FAIRMONT SEDIMENTATION PLANT

SCOPE OF WORK DOCUMENT

March 2017

Prepared by:

Los Angeles Department of Water and Power (LADWP)
Water Engineering & Technical Services
Groundwater Planning/Special Projects

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ABBREVIATIONS

AACE	Association for the Advancement of Cost Engineering
cfs	cubic feet per second
CIP	Capital Improvement Program
CTP	Cottonwood Treatment Plant
DBP	disinfection by-product
DSOD	Division of Safety of Dams
EIR	Environmental Impact Report
ft	foot or feet
FTE	full-time equivalent
GAC	granular activated carbon
gpm	gallons per minute
HMI	human machine interface
LAA	Los Angeles Aqueduct
LAA1	First Los Angeles Aqueduct
LAA2	Second Los Angeles Aqueduct
LAAFP	Los Angeles Aqueduct Filtration Plant
LADWP	Los Angeles Department of Water and Power
mgd	million gallons per day
mg/L	milligram per liter
µg/L	microgram per liter
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
PLC	Programmable Logic Controller
PP1	San Francisquito Power Plant #1
SWP	State Water Project
SWP-E	State Water Project East Branch
SWP-W	State Water Project West Branch
Sqft	square feet
SUSMP	Standard Urban Storm water Mitigation Plan
SWPPP	Storm Water Pollution Prevention Plan
TOC	Total Organic Carbon
TOCC	Treatment Operations Control Center
WETS	Water Engineering & Technical Services

Fairmont Sedimentation Plant
Function Item: 24310
Job No. 20057

I. Project Objective

The Project, as described in this section, includes the planning, design, and construction of the Fairmont Sedimentation Plant and related facilities. The objectives for the Project include the following:

1. Improve operational flexibility of the Los Angeles Aqueduct Filtration Plant by improving source water quality.
2. Prevent additional arsenic laden sediment accumulation in the North Haiwee Reservoir by eliminating the need to operate the Cottonwood Treatment Plant.

II. Project Team

Project Management	
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4/4/17

Manager of Planning Date
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V. Project Overview & Background

Los Angeles Aqueduct Filtration Plant (LAAFP) is currently receiving raw water from two primary sources: the Los Angeles Aqueduct (LAA) and State Water Project West Branch (SWP-W). A third source, State Water Project East Project (SWP-E), is anticipated to be accessible upon successful completion and permitted demonstration of the Neenach Pump Station, which will pump SWP-E into the LAA upstream of the Fairmont Reservoir #2.

A. Governing Conditions

Treatment of source waters from the LAA are currently being addressed by LADWP in a two-step process: 1) pretreatment at Cottonwood Treatment Plant (CTP) with coagulant addition in the LAA and particle settling within the North Haiwee Reservoir and 2) final treatment at the LAAFP with ozonation, biological filtration, UV disinfection, and chlorine disinfection followed by chloramination to maintain a secondary disinfectant residual. The successful completion of the Project would allow source waters from the first LAA (LAA1), the second LAA (LAA2), and SWP-E to be treated via an engineered sedimentation basin using plate settler technology at the Fairmont Reservoir, followed by final treatment at the LAAFP. SWP-W does not require pretreatment prior to the LAAFP due to its higher water quality upon arrival to the LAAFP. The revised treatment configuration would eliminate the need for the CTP and further solids accumulation in the North Haiwee Reservoir. Figure V-1 shows the Project location with respect to related Los Angeles Aqueduct facilities and transmission pipelines.

B. Current and Future Concerns

Presently, the combination of pre-treatment at the CTP and the LAAFP has been effective in meeting water quality goals and regulatory limits as an interim solution. However, this current treatment strategy is approaching its operational limits. The current concerns are North Haiwee Reservoir sediments create a hydraulic limitation for LAA exacerbated by upstream CTP chemical coagulation activities. Sluicing the sediments at North Haiwee Reservoir has provided temporary relief, but the continual deposition of arsenic laden sediments from coagulation activities without the ability to remove them is anticipated to worsen these issues. North Haiwee Reservoir sediments pose a risk of releasing arsenic back into LAA without an effective treatment barrier downstream. In addition, the existing LAAFP filters can only address lower turbidity values and has struggled with significant turbidity spikes as seen in 1995 glacial silt episode and 2016 Castaic Reservoir mud slide. Furthermore, the addition of SWP-E source and its occasional turbidity spikes could exceed LAAFP’s treatment capabilities. Adding a pre-treatment for SWP-E would provide an additional control barrier prior to filtration at LAAFP.

Future concerns are that new source waters or regulatory changes will require additional treatment processes at LAAFP or on individual sources.

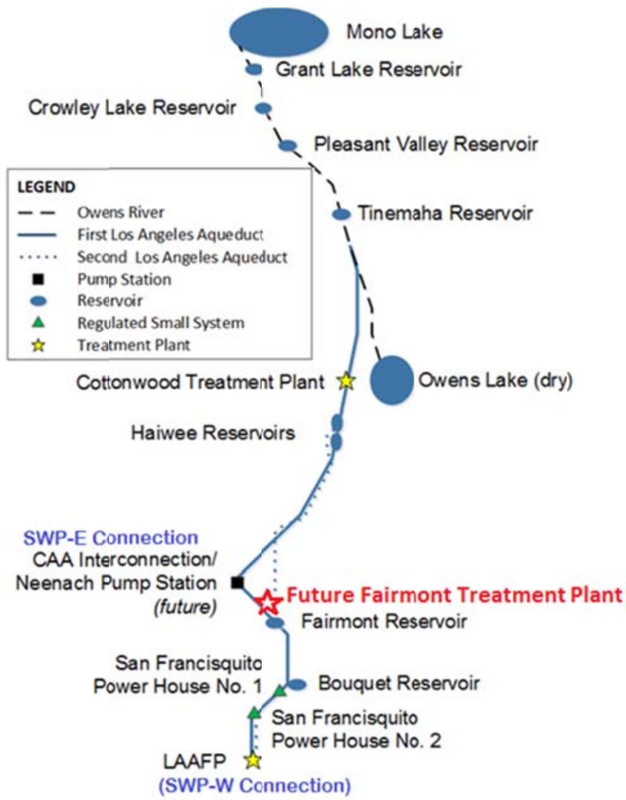


Figure V-1: Schematic of Los Angeles Aqueduct Facilities

C. *General Strategy*

The Project, as described in the proceeding sections, aims to address concerns revolving around the CTP at North Haiwee Reservoir and the LAAFP through the construction of a new water treatment plant using sedimentation basins with plate settlers engineered to handle the maximum design capacity of the LAA, 720 cubic feet per second (cfs). The construction of this water treatment plant is anticipated to accomplish the following:

- Treat the 720 cfs maximum combined LAA design capacity under a variety of water quality conditions for turbidity, arsenic, Total Organic Carbon (TOC), and other emerging contaminants including disinfection by-product (DBP) precursors.
- Treat future raw water purchased from the SWP-E prior to processing at LAAFP.
- Provide a more robust treatment barrier as compared to the existing CTP in the event of arsenic and/or turbidity spikes.
- Eliminate the need to operate the CTP and subsequently eliminate arsenic laden sediment from accumulating in the North Haiwee Reservoir.
- Reduce the burden on the filters at the LAAFP through pre-treatment of incoming source waters from the LAA and SWP-E.

VI. Project Justification

A Feasibility Study evaluating several options to achieve these goals was performed in two phases, a Preliminary Screening Evaluation and a Detailed Alternatives Analysis. The findings and conclusions are summarized in the following section.

A. Preliminary Screening Evaluation

The primary objective of the Preliminary Screening Evaluation was to develop a list of alternatives, including a no action alternative, by which the top three alternatives could be screened for further consideration during the subsequent Detailed Alternatives Evaluation. A total of eight alternatives were proposed for preliminary screening. Each alternative was screened relative to several evaluation criteria related to water quality, operations, cost and implementation. Treatment at LAAFP, sedimentation downstream of Neenach, and split treatment ranked as the top three alternatives. Table VI-1 summarizes these top three alternatives identified during the preliminary screening process.

Table VI-1: Preliminary Screening Evaluation Top Three Alternatives

No.	Alternative	Alternative Description
1	Treatment at LAAFP	Construction of additional treatment facilities at LAAFP. Treatment technologies could include a number of processes that would fit on the limited space available within the LAAFP property boundary. This treatment plant would be able to capture flow from the LAA, SWP-E, and SWP-W.
2	Sedimentation downstream of Neenach Pump Station	Construction of sedimentation basins at a location downstream of the SWP-E connection via Neenach Pump Station, and upstream of LAAFP. These sedimentation basins would capture SWP-E as well as all flow from the LAA but does not capture flow from the SWP-W.
3	Split treatment downstream of Cottonwood and LAAFP	A combined treatment approach with two phases. The first phase would include construction of sedimentation basins south of the CTP to eliminate solids accumulation at the North Haiwee Reservoir. The second phase would include the construction of additional treatment facilities at LAAFP that would meet future regulatory and water quality goals.

B. Detailed Alternatives Evaluation

The top three alternatives were compared and ranked according to the following three criteria categories:

- **Cost:** Includes Association for the Advancement of Cost Engineering International (AACE) Class 5 cost estimates for capital and annual operations and maintenance (O&M) costs.
- **Effectiveness:** Includes the ability of an alternative to address current issues (i.e., improving the operational flexibility of the current LAAFP biofilters and preventing additional solids accumulation in the North Haiwee Reservoir) and future water quality regulations (e.g., new arsenic regulations, DBP precursors, and turbidity limits).

- **Implementation:** Includes the ability of an alternative to minimize interference with ongoing operations; constructability (e.g. footprint requirements, site restrictions, equipment availability, and schedule); and permitting and other requirements (i.e., local zoning restrictions).

A summary of each of the top three alternatives are presented in Table VI-2 below.

Table VI-2: Detailed Alternatives Evaluation Summary

Parameter	**Alternative 1: Treatment at LAAFP**	**Alternative 2: Sedimentation downstream of Neenach (Recommended)**	**Alternative 3: Split Treatment - Downstream of Cottonwood and at LAAFP**
Description	High Rate Clarification with Microsand Enhanced Sedimentation	Plate Settler Sedimentation Basins at Fairmont	Plate Settler Sedimentation Basins at Fairmont and Post-Filter granular activated carbon (GAC) at LAAFP
Design Flow	930 cfs: Design capacity of LAAFP	720 cfs: maximum rated flow of LAA at Fairmont	720 cfs: maximum rated flow of LAA at Fairmont 930 cfs: Design capacity of LAAFP
Estimated Capital Cost	$300 Million	$220 Million	$600 Million

Alternative 2 – Sedimentation downstream of the Neenach Pump Station, was selected as the best alternative to move forward with as an official project, which includes the design and construction of plate settler sedimentation basins at Fairmont, and forms the basis for the Project described in *Section VIII Project Description*. Alternative 2 effectively satisfied the requirements for stopping further arsenic laden sediment accumulation at North Haiwee Reservoir, eliminating the need to operate the CTP, and providing an adequate pre-treatment process for current and future source waters (LAA and SWP-E) prior to entering LAAFP. Alternative 2 satisfied these requirements within an acceptable cost estimate range, and within sufficient constructability, implementability, and schedule constraints.

In general, Alternative 1 – Treatment at LAAFP provided a viable and effective option for addressing the goals and objectives identified by LADWP in *Section I* of this scoping document. However, the complications associated with constructing a new facility within the limited space available at LAAFP and the Van Norman Complex resulted in too many unknown variables for construction, costs, and project schedule. In addition to the physical construction challenges, concerns related to interference with ongoing operations and future land use at LAAFP, resulted in the elimination of this alternative for additional consideration.

Alternative 3 – Split Treatment provided the most robust solution for addressing the goals and objectives identified in Section I of this scoping document. The resulting effectiveness of building two separate treatment facilities with complimentary treatment technologies ranked high. However, the exceedingly high capital cost, and immense constructability challenges related to the footprint, piping and hydraulic requirements of locating post-filter GAC filtration units at LAAFP was not justifiable given LADWP's current needs and anticipated regulatory requirements. Alternative 3 was eliminated from further consideration for the Project, with the understanding that future enhancements at LAAFP may still be considered as a separate project in the future due to its effectiveness potential.

VII. Related Projects

A. North Haiwee Dam No. 2 (Job Number 23173)

A new earth-fill embankment dam will be constructed north of the existing North Haiwee Dam for seismic hazard mitigation. The North Haiwee Dam No. 2 Project also includes the construction of a new portion of Cactus Flats Road, realignment of the LAA channel, and an Aqueduct takeout. A future project will need to be initiated to design and construct a diversion structure and a V-notch on Haiwee Dam No 1 to divert water to the basin between the two Dams. Coordination between the North Haiwee Dam No 2 Project and the future basin project is required in order to prevent accumulation of arsenic laden sediment deposits between Haiwee Dam No 1 and 2 prior to decommissioning Cottonwood Treatment Plant. The North Haiwee Dam No. 2 Project is currently in the Design Phase with the Gate 4 Meeting scheduled for May 2017. Construction is expected to begin in September 2017 in order to meet the Division of Safety of Dams (DSOD) mandate.

B. LA Aqueduct System Sediment Control (Job Number 23259)

The LA Aqueduct System Sediment Control Project involves the planning, design and construction of facilities to manage the existing sediment deposits near the North Haiwee Reservoir inlet to ensure unimpeded flow through the reservoir. The Sediment Control Project will address existing sediment accumulation in North Haiwee Reservoir while the Fairmont Sedimentation Plant Project will treat for source water arsenic and turbidity. Coordination with the Sediment Control Project is required to ensure Cottonwood Treatment Plant will not continue to deposit sediment near North Haiwee Reservoir inlet. This project is currently in the Planning Phase with a feasibility study expected to be completed in April 2017.

C. Elizabeth Tunnel Seismic Enhancement (Job Number 23529)

The objective of the Elizabeth Tunnel Seismic Enhancement Project is to reduce seismic risk at the Elizabeth Tunnel by installing a highly ductile carrier pipe within the tunnel to increase the probability of providing reduced, but sustained, flow following a San Andreas Earthquake. Currently, this project is in the Planning Phase with Groundbreaking in October 2020 and Construction Completion in August 2025. Due to limited access to the Fairmont Reservoir Property, located at the Intersection of H Avenue and 170th St, coordination shall be maintained to minimize schedule impacts during Construction.

VIII. Project Description

A. *Project Location*

The Project will be located within the Water System-owned Fairmont Reservoir property at the intersection Ave H and 170th St in the City of Lancaster, California. The land is Zone A-2-2, Heavy Agricultural. Within the Fairmont Reservoir property boundary, the project footprint is located east of LAA1, and northeast of Fairmont Reservoir #2. *Appendix A* shows the approximate location for the Project, including approximate footprint for the various related project facilities. Alternative project locations, including locating facilities west of LAA1 or within old Fairmont Reservoir, were considered but ultimately ruled out for hydraulic, environmental, cost, and project complexity reasons.

B. *Design Flow*

The Fairmont Sedimentation Plant is intended to treat the maximum combined LAA flow condition of 720 cfs as established by LADWP Aqueduct Group. The Neenach Pump Station pumps source waters from the SWP-E into LAA1 upstream of Fairmont Reservoir Complex. Seasonal demand for SWP-E thus does not affect the maximum flow condition for LAA1, which is limited by the physical properties of the Aqueduct rather than being limited by supply. The Project shall combine LAA1 and LAA2 upstream of Fairmont Reservoir #2 in order for the Fairmont Sedimentation Plant to capture and treat both flows.

C. *Treatment Criteria*

The Fairmont Sedimentation Plant will be required to meet a higher treatment standard than what is currently achieved at the CTP. The CTP consists of a modified clarification process where coagulants are introduced into the LAA at CTP and settled out in the North Haiwee Reservoir (refer to *Section V*). With this goal in mind, LADWP established minimum treatment standards for arsenic, TOC, and turbidity for the Project in a Design Criteria Workshop. These Treatment Goals are presented in Table VIII-1 below.

Table VIII-1: Fairmont Sedimentation Plant Treatment Goals

Contaminant	Design Influent Water Quality[1]	Fairmont Sedimentation Plant Settled Water Goal
Arsenic (μg/L)	55	10
TOC (mg/L)	4	3
Turbidity (NTU)	23	3

[1]Influent water quality should be verified with Jar Testing.

Design influent water quality concentrations were derived from the 99th percentile maximum 10-year historical concentrations of the LAA (from 2005 to 2015), measured at Tinemaha Reservoir Outlet which is upstream of CTP. Water quality for the SWP-E was additionally evaluated, and the 99th percentile maximum historical concentrations for arsenic, TOC, and turbidity were lower than those of the LAA; therefore, LAA govern the influent water quality. Similar to the current CTP settled water goals, the settled water goals for the Fairmont Sedimentation Plant are minimum standards that are expected to be met under a variety of flow and water quality conditions expected throughout its continuous operation. As a result of historical maximum arsenic trends pairing with lower flows into the LAA, under normal operating conditions Fairmont is expected to successfully treat arsenic concentrations higher than the 10-year 99th percentile value of 55 µg/L at lower flows. Emerging and other contaminants of concern including DBP precursors were considered but not assigned specific treatment goals. Although the plate settler sedimentation basin technology selected for the Project will be able to address some of these emerging and other contaminants, a further evaluation on LADWP treatment goals will be needed if future regulations arise or if source water constituents changes.

D. *Treatment Process*

The Fairmont Sedimentation Plant treatment process will consist of coarse screening followed by rapid mix, flocculation and sedimentation using plate settlers. The hydraulic loading rate for the plate settlers shall be 0.5 gpm per square foot to accommodate design flow conditions within the constraints of the site footprint. The treated water will flow through the LAA to the LAAFP for additional treatment and disinfection before entering the distribution system. The Fairmont Sedimentation Plant will incorporate the addition of ferric chloride and a cationic polymer, similar to the CTP. These chemicals will be fed into the rapid mix upstream of the plate settler sedimentation basins.

The settled solids shall be conveyed to an on-site mechanical sludge thickening facility consisting of equalization basins, followed by rapid mixers and settling tanks, where coagulants will be introduced and settled out to form thickened solids. The supernatant (clear water left after settling) is recycled to the head of the Fairmont Sedimentation Plant. The residual solids are conveyed to a mechanical dewatering facility where additional coagulants will be added to further dewater the sludge. The resulting sludge cake will be temporary stored into a sludge hopper where it can be loaded directly into trucks at an on-site loading bay for off-site disposal. The sludge hopper shall be designed to include a minimum of a week of sludge storage in the event of trucking delays. Figure VIII-1 depicts the treatment processes described in this section.

Evaluation of Dewatering Processes and Technologies, Appendix D, describes the methodology and selection of an active dewatering process (e.g. centrifuge, screw press, and belt filter press) in comparison to a passive system (e.g. drying beds/ drying lagoons) based on cost and implementation. Furthermore, the preliminary evaluation of active dewatering technologies concluded centrifuges is the preferred technology based on cost and effectiveness; however, a detailed design evaluation on the specific dewatering technology selection should be completed in Design.

Based on an average flow condition of 320 cfs and a mean turbidity of 14 NTU averaged across the last 10 years of available water quality data, approximately 144 wet tons per day of processed residuals for off-site disposal have been estimated for O&M purposes. The actual day to day quantities and solids composition for waste classification will be dependent on the daily flow, water quality parameters and coagulant dosing requirements. Solid content and sludge volumes are estimated in part using available turbidity data to generate turbidity/total suspended solids ratios which are also expected to vary on a day to day basis. Based on previous sediment analysis studies in the North Haiwee Reservoir, the generated solid residuals must be disposed as a California Hazardous Waste. It is anticipated that the residuals or sludge to have a waste manifest profile of approximately 70% listed as California Hazardous Waste for arsenic and 30% as a nonhazardous waste. In the event of disposal delays, Fairmont Sedimentation Plant should perform a Planned Shutdown Operation and resume once the dewatered sludge can be removed off-site.

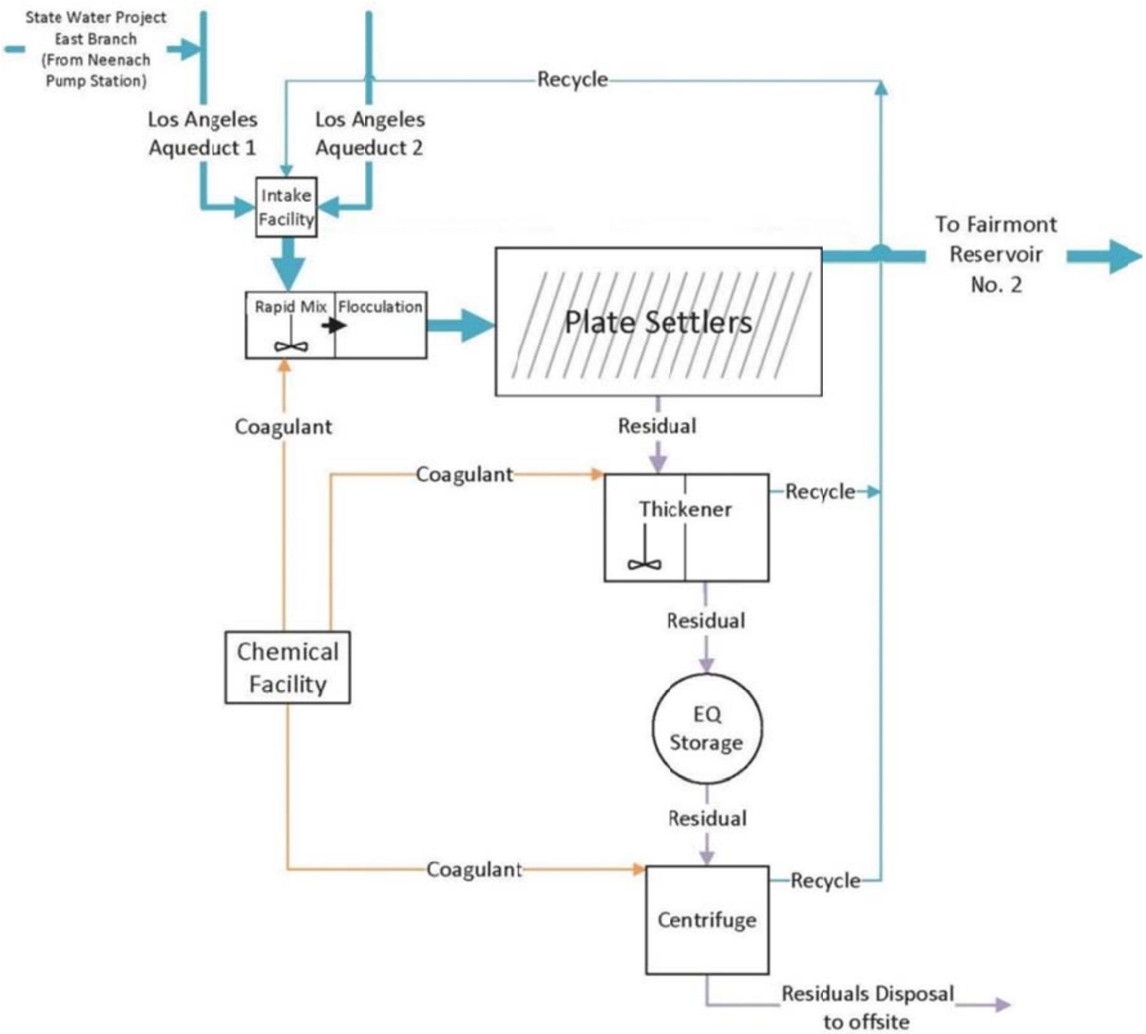


Figure VIII-1: Fairmont Sedimentation Plant Process Flow Diagram

E. *Alternative Sludge Handling Methods*

The Project recommends loading and hauling solid residuals off-site as the primary method for sludge handling. Due to the amount of solid residuals produced annually and the risk of disposal delays, two alternative methods for sludge handling were evaluated.

Method 1 is to construct backup sludge detention ponds to store thickened sludge; once the sludge is in solid form, it would be loaded and hauled off-site. This option would require approximately 280,000 sqft of land for 28 days of storage. The estimated Capital Cost is $33 Million to design and construct a series of geomembrane and clay lined drying basins for sludge storage. The estimated Operation and Maintenance Cost for removal and off-site disposal of the dried solids is $46,000/day at average flow conditions. The estimated costs are based on the construction of four sludge detention ponds, located south of Fairmont Sedimentation Plant, as shown in Appendix A – Site Plan.

Method 2 is to construct a sludge processing facility to convert California hazardous waste into a nonhazardous waste to be hauled off site. Although there are several methods for removing arsenic from soils including ex-situ bioremediation and chemical redox, these technologies are costly and would create a concentrated arsenic liquid waste stream that requires disposal. Alternatively, the Department is exploring the option of binding residuals from the treatment process to generate a non-hazardous concrete. This technique is currently being tested and further research and development is needed to evaluate the feasibility, costs, associated environmental risks, and disposal or reuse of generated concrete.

Ultimately, neither Method 1 nor Method 2 was included in the Project scope due to the high cost and high schedule risk. Furthermore, as described in *Section IX Operations*, Planned Shutdown Operations can be performed in the event of a foreseen disposal delay. A future project to further evaluate alternative sludge handling methods should be considered if the sludge handling limits the treatment process or if sludge handling technology becomes more cost effective. The Project shall construct a separate pipe connection and piping downstream of the thickeners to allow for ease of adaption to future alternative sludge handling.

F. *Hydraulic Considerations*

The Fairmont Sedimentation Plant shall be operated via gravity flow from both LAA1 and LAA2. In its current configuration, LAA1 flows as an open channel into Fairmont Reservoir #2 through a concrete inlet structure built at grade. Fairmont Reservoir #2 includes a bottom drain outlet that exits to the Elizabeth Tunnel and travels to the LAAFP. LAA2 currently consists of a buried 87-inch diameter pipeline, which connects directly downstream of Fairmont Reservoir #2 outlet. At the proposed project location, the hydraulic grade line for LAA2 is 3043 ft (reference DWG C1508-40C) which is greater than LAA1 high water elevation of 3035 ft. LAA2 may require an energy dissipater prior to the

Intake facility in order to combine LAA1 and LAA2 flows. Engineering controls should be constructed to ensure flows from both LAA1 and LAA2 meet the designed inlet velocities at the head of the Plant. Inlet velocities will be determined during design using hydraulic modeling.

G. *Fairmont Reservoir #2 Modifications*

Modifications to Fairmont Reservoir #2 shall include the following:

- Fairmont Reservoir #2 Inlet structure – New inlet structure to Fairmont Reservoir #2 to accommodate combined LAA1 and LAA2 flow from Fairmont Sedimentation Plant effluent. Inlet structure to include connection to existing LAA1 to bypass Fairmont Sedimentation Plant.
- Fairmont Reservoir #2 Outlet Modifications – Assessment and modification for the existing outlet shall be confirmed during design using hydraulic modeling.
- Fairmont Reservoir #2 Spillway Modification – No spillway modifications needed as assessed by Geotechnical Engineering Group.
- Fairmont Reservoir #2 Asphalt Paving and Liner – Existing asphalt paving and liner should be assessed during design. Provide concrete liner for reservoir bottom due to heavy vehicle traffic during maintenance.
- Fairmont Reservoir #2 Operating Level Restrictions – Refer to *Section IX Operations*.

H. *Project Facilities and Siting Requirements*

The resulting facilities from the above described Project framework include the following:

1. Intake Facility – Intake facility capable of processing flows from LAA1, LAA2, and the recirculated water from the Residuals Thickening and Dewatering process. Flow metering requirements shall include total flow, flow from recirculation processes, and flow to each sedimentation basin train. A screen at the intake facility shall be provided to capture algae and larger debris.
2. Rapid Mix / Flocculation System – Mechanical rapid mix coagulation/flocculation tanks which feed directly into the sedimentation system.
3. Sedimentation System – Plate settler sedimentation basins with mechanical sludge removal. Sedimentation basins will be sized for appropriate number of trains to accommodate the design flow of the plant. Provide one fully redundant treatment train to accommodate maintenance activities.
    a. Spray nozzles – Considerations for an automated spray system to clean plates shall be coordinated with Water Operations Division during design.
    b. Walkways and platforms – Provide walkways and platforms to perform all routine operation and maintenance work.
4. Chemical Feed – Chemical handling and storage facility for coagulants and polymer. Chemicals shall be stored in an open tank farm with a storage capacity of approximately 30 days. Provide spill containment for all storage tanks, equipment, and piping. Safety showers/ eyewashes shall be provided and meet OSHA regulations.
5. Residuals Thickening and Dewatering – Provide Rapid Mix mechanical thickening and mechanical dewatering equipment. Provide a pipe connection and piping downstream

of the thickeners. Cap pipe connection and both ends of pipe for potential future connection to alternative sludge handling method, as described in *Section VIII-E.*

6. Sludge Handling – Provide a truck staging facility to convey processed residuals directly onto trucks for off-site haul and disposal.
7. LAA1 isolation and bypass valves – One isolation valve to divert water to Fairmont Sedimentation Plant. Two isolation valves for double block and bleed to bypass Fairmont Sedimentation Plant to existing Fairmont Reservoir #2.
8. LAA2 isolation and bypass valves – One isolation valve to divert water to Fairmont Sedimentation Plant. One isolation valve to bypass LAA2 around Fairmont Sedimentation to existing Fairmont Reservoir #2 outlet. Assess condition of existing 90" Butterfly valve downstream to serve as double block valve.
9. LAA2 flow meter – Replace existing LAA2 Venturi meter upstream of Fairmont Sedimentation Plant takeoff. Coordinate with Southern Aqueduct District Engineering.
10. Administrative Building shall include:
    a. Control Room – Control room for continuous monitoring of plant operations.
    b. Laboratory Room – Laboratory room for conducting jar tests and other sampling analysis. Room should include a lab bench with laboratory sinks.
    c. Electrical Room
    d. Instrumentation Room
    e. Conference Room
    f. Office space
    g. Restrooms, lockers and showers.
    h. Lunch room with table, chairs, refrigerator, microwave and sink.
    i. Water Emergency Control Center supplies, including 72 hours of food and water for each full-time personnel.
11. Other Staff Facilities – Provide a mechanic, electrical, water biologist, and other trades shop and equipment and material storage warehouse. Layout and facility size shall be discussed with Water Operations and Water Quality Divisions during design.
12. Human Machine Interface (HMI), Alarm Systems, and Signals - A HMI is required to allow the operators to monitor the systems of each facility. The HMI shall be located within the Control Room. The Programmable Logic Controller (PLC) shall transmit real-time data on the operation of the facility to the Treatment Operations Control Center (TOCC). HMI shall be General Electric Intellution version iFix 5.1 platform and PLCs shall be Allen Bradley Contrologix platform. In addition, backup power is required to preserve the program data in the PLC and other instrumentation in case of power outage. TOCC system requirements shall be coordinated with the Water Operations Division's Water Technology and Control Systems staff.
13. Power Availability – The existing power service will have to be evaluated for necessary modifications during design to ensure proper capacity is available for the Project. The Project should include location and structural support for Industrial Station. WETS Electrical Design Group will coordinate with Southern California Edison to establish a power service for Fairmont Sedimentation Plant. The Project shall include backup power to support minimal critical treatment processes, including rapid mix/

flocculation system, sedimentation system, chemical feed, residuals thickening and dewatering, sludge handling, communications, HMI, Alarm Systems, and Signals.

14. Communication System – Communication System requirements shall be coordinated with LADWP Information Technology Services.
15. Sewer Requirement – Septic tank system or sanitary sewer connection required to accept waste streams from restrooms, water sampling, and operational needs.
16. Potable Water Treatment Facility and Storage Tank– Project to include location, design, and construction of a permitted water treatment facility to supply potable water for restrooms, drinking fountains, laboratory sink, emergency eyewash/ shower, and other operational needs requiring potable water. Water supply to be taken from the Fairmont Sedimentation Plant effluent. Design to include potable water storage tank in the event of operational shutdown or emergency use.
17. Security – Security system should include perimeter lighting, intrusion alarms on all access doors, access hatches, and exterior cabinets. Provide a dedicated security cabinet. All site entries to include security booth and electric operated gate. Coordinate with Property Management, Information and Technology Services/ Telecom, and Security Services groups during the design to determine site protection measures for the Project.
18. Access – The existing roads from Lancaster Road to Fairmont Reservoir property should be paved for heavy vehicle access, which includes portions of 170th Street, 160th Street, and Avenue H as shown in Appendix C. Provide a driveway and parking area for staff and visitors to access Fairmont Sedimentation Plant.
19. Landscaping Requirements – Landscaping requirements shall be evaluated during design and coordinated with Property Management and Architectural Design Group.
20. Operation and Maintenance Requirements – Power, communications, site access, and all additional requirements to properly operate and maintain the facility will be addressed in the Design Phase and documented in a Preventive Maintenance schedule.
21. Resiliency by Design – The design shall include a resiliency analysis for all associated hazards applicable to this project. The project team shall work with Resiliency Manager to develop design performance levels until a Water System policy is issued.

The Project will include the following key civil/site preparation requirements:

- Grading of the Fairmont site to accommodate the hydraulic and operational conditions dictated by the Project.
- Realignment of the LAA including the joining of LAA1 and LAA2 to flow to the Fairmont Sedimentation Plant intake facility.
- Realignment and expansion of any existing private road and access, within Fairmont Reservoir Property, to accommodate future operations.
- Site drainage including the diversion of dry creek. Assessment and modifications to the dry creek shall be coordinated with LADWP Environmental Assessment Group.
- Removal of existing Weather Station – Coordinate with Water Operations Southern Aqueduct Engineering Group to request for existing weather station removal prior to start of construction.

IX. Operations

A. Current

In its current configuration, source waters from the Owens River, Mono Lake, and other tributaries travel along the LAA and undergo pre-treatment at the CTP via direct injection of ferric chloride and cationic polymer into the LAA. These chemicals mix downstream of the CTP and flow into North Haiwee Reservoir for particle settling. Settled water exits North Haiwee Reservoir and either flows into South Haiwee Reservoir, or it enters the South Haiwee Reservoir Bypass Channel, which flows around South Haiwee Reservoir and ultimately becomes LAA2. The waters of South Haiwee Reservoir itself flow into LAA1, through Haiwee Power Plant and then south. Where LAA1 crosses the SWP-E, flows from the Neenach Pump Station are added to LAA1, and the combined flows then enter Fairmont Reservoir #2. LAA2 joins LAA1 downstream of Fairmont Reservoir #2 and the combined flows then enter Elizabeth Tunnel as shown in Figure IX-1 below. From the Elizabeth Tunnel, water flows through San Francisquito Power Plant #1 (PP1), joining with the inflows and outflows of Bouquet Reservoir, and finally into the LAAFP, where it is treated and disinfected for distribution to the public. LAA1 and LAA2 flows are controlled at Haiwee Power Plant and at PP1.

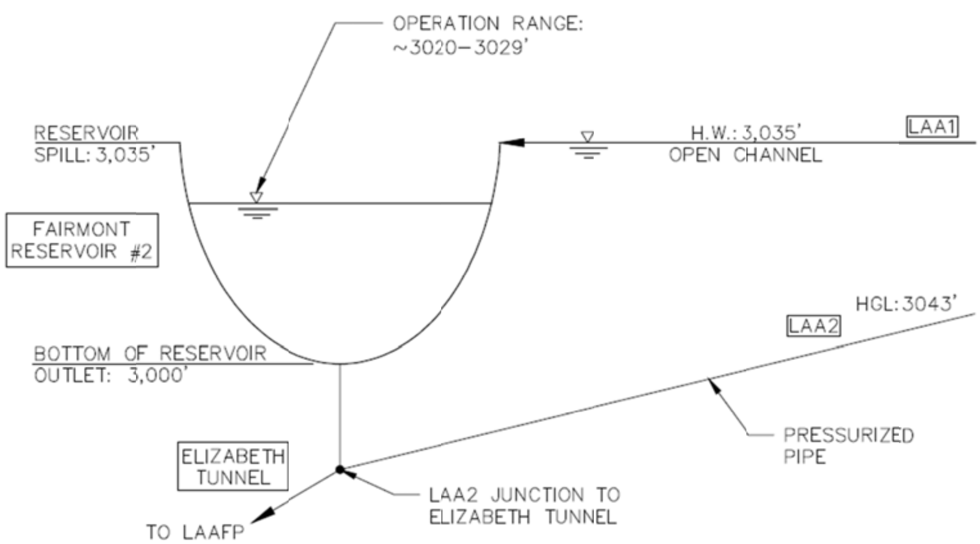


Figure IX-1: Schematic of Current Operations

B. During Construction

During the construction of the Project, facilities along the LAA including the CTP, Fairmont Reservoir #2, and LAAFP will operate as under Current Operations. LAA1 and LAA2 shutdown period should be staggered and limited to 2 weeks for each aqueduct to ensure a minimum water flow of 30 cfs through one of the two aqueducts at all times. Fairmont Reservoir #2 shutdown should be limited to 3 months to perform any modifications to the reservoir. The construction shutdown window is weather dependent with the best opportunity between October 1st and December 31st. During a "wet winter", high flows of snowpack runoff, LAA1 and LAA2 shall not be removed from service. LAA and Fairmont Reservoir #2 shutdowns shall be coordinated with Aqueduct Operations Group.

During project commissioning, coordination with Water Quality Control, Treatment Operations and Aqueduct Operations groups are required to transition treatment from the CTP to Fairmont Sedimentation Plant. The Project Operations, Monitoring and Maintenance Plan shall include a protocol to ramp down operations at the CTP over a period of 6 months and monitor water quality at North Haiwee Reservoir for any risk of settled contaminants reabsorbing into the water. Cottonwood Treatment Plant injection piping near LAA should be isolated and intact for future emergency use.

C. Proposed

<u>Normal Operation</u>

Upon project completion and CTP decommissioning, untreated LAA water will flow via LAA1 and LAA2 and combine at the Fairmont Sedimentation Plant intake facility. During Normal Operations, LAA1 and LAA2 double block valves will remain closed and the LAA1 and LAA2 isolation valves will be open to allow flow into the intake facility. Fairmont Sedimentation Plant will act as a flow through facility and the Plant effluent water will flow into the new Fairmont Reservoir #2 inlet structure as shown in Figure IX-2. From the reservoir, treated water will travel through the Elizabeth Tunnel to LAAFP, where it is treated and disinfected for distribution to the public. LAA1 and LAA2 flows will continue to be controlled at Haiwee Power Plant as noted in Current Operations.

Due to the hydraulic head losses incurred at the Fairmont Sedimentation Plant (estimated at 2 feet maximum) and designed operational levels for the Plant to maximize flexibility, treated water flowing through the Fairmont Reservoir #2 inlet will have an expected maximum high water elevation of 3029 feet. Currently, PP1 does not operate Fairmont Reservoir #2 greater than 3029 feet to avoid waves in the reservoir, and typically operates at elevations below 3028 feet. Thus, the planned operational use of Fairmont Reservoir #2 as a hydraulic equalizing basin for PP1 is anticipated to remain unaffected. Fairmont Reservoir #2 maximum operation level shall not exceed 3029 feet to ensure proper operation of the new Sedimentation Plant. Design to include level transmitter at the new inlet structure to alarm Fairmont Sedimentation Plant of high water level, notify PP1 and close Fairmont Sedimentation Plant effluent valve. Currently, PP1 is capable of drawing down Fairmont Reservoir #2 level at rate of 600 cfs or approximately 2 feet per hour by opening Bouquet Valves to allow water to flow/ pump into Bouquet Reservoir.

<u>Emergency Shutdown Operation</u>

During Emergency Shutdown, LAA1 and LAA2 isolation valves can be closed while LAA1 and LAA2 double block valves can be opened to allow untreated water to bypass Fairmont Sedimentation Plant and flow through Elizabeth Tunnel to LAAFP. In the event of a “catastrophic” amount of arsenic release from the Haiwee arsenic laden sediment, ferric chloride can be added at Merritt Cut Ferric Chloride Feed Facility. Alternatively, a portable treatment system can be used at the existing Cottonwood injection piping to add ferric chloride into the LAA. These emergency plans should be included in Fairmont Sedimentation Plant Division of Drinking Water Operation Permit and Operation, Maintenance, and Monitoring Plan. CTP will be decommissioned and maintained as a permitted backup facility.

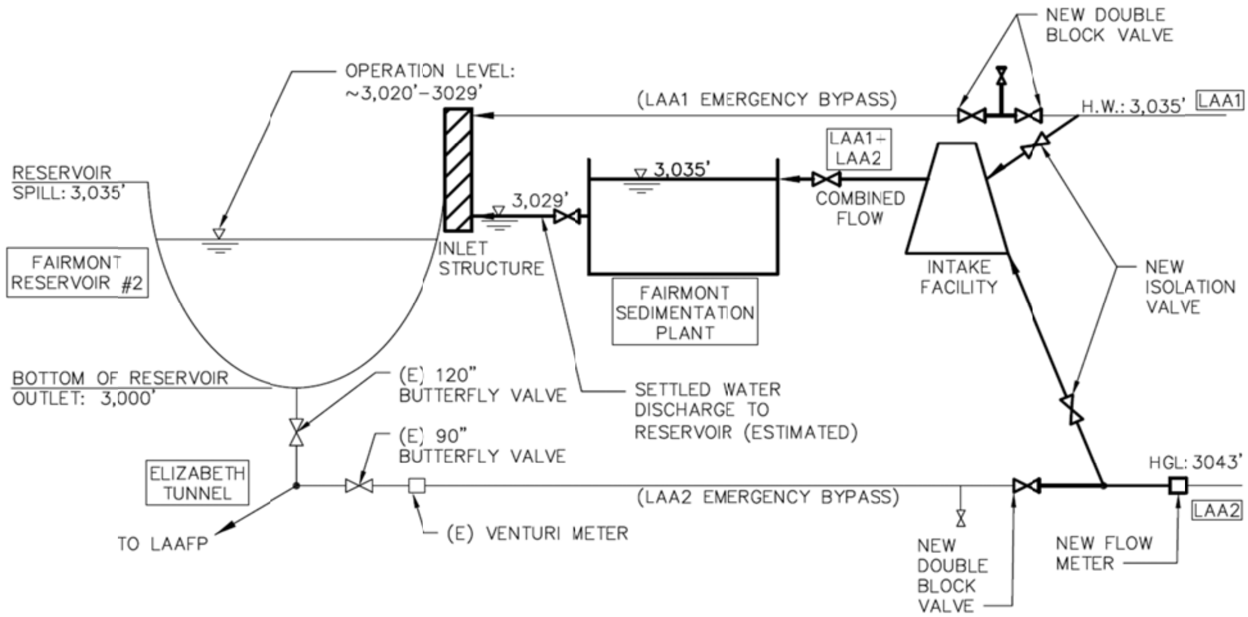


Figure IX-2: Schematic of Proposed Operations

<u>Planned Shutdown Operation</u>

During non-wet years, Planned Shutdown Operations for maintenance activities can be accommodated by closing LAA1 and LAA2 isolation valves to the Sedimentation Plant during the winter months between October 1st and March 31st of each year. LAA1 and/ or LAA2 double block valves may be opened to allow a minimum of 30 cfs untreated water to bypass the Fairmont Sedimentation Plant to flow through Elizabeth Tunnel. For flows greater than 100 cfs, Power Plant 1 requires Fairmont Reservoir #2 to be in service. The untreated water will be blended with SWP-West. Fairmont Reservoir #2 can be in operation during this shutdown period.

During wet years, Planned Shutdown Operations can be accommodated by closing LAA1 and LAA2 isolation valves to the Sedimentation Plant and opening the LAA1 and/ or LAA2 double block valves and applying one or more of the following Operational Strategies while taking into account the turbidity of North Haiwee Reservoir, South Haiwee Reservoir, SWP-East, Bouquet Reservoir, and SWP-West:

- If Fairmont Sedimentation Plant influent water is not turbid and arsenic levels are within acceptable range, do nothing. Untreated water will flow to LAAFP.
- If North Haiwee Reservoir turbidity is high, reduce flow from LAA2 and increase LAA1 flow.

- If South Haiwee Reservoir turbidity is high, reduce flow from LAA1 and increase LAA2 flow.
- If both North and South Haiwee Reservoir turbidity is high, reduce LAA1 and LAA2 flows. To maintain a City delivery, PP1 will pull water from Bouquet Reservoir.
- If both North and South Haiwee Reservoir turbidity is high, reduce LAA1 and LAA2 flows, reduce City delivery, and purchase water from SWP-West.
- If SWP-East turbidity is high, reduce pumping at Neenach and increase flow from LAA1 and/or LAA2 and/ or Bouquet outlet.

Planned Shutdown Operations shall be coordinated with Aqueducts Operation, Water Quality Control, and Treatment Operations groups.

X. Permits, Regulations, Codes, and Approvals

A. California Department of Fish and Wildlife

- *A 2081 Incidental Take Permit* may be required to mitigate the impact on potential taking of wildlife habitat during geotechnical field investigation and construction.
- A *Lake or Streambed Alteration Agreement* required due to modifications to dry creek.

A. California Department of Water Resources – Division of Safety of Dams

- An Application for Approval of Plans and Specifications for the Repair or Alteration of a Dam and Reservoir needed for modifications to Fairmont Reservoir #2 Inlet and Outlet.

B. County of Los Angeles Department of Public Works, Building and Safety

- Building, Electrical, Mechanical, Plumbing, Fire Sprinkler Permit, and Certificate of Occupancy.

C. County of Los Angeles Department of Public Works, Bureau of Sanitation

- Facility design may need to comply with the following for storm water capture**:**
  - Standard Urban Storm water Mitigation Plan (SUSMP) post construction.
  - Low Impact Development (LID) Ordinance to manage storm water on-site.
  - To comply with SUSMP and the LID Ordinance, projects should include measures to capture and infiltrate storm water for groundwater recharge or for re-use on-site, by directing runoff into previous areas and reducing impervious areas. See LADWP's Wastewater Quality and Compliance Group for direction and recommendations.
  - In addition, landscaping should meet the Irrigation Guidelines of the City of Los Angeles Landscape Ordinance by using native and/or climate adapted landscaping on site to reduce potable water demand where applicable.

D. County of Los Angeles Department of Public Works, Drainage and Grading Section

- A *Grading Permit* must be obtained from the building official prior to grading.

E. County of Los Angeles Department of Public Works, Industrial Waste Unit

- I*ndustrial Waste Discharge Permit* is required for any facility which generates, handles, or disposes of industrial wastewater.

F. County of Los Angeles Department of Public Works, Road Permit

G. County of Los Angeles Department of Regional Planning

- A *Conditional Use Permit* is required for certain land uses which may need special conditions to ensure compatibility with surrounded land uses.

H. Environmental Protection Agency

- Hazardous Waste Generator Identification number

I. State of California Lahontan Regional Water Quality Control Board

- Under *Section 401* of the Clean Water Act, every application for a federal permit or license for any activity which may result in a discharge to a water body must obtain State Water Quality Certification that the proposed activity will comply with state water quality standards.
- Waste Discharge Requirement.
- *NPDES Discharge Permit* is needed for construction dewatering and hydrostatic test water discharge into the storm system and channels.

G. State Water Resources Control Board

- Under the *National Pollutant Discharge Elimination System (NPDES)*, approval is needed for Storm Water Discharges Associated with Construction and Land Disturbance Activities (i.e. General Construction Storm Water Permit).
  - A *Storm Water Pollution Prevention Plan (SWPPP)* must be developed to comply with the NPDES permit.

H. State Water Resources Control Board Division of Drinking Water

- The Water Quality Division shall obtain all necessary water supply and operating permits necessary for the facilities.

H. State of California Division of Occupational Safety and Health

- Excavations, Trenches, Construction and Demolition and the Underground Use of Diesel Engines in Work in Mines and Tunnels Permit.

I. U.S. Army Corps of Engineers

- *Under Section 404* of the Clean Water Act, a permit may be required before dredged or fill material may be discharged into waters of the United States.

XI. Current Status

A. Geological Determination

A "desktop" preliminary assessment was performed by the Geology & Reservoir Surveillance Group and Geotechnical Engineering Group to evaluate the geologic and geotechnical feasibility of two site options for the proposed Fairmont Sedimentation Plant Project. Option 1, is located northeast of the north end of Fairmont Reservoir No. 2 and Option 2 is located immediately north of Fairmont Reservoir #2. The assessment consisted of a review of existing literature and a brief site visit on April 27, 2016. The purpose of the literature review was to evaluate the geologic setting within and near the proposed project and to help identify known or potential geologic hazards. The assessment concluded both proposed site options appear to be feasible for the construction of the proposed project provided consideration is given to the potential geologic and geotechnical hazards and conditions. A full geological and geotechnical investigation, including subsurface geological investigation and environmental evaluation, of the Project site (Option 1) is recommended prior to design.

B. Environmental Documentation

LADWP's Environmental Assessment Group has determined this project is subject to the California Environmental Quality Act (CEQA) and does not meet the qualification for any CEQA Exemptions. An Initial study will need to be conducted and it is expected that an Environmental Impact Report (EIR) will need to be prepared. The Initial Study, EIR, and related public outreach component will need to be completed, and the EIR Certified by our Board of Water and Power Commissioners prior to start of Construction. CEQA Kickoff meeting was held on December 12th, 2016 and estimated EIR Board Meeting in August 2018.

XII. Elected Officials

Honorable Eric Garcetti, Mayor of the City of Los Angeles
Honorable R. Rex Parris, Mayor of the City of Lancaster
Mr. Marvin Crist, Vice Mayor of the City of Lancaster
Mr. Raj Malhi, Council Member of the City of Lancaster
Mr. Ken Mann, Council Member of the City of Lancaster
Ms. Angela Underwood-Jacobs, Council Member of the City of Lancaster

XIII. Project Division of Responsibilities

Project Management Office will determine division of responsibilities and prepare a Project Management Plan by the Gate 2 meeting.

XIV. Project Schedule

Water Engineering & Technical Services Capital Improvement Program's (CIP) Primavera system maintains the current schedule. Project milestones dates as of October 2016 are shown below. The planning-level schedule is included as Appendix B. The project schedule is subject to change depending on resource availability.

Bid-Award (Design-Build)	November 2018
Construction Mobilization	November 2018
Groundbreaking	January 2019
Construction Completion	May 2022

XV. Project Budget and Cost Estimate

A. Work Order Information

The work order hierarchy and other budget tracking information are shown below:
Title: Fairmont Sedimentation Plant
Job Number: 20057
Functional Item: 24310
Work Orders:

Level 1 (Parent)	XAT00
Level 2	UAK30
Level 3	
Planning	UAK31
Design	UAK32
Bid-Award	UAK36
Construction Management	UAK39
Construction	UAK33
Post Construction	UAK35

B. Funding

The Project may qualify for State or Federal funding, which may include specific environmental review, procurement, schedule, and cost tracking requirements. The Project Manager shall discuss with Water Engineering & Technical Services (WETS) Administrative Services and Legislation & Grants to identify potential funding sources and associated requirements. No procurement shall take place prior to this discussion.

C. *Preliminary Cost Estimate*

Similar to the schedule, the planning-level budget is available from the CIP and Budget groups. A summary of the cost estimates are as follows:

Planning	$ 4,100,000
Design	$ 9,600,000
Bid-Award	$ 210,000
Construction Management	$ 6,900,000
Construction	$ 190,600,000
Post-Construction	$ 600,000
Total Project Cost	$ 212,010,000

Table XV-1: Estimated Annual Operation & Maintenance Costs

ITEM	UNIT	QUANTITY	UNIT COST	TOTAL COST
Energy	kwh	9,377,471	$ 0.11	$ 1,100,000
Ferric Chloride	$/ton	4,142	$ 506	$ 2,100,000
Emulsion Polymer	$/ton	165	$ 3,200	$ 600,000
Subtotal of Consumables Costs				$ 3,800,000
Labor	hrs	14,300	$ 92	$ 1,400,000
Materials[4]	--	--	--	$ 1,700,000
Dewatered Sludge Removal[5]	$/ton	52,560	$ 105	$ 5,200,000
TOTAL O&M COST ESTIMATE (2016 USD)				**$ 12,100,000**
Notes:				
1. All unit costs are rounded to the nearest $10,000.				
2. All subtotal and final costs are rounded up to the nearest $100,000.				
3. Estimates are consistent with an AACE Class 3 construction cost estimate, which are typically accurate between a range of -10% to -20% and +10 to +30%.				
4. Materials are assumed to be 2.5% of installed equipment cost.				
5. Dewater Sludge Quantity is based on average flow and turbidity.				

Table XV-2: Estimated Annual Operation & Maintenance Labor Hours

Facility[1]	Description[2]	General O&M[3]	Annual Labor Hours: Aqueduct & Reservoir Keeper	Annual Labor Hours: Treatment Operations	Annual Labor Hours: Repair & Construction
Intake facility	This facility will join LAA1 and LAA2. It will consist of a coarse screen, and will include valves, pumps and flow meters which dictate the hydraulic conditions of the Plant, as well as chemical dosing quantities.	This facility will need typical maintenance including periodic cleaning of the screens, and adjusting flow through basins in the Plant.	108	260	240
Coagulation/Flocculation Tanks	These will include the injection of coagulants via mechanical rapid mixers.	A chemical injection system similar to that of LAAFP may be employed and will require similar maintenance, including monitoring and adjustments for proper floc formation.	-	260	360
Plate Settler Sedimentation Basins	Plate settling basins have no moving parts, aside from the bottom mounted automated sludge collecting systems.	Plate settlers will require periodic hosing to free the plates of any accumulated solids. The plates are stainless steel and can be walked on directly for O&M activities. There are several technologies available for the automated sludge removal which will be determined during design, and each will require some maintenance.	-	416	288
Sludge Thickeners and Equalizing Storage Tanks	These facilities thicken the sludge collected from the plate settlers, and even out their flow prior to being run through the centrifuges.	These are mechanical rapid mix units similar to the coagulation/flocculation tanks, and will require similar maintenance.	-	260	360
Centrifuges	Centrifuges are low maintenance units which perform the final dewatering processes to create a sludge cake from the incoming residuals.	Typical O&M for turbines which include periodic monitoring, upkeep, and changing of oil/fluids. Backup centrifuges will be on standby for O&M activities and emergency use.	-	260	456
Off-Site residuals disposal	Sludge cake from the centrifuges will be loaded onto a conveyor belt or equivalent, and will distribute the disposable solids directly onto trunks in a loading bay.	An operator will need to be present for waste manifest duties. The loading and hauling of residuals is expected to be continuous, with on-site storage capabilities as-need.	-	1440	240
Chemical Facility	Chemical storage facility for polymer and ferric chloride	This facility will be similar in function to the chemical tank farm at LAAFP, and will require similar maintenance.	-	96	240
Control Room	An on-site control room for the Plant	Continuous monitoring of plant facilities and flow & treatment parameters.	-	8760	240
		Total Annual Labor Hours	108	11752	2424
		FTEs	0.1	7.0	1.44
		(1 FTE = 1680 hours)			

Notes:

(1) See attached process flow diagram for additional information

(2) General descriptions are provided with respect to conceptual design parameters. Details are subject to change based on final design.

(3) High level O&M descriptions are provided to assist with the initial stages of FTE procurement. Detailed O&M descriptions to be provided as the Project is further developed.

XVI. Risk Assessment

A risk evaluation was conducted for the Project in order to assess the potential impacts, likelihoods of these impacts, and viable mitigation measures for these identified scenarios. Project risk outcomes may have adverse or advantageous outcomes. For the purpose of this preliminary assessment, only adverse outcomes were considered, with the understanding that risk assessment is an ongoing process and will be explored in further detail as the Project progresses through design and construction. Potential impacts to the Project are summarized in Table XVI-1.

Table XVI-1: Preliminary Project Risk Assessment

Risk	Description	Likelihood of Occurrence	Potential Mitigation
Planning Delays	Delays to the project schedule during the planning phase could delay design and construction. These delays could be related to siting complications, unforeseen issues related to the CEQA process and unforeseen regulatory/permitting setbacks.	Moderate	Identify long-lead processes and initiate them at the start of Planning. Engage regulatory/ permitting officials early on.
Design Complications	Required modifications to the Project during the Design phase could negatively impact the Project schedule and budget. Changes to the Project design may be related to a number of unanticipated issues including site hydraulic analysis vastly differing from what are depicted in existing as-builts, changing design flow requirements, and modifications to the Project treatment processes as a result of requirements identified during Planning.	Moderate	Gain agreement on treatment processes and methodology during Conceptual Design and Planning. Initiate site hydraulic modeling early during Design or Planning if feasible. Maintain good communication between Planning and Design teams.
Construction complications/ delays	Issues arising during Construction have the potential to increase Project construction costs and delays to the overall schedule. These issues may be related to the procurement of raw materials and equipment, availability of unique construction services including plate settler installation, and unforeseen Design requirements identified during Construction.	Moderate	Engage construction suppliers/vendors as early as feasible, select a method of project delivery that ensures good communication between the Design and Construction teams.
Unforeseen site conditions	Site conditions, including unknown substructures, unexpected soil conditions, vary from design and discovered during construction.	Moderate	Conduct site investigations at start of Design. Pothole substructures found in as-builts. Identify all substructures in design drawings.

Increase in material costs.	Materials such as steel and concrete are subject to market price fluctuations.	Moderate	Include a cost contingency for material inflation in project costs.
Funding requires compliance with American Iron and Steel rule.	All iron and steel products must be manufactured in the United States.	Moderate	Identify materials that may be subject to AIS rule during Design and determine if AIS compliance will be required early on in the project.
Aqueduct Operations experience Wet Year	LAA1, LAA2, and Fairmont Reservoir #2 cannot be shut down during a wet year. Aqueduct Operations can advise whether snowmelt will impact shutdown schedule during March/ April months for that year. Inability to shut down LAA1, LAA2, and Fairmont Reservoir #2 will delay construction schedule.	Low/ Moderate	Schedule Shutdown timeframe to be in October-December to reduce weather impacts on shutdown schedule. Coordinate with Aqueduct Operations in early March/ April to determine construction schedule impacts. Minimize construction duration for LAA1, LAA2, and Fairmont Reservoir #2 in design elements.
DSOD approval delay	DSOD approval for inlet and outlet modification is delayed.	Moderate/ High	Discuss plans with DSOD early on in design process. Add additional time for DSOD review in project schedule during design phase.
Delay in CEQA and Environmental Permit	Delay in completing CEQA and obtaining Environmental Permit. CEQA and Environmental Permit delays will impact Construction start date.	Moderate	Meet with Environmental Assessment Group early in Planning and continual communication during Design to monitor status.
Chemical Contract Delay	Delay in obtaining contract for ferric chloride and polymer.	Low/ Moderate	Meet with Treatment Operations early in Construction Phase to update them on Commissioning start schedule. Continue to update Treatment Operations throughout Construction Phase.
Hazardous Waste Contract Delay	Delay in obtaining contract to haul California Hazardous Waste off-site.	Moderate	Meet with Hazardous Waste Management Group early in Construction Phase to update them on Commissioning start schedule. Continue to update Hazardous Waste Management Group throughout Construction Phase.
Delay in Building Permit Processing	Delay in processing building, plumbing, sewer, electrical, and fire permits	Low/ Moderate	Track permits processing status in project schedule.

Delay in EIR documentation	Delay in CEQA review will delay other permits that require CEQA to be completed prior to being issued.	Moderate	Allocated a conservative CEQA review/ processing period (18 months) in schedule. Track CEQA review process and permits requiring CEQA completion.
Funding requires additional Environmental Review beyond CEQA.	Additional environmental documentation required for federal/ state funded projects.	Moderate	Notify Environmental Assessment Group if pursuing funding requiring additional environmental documentation.

XVII. Safety

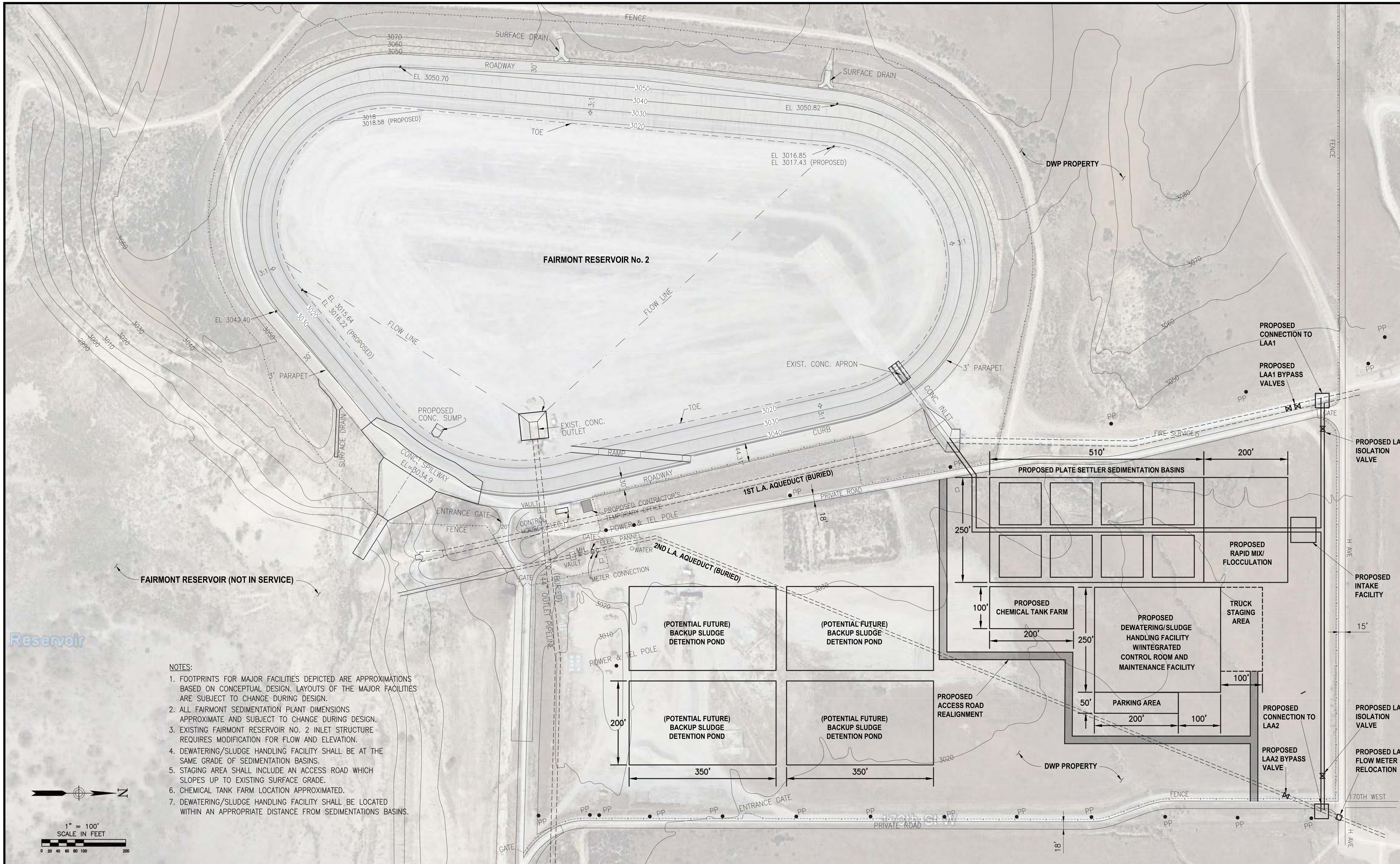
Fairmont Sedimentation Plant, including design, construction, and in-service phases, shall conform to safety regulations, especially those from the State of California Division of Occupational Safety and Health Administration. During the design process, Water System Safety and Corporate Safety shall be included in design meetings, user reviews, gate meetings, plan reviews and discussions to ensure safety is considered and incorporated into the contract documents.

The design shall incorporate safety by design elements for all applicable components of this project, including but not limited to, providing stairs instead of ladders where appropriate, handrails, machine guarding, safe chemical/waste handling and storage, crane for ease of operations and maintenance, adequate equipment clearances to perform maintenance activities, all instruments are mounted at accessible level and equipment and piping includes clear and appropriate signage. Fall protection requirements shall be evaluated during design in order to safely construct, operate, and maintain the facility. Develop Lock out Tag Out procedures and perform an ArcFlash study. End users groups constructing, operating, and maintaining the facility, including Water Operations, will participate in the design review process to ensure “Safety by Design” principles are incorporated and address potential safety hazards.

END OF DOCUMENT

Appendix A

Site Plan
Fairmont Sedimentation Plant Proposed Project Location



NOTES:

1. FOOTPRINTS FOR MAJOR FACILITIES DEPICTED ARE APPROXIMATIONS BASED ON CONCEPTUAL DESIGN. LAYOUTS OF THE MAJOR FACILITIES ARE SUBJECT TO CHANGE DURING DESIGN.
2. ALL FAIRMONT SEDIMENTATION PLANT DIMENSIONS APPROXIMATE AND SUBJECT TO CHANGE DURING DESIGN.
3. EXISTING FAIRMONT RESERVOIR No. 2 INLET STRUCTURE REQUIRES MODIFICATION FOR FLOW AND ELEVATION.
4. DEWATERING/SLUDGE HANDLING FACILITY SHALL BE AT THE SAME GRADE OF SEDIMENTATION BASINS.
5. STAGING AREA SHALL INCLUDE AN ACCESS ROAD WHICH SLOPES UP TO EXISTING SURFACE GRADE.
6. CHEMICAL TANK FARM LOCATION APPROXIMATED.
7. DEWATERING/SLUDGE HANDLING FACILITY SHALL BE LOCATED WITHIN AN APPROPRIATE DISTANCE FROM SEDIMENTATIONS BASINS.

REVISIONS | REFERENCES: D4482-X-6C | SCALE: AS SHOWN | APPROVED

FILE NAME Fairmont Sedimentation Plant.DWG

FAIRMONT SEDIMENTATION PLANT
PROPOSED LOCATION SITE PLAN

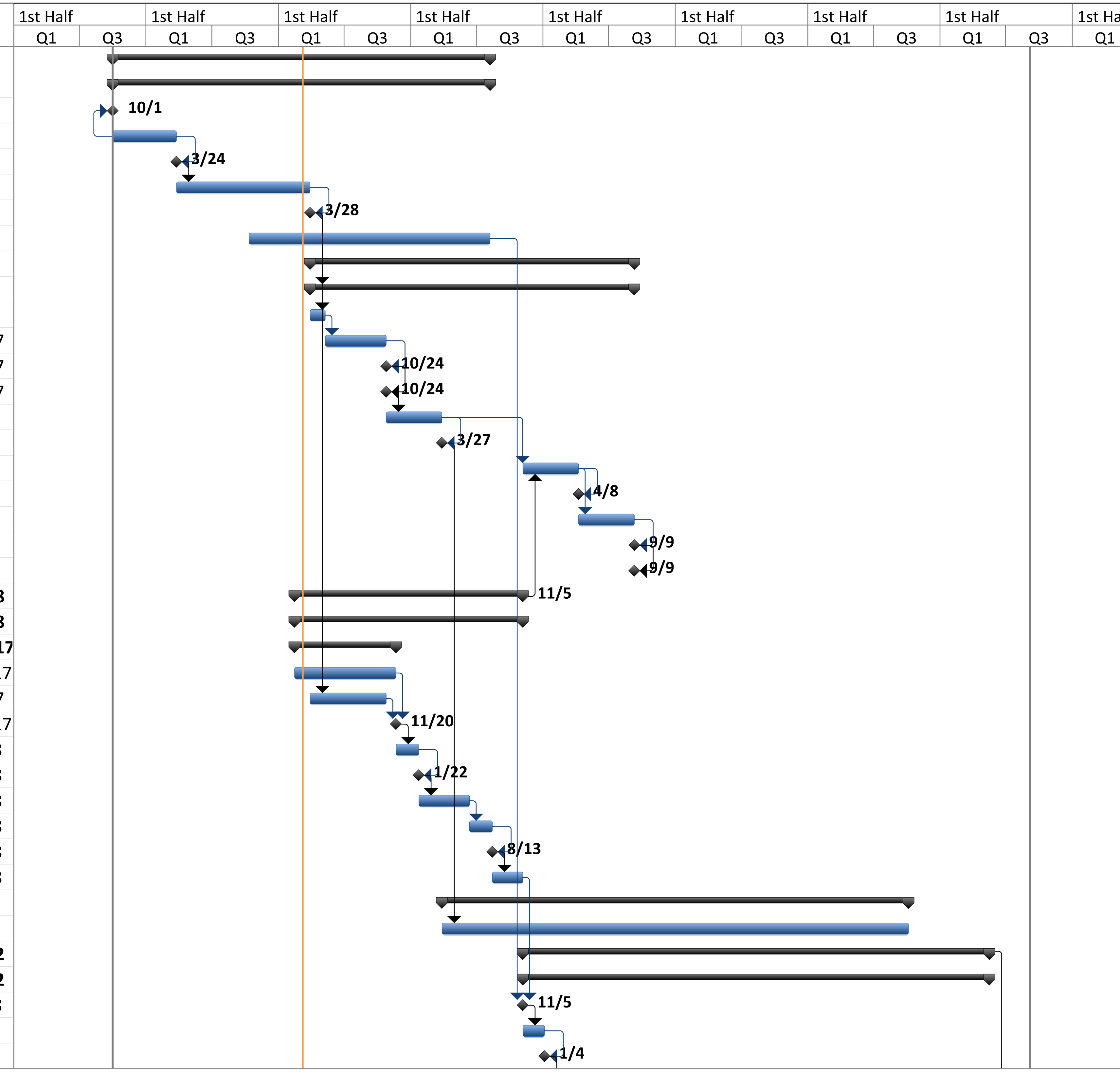
DEPARTMENT OF WATER AND POWER
WATER SERVICES ORGANIZATION — CITY OF LOS ANGELES

DRAWING NUMBER: APPENDIX A

Appendix B

Project Schedule

ID		Task Mode	Task Name	Duration	Start	Finish
1			**Planning**	**744 days**	**Thu 10/1/15**	**Tue 8/7/18**
2			**Planning Hammock**	**744 days**	**Thu 10/1/15**	**Tue 8/7/18**
3			**Project Start**	0 days	Thu 10/1/15	Thu 10/1/15
4			Preliminary Planning	126 days	Thu 10/1/15	Thu 3/24/16
5			**Gate 1**	0 days	Thu 3/24/16	Thu 3/24/16
6			Final Planning	263 days	Fri 3/25/16	Tue 3/28/17
7			**Gate 2**	0 days	Tue 3/28/17	Tue 3/28/17
8			CEQA Approval	476 days	Tue 10/11/16	Tue 8/7/18
9			**Design**	**639 days**	**Wed 3/29/17**	**Mon 9/9/19**
10			**Design Hammock**	**639 days**	**Wed 3/29/17**	**Mon 9/9/19**
11			Issue 30% Task Authorization	30 days	Wed 3/29/17	Tue 5/9/17
12			0-30% Design	120 days	Wed 5/10/17	Tue 10/24/17
13			**30% Design Complete**	0 days	Tue 10/24/17	Tue 10/24/17
14			**Gate 3**	0 days	Tue 10/24/17	Tue 10/24/17
15			31-60% Design	110 days	Wed 10/25/17	Tue 3/27/18
16			**60% Design Complete**	0 days	Tue 3/27/18	Tue 3/27/18
17			61-90% Design	110 days	Tue 11/6/18	Mon 4/8/19
18			**90% Design Complete**	0 days	Mon 4/8/19	Mon 4/8/19
19			91%-Final Design	110 days	Tue 4/9/19	Mon 9/9/19
20			**Final Design Complete**	0 days	Mon 9/9/19	Mon 9/9/19
21			**Gate 4**	0 days	Mon 9/9/19	Mon 9/9/19
22			**Bid-Award**	**450 days**	**Tue 2/14/17**	**Mon 11/5/18**
23			**Spec-Bid-Award Hammock**	**450 days**	**Tue 2/14/17**	**Mon 11/5/18**
24			**Pre-advertise Activities**	**200 days**	**Tue 2/14/17**	**Mon 11/20/17**
25			Obtain Design-Build Ordinance	200 days	Tue 2/14/17	Mon 11/20/17
26			Prepare Design-Build RFP	150 days	Wed 3/29/17	Tue 10/24/17
27			ADVERTISE DATE	0 days	Mon 11/20/17	Mon 11/20/17
28			Advertise Period	45 days	Tue 11/21/17	Mon 1/22/18
29			BID OPENING DATE	0 days	Mon 1/22/18	Mon 1/22/18
30			Bid Evaluation & Award Process	100 days	Tue 1/23/18	Mon 6/11/18
31			COA Review	45 days	Tue 6/12/18	Mon 8/13/18
32			BOARD APPROVAL/ CONTRACT AWARD	0 days	Mon 8/13/18	Mon 8/13/18
33			Contract Execution Process	60 days	Tue 8/14/18	Mon 11/5/18
34			**Construction Management**	**920 days**	**Wed 3/28/18**	**Tue 10/5/21**
35			Construction Management Hammock	920 days	Wed 3/28/18	Tue 10/5/21
36			**Construction**	**920 days**	**Mon 11/5/18**	**Mon 5/16/22**
37			**Construction Hammock**	**920 days**	**Mon 11/5/18**	**Mon 5/16/22**
38			**Issue Notice-to-Proceed**	0 days	Mon 11/5/18	Mon 11/5/18
39			Mobilization	44 days	Tue 11/6/18	Fri 1/4/19
40			**Groundbreaking**	0 days	Fri 1/4/19	Fri 1/4/19

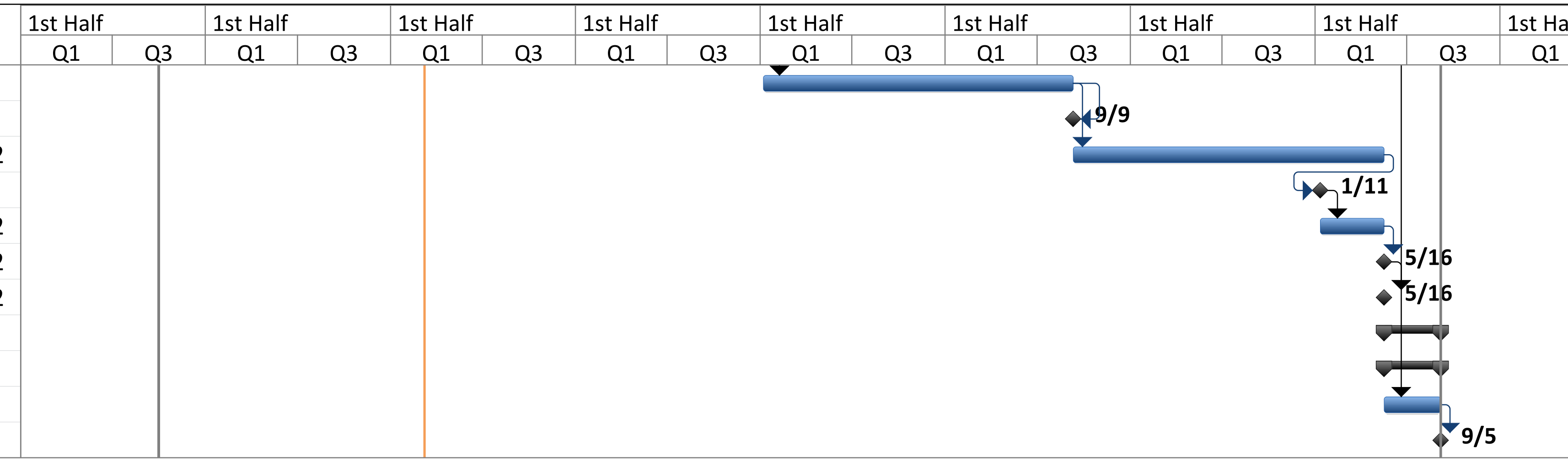


Project: 20057_Fairmont Sedimen
Date: Thu 3/9/17

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Page 1

ID	Task Mode	Task Name	Duration	Start	Finish
41		1-50% Construction	438 days	Mon 1/7/19	Wed 9/9/20
42		**50% Construction Complete**	0 days	Wed 9/9/20	Wed 9/9/20
43		51-100% Construction	438 days	Thu 9/10/20	Mon 5/16/22
44		**Gate 5 Meeting**	0 days	Tue 1/11/22	Tue 1/11/22
45		Commissioning	90 days	Tue 1/11/22	Mon 5/16/22
46		**Gate 6 Meeting**	0 days	Mon 5/16/22	Mon 5/16/22
47		**100% Construction Complete**	0 days	Mon 5/16/22	Mon 5/16/22
48		**Post-Construction**	**80 days**	**Tue 5/17/22**	**Mon 9/5/22**
49		**Post-Construction Hammock**	**80 days**	**Tue 5/17/22**	**Mon 9/5/22**
50		Post-Construction	80 days	Tue 5/17/22	Mon 9/5/22
51		**Gate 7 Meeting**	0 days	Mon 9/5/22	Mon 9/5/22



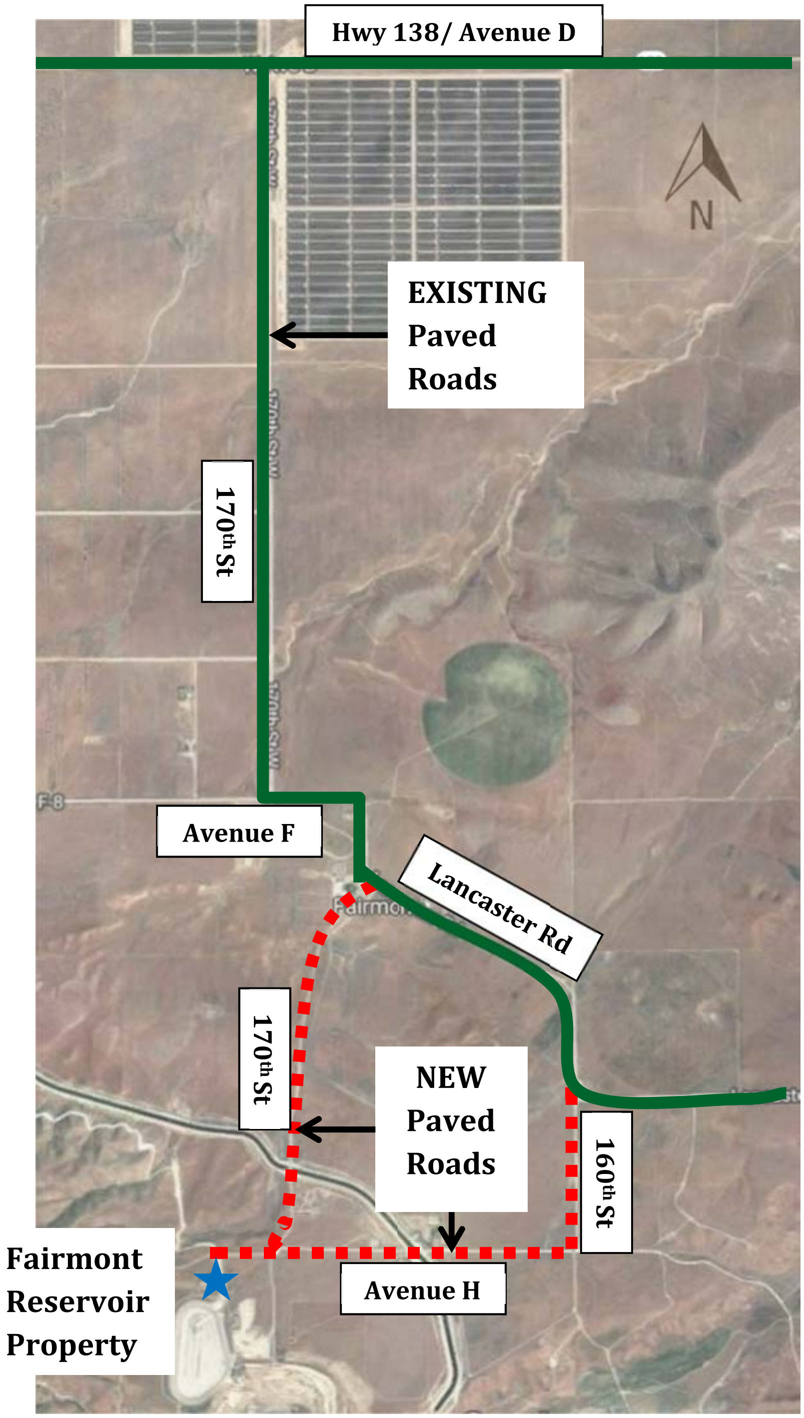
Project: 20057_Fairmont Sedimen
Date: Thu 3/9/17

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

Appendix C

Proposed Road Pavement for Facility Access

FAIRMONT SEDIMENTATION PLANT	PROPOSED ROAD IMPROVEMENT FOR HEAVY VEHICLE ACCESS TO FAIRMONT RESERVOIR PROPERTY	APPENDIX C



Reference: Google Maps, accessed October 26, 2016

LEGEND

EXISTING PAVED ROADS

PROPOSED ROAD IMPROVEMENT – *Pave existing dirt road to Fairmont Reservoir Property*

Appendix D

Evaluation of Dewatering Processes and Technologies

Evaluation of Dewatering Processes and Technologies

A main component of the Fairmont Sedimentation Plant Project is the dewatering process. In order to select the most cost effective dewatering process alternative, two types dewatering process methods were evaluated – an active system and a passive system.

Passive System

The passive dewatering system would be solids drying basins similar in construction and operation to Los Angeles Aqueduct Filtration Plant backwash ponds. The following major assumptions were made to generate an AACE Class 4 standards Capital and O&M cost estimate:

1. Passive dewatering basins will be sized and designed to accommodate the Fairmont Sedimentation Plant's maximum flow of 720 cfs.

2. Passive dewatering basins will be designed to operate similarly to the existing basins at LAAFP. Modifications to the existing basin design at LAAFP include the following:
    - an impermeable clay and geotextile liner to minimize impact to the environment
    - a grid of 10 leachate monitoring wells to monitor liner performance
    - concrete tracks placed strategically over the basins gravel fill to increase efficiency of the manual sludge handling process with front loaders.

3. The footprint required for passive dewatering basins at Fairmont shall include approximately 75 acres. This footprint estimation is based on the current performance of the dewatering basins at LAAFP and is deemed a reasonable estimate for the purpose of cost estimation. It is understood this footprint may change based on design factors such as climate variation, water quality, and performance of the Fairmont Sedimentation Plant's primary clarification process.

4. Placement of dewatering basins will lie within the approximate footprint of Fairmont Reservoir #1. No modifications to the existing side slope or other components affecting the structural integrity of Fairmont Reservoir #1 will be required. Dewatering basins will not overlap the LAA where it travels within the Fairmont Reservoir #1 boundary.

5. Dewatering basins will be engineered with a top height of approximately 2990 feet ASL, the typical elevation indicated by aerial photography topographic surveys conducted by LADWP circa 1969. It is understood that the topography of the south-west portion of Fairmont Reservoir #1 includes greater variation and will require additional earthwork.

6. Recirculation pumps will be sized to overcome an elevation head of 55 feet, the difference between the bottom height of the proposed basins and the water level of the Fairmont Sedimentation Plant intake facility. Other major and minor losses will be conservatively estimated using a maximum flow scenario.

The estimated Capital Cost is approximately $46,044,266 with an annual O&M cost of $838,075. Cost breakdowns are provided in the subsequent tables.

Active System

Although there are multiple technologies for an active dewatering system, Centrifuges was selected to represent an active dewatering system because of it is a proven dewatering method for large water and wastewater treatment plants across the country based on its ability to quickly and efficiently thicken sludge cake to a high solids concentration on a continuous basis with relatively minimal O&M requirements. Other technologies were also considered and had similar capital costs but O&M cost were generally higher due to the added cost for handling, trucking, and landfill disposal associated with additional water weight content.

The following major assumptions were made to generate an AACE Class 4 standards Capital and O&M cost estimate:

1. Centrifuges will be sized and designed to accommodate the Fairmont Sedimentation Plant's maximum flow of 720 cfs.
2. One redundant centrifuge was included in the capital cost to allow for maintenance activities.
3. The footprint required for active system includes approximately 60,000 square feet building to house the equipment and can be integrated with the control room and related facilities.

The estimated Capital Cost is approximately $14,131,200 with an annual O&M cost of $761,502. Cost breakdowns are provided in the subsequent tables.

Preferred Dewatering Process Alternative

Based on the cost estimates evaluated for a passive and active dewatering system, the preferred alternative is an Active Dewatering System. Although the Operation and Maintenance cost is comparable for both system, the capital cost to construct an active system compared to a passive system is 70% less. Furthermore, passive dewatering process is weather dependent and additional pilot testing during design may be required to confirm location and refine design parameters.

Although centrifuges were used to represent an active dewatering technology, a comparative analysis on maintenance requirements and lifecycle costs shall be completed for other active technologies including belt filter press, screw press, and centrifuges.

Capital Construction
Cost Summary - Dewatering Basins

Description	Quantity	Unit	Rate	Totals
Excavation				
Bulk Excavation	900,000	CY	6	$ 5,400,000
Stockpile on Site	900,000	CY	6	$ 5,400,000
Basin Liner				
Sand Top Layer - 1 ft	103,250	CY	30	$ 3,097,500
Gravel Drainage Layer - 1.5 ft	154,875	CY	30	$ 4,646,250
Clay Liner - 1 ft	103,251	CY	30	$ 3,097,530
Geotextile Membrane	2,787,840	SF	1	$ 2,787,840
Leachate Monitoring	10	EA	50,000	$ 500,000
Intake Gravity Line				
66" RCP Pipe	1,100	LF	252	$ 277,200
122" PVC Pipe	1,100	LF	550	$ 605,000
Discharge Line to Settlers				
4" Perforated Drains	25,600	LF	8	$ 204,800
8" PVC Pipe	9,035	LF	14	$ 126,490
Structural				
Concrete	4,000	CY	300	$ 1,200,000
Steel		LS		$ 1,000,000
Road				
Concrete/Asphalt/Grading	4,350	CY	400	$ 1,740,000
Pump System				
Circulation Pumps	12	EA	180,000	$ 2,160,000
66" RCP Pipe	1,400	LF	252	$ 352,800
122" PVC Pipe	1,400	LF	550	$ 770,000
Construction and General Conditions		15%		$ 5,004,812
Contingency		20%		$ 7,674,044
Total				**$ 46,044,266**

Assumptions:

1. Design based on Metcalf & Eddy Wastewater Design Manual for Sand Drying Bends
2. Drying beds assumed 3.2 acres each, 20 beds total
3. Equipment and piping cost estimates based on vendor quotes obtained January 2017

Annual Operation and Maintenance
Cost Summary - Dewatering Basins

Description	Quantity	Unit	Rate	Totals
Sludge Handling/Loading				
Equipment Rental - Three 5 or 7 yd front loaders, CAT 988F or comparable	4	Per Mo	30000	$ 120,000
Labor - 2 FTEs, 4 mo, 5 days/wk 2 FTE, 12 mo, 3 days/wk	3,584	Hourly	90	$ 322,560
Leachate Monitoring				
Labor -1 FTE, 2 days/mo, quarterly	64	Hourly	90	$ 5,760
Laboratory Analysis - Metals	10	EA	30	$ 300
Sand and Gravel Replacement	60	CY	30	$ 1,800
Power Consumption	2,705,193	kwH	0.11	$ 297,571
Contingency		20%		$ 90,084
Total				**$ 838,075**

Assumptions:

1. Water content of dried sludge assumed comparable with centrifuge with adequate drying time and sludge redistribution
2. Sludge handling labor estimated under average conditions, with a plant flow of 495 cfs / 320 MGD
3. Power consumption based on average conditions of 495 cfs / 320 MGD

Capital Construction
Cost Summary -Centrifuges

Description	Quantity	Unit	Rate	Totals
Centrifuge System				
Centrifuges	5	LS	600,000	$ 3,000,000
Conveyors	1	LS	1,240,000	$ 1,240,000
Dewatering Building				
Facility for centrifuges only	20,000	SF	300	$ 6,000,000
Construction and General Conditions		15%		$ 1,536,000
Contingency		20%		$ 2,355,200
Total				**$ 14,131,200**

Assumptions:
1. Estimated costs based on vendor quotes for solid bowl centrifuges, June 2015
2. Dewatering building may be integrated with the control room and relatedfacilities, reducing costs

Annual Operation and Maintenance
Cost Summary - Centrifuges

Description	Quantity	Unit	Rate	Totals
Labor - 2 FTE, 12 mo, 1 days/wk	768	Hourly	90	$ 69,120
Power Consumption	6,168,708	kwH	0.11	$ 678,558
Contingency		20%		$ 13,824
Total				**$ 761,502**

Assumptions:

1. Labor includes general centrifuge maintenance and oversight when loading onto trucks
1. Sludge handling labor estimated under average conditions, with a plant flow of 495 cfs / 320 MGD
2. Power consumption based on average conditions of 495 cfs / 320 MGD

CITY OF LOS ANGELES
DEPARTMENT OF WATER AND POWER
INTRADEPARTMENTAL CORRESPONDENCE

Date: June 10, 2016

To: Kurt G. Wells, Special Projects & Groundwater Planning Manager

From: CCP Clifford C. Plumb, Geology & Reservoir Surveillance Manager
AP Adam Perez, Geotechnical Engineering Manager

Subject: Preliminary Geological and Geotechnical Assessment of the Proposed Fairmont Sedimentation Plant

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Introduction

The Special Projects & Groundwater Planning Group (SPGPG) has requested a "desktop" Preliminary Geologic and Geotechnical assessment for the proposed Fairmont Sedimentation Plant Project (Project) (LADWP, 2016). This memorandum has been prepared by the Geology and Reservoir Surveillance Group (GRSG) and the Geotechnical Engineering Group (GEG) and details the results of the assessment. The primary purpose of this memorandum is to provide information regarding potential geologic and geotechnical hazards and conditions within the project area to assist SPGPG in evaluating the feasibility of the proposed project.

The proposed Project is located along the southwestern edge of the Antelope Valley, near the intersection of Avenue H and 170th Street as depicted on the attached Site Location Map (Figure 1). The Project is anticipated to include the construction of sedimentation basins, a chemical tank farm, and a dewatering/sludge handling facility. Additional improvements include modifications to the Fairmont Reservoir No. 2 inlet/outlet structures and a connection between the First Los Angeles Aqueduct (FLAA) and Second Los Angeles Aqueduct (SLAA).

Two optional locations for the Project have been introduced by the SPGPG. Option 1 is located northeast of the north end of Fairmont Reservoir No. 2. Option 2 is located immediately north of Fairmont Reservoir No. 2. We understand that the location options are conceptual at this time and potential grades have not yet been determined. The approximate locations of both options are delineated on the Site Map (Figure 2).

Methodology

This preliminary geological and geotechnical assessment consisted of a review of existing literature and a brief site visit on April 27, 2016. The purpose of the literature review was to evaluate the geologic setting within and near the proposed Project and to help identify known or potential geologic hazards. The primary information reviewed for this memorandum included published and unpublished geologic and geotechnical reports and maps gathered from in-house, state, regional, and local levels. Sources of data included the California Geological Survey (CGS) (formerly the California Division of Mines and Geology [CDMG]) and the United States Geological Survey (USGS), as well as internal reports and unpublished resources. A list of the available references used to prepare this memorandum is provided in the References section following the main text. A subsurface geological investigation was not performed for this assessment. Environmental evaluation and services were also not performed and are considered beyond the scope of this assessment.

Several potential geologic hazards were evaluated for their potential impact the Project area. These hazards include surface fault rupture, ground shaking, groundwater, collapsible soils, and liquefaction. Note that certain potential geologic hazards, such as those areas identified in the literature as having the potential for liquefaction, cannot be verified without performing subsurface field investigation and engineering analysis.

Site Description

The proposed Project is currently comprised of two site options northeast (Option 1) and north (Option 2) of the existing Fairmont Reservoir No. 2. The area is characterized by low rolling hills with low to moderate topographic relief. Elevations in Option 1 range from approximately 3,014 to 3,044 feet and from approximately 3,046 to 3,085 feet in Option 2. Surface drainage is generally directed to the east and northeast by sheet flow to a series of natural and locally modified swales and gullies.

The two options are separated by a dirt road which is directly adjacent to the FLAA and a row of wooden power poles. The SLAA is located east and southeast of Option 1. Topography in portions of the project area has been modified to accommodate various improvements, including roads, culverts, aqueducts, and Fairmont Reservoir No. 2. A radio antenna and associated guy wires are located in the northwestern portion of Option 1. Review of historic satellite images on Google Earth indicates that a large windmill was previously located near the east edge of Option 1. Based on these images, the windmill was constructed between June 6, 2002, and April 21, 2003, and was removed between June 3, 2003, and November 2, 2005. Evidence of the windmill was not noticed during our site visit. Please refer to the Site Map, Figure 2, for locations of the features described above.

Geologic Setting

This section provides brief descriptions of the regional and local geologic setting as well as groundwater conditions in the Project area.

Regional Geology

The proposed Project is located along the southwestern edge of the Antelope Valley in the Mojave Desert geomorphic province of Southern California (Norris & Webb, 1990) Geomorphic provinces are large geographic regions that are similar in topography and geologic structure. This province is bounded to the southwest by the San Andreas Fault and to the northwest by the Garlock Fault, approximately 2.5 miles and 18 miles from the Project, respectively.

The proposed Project is primarily located on an old uplifted and dissected alluvial fan comprised of sediments shed from Portal Ridge to the south and east. The area consists of moderate relief with low rolling hills and local incised drainage channels that generally direct surface runoff to the northeast. Bedrock consisting of granodiorite outcrops in the nearby hills of Portal Ridge (Figure 3) and likely underlies the Project site at depth.

Site Geology

The two options presented for the proposed Project are generally depicted on the attached Site Map (Figure 2) and the Geologic Map (Figure 3). Regional geologic mapping indicates that both sites are primarily located on late Pleistocene “older alluvial fan deposits” consisting of “moderately consolidated, strong brown, medium dense, fine- to medium-grained arkosic sand with fine to medium gravel” (Hernandez, 2011). The south west corner of the eastern site, Option 1, may be underlain by “younger alluvial fan deposits” consisting of “unconsolidated to weakly consolidated, dark-yellowish-brown, fine to medium arkosic sand with fine gravel” (Hernandez, 2011). The CGS (2003b) describes the alluvial materials in the Project vicinity as “undifferentiated older Quaternary surficial deposits” consisting of dense gravel, sand, silt, and clay.

Geologic investigations were performed prior to construction of Fairmont Reservoir No. 2 which included drilling of numerous rotary-wash and bucket auger borings within and around the perimeter of the reservoir (LADWP, 1981b). The borings nearest to the Project site have been reviewed and their locations plotted on Figure 2. LADWP (1981b) generally described the materials in the vicinity of the Fairmont Reservoir No. 2 as consisting of “Older Alluvium which is composed primarily of sand and gravelly sand, with occasional silty and clayey layers.” Quartz monzonite bedrock is described as underlying the older alluvium at depths of approximately 50 feet in boring F-123 B and at approximately 72.5 feet in boring F-124 B. Bucket auger borings depicted on Figure 2 were not excavated to sufficient depths to encounter bedrock.

A soils report based on the geologic investigations concluded that the alluvial materials within the area of Fairmont Reservoir No. 2 can be classified as well-graded, non-plastic, silty sand with an average dry density of 109.3 pounds per cubic foot, an average field moisture content of 21.3 percent, and an average relative compaction of 88.4 percent (LADWP, 1981a).

Younger alluvial material associated with recent runoff and storm events is likely present in the bottom of the main drainage channels that are more prominent in the Option 1 site. This material is likely very sandy and loose.

Undocumented artificial fill materials were noted at the Project site during our brief site visit on April 27, 2016. The approximate locations of these materials have been plotted on the Site Map (Figure 2). Undocumented artificial fill was observed along the eastern side of the north-south trending access road that divides Option 1 from Option 2. Two areas of undocumented artificial fill were observed in the southern portion of Option 1 which are likely associated with reservoir operations as well as an old windmill that was once present at the site, but has since been removed. Asphalt chunks were observed in some of this fill. A small stockpile was also observed near the northeast corner of Option 1.

Less undocumented artificial fill was observed within the proposed footprint of Option 2. A low hill in the middle portion of Option 2 appears to have been previously cut, perhaps to obtain borrow material. An undocumented artificial fill stockpile may have been placed in a portion of the cut area. Although not specifically identified on Figure 2, undocumented artificial fill may also be present associated with improvements along the north edge of Fairmont Reservoir No. 2, the FLAA, and the east extension of Avenue H in the northwest corner of Option 2.

Faulting

No faults have been mapped through or adjacent to the Project and no faults were observed during our site visit. The closest mapped fault to the Project, as mapped by Hernandez (2011), is approximately one-half mile north and is shown potentially offsetting older Quaternary alluvial fan deposits, but buried by younger alluvial fan deposits. Additional east-west trending faults are illustrated by Hernandez (2011) approximately 1 mile north and 1 to 1.5 miles south of the Project (Figure 3).

The 2010 Fault Activity Map of California (Jennings & Bryant, 2010a) (USGS & CGS, 2006) provides a compilation of faults believed to be active during the Quaternary (past 2.6 million years). As illustrated on Figure 5a, a fault is illustrated approximately one-half mile south of the Project and is considered active within the past 11,000 years. We have designated this fault the “Fairmont Fault” as briefly described by Lindvall, Richter & Associates (LRA, 1975). The “Fairmont Fault” appears to be poorly understood as there is limited information in the available literature about this fault and it is not included on several recently published geologic maps of the area (Hernandez, 2011) (Dibblee & Minch, 2002).

The San Andreas Fault is located approximately 2.5 miles south-southwest of the Project as illustrated in Figures 5a and 5b.

Groundwater

The Project area is located near the southwest edge of the Antelope Valley Groundwater Basin. Historical groundwater levels in the vicinity are sparse and the CGS (2003b) generally estimates historical highest groundwater at the Project site is deeper than 40 feet as illustrated in Figure 4. A search of public well information from the Los Angeles County Department of Public Works (LACDPW, 2016) or the California Department of Water Resources (CDWR, 2016) did not provide useful well information at or near the Project site. However, groundwater observation wells associated with monitoring activities of the Fairmont Reservoir No. 2 are periodically measured by LADWP and the recent data (January 31, 2008, through February 10, 2016) was reviewed as part of this assessment. Observation wells 82-C and 82-D are located nearest to the project and are illustrated on Figure 2. Depths in these wells ranged from approximately 46.5 to 52.5 feet in well 82-C and approximately 53.7 to 59.2 feet in well 82-D.

Localized shallow groundwater could be encountered at various unknown locations within the proposed Project area. Near-surface groundwater would not be considered a continuous “regional” groundwater table but would more likely be a perched or localized condition at the contact between more permeable soils overlying a less permeable soil. Localized shallow groundwater may also be present periodically as a result of seasonal fluctuations.

Potential Geologic Hazards

Based on the literature review, potential geologic hazards were identified that could impact the proposed Project. An earthquake occurring on the San Andreas Fault through Leona Valley is likely the most threatening geologic hazard to the proposed Project. Seismic hazards resulting from earthquakes include ground shaking, liquefaction, and earthquake-induced landslides. Additional geologic hazards that were evaluated include surface fault rupture, shallow groundwater, and collapsible soils. A brief discussion of the potential geologic hazards is provided below.

Ground Motions

The Project area is located within a seismically active region that is known for its many active faults and historic seismicity. Therefore, ground shaking resulting from an earthquake could impact the proposed Project. The degree of ground shaking that is felt at a given site depends on the distance from the earthquake source, the magnitude of the earthquake, the type of subsurface material on which the site is situated, and topography. Ground shaking can result in severe damage to pipelines or structures if they are subjected to strong horizontal movement that exceeds what they are designed to withstand. Strong ground shaking in the site vicinity likely occurred during the M7.9 1857 Fort Tejon earthquake on the San Andreas Fault (SCEDC, 2016).

Ground motions in the vicinity of the proposed Project area were calculated by an online USGS Seismic Design Tool (USGS, 2014). Online deterministic calculations from the program indicate the design ground motions for essential facilities and Site Class “D” at the Project site are approximately 0.995g. Due to the uncertainty of the ultimate project location, the design ground motions may vary throughout the proposed sites and should be re-evaluated during future site specific evaluations.

Surface Fault Rupture

Surface fault rupture is the displacement that occurs along the ground surface trace of a fault, primarily as the result of an earthquake. Ground surface fault rupture also may accompany fault creep or natural or man-induced subsidence.

The “Alquist-Priolo Earthquake Fault Zoning (AP) Act” is a state law that regulates development projects near active faults to mitigate the hazard of surface fault rupture. Based on our review of the available referenced literature, the proposed Project alignment is not located within an AP fault zone. The closest AP fault zones to the Project are located approximately 1 mile north and 2.5 miles to the southwest as illustrated on Figure 5b. Additionally, geologic mapping by Hernandez (2011) does not indicate any known faults passing through the Project site, as illustrated on Figure 3. Therefore, the potential for surface fault rupture to affect the Project site is considered low.

Earthquake-Induced Landslides

Earthquake-induced landslide zones are areas with previous occurrence of landslide movement, or local topographic, geologic, geotechnical, and subsurface water conditions indicate the potential for permanent ground displacement during a seismic event. Potential earthquake-induced landslide zones are detailed in the Seismic Hazard Zone map provided in CGS (2003a) and are depicted as light blue shading on Figure 6.

The majority of the Project site is comprised of relatively gentle low rolling hills and flat terrain where landslides are not expected to occur. Seismic Hazard Zone Maps provided in CGS (2003a) do not identify any portion of the Project sites as susceptible to earthquake-induced landslides. Once grading plans are available for the proposed sedimentation plant, stability of site and surrounding slopes should be evaluated.

Liquefaction

The CGS produces liquefaction hazard zone maps that designate certain areas within California as potential liquefaction hazard zones. These are areas considered at greater risk of liquefaction-related ground failure during a seismic event based upon mapped surficial deposits and the presence of a relatively shallow groundwater table. These liquefaction hazard zone maps are intended to prompt more detailed, site-specific geotechnical investigations. They do not predict the amount or direction of liquefaction-related ground displacements, or the amount of damage to facilities that may result from liquefaction. The CGS seismic hazard map indicates that the Project area is not located within a potential liquefaction hazard zone (CDMG, 2003a), as shown on Figure 6.

Shallow Groundwater

Historically highest regional groundwater is estimated to be greater than 40 feet throughout the proposed Project; however, existing groundwater data for the area is limited. Localized shallow groundwater could be encountered in the proposed options in excavations for pipe, vaults, or other subsurface structures at various unknown locations within the proposed Project area. The potential to encounter local shallow groundwater cannot be determined without additional study. However, even with additional study, not all potential locations of localized shallow groundwater may be identified. Perched zones may fluctuate based on local irrigation practices, seasonal conditions, nearby reservoir operations, etc.

Collapsible Soils

Site-specific subsurface soil data for the two options is not available; however, the presence of undocumented artificial fill and alluvial materials indicates that some site soils may not be adequate for support of the proposed Project. Suitability of the soils should be determined based on future subsurface investigations and laboratory testing as well as review of the Project details, including structure design loads, depths, and locations. Additional discussion is provided in the Geotechnical Considerations section below.

Geotechnical Considerations

Based on the review of the existing literature, the following geotechnical considerations are identified:

- Site-specific field investigation should be performed in order to provide preliminary design and construction recommendations.
- The depth of groundwater in the proposed project site was estimated to be greater than 40 feet below ground surface (bgs). However, further investigation is necessary to assess current groundwater depths in the proposed Project option areas.
- If groundwater is encountered during construction activities, dewatering may be required as well as attendant treatment and disposal.
- Undocumented artificial fill materials will likely need to be completely removed prior to construction of new facilities.
- Alluvial materials may require removal and re-compaction prior to construction of new facilities.

- The alluvium in the project area may contain sporadic cobbles or boulders. The presence or significance of such materials should be evaluated during future site investigation.
- The site is not located within a liquefaction hazard zone as delineated in Seismic Hazard Zone Map (Figure 6). However, liquefaction zones are located to the north and south of the site options. Liquefaction should be further evaluated during future site investigations.
- Soil corrosivity should be evaluated to determine the corrosive potential of on-site soils to proposed concrete foundations/flatwork and underground metal conduits.

Conclusions and Recommendations

Based on the initial review of literature for this preliminary geologic and geotechnical assessment, the proposed site options appear to be feasible for construction of the proposed Project provided consideration is given to the potential geologic and geotechnical hazards and conditions. A full geological and geotechnical investigation is recommended prior to design.

A brief summary of our conclusions is provided below:

- Option 1 and Option 2 are both considered geologically and geotechnically feasible for siting of the proposed Project. The sites are similar; however, each has unique conditions that may affect Project design and costs. For instance, Option 1 is generally lower in elevation than the FLAA while most of Option 2 is higher. These conditions will need to be considered by the Project team when selecting an Option.
- Seismic shaking due to an earthquake is the most significant geologic hazard to the Project. Ground motions should be addressed in the full investigation for the Project.
- The Project is not located within an AP fault zone.
- Undocumented artificial fill material is present and is not suitable for support of the proposed facilities. Limits and properties of this material should be evaluated during future site investigation.
- A windmill was located near the east edge of Option 1. The location of this feature should be confirmed and potential impacts of its foundation system on the proposed facilities should be evaluated.
- Groundwater is likely deeper than 40 feet beneath both site options. The depth to groundwater should be confirmed during a full geologic and geotechnical investigation.

- The site is not located within a zone of required investigation for liquefaction or earthquake-induced landslides as designated by the State of California.
- Preliminary planning and design of the Project should take into account the geotechnical constraints discussed in the "Geotechnical Considerations" section above.

If you have any questions, please contact Jeffrey W. Tyson, Engineering Geologist Associate, at Extension 70031 or Yangsoo Lee, Civil Engineering Associate, at Extension 71048.

JWT/YL:cc
Attachments: References
Figures 1, 2, 3, 4, 5a, 5b, and 6

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Jeffrey W. Tyson

P – Fairmont Reservoir
P – Los Angeles Aqueduct
FileNET
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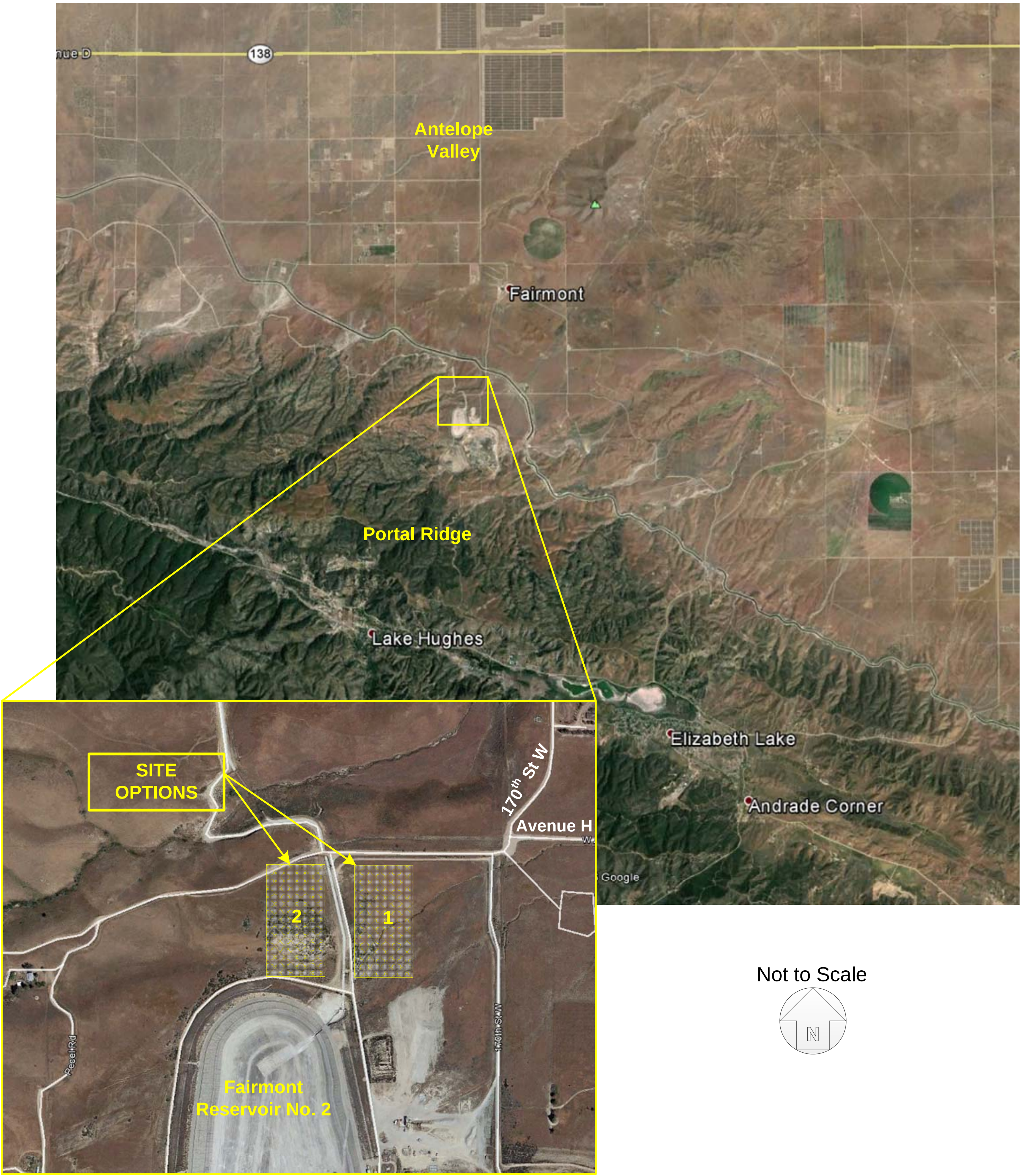
FIGURES



Not to Scale

N

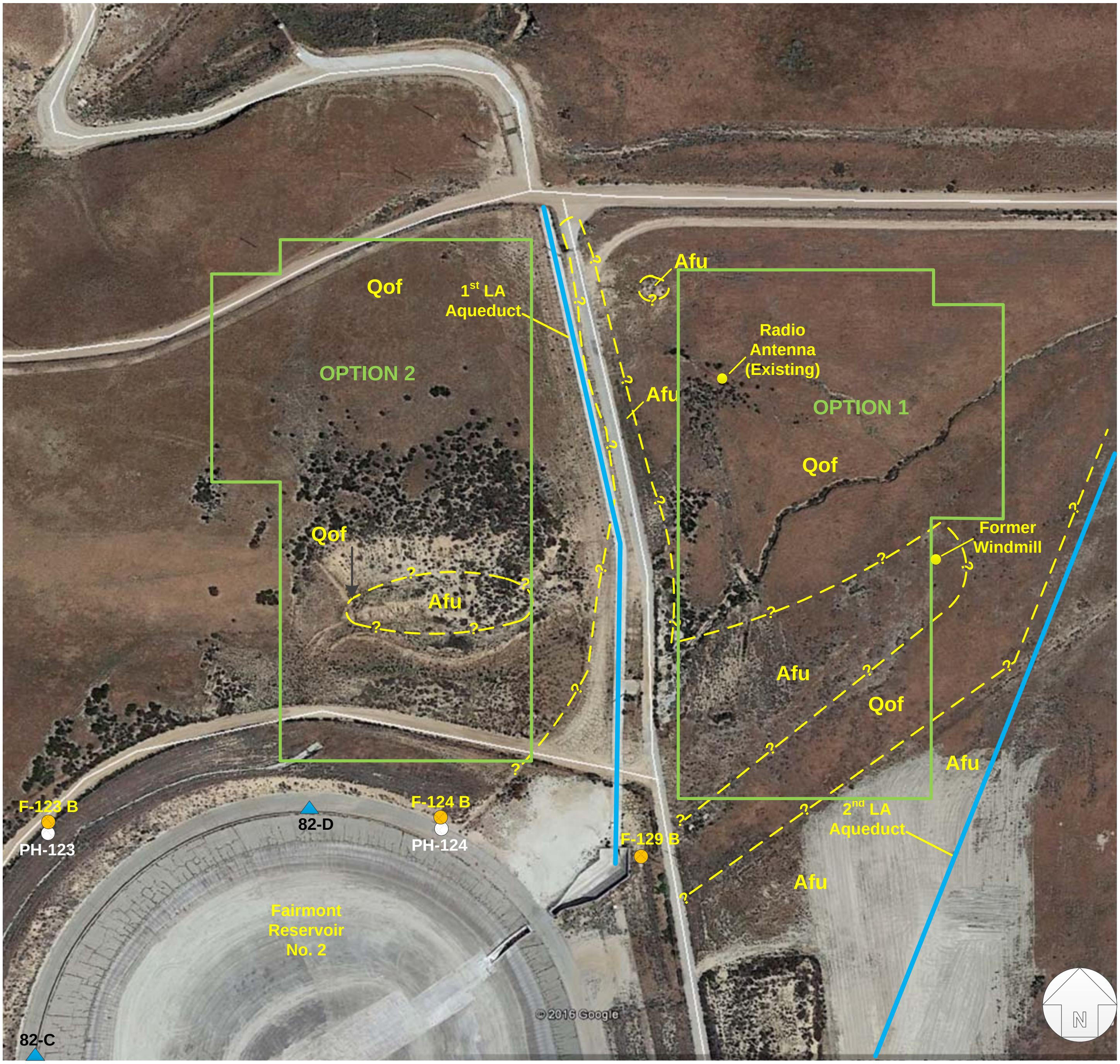
Reference: Google Earth, accessed May 4, 2016

Los Angeles Department of Water & Power

Site Location Map

Fairmont Sedimentation Plant
Los Angeles County, California

Figure:	1
Date:	June 2016



LEGEND

Afu	Undocumented Artificial Fill
Qof	Quaternary Older Alluvial Fan Deposits
— —?— —	Geologic Contact (approximate)
82-D	Groundwater Observation Well (approximate)
F-129 B	1974 Bucket Auger Boring (approximate) (LADWP, 1981b)
PH-124	1974 Rotary-Wash Boring (approximate) (LADWP, 1981b)

0 — Approximate Scale: — 500 feet

Base Image: Google Earth, accessed May 4, 2016

Los Angeles Department of Water & Power

Site Map

Fairmont Sedimentation Plant
Los Angeles County, California

Figure: 2

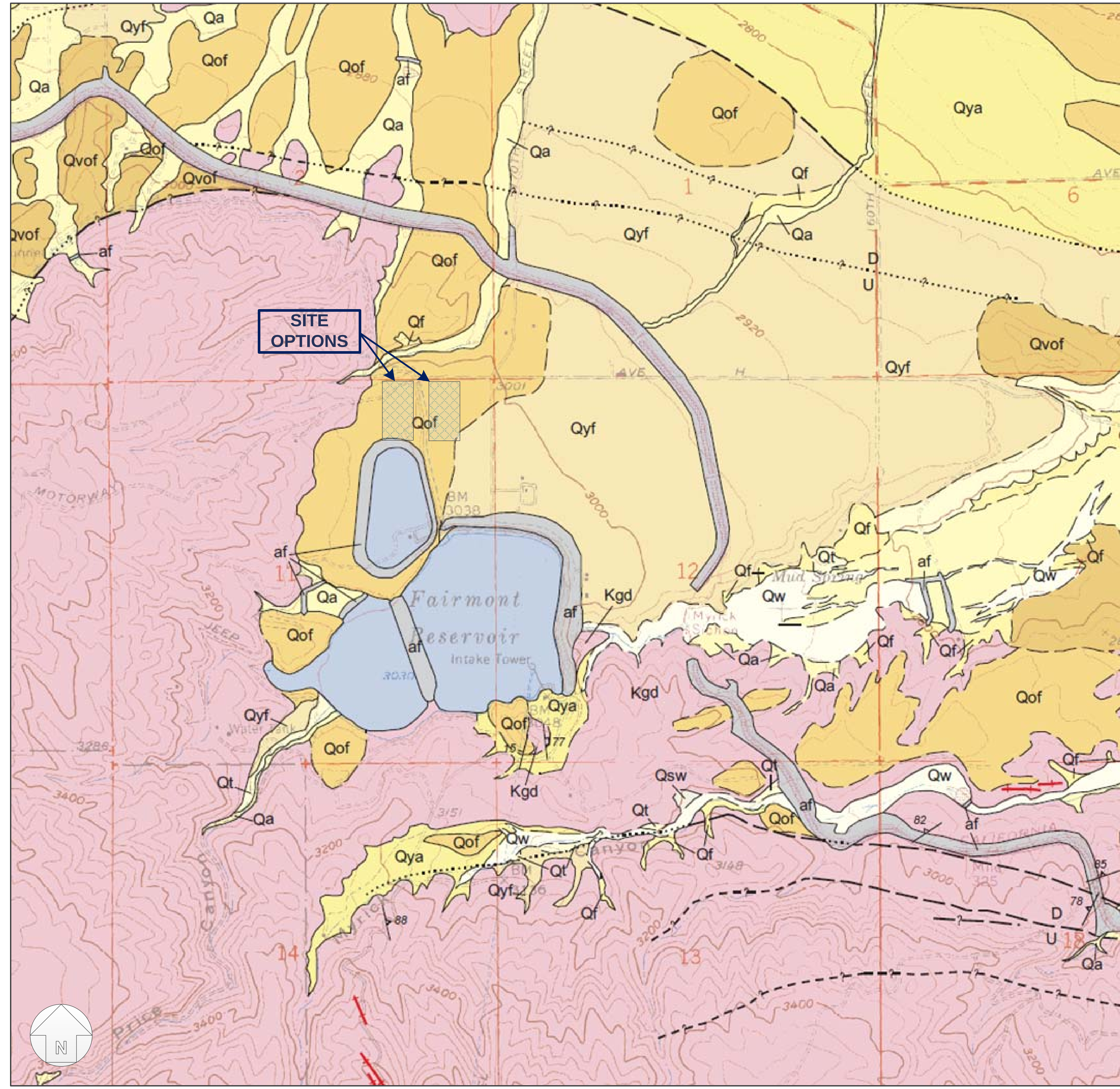
Date: June 2016

MAP EXPLANATION

af	**Artificial fill and disturbed areas (Holocene, historic)** – Surfaces intensely modified by human construction and grading activities. Consists of man-made deposits of earth-fill soils derived from local sources. Mapped specifically along the California Aqueduct structure, debris catchment basins, reservoirs or small dams, and includes fill soils along road alignments.
Qw	**Wash deposits (late Holocene)** – Unconsolidated fine- to medium-grained sand, with some coarse sand, fine gravel, and silt. Deposits are generally pale-brown (10YR 5/3), angular to sub-angular grains, derived from local bedrock, or reworked from other local Quaternary sources. Cobbles and boulder clasts predominant within Pine Canyon. Subject to localized reworking and new sediment deposition during storm events.
Qa	**Modern alluvium (Holocene)** – Unconsolidated to weakly consolidated, fluvial gravel, sand, and silt. Loose, yellowish-gray to brown (10YR 4/3) sand, silt, and pebble-cobble gravel. Consists predominately of moderately sorted medium- to very coarse-grained arkosic sand with silt.
Qsw	**Slope Wash (Holocene)** – Loose sand and rubble debris from downslope movement of surficial materials. Unconsolidated sand and rubble transported predominantly by mass wasting and runoff and deposited directly downslope from local sources as nearly undissected talus cones and broad aprons. Slope wash is differentiated from alluvium especially where it masks contacts and faults.
Qt	**Terrace deposits (Holocene)** – Loose, fluvial sand and silt deposits. Unconsolidated, poorly sorted, fluvial deposits of gravel, sand, and silt locally adjacent to, but slightly above, present stream channels and washes.
Qf	**Modern alluvial fan deposits (Holocene)** – Unconsolidated to weakly consolidated, poorly sorted, rubble, gravel, sand, and silt deposits forming active, essentially undissected, alluvial fans. Includes small to large cones at the mouths of stream canyons and broad aprons of coarse debris adjacent to mountain fronts.
Qya	**Younger alluvium (Holocene to late Pleistocene)** – Unconsolidated, dark-yellowish-brown (10YR 4/4) sand and gravel of slightly dissected alluvial valleys and associated washes.
Qyf	**Younger alluvial fan deposits (Holocene to late Pleistocene)** – Unconsolidated to weakly consolidated, dark-yellowish-brown (10YR 4/4), fine to medium arkosic sand with fine gravel. Gravels are primarily from granitic sources, with many subangular quartz fine gravel clasts. Unit is exposed as slightly dissected, elevated alluvial fans. Where discernable, alluvial fan deposits Qyf_1 and Qyf_2 are mapped, oldest to youngest, respectively.
Qof	**Older alluvial fan deposits (late Pleistocene)** – Moderately consolidated, strong brown (7.5YR 4/6 to 5/6), medium dense, fine- to medium-grained arkosic sand with fine to medium gravel. Gravels predominately fine to medium, sub-rounded granitic clasts. Clay coatings on grains and clasts predominant. Crude bedding observed with basal gravel layers.
Qvof	**Very old alluvial fan deposits (middle to late Pleistocene)** – Moderately consolidated, reddish-brown, medium dense, fine- to medium-grained arkosic sand with fine to medium gravel. Gravels predominately fine to medium, sub-rounded granitic clasts. Clay coatings on grains and clasts predominant.
Kgd	**Granodiorite (Late Cretaceous?)** – Light-gray to medium-gray, medium-grained, somewhat incoherent where weathered. Moderate to strongly foliated. Foliation on hornblende crystals commonly observed. Isolated zones of mafic inclusions, oriented sub-parallel to mineral foliation. Many leucocratic aplite and pegmatite dikes cross-cut unit. Late Cretaceous age assumed from regional work by Miller and Morton (1980). Mapped as quartz monzonite by Dibblee (1960, 2002), and granodiorite by Evans (1978).

MAP SYMBOLS

- Contact between map units - Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed, queried where uncertain.
- Fault - Solid where accurately located; dashed where approximately located; short dash where inferred; dotted where concealed, queried where uncertain. Arrow and number indicate direction and angle of dip of fault plane.
- Thrust fault - Solid where accurately located; dashed where approximately located; short dash where inferred; dotted where concealed; queried where uncertain. Barb located on upthrown block.
- Aplite dike
- Horizontal sedimentary beds
- Strike and dip of sedimentary beds
- Vertical sedimentary beds
- Strike and dip of overturned sedimentary beds
- Strike and dip of metamorphic foliation
- Vertical metamorphic foliation
- Strike and dip of igneous foliation
- Vertical igneous foliation
- Strike and dip of igneous joint
- Landslide - Arrows indicate principal direction of movement



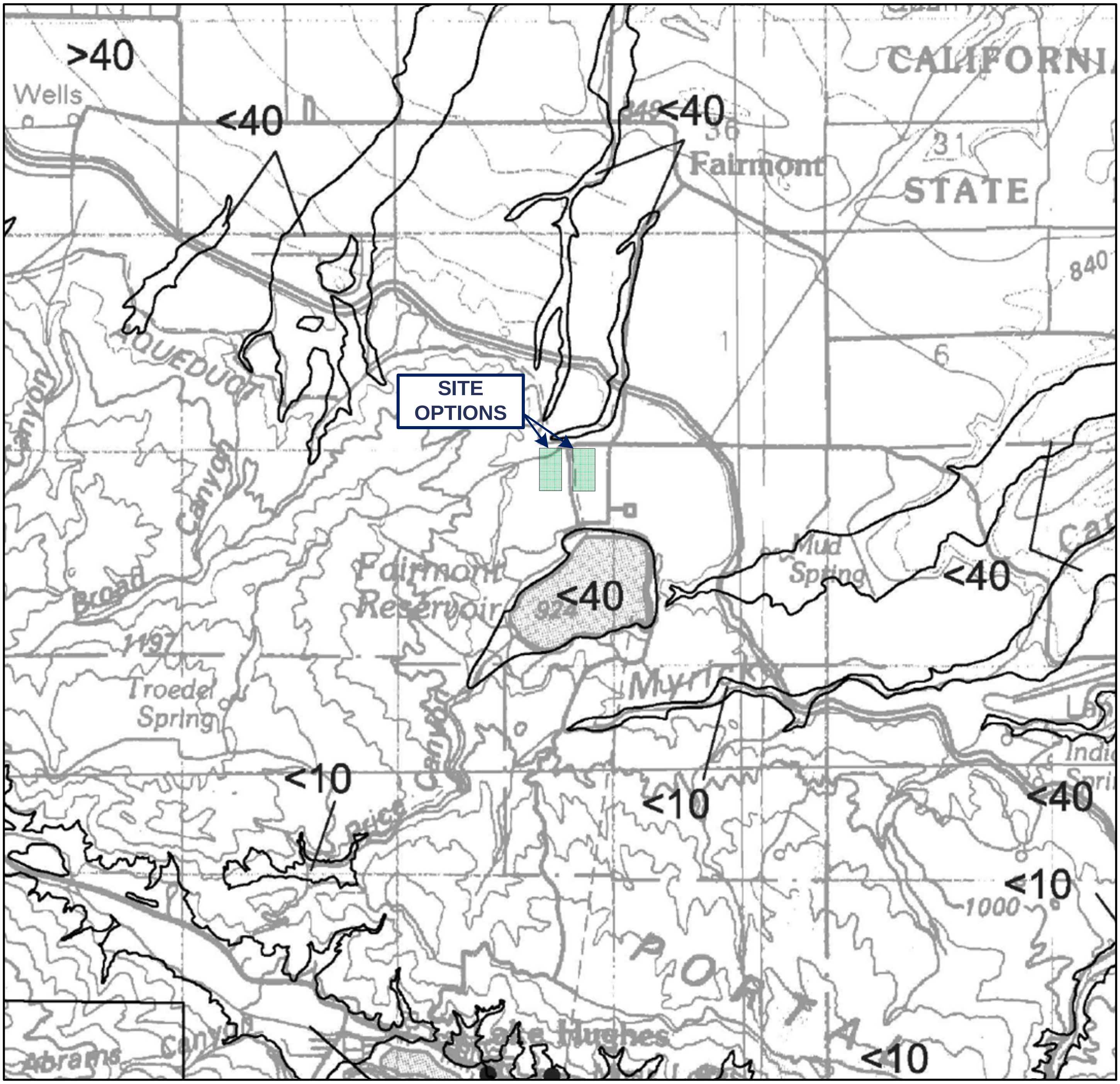
0 .5 1 2 Miles

Base Map: Hernandez, 2011

Los Angeles Department of Water & Power

Regional Geologic Map
Fairmont Sedimentation Plant
Los Angeles County, California

Figure: 3
Date: June 2016



Not to Scale

N

MAP EXPLANATION

10 — Depth to ground water, in feet

● Geotechnical borings used in liquefaction evaluation

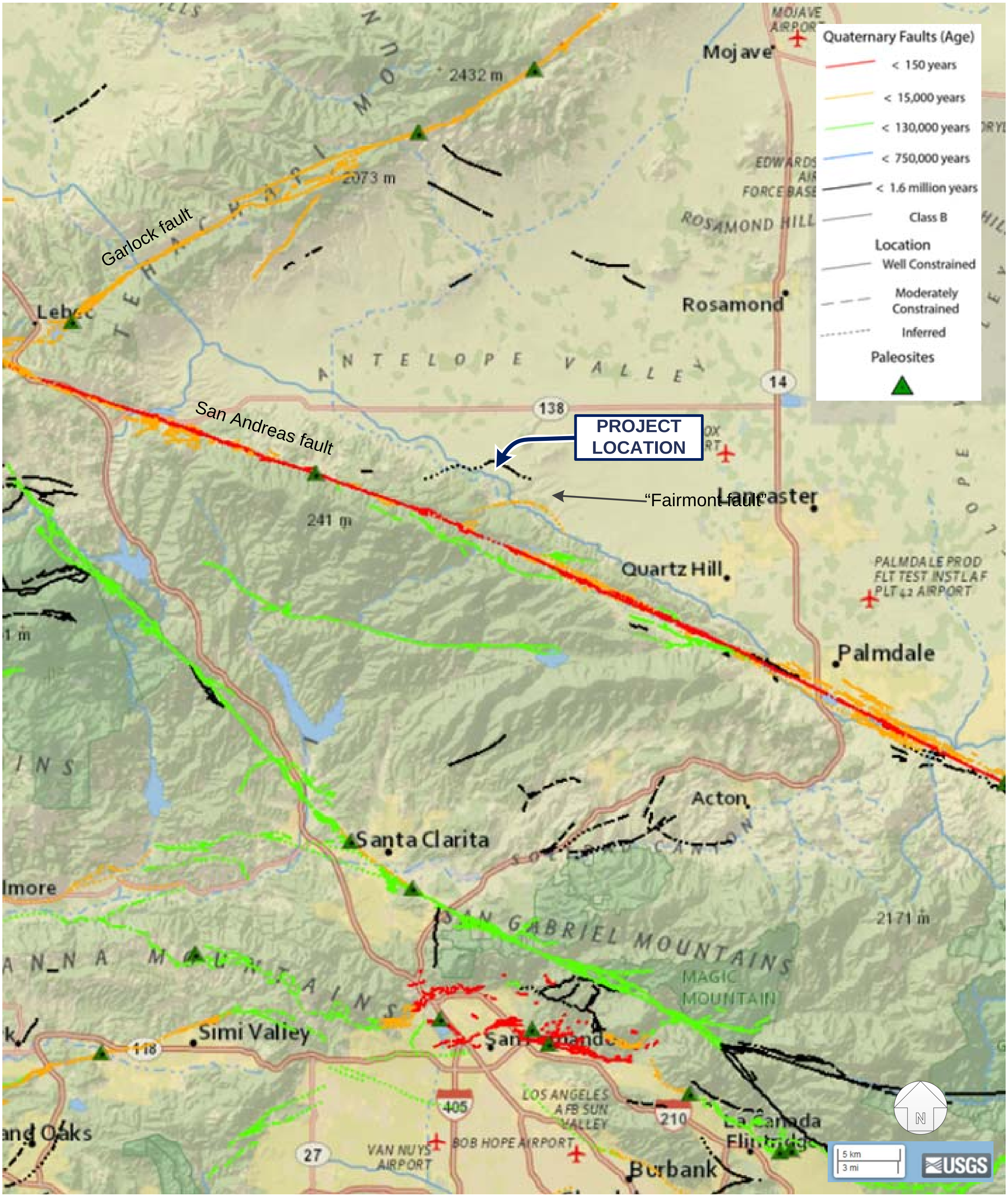
Base Map: CGS, 2003b

LA DWP Los Angeles Department of Water & Power

Historically Highest Groundwater Levels
Fairmont Sedimentation Plant
Los Angeles County, California

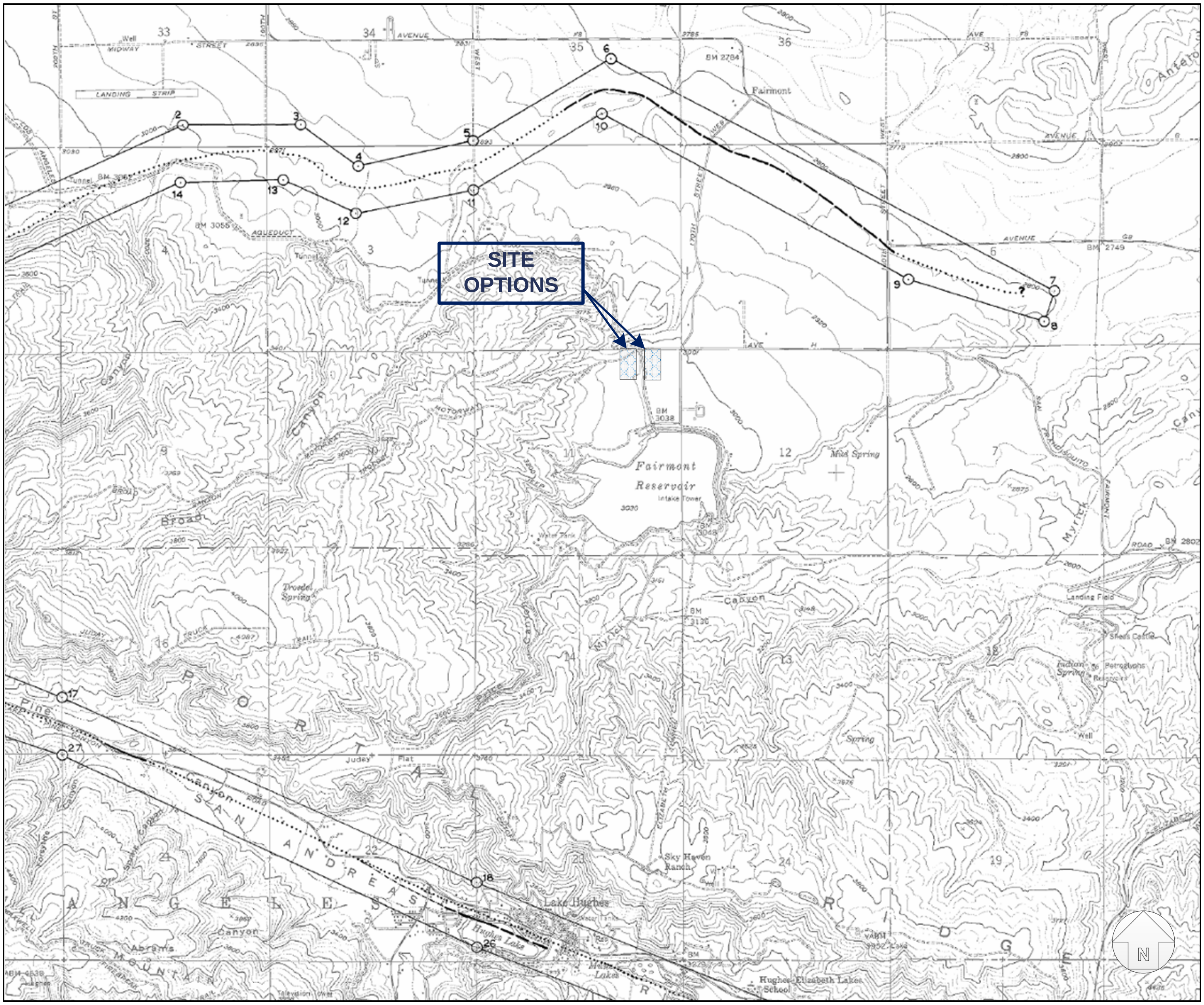
Figure: 4

Date: June 2016



Base Map: USGS & CGS, 2006

LA DWP Los Angeles Department of Water & Power	**Quaternary Fault Map** Fairmont Sedimentation Plant Los Angeles County, California	Figure: 5a Date: June 2016



MAP EXPLANATION

Potentially Active Faults

1906 C — Faults considered to have been active during Quaternary time; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Aerial photo lineaments (not field checked); based on youthful geomorphic and other features believed to be the results of Quaternary faulting.

Special Studies Zone Boundaries

These are delineated as straight-line segments that connect encircled turning points so as to define special studies zone segments.

Seaward projection of zone boundary.

Scale: 0 — 1 Mile

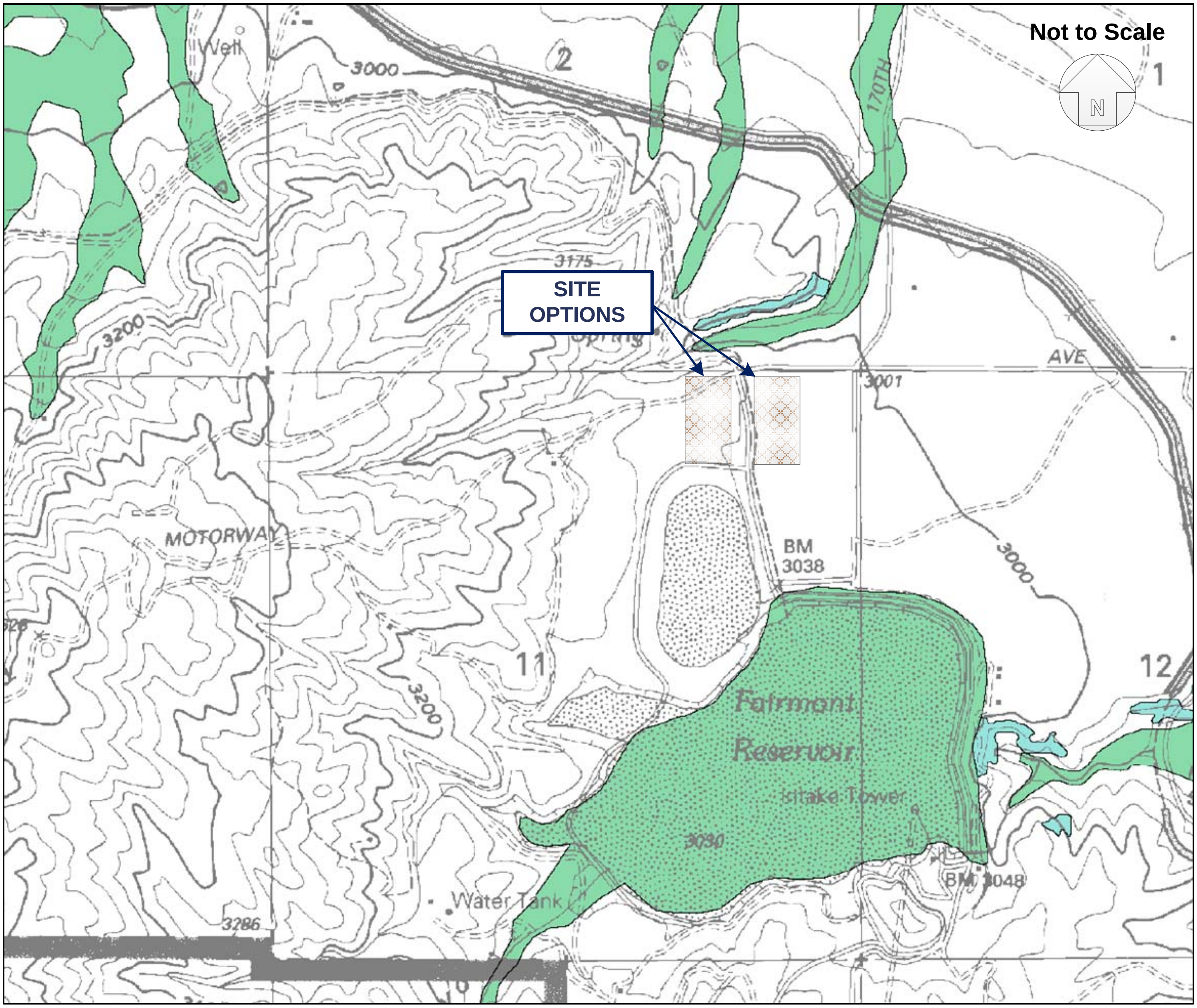
Base Map: CDMG, 1974

LA DWP Los Angeles Department of Water & Power

Alquist-Priolo Fault Map
Fairmont Sedimentation Plant
Los Angeles County, California

Figure: 5b

Date: June 2016



MAP EXPLANATION

Liquefaction
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Base Map: CGS, 2003a

LA DWP Los Angeles Department of Water & Power	**Seismic Hazard Zones Map** Fairmont Sedimentation Plant Los Angeles County, California	Figure: 6 Date: June 2016