redirect flood flows. Furthermore, the project will not expose people or structures to a significant risk of loss, injury, or death involving flooding as a result of the failure of a levee or dam, as there are no levees or dams impacted by the project site. It is important to note that instead of an above-ground dam and reservoir, the project proposes a 3.1 MG underground reinforced concrete tank and an 18-inch emergency overflow pipe that discharges to the channel within Basin 100 (POC-1).

5. DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

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

Tory R Walker ______________________ April 10, 2019 ______________________

TORY R. WALKER, R.C.E. 45005 DATE

Appendix A

Figures and Nomographs

NOAA Atlas 14, Volume 6, Version 2
Location name: La Jolla, California, USA*
Latitude: 32.8434°, Longitude: -117.26°
Elevation: 603.21 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.113 (0.095-0.136)	0.141 (0.118-0.171)	0.179 (0.149-0.217)	0.210 (0.174-0.256)	0.253 (0.202-0.320)	0.286 (0.223-0.370)	0.320 (0.244-0.425)	0.356 (0.263-0.486)	0.405 (0.287-0.578)	0.444 (0.303-0.656)
10-min	0.162 (0.136-0.195)	0.203 (0.170-0.245)	0.257 (0.214-0.311)	0.301 (0.249-0.368)	0.362 (0.289-0.458)	0.410 (0.320-0.530)	0.459 (0.349-0.609)	0.510 (0.377-0.697)	0.580 (0.411-0.828)	0.636 (0.434-0.940)
15-min	0.196 (0.164-0.236)	0.245 (0.205-0.296)	0.310 (0.259-0.376)	0.364 (0.301-0.445)	0.438 (0.350-0.554)	0.496 (0.387-0.641)	0.555 (0.423-0.736)	0.617 (0.456-0.842)	0.702 (0.497-1.00)	0.769 (0.525-1.14)
30-min	0.273 (0.228-0.329)	0.341 (0.285-0.412)	0.431 (0.360-0.522)	0.506 (0.419-0.618)	0.609 (0.486-0.770)	0.689 (0.538-0.891)	0.772 (0.588-1.02)	0.858 (0.634-1.17)	0.976 (0.691-1.39)	1.07 (0.731-1.58)
60-min	0.388 (0.325-0.467)	0.485 (0.405-0.585)	0.613 (0.512-0.743)	0.720 (0.595-0.879)	0.866 (0.691-1.10)	0.980 (0.765-1.27)	1.10 (0.835-1.46)	1.22 (0.902-1.67)	1.39 (0.983-1.98)	1.52 (1.04-2.25)
2-hr	0.541 (0.453-0.652)	0.666 (0.557-0.804)	0.831 (0.693-1.01)	0.967 (0.799-1.18)	1.15 (0.921-1.46)	1.30 (1.01-1.68)	1.45 (1.10-1.92)	1.60 (1.19-2.19)	1.82 (1.29-2.59)	1.98 (1.36-2.93)
3-hr	0.651 (0.545-0.785)	0.799 (0.668-0.964)	0.993 (0.829-1.20)	1.15 (0.953-1.41)	1.37 (1.10-1.73)	1.54 (1.20-1.99)	1.71 (1.30-2.27)	1.89 (1.40-2.58)	2.14 (1.51-3.05)	2.33 (1.59-3.44)
6-hr	0.881 (0.738-1.06)	1.08 (0.907-1.31)	1.35 (1.13-1.63)	1.56 (1.29-1.91)	1.85 (1.48-2.34)	2.07 (1.62-2.68)	2.30 (1.75-3.04)	2.52 (1.87-3.45)	2.83 (2.01-4.04)	3.07 (2.10-4.54)
12-hr	1.17 (0.977-1.41)	1.46 (1.22-1.76)	1.82 (1.52-2.21)	2.12 (1.75-2.59)	2.50 (2.00-3.17)	2.79 (2.18-3.61)	3.08 (2.35-4.09)	3.37 (2.49-4.60)	3.75 (2.66-5.35)	4.04 (2.76-5.98)
24-hr	1.45 (1.28-1.69)	1.85 (1.62-2.15)	2.34 (2.04-2.72)	2.72 (2.36-3.20)	3.22 (2.71-3.90)	3.58 (2.96-4.42)	3.94 (3.18-4.97)	4.29 (3.38-5.56)	4.75 (3.60-6.40)	5.10 (3.74-7.08)
2-day	1.79 (1.57-2.08)	2.29 (2.01-2.66)	2.91 (2.54-3.39)	3.39 (2.94-3.98)	4.01 (3.38-4.86)	4.47 (3.69-5.52)	4.91 (3.97-6.20)	5.35 (4.22-6.94)	5.92 (4.49-7.98)	6.35 (4.66-8.82)
3-day	2.01 (1.77-2.34)	2.57 (2.26-2.99)	3.28 (2.87-3.82)	3.82 (3.32-4.49)	4.53 (3.82-5.49)	5.05 (4.18-6.24)	5.56 (4.49-7.02)	6.07 (4.78-7.86)	6.72 (5.09-9.05)	7.20 (5.29-10.0)
4-day	2.18 (1.91-2.53)	2.80 (2.46-3.26)	3.58 (3.13-4.18)	4.19 (3.64-4.92)	4.97 (4.19-6.03)	5.55 (4.59-6.86)	6.12 (4.94-7.73)	6.68 (5.26-8.66)	7.41 (5.61-9.97)	7.95 (5.83-11.0)
7-day	2.56 (2.25-2.98)	3.37 (2.95-3.92)	4.37 (3.82-5.09)	5.15 (4.47-6.06)	6.18 (5.20-7.48)	6.93 (5.73-8.56)	7.67 (6.20-9.69)	8.41 (6.62-10.9)	9.37 (7.10-12.6)	10.1 (7.41-14.0)
10-day	2.86 (2.51-3.32)	3.80 (3.33-4.42)	4.99 (4.36-5.82)	5.92 (5.14-6.96)	7.15 (6.02-8.66)	8.05 (6.65-9.94)	8.95 (7.23-11.3)	9.84 (7.75-12.8)	11.0 (8.34-14.8)	11.9 (8.73-16.5)
20-day	3.37 (2.96-3.92)	4.57 (4.00-5.31)	6.08 (5.32-7.10)	7.29 (6.33-8.56)	8.88 (7.48-10.8)	10.1 (8.32-12.4)	11.3 (9.09-14.2)	12.4 (9.80-16.1)	14.0 (10.6-18.9)	15.2 (11.2-21.2)
30-day	4.01 (3.52-4.66)	5.44 (4.77-6.33)	7.28 (6.36-8.49)	8.74 (7.59-10.3)	10.7 (9.00-12.9)	12.2 (10.0-15.0)	13.6 (11.0-17.2)	15.1 (11.9-19.6)	17.1 (13.0-23.0)	18.6 (13.7-25.9)
45-day	4.68 (4.11-5.44)	6.34 (5.56-7.38)	8.48 (7.42-9.89)	10.2 (8.86-12.0)	12.5 (10.5-15.2)	14.3 (11.8-17.6)	16.0 (12.9-20.2)	17.8 (14.0-23.1)	20.3 (15.4-27.3)	22.2 (16.3-30.8)
60-day	5.41 (4.75-6.29)	7.26 (6.36-8.44)	9.65 (8.45-11.3)	11.6 (10.1-13.6)	14.2 (12.0-17.2)	16.2 (13.4-20.0)	18.3 (14.8-23.1)	20.4 (16.0-26.4)	23.2 (17.6-31.3)	25.4 (18.7-35.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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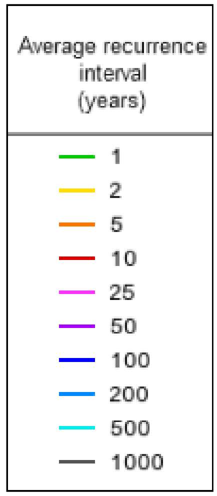
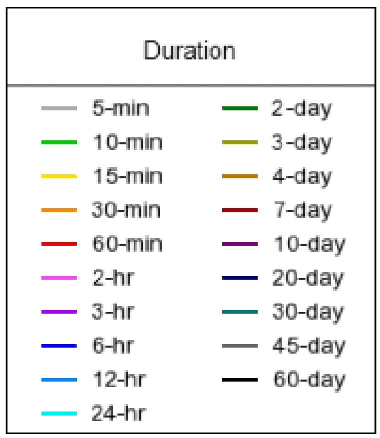
PF graphical

curve plots





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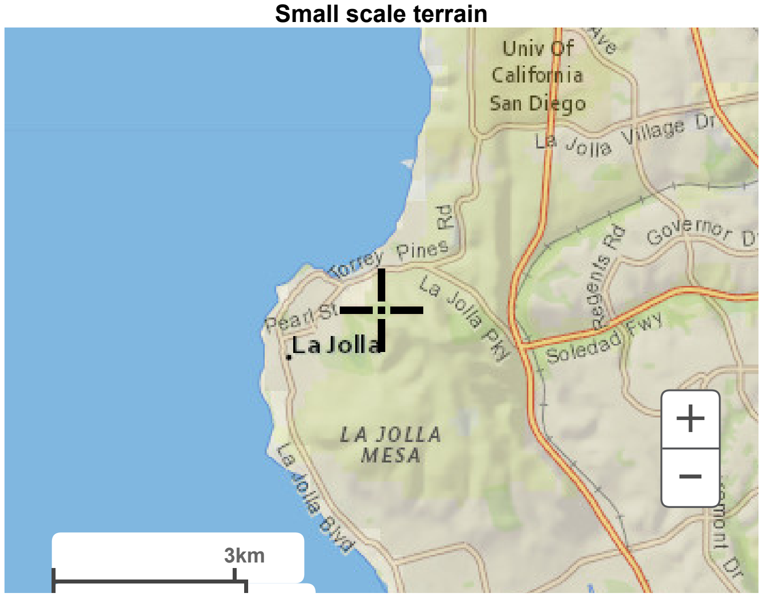
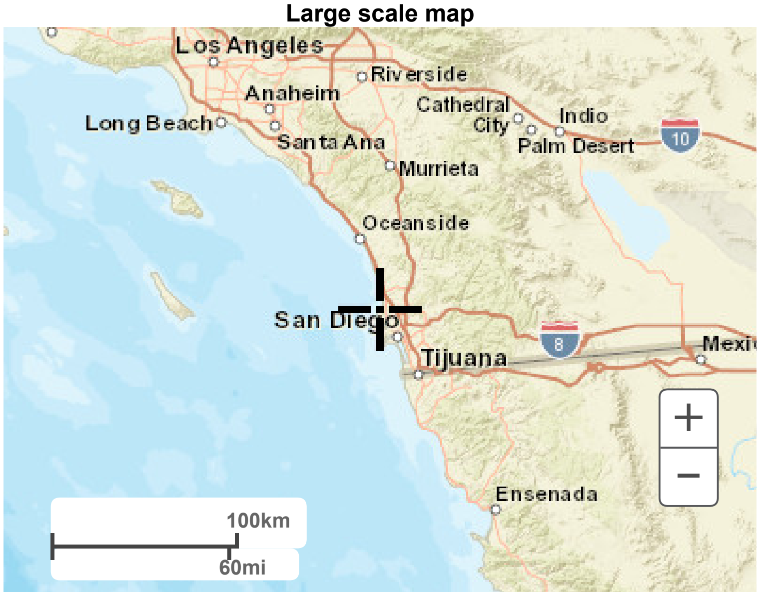
Maps & aerials

Small scale terrain

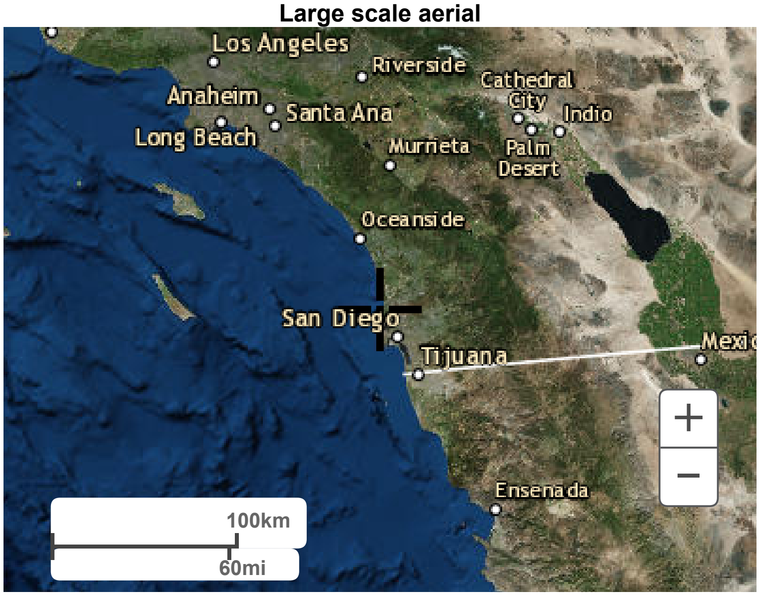


Large scale terrain

Large scale map



Large scale aerial



Back to Top

Error 500: Internal Server Error. Please try another location.

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

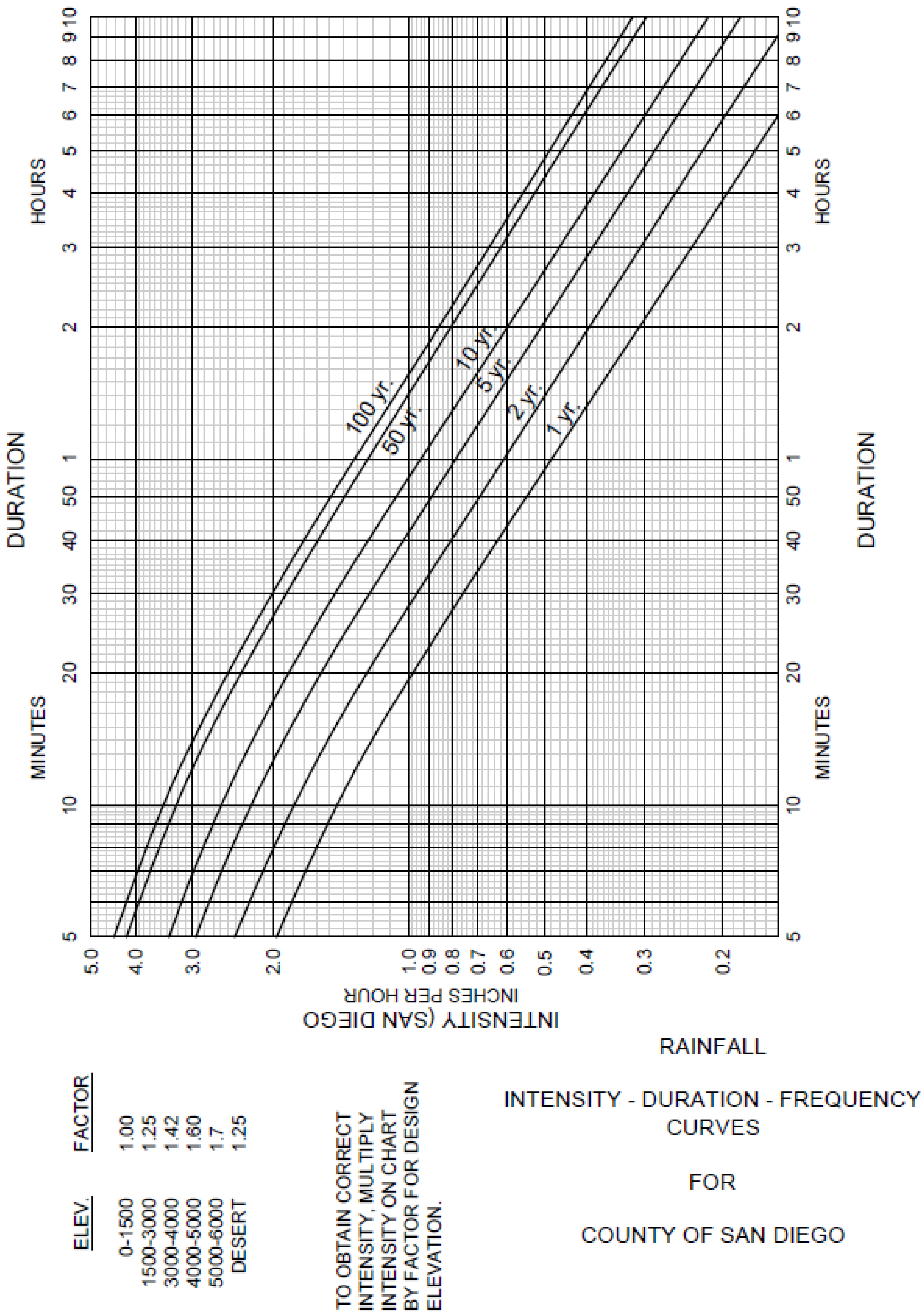
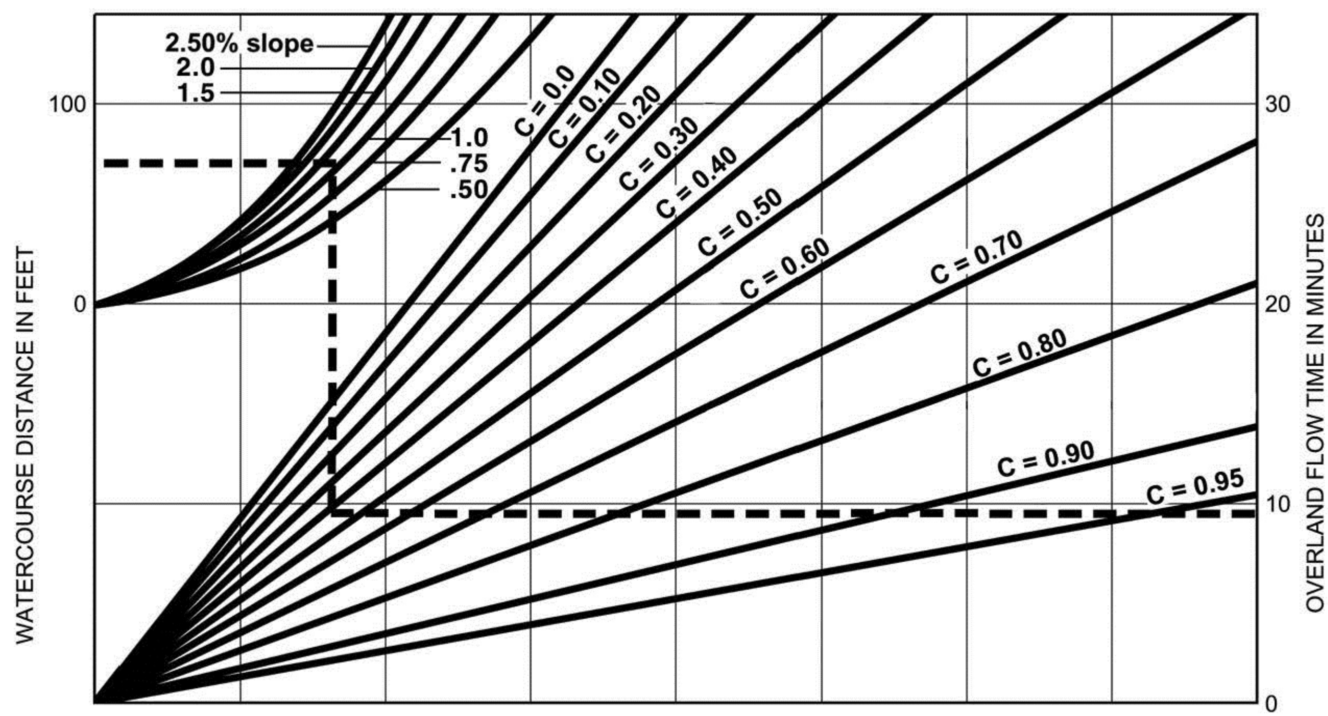


Figure A-1. Intensity-Duration-Frequency Design Chart



EXAMPLE:

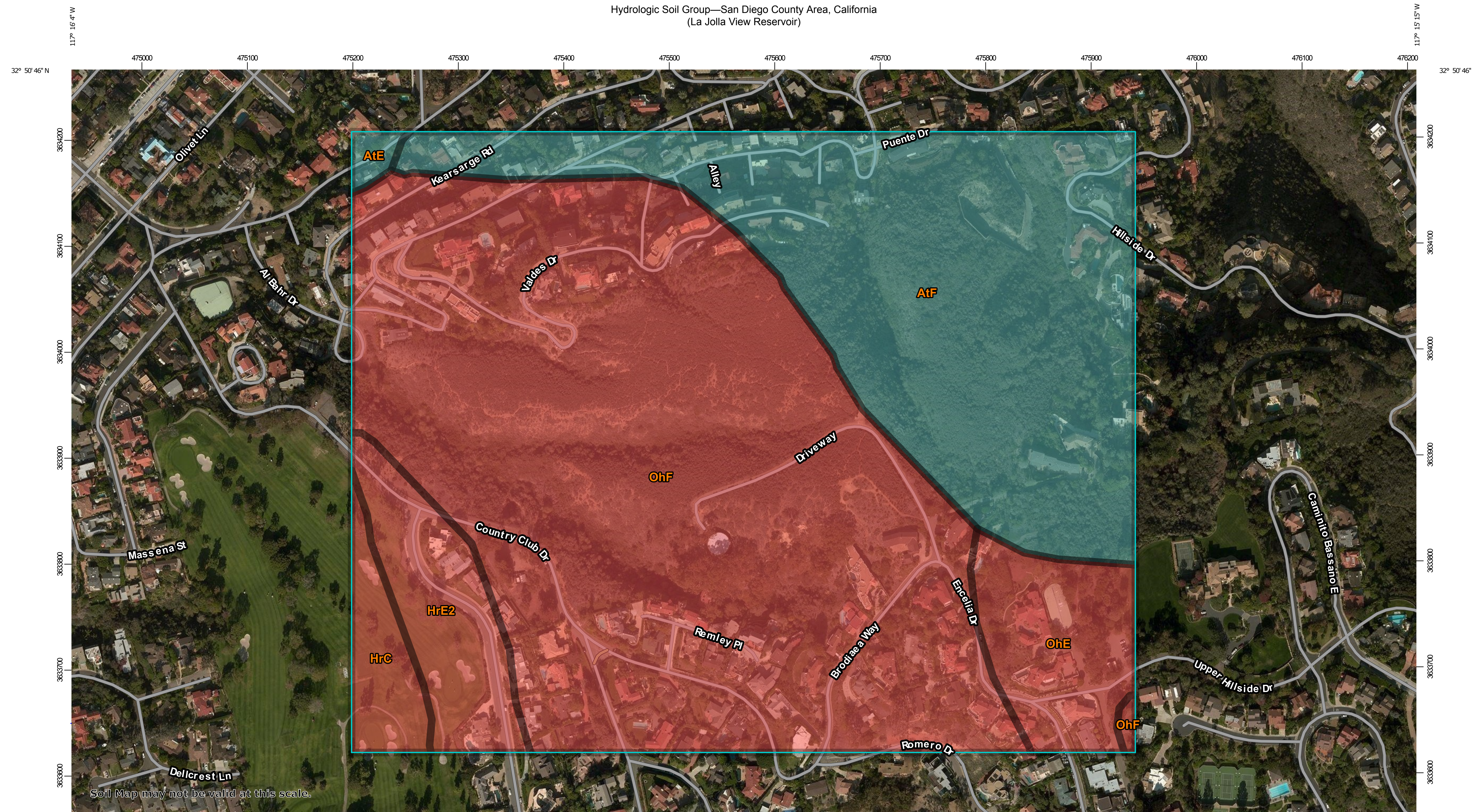
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

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

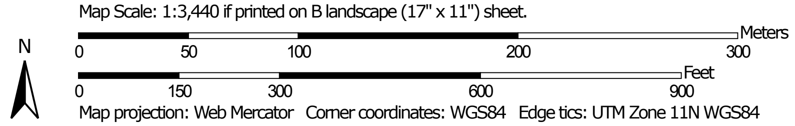
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

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

Note: Use formula for watercourse distances in excess of 100 feet.



Map Scale: 1:3,440 if printed on B landscape (17" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AtE	Altamont clay, 15 to 30 percent slopes, warm MAAT, MLRA 20	C	0.5	0.5%
AtF	Altamont clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	C	32.3	29.9%
HrC	Huerhuero loam, 2 to 9 percent slopes	D	2.8	2.6%
HrE2	Huerhuero loam, 15 to 30 percent slopes, eroded	D	5.9	5.5%
OhE	Olivenhain cobbly loam, 9 to 30 percent slopes	D	6.2	5.7%
OhF	Olivenhain cobbly loam, 30 to 50 percent slopes	D	60.3	55.8%
Totals for Area of Interest			**107.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Table A-1. Runoff Coefficients for Rational Method

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

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

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

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

A.1.3. Rainfall Intensity

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

Appendix B

Rational Method Calculations (Q100)

RATIONAL METHOD HYDROLOGY DATA SHEET

Project Name: La Jolla View Reservoir
Date: 11/14/2018
Description: Existing Conditions (CEQA Drainage Study)
Drawing Path: X:\Projects2\022 (Helix Enviornmental Planning, Inc.)\11 (SD PWD Enviro Planning)\01 La Jolla View Reservoir\04 ACAD\hydrology-map-exist_LVR.dwg

Job#: 022-11-01

U/S NODE	D/S NODE	AES CODE	U/S ELEV	D/S ELEV	LENGTH (feet)	LAND USE	Imperv. Area (sf)	%Imperv		C coeff*	AREA (acres)
100.0	101.0	2	632.0	608.0	115	Rural	668	19.8%		0.45	0.08
101.0	102.0	5	608.0	579.0	176	Rural	2653	13.3%		0.45	0.46
102.0	103.0	5	579.0	529.0	95	Rural					
103.0	103.0	8				Rural	79	0.4%		0.45	0.49
103.0	104.0	5	529.0	453.0	265	Rural	3219	2.9%		0.45	2.53
200.0	201.0	2	653.0	652.0	80	Rural	4169	88.8%		0.95	0.11
201.0	202.0	5	652.0	612.0	209	Rural	3053	12.8%		0.45	0.55
202.0	203.0	5	612.0	470.0	425	Rural	24146	16.0%		0.45	3.46
203.0	204.0	5	470.0	346.0	760	Rural	26044	10.4%		0.45	5.74

*Note: The runoff coefficient C was selected based on the % Impervious and the closest applicable Land Use from Table A-1 of the City of San Diego Drainage Design Manual. The Rural Land Use with C = 0.45 from Table A-1 was selected for most subareas. For the subarea with % Impervious = 88.8%, a C = 0.95 was selected, as this corresponds well to the 90% Impervious Industrial Land Use in Table A-1.

RATIONAL METHOD HYDROLOGY DATA SHEET

Project Name: La Jolla View Reservoir
Date: 11/14/2018
Description: Proposed Conditions (CEQA Drainage Study)
Drawing Path: X:\Projects2\022 (Helix Enviornmental Planning, Inc.)\11 (SD PWD Enviro Planning)\01 La Jolla View Reservoir\04 ACAD\hydrology-map-prop_LVR.dwg

Job#: 022-11-01

U/S NODE	D/S NODE	AES CODE	U/S ELEV	D/S ELEV	LENGTH (feet)	LAND USE	Imperv. Area (sf)	%Imperv		C coeff*	AREA (acres)
100.0	101.0	2	648.0	632.0	106	Rural	0	0.0%		0.45	0.17
101.0	102.0	5	632.0	625.0	29	Rural	-				
102.0	103.0	5	625.0	599.3	198	Rural	2939	15.3%		0.45	0.44
103.0	104.0	5	599.3	599.2	25	Rural	1332	37.9%		0.45	0.08
104.0	105.0	5	599.2	598.5	111	Rural	1603	11.8%		0.45	0.31
105.0	106.0	5	598.5	529.0	184	Rural	845	2.8%		0.45	0.69
106.0	107.0	5	529.0	453.0	261	Rural	0	0.0%		0.45	2.65
200.0	201.0	2	653.0	652.0	80	Rural	4169	88.8%		0.95	0.11
201.0	202.0	5	652.0	612.0	209	Rural	3053	12.8%		0.45	0.55
202.0	203.0	5	612.0	470.0	425	Rural	24146	16.0%		0.45	3.46
203.0	204.0	5	470.0	346.0	760	Rural	10100	4.2%		0.45	5.54

*Note: The runoff coefficient C was selected based on the % Impervious and the closest applicable Land Use from Table A-1 of the City of San Diego Drainage Design Manual. The Rural Land Use with C = 0.45 from Table A-1 was selected for most subareas. For the subarea with % Impervious = 88.8%, a C = 0.95 was selected, as this corresponds well to the 90% Impervious Industrial Land Use in Table A-1.

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
             Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                           Analysis prepared by:

                        Tory R. Walker Engineering



 ************************** DESCRIPTION OF STUDY **************************
* EXISTING CONDITION (100-YR)                                              *
* La Jolla View Reservoir, San Diego, CA                                   *
*                                                                          *
 **************************************************************************

  FILE NAME: LJ-EX100.DAT
  TIME/DATE OF STUDY: 14:48 11/09/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  8
   1)   5.000;  4.400
   2)   6.000;  4.200
   3)   7.000;  3.900
   4)   8.000;  3.750
   5)   9.000;  3.600
   6)  10.000;  3.450
   7)  12.000;  3.200
   8)  15.000;  2.900
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN- / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================= ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   115.00
  UPSTREAM ELEVATION(FEET) =    632.00
  DOWNSTREAM ELEVATION(FEET) =    608.00
  ELEVATION DIFFERENCE(FEET) =     24.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.431
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.314
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    608.00  DOWNSTREAM(FEET) =    579.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   176.00   CHANNEL SLOPE =  0.1648
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   0.30
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.115
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.44
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.85
  Tc(MIN.) =    6.28
  SUBAREA AREA(ACRES) =     0.46       SUBAREA RUNOFF(CFS) =    0.85
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       1.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   3.91
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     291.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    579.00  DOWNSTREAM(FEET) =    529.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    95.00   CHANNEL SLOPE =  0.5263
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.080   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.00
  FLOW VELOCITY(FEET/SEC.) =   2.83   FLOW DEPTH(FEET) =   0.19
  TRAVEL TIME(MIN.) =   0.56   Tc(MIN.) =    6.84
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     386.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.947
  *USER SPECIFIED(SUBAREA):
```

```
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
 SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    0.87
 TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       1.83
 TC(MIN.) =    6.84

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    529.00  DOWNSTREAM(FEET) =    453.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   265.00   CHANNEL SLOPE =  0.2868
 CHANNEL BASE(FEET) =    0.50   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.060   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.803
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.00
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.49
 AVERAGE FLOW DEPTH(FEET) =   0.49   TRAVEL TIME(MIN.) =   0.80
 Tc(MIN.) =    7.65
 SUBAREA AREA(ACRES) =     2.53       SUBAREA RUNOFF(CFS) =    4.33
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
 TOTAL AREA(ACRES) =        3.6         PEAK FLOW RATE(CFS) =       6.09

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.59   FLOW VELOCITY(FEET/SEC.) =   6.14
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     651.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .9500
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
 UPSTREAM ELEVATION(FEET) =    653.00
 DOWNSTREAM ELEVATION(FEET) =    652.00
 ELEVATION DIFFERENCE(FEET) =      1.00
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.153
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    73.75
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.46
 TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    652.00  DOWNSTREAM(FEET) =    612.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   209.00   CHANNEL SLOPE =  0.1914
```

```
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.56
  AVERAGE FLOW DEPTH(FEET) =   0.30   TRAVEL TIME(MIN.) =   0.63
  Tc(MIN.) =    2.78
  SUBAREA AREA(ACRES) =     0.55       SUBAREA RUNOFF(CFS) =    1.09
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.533
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       1.55

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   6.39
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     289.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    612.00  DOWNSTREAM(FEET) =    470.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   425.00   CHANNEL SLOPE =  0.3341
  CHANNEL BASE(FEET) =    0.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.060   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.97
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.18
  AVERAGE FLOW DEPTH(FEET) =   0.52   TRAVEL TIME(MIN.) =   1.15
  Tc(MIN.) =    3.92
  SUBAREA AREA(ACRES) =     3.46       SUBAREA RUNOFF(CFS) =    6.85
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.463
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =       8.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.66   FLOW VELOCITY(FEET/SEC.) =   7.01
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    470.00  DOWNSTREAM(FEET) =    346.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   760.00   CHANNEL SLOPE =  0.1632
  CHANNEL BASE(FEET) =    0.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.060   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.203
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.14
  AVERAGE FLOW DEPTH(FEET) =   0.94   TRAVEL TIME(MIN.) =   2.06
```

```
  Tc(MIN.) =    5.99
  SUBAREA AREA(ACRES) =     5.74       SUBAREA RUNOFF(CFS) =   10.86
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.456
  TOTAL AREA(ACRES) =        9.9         PEAK FLOW RATE(CFS) =      18.88

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.08   FLOW VELOCITY(FEET/SEC.) =   6.59
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =    1474.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        9.9  TC(MIN.) =      5.99
  PEAK FLOW RATE(CFS)    =      18.88
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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             Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                          Analysis prepared by:

                        Tory R. Walker Engineering



 ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION POC-1 (100-YR)                                        *
 * La Jolla View Reservoir, San Diego, CA                                   *
 *                                                                          *
 **************************************************************************

  FILE NAME: LJPR1001.DAT
  TIME/DATE OF STUDY: 15:36 11/09/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  8
   1)   5.000;  4.400
   2)   6.000;  4.200
   3)   7.000;  3.900
   4)   8.000;  3.750
   5)   9.000;  3.600
   6)  10.000;  3.450
   7)  12.000;  3.200
   8)  15.000;  2.900
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   106.00
  UPSTREAM ELEVATION(FEET) =    648.00
  DOWNSTREAM ELEVATION(FEET) =    632.00
  ELEVATION DIFFERENCE(FEET) =     16.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.431
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.314
  SUBAREA RUNOFF(CFS) =      0.33
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.33

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    632.00  DOWNSTREAM(FEET) =    625.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    29.00   CHANNEL SLOPE =  0.2414
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.060   MAXIMUM DEPTH(FEET) =   0.50
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.33
  FLOW VELOCITY(FEET/SEC.) =   2.26   FLOW DEPTH(FEET) =   0.17
  TRAVEL TIME(MIN.) =   0.21   Tc(MIN.) =    5.64
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    625.00  DOWNSTREAM(FEET) =    599.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   198.00   CHANNEL SLOPE =  0.1298
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.012
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.73
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.36
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.98
  Tc(MIN.) =    6.63
  SUBAREA AREA(ACRES) =     0.44       SUBAREA RUNOFF(CFS) =    0.79
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.10

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   4.08
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     333.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    599.30  DOWNSTREAM(FEET) =    599.20
```

```
 CHANNEL LENGTH THRU SUBAREA(FEET) =    25.00   CHANNEL SLOPE =  0.0040
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.896
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.17
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.05
 AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   0.40
 Tc(MIN.) =    7.02
 SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.14
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
 TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       1.21

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   1.08
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     358.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    599.20  DOWNSTREAM(FEET) =    598.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   111.00   CHANNEL SLOPE =  0.0063
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.620
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.46
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.00
 AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   1.84
 Tc(MIN.) =    8.87
 SUBAREA AREA(ACRES) =     0.31       SUBAREA RUNOFF(CFS) =    0.50
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
 TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       1.63

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   1.02
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     469.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    598.50  DOWNSTREAM(FEET) =    529.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   184.00   CHANNEL SLOPE =  0.3777
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  50.000
 MANNING'S FACTOR = 0.080   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.397
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.16
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.97
 AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   1.55
 Tc(MIN.) =   10.42
```

```
  SUBAREA AREA(ACRES) =     0.69       SUBAREA RUNOFF(CFS) =    1.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        1.7         PEAK FLOW RATE(CFS) =       2.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   2.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     653.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    529.00  DOWNSTREAM(FEET) =    453.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   261.00   CHANNEL SLOPE =  0.2912
  CHANNEL BASE(FEET) =    0.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.060   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.303
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.55
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.76
  AVERAGE FLOW DEPTH(FEET) =   0.52   TRAVEL TIME(MIN.) =   0.76
  Tc(MIN.) =   11.18
  SUBAREA AREA(ACRES) =     2.65       SUBAREA RUNOFF(CFS) =    3.94
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        4.3         PEAK FLOW RATE(CFS) =       6.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.61   FLOW VELOCITY(FEET/SEC.) =   6.23
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =     914.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.3  TC(MIN.) =     11.18
  PEAK FLOW RATE(CFS)   =       6.45
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

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

                          Tory R. Walker Engineering



 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDITION POC-2 (100-YEAR)                                      *
* La Jolla View Reservoir, San Diego, CA                                   *
*                                                                          *
 **************************************************************************

  FILE NAME: LJPR1002.DAT
  TIME/DATE OF STUDY: 16:11 11/09/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  8
   1)   5.000;  4.400
   2)   6.000;  4.200
   3)   7.000;  3.900
   4)   8.000;  3.750
   5)   9.000;  3.600
   6)  10.000;  3.450
   7)  12.000;  3.200
   8)  15.000;  2.900
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0160

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
```
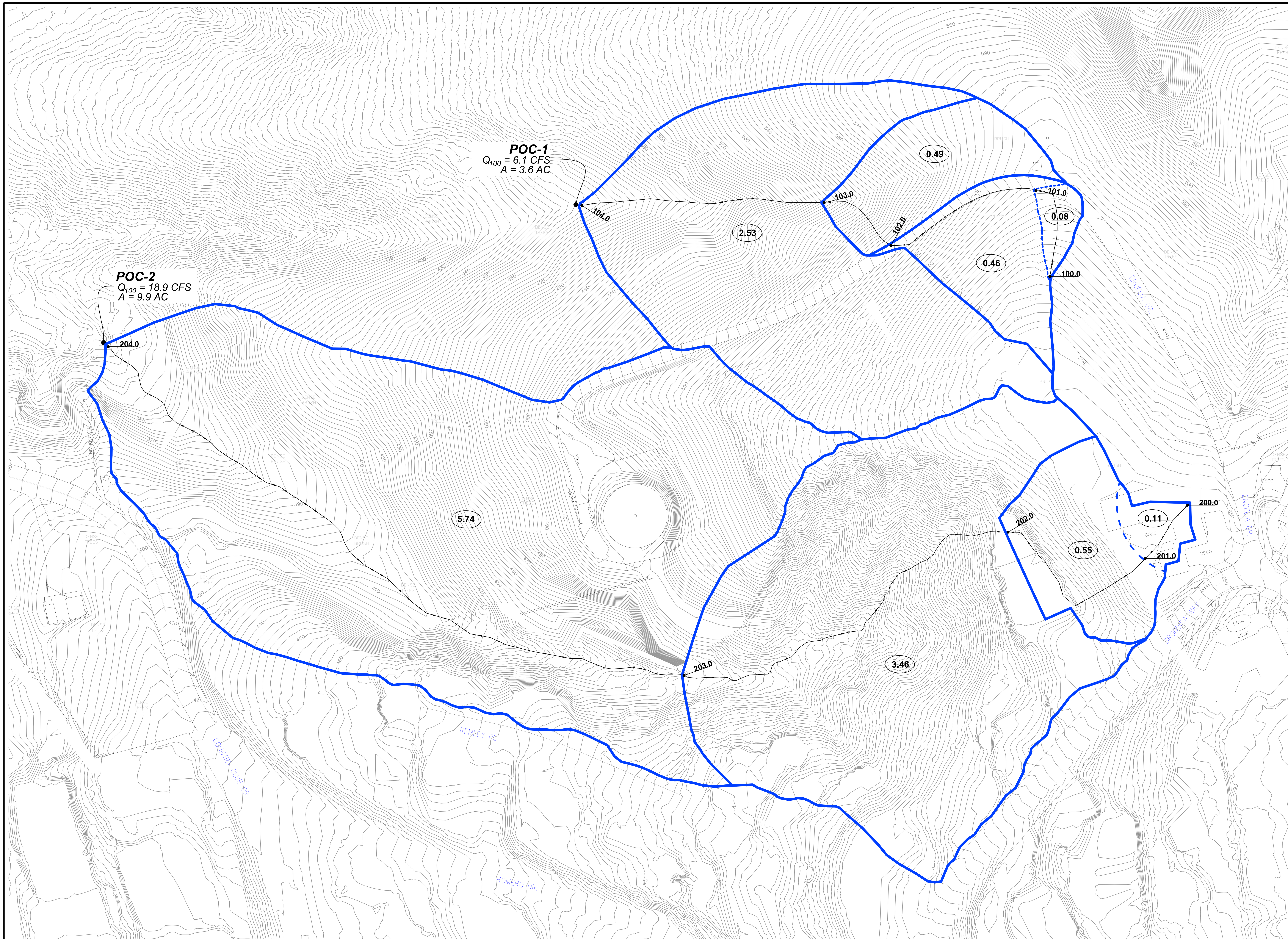

```
 USER-SPECIFIED RUNOFF COEFFICIENT = .9500
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
 UPSTREAM ELEVATION(FEET) =    653.00
 DOWNSTREAM ELEVATION(FEET) =    652.00
 ELEVATION DIFFERENCE(FEET) =      1.00
 URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.153
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    73.75
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.46
 TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    652.00  DOWNSTREAM(FEET) =    612.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   209.00   CHANNEL SLOPE =  0.1914
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.56
 AVERAGE FLOW DEPTH(FEET) =   0.30   TRAVEL TIME(MIN.) =   0.63
 Tc(MIN.) =    2.78
 SUBAREA AREA(ACRES) =     0.55       SUBAREA RUNOFF(CFS) =    1.09
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.533
 TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       1.55

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   6.39
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     289.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    612.00  DOWNSTREAM(FEET) =    470.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   425.00   CHANNEL SLOPE =  0.3341
 CHANNEL BASE(FEET) =    0.50   "Z" FACTOR =   2.000
 MANNING'S FACTOR = 0.060   MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.400
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.97
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.18
 AVERAGE FLOW DEPTH(FEET) =   0.52   TRAVEL TIME(MIN.) =   1.15
 Tc(MIN.) =    3.92
 SUBAREA AREA(ACRES) =     3.46       SUBAREA RUNOFF(CFS) =    6.85
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.463
  TOTAL AREA(ACRES) =        4.1         PEAK FLOW RATE(CFS) =       8.40

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.66   FLOW VELOCITY(FEET/SEC.) =   7.01
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     714.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    470.00  DOWNSTREAM(FEET) =    346.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   760.00   CHANNEL SLOPE =  0.1632
  CHANNEL BASE(FEET) =    0.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.060   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.198
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.08
  AVERAGE FLOW DEPTH(FEET) =   0.94   TRAVEL TIME(MIN.) =   2.08
  Tc(MIN.) =    6.01
  SUBAREA AREA(ACRES) =     5.54       SUBAREA RUNOFF(CFS) =   10.46
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.456
  TOTAL AREA(ACRES) =        9.7         PEAK FLOW RATE(CFS) =      18.48

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.07   FLOW VELOCITY(FEET/SEC.) =   6.59
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =    1474.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        9.7  TC(MIN.) =      6.01
  PEAK FLOW RATE(CFS)   =      18.48
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix C

Project Maps

Existing Condition Hydrology Map
Developed Condition Hydrology Map



LEGEND

	SUBAREA BASIN BOUNDARY
	INITIAL AREA BOUNDARY
	FLOW DIRECTION
100.0	RATIONAL METHOD NODE
0.08	AREA (AC)
610	EXISTING CONTOUR

N
W E
S
0 50 100 Feet

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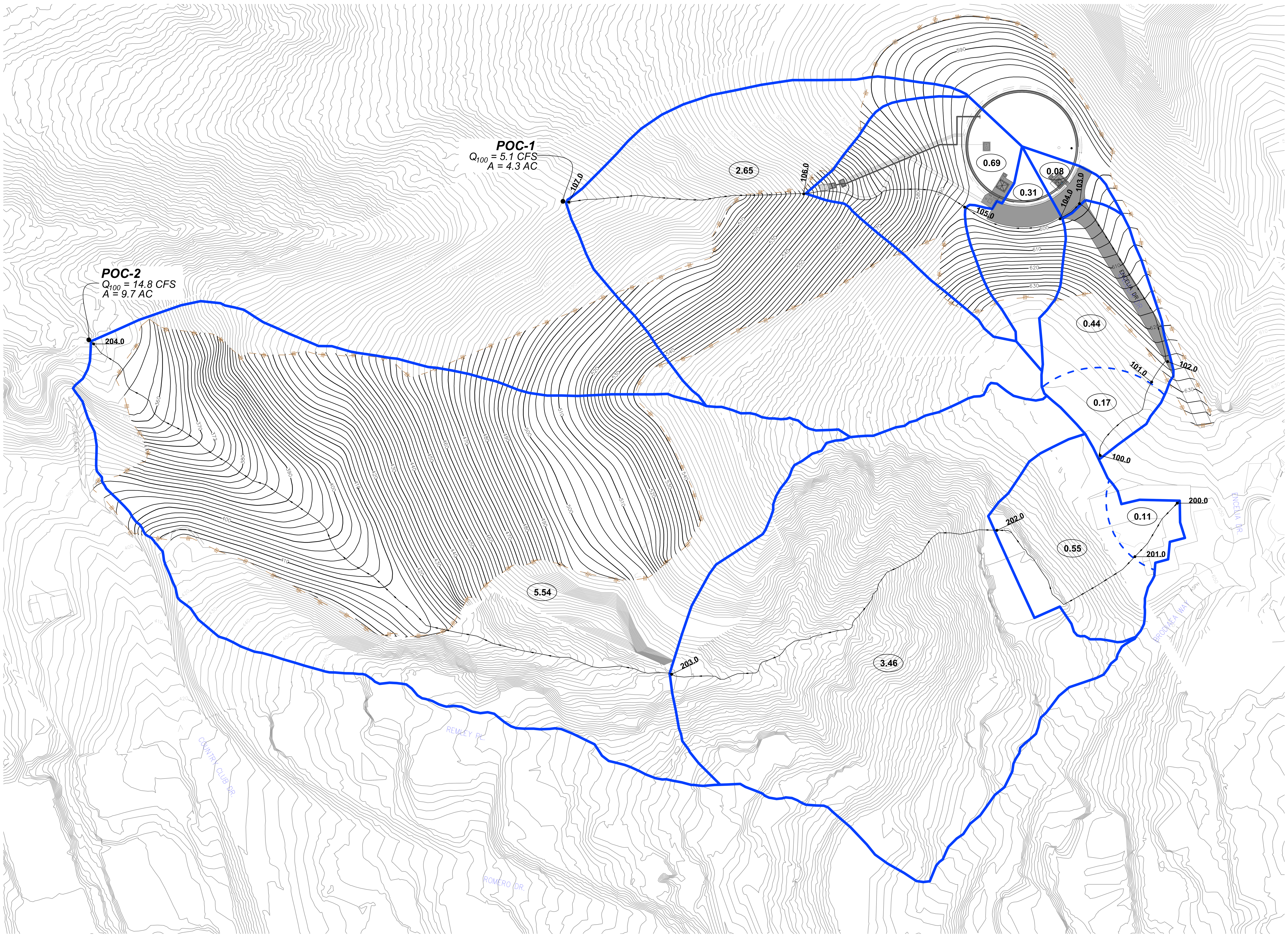
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 · 760-414-9212

LA JOLLA VIEW RESERVOIR
EXISTING CONDITION HYDROLOGY MAP

X:\Projects\2\022 (Helix Environmental Planning, Inc.)\11 (SD PWD Enviro Planning)\01 La Jolla View Reservoir\04 ACAD\hydrology-map-exist_LVR.dwg, 3/1/2018 4:53:24 PM



LEGEND

SUBAREA BASIN BOUNDARY

INITIAL AREA BOUNDARY

FLOW DIRECTION

100.0 RATIONAL METHOD NODE

0.08 AREA (AC)

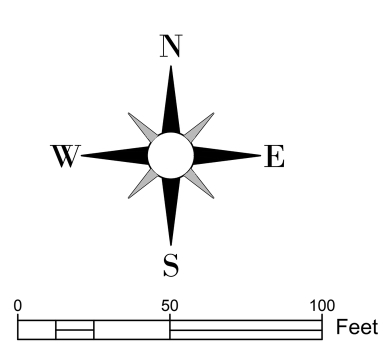
LIMIT OF GRADING

PROPOSED IMPERVIOUS AREA

610 PROPOSED CONTOUR

610 EXISTING CONTOUR

NOTE:
PROPOSED IMPERVIOUS AREAS ARE SHOWN ON THIS EXHIBIT (SEE LEGEND). ALL OTHER AREAS WITHIN LIMIT OF GRADING ARE VEGETATED WITH SOUTHERN MARITIME CHAPARRAL (SEE LANDSCAPE RESTORATION PLAN FOR DETAIL).



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LA JOLLA VIEW RESERVOIR
PROPOSED CONDITION HYDROLOGY MAP

X:\Projects2\022 (Helix Enviornmental Planning, Inc.)\11 (SD PWD Enviro Planning)\01 La Jolla View Reservoir\04 ACAD\hydrology-map-prop_LVR.dwg, 3/1/2018 4:54:41 PM

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 EVALUATION
LA JOLLA VIEW RESERVOIR
REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PREPARED FOR:

Infrastructure Engineering Corporation
14271 Danielson Street
Poway, California 92064

PREPARED BY:

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

July 11, 2014
Project No. 107314001

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

July 11, 2014
Project No. 107314001

Mr. Anders Egense
Infrastructure Engineering Corporation
14271 Danielson Street
Poway, California 92064

Subject: Geotechnical Evaluation
La Jolla View Reservoir Replacement Project
La Jolla, California

Dear Mr. Egense:

In accordance with your authorization, we have performed a geotechnical evaluation for the City of San Diego's La Jolla View Reservoir Replacement Project in La Jolla, California. This report presents our geotechnical findings, conclusions, and recommendations regarding the proposed project. Our report was prepared in accordance with our revised proposal dated August 27, 2012.

We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

William R. Morrison, PE, GE
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Appendices

Appendix A – Boring Logs
Appendix B – Laboratory Testing
Appendix C – Slope Stability Analysis

1. INTRODUCTION

In accordance with your request, we have performed a geotechnical evaluation for the proposed La Jolla View Reservoir Replacement Project located in La Jolla, California (Figure 1). The project consists of construction of a new 3.11 million gallon (MG) water storage tank and associated pipelines as well as demolition of the existing La Jolla View and Exchange Place Reservoirs. This report presents our findings and conclusions regarding the geotechnical conditions at the subject site, and our recommendations for the design, earthwork, and construction of this project.

2. SCOPE OF SERVICES

Our scope of services for this evaluation included the following:

- Project coordination and review of readily available background materials pertaining to the site, including geologic and topographic maps, geotechnical reports, faulting and seismic hazard reports, and stereoscopic aerial photographs.
- Review of engineering plans, previous reports, and other data provided by the client.
- Performance of a site reconnaissance to observe and document existing conditions and to mark exploratory boring locations for utility clearance by Underground Service Alert.
- Acquisition of a boring permit from the County of San Diego Department of Environmental Health (DEH).
- Coordinating with environmental professionals to limit environmental impacts at the proposed boring locations.
- Performance of a subsurface exploration consisting of the drilling, logging, and sampling of eight exploratory borings. Specifically, we performed three large-diameter borings which were downhole logged by a Certified Engineering Geologist and five small-diameter borings. Bulk and in-place samples were collected and transported to our in-house geotechnical laboratory for testing.
- Performance of geotechnical laboratory testing on selected samples.
- Compilation and geotechnical analysis of data obtained from our research, subsurface exploration, and geotechnical laboratory testing.
- Preparation of this geotechnical report presenting our findings, conclusions, and recommendations for the design and construction of the proposed project.

3. SITE DESCRIPTION

The La Jolla View Reservoir Replacement Project site is generally located within the City of San Diego La Jolla Natural Park and along Country Club Drive in the La Jolla community of San Diego, California (Figure 1). Topography of the project area is characterized by native ridges and slopes incised by steep-sided erosional ravines. A large, westerly trending ravine is located along the north side of Country Club Drive. Drainage at the site is by sheet flow down the flanks of existing ridges to the ravine north of Country Club Drive. Elevations across the site range from approximately 240 feet above mean sea level (MSL) near the intersection of Soledad Avenue and Exchange Place to approximately 650 above MSL near the intersection of Brodiaea Way and Encelia Drive. The proposed reservoir site is located near the top of a ridge with north-, east-, and west-facing slopes covered with low-lying chaparral and succulents.

The project site is currently occupied by two existing reservoirs. The existing La Jolla View Reservoir is a 0.72 MG steel tank approximately 70 feet in diameter and 30 feet in height. This reservoir, constructed in approximately 1948, is located near the southern edge of the site near the upper end of the large ravine that cuts across the site from east to west. An asphalt-paved access road to the existing La Jolla View Reservoir is located northeast of the reservoir and extends to a gated entrance at Brodiaea Way and Encelia Drive. A buried utility water pipeline extends southwest from the reservoir to Country Club Drive. This reservoir is partially supported on fill soils that were placed at the time the reservoir was constructed. A roughly 30-foot-high cut slope constructed at a slope angle of approximately ½:1 (horizontal to vertical) is located on the east side of the existing tank. A geotechnical reconnaissance report was performed for the existing La Jolla View Reservoir site in 2001 (LawCrandall, 2001).

A second existing reservoir, the 0.98 MG Exchange Place Reservoir, is a buried rectangular tank located near the western end of the project, between Country Club Drive, Exchange Place, La Jolla Knolls Drive, and Al Bahr Drive. Slopes and retaining walls up to 25 feet in height are located on the north, east, and west sides of this reservoir.

4. PROJECT DESCRIPTION

We understand that, as part of the La Jolla View Reservoir Replacement project, the existing Exchange Place Reservoir and La Jolla View Reservoir will be demolished. Following demolition of the Exchange Place Reservoir, the below-grade portions of the concrete liner will be left in-place and the resulting excavation will be filled with cuttings generated from the new reservoir site. After demolition and removal of the tank, the site of the former La Jolla View Reservoir will be graded to approximately restore the pre-development hillside configuration.

A new 3.11 MG La Jolla View Reservoir is proposed to be constructed on a ridge approximately 500 feet northwest of the intersection of Brodiaea Way and Encelia Drive and approximately 600 feet northeast of the existing La Jolla View Reservoir (Figure 2). Based on our current understanding of the project, the new pre-stressed concrete reservoir will be approximately 120 feet in diameter and 40 feet in height and will be buried below the existing terrain. Excavation for the new tank pad is anticipated to result in temporary cut slopes of up to approximately 70 feet in height. These temporary cut slopes will be constructed at near-vertical and approximately 1:1 (horizontal to vertical) slope gradients. It is anticipated that soil nails may be used to provide stability to the vertical portions of the temporary cut slopes. A temporary access road will provide site access from Country Club Drive. Construction of the access road as well as a temporary stockpile along the road will include cuts and fills of up to 60 feet. A new utility water pipeline will be constructed between the new reservoir and the intersection of Brodiaea Way and Encelia Drive. We also understand that the existing access road northwest of Encelia Drive may either be removed or replaced with pervious pavement.

As part of the project, a new 2,800-foot long, 30-inch diameter water pipeline will be constructed. The new pipeline will extend southwest from the new reservoir to Country Club Drive. The pipeline will then extend to the northwest along Country Club Drive to the intersection of Exchange Place and Soledad Avenue (Figure 2). While most of the pipeline is anticipated to be constructed by open-trench methods, the section of the pipeline that crosses the deep ravine north of Country Club Drive may utilize trenchless methods (e.g., microtunneling, jack-and-bore, etc.).

5. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our subsurface exploration was conducted on February 19 and 20, 2014 and on March 26, 27, and 28, 2014 and consisted of the drilling, logging, and sampling of eight exploratory borings (Borings B-1 through B-8). Borings B-1 and B-2 were drilled in the area of the proposed reservoir, Borings B-3 and B-4 were drilled at the existing La Jolla View Reservoir site, Boring B-5 was drilled adjacent to the Muirlands Pump Station (along Country Club Drive) in the vicinity of the proposed pipeline, and Borings B-6 through B-8 were drilled at the existing Exchange Place Reservoir site. Borings B-1 through B-3 were drilled using a truck-mounted drill rig equipped with 30-inch diameter bucket and solid flight augers. These borings were downhole logged by a Certified Engineering Geologist (CEG). Borings B-4 through B-8 were drilled with a truck-mounted drill rig using 6-inch diameter hollow-stem augers. The exploratory borings were drilled to depths of up to approximately 84 feet. The approximate locations of our exploratory borings are shown on the maps presented in Figures 3A through 3D. Logs of the borings are presented in Appendix A.

Relatively undisturbed and bulk samples were collected at selected depths from the borings and transported to our in-house geotechnical laboratory for testing. Laboratory testing included in-situ moisture content and dry density, gradation, Atterberg limits, direct shear testing, expansion index, soil corrosivity, and R-value. The results of the in-situ moisture content and dry density tests are shown at the corresponding sample depths on the boring logs in Appendix A. The results of the other laboratory tests performed are presented in Appendix B.

6. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, including groundwater conditions, faulting and seismicity, and landslides at the subject site are provided in the following sections. A regional geologic map, geologic cross-sections, a regional faulting map, and a geologic hazards map are presented on Figures 4 through 7.

6.1. Regional Geologic Setting

The project area is situated in the coastal section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990; Harden, 2004). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the southern California batholith. The portion of the province in San Diego County that includes the project area is generally underlain by Cretaceous-, Tertiary-, and Quaternary-age sedimentary rock.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest. Several of these faults, which are shown on Figure 6, are considered active faults. The Whittier-Elsinore, San Jacinto, San Andreas, and Rose Canyon faults are active fault systems located east and northeast of the project area and the Agua Blanca-Coronado Bank, San Diego Trough, and San Clemente faults are active faults located west of the project area. Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement. Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report.

6.2. Site Geology

Based on our subsurface evaluation and our review of published maps and reports, earth units at the project site consist of fill and topsoil/colluvium, which mantle formational materials including very old paralic deposits (formerly designated the Lindavista Formation), the Mount Soledad Formation, Ardath Shale, and the Cabrillo Formation. Generalized descriptions of the earth units encountered during our field reconnaissance and subsurface exploration are provided in the subsequent sections. Additional descriptions of the subsurface units are provided on the boring logs in Appendix A.

6.2.1. Fill

Fill material was encountered in Borings B-2 through B-8 and is expected to underlie various portions of the proposed project. As encountered in Boring B-2 at the proposed reservoir site beneath the existing pavement, the fill is approximately 1-foot thick and consists of brown, damp, soft to firm sandy clay with gravel and cobbles. At the existing La Jolla View Reservoir site, fill was encountered beneath the existing pavement and extended to depths of greater than 20 feet. As encountered in Borings B-3 and B-4, the fill material consists of brown, damp to moist, medium dense to dense, clayey to sandy gravel with cobbles. In Boring B-5, the encountered fill materials consist of light brown to brown, damp, medium dense to dense, clayey sand with scattered cobbles. Similar fill materials are expected to underlie the pipeline alignment along Country Club Drive. At the existing Exchange Place Reservoir site, fill was encountered beneath the existing pavements and extended to the total depths explored (24 feet). As encountered in Borings B-6 through B-8, the fill materials consist of various shades of brown, damp to moist, medium dense to dense, silty and clayey sand and stiff to hard, gravelly clay. Abundant gravel and cobbles were encountered in the fill materials. Existing fill soils are assumed to be undocumented.

6.2.2. Topsoil/Colluvium

A mantle of topsoil/colluvium is anticipated to exist along ridges and slopes across the site. As encountered in Borings B-1 and B-2 at the proposed reservoir site, these materials are up to about 2 feet in thickness and consist of various shades of brown and gray, moist, stiff, sandy clay. These materials were also encountered in Boring B-5 beneath the fill materials and extended down to a depth of approximately 10 feet. As encountered, these materials consist of brown to reddish brown, moist, dense, clayey gravel.

6.2.3. Very Old Paralic Deposits

While not encountered in our exploratory borings, Pleistocene-age very old paralic deposits (Kennedy and Tan, 2008) are mapped in the vicinity of the new proposed La Jolla View Reservoir site and across portions of the proposed pipeline alignment. This unit was formerly designated as the Lindavista Formation on older geologic maps. The very old paralic deposits consist of reddish brown, moderately to well-cemented silty sandstone with numerous gravels and cobbles and sandy conglomerate. The very old paralic deposits unconformably overlie the Ardath Shale, Mount Soledad Formation, and Cabrillo Formation.

6.2.4. Ardath Shale

Although not encountered in our exploratory borings, materials of the Eocene-aged Ardath Shale are mapped southwest of the Country Club fault, underlying the western portion of the proposed pipeline alignment. The Ardath Shale generally consists of light gray to light reddish brown, finely bedded, moderately indurated, clayey siltstone with lesser amounts of moderately to well cemented, silty fine-grained sandstone. Resistant, well-cemented concretions and concretionary layers may be encountered within the Ardath Shale. The Ardath Shale is conformably underlain by the Mount Soledad Formation.

6.2.5. Mount Soledad Formation

The Eocene-aged Mount Soledad Formation is mapped within the central portion of the proposed water pipeline and was encountered in our Boring B-5. As encountered underlying fill and colluvium, this unit consists of light brown, brown, and yellowish brown, weakly cemented, sandy and clayey siltstone and silty sandstone and conglomerate. Resistant, well-cemented concretions and concretionary layers may be encountered within the Mount Soledad Formation. The Mount Soledad Formation is conformably overlain by the Ardath Shale and is unconformably underlain by the Cabrillo Formation.

6.2.6. Cabrillo Formation

Materials of the Cretaceous-aged Cabrillo Formation were encountered in our Borings B-1 through B-3 at the proposed and existing La Jolla View Reservoir sites. The Cabrillo Formation is also expected at several locations along the proposed water pipeline. As encountered, materials comprising the Cabrillo Formation generally consist of various shades of brown and gray, weakly to strongly cemented sandstone and light brown, poorly to moderately cemented cobble conglomerate. Lesser beds of siltstone and claystone were also encountered. The Cabrillo Formation is unconformably overlain by the Mount Soledad Formation.

6.3. Geologic Structure

The Mount Soledad area is an intensely folded and faulted area, due to uplift and deformation caused by the movement along the Rose Canyon fault. The project area is located on the western side of the Mount Soledad anticline, a shallow folded structure with limbs that dip to the northeast and southwest. The anticline is cut and deformed by several faults including the Rose Canyon fault, the Mount Soledad fault, the Country Club fault, and several unnamed faults.

Bedding within the Cabrillo Formation at the proposed reservoir site was observed to be undulatory and dipping up to 35°. Older fractures and faults were observed within the Cabrillo Formation and were found to generally dip 55° or more to the south and west. Excavations in areas crossed by these older fractures and faults may result in surficial block failures. Further recommendations regarding excavation conditions can be found in the Section 8.1.11 of this report. In addition, several clay seams were observed within intact portions of the Cabrillo Formation with orientations generally consistent with that of bedding. It is our opinion that these clay seams represent bedding-parallel shear zones (Hart, 2000) and are not indicative of recent landsliding. Graphic representations of structural features encountered during our subsurface evaluation are included on Figure 5.

6.4. Groundwater

Groundwater was not encountered in our exploratory borings. Based on the elevation and topography of the area and our experience in the vicinity of the site, static groundwater is likely to be encountered at depths greater than 85 feet below the proposed reservoir site. Static groundwater may be encountered at shallower depths within the ravines, especially the ravine northwest of Country Club Drive. Groundwater seepage at other elevations may be encountered and fluctuations in the groundwater level may occur due to variations in ground surface topography, subsurface geologic conditions and structure, rainfall, irrigation, and other factors.

6.5. Faulting and Seismicity

Like other areas of southern California, the project area is considered to be seismically active and the potential for strong ground motion is considered significant during the design life of the proposed project improvements. Based on our review of the referenced geologic maps and stereoscopic aerial photographs, as well as on our subsurface evaluation, the subject site is not located within a State of California Earthquake Fault Zone (EFZ), formerly known as an Alquist-Priolo Special Studies Zone (Hart and Bryant, 1997). However, two potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 2,000,000 years) have been mapped as crossing the proposed pipeline alignment (Figures 4 and 7). These faults, the Country Club fault and a shorter, unnamed fault, traverse portions of the proposed water pipeline alignment.

The nearest known active fault is the Rose Canyon fault, located approximately 0.4 miles northeast of the site. Table 1 lists selected principal known active faults that may affect the subject site, the maximum moment magnitude (M_{max}) and the fault types as published for the California Geological Survey (CGS) by Cao et al. (2003). The approximate fault-to-site distance was calculated by the United States Geological Survey (2008) National Seismic Hazard Maps database (web-based) or was assessed from the referenced geologic maps.

Table 1 – Principal Active Faults

Fault	Distance miles [1]	Moment Magnitude/ Fault Type [1,2]
Rose Canyon	0.4	7.2/B
Coronado Bank	13	7.6/B
Newport-Inglewood (Offshore)	24	7.1/B
Elsinore (Temecula Segment)	37	6.8/A
Elsinore (Julian Segment)	39	7.1/A
Earthquake Valley	46	6.5/B
Palos Verdes	49	7.3/B
Elsinore (Glen Ivy Segment)	54	6.8/A
Elsinore (Coyote Mountain)	54	6.8/A
San Joaquin Hills	57	6.6/B
San Jacinto (Coyote Creek Segment)	60	6.8/A

Notes:
[1] USGS (2008)
[2] Cao, et al. (2003)

In general, hazards associated with seismic activity include strong ground motion, ground surface rupture, liquefaction, and seismically induced settlement. These hazards are discussed in the following sections.

6.5.1. Strong Ground Motion

The 2013 California Building Code (CBC) recommends that the design of structures be based on the spectral response accelerations in the direction of maximum horizontal response (5 percent damped) having a 1 percent probability of collapse in 50 years. Such spectral response accelerations represent the Risk-Targeted Maximum Considered Earthquake (MCE_R) ground motion. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated as 0.51g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based). The mapped and design PGA were estimated to be 0.58g and 0.34g, respectively, using the USGS (2013) calculator and the American Society of Civil Engineers (ASCE) 7-10 Standard.

6.5.2. Ground Surface Rupture

Based on our review of the referenced reports, geologic maps, and stereoscopic aerial photographs, as well as on our geologic field reconnaissance and subsurface evaluation, active faults have not been mapped and were not observed at the proposed new La Jolla View Reservoir site. Based on this information, the potential for surface rupture on the site is considered low. However, as previously discussed, two potentially active faults (the Country Club fault and a shorter, unnamed fault), cross portions of the proposed water pipeline alignment. The Country Club fault has been mapped as generally following the ravine northwest of Country Club Drive. The short, unnamed fault parallels the Country Club fault, approximately 800 feet northeast of Country Club Drive. The mapped southeastern end of the unnamed fault is located roughly 200 feet southwest of the new reservoir site. While ground surface rupture is not considered likely at these locations, it is possible. In addition, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

6.5.3. Liquefaction and Seismically Induced Settlement

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction. Based on the dense nature of the underlying formational materials and absence of a shallow groundwater table, it is our opinion that liquefaction and seismically induced settlement at the project site are not design considerations.

6.6. Landsliding

Numerous landslides have been mapped in the vicinity of the project area (Figures 4 and 7). Most of these mapped landslides appear to be the result of shallow earth flow type failures with some deeper translational landslides located north of the project area. Based on our review of published geologic literature and aerial photographs and our subsurface exploration, no deep-seated landslides or related features underlie the proposed reservoir site. Due to the proposed temporary steep slopes and the fractured nature of the Cabrillo Formation, the potential for shallow block failures to impact the site during construction should be anticipated. Slope stability is discussed further in our recommendations.

While landslides have not been mapped adjacent or beneath the new reservoir site, the LawCrandall (2001) report indicates "...a landslide appears to underlie the existing (La Jolla View) reservoir site…" based on LawCrandall's review of aerial photographs and as-built reservoir plans (City of San Diego, 1948). Evidence of deep-seated landsliding was not observed in our exploratory borings drilled at the existing La Jolla View Reservoir site. However, the total extent of a possible landslide at the existing reservoir could not be evaluated at the time of our field activities due to drilling access restraints. Landsliding should be further evaluated during demolition of the existing reservoir and during earthwork for the former and new reservoir sites.

7. CONCLUSIONS

Based on our review of the referenced background data, subsurface exploration, and laboratory testing, it is our opinion that the proposed reservoir replacement project is feasible from a geotechnical standpoint provided the recommendations presented in this report are incorporated into the design and construction of the project. Due to the preliminary nature of the anticipated depth of the proposed improvements and the variable subsurface conditions, we recommend that our office re-evaluate our conclusions and recommendations once final plans are available. In general, the following conclusions were made:

- The proposed reservoir site is underlain by fill, topsoil, and formational materials of the Cabrillo Formation. Fill and topsoils are not considered suitable for structural support of the proposed improvements in their current condition. The Cabrillo Formation is considered suitable for structural support.

- Based on our subsurface exploration, excavation at the proposed reservoir site should be feasible with heavy-duty earthmoving equipment in good working condition. However, the contractor should anticipate heavy ripping or rock breaking in areas of concretionary or well cemented sandstone and conglomerate.

- The project site is located in a seismically active zone. Accordingly, the potential for strong seismic ground motions should be considered in the project design. A design PGA of 0.34g was calculated for the project site.
- Groundwater was not encountered in our borings. Accordingly, we do not anticipate that groundwater will be a constraint for the proposed construction.
- On-site excavations are anticipated to generate oversized materials. Additional processing (i.e., screening or crushing) should be anticipated prior to usage as engineered fill.
- Based on our limited laboratory testing, the encountered soils and formational materials are considered corrosive.

8. RECOMMENDATIONS

Based on our understanding of the project, the following recommendations are provided for the design and construction of the proposed improvements.

8.1. Earthwork

In general, earthwork should be performed in accordance with the recommendations included in this report. Ninyo & Moore should be contacted for questions regarding the recommendations provided herein.

8.1.1. Pre-Construction Conference

We recommend that a pre-construction conference be held in order to discuss the recommendations presented in this report. The owner and/or their representative, the governing agencies' representatives, the civil engineer, Ninyo & Moore, and the contractor should be in attendance to discuss the work plan, project schedule, and earthwork requirements.

8.1.2. Site Preparation

Prior to excavation and placement of fill, the project site should be cleared of abandoned utilities (if present), and stripped of rubble, debris, vegetation, any loose, wet, or otherwise unstable soils, as well as surface soils containing organic material. Obstructions that extend below the finished grade, if any, should be removed and the resulting holes filled with com-

compacted soil. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite away from the project area.

8.1.3. Remedial Grading

In general, we recommend that the on-site existing fill, topsoil, and colluvium be removed down to competent materials in those areas where improvements or additional fill soils are planned. The extent and depths of removals should be evaluated by Ninyo & Moore's representative in the field based on the materials exposed. Where required, the resulting excavation may be filled with engineered fill soils (either on-site derived or imported) that meet the recommendations presented in the following sections. Precautions should be taken by the contractor when grading adjacent to existing structures.

8.1.4. Excavation Characteristics

Our evaluation of the excavation characteristics of the on-site materials is based on the results of our exploratory borings, our site observations, and our experience with similar materials in the general vicinity of the site. Due to the presence of gravel, cobbles, and possible boulders along with strongly cemented zones within the materials of very old paralic deposits, the Mount Soledad Formation, and the Cabrillo Formation, difficulty in the performance of excavations should be anticipated. The presence of rock masses, and/or strongly cemented or concretionary zones can be problematic in a narrow trench and should be anticipated. Consequently, special excavation methods, including heavy ripping or rock breaking may be needed.

8.1.5. Cut/Fill Transition

The proposed reservoir should not straddle a cut/fill transition. In the instance that a cut/fill transition condition is created beneath the reservoir through grading, one of the two following recommendations may be implemented. The first option consists of the overexcavation of the pad area for the new reservoirs. The overexcavation should extend to a depth of 2 feet below the bottom of the footing elevation or one-third of the largest thickness of fill, whichever is deeper. Engineered fill may then be moisture-conditioned, placed in the overexcavation, and compacted in accordance with the recommendations herein. The reservoir pad area is defined as the structure footprint and extending 5 feet horizontally outside of the structure footprint plus the depth of the overexcavation.

As an alternative to overexcavation, the fill portion of the cut/fill transition may be removed and replaced with a controlled low strength material (CLSM). The reservoir base may be supported on the CLSM.

8.1.6. Materials for Fill

The on-site soils with an organic content of less than approximately 3 percent by volume (or 1 percent by weight) are suitable for reuse as engineered fill. In general, fill material should not contain rocks or lumps over approximately 3 inches, and not more than approximately 30 percent larger than ¾-inch. Oversize material generated during excavations should be disposed of off-site or broken into acceptable size material. Imported fill material, if needed for the project, should generally be granular soils with a very low to low expansion potential (ASTM International [ASTM] 4829). Import material should also be non-corrosive in accordance with the Caltrans (2012) and American Concrete Institute (ACI) 318 corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

8.1.7. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed removal surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified to a depth of approximately 8 inches and watered or dried, as needed, to achieve moisture contents generally above the optimum moisture content. The scarified materials should then be compacted to a relative compaction of 90 percent as evaluated in accordance with the ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when project areas are ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture-conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture-conditioning of fill soils should be generally consistent within the soil mass. As noted, wet soils may be encountered during construction and aeration/processing should be anticipated.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture-conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally above the laboratory optimum, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

We understand that structural foam blocks (i.e., lightweight fill) are being considered for use as backfill for the reservoir excavation. If structural foam blocks are used, we recommend that they be placed in accordance with the manufacturer's guidelines/specifications.

8.1.8. Fill Slopes

Fill slopes for the project should be constructed at an inclination of 2:1 (horizontal to vertical) or flatter. We performed global slope stability of the proposed temporary 2:1 (horizontal to vertical) stockpile slope using the two-dimensional stability analysis program GSTABL7 with STEDwin (version 2). The slope stability calculations of the stockpile slope (section B-B') are presented in Appendix C. The results of our analysis indicate that the proposed 2:1 (horizontal to vertical) fill slopes will be globally stable if the fills are derived from suitable materials and properly constructed as recommended in this report.

Compaction of the face of temporary and permanent fill slopes should be performed by backrolling at intervals of 4 feet or less in vertical height, or as dictated by the capability of the available equipment, whichever is less. Fill slopes should be backrolled utilizing a conventional sheepsfoot-type roller. Care should be taken to maintain the desired moisture conditions and/or reestablish them, as needed, prior to backrolling. The placement, moisture-conditioning, and compaction of fill slope materials should be done in accordance with the recommendations presented in the Compacted Fill section of this report. Slopes and other exposed ground surfaces should be appropriately planted with a protective ground cover. To enhance surficial stability, fill slopes should be planted as soon as feasible subsequent to grading. Erosion control and drainage devices should be installed in compliance with the requirements of the local governing agencies as soon as feasible subsequent to grading.

8.1.9. Fill Placement on Sloping Ground

Fills constructed on sloping ground having an inclination steeper than 5:1 should be keyed and benched into competent materials underlying loose soils. Keys should generally be 15 feet in width or greater and extend 3 feet or more into the competent material. The actual width of the keys and extent of removal of any existing loose surficial soil or other native materials should be evaluated by Ninyo & Moore or the client's designated representative in the field during construction. In addition, key excavations should be observed by Ninyo & Moore or the client's designated representative prior to placing fill.

8.1.10. Cut Slopes

The stability of cut slopes is generally affected by local geologic conditions, the gradient of the overall slope, groundwater seepage conditions and also by the excavation technique used in creating the slope. We performed global slope stability of the proposed temporary 1:1 (horizontal to vertical) cut slope using the two-dimensional stability analysis program GSTABL7 with STEDwin (version 2). The slope stability calculations of the cut slope (section C-C') are presented in Appendix C. The results of our analysis indicate that the proposed 1:1 (horizontal to vertical) cut slopes will be globally stable if the cuts are made into suitable materials of the Cabrillo Formation or similar formational materials and properly constructed as recommended in this report. Permanent cut slopes within the Cabrillo Formation should be constructed at an inclination of 2:1 (horizontal to vertical) or flatter. Excavation of cut slopes should include removal of near-surface residual soils and/or weathered materials. It is recommended that cut slopes be observed by Ninyo & Moore during grading to further evaluate their stability, the presence of geologic planes of weakness, and to provide appropriate mitigation recommendations as needed.

Typically, in slopes excavated in ripped formational materials, loose materials may be present in slope faces. Finish slopes should be groomed to reduce spalling of loose materials from the slope faces.

Surface runoff should not be permitted to flow over the tops of slopes. Positive drainage should be established away from the top of slopes. This may be accomplished by utilizing brow ditches placed at the top of cut slopes to divert surface runoff away from the slope face where drainage devices are not otherwise available.

8.1.11. Temporary Excavations and Shoring

For temporary excavations, we recommend that the following Occupational Safety and Health Administration (OSHA) soil classifications be used:

Fill and Colluvium	*Type C*
Very Old Paralic Deposits, Mount Soledad Formation, Ardath Shale, Cabrillo Formation	*Type B*

Upon making the excavations, the soil classifications and excavation performance should be evaluated in the field by the geotechnical consultant in accordance with the OSHA regulations. Temporary excavations should be constructed in accordance with OSHA recommendations. For trenches, jacking and receiving pits, or other excavations, OSHA requirements regarding personnel safety should be met using appropriate shoring (including trench boxes) or by laying back the slopes to no steeper than 1.5:1 in fill colluvial materials and 1:1 for formational materials including very old paralic deposits, Mount Soledad Formation, Ardath Shale, and Cabrillo Formation.

Figure 8 presents recommended lateral earth pressures for the design of braced shoring. The recommended design pressures are based on the assumptions that the shoring system is constructed without raising the ground surface elevation behind the shoring, that there are no surcharge loads (such as soil stockpiles and construction materials), and that no loads act above a 1:1 plane extending up and back from the base of the shoring system. The contractor should include the effect of any surcharge loads on the lateral pressures against the shoring.

Temporary excavations that encounter seepage may be shored or stabilized by placing sandbags or gravel along the base of the seepage zone. Excavations encountering seepage should be evaluated on a case-by-case basis. On-site safety of personnel is the responsibility of the contractor.

Older fractures and faults were encountered within the Cabrillo Formation during our subsurface evaluation. Due to the proposed steep temporary slopes and the fractured and weathered nature of the Cabrillo Formation, the potential for surficial block failures to impact the slopes during construction should be anticipated.

8.1.12. Backfilling of Exchange Place Reservoir

Based on our communications with Infrastructure Engineering Corporation, we understand that demolition of the Exchange Place Reservoir will include the demolition of the above-grade portions of the existing reservoir and leaving portions of the existing concrete liner in-place. We further understand that the portions of the liner left in-place will be cored in several places to help facilitate drainage of water, and that the resulting excavation will be backfilled with materials excavated from the La Jolla View Reservoir site.

In addition to the coring of the liner (as described above) and to further reduce the potential for the accumulation of subsurface water upon the liner (and to reduce the potential for seepage of this water through the slope face and onto the adjacent properties), we recommend that a subdrain be installed beneath the cored liner prior to the placement of the backfill. This subdrain should consist of a 6-inch-diameter perforated PVC pipe (Schedule 40 or approved equivalent), which is surrounded by 3 cubic feet per lineal foot of clean crushed gravel, and wrapped in Mirafi 140N filter fabric (or approved equivalent). The subdrain should allow gravity flow of water to a nearby storm drain or other suitable outlet.

8.1.13. Soil Nail Retaining Wall

It is our understanding that the City of San Diego is considering the use of a soil nail wall as a method to shore portions of the proposed near-vertical temporary excavation at the reservoir site. The wall will be approximately 350 feet in length and extend along the eastern and southern sides of the reservoir excavation. Preliminary soil nail recommendations for the subject wall are presented below. These recommendations were developed based on the subsurface information obtained from our exploratory borings at the proposed reservoir location (B-1 and B-2) and surface data gathered from our geologic reconnaissance of the site. These soil nail recommendations are also based on our understanding of the general wall profile and sections at the proposed reservoir location. It should be noted that based on our review of the grading plans, the steep inclination of the existing descending slope adjacent to the eastern portion of the wall may result in day-lighting of soil nails installed near the top of the wall. Recommendations regarding soil nails in this area of the site are presented in Section 8.1.13.4. We assume that no additional fill or surcharge will be placed above the soil nail wall. In the event that additional fill materials are to be placed and the retained heights are to be increased, the following recommendations will need to be revisited and refined, as needed.

Based on our understanding of the proposed wall configuration, we anticipate that the soil nail wall will utilize a typical nail spacing of 4 feet on center in both the horizontal and vertical directions. An ultimate unit pullout resistance of 2,100 psf and an allowable unit pullout resistance of 1,050 psf is estimated for the bonded portion of the nail in the materials comprising the Cabrillo Formation. This pullout resistance is based on Table 3.10 of the Federal Highway Administration soil nail design guideline (FHWA, 2003) and assumes rotary drilling methods and gravity grouting of the soil nails. We recommend that soil nails be inclined at an angle of 15 degrees below the horizontal plane with a minimum grout diameter of 6 inches. A nail bar diameter of 1 inch is recommended for design.

For preliminary design purposes, we recommend that soil nails be designed using an unbonded length of 5 feet and a bonded length of 5 feet or more into the materials comprising the Cabrillo Formation. The actual bonded length should be determined by the wall designer based on anticipated loading considerations. The design bond length may be revised based on the pullout testing of the nails during construction. Design of the soil nail walls should be performed in accordance with FHWA soil nail wall design guideline (FHWA, 2003) and should utilize minimum factors of safety presented in Table 5.3 of the FHWA guideline.

In the event the actual nail spacing chosen for the project is different than that recommended herein, the recommendations presented above should be reevaluated and modified as needed. The nail lengths may also need modification if underground utilities are present near the retained areas. While preparing the soil nail layout profile, special care should be taken in limiting the non-anchored portion of the wall (i.e., the top, bottom and the edge segments of the wall) to less than the nail spacing (i.e., less than 4 feet in this case).

8.1.13.1. Materials

The nail bars should conform to ASTM A615 - Grade 75 or ASTM A722 - Grade 150. The soil nails should be epoxy coated in accordance with ASTM A775. The epoxy coat should have a minimum thickness of approximately 0.3-inch, and should be electro-statically applied. If potentially aggressive ground conditions (i.e., low electrical resistivity) are encountered, the use of encapsulation should be considered. Encapsulation should be achieved by grouting the steel bar inside a corrugated HDPE or PVC sleeve. A neat cement grout containing admixtures to control water bleed from the grout should be used to fill the annular space between the bar and the sleeve. The cement grout for the nail should consist of either neat cement or a sand-cement mixture with a minimum three-day compressive strength of 1,500 pounds per square inch (psi) and a minimum 28-day compressive strength of 3,000 psi per ASTM C109. The cement should conform to ASTM C150, Type II/V Portland cement. Fine aggregate for the grout mix should comply with ASTM C33. Water used for grout should potable, clean and free from substances deleterious to concrete and steel. Testing of nail grout during construction should be performed at a frequency no less than one test for every 50 cubic yards of grout placed or once a week, whichever occurs first.

8.1.13.2. Nail Testing

The soil nails should be tested during construction to evaluate the design assumptions and the nail capacities. The contractor should provide equipment and instrumentation needed to check the adequacy of the nails. A dial gauge capable of measuring displacements to 0.01-inch precision should be used to measure the nail movement. A hydraulic jack and pump should be used to apply the test load, and the jack and a calibrated pressure gauge should be used to measure the load. The standard testing procedures typically consist of the following methods:

- <u>Verification Test</u> – These tests are typically performed on a limited number of sacrificial nails to check that 1) the design test load (DTL) may be safely carried, 2) effective bond length corresponds to the design requirements, and 3) the residual movement is within tolerable range. The verification test consists of a single cycle of incremental loading to a maximum test load of 200 percent of the DTL in accordance with the guideline presented in Appendix B1 of FHWA Manual for Design and Construction Monitoring of Soil Nail Walls (Publication No. FHWA-SA-96-069R, dated October 1998). The verification test should be conducted on at least three soil nails within the wall. The location of the verification test nails will be provided by Ninyo & Moore once the soil nail wall profile is developed. The sacrificial nails used for verification tests should not be used as production nails.

- Proof Test – These tests are typically performed on about 5 percent of the production nails in each row to check that the load-deflection behavior of the production nail is consistent with the specified acceptance criteria. The proof test consists of a single cycle of incremental loading to a maximum test load of 150 percent of the DTL in accordance with the guideline presented in Appendix B1 of the aforementioned FHWA Manual (1998). The location of the proof test nails will be evaluated by Ninyo & Moore once the soil nail wall profile is developed.

The verification and proof test schedules for the nails, including the acceptance criteria and repair mechanism of failed test nails, should be developed by the contractor utilizing his experience on similar projects, the nail design/testing recommendations presented here, and the FHWA (1998) guidelines. In general, the acceptance criteria for the tested nails should be based on the following aspects.

- For verification tests, a total creep movement of less than 2 millimeters (mm) per log cycle of time between the 6- and 60-minute readings is measured during creep testing and the creep rate is linear or decreasing throughout the creep test load hold period.

- For proof tests, a total creep movement of less than 1 mm is measured between the 1- and 10-minute readings or a total creep movement of less than 2 mm is measured between the 6- and 60-minute readings and the creep rate is linear or decreasing throughout the creep test load hold period.

- The total measured movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the test nail unbonded length.

- A pullout failure does not occur at the maximum test load. Pullout failure is defined as the load at which attempts to further increase the test load result in continued pullout movement of the test nail. The pullout failure load shall be recorded as part of the test data.

The test schedules of the soil nails and the acceptance criteria should be included in the project plans. Ninyo & Moore should be given the opportunity to review the project plans to check compliance with design and construction recommendations presented herein.

8.1.13.3. Shotcrete Cover

The shotcrete cover for the soil nail wall should be constructed as a reinforced concrete wall at vertical or near-vertical inclination. The wall should be structurally connected to the soil nails through the bearing plate and the nail head assembly. The portion of the wall below the nail will act as a non-structural façade to the cut slope and may not need a footing for vertical or lateral support.

The shotcrete wall should be provided with appropriate drainage in order to reduce build-up of hydrostatic pressure behind the wall. A limited area may exist behind the wall for installation of a conventional pipe and gravel subdrain. Therefore, a drain mat such as Miradrain 6000 or equivalent should be considered. The drain mat should be installed between the soil nails along the back of the shotcrete wall. In the vertical direction, the drain mats should be connected to facilitate the downslope flow of water under gravity. A perforated subdrain should be placed behind the bottom of the shotcrete wall, and it should be partially or wholly wrapped inside the lower edges of the drain mat. Water collected by the perforated subdrain system should be routed to a suitable discharge point.

8.1.13.4. Construction Considerations

The nail installation and shotcrete wall construction should be performed by a specialized contractor having significant experience in nail installations. The construction should be performed in a phased, "top down" manner starting at the top of the wall and proceeding gradually to the bottom. In each phase, nail installation in a row should be preceded by removal of unsuitable materials (e.g., loose fill and/or weathered bedrock) from the slope face and followed by placement of rebar cage and drainage mat for the shotcrete wall, spraying of shotcrete onto the rebar, and finishing and/or sculpturing the wall. Slope excavations should be performed in accordance with the published guidelines of the OSHA.

Based on our review of the grading plans, the steep inclination of the existing descending slope adjacent to the eastern portion of the proposed wall may result in daylighting of soil nails installed near the top of the wall. Therefore, we recommend that soil nail installation should occur no less than 15 feet below the top of the wall along the eastern side. This upper area may be stabilized during construction by sloping back the cut, thereby reducing the slope angle and height of the slope. An alternative method to ensure installation of soil nails into formational materials may include reducing the length of soil nails in this area. In order to adequately reduce the length of the soil nails, the spacing of soil nails should also be reduced.

The nails should be installed at the design angle below the horizontal plane with a tolerance of ±2 degrees at the bearing plate. The bonded portion of the nail should be filled with neat cement grout or a sand-cement mixture following placement of the steel bar inside the nail hole. The unbonded portion of the nail may be filled with lean concrete or slurry. However, the unbonded portion of the nail should be free to move.

The performance of the soil nail should be monitored during construction. The contractor should develop a monitoring plan and submit it to the City for review and approval. As a minimum, the monitoring should include observations for and measurements of 1) lateral movements of the wall face using survey markers, 2) vertical and lateral movements of the top of the wall facing and the ground surface behind the shotcrete facing using optical survey methods, and 3) ground cracks and other signs of disturbance in the wall backfill zone by daily visual inspection.

Zones containing more resistant cobbly, concretionary or well cemented sandstone and conglomerate should be anticipated during construction of the soil nail wall. Consequently, nail construction in such zones would be expected to necessitate coring or percussion drilling. We recommend that an experienced specialty contractor be used for construction of the soil nail wall.

Nail installation and wall construction should be observed by Ninyo & Moore or the City's designated representative. The contractor should provide equipment and instrumentation needed to check placement of steel bars and concrete within the nail holes. The quantity of grout and the grout pressure, if applicable, should be recorded by the contractor for each nail. The nails should be tested to check for the design considerations presented here.

8.1.14. Pipe Bedding and Modulus of Soil Reaction

It is our recommendation that the new pipelines, where constructed in open excavations, be supported on 6 or more inches of granular bedding material. Granular pipe bedding should be provided to distribute vertical loads around the pipe. Pipe bedding should have a Sand Equivalent (SE) of 30 or greater, and be placed around the sides and the crown of the pipe. In addition, the pipe bedding material should extend 1 foot or more above the crown of the pipe. Bedding material and compaction requirements should be in accordance with the recommendations of this report, the project specifications, and applicable requirements of the appropriate governing agency.

The modulus of soil reaction is used to characterize the stiffness of soil backfill placed at the sides of buried flexible pipes for the purpose of evaluating deflection caused by the weight of the backfill over the pipe (Hartley and Duncan, 1987). A soil reaction modulus of 1,000 pounds per square inch (psi) may be used for an excavation depth of up to about 5 feet when backfilled with granular soil compacted to a relative compaction of 90 percent as evaluated by the ASTM D 1557. A soil reaction modulus of 1,400 psi may be used for trenches deeper than 5 feet.

8.1.15. Trench Zone Backfill

Based on our subsurface exploration, the on-site earth materials may be generally suitable for re-use as trench zone backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works) specifications for structure backfill. Soils classified as silts or clays should not be used for backfill in the pipe zone. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent as evaluated by ASTM D 1557 except for the upper 12 inches of the backfill in pavement areas that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

8.1.16. Pipe Jacking and Thrust Blocks

As noted above, the section of the pipeline that crosses the deep ravine north of Country Club Drive may be installed utilizing trenchless methods (e.g., directional drilling, jack-and-bore, tunneling, etc.). If trenchless methods are employed, jacking and receiving pits will be installed at each end of the trenchless segment. Due to seasonal variations in groundwater, the pits may require dewatering during excavation. It should be anticipated that more resistant cobbly, concretionary or well cemented sandstone and conglomerate will also be encountered during excavation and that excavation in such zones would necessitate heavy ripping, rock breaking, or coring. In addition, resistant cobbles, concretions, and/or well cemented zones could affect the installation of the jacked portions of the pipelines by deflecting the bore-and-jack equipment away from pipeline's design alignment. We recommend that an experienced specialty contractor be used for the jack-and-bore operations.

Minor ground surface settlements may occur from the pipe jacking operations. However, due to the anticipated depth of the proposed pipeline, these settlements are not anticipated to impact existing improvements provided that an experienced contractor performs the work.

In order to evaluate the load factors on the proposed pipeline, the loading presented in the following table should be used.

Table 2 – Loading on Trenchless Segment of Pipeline

Approximate Depth from Existing Ground Surface to Top of Pipeline (feet)	Load on 36-inch Pipeline/ Casing (pounds/lineal foot of pipe)	Load on 24-inch Pipeline/ Casing (pounds/lineal foot of pipe)
5	1,500	900
10	2,500	1,400
15	3,100	1,600
20	3,500	1,700

Notes:
Linear interpolation may be used to obtain loading between the depths shown. Loading assumes 36-inch and 24-inch sleeve diameter of the trenchless section. Loading may need to be modified for different sleeve sizes.

Following installation of the pipeline, the jacking and receiving pits should be backfilled in accordance with recommendations contained in Section 8.1.7.

8.1.17. Lateral Earth Pressure for Thrust Blocks and Jacking

Thrust restraint for buried pipelines may be achieved by transferring the thrust force to the soil outside the pipe through a thrust block. Thrust blocks may be designed using the magnitude and distribution of passive lateral earth pressures presented on Figure 9.

Thrust blocks should be backfilled with granular backfill material and compacted following the recommendations presented in this report.

8.1.18. Seismic Design Considerations

Design of the proposed improvements should be performed in accordance with the requirements of governing jurisdictions and applicable building codes. The following table presents the seismic design parameters for the site in accordance with CBC (2013) and adjusted MCE_R spectral response acceleration parameters (USGS, 2013).

Table 3 – 2013 California Building Code Seismic Design Criteria

Site Coefficients and Spectral Response Acceleration Parameters	Values
Site Class	C
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.3
Mapped Spectral Response Acceleration at 0.2-second Period, S_S	1.283g
Mapped Spectral Response Acceleration at 1.0-second Period, S_1	0.496g
Spectral Response Acceleration at 0.2-second Period Adjusted for Site Class, S_{MS}	1.283g
Spectral Response Acceleration at 1.0-second Period Adjusted for Site Class, S_{M1}	0.647g
Design Spectral Response Acceleration at 0.2-second Period, S_{DS}	0.855g
Design Spectral Response Acceleration at 1.0-second Period, S_{D1}	0.431g

8.2. Foundations

Foundation recommendations presented in the following sections are for shallow, spread footings bearing on compacted fill or competent materials comprising the Cabrillo Formation. Based on our review of the project plans (IEC, 2013; 2014), foundations supporting the proposed reservoir are anticipated to bear within materials comprising the Cabrillo Formation. Foundations should be designed in accordance with structural considerations and the following recommendations. Requirements of the appropriate governing jurisdictions and applicable building codes should be considered in the design of the structures.

8.2.1. Shallow Footings

Shallow, spread or continuous footings, founded in compacted fill materials may be designed using a net allowable bearing capacity of 3,000 pounds per square foot (psf).

Footings founded in materials comprising the Cabrillo Formation may be designed using a net allowable bearing capacity of 4,500 psf. Spread footings should be founded 24 inches below the lowest adjacent grade. Continuous footings should have a width of 18 inches and isolated footings should be 24 inches in width. The allowable bearing capacity may be increased by 250 psf for every foot of increase in width or 600 psf for each additional foot of embedment up to a value of 8,000 psf. These allowable bearing capacities may be increased by one-third when considering loads of short duration such as wind or seismic forces. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer. If cemented or concretionary zones are encountered and removed during footing excavation, the resulting voids may be backfilled with CLSM. Concrete footings may be placed on CLSM.

8.2.2. Lateral Resistance

For resistance of footings to lateral loads, we recommend a passive pressure of 350 psf per foot of depth be used with a value of up to 3,500 psf for footings founded in compacted fill. For portions of the footings embedded in the Cabrillo Formation, a passive pressure of 500 psf per foot of depth can be used with a value of up to 5,000 psf. These values assume that the ground is horizontal for a distance of 10 feet, or three times the height generating the passive pressure, whichever is greater. In those areas where the ground surface slopes downward from the footing/retaining wall at an inclination of 2:1 (horizontal to vertical), a passive pressure of 150 psf per foot is recommended. At those locations where the ground surface slopes downward at an inclination of 1.5:1 (horizontal to vertical), we recommend a passive pressure of 95 psf per foot. We recommend that the upper one-foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend that a coefficient of friction of 0.35 be used between engineered fill and concrete and 0.45 be used between formational materials and concrete. The allowable lateral resistance can be taken as the sum of the frictional resistance and passive resistance provided the passive resistance does not exceed one-half of the total allowable resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

8.2.3. Static Settlement

We estimate that the proposed facilities, designed and constructed as recommended herein, will undergo total settlement on the order of 1 inch. Differential settlement on the order of 1/2 inch over a horizontal span of 40 feet should be expected.

8.3. Retaining Wall Earth Pressures

We understand that the perimeter walls of the reservoirs will act as retaining walls. Retaining walls may also be constructed at the valve locations. For the design of a yielding retaining wall that is not restrained against movement by rigid corners or structural connections, an active pressure represented by an equivalent fluid weight of 65 pounds per cubic foot (pcf) may be assumed for 2:1 backfill and 40 pounds per cubic foot (pcf) may be assumed for level backfill. Restrained walls (non-yielding) may be designed for at-rest pressure represented by an equivalent fluid weight of 87 pcf for 2:1 backfill and 60 pcf for level backfill. Seismic loading can be modeled assuming an inverted triangular loading. Should dynamic earth pressures be considered in the design, an inverse triangular pressure distribution with an equivalent fluid weight of 14 pcf may be used. For retaining walls with heights of 6 feet or less, dynamic earth pressures do not need to be considered in the design. These pressures assume low-expansive, granular backfill as defined in the Materials for Fill section of this report. Wall backfill should be moisture-conditioned and compacted to a relative compaction of 90 percent at a moisture content near the optimum as evaluated by ASTM D 1557. A drain should be provided behind the wall as shown on Figure 10. The drain should be connected to an appropriate outlet.

8.4. Slabs–on-Grade

We recommend that conventional slabs-on-grade, underlain by compacted fill materials of generally very low to low expansion potential, be 5 inches in thickness and be reinforced with No. 4 reinforcing bars spaced 18 inches on center each way. The reinforcing bars should be placed near the middle of the slab. As a means to help reduce shrinkage cracks, we recommend that the slabs be provided with expansion joints at intervals of approximately 12 feet each way. The final slab thickness, reinforcement, and expansion joint spacing should be designed by the project structural engineer.

8.5. Concrete Flatwork

Exterior concrete flatwork should be 4 inches in thickness and should be reinforced with No. 3 reinforcing bars placed at 24 inches on center both ways. To reduce the potential manifestation of distress to exterior concrete flatwork due to movement of the underlying soil, we recommend that such flatwork be installed with crack-control joints at appropriate spacing as designed by the structural engineer. Exterior slabs should be underlain by 4 inches of clean sand. The subgrade soils should be scarified to a depth of 12 inches, moisture-conditioned to generally above the laboratory optimum moisture content, and compacted to a relative compaction of 90 percent as evaluated by ASTM D 1557. Positive drainage should be established and maintained adjacent to flatwork.

8.6. Corrosion

The corrosion potential of the near-surface site soils was evaluated using the results of representative samples obtained from our borings. Laboratory testing was performed to evaluate pH, minimum electrical resistivity, soluble sulfate and chloride contents. The pH and electrical resistivity tests were performed in accordance with California Test (CT) 643 and the sulfate and chloride content tests were performed in accordance with CT 417 and 422, respectively. The laboratory test results are presented in Appendix B.

The results of the corrosivity testing indicated electrical resistivity ranging from 310 to 420 ohm-cm, soil pH of 5.7 to 8.9, chloride content of 1,040 to 1,920 parts per million (ppm), and sulfate content of 0.003 to 0.068 percent (i.e., 30 ppm to 680 ppm). Based on the laboratory test results and Caltrans (2012) and American Concrete Institute (ACI) 318 corrosion criteria, the project site can be classified as a corrosive site. Corrosive soils are defined as soils with more than 500 ppm chlorides, more than 0.20 percent sulfates (i.e., 2,000 ppm), a pH of 5.5 or less, or an electrical resistivity of 1,000 ohm-centimeters or less.

8.7. Concrete Placement

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical and/or physical deterioration. Based on the CBC criteria (CBC, 2013), the potential for sulfate attack is negligible for water-soluble sulfate contents in soil ranging from 0.00 to 0.10 percent by weight (i.e., 0 to 1,000 ppm). As noted, the soil samples tested for this evaluation had water-soluble sulfate contents of approximately 0.003 to 0.068 percent by weight (i.e., 30 ppm to 680 ppm). Accordingly, the on-site soils are considered to have a negligible potential for sulfate attack. Due to the variable nature of the on-site soils and possible changes in the soil conditions during grading, we recommend that Type II/V cement with a water/cement ratio of 0.50 or less, be considered for the project.

8.8. Drainage

Roof, pad, and slope drainage should be directed such that runoff water is diverted away from slopes and structures to suitable discharge areas by nonerodible devices (e.g., gutters, downspouts, concrete swales, etc.). Positive drainage adjacent to structures should be established and maintained. Positive drainage may be accomplished by providing drainage away from the foundations of the structure at a gradient of 2 percent or steeper for a distance of 5 feet or more outside the structure perimeter, and further maintained by a graded swale leading to an appropriate outlet, in accordance with the recommendations of the project civil engineer and/or landscape architect.

Surface drainage on the site should be provided so that water is not permitted to pond. A gradient of 2 percent or steeper should be maintained over the pad area and drainage patterns should be established to divert and remove water from the site to appropriate outlets. Care should be taken by the contractor during final grading to preserve any berms, drainage terraces, interceptor swales or other drainage devices of a permanent nature on or adjacent to the property.

Drainage patterns established at the time of final grading should be maintained for the life of the project. The property owner and the maintenance personnel should be made aware that altering drainage patterns might be detrimental to slope stability and foundation performance.

8.9. Pavement Design

For design of flexible pavements, we have used Traffic Indices (TI) of 5, 6, and 7 to represent the volume and loading of the traffic for site pavements. If traffic loads are different from those assumed, the pavement design should be re-evaluated. Actual pavement recommendations should be based on R-value tests performed on bulk samples of the soils exposed at the finished subgrade elevations once grading operations have been performed.

The resistance (R-value) characteristics of the subgrade soils were evaluated by conducting laboratory testing on a representative soil sample obtained from our soil boring. The test result indicated an R-value of 10, which was utilized in our analysis. The preliminary recommended flexible pavement sections are as follows:

Table 4 – Recommended Pavement Sections

Traffic Index	R-value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
5.0	10	3.0	9.0
6.0	10	3.0	12.5
7.0	10	4.0	14.0

We recommend that the upper 12 inches of the subgrade and aggregate base materials be compacted to 95 percent relative compaction as evaluated by ASTM D 1557. The pavement sections should provide an approximate pavement life of 20 years.

In areas where concrete pavement is anticipated, as well as drainage swales and gutters, we recommend a rigid pavement section consisting of 6 inches of Portland cement concrete underlain by 12 inches of subgrade soils compacted to a relative compaction of 95 percent, as evaluated by ASTM D 1557.

9. CONSTRUCTION OBSERVATION

The recommendations provided in this report are based on our understanding of the proposed project and on our evaluation of the data collected based on subsurface conditions disclosed by widely spaced exploratory borings. It is imperative that the geotechnical consultant checks the interpolated subsurface conditions during construction. We recommend that Ninyo & Moore review the project plans and specifications prior to construction. It should be noted that, upon review of these documents, some recommendations presented in this report may be revised or modified.

During construction, we recommend that the duties of the geotechnical consultant include, but not be limited to the following:

- Observing clearing, grubbing, and removals.
- Observing excavation, placement, and compaction of fill.
- Evaluating imported materials prior to their use as fill (if used).
- Performing field tests to evaluate fill compaction.
- Observing cut slopes for fractures, joints, and other geologic planes of weakness.
- Observing placement of soil nail wall or other shoring methods.
- Observing installation of portions of the pipe using trenchless methods.
- Observing foundation excavations for bearing materials and cleaning prior to placement of reinforcing steel or concrete.
- Performing material testing services, including concrete compressive strength and steel tensile strength tests and inspections.

The recommendations provided in this report assume that Ninyo & Moore will be retained as the geotechnical consultant during the construction phase of this project. If another geotechnical consultant is selected, we request that the selected consultant indicate to the owner and to our firm in writing that our recommendations are understood and that they are in full agreement with our recommendations.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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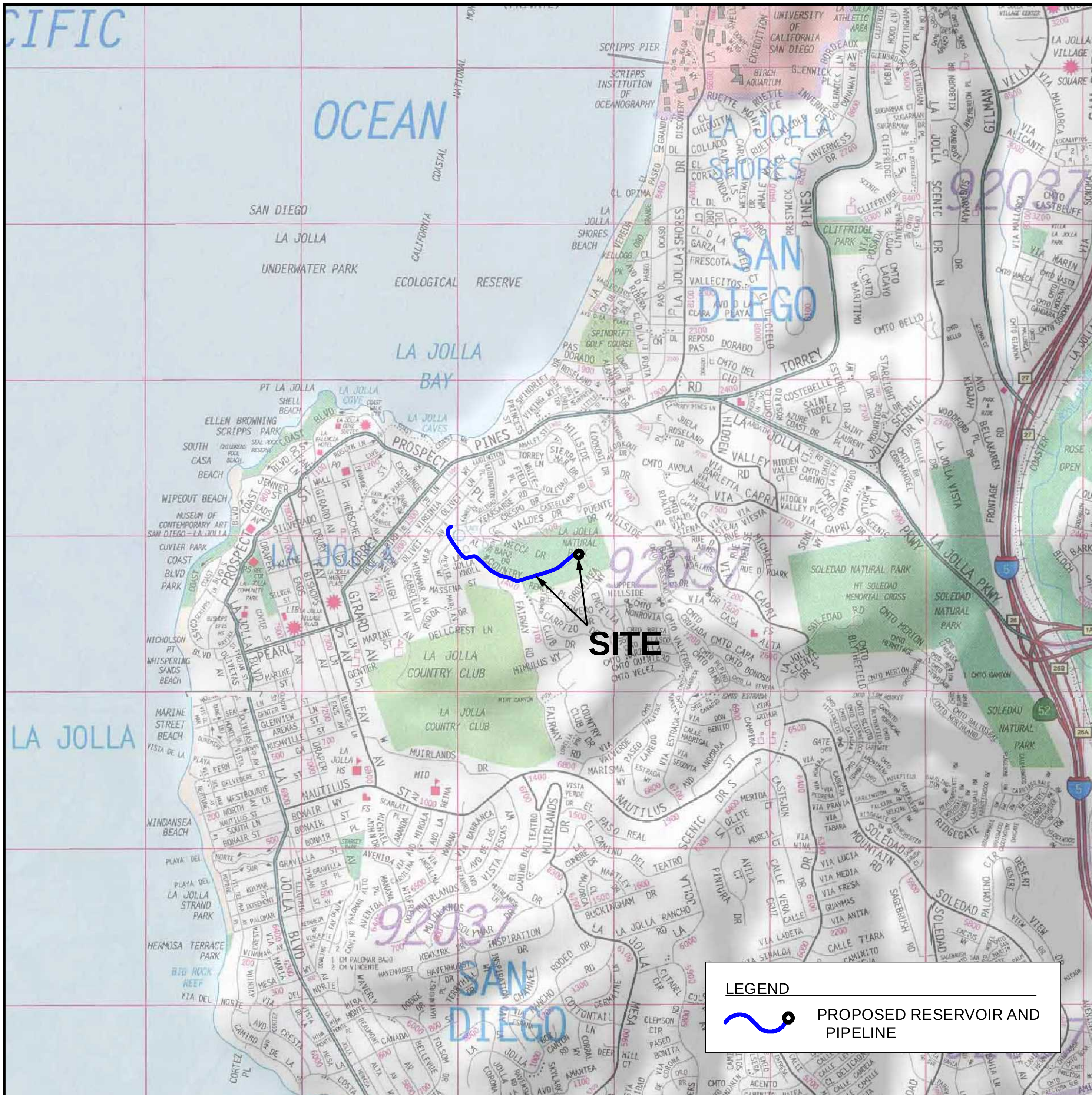
AERIAL PHOTOGRAPHS

Source	Date	Flight	Numbers	Scale
County of San Diego	1928	52	C-1 and CA-1	1:15,000
USDA	4-11-1953	AXN-8M	89 and 90	1:20,000
County of San Diego	10-09-1970	4	3 and 4	1:10,000
County of San Diego	11-25-1973	31	17 and 18	1:10,000
County of San Diego	10-23-1978	17B	53 and 54	1:20,000



SOURCE: 2008 THOMAS GUIDE FOR SAN DIEGO COUNTY, STREET GUIDE AND DIRECTORY; MAP © RAND MCNALLY, R.L.07-S-129.

MAP INDEX

N

SCALE IN FEET

0 2,400 4,800

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore

SITE LOCATION

FIGURE

PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	1
107314001	7/14		

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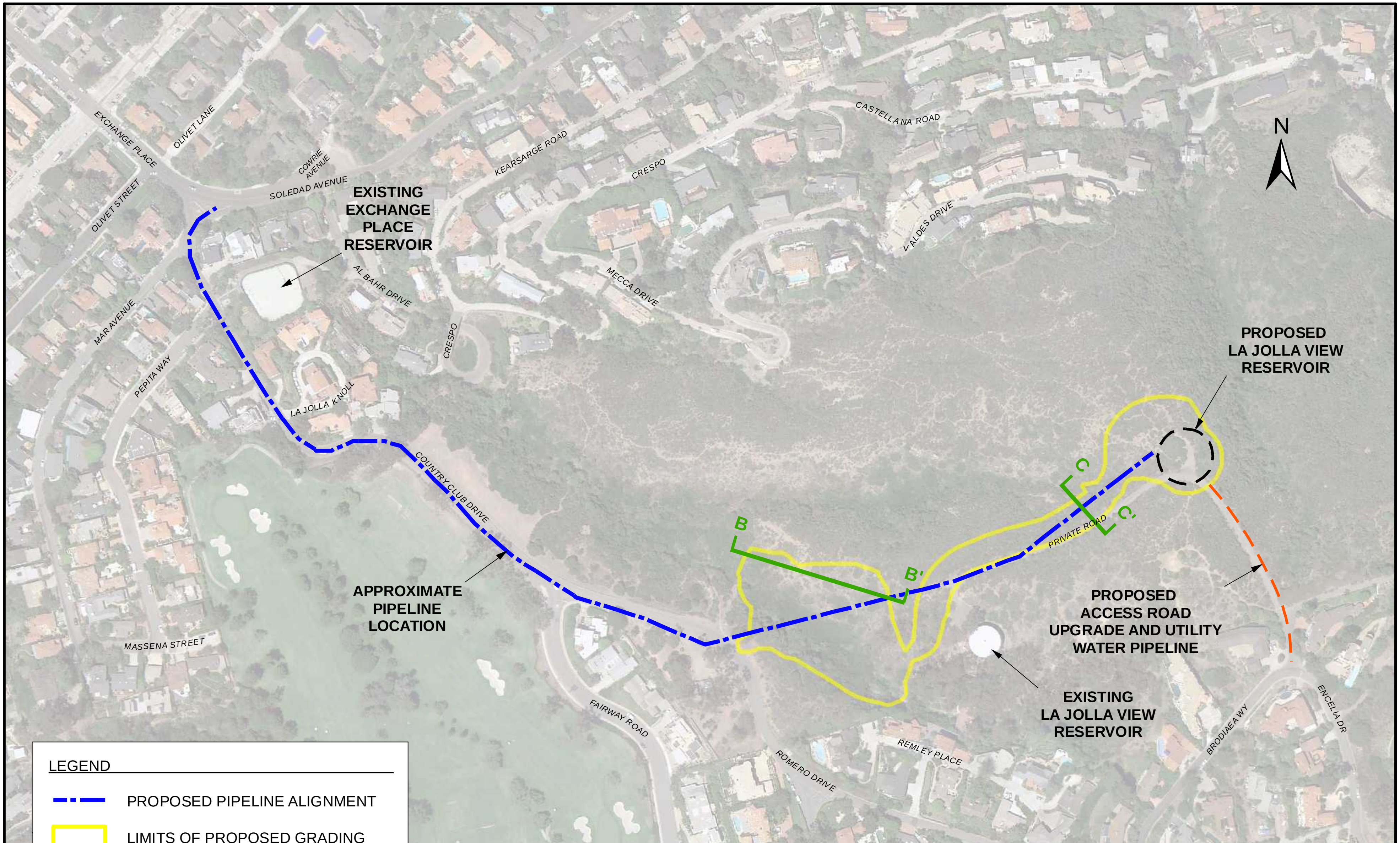

SOURCE: AERIAL IMAGERY - (C) GOOGLE EARTH, 2013.

LEGEND

- PROPOSED PIPELINE ALIGNMENT
- LIMITS OF PROPOSED GRADING
- C C' SLOPE STABILITY CROSS-SECTION (SEE APPENDIX C)

SCALE IN FEET

0 300 600

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		SITE PLAN	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	2
107314001	7/14		

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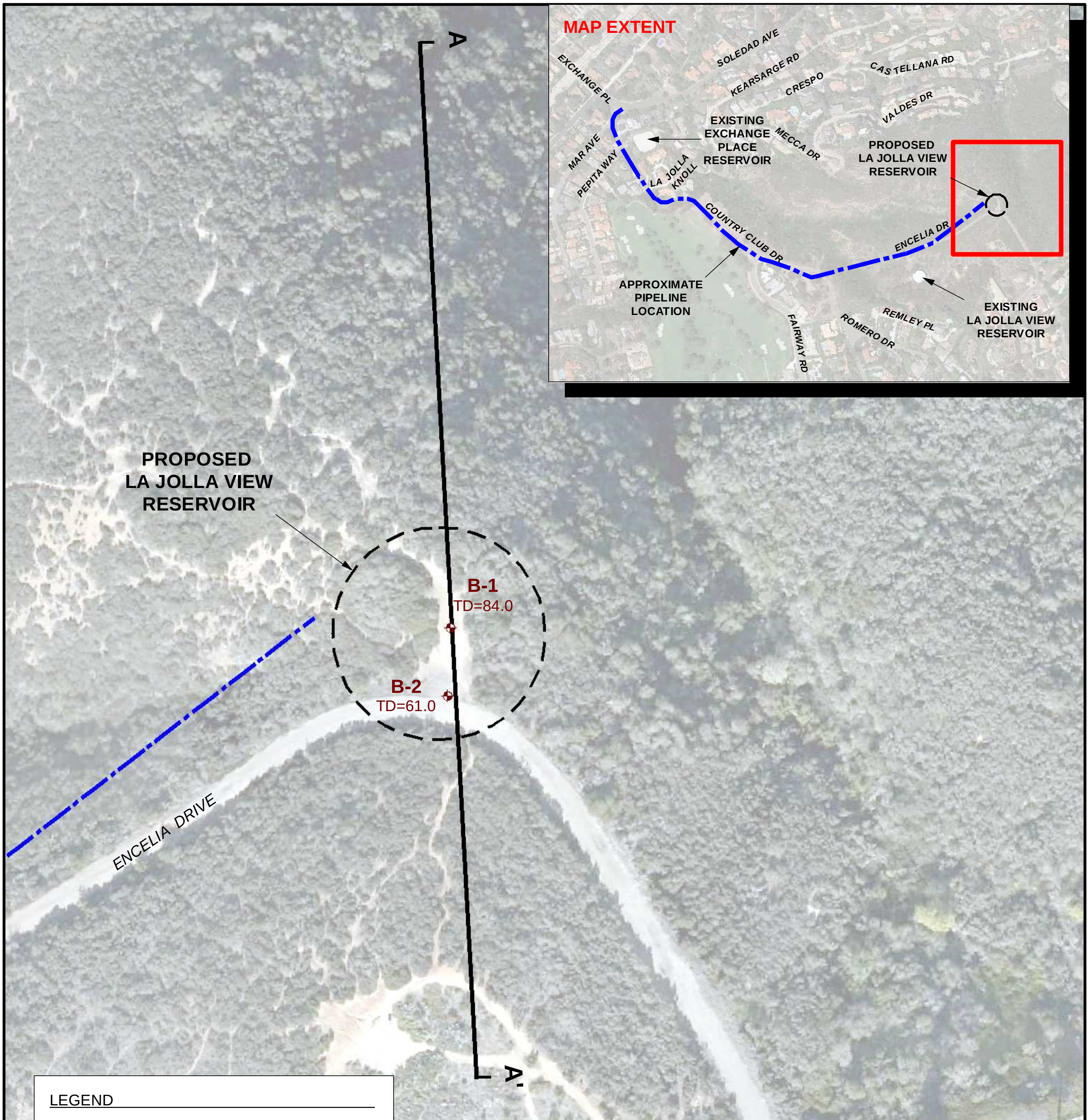

LEGEND

B-2 TD=61.0 — BORING LOCATION, TD=TOTAL DEPTH IN FEET

PIPELINE ALIGNMENT

A A' — CROSS-SECTION

SOURCE: AERIAL IMAGERY - GOOGLE EARTH, 2014.

N

SCALE IN FEET

0 80 160

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	BORING LOCATIONS	FIGURE
PROJECT NO. 107314001	DATE 7/14	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	3A

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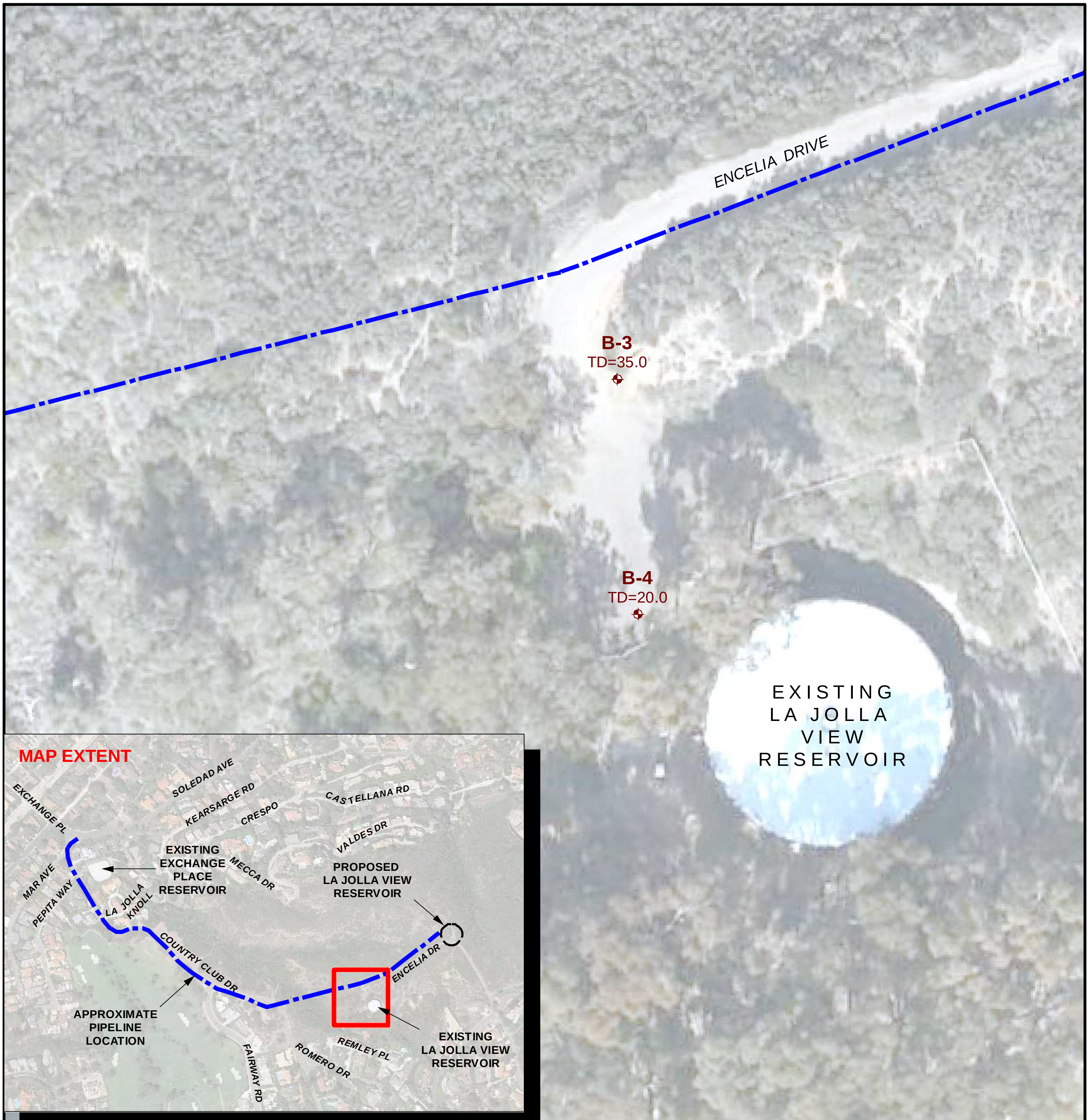

SOURCE: AERIAL IMAGERY - GOOGLE EARTH, 2014.

LEGEND

B-4 TD=20.0 — BORING LOCATION, TD=TOTAL DEPTH IN FEET

PIPELINE ALIGNMENT

N

SCALE IN FEET

0 40 80

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	BORING LOCATIONS	FIGURE
PROJECT NO. / DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT	
107314001 / 7/14	LA JOLLA, CALIFORNIA	3B

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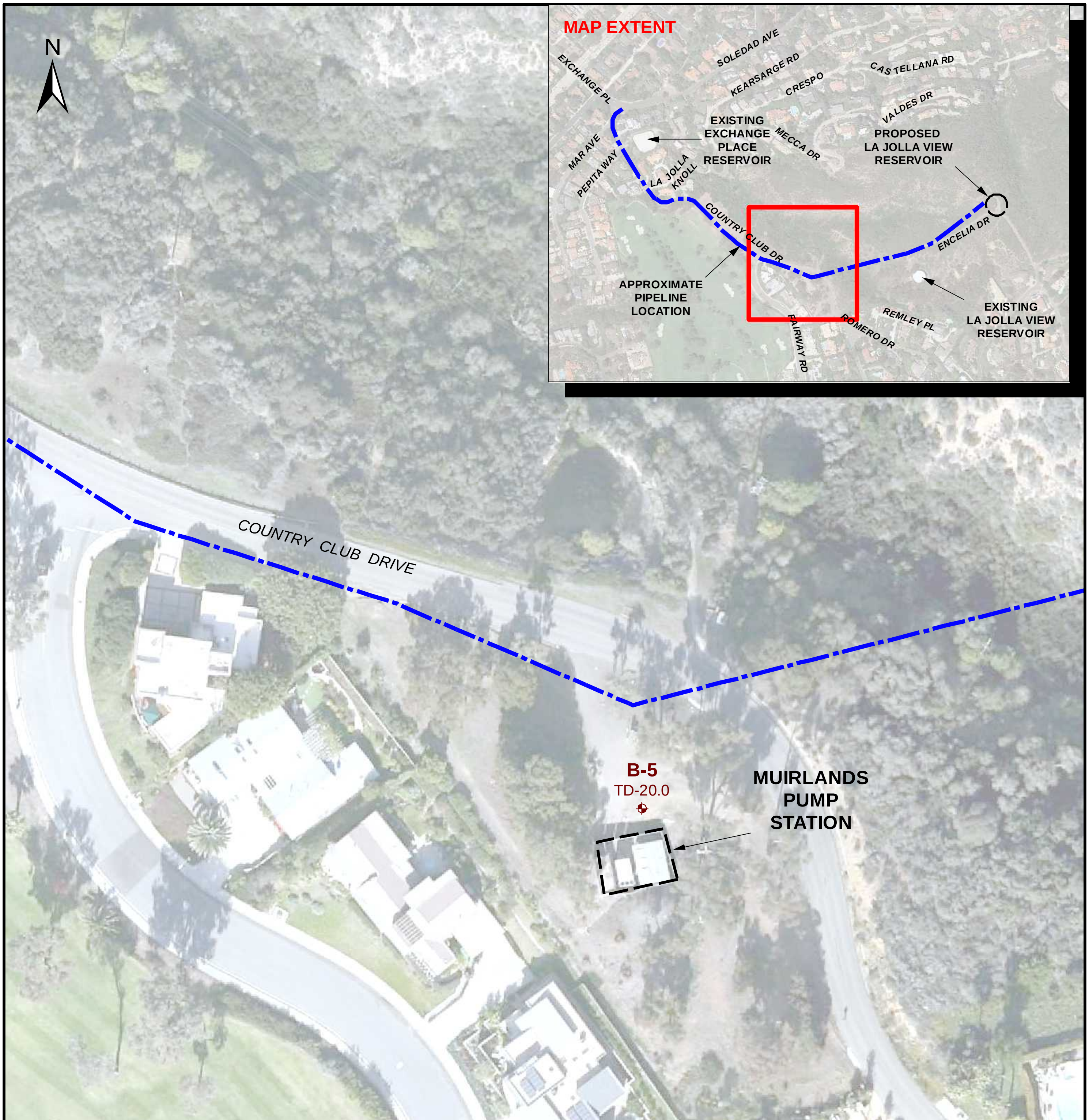

SOURCE: AERIAL IMAGERY - GOOGLE EARTH, 2014.

LEGEND

B-5 TD-20.0 — BORING LOCATION, TD=TOTAL DEPTH IN FEET

PIPELINE ALIGNMENT

N

SCALE IN FEET

0 80 160

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		BORING LOCATIONS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	3C
107314001	7/14		

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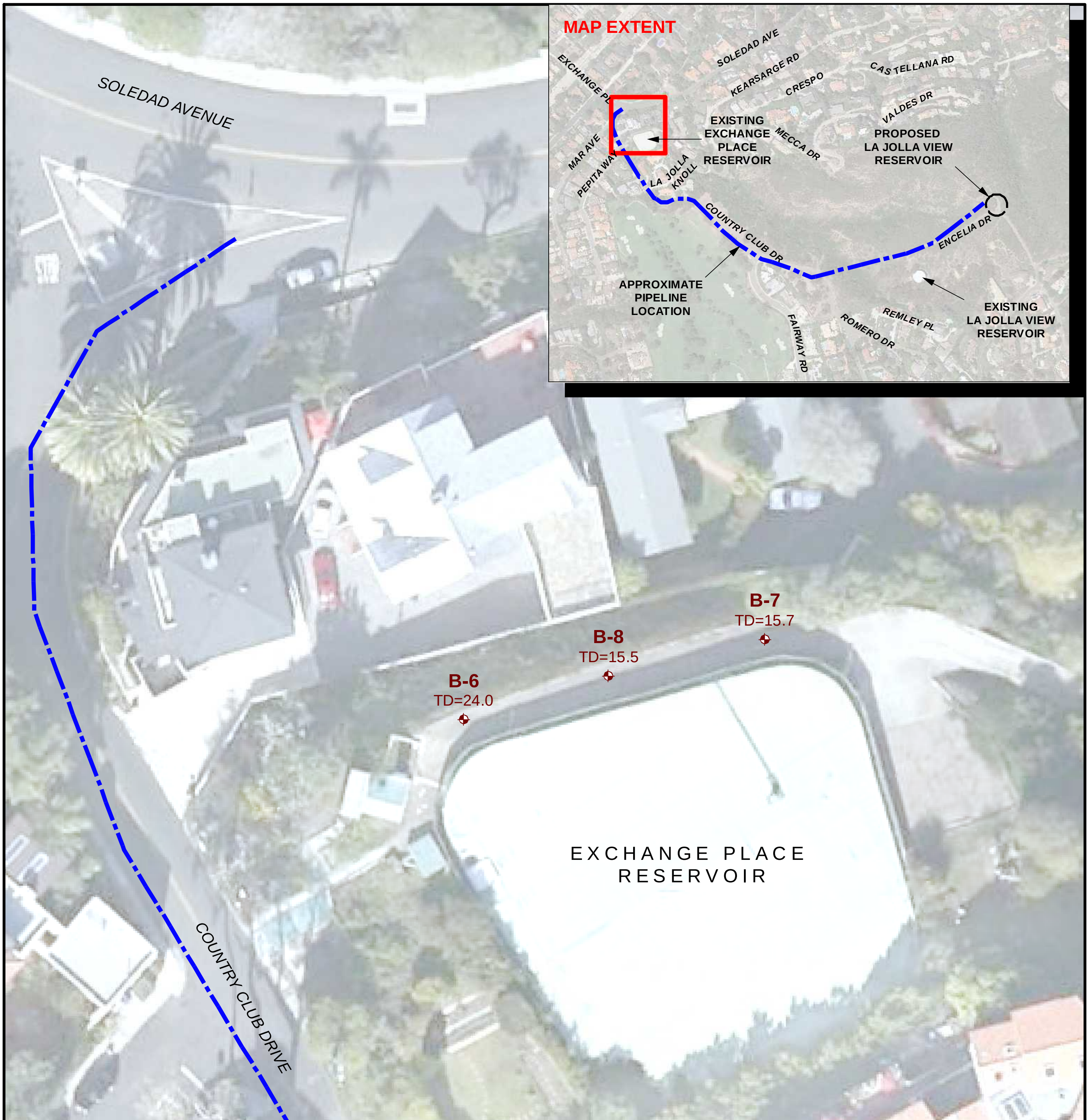

SOURCE: AERIAL IMAGERY - GOOGLE EARTH, 2014.

LEGEND

B-8 TD=15.5 — BORING LOCATION, TD=TOTAL DEPTH IN FEET

PIPELINE ALIGNMENT

N

SCALE IN FEET

0 40 80

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		BORING LOCATIONS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	3D
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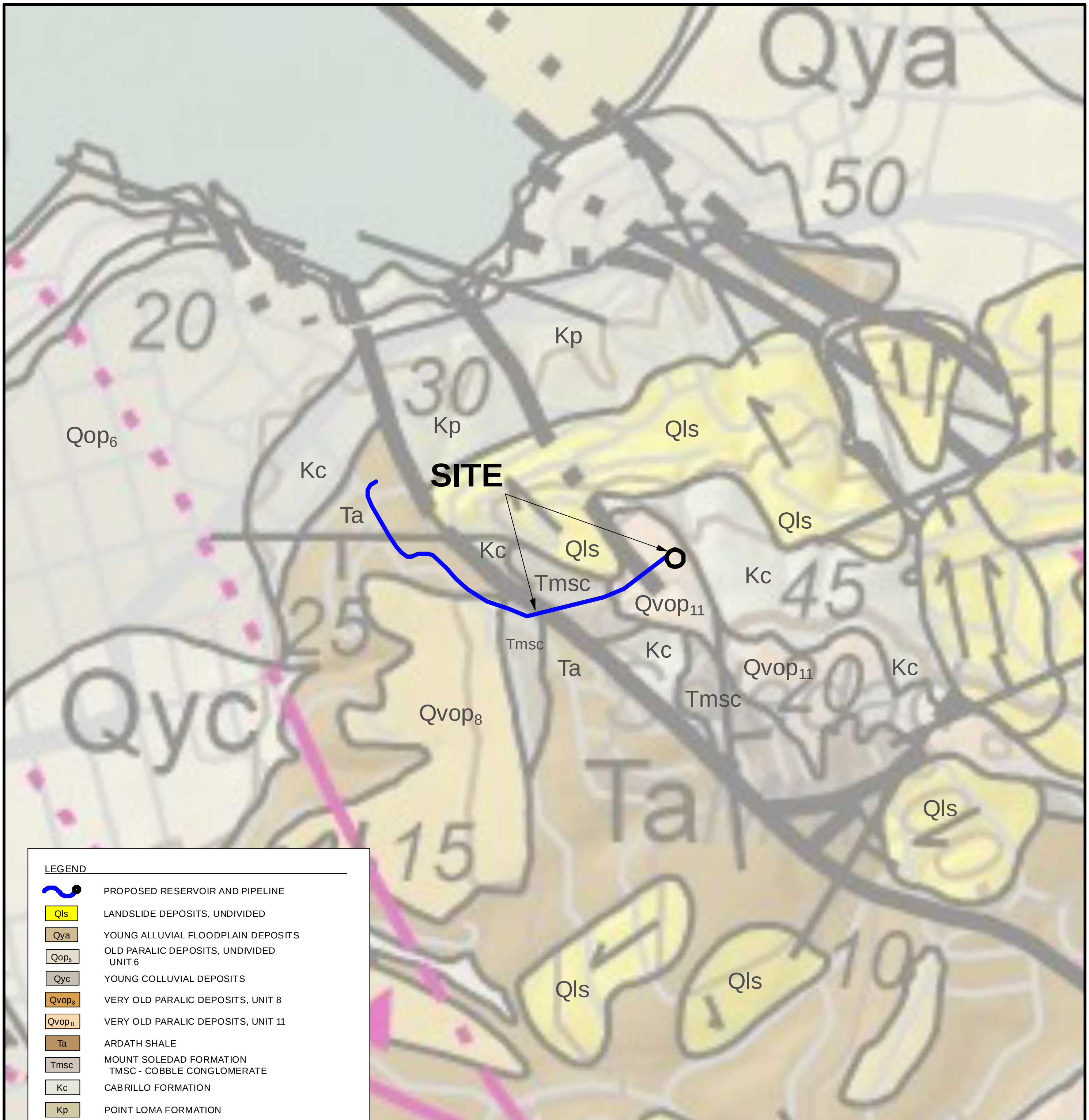


LEGEND

(blue line with dot)	PROPOSED RESERVOIR AND PIPELINE
Qls	LANDSLIDE DEPOSITS, UNDIVIDED
Qya	YOUNG ALLUVIAL FLOODPLAIN DEPOSITS
Qop_6	OLD PARALIC DEPOSITS, UNDIVIDED UNIT 6
Qyc	YOUNG COLLUVIAL DEPOSITS
$Qvop_8$	VERY OLD PARALIC DEPOSITS, UNIT 8
$Qvop_{11}$	VERY OLD PARALIC DEPOSITS, UNIT 11
Ta	ARDATH SHALE
Tmsc	MOUNT SOLEDAD FORMATION TMSC - COBBLE CONGLOMERATE
Kc	CABRILLO FORMATION
Kp	POINT LOMA FORMATION
U / D	FAULT - SOLID WHERE ACCURATELY LOCATED; DASHED WHERE APPROXIMATELY LOCATED; DOTTED WHERE CONCEALED. U = UPTHROWN BLOCK, D = DOWNTHROWN BLOCK.
	ANTICLINE - SOLID WHERE ACCURATELY LOCATED; DASHED WHERE APPROXIMATELY LOCATED; DOTTED WHERE CONCEALED. ARROW INDICATES DIRECTION OF AXIAL PLUNGE.
50	STRIKE AND DIP OF BEDS, INCLINED
Qls?	LANDSLIDE - ARROWS INDICATE PRINCIPAL DIRECTION OF MOVEMENT, QUERIED WHERE EXISTENCE IS QUESTIONABLE

SOURCE: GEOLOGY - KENNEDY, M.P., AND TAN, S.S., 2008, GEOLOGIC MAP OF THE SAN DIEGO 30' X 60' QUADRANGLE, CALIFORNIA

N

SCALE IN FEET

0 1,000 2,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

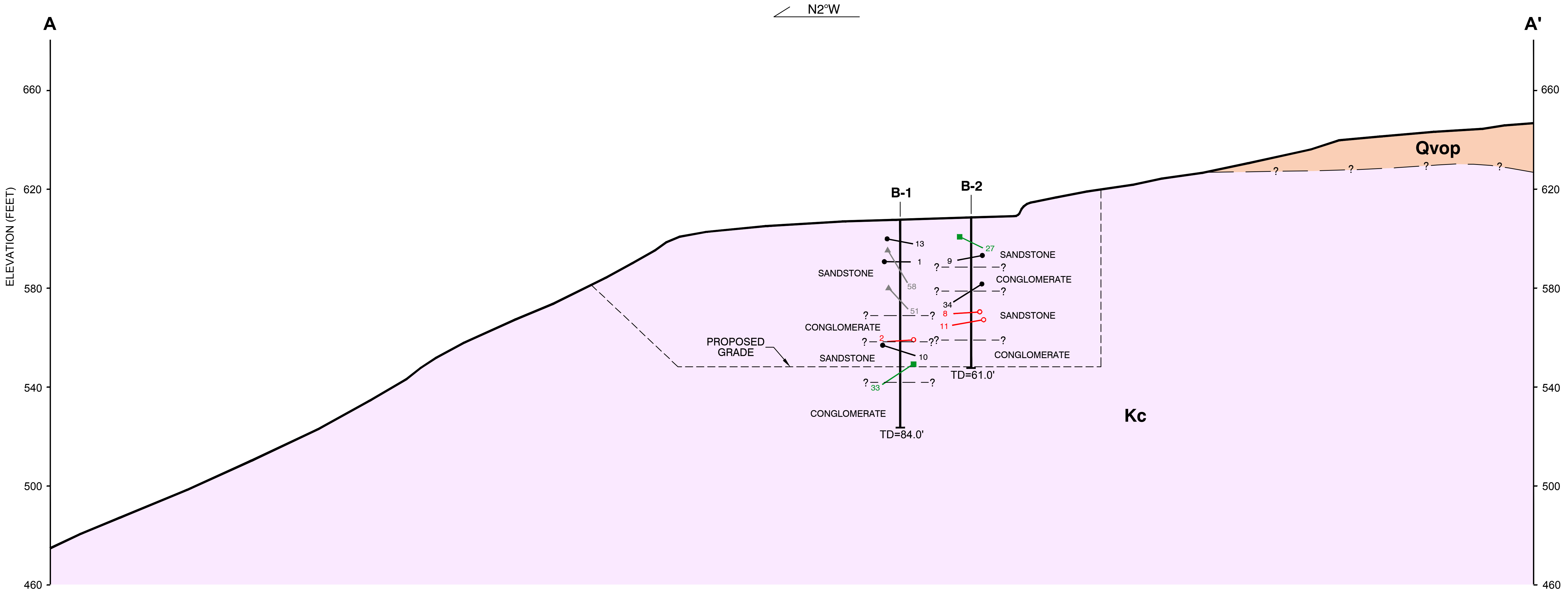
Ninyo & Moore

REGIONAL GEOLOGY

FIGURE 4

PROJECT NO.	DATE
107314001	7/14

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA



LEGEND

B-2 TD=61.0'	BORING TD=TOTAL DEPTH IN FEET	20	APPARENT DIP OF BED
		20	APPARENT DIP OF JOINT/FRACTURE
Qvop	VERY OLD PARALIC DEPOSITS	20	APPARENT DIP OF FAULT
Kc	CABRILLO FORMATION	20	APPARENT DIP OF CLAY SEAM

SCALE IN FEET

0 40 80

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

5B 107314001 cs b-b'.dwg AOB

Ninyo & Moore

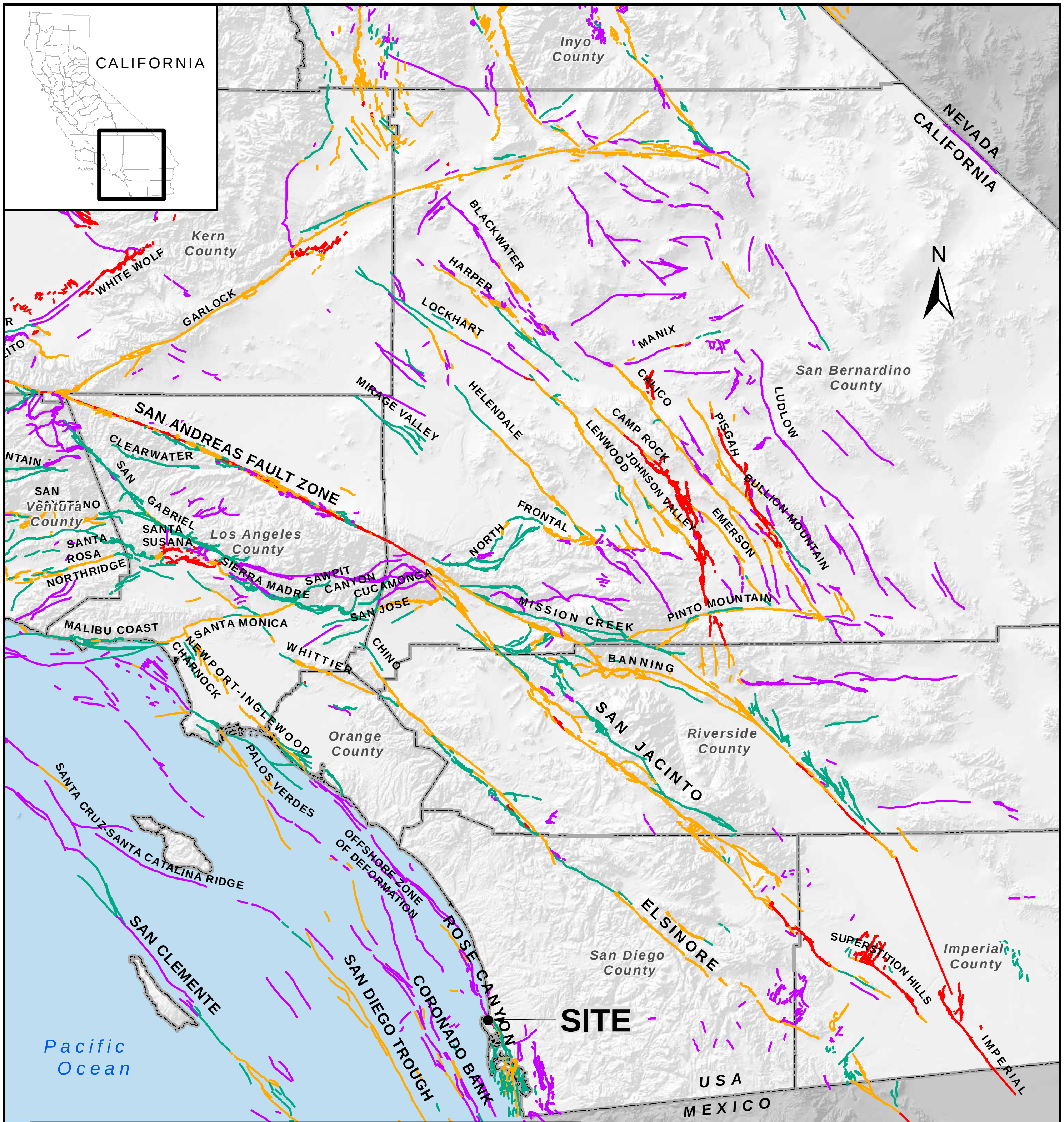
GEOLOGIC CROSS-SECTION A-A'

PROJECT NO.	DATE
107314001	7/14

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

FIGURE

5



LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: U.S. GEOLOGICAL SURVEY AND CALIFORNIA GEOLOGICAL SURVEY, 2006, QUATERNARY FAULT AND FOLD DATABASE FOR THE UNITED STATES.

SCALE IN MILES

0 30 60

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

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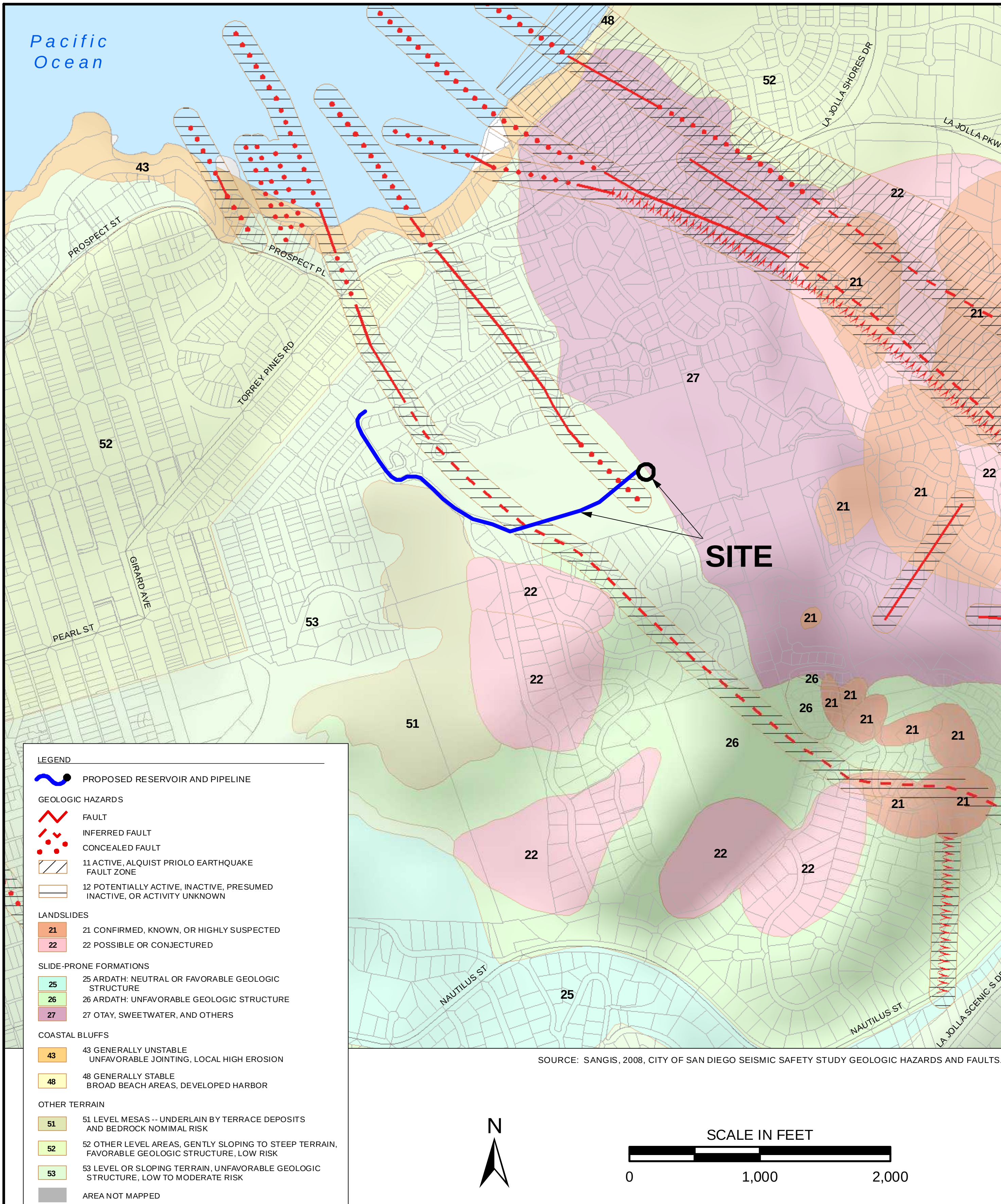
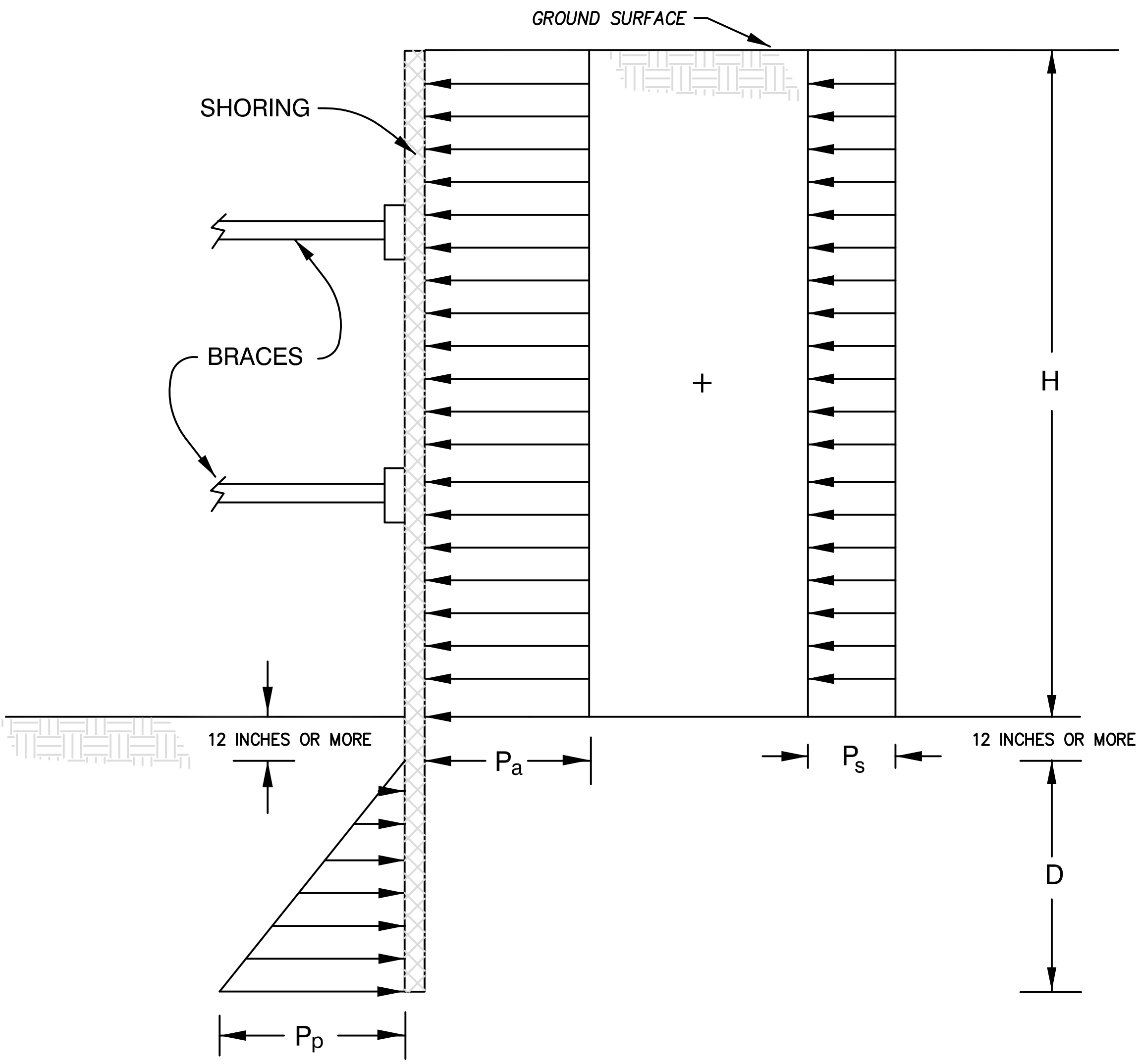
PROJECT NO.	DATE	FAULT LOCATIONS	FIGURE
107314001	7/14	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	6



SOURCE: SANGIS, 2008, CITY OF SAN DIEGO SEISMIC SAFETY STUDY GEOLOGIC HAZARDS AND FAULTS.

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		GEOLOGIC HAZARDS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	7
107314001	7/14		



NOTES:

1. APPARENT LATERAL EARTH PRESSURE, P_a
   P_a = 25 H psf
2. CONSTRUCTION TRAFFIC INDUCED SURCHARGE PRESSURE, P_s
   P_s = 120 psf
3. PASSIVE LATERAL EARTH PRESSURE, P_p
   P_p = 350 D psf
4. ASSUMES GROUNDWATER IS NOT PRESENT
5. SURCHARGES FROM EXCAVATED SOIL OR CONSTRUCTION MATERIALS ARE NOT INCLUDED
6. H AND D ARE IN FEET

NOT TO SCALE

8 107314001 d-beg.dwg

Ninyo & Moore

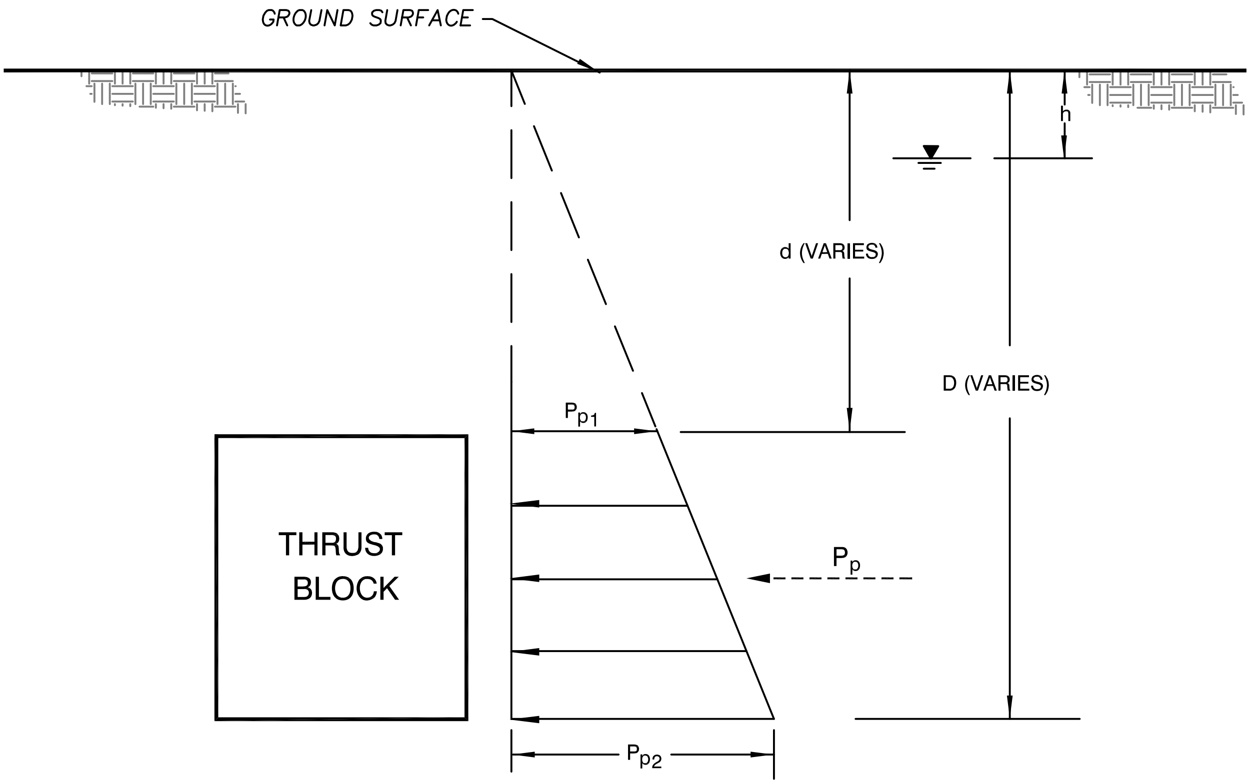
PROJECT NO.	DATE
107314001	7/14

LATERAL EARTH PRESSURES FOR BRACED EXCAVATION (GRANULAR SOIL)

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

FIGURE

8



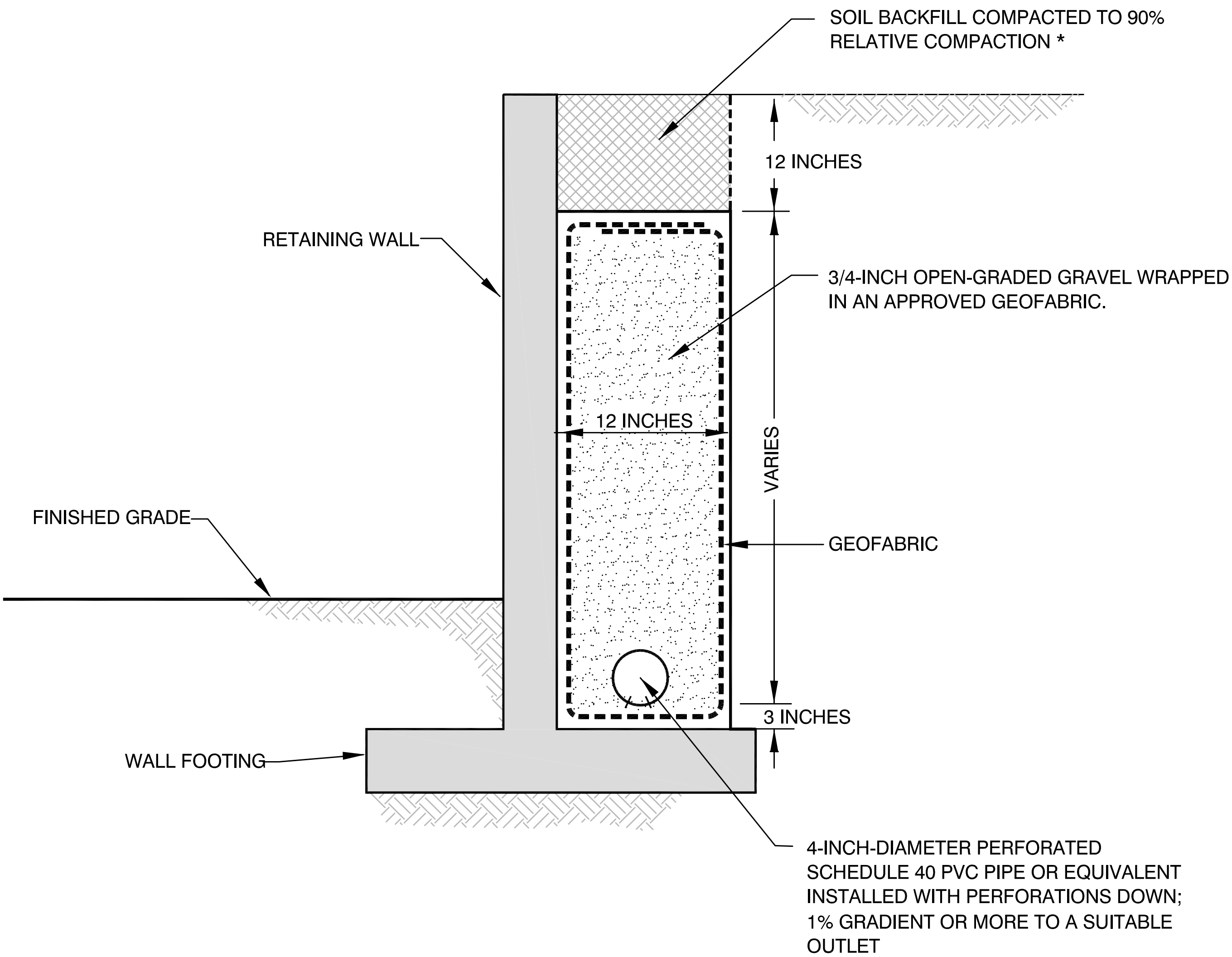
NOTES:

1. GROUNDWATER BELOW BLOCK
   $P_p = 175\ (D^2 - d^2\ )$ lb/ft
2. GROUNDWATER ABOVE BLOCK
   $P_p = 1.5\ (\ D - d\ )[\ 124.8h + 57.6\ (\ D+d\ )]$ lb/ft
3. ASSUMES BACKFILL IS GRANULAR MATERIAL
4. ASSUMES THRUST BLOCK IS ADJACENT TO COMPETENT MATERIAL
5. D, d AND h ARE IN FEET
6. GROUNDWATER TABLE

9 107314001 d-tb.dwg

NOT TO SCALE

Ninyo & Moore	THRUST BLOCK LATERAL EARTH PRESSURE DIAGRAM	FIGURE
PROJECT NO.: 107314001 / DATE: 7/14	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	9



*BASED ON ASTM D1557

NOT TO SCALE

10 107314001_d-rwd.dwg

NOTE: AS AN ALTERNATIVE, AN APPROVED GEOCOMPOSITE DRAIN SYSTEM MAY BE USED.

Ninyo & Moore		RETAINING WALL DRAINAGE DETAIL	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	10
107314001	7/14		

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer falling freely from a height of 30 inches in general accordance with ASTM D 1586. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following methods.

The Modified Split-Barrel Drive Sampler

The sampler, with an external diameter of 3 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a hammer or the Kelly bar of the drill rig in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer or bar, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								2-inch inner diameter split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
								Sample retained by others.
5								Standard Penetration Test (SPT).
								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
10								Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change.
								Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15								
								The total depth line is a solid line that is drawn at the bottom of the boring.
20								

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BORING LOG		
Explanation of Boring Log Symbols		
PROJECT NO.	DATE	FIGURE

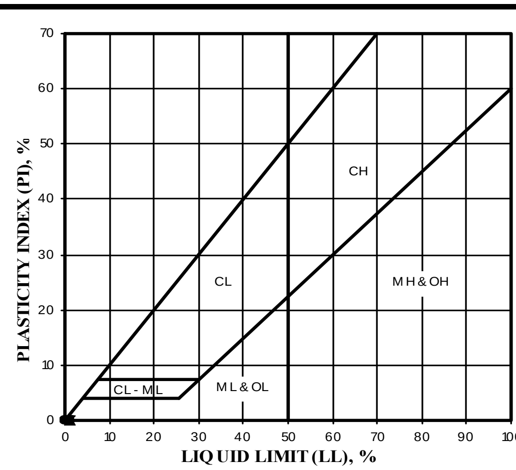
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (More than 1/2 of soil > No. 200 Sieve Size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size	GW	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < No. 4 sieve size	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil < No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts 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 of low plasticity
	SILTS & CLAYS Liquid Limit >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, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

GRAIN SIZE CHART

CLASSIFICATION	RANGE OF GRAIN	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	306 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
Coarse	3" to 3/4"	76.2 to 19.1
Fine	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.075
Coarse	No. 4 to No. 10	4.76 to 2.00
Medium	No. 10 to No. 40	2.00 to 0.420
Fine	No. 40 to No. 200	0.420 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

PLASTICITY CHART



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U.S.C.S. METHOD OF SOIL CLASSIFICATION

Updated Nov. 2011

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 3/26/14 BORING NO. B-1 GROUND ELEVATION 608' ± (MSL) SHEET 1 OF 3 METHOD OF DRILLING 30" Bucket Auger (Pacific Drilling - EZ Bore) DRIVE WEIGHT See notes DROP 12" SAMPLED BY BTM LOGGED BY BTM/RDH REVIEWED BY RDH DESCRIPTION/INTERPRETATION
0							CL	TOPSOIL: Mottled dark brown and gray, moist, stiff, silty CLAY; abundant roots extending to 2 feet in depth.
								CABRILLO FORMATION: Mottled light brown and white, damp, moderately cemented, sandy SILTSTONE; scattered gravel. Layer of rounded gravel 1 to 4 inches in diameter.
		X	8	10.0	117.2			Light brown, damp, moderately cemented, silty fine-grained SANDSTONE; scattered gravel. Generally massive with near vertical fracturing infilled with white calcium carbonate. Fractures are approximately 1/2-inch wide and extend from 3 feet to 11 feet. @9'-10':Alternating yellowish brown to gray beds; undulatory bedding.
10	X	X	5	11.0	111.6			
								@13': Distinct concretions on north and south sides approximately 1 foot in diameter at 13.1 feet and 13.8 feet, at 14 feet to 15 feet (south side), and at 13.5 feet to 14 feet (north side); well cemented. @13'-17': Tight clay lined fractures 1/8-inch wide on southwest side of hole; undulatory; near vertical. @15': Clay rip-up clasts 2 to 6 inches in diameter. @15'-16': 2 to 6 inch gravel and cobble clasts. @15'-17': Concretions on north side. @17': b: N 10°W, 6°SW.
20		X	5	9.8	113.0			@18'-20': Discontinuous concretion on south side; clay rip-up clasts 2 inches in diameter. Massive. @21'-30.7': Fault zone of undulatory polished clay-lined surfaces within sandstone. Clay is moist and soft; sandstone on NE side of fault zone and sandstone with claystone on SW side. @20.2': F: N 55°W, 63°S. @22': Concretionary zones on south side; rip-up clasts. @22'-24': 1/16- to 1/8-inch thick clay lined fractures.
30		X	6	10.3	120.1			Gravel. @30.7': F: N 60°W, 55°S; undulatory.
	X							@33': Discontinuous concretionary layer approximately 8 inches thick; claystone rip-up clasts approximately 6 inches in diameter within massive sandstone. Rip-up clasts and gravel more numerous with depth.
								@36': Gradational contact to light brown, damp, moderately cemented, sandy CONGLOMERATE; clasts up to 6 inches in diameter in matrix of fine silty sand; clasts are well rounded and composed of granitic and metavolcanic rock.
40								

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BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-1

DATE DRILLED 3/26/14 BORING NO. B-1

GROUND ELEVATION 608' ± (MSL) SHEET 2 OF 3

METHOD OF DRILLING 30" Bucket Auger (Pacific Drilling - EZ Bore)

DRIVE WEIGHT See notes DROP 12"

SAMPLED BY BTM LOGGED BY BTM/RDH REVIEWED BY RDH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40	■							CABRILLO FORMATION: (Continued) Light brown, damp, moderately cemented, sandy CONGLOMERATE. @44': Clasts composed of granitic rock. @45'-46.5': Sandstone layer on north side. @48': Well cemented concretion approximately 2.5 feet in diameter along southwest side. @48'-48.8': Base of conglomerate. North side is a mixture of sandstone and claystone rip-up clasts.
	■							
		■	10	13.9	118.7			@49': Continuous zone of soft to stiff clay approximately 4 inches thick at contact with conglomerate; undulatory. @49.3': cs N15°W, 5-15°W; 1/4- to 1/2-inch thick; well developed polished parting surfaces. Below clay sharp contact to light gray to brown, moist, moderately cemented, silty fine-grained SANDSTONE. @50': Sandstone becomes well cemented; trace of clay. @52': Fine clay-filled fractures; very tight. @52.2': b: N35°E, 10-22°SE; crossbedding.
50								
60		■	15	10.3	111.5			@61': f: N 20°E, 60°W; tight fracture lined with clay.
								Undulatory contact (sharp) to brown, damp, weakly cemented, sandy CONGLOMERATE; clasts 1-6 inches in diameter with a matrix of fine silty sand.
70								
								Undulatory contact to dark gray, damp, well indurated, silty CLAYSTONE; 6-8 inches of light gray, damp, moderately cemented, silty fine-grained sandstone above and below claystone.
	■							
								Brown, damp, weakly cemented, sandy CONGLOMERATE.
80								

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BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-2

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 3/26/14 BORING NO. B-1 GROUND ELEVATION 608' ± (MSL) SHEET 3 OF 3 METHOD OF DRILLING 30" Bucket Auger (Pacific Drilling - EZ Bore) DRIVE WEIGHT See notes DROP 12" SAMPLED BY BTM LOGGED BY BTM/RDH REVIEWED BY RDH **DESCRIPTION/INTERPRETATION**
80								CABRILLO FORMATION: (Continued) Brown, damp, weakly cemented, sandy CONGLOMERATE.
								Total Depth = 84 feet. (Logged to 82 feet) Groundwater not encountered during drilling. Backfilled with bentonite and soil cuttings on 3/27/14. Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Drive Weight: 0 to 27 feet: 4,500 lbs.; 27 to 50 feet: 3,700 lbs.; 50 to 80 feet: 1,500 lbs.
90								
100								
110								
120								

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BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-3

DATE DRILLED 3/27/14 BORING NO. B-2

GROUND ELEVATION 608' ± (MSL) SHEET 1 OF 2

METHOD OF DRILLING 30" Bucket Auger (Pacific Drilling - EZ Bore)

DRIVE WEIGHT See notes DROP 12"

SAMPLED BY BTM LOGGED BY BTM/RDH REVIEWED BY RDH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						CL	ASPHALT CONCRETE: Approximately 2.5 inches thick.
	■					CL	FILL: Brown, damp, soft to firm, sandy CLAY; scattered roots, gravel, and cobbles.
							TOPSOIL: Brown, moist, stiff, sandy CLAY.
							CABRILLO FORMATION: Light brown, damp, moderately cemented, silty fine-grained SANDSTONE; massive. @4.6'-7.3': f: N18°E, 55°W; calcium carbonate infilled fractures; 1-2 inches wide; N 18° E and 55°W.
10							@9.4': f: N15°W, 66°W; fracture filled with calcium carbonate. @11': Carbonate layer 1/4-inches thick; semi-continuous; yellowish brown to gray; 6-inch thick concretionary layer extends approximately 1/2 hole. @13': Calcium carbonate and 8-inch thick concretion. @14.5': 6-inch thick concretionary layer.
		■	4	11.9	115.5		@16': b: N 70°W, 10° N. @18'-18.5': Concretion.
20							Sharp, undulatory contact to brown, damp, moderately cemented, sandy CONGLOMERATE; matrix of fine silty sand; rounded clasts 2-6 inches in diameter.
30							Undulatory contact to light brown, damp, moderately cemented, silty fine-grained SANDSTONE; c: N78°E, 34°N. @31': Scattered gravel and cobbles; trace of clay. @32.6': Gravel layer. @33': Light gray; no gravel.
		■	8	12.2	108.2		@38'-39.5': Disturbed zone; with seams of dark gray, moist, soft clay; 1/16-1/8 inches thick; undulatory. @38.5': sz: N25°W, 80°NE; approximately 1/4-inch discontinuous layer of soft clay. @39': cs: N 25° to 30°W and 15° to 22° NE.
40							

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BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-4

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.

DATE DRILLED 3/27/14 BORING NO. B-2

GROUND ELEVATION 608' ± (MSL) SHEET 2 OF 2

METHOD OF DRILLING 30" Bucket Auger (Pacific Drilling - EZ Bore)

DRIVE WEIGHT See notes DROP 12"

SAMPLED BY BTM LOGGED BY BTM/RDH REVIEWED BY RDH

DESCRIPTION/INTERPRETATION

Depth (feet)	Bulk	Driven	Blows/Foot	Moisture (%)	Dry Density (PCF)	Description/Interpretation
40						CABRILLO FORMATION: (Continued) Light gray, damp, moderately cemented, silty fine-grained SANDSTONE. @41': cs: N45°W, 35°NE; soft clay; base of disturbed zone. @41.9': cs: N45°E, 15°NW, 1/8-1/2-inch thick, dark gray, moist, soft clay; sandstone above and below; undulatory. @43': Scattered gravel. @43'-44': Rip-up claystone clasts; 1-2 inches in diameter.
			8	8.8	115.6	
						@46.2': 1/8-inch thick red stained laminate; undulatory; approximately horizontal.
						@49': Gravelly; grades to conglomerate.
50						Brown, damp, moderately cemented, sandy CONGLOMERATE. @51'-52': Sandstone layer with few gravel clasts.
60						
						Total Depth = 61 feet. (Logged to 59 feet) Groundwater not encountered during drilling. Backfilled with bentonite and soil cuttings on 3/28/14.
						Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Drive Weight: 0 to 27 feet: 4,500 lbs.; 27 to 50 feet: 3,700 lbs.; 50 to 61 feet: 1,500 lbs.
70						
80						

Ninyo & Moore

BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-5

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								ASPHALT CONRETE: Approximately 4 inches thick.
							GC	FILL: Approximately 3 inches thick. Brown, moist, medium dense, clayey GRAVEL.
								CABRILLO FORMATION: Light brown, damp, moderately cemented, sandy CONGLOMERATE.
10								Sharp contact to gray to reddish brown, moist, weakly to moderately indurated clayey SILTSTONE.
								Light brown to light gray, damp to moist, weakly cemented, silty fine-grained SANDSTONE; massive. @11.7-12.2': Scattered concretions. @12.2': Moderately cemented.
								@15'-17': f: N28°E, near vertical fracture infilled with clay; 1/16-inch wide.
		■	4	13.0	111.1			@17': b: N55°E, 35°W; light brown with reddish staining. @17'-27': Mostly massive sandstone; scattered siltstone/claystone rip-up clasts; near vertical fractures with iron oxide staining.
20								Light gray.
								@23.2'-23.8': Scattered concretions; light brown.
								Dark gray to reddish brown, damp, moderately to strongly indurated, silty CLAYSTONE. @25'-26.3': Concretion.
								Grayish brown, damp, weakly to moderately indurated, clayey SILTSTONE; near horizontal, sharp contact with iron oxide staining; massive.
30								
								Total Depth = 35 feet. (Logged to 33 feet) Groundwater not encountered during drilling. Backfilled with bentonite and soil cuttings on 3/31/14. Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Drive Weight: 0 to 27 feet: 4,500 lbs.; 27 to 35 feet: 3,700 lbs.
40								

DATE DRILLED 3/31/14 BORING NO. B-3

GROUND ELEVATION 512' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 30" Bucket Auger (Pacific Drilling - EZ Bore)

DRIVE WEIGHT See notes DROP 12"

SAMPLED BY BTM LOGGED BY BTM/FOM REVIEWED BY RDH

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BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-6

DATE DRILLED	2/19/14
BORING NO.	B-4
GROUND ELEVATION	507' ± (MSL)
SHEET	1 OF 1
METHOD OF DRILLING	6" Diameter Hollow Stem Auger (Pacific) (Wolverine)
DRIVE WEIGHT	140 lbs. (Auto-Trip)
DROP	30"
SAMPLED BY	GS
LOGGED BY	GS
REVIEWED BY	RDH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/3/4"	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								ASPHALT CONCRETE: Approximately 10 inches thick.
							GP	FILL: Brown, damp, dense, sandy to silty GRAVEL; with cobbles. Difficult drilling.
			50/6"					
10								
20								Auger refusal on cobbles.
								Total Depth = 20 feet. (Refusal) Groundwater not encountered during drilling. Backfilled shortly after drilling on 2/19/14. Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
30								
40								

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BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-8

DATE DRILLED 2/19/14 BORING NO. B-5

GROUND ELEVATION 397' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 6" Diameter Hollow Stem Auger (Pacific) (Wolverine)

DRIVE WEIGHT 140 lbs. (Auto-Trip) DROP 30"

SAMPLED BY GS LOGGED BY GS REVIEWED BY RDH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/3/4"	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0					SC	FILL: Light brown to brown, damp, medium dense, clayey fine to medium SAND; scattered chunks of asphalt; little cobbles.
						Medium dense to dense.
	Bulk					Grinding; difficult drilling.
	Driven	68			GC	COLLUVIUM: Brown to reddish brown, moist, very dense, clayey GRAVEL; some sand.
			5.6			Reddish brown.
10	Driven	50/5"				MOUNT SOLEDAD FORMATION: Yellowish brown, moist, weakly cemented, fine sandy SILTSTONE; some gravel.
	Driven	31	16.0	111.0		
	Driven	43				Light brown, moist, weakly cemented, silty SANDSTONE; few gravel.
	Driven	40				Brown, moist, weakly cemented, clayey SILTSTONE. Abundant gravel and cobbles.
20						Total Depth = 20 feet. (Refusal) Groundwater not encountered during drilling. Backfilled shortly after drilling on 2/19/14.
						Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
30						
40						

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BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-9

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/3/4"	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	

DATE DRILLED 2/20/14 BORING NO. B-6

GROUND ELEVATION 268' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 6" Diameter Hollow Stem Auger (Pacific) (Wolverine)

DRIVE WEIGHT 140 lbs. (Auto-Trip) DROP 30"

SAMPLED BY GS LOGGED BY GS REVIEWED BY RDH

DESCRIPTION/INTERPRETATION

Depth (feet)	Blows/3/4"	Moisture (%)	Classification U.S.C.S.	Description/Interpretation
0			SM	ASPHALT CONCRETE: Approximately 4 inches thick.
				FILL: Yellowish brown, damp, medium dense, silty fine SAND; slightly clayey; scattered gravel.
			CL	Gray brown, moist, stiff, gravelly CLAY; scattered to abundant gravel and cobbles.
5	10	9.9		
10				
				More cobbles; difficult drilling.
20	50/6"			Hard; scattered pieces of siltstone; some cobbles.
				Refusal on cobbles.
24				Total Depth = 24 feet. (Refusal) Groundwater not encountered during drilling. Backfilled with approximately 7 cubbic feet of grout shortly after drilling on 2/20/14.
				Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
30				
40				

Ninyo & Moore

BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-10

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/3/4"	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SC	ASPHALT CONCRETE: Approximately 2 inches thick.
				6.2				FILL: Brown, moist, medium dense to dense, clayey SAND; scattered to abundant gravel and cobbles.
			24					Grayish brown; dense; damp to moist.
10			50/6"					
			50/3"				SM	Grayish brown and yellowish brown, damp, dense, sandy GRAVEL; numerous cobbles.
								Total Depth = 15.7 feet. (Refusal) Groundwater not encountered during drilling. Backfilled with on 2/20/14. Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
20								
30								
40								

DATE DRILLED 2/20/14 BORING NO. B-7

GROUND ELEVATION 267' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 6" Diameter Hollow Stem Auger (Pacific) (Wolverine)

DRIVE WEIGHT 140 lbs. (Auto-Trip) DROP 30"

SAMPLED BY GS LOGGED BY GS REVIEWED BY RDH

Ninyo & Moore

BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-11

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/3/4"	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.

DATE DRILLED 2/20/14 BORING NO. B-8

GROUND ELEVATION 271' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 6" Diameter Hollow Stem Auger (Pacific) (Wolverine)

DRIVE WEIGHT 140 lbs. (Auto-Trip) DROP 30"

SAMPLED BY GS LOGGED BY GS REVIEWED BY RDH

DESCRIPTION/INTERPRETATION

Depth (feet)	Samples	Blows/3/4"	Moisture (%)	Dry Density (PCF)	Classification U.S.C.S.	Description/Interpretation
0					CL	ASPHALT CONCRETE: Approximately 2 inches thick.
						FILL: Brown, moist, stiff, gravelly CLAY.
						Grayish brown; damp to moist.
10	Driven	30	6.7			Hard; scattered pieces of siltstone, cobbles, and sandstone.
	Driven	50/6"				Grinding on numerous cobbles; refusal.
						Total Depth = 15.5 feet. (Refusal) Groundwater not encountered during drilling. Backfilled with on 2/20/14.
20						Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
30						
40						

Ninyo & Moore

BORING LOG

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107314001	7/14	A-12

APPENDIX B

LABORATORY TESTING

Classification

Soils and formational soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the boring logs in Appendix A.

Gradation Analysis

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422. The grain-size distribution curves are shown on Figures B-1 through B-5. These test result were utilized in evaluating the soil classifications in accordance with the USCS.

Atterberg Limits

Tests were performed on selected representative fine-grained samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with the USCS. The test results and classifications are shown on Figure B-6.

Direct Shear Tests

Direct shear tests were performed on relatively undisturbed samples in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of selected materials. The samples were inundated during shearing to represent adverse field conditions. The results are shown on Figures B-7 through B-12.

Expansion Index Tests

The expansion index of selected materials was evaluated in general accordance with ASTM D 4829. A specimen was molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The results of this test are presented on Figure B-13.

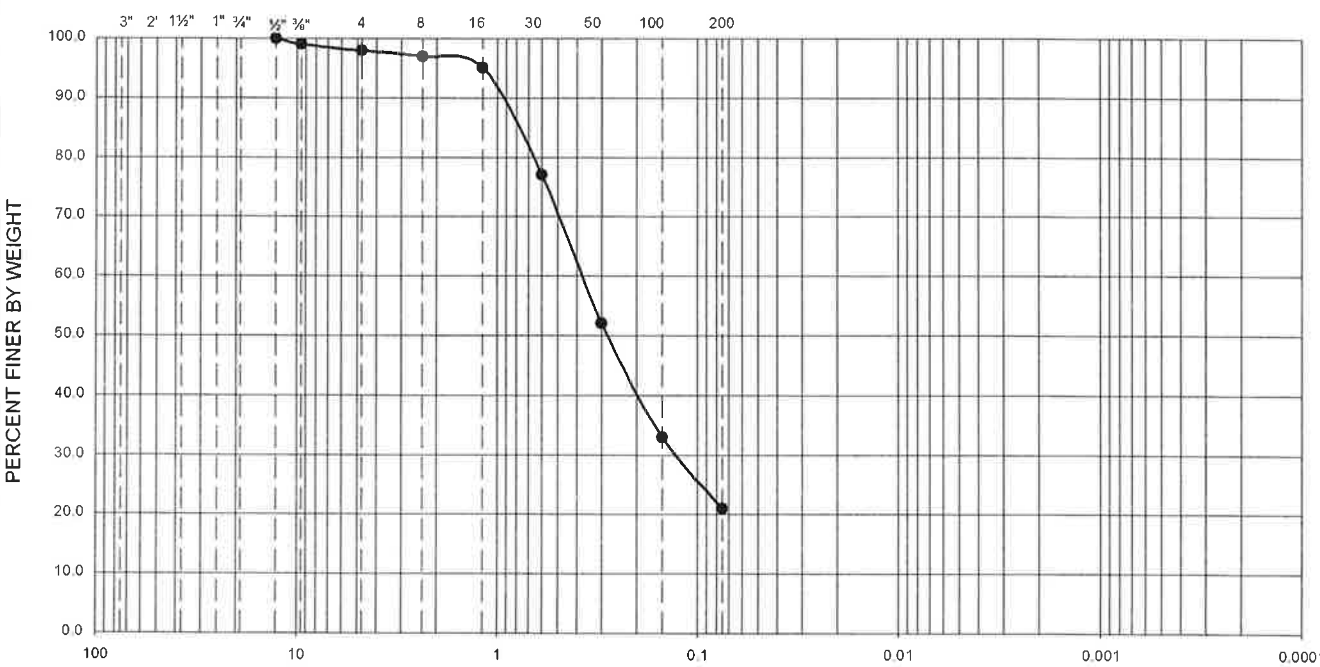
Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on representative samples in general accordance with California Test (CT) 643. The chloride content of the selected samples was evaluated in general accordance with CT 422. The sulfate content of the selected samples was evaluated in general accordance with CT 417. The test results are presented on Figure B-14.

R-Value

The resistance value, or R-value, for site soils was evaluated in general accordance with CT 301. A representative sample was prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results. The test results are shown on Figure B-15.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



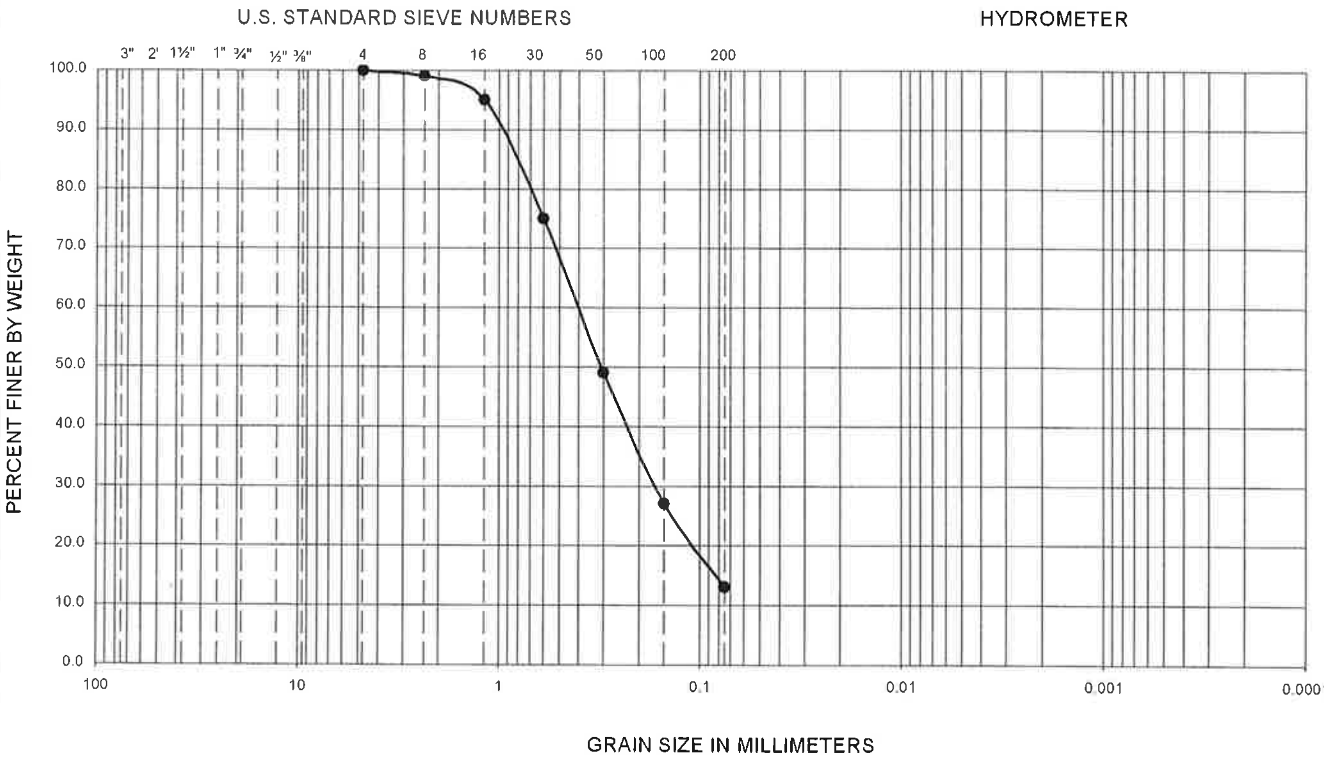
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	Equivalent USCS
●	B-1	10.0-12.0	--	--	--	--	--	--	--	--	21	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-1
107314001	7/14		

107314001_SIEVE B-1 @ 10.0-12.0.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



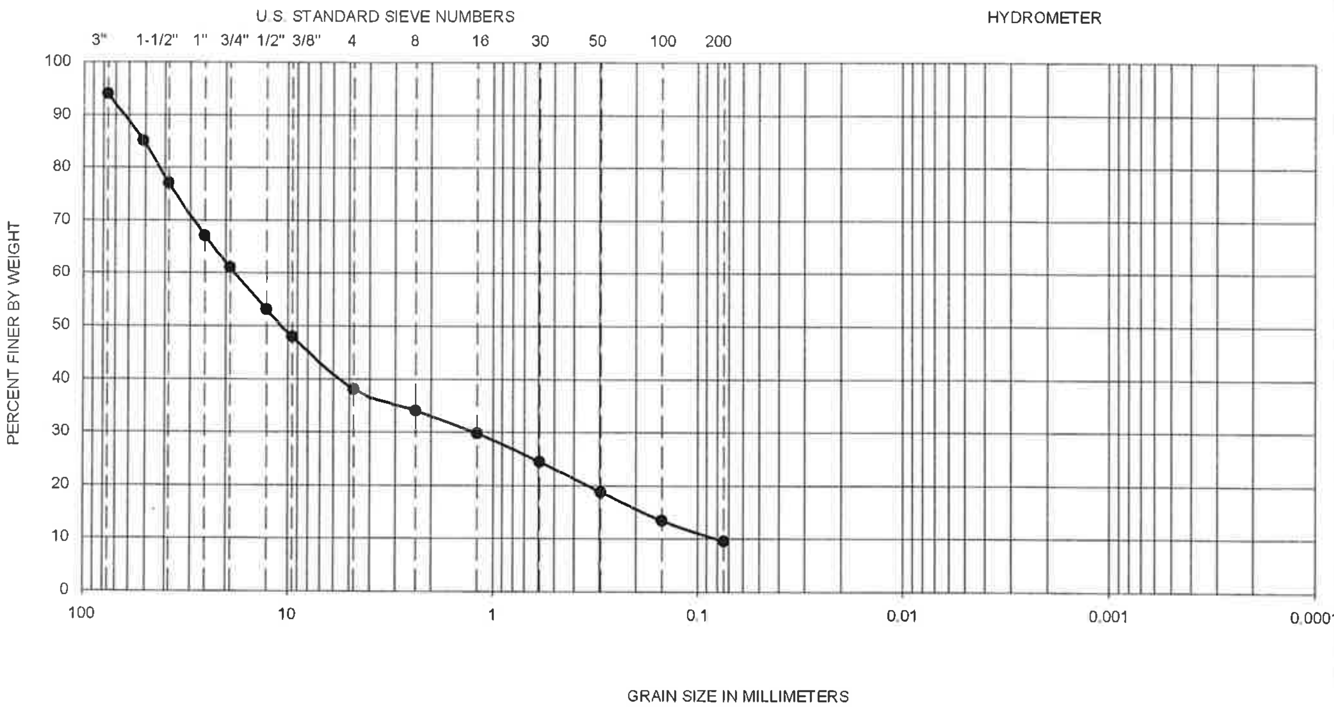
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	Equivalent USCS
●	B-1	30.0-31.0	--	--	--	--	--	--	--	--	13	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-2
107314001	7/14		

107314001_SIEVE B-1 @ 30.0-31.0.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



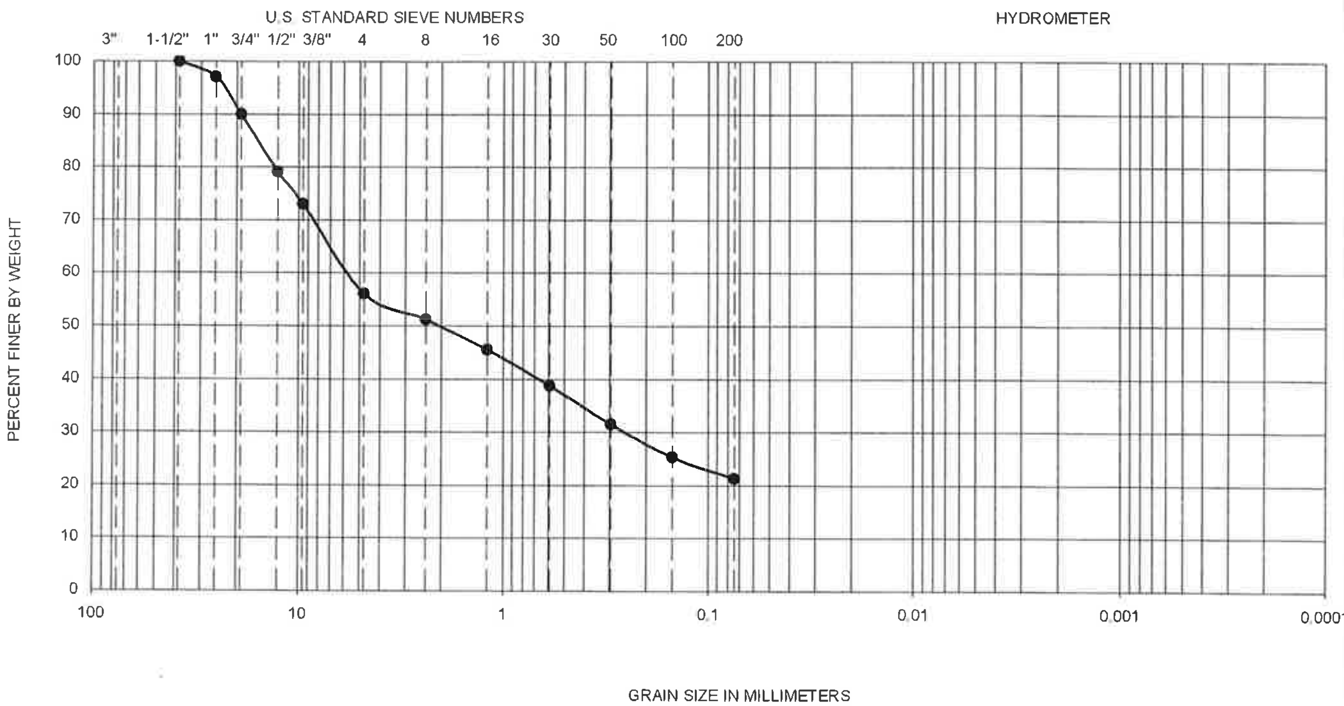
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	Equivalent USCS
●	B-1	40.0-41.0	--	--	--	0.08	1.19	18.10	241.3	1.0	10	GW-GM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-3
107314001	7/14		

107314001_SIEVE B-1 @ 40.0-41.0.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



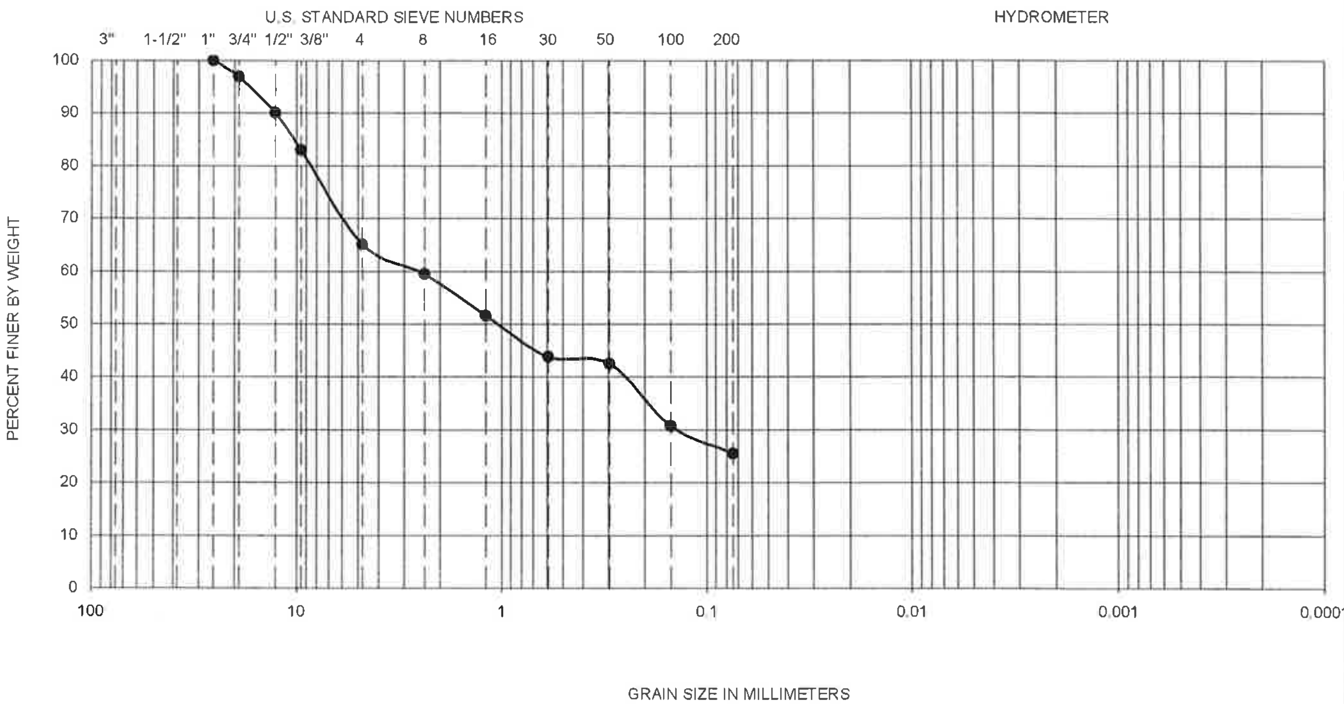
Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-5	5.0-10.0	--	--	--	--	--	--	--	--	21	GC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-4
107314001	7/14		

107314001_SIEVE B-5 @ 5.0-10.0.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay

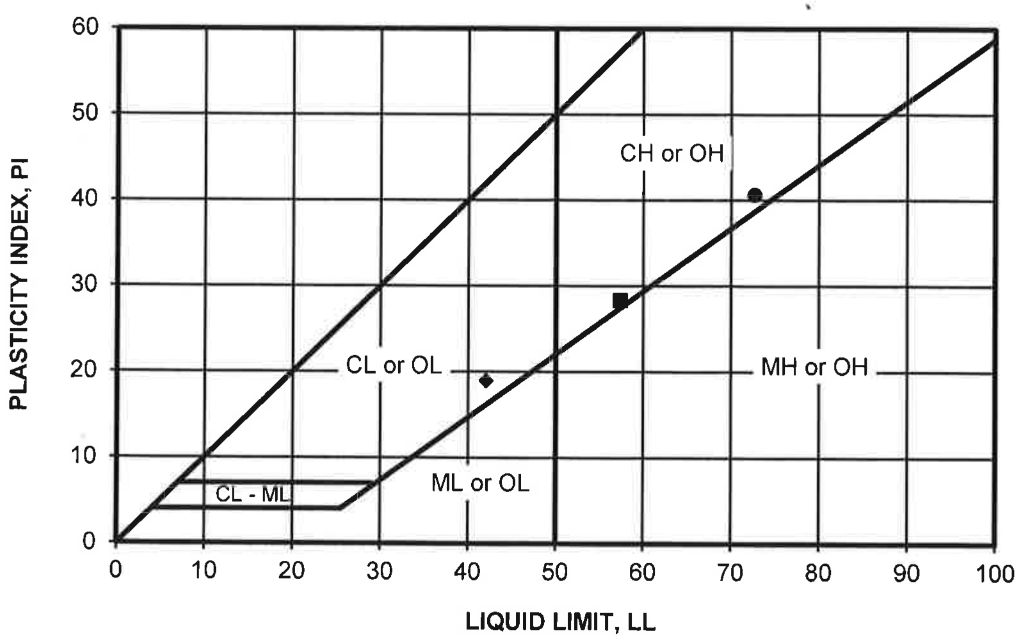


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-7	1.0-5.0	--	--	--	--	--	--	--	--	25	SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

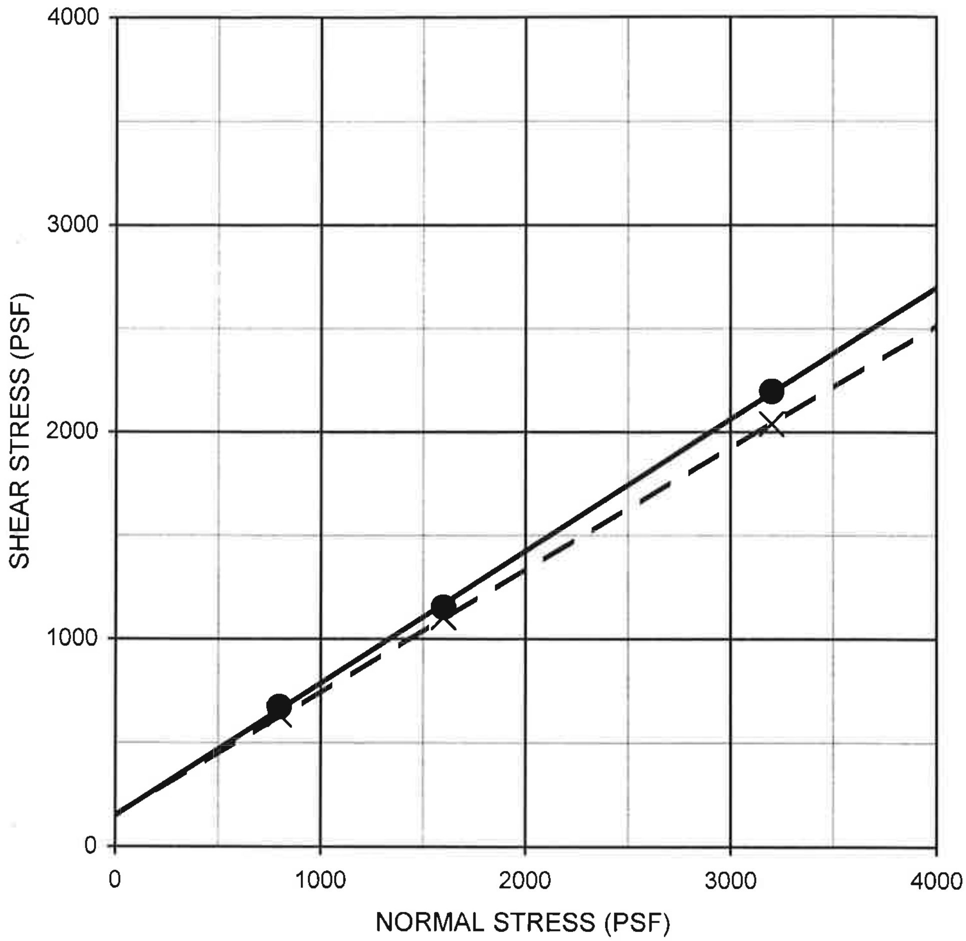
Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-5
107314001	7/14		

SYMBOL	LOCATION	DEPTH (FT)	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	USCS (Entire Sample)
●	B-1	49.0-50.0	73	32	41	CH	CH
■	B-1	77.0-78.0	57	29	28	CL	CL
◆	B-2	41.0-42.0	42	23	19	CH	CH



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

Ninyo & Moore	ATTERBERG LIMITS TEST RESULTS	FIGURE
PROJECT NO. 107314001 / DATE 7/14	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-6

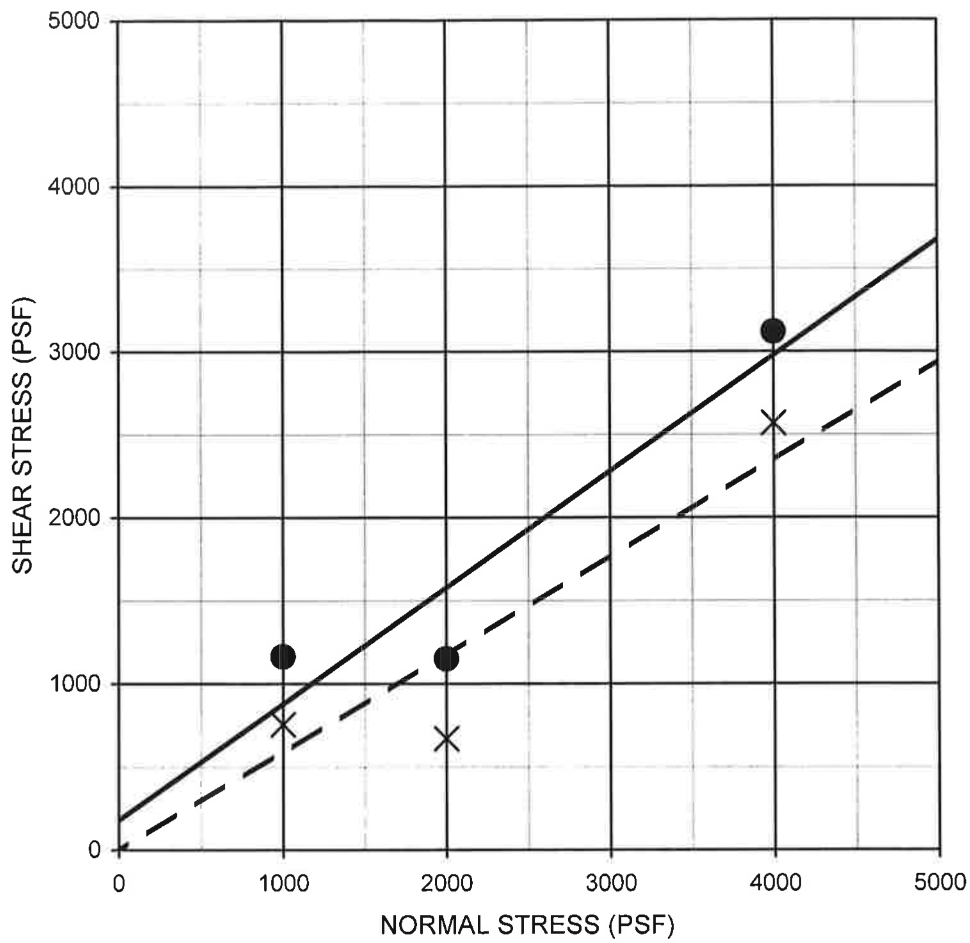


Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SANDSTONE	——●——	B-1	5.0-6.0	Peak	150	33	Formation
Silty SANDSTONE	- - x - -	B-1	5.0-6.0	Ultimate	150	31	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-7
107314001	7/14		

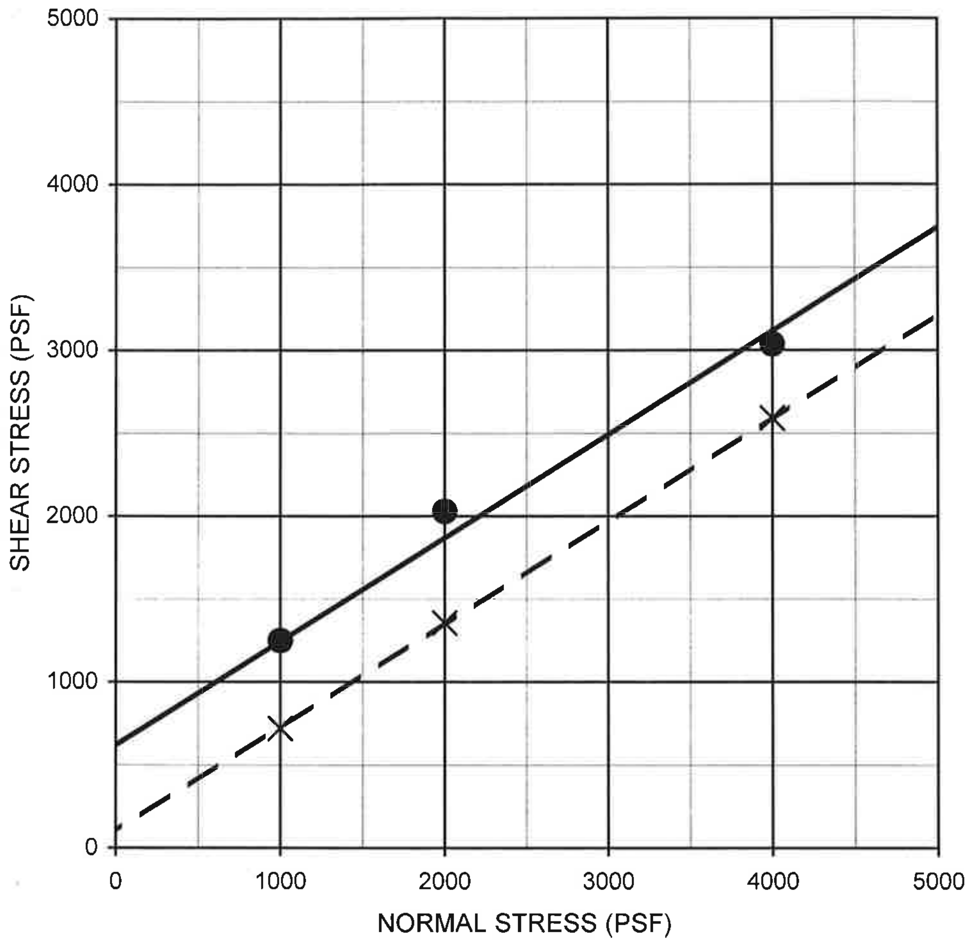
107314001_DIRECT SHEAR B-1 @ 5.0-6.0.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SANDSTONE	——●——	B-1	20.0-21.0	Peak	180	34	Formation
Silty SANDSTONE	- - x - -	B-1	20.0-21.0	Ultimate	0	31	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

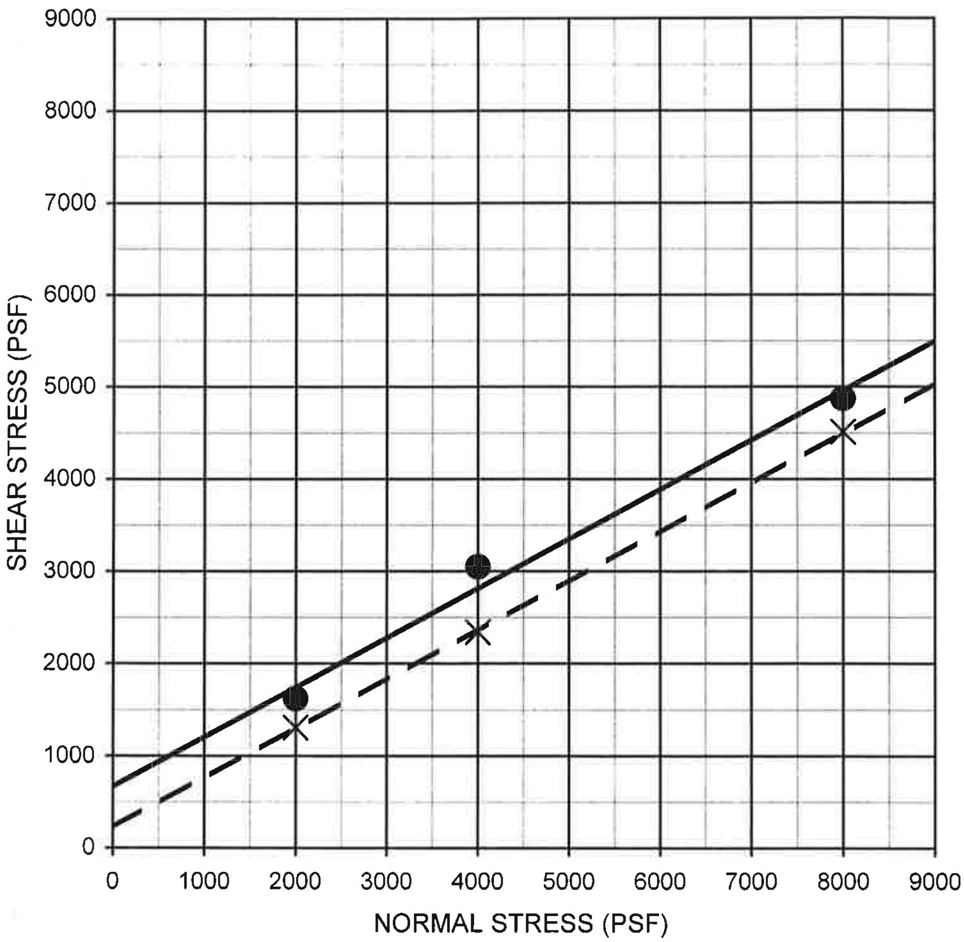
Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-8
107314001	7/14		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SANDSTONE	—●—	B-2	15.0-16.0	Peak	620	32	Formation
Silty SANDSTONE	- - x - -	B-2	15.0-16.0	Ultimate	100	32	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

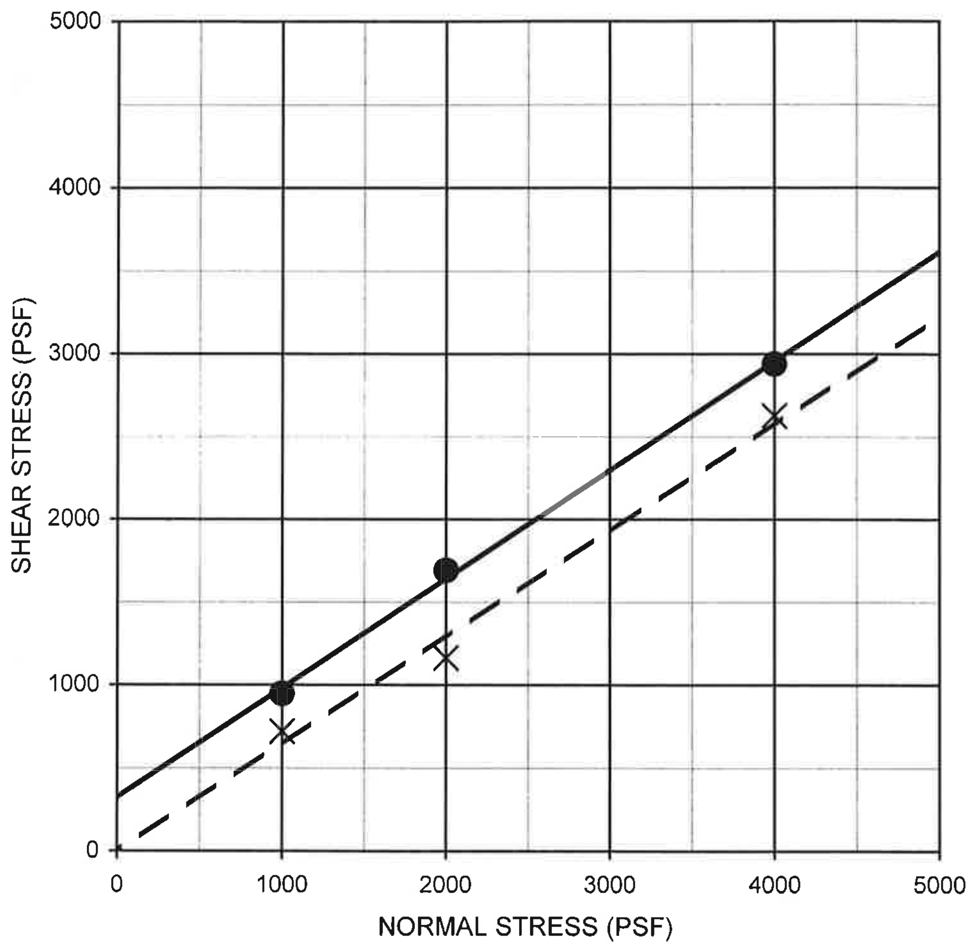
Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-9
107314001	7/14		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SANDSTONE	—●—	B-2	35.0-36.0	Peak	670	28	Formation
Silty SANDSTONE	- - x - -	B-2	35.0-36.0	Ultimate	220	28	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

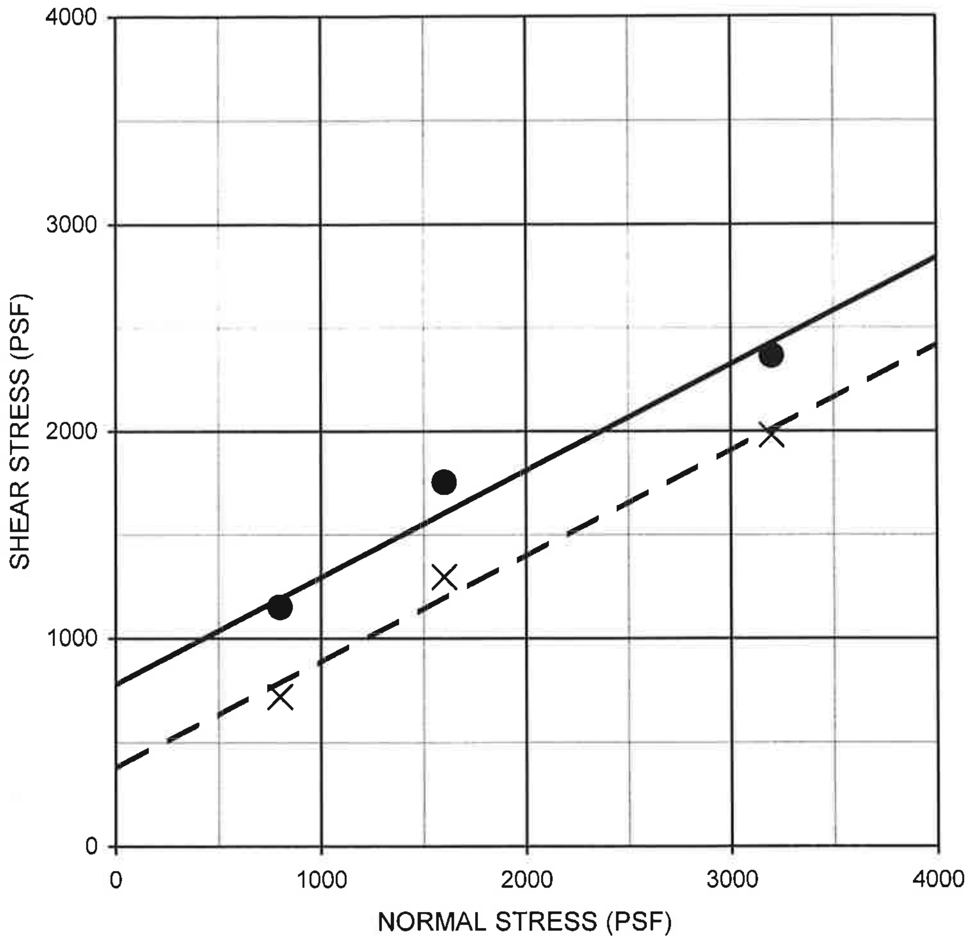
Ninyo & Moore	DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO. / DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-10
107314001 / 7/14		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SANDSTONE	—●—	B-3	17.0-18.0	Peak	320	33	Formation
Silty SANDSTONE	- - x - -	B-3	17.0-18.0	Ultimate	0	33	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-11
107314001	7/14		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Sandy SILTSTONE	—●—	B-5	12.0-13.5	Peak	780	27	Formation
Sandy SILTSTONE	- - X - -	B-5	12.0-13.5	Ultimate	380	27	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-12
107314001	7/14		

IT PROJECT

SAMPLE LOCATION	SAMPLE DEPTH (FT)	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (PCF)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (IN)	EXPANSION INDEX	POTENTIAL EXPANSION
B-2	1.5-3.0	13.5	98.3	28.7	0.128	129	High

PERFORMED IN GENERAL ACCORDANCE WITH ☐ UBC STANDARD 18-2 ☑ ASTM D 4829

Ninyo & Moore

EXPANSION INDEX TEST RESULTS

PROJECT NO.	DATE
107314001	7/14

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

FIGURE
B-13

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-1	32.0-33.0	8.9	420	30	0.003	1,040
B-2	1.5-3.0	5.7	310	510	0.051	1,040
B-5	5.0-10.0	6.8	400	680	0.068	1920

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore

CORROSIVITY TEST RESULTS

FIGURE **B-14**

PROJECT NO.	DATE
107314001	7/14

LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT
LA JOLLA, CALIFORNIA

SAMPLE LOCATION	SAMPLE DEPTH (FT)	SOIL TYPE	R-VALUE
B-2	1.5-3.0	CLAY (CL)	10

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844/CT 301

Ninyo & Moore		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	DATE	LA JOLLA VIEW RESERVOIR REPLACEMENT PROJECT LA JOLLA, CALIFORNIA	B-15
107314001	7/14		

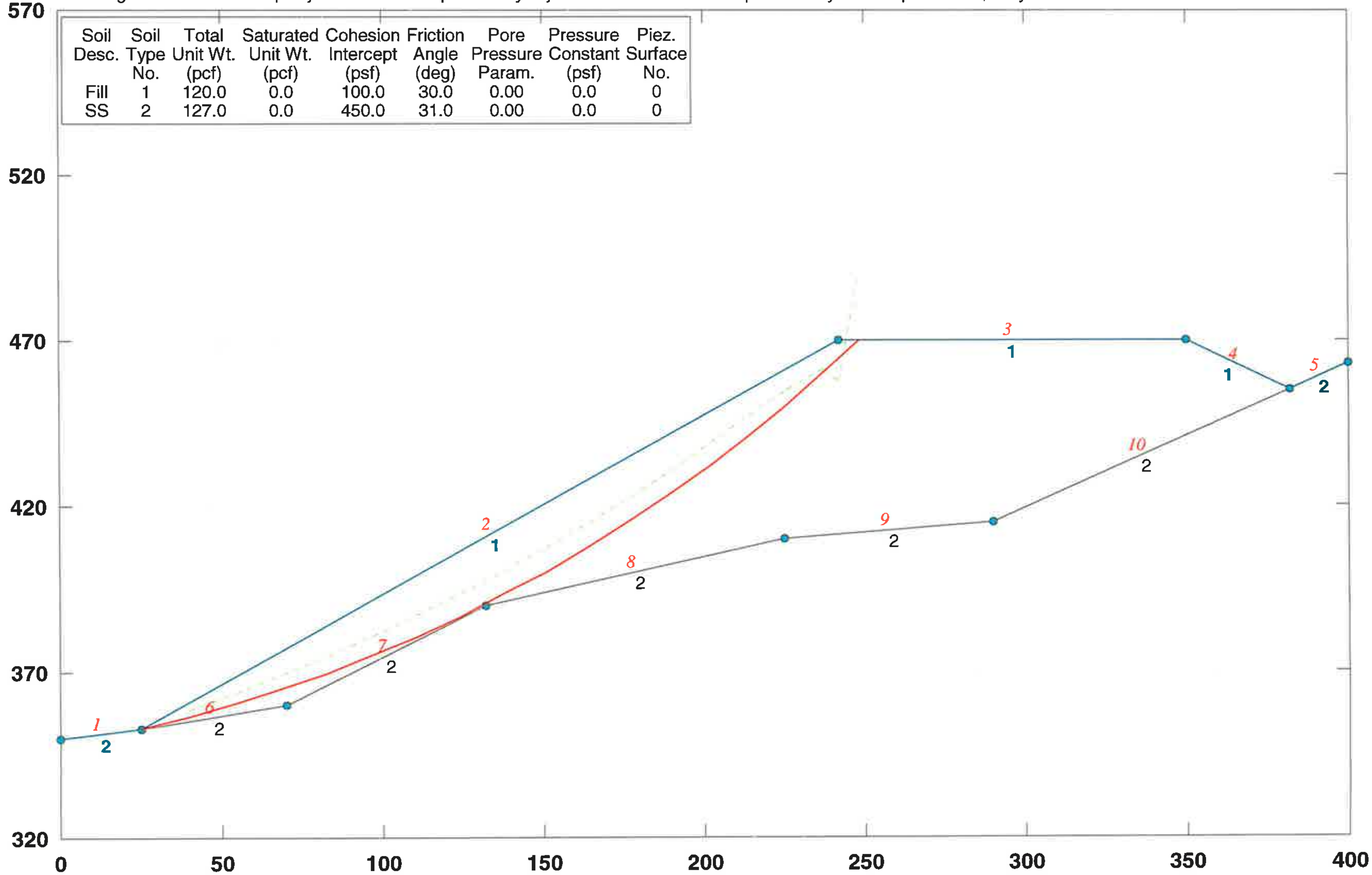
APPENDIX C

SLOPE STABILITY ANALYSIS

La Jolla View Reservoir Project B-B' La Jolla, California

g:\file share\ckv.temp\la jolla reservoir\slope stability\la jolla view b-b' surface #1.plt   Run By: Christopher Vonk, Ninyo & Moore   5/21/2014   03:29PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Fill	1	120.0	0.0	100.0	30.0	0.00	0.0	0
SS	2	127.0	0.0	450.0	31.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.263
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)

***** GSTABL7 *****

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.2, Jan. 2011 **

****
SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
****

Analysis Run Date: 5/21/2014
Time of Run: 03:29PM
Run By: Christopher Vonk, Ninyo & Moore
Input Data Filename: G:\File Share\CKV.temp\La Jolla Reservoir\Slope Stability\la jolla view b-b' Surface #1.in
Output Filename: G:\File Share\CKV.temp\La Jolla Reservoir\Slope Stability\la jolla view b-b' Surface #1.OUT
Unit System: English
Plotted Output Filename: G:\File Share\CKV.temp\La Jolla Reservoir\Slope Stability\la jolla view b-b' Surface #1.PLT
PROBLEM DESCRIPTION: La Jolla View Reservoir Project B-B'
La Jolla, California

BOUNDARY COORDINATES
5 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	350.00	25.00	353.00	2
2	25.00	353.00	242.00	470.00	1
3	242.00	470.00	350.00	470.00	1
4	350.00	470.00	382.00	455.00	1
5	382.00	455.00	400.00	463.00	2
6	25.00	353.00	70.00	360.00	2
7	70.00	360.00	132.00	390.00	2
8	132.00	390.00	225.00	410.00	2
9	225.00	410.00	290.00	415.00	2
10	290.00	415.00	382.00	455.00	2

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	0.0	100.0	30.0	0.00	0.0	0
2	127.0	0.0	450.0	31.0	0.00	0.0	0

Trial Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	25.000	353.000
2	39.587	356.495
3	54.060	360.438
4	68.404	364.826
5	82.606	369.653
6	96.652	374.915
7	110.530	380.608
8	124.226	386.726
9	137.727	393.262
10	151.020	400.212
11	164.092	407.568
12	176.932	415.323
13	189.526	423.470
14	201.864	432.002

15	213.933	440.909
16	225.721	450.184
17	237.219	459.818
18	248.413	469.802
19	248.622	470.000

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	1.77	15.00
2	1.77	15.00
3	1.76	15.00
4	1.77	15.00
5	1.77	15.00
6	1.77	15.00
7	1.76	15.00
8	1.77	15.00
9	1.77	15.00
10	1.76	15.00
11	1.77	15.00
12	1.77	15.00
13	1.76	15.00
14	1.77	15.00
15	1.76	15.00
16	1.77	15.00

Circle Center At X = -81.109(ft) ; Y = 828.028(ft); and Radius = 486.735(ft)

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
13.30	1.359	1.251	0.236
19.95	1.328	1.256	0.363
37.90	1.093	1.274	0.778
26.76	1.268	1.262	0.504
23.52	1.303	1.259	0.435
28.53	1.242	1.264	0.544
26.29	1.274	1.262	0.494
26.62	1.270	1.262	0.501
27.40	1.259	1.263	0.518
27.17	1.263	1.263	0.513

((Modified Bishop FS for Specified Surface = 1.263))
Factor Of Safety For The Preceding Specified Surface = 1.263
Theta (ki = 1.0) = 27.17 Deg Lambda = 0.513
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 0.099(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	39.59	358.49	0.457	2313.	1.000	27.17	1187.2
2	54.06	363.65	0.391	5865.	1.000	27.17	3009.5
3	68.40	369.10	0.369	9908.	1.000	27.17	5084.7
4	82.61	374.81	0.358	13863.	1.000	27.17	7113.8
5	96.65	380.81	0.353	17283.	1.000	27.17	8869.0
6	110.53	387.07	0.349	19856.	1.000	27.17	10189.3
7	124.23	393.61	0.348	21386.	1.000	27.17	10974.7
8	137.73	400.40	0.348	21789.	1.000	27.17	11181.3
9	151.02	407.47	0.350	21067.	1.000	27.17	10810.7
10	164.09	414.81	0.354	19316.	1.000	27.17	9912.4
11	176.93	422.43	0.363	16708.	1.000	27.17	8573.8
12	189.53	430.40	0.380	13475.	1.000	27.17	6914.7
13	201.86	438.83	0.417	9910.	1.000	27.17	5085.3
14	213.93	447.20	0.451	6220.	0.776	21.70	1920.1
15	225.72	454.87	0.425	3074.	0.512	14.72	413.6

16	237.22	461.29	0.194	749.	0.255	7.45	25.0
17	242.00	457.57	-1.100	56.	0.148	4.35	0.6
18	248.41	491.17	107.938	-21.	0.005	0.14	0.0
19	248.62	3335.75	0.000	0.	0.000	0.00	0.0

Table 1 - Individual data on the 19 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	14.6	3824.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	14.5	10941.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	14.3	17046.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	14.2	22140.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	14.0	26230.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	13.9	29331.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	13.7	31457.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	13.5	32638.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	13.3	32901.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	13.1	32283.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	12.8	30831.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	12.6	28587.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	12.3	25610.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	12.1	21953.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	11.8	17679.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	11.5	12861.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	4.8	3878.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	6.4	2353.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.2	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

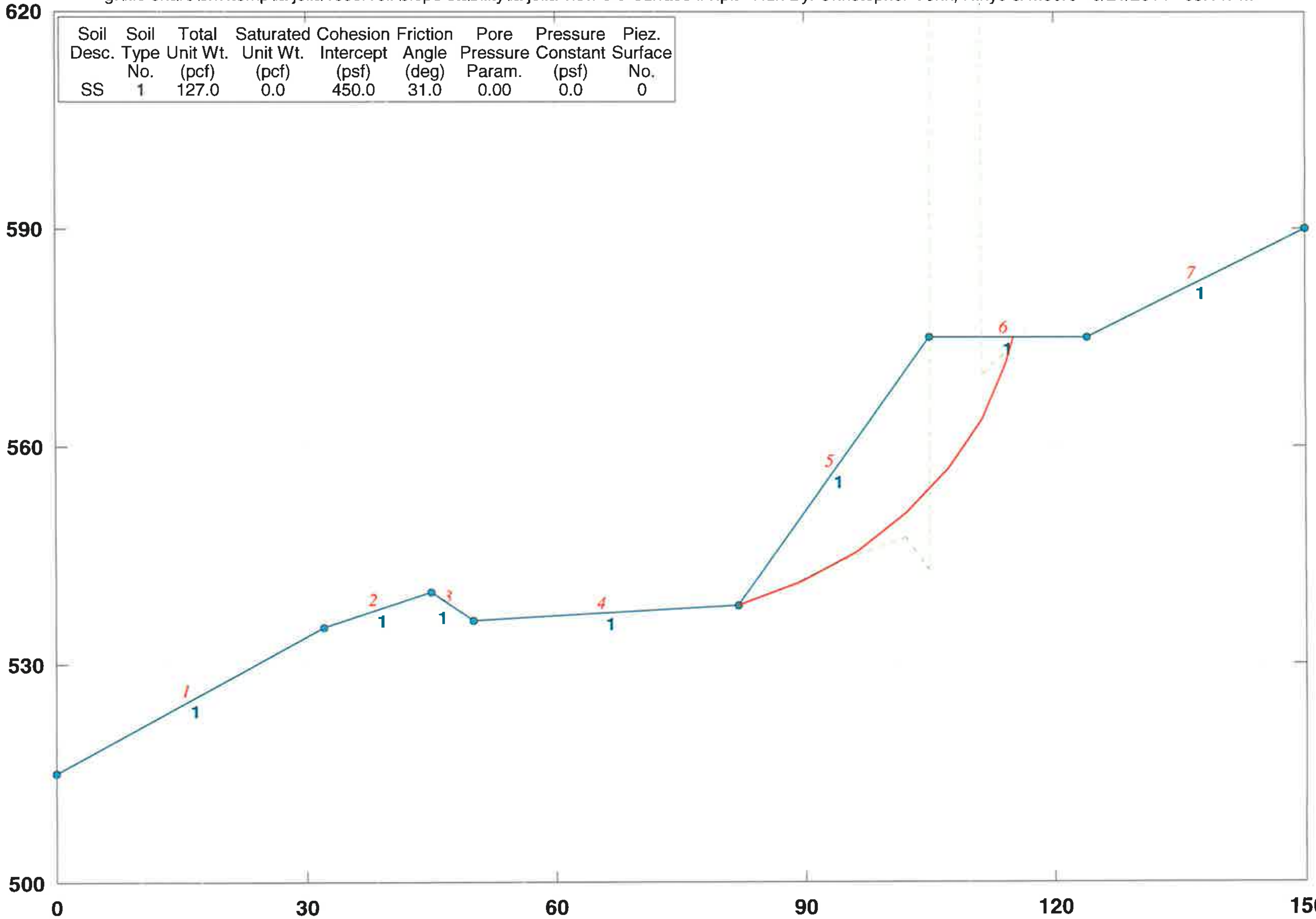
- TABLE 2 - Base Stress Data on the 19 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	13.47	32.29	15.00	284.46	254.98	209.26
2	15.24	46.82	15.00	752.69	729.43	423.35
3	17.01	61.23	15.00	1134.23	1136.40	597.80
4	18.77	75.50	15.00	1436.00	1476.03	735.78
5	20.54	89.63	15.00	1663.93	1748.76	840.00
6	22.30	103.59	15.00	1823.60	1955.37	913.01
7	24.07	117.38	15.00	1920.29	2097.14	957.22
8	25.83	130.98	15.00	1959.08	2175.88	974.95
9	27.60	144.37	15.00	1944.11	2193.38	968.11
10	29.37	157.56	15.00	1880.16	2152.26	938.87
11	31.13	170.51	15.00	1771.46	2055.43	889.16
12	32.90	183.23	15.00	1621.78	1905.89	820.73
13	34.66	195.70	15.00	1435.24	1707.27	735.43
14	36.43	207.90	15.00	1178.53	1463.55	618.06
15	38.20	219.83	15.00	962.42	1178.71	519.25
16	39.96	231.47	15.00	717.75	857.40	407.38
17	41.73	239.61	6.41	512.33	605.48	313.45
18	41.73	245.21	8.59	210.00	273.85	175.21
19	43.45	248.52	0.29	0.00	8.62	59.13

**** END OF GSTABL7 OUTPUT ****

La Jolla View Reservior Project C-C' La Jolla, California

g:\file share\ckv.temp\la jolla reservoir\slope stability\la jolla view c-c' surface #1.plt Run By: Christopher Vonk, Ninyo & Moore 5/21/2014 03:11PM



GSTABL7 v.2 FSmin=1.294

Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-1)

GSTABL7

*** **GSTABL7** ***

** GSTABL7 by Dr. Garry H. Gregory, Ph.D.,P.E.,D.GE **
** Original Version 1.0, January 1996; Current Ver. 2.005.2, Jan. 2011 **

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SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

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Analysis Run Date: 5/21/2014
Time of Run: 03:11PM
Run By: Christopher Vonk, Ninyo & Moore
Input Data Filename: G:\File Share\CKV.temp\La Jolla Reservoir\Slope Stability\la jolla view c-c' Surface #1.in
Output Filename: G:\File Share\CKV.temp\La Jolla Reservoir\Slope Stability\la jolla view c-c' Surface #1.OUT
Unit System: English
Plotted Output Filename: G:\File Share\CKV.temp\La Jolla Reservoir\Slope Stability\la jolla view c-c' Surface #1.PLT
PROBLEM DESCRIPTION: La Jolla View Reservior Project C-C'
La Jolla, California

BOUNDARY COORDINATES
7 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	515.00	32.00	535.00	1
2	32.00	535.00	45.00	540.00	1
3	45.00	540.00	50.00	536.00	1
4	50.00	536.00	82.00	538.00	1
5	82.00	538.00	105.00	575.00	1
6	105.00	575.00	124.00	575.00	1
7	124.00	575.00	150.00	590.00	1

User Specified Y-Origin = 500.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	127.0	0.0	450.0	31.0	0.00	0.0	0

Trial Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.000	538.000
2	89.345	541.170
3	96.103	545.452
4	102.107	550.739
5	107.208	556.901
6	111.282	563.786
7	114.228	571.224
8	115.071	575.000

DEFLECTION ANGLE & SEGMENT DATA FOR SPECIFIED SURFACE(Excluding Last Segment)

Angle/Segment No.	Deflection(Deg)	Segment Length(ft)
1	9.02	8.00
2	9.01	8.00
3	9.02	8.00
4	9.00	8.00
5	9.01	8.00

Circle Center At X = 65.870(ft) ; Y = 585.696(ft); and Radius = 50.350(ft)

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda

22.50	1.301	1.290	0.414
33.75	1.278	1.300	0.668
27.30	1.295	1.294	0.516

((Modified Bishop FS for Specified Surface = 1.292))
Factor Of Safety For The Preceding Specified Surface = 1.294
Theta (ki = 1.0) = 27.30 Deg Lambda = 0.516
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-1)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Constant (1.0)
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 1.888(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	89.35	541.48	0.036	3005.	1.000	27.30	1550.9
2	96.10	544.99	-0.030	4272.	1.000	27.30	2205.0
3	102.11	547.44	-0.168	3007.	1.000	27.30	1551.9
4	105.00	542.85	-0.548	1246.	1.000	27.30	642.9
5	107.21	2528.74	108.947	-8.	1.000	27.30	-4.0
6	111.28	569.82	0.538	-1793.	1.000	27.30	-925.4
7	114.23	572.95	0.458	-1176.	1.000	27.30	-606.9
8	115.07	587.75	0.000	-5.	1.000	27.30	-2.4

Table 1 - Individual data on the 8 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.3	4032.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	6.8	10248.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	6.0	13283.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.9	7416.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.2	5449.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	4.1	7583.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	2.9	2804.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.8	202.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

- TABLE 2 - Base Stress Data on the 8 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	23.34	85.67	8.00	488.72	504.08	574.48
2	32.36	92.72	8.00	1068.07	1280.96	843.40
3	41.37	99.10	8.00	1284.63	1660.47	943.92
4	50.38	103.55	4.54	1194.67	1634.81	902.16
5	50.38	106.10	3.46	1145.43	1573.74	879.31
6	59.39	109.24	8.00	601.26	947.90	626.72
7	68.39	112.75	8.00	78.38	350.51	384.01
8	77.41	114.65	3.87	0.00	52.24	245.10

**** END OF GSTABL7 OUTPUT ****