FINAL DRAFT

Pure Water Project
Las Virgenes-Triunfo Joint Powers Authority
Title XVI Feasibility Study

6 September 2018

Funded in part by:

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Prepared by:

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Acronyms and Abbreviations

AF	Acre-feet
AFY	Acre-feet per year
AOP	Advanced oxidation process
AWT	Advanced Water Treatment
AWTF	Advanced Water Treatment Facility
BAC	Biologically Activated Carbon
BODR	Basis of Design Report
BOR	U.S. Bureau of Reclamation
CCR	California Code of Regulations
CDPH	California Department of Public Health (now DDW)
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System
CWA	Clean Water Act
CWMD	Calleguas Municipal Water District
DBP	disinfection byproduct
DDW	Division of Drinking Water
DPR	Direct potable reuse
DSOD	Division of Safety of Dams
DWR	Department of Water Resources
EIR	Environmental Impact Report
Ft	Feet
gpd	Gallons per day
gpm	Gallons per minute
GW	Groundwater
Hp	horsepower
IAP	Independent Advisory Panel
IPR	Indirect potable reuse
JPA	Joint Powers Authority
LACFCD	Los Angeles County Flood Control District
LADWP	Los Angeles Department of Water and Power
LF	Lineal feet
LRV	Log reduction values
LVWMD	Las Virgenes Municipal Water District
M	million
Max	Maximum
MCL	Maximum contaminant limit
MCWEWMP	Enhanced Watershed Management Program for Malibu Creek Watershed
MF	Microfiltration
MG	Million gallons
mg/L	Milligrams per liter
mgd	Million gallons per day

Min	Minimum
MND	Mitigated Negative Declaration
MOU	Memorandum of Understanding
MWDSC	Metropolitan Water District of Southern California
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPR	Non-Potable Reuse
NTU	Nephelometric Turbidity Units
NWRI	National Water Research Institute
O&M	Operations and maintenance
OPWS	Oak Park Water Service
P3	Public Private Partnership
RO	Reverse osmosis
RW	Recycled water
RWPS	Recycled Water Pump Station
RWQCB	Regional Water Quality Control Board or Regional Board
SBDDW	State Board Division of Drinking Water
SMP	CMWD's Salinity Management Pipeline
SRF	State Revolving Fund
SWA	Surface Water Augmentation
SWRCB	State Water Resources Control Board or State Board
SWSAP	Surface Water Source Augmentation Project
TDS	Total dissolved solids
TM	Technical memorandum
TMDL	Total Maximum Daily Load
TOC	Total organic carbon
TSD	Triufno Sanitation District
TSD-OPWS	Triufno Sanitation District- Oak Park Water Service
TSS	Total suspended solids
TWRF	Tapia Water Reclamation Facility (also Tapia WRF)
UF	Ultrafiltration
UV	Ultraviolet
UWMP	Urban Water Management Plan
V/G/C	Virus, Giardia, and Cryptosporidium
VCWWD	Ventura County Waterworks District
WC	Water Code
WDR	Waste Discharge Requirements
WLA	Waste Load Allocation
WLFP	Westlake Filtration Plant
WRF	Water Reclamation Facility
WRFP	Water Recycling Funding Program
WRRF	WateReuse Research Foundation
WWTF	Wastewater Treatment Facility

Executive Summary

The Las Virgenes – Triunfo Joint Powers Authority (JPA) received a grant from the U.S. Bureau of Reclamation (BOR) to perform the Feasibility Study under its Water Reclamation and Reuse (Title XVI) Program. The JPA operates the Tapia Water Reclamation Facility (TWRF or Tapia WRF) that provides wastewater treatment service for approximately 100,000 residents in the Las Virgenes Municipal Water District (LVMWD) and Trunfio Sanitation District (TSD) service areas. The JPA is the project sponsor and will own and operate the proposed Project. This report has been prepared for the JPA in accordance with BOR's Reclamation Manual Directives and Standards (WTR 11-01).

ES-1 Project Overview

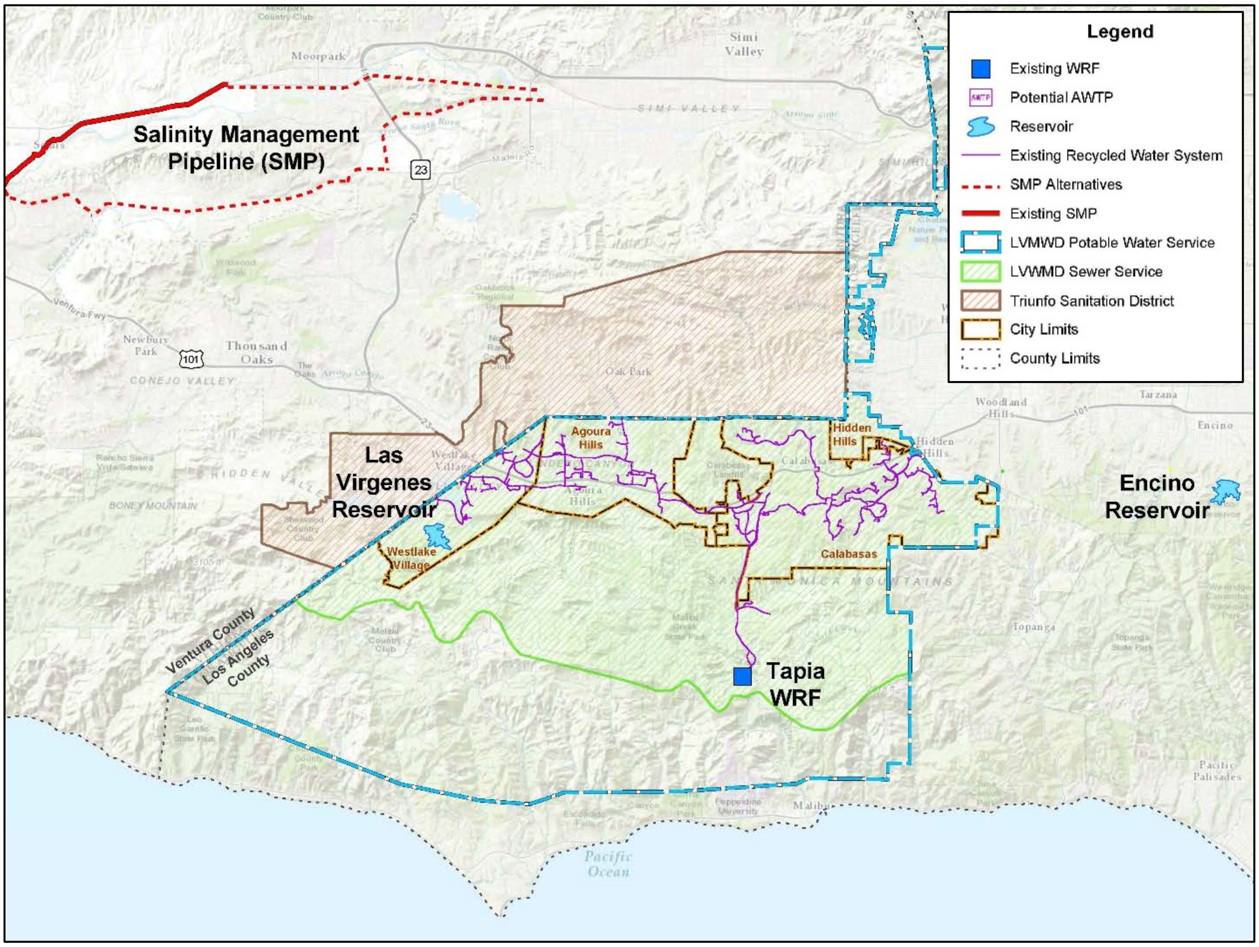
The JPA, embarked on this Title XVI Feasibility Study to identify a preferred project to improve local water supply reliability and drought resilience, and effectively eliminate discharges to Malibu Creek in most circumstances, a current practice that will become very costly due to new regulations without commensurate public benefit. Two approaches are evaluated to enable JPA to capture all its unused recycled water available during winter low irrigation demand season:

(1) An indirect potable reuse project, herein referred to as the **"Pure Water Project"** to deliver recycled water to a proposed advanced water treatment facility (AWTF) where proven technology would be used to purify the water and augment imported drinking water supplies stored at the existing Las Virgenes Reservoir. The use of purified recycled water from a municipal water reclamation facility for augmenting a reservoir that is designated as a source of domestic water supply is defined as surface water augmentation (SWA).

(2) A seasonal storage project, herein referred to as the **"Encino Reservoir Project"**, to convey surplus recycled water to the currently dormant Encino Reservoir during the low-demand winter season for use during the high-demand summer season. This project would require minimal additional treatment beyond the existing Title 22 process, as the stored water would only be available for non-potable use. Encino Reservoir is owned by Los Angeles Department of Water and Power (LADWP); thus, this project would be developed in cooperation with the City of Los Angeles.

The purpose of this Title XVI Feasibility Study is to evaluate the Pure Water Project and the Encino Reservoir Project alternatives, leveraging preliminary planning studies, the finalized SWA Regulations and findings from recent engineering and planning studies to identify a proposed Title XVI Project. The project study area, JPA service area, reservoir locations, and existing facilities are depicted in Figure ES-1.

Figure ES-1: Study Area



ES-2 Background and Reuse Opportunities

The JPA has been working to resolve three critical water resource management problems related to (1) their dependence on imported water supplies, (2) the seasonal imbalance in their supply and demand for recycled water and (3) the constraints related to discharges to Malibu Creek. Increasing water reuse presents an opportunity to address and resolve each of these issues. The proposed project alternatives seek to address these problems by maximizing utilization of the available recycled water supply, which will offset demands for imported water and eliminate discharges of recycled water to Malibu Creek.

LVMWD has very limited natural water resources and currently relies on imported water from the Metropolitan Water District of Southern California (MWD) for the majority of their supply (~84%), with recycled water providing approximately 16% of the overall supply and a minor contribution (~0.5%) from the Ventura County Waterworks District (VCWWD). TSD and Oak Park Water Service (herein referred to as the "TSD-OPWS") similarly has limited natural water resources. The only source of potable water utilized by TSD-OPWS is imported water through Calleguas Municipal Water District (CMWD). Recycled water supply is also available from the Tapia WRF for non-potable irrigation use. The JPA is interested in pursuing local, sustainable and reliable water supply projects, such as the Title XVI project alternatives explored herein, to provide additional reliability beyond imported supplies in the future.

Currently, 100 percent of the wastewater in the JPA service area is collected and treated to disinfected tertiary recycled water standards at the Tapia WRF. Excess treated water effluent is discharged into Malibu Creek during the months of November to April. Excess effluent, beyond what can be discharged to Malibu Creek, is discharged to the Los Angeles River, via the Arroyo Calabasas, which requires pumping over the Calabasas grade. Under the existing NPDES permit (Order No. R4-2017-0124), the JPA is generally prohibited from discharging to Malibu Creek from April 15 to November 15. However, when the creek flow drops below 2.5 cubic feet per second (cfs) during this period, releases of recycled water from Tapia WRF are required to provide water pools (habitat) for the endangered steelhead trout.

The JPA has explored long-range plans to beneficially use all of the JPA's recycled water and to effectively discontinue discharges to Malibu Creek. Maximizing reuse of recycled water from the Tapia WRF through non-potable and/or potable reuse remains the most promising means to achieve this goal. There are no legal or institutional barriers related to the availability or ownership of the excess recycled water that would interfere with the project.

The JPA currently reuses 100% of the available summer flows produced at the Tapia WRF and 70% of the annual flow on average, based on data from 2001 to 2015. Future use of recycled water is influenced by the seasonal imbalance in the supply and demand for recycled water, as illustrated in Figure ES-2, where peak demands occur during the warm summer months and drop to near zero during the cool winter months. The amount of excess recycled water available for the Encino Reservoir Project and Pure Water Project Alternatives is only available in the winter months after existing recycled water demands are met, as summarized in Table ES-1. Brine minimization and stormwater capture have the potential to increase project yield but would require additional investigation to confirm feasibility and estimate additional yield and costs.

Figure ES-2: Seasonal Imbalance of Recycled Water Supply and Demand

Source: Historical Monthly Volume of Recycled Water Produced and Sold (MWH 2016)

Table ES-1: Anticipated Available Recycled Water Projections

Year	Total Supply from TWRF and Imported Water Supplement [1] (AFY)	Existing Demand [2] (AFY)	Available Supply for Project (AFY) [3]	Project Yield (AFY)
Encino Reservoir Alternative				
Year 1	7,347 – 9,650	6,547	800 – 3,102	0
Year 20	10,877 – 12,607	6,547	4,330 – 6,060	2,395 [4]
Pure Water Alternative				
Year 1	7,347 – 9,650	6,547	1,819 – 3,272	1,546 – 2,781 [5]
Year 20	10,877 – 12,607	6,547	4,330 – 6,060	3,605 – 4,609 [5]

[1] Source: Basis of Design Report (BODR) (MWH 2016)
[2] Based on the 2001-2015 average recycled water demand
[3] For the Encino Reservoir Project, the available supply accounts for existing demand and 400 AFY of seepage loss at the Encino Reservoir. For the Pure Water Project, the available supply accounts for existing demand on a monthly basis, which incorporates seasonal variability in existing demand.
[4] Additional 2,395 AFY demand from identified non-potable customers.
[5] For the Pure Water Project, the project yield accounts for the AWTF plant capacity and 15% water loss due to RO brine.

ES-3 Project Alternatives

The two Project alternatives that are evaluated as part of this Title XVI Feasibility Study encompass two different approaches to enable JPA to maximize the use of recycled water available during winter low irrigation demand season.

- **Alternative 1 – Pure Water Project** is an indirect potable reuse project to supplement potable water supplies in Las Virgenes Reservoir with purified water
- **Alternative 2 – Encino Reservoir Project** is a seasonal storage project to utilize Encino Reservoir for storage of tertiary recycled water to expand non-potable reuse.

The alternatives evaluated are shown in Figure ES-3 and described Table ES-2.

Figure ES-3: Recycled Water Project Alternatives

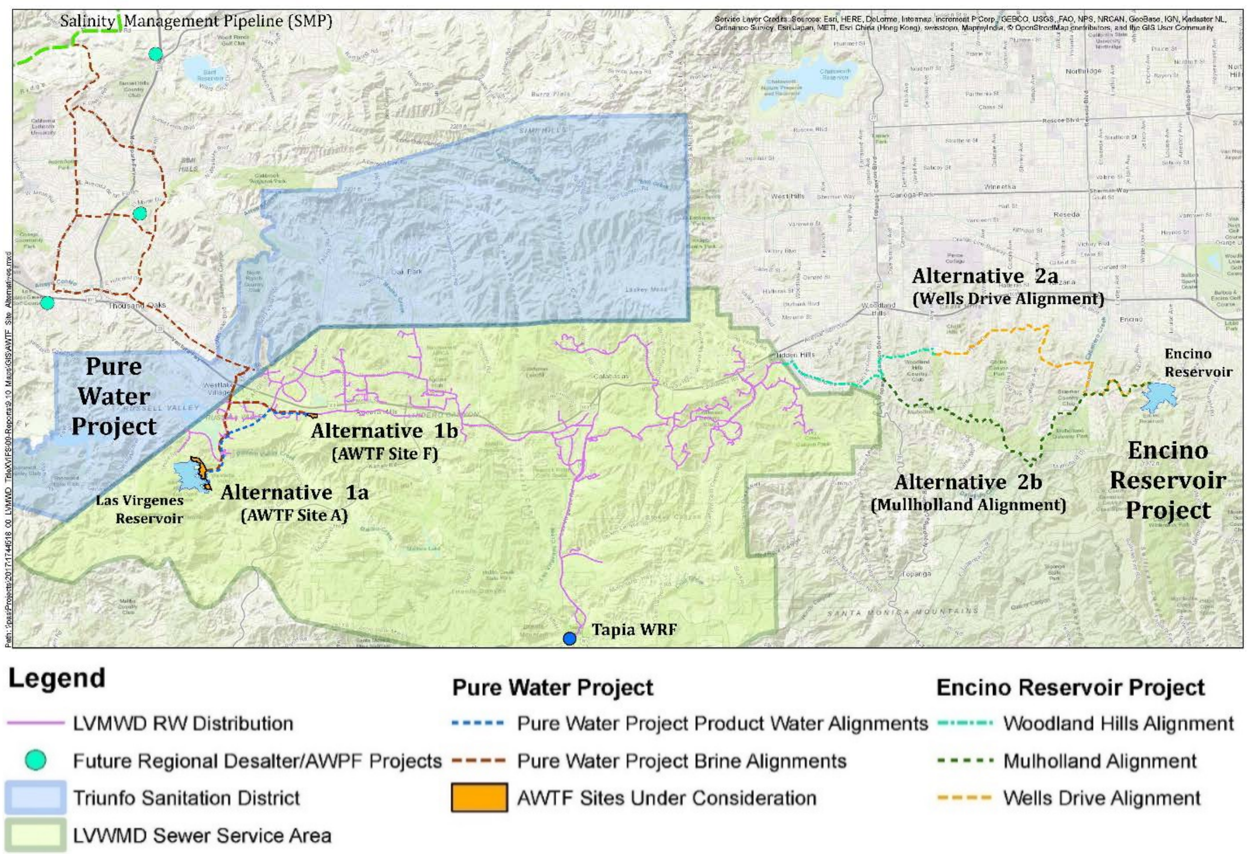


Table ES-2: Recycled Water Projects Alternatives

Alternative	Sub Alt	AWTF Location	Buildout Project Yield (AFY)	Average Project Yield (AFY)	Treatment Design Flow (mgd)	Brine Flow (mgd)
Alt 1: Pure Water Project	Alt 1a: AWTF near Las Virgenes Reservoir	Site A	4,130	3,100	6.0	0.8
	Alt 1b: AWTF at Agoura Rd Site	Site F	4,130	3,100	6.0	0.8
Alternative	**Sub Alt**	**Alignment to Reservoir**	**Buildout Project Yield (AFY)**	**Average Project Yield (AFY)**	**Conveyance Design Flow (mgd)**	**Brine Flow (mgd)**
Alt 2: Encino Reservoir Project	Alt 2a: Wells Drive Alignment	Wells Drive	2,395	1.200	11.0	none
	Alt 2b: Mullholland Alignment	Mulholland Drive	2,395	1.200	11.0	none

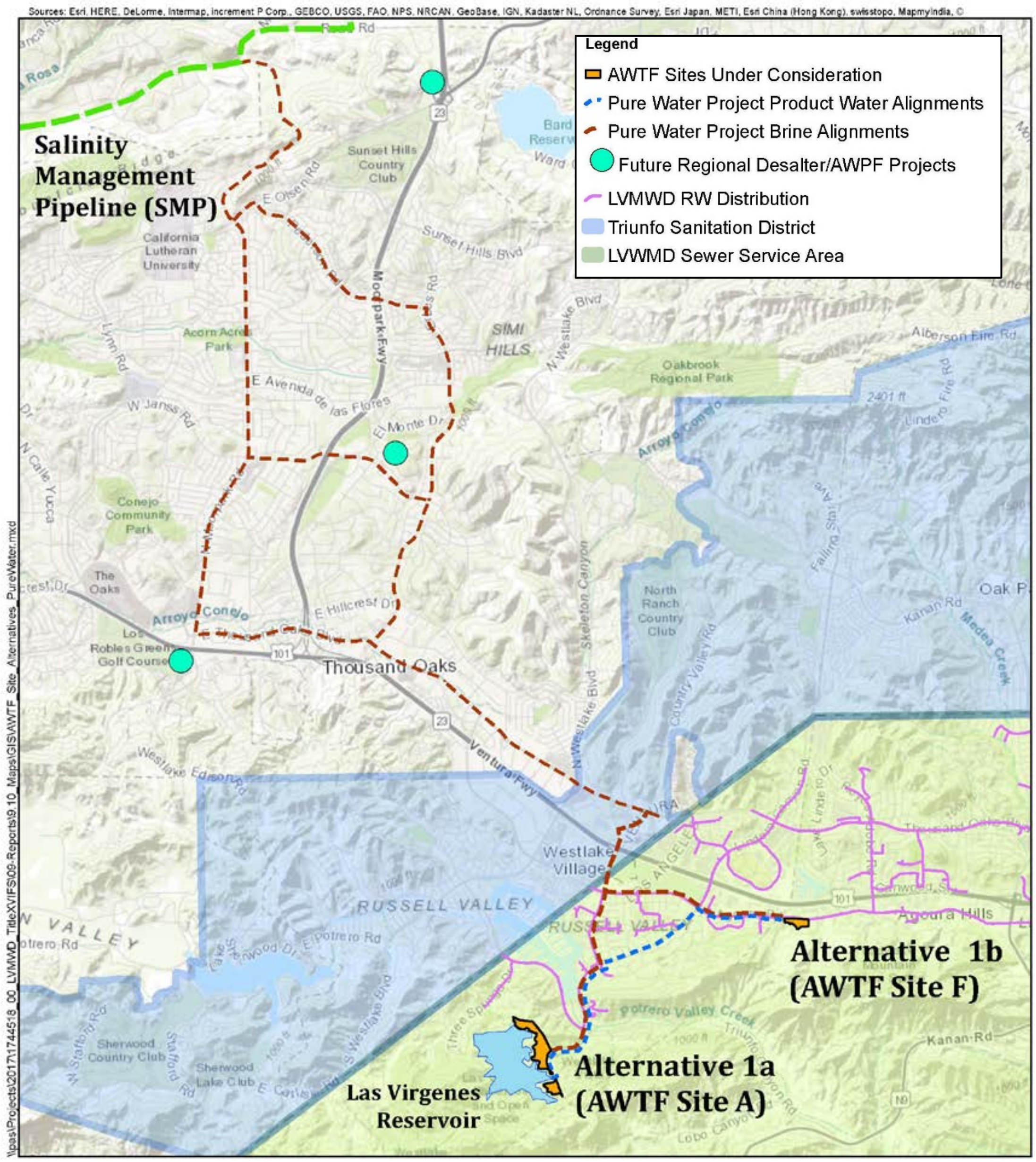
These two Project alternatives were developed to take a technically innovative approach, leveraging regional cooperation, to solve the ever-growing water shortage and discharge compliance issues in the JPA service area. Each alternative would serve to meet the Project objectives to improve local water supply reliability and drought resilience, and effectively eliminate discharges to Malibu Creek for compliance with new, stringent regulatory standards.

Alternative 1 - Pure Water Project

The Pure Water Project includes delivery of recycled water from the JPA's existing recycled water system to a proposed AWTF, where proven advanced water treatment processes would purify the water prior to augmenting the Las Virgenes Reservoir (MWH 2016). Water from the reservoir is treated and disinfected at the Westlake Filtration Plant (WLFP) prior to distribution to the drinking water system. Reject water, or brine, from the reverse osmosis (RO) process would be disposed of via a pipeline from the AWTF to the Salinity Management Pipeline (SMP) in Ventura County, owned and operated by CMWD. Residuals from the AWTF, other than brine, would be disposed of via a connection from the AWTF to the sanitary sewer. Figure ES-4 illustrates major facilities associated with the Pure Water Project alternatives.

The use of purified recycled water from a municipal water reclamation facility for augmenting a reservoir that is designated as a source of domestic water supply is defined as a surface water augmentation (SWA) project. Regulations for SWA (SBDDW-16-02) were adopted by the SWRCB on March 6, 2018 (herein referred to as SWA Regulations). The Pure Water Project must meet all requirements as set forth in the SWA Regulations.

Figure ES-4: Pure Water Project Alternatives



Advanced Water Treatment (AWT) Process

The treatment processes for the Pure Water Project are selected to meet SWA Regulations and achieve specified pathogen reduction criteria at the end of the treatment train to be protective of public health. The advanced water treatment train would include microfiltration/ultrafiltration (MF/UF), 3-stage reverse osmosis (RO) for high recovery (85%) and ultraviolet disinfection with an advanced oxidation process (UV/AOP) with stabilization and chlorination (if-needed) prior to pumping to the Las Virgenes Reservoir (MWH 2016). An AWTF demonstration program is underway by the JPA to test several approaches to purification and provide engineering data to guide selection of the most effective protocols for purifying the effluent water from the Tapia WRF and to secure regulatory approval (CDM 2017). The findings from the demonstration program may result in future modifications to the proposed advanced water treatment train, such as the selection of brine minimization technologies to increase yield and reduce reject water from the RO system.

The AWTF operation would vary by season, treating excess recycled water after existing non-potable demands are met. The facility would ramp up and down incrementally by bringing portions of the treatment train online as supply becomes available. Appropriate shut-down and storage procedures would need to be followed to maintain the life of treatment equipment, particularly for the MF/UF and RO membranes and UV reactors. Protocols for disposal of off-spec water and emergency operations would be put in place to meet all regulatory requirements.

AWTF Siting

Two sites were identified through prior siting studies as preferred locations for an AWTF, as shown in Figure ES-4 and summarized below:

- **Site A** is located on the edge of Las Virgenes Reservoir in an open space area in the City of Westlake Village. LVMWD owns the parcel and a new access road would be required to reach the site and avoid driving through residential streets for truck access to the site
- **Site F** s located on an empty lot in a business park/office retail zone off Agoura Road in the City of Agoura Hills. The JPA adopted the Negative declaration for the purchase of this property (30800 Agora Road) in August 2017 and authorized purchase of the property at the March 5, 2018 Board Meeting. The potential routes for an access road do not require driving through residential streets for truck access to the site and there is immediate access to basic utilities.

The JPA has not selected a preferred site at this time, so both sites are carried forward as potential AWTF locations for this study.

Reservoir Operations Modeling

Three operating scenarios were evaluated as part of a Modeling Study, prepared for the JPA under a separate contract (Trussell 2018 and FSI 2018), to maximize the operational flexibility of the Pure Water Project and meet regulatory requirements.

- **Routine:** During winter months, available potable reuse water would be discharged to the Reservoir when the WLFP is not in service. Then during summer months, the WLFP would operate (i.e., drawing water from the Reservoir) to recover stored purified water. Because the primary regulatory parameters, dilution and retention time, are less applicable and no modeling was required to demonstrate compliance with the SWA Regulations.

- **Boundary:** The WLFP would be operated through a full winter, while simultaneously providing purified water to the reservoir. In this scenario, during the summer, irrigation demand would still be prioritized and there would be minimal input to the Reservoir. In addition, to represent a worst-case scenario in terms of dilution, no other water source would enter the reservoir (e.g., no MWDSC water received). In effect, this scenario represents the most consistent use of the Pure Water Project by incorporating all available purified water, including during the shoulder months (in Spring and Fall) when excess recycled water is available and the WLFP is under normal operating conditions
- **Emergency:** Represents an emergency scenario, where the MWDSC feeder line to the Reservoir is inoperable, either for long-term maintenance or as a result of failure and the WLFP must come on-line at a high capacity.

These operational scenarios were developed to bracket the intended use of the Reservoir with the Pure Water Project and to maximize operational flexibility by considering 'boundary' conditions. These are conditions that achieve SWA regulatory requirements but are up against the boundary of the regulations or possible uses of the project. Table ES-3 provides a summary of the three reservoir operational scenarios (Trussell 2018) in terms of the ability to meet SWA regulatory objectives for retention time and dilution.

Table ES-3: Modeling Results for Operational Scenarios

SCENARIO	Purified water inflow (MGD)	WLFP Withdrawal (MGD)	Theoretical retention time (months)	Theoretical Retention Time Regulatory Objective (months)	Predicted Lowest Minimum Dilution for All Traces [1,2]
Routine	AWTF flows during winter and Filtration Plant flows during summer. No modeling required.				
Boundary	1.7	5.0	8.5	> 6.0	77:1
Emergency	6.0	15.0	2.4	> 2.0	69:1

Source: Modeling Study (Trussell 2018)

1 Estimated based on approximately 30 tracer release simulations. The shortest predicted lag time from the introduction of purified water to the inlet of the WFLP was 0.6 days.

2 SWA Regulations require a dilution requirement in the reservoir of 100:1 (one percent by volume), or 10:1 (ten percent by volume) with an additional 1-log microbial pathogen treatment to demonstrate the percent of recycled water withdrawn from the reservoir, by volume, during any 24-hour period.

As shown in Table ES-3, under all operational scenarios considered, the theoretical retention regulatory objective of greater than 2 months (60-days) would be met. Overall, the hydrodynamic modeling results and tracer simulations were favorable, indicating that the Pure Water Project would be in compliance with the SWA Regulations for retention and dilution.

An Independent Advisory Panel (IAP) meeting was held on May 4, 2018 to solicit feedback on (1) the results of initial reservoir modeling efforts and (2) the feasibility of the Pure Water Project to comply with reservoir requirements of the SWA Regulations. Based on the information presented at the May 4th meeting, the Panel concluded the following (NWRI 2018):

- The JPA's Board of Directors and executive leadership appear committed to appropriate planning and investment to ensure regional water supply reliability.
- The proposed Project effectively addresses the necessary water supply, regulatory, and environmental considerations.
- The preliminary reservoir model analyses and scenarios are reasonable and provided the Panel with valuable insight into the proposed Project.
- The proposed Project, as presented to the Panel, appears to be capable of complying with the SWA Regulations.

The JPA's proactive approach to obtain expert panel review and the Panel's conclusions should serve to expedite the permitting process. For the purpose of this study, Alternative 1 assumes a submerged multi-port diffuser to increase mixing and that one additional log removal of pathogens would be needed at the AWTF to operate under emergency conditions.

Alternative 1a and 1b Facilities

Table ES-4 summarizes the facilities and sizing associated with Alternatives 1a and 1b, which primarily differ due to AWTF siting. Both alternatives would produce up an average of 3,100 AFY of purified water supply. An extension pipeline would be constructed to convey tertiary water from the existing non-potable recycled water system to serve as influent to the AWTF. A new purified water pipeline would be constructed to convey purified water produced at the AWTF to the Reservoir. A new brine pipeline would convey RO process reject water from the AWTF to the SMP. Purified water stored in the Reservoir would co-mingle with imported drinking water supplies, also stored in the Reservoir, and would be released for treatment and disinfection at the WLFP prior to distribution to the drinking water system.

Table ES-4: Summary of Alternative 1a and 1b Facilities

Facility Component	Units	Alt 1a AWTF Site A	Alt 1b AWTF Site F
Treatment (AWTF capacity)[1]	MGD	6.0	6.0
Pipelines			
Tertiary (24"-dia)	LF	15,800	9,200
Purified (20"-dia)	LF	900	15,200
Brine (12"-dia)	LF	63,800	62,800
Waste (6"-dia)	LF	2,510	1,060
Pump Station	No pump stations are required to convey various flows to and from the AWTF based on a preliminary hydraulic analysis.		
Storage	No external storage reservoirs are needed outside of the AWTF		
Mixing System	Two mixing aerators in Las Virgenes Reservoir and a product water diffuser.		
Brine Discharge Station	Brine discharge station to connect to the CMWD SMP		

[1] Includes MF/RO/UV/AOP process train and associated chemical feed systems, wet wells, inter-process pumps and other appurtenances. Brine concentration or minimization technology is not included in this alternative.

Alternative 2 – Encino Reservoir Project

The Encino Reservoir Project would convey surplus recycled water from the Tapia WRF to the currently dormant Encino Reservoir during the low-demand winter season for use during the high-demand summer season. Encino Reservoir is owned by Los Angeles Department of Water and Power (LADWP) and is not currently in service because of challenges meeting the requirements of the Surface Water Treatment Rule and concerns about the seismic stability of the dam. This project would be developed in cooperation with the City of Los Angeles. Figure ES-5 illustrates facilities associated with the Encino Reservoir Project alternatives.

Treatment

The Encino Reservoir Project would receive Title 22 recycled water from the Tapia WRF that already meets standards for unrestricted non-potable reuse. However, additional treatment facilities would be constructed at Encino Reservoir to improve water quality of outflows from the reservoir, to remove any algae or debris from the open-air reservoir. Treatment facilities would include filtration and disinfection to prevent clogging of sprinklers or growth in distribution systems, which would provide quality assurance for customers and protect equipment and facilities within the recycled water distribution system.

Non-Potable Demands

The Encino Reservoir Project would provide an opportunity to increase the amount of supply available for irrigation uses by storing winter flows for delivery in high demands months to meet the supply gap in the summer months rather than relying upon potable water supplements to fill the gap. Potential customers include infill development, non-potable users in route to Encino

Reservoir and an extension in Woodland Hills, as listed in Table ES-5. Of the 1,200 AFY of potential average demand, only 474 AFY would offset potable water demands in the JPA service area.

Figure ES-5: Encino Reservoir Project Alternatives

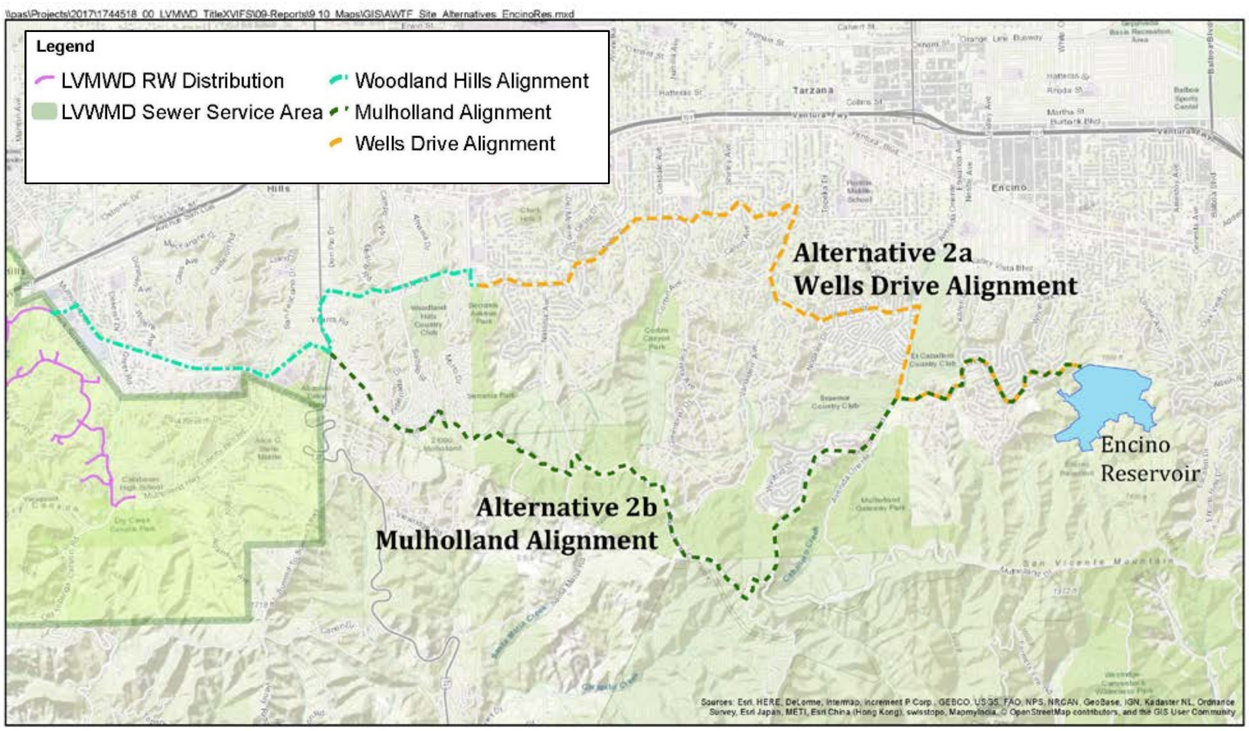


Table ES-5: Estimated Demands for NPR Users for Encino Reservoir Project

Potential Non Potable Use Areas	Estimated Demands at Buildout[1] (AFY)	Estimated Average Demands [1] (AFY)	Estimated Potable Offset within JPA Service Area (AFY)
Infill development within LVMWD	740	370	370
Thousand Oaks Boulevard Extension	251	126	-
Oak Park HOA Conversions	207	104	104
Westlake Conversions (schools/parks)	130	65	-
Woodland Hills GC Extension	477	240	-
El Caballero Country Clubs	590	295	-
Total Demand	**2,395**	**1,200**	**474**

[1] 2016 BODR (MWH 2016), including Appendix K

Encino Reservoir Operations

The 168-foot-tall earth dam at Encino Reservoir was constructed in 1924 and is routinely inspected by the Division of Safety of Dams (DSOD). The reservoir capacity is 9,789 AF; however, LADWP typically maintained a volume of about 7,300 AF for operation until it was taken out of regular service in 2002. In 2005, a new filtration plant and pumping station were constructed next to the reservoir to meet the new surface water treatment regulations and LADWP currently only uses Encino Reservoir as emergency water storage for use during severe seismic events or other catastrophic water system failures (MWH 2016)

At the most simplistic level, reservoir operations for the project would consist of (1) filling Encino Reservoir with surplus water available from TWRF on a daily basis and (2) conveying stored water from Encino Reservoir back to the recycled water distribution system to satisfy peak demands on days when demand exceeds supply. In practice, however, reservoir operations would be much more complicated. Reservoir operations would need to carefully balance the need to maintain adequate storage capacity, address water quality issues and utilize unallocated surplus recycled waters supplies.

Pursuit of the Encino Reservoir Project would necessitate the completion of a seismic study to identify additional rehabilitation requirements for the dam, modifications to the outflow from the reservoir to provide an alternate drain in case of emergency and likely a change in its use as an emergency supply. Furthermore, institutional agreements and extensive coordination with LADWP and the City of Los Angeles would be the cornerstone of the Encino Reservoir Project. In addition, future efforts would be needed to develop a robust reservoir operations model, establish a water quality sampling plan and identify a preferred approach for utilizing unallocated recycled water surplus supplies

Alternative 2a and 2b Facilities

Table ES-6 summarizes the facilities and sizing associated with Alternatives 2a and 2b, which primarily differ due to conveyance alignments. Both alternatives would result in an additional 2,395 AFY of non-potable reuse at buildout (1,200 AFY on average) and would rely on a combination of existing conveyance infrastructure and new pipelines and pump stations to convey water to and from Encino Reservoir. New pump stations and pipelines would be sized to carry the maximum day surplus recycled water flow during the winter months (12 mgd) to Encino Reservoir and to meet peak irrigation demands (11 mgd) from the reservoir during the summer months. The existing recycled water pump station (RWPS) East would require a 5.5 mgd increase from the existing capacity (6.5 mgd) to meet project design flows. Additional treatment facilities would be sized to meet the peak hourly irrigation demands to maintain water quality re-entering the recycled water distribution system

Table ES-6: Summary of Alternative 2a and 2b Facilities

Facility Component	Units	Alt 2a Wells Drive Alignment	Alt 2b Mulholland Alignment
Treatment at Encino Reservoir[1]	MGD	11.0	11.0
Pipelines			
24" Standard Pressure Pipeline	LF	52,400	28,300
24" High Pressure Pipeline	LF	27,500	52,500
Pump Station			
Pump Station at Encino Reservoir	HP	2,500	2,500
RWPS East Upgrade	HP	1,000	500
Pump Station on Mulholland	HP	not incl.	1,200
Storage	MG	not incl.	1.0
Aeration and Mixing System	Two air compressors and a grid of distribution piping anchored just above the reservoir bottom to help meet oxygen demand		

[1] Includes strainers and chlorination system at Encino Reservoir, including associated appurtenances to meet peak irrigation demands from the reservoir during the summer months

ES-4 Economic Analysis

An engineer's opinion or probable cost was generated based on the engineering work to allow for an economic and financial analysis of the project alternatives. Costs are broken down for capital and operation and maintenance (O&M) costs in accordance with Title XVI guidelines. Annualized capital costs, annual O&M costs and average project yields are used to estimate the anticipated unit life cycle cost of each project alternative to compare project alternatives.

If no project was implemented, the District would continue to purchase MWDSC water at Tier 1 commodity rates to meet increased potable demands. Thus, the economic analysis accounts avoided costs, from reduced MWDSC purchases, as a direct annual O&M savings for both the Pure Water and Encino Reservoir Projects. For the Encino Reservoir Project, the revenues from additional recycled water sales are also included as an annual O&M cost saving.

Table ES-7 compares the construction cost of major facility components and details annual and life cycle unit costs based on the average project yield for each alternative. Figure ES-6 graphically compares costs between alternatives.

Table ES-7: Cost Comparison of Alternatives

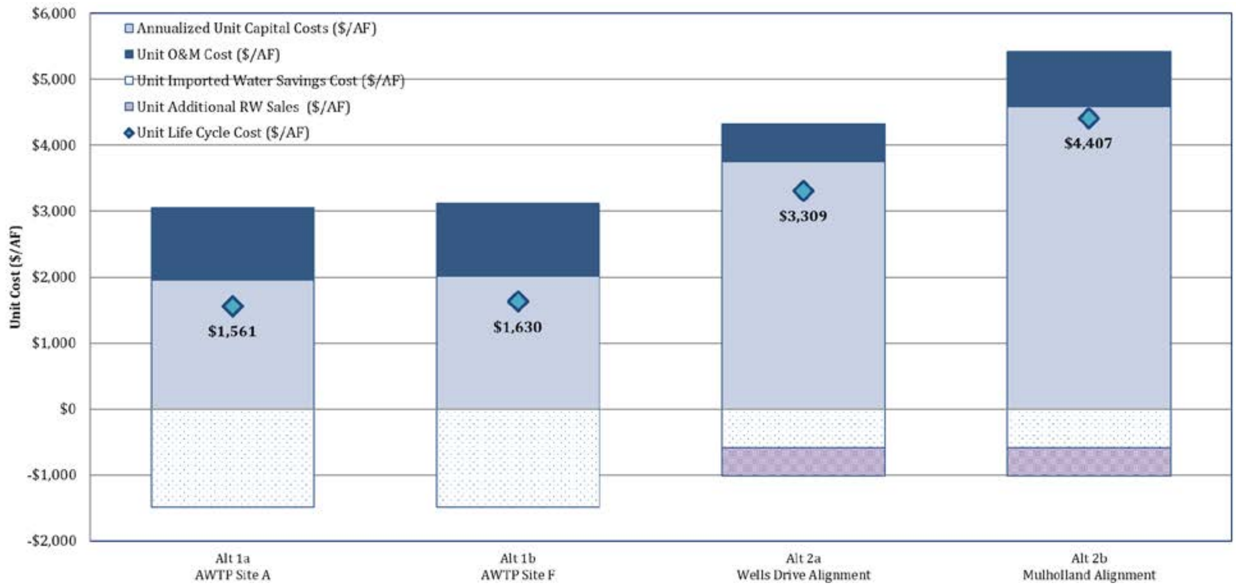
	Pure Water Project		Encino Reservoir Project	
Alternative	Alt 1a AWTF Site A	Alt 1b AWTF Site F	Alt 2a Wells Drive Alignment	Alt 2b Mulholland Alignment
Average Annual Project Yield (AFY)	**3,100**	**3,100**	**1,200**	**1,200**
Facility Component (Loaded Costs)				
Treatment	$80,600,000	$76,100,000	$1,600,000	$1,600,000
Pipelines	$35,600,000	$38,600,000	$56,000,000	$62,200,000
Pump Station	$0	$3,600,000	$29,600,000	$37,800,000
Storage	NA	NA	NA	$4,700,000
Mixing System	$1,700,000	$1,700,000	$800,000	$800,000
Brine Discharge Station	$500,000	$500,000	NA	NA
Subtotal Construction *(with Markups and Contingency)*	$118,400,000	$120,500,000	$88,000,000	$107,100,000
Land Acquisition	$0	$2,100,000	$0	$1,000,000
Project Capital Cost Total ($)	**$118,400,000**	**$122,600,000**	**$88,000,000**	**$108,100,000**
Annualized Unit Capital Costs ($/AF)	**$1,949**	**$2,018**	**$3,742**	**$4,591**
Annual O&M Cost ($/yr)	$3,400,000	$3,400,000	$700,000	$1,000,000
Unit O&M Cost ($/AF)	$1,100	$1,100	$580	$830
Unit Imported Water Savings Cost[1] ($/AF)	-$1,488	-$1,488	-$588	-$588
Unit Additional RW Sales[2] ($/AF)	NA	NA	-$425	-$425
Unit Life Cycle Cost ($/AF)	**$1,561**	**$1,630**	**$3,309**	**$4,407**

Note:

[1] For the Encino Reservoir Project, the unit imported water savings is lower because it only applies to buildout demands in the JPA service area (474 AFY for infill demand and Oak Park HOA conversations).

[2] Additional recycled water sales are assumed to apply to the average annual project yield (1,200 AFY)

Figure ES-6: Alternative Unit Life Cycle Cost Comparison



In the absence of the Project (i.e. the "No Project Alternative), the JPA would continue to purchase MWDSC water at Tier 1 commodity rates to meet increased potable demands and develop, expand or explore possible opportunities to increase local supply resiliency. The costs associated with the No Project alternative include the following:

- Continued purchases of treated MWDSC water at Tier 1 commodity rates to meet increased potable demands,
- Advanced nutrient removal for total maximum daily load (TMDL) compliance for future discharges of unused recycled water from Tapia WRF to Malibu Creek, including solids handling improvements, and
- Disposal costs associated with unused recycled water from Tapia WRF via alternative means during the prohibition period (May to October).

Table ES-8 summarizes the No Project Alternative costs. For the purpose of this economic analysis, it is assumed that these activities would continue for 20 years, the assumed project duration for Alternatives 1 and 2, and applies the same cost assumptions presented in Table ES-7. The No Project unit life cycle cost of $3,450 to $4,077 per AF is higher than both the Pure Water Project unit life cycle cost of $1,561 to $1,630 per AF and the Encino Reservoir Project unit life cycle cost of $3,309 per AF for Alternative 2a. Alternative 2b has the highest unit life cycle cost of $4,407 per AF.

Table ES-8: No Project Alternative Costs

No Project Alternative	Range of Costs		
TMDL Compliance for Discharge of Winter Excess Flow to Malibu Creek[1]			
Capital Cost ($mil)	$130	to	$150
O&M Cost ($mil per year)	$4	to	$5
Excess Recycled Water (Nov to Apr) (AF)[2]	2,400	to	4,040
TMDL Compliance Unit Cost ($/AF)	$3,300	to	$3,927
Disposal of Sumer Excess Flows[3]			
Excess Recycled Water (May to Oct) (AF)	60	to	1,150
Project Disposal Total Cost ($mil per year)	$0.01	to	$0.17
Project Disposal Unit Cost ($/AF)	$150	to	$150
Unit life Cycle Cost ($/AF)	**$3,450**	**to**	**$4,077**

1 Estimated cost for advanced nutrient removal and brine disposal from Scenario Concept #1 of the Recycled Water Seasonal Storage Plan of Action (MWH 2015) plus additional costs for solids handling improvements for increased disposal (Hazen 2016).
2 Excess recycled water for Year 1 to Year 20.
3 Estimated unit cost based on historical disposal costs for Rancho spray fields, pumping to LA River and BOS raw sewage disposal.

ES-5 Proposed Title XVI Project

The JPA desires to fully and beneficially reuse its recycled water, and adopted the following principals to guide the investigation of Project alternatives:

1) Maximize Beneficial Reuse
2) Seek Cost Effective Solutions
3) Seek Partnerships beyond the JPA
4) Gain Community Support
5) Govern with a Partnership
6) Be Forward Thinking

The BODR (MWH 2016) and Recycled Water Seasonal Storage Plan of Action (MWH 2015) engaged key stakeholders to define project goals and key metrics for evaluating alternatives. Project alternatives were compared based on their ability to meet the six guiding principles, achieve project objectives and address potential risk identified by the stakeholders. Both project alternatives were deemed to offer value to the JPA; however, based on the stakeholder workshop project evaluation results, the Pure Water Project scored twice as high as the Encino Reservoir Project.

On August 1, 2016 the JPA governing Board selected the Pure Water Project as the preferred alternative (herein also referred to as the proposed Title XVI project) for the following reasons:

1) Indirect potable reuse (IPR) is visionary and forward-thinking, consistent with the JPA Board's adopted Guiding Principles.
2) The Pure Water Project involves the best and highest use of the JPA's recycled water resource and retains the full benefit of the resource for the JPA's customers.
3) Potential risks, as identified by the stakeholders, are more effectively avoided with the Pure Water Project.
4) Stakeholder polling identified the Pure Water Project as the preferred alternative.
5) By offsetting the escalating cost to purchase imported water, the Pure Water Project provides substantially greater long-term economic value to the JPA.
6) By replacing energy intensive imported water, there will be greater energy savings and an overall reduction in greenhouse gases.
7) By efficiently utilize existing assets in combination with new infrastructure, there will be cost savings and reduced impacts associated with new construction.
8) The Pure Water Project can be completed in sufficient time to achieve compliance with the terms for implementation of the 2013 Malibu Creek and Lagoon TMDL for Sedimentation and Nutrients to Address Benthic Community Impacts; whereas, timing for The Encino Reservoir Project remains uncertain.

The Pure Water Project will provide a significant new, local and drought-resilient potable water supply that will reduce the JPA's reliance on imported water and the need to develop other water supplies. With reduced imported water usage, which is supplied from the State Water Project, the fragile Bay Delta ecosystem will be less strained and overall greenhouse gases production will decrease.

ES-6 Other Considerations

Environmental Considerations

The proposed Title XVI project construction activities are anticipated to have short-term impacts to endangered or threatened species, water quality, hydrology, natural resources, waters of the United States, and cultural resources. Short-term construction impacts, associated with activities such as grading, excavation and installation of facilities, can be mitigated by methods such as utilizing trenchless technologies for sensitive areas, performing biological and cultural surveys, and implementing best management practices.

Longer-term operation and maintenance activities would include mechanical and chemical treatment of recycled water to meet SWA regulatory requirements, energy, material use, and transportation associated with facility operations, most of which would be conducted at the AWTF.

By replacing imported water, the environmental impacts and energy use may be reduced by the generation of local water supplies.

In addition, the proposed Title XVI project will introduce a very high-quality water into the basin and convey reject water from the RO process out of the basin, which will result in a net export of salt from the watershed and a reduction in constituents, such as bromide (NWRI 2018). The purification of recycled water would thereby produce long-term benefits for groundwater and surface water in the region.

Legal and Institutional Requirements

The JPA is the owner of the Tapia WRF and has made no arrangements nor agreements to transfer jurisdiction of rights to the wastewater. There are no downstream legal users from the Tapia WRF. Thus, there are no anticipated issues related to water or wastewater rights resulting from the implementation of the Pure Water Project.

There are existing contractual water supply obligations as defined in various agreements between LVMWD, TSD and existing water users in the JPA service area that may be affected by implementation of the Pure Water Project. In addition, a new agreement with CMWD would be required to allow the discharge of brine to the SMP.

Interagency coordination would be required with local cities for encroachment permits and with the RWQCB and DDW for permitting. The Pure Water Project must meet all permitting requirements as set forth in the SWA Regulations (SBDDW-16-02), including but not limited to applying to the Regional Board for a permit, obtaining a permit for the operation of a Surface Water Source Augmentation Project (SWSAP), and complying with the terms and conditions of the Regional Board permit.

The JPA has already taken initial steps to meet the SWA regulatory permitting requirements. Completion of CEQA/NEPA compliance requirements will be satisfied prior to construction.

Implementation of the proposed Title XVI project would allow the JPA to beneficially use most, if not all, of the Tapia WRF's excess recycled water and to effectively discontinue discharges to Malibu Creek in the winter months. The Project would therefore achieve compliance with the winter waste load allocations (WLAs) as described in Tapia WRF's waste discharge requirements (WDRs) contained in Order No. R4-2017-0124 and National Pollutant Discharge Elimination System (NPDES) Permit No. CA0056014.

Financial Capability of Sponsor

The JPA would fund its share of the costs in the following way. Capital costs are assumed to be allocated between LVMWD and TSD based on a 70.6%/29.4% split, with O&M costs following the same allocation (PFM 2017).

- Pre-construction costs are expected to be funded through a combination of cash contributions from LVMWD, TSD and grants, to the extent they are available, based on the cost allocation framework (PFM 2017).
- Construction costs are expected to be funded through a combination of grants, loans and municipal bonds. Potential funding partners may be identified, as-appropriate, depending on the potential for a Public Private Partnership (P3) or Regional Consortium to make the Project more cost-effective and/or to reduce risk.
- The JPA would fund full operation, maintenance, and ongoing replacement costs through ongoing rates and charges.

The JPA would evaluate available funding options at the appropriate time when project costs and agreements are further refined, and the Project is closer to construction. A method for allocating costs among the applicable service types (e.g. potable water, recycled water, and sanitation) would also be developed in order to properly determine cost impacts on each respective customer class (PFM 2017). As the initial date of construction nears, the JPA would define an overall Project Financing Plan based on contemporary market conditions and available funding sources.

Research Needs

The proposed Title XVI project would rely on a combination of proven technologies and conventional system components along with the exploration innovative approaches through new areas of research. The AWTF would use proven advanced treatment processes to meet SWA Regulations, while the conveyance of flows to and from the AWTF would consist of conventional conveyance components (e.g. pipelines and pump stations) implemented via industry standard design and construction practices. Three potential areas of research are identified that could be beneficial to the proposed Project:

(1) **brine minimization technologies** - to identify opportunities to achieve a higher RO recovery rate to reduce infrastructure, energy and disposal costs associated with disposal of brine through the SMP.
(2) **brine chemical stabilization strategies** - to identify pretreatment and/or chemical addition/control solutions for stabilizing brine generated from the RO process to maize and/or avoid precipitation in the brine line.
(3) **stormwater capture opportunities** – to provide an opportunity to store and divert stormwater to the sanitary sewer for additional treatment at the Tapia WRF and to increase available flows to the AWTF.

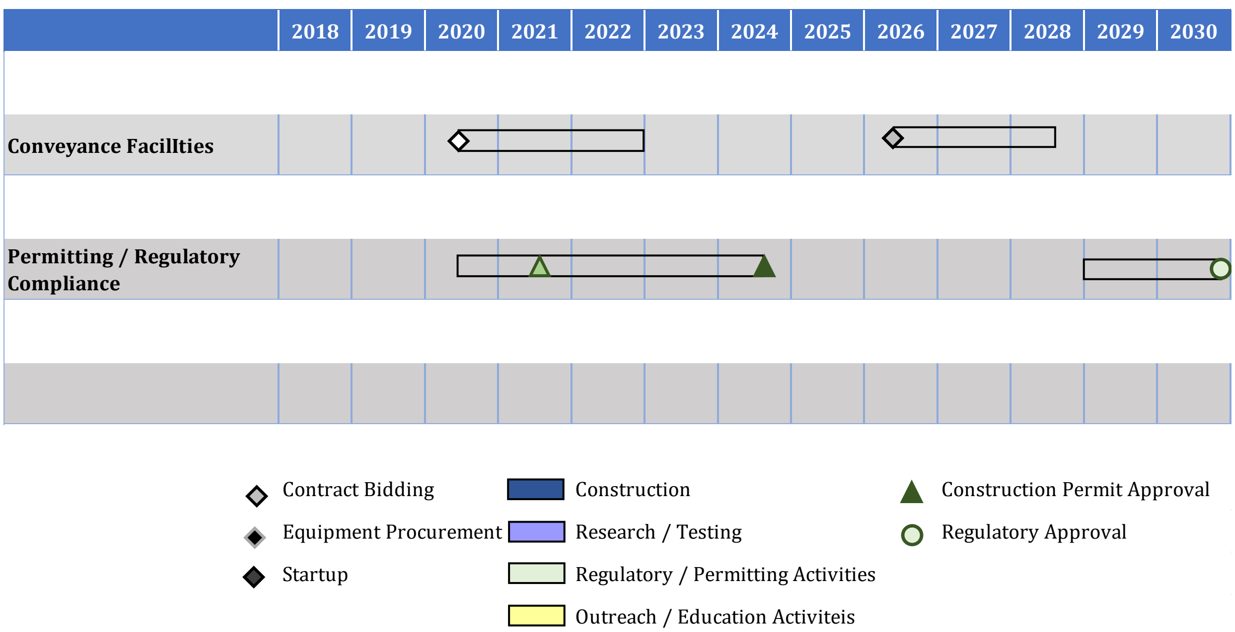
The JPA would administer and lead research projects for brine minimization and stabilization. Research projects related to brine minimization and stabilization would be conducted in the next 1 to 2 years to inform the final design of the AWTF. Initial investigation into these research areas is already being explored as part of the JPA’s Demonstration Project.

A stormwater capture research project would be developed in collaboration with the Enhanced Watershed Management Program for Malibu Creek Watershed (MCWEWMP) developers, County of LADWP, Los Angeles County Flood Control District (LACFCD), and local stormwater management entities, such as Agoura Hills, Calabasas, and Westlake Village. According to the 2016 MCEWMP, the stormwater capture projects being considered are slated for design in December 2019. Should the JPA pursue collaborative or independent research to enhance stormwater capture to supplement source water supplies, it would be beneficial to initiate a feasibility assessment in the next 1 to 2 years to align with the greater MCWEWMP.

ES-7 Next Steps

A proposed implementation schedule for the proposed Pure Water Project is illustrated in Figure ES-7. This schedule is based, in part, on the compliance schedule and milestone dates to achieve compliance with the winter WLAs as described in the Tapia WRF's WDR and NPDES permits.

Figure ES-7: Proposed Pure Water Project Implementation Schedule



The JPA is committed to constructing a purified water demonstration facility and is in the initial phases of planning and design. The JPA received a Bureau of Reclamation WaterSMART grant to conduct research for a variety of operational efficiencies at the demonstration facility. Following the demonstration project, the JPA will be initiating design, equipment procurement and construction for the AWTF and conveyance facilities. Permitting efforts will be conducted in parallel to meet all regulatory requirements and complete necessary environmental documentation. The IAP may be called upon, as-needed to provide expertise and peer review.

Public outreach will be sustained through the Pure Water Project to maintain transparent and open communications with stakeholders and JPA customers.

Section 1 Introduction

The Las Virgenes – Triunfo Joint Powers Authority (JPA) received a grant from the U.S. Bureau of Reclamation (BOR) to perform the Feasibility Study under its Water Reclamation and Reuse (Title XVI) Program.

1.1 Report Organization

This report has been prepared in accordance with BOR's Reclamation Manual Directives and Standards (WTR 11-01). Italicized red text within this report represents excerpts from the BOR manual, whereby the ensuring report text addresses the specific topic. This report consists of the following sections:

- Section 1: Introduction
- Section 2: Background
- Section 3: Water Reclamation and Reuse Opportunities
- Section 4: Description of Alternatives
- Section 5: Economic Analysis
- Section 6: Selection of the Proposed Title XVI Project
- Section 7: Environmental Consideration and Potential Effects
- Section 8: Legal and Institutional Requirements
- Section 9: Financial Capability of Sponsor
- Section 10: Research Needs
- Section 11: References

The following appendices are included to provide additional detail and supporting materials as needed:

- Appendix A: Allowable Recycled Water Uses in California
- Appendix B: Supporting Engineering Calculations
- Appendix C: Engineers Opinion of Probable Costs
- Appendix D: Stormwater Capture
- Appendix E: Brine Minimization
- Appendix F: Initial Environmental Review
- Appendix G: Surface Water Augmentation (SWA) Regulations (SBDDW-16-02)
- Appendix H: Reservoir Modeling
- Appendix I: Independent Advisory Panel
- Appendix J: Project Financing Plan

1.2 Project Overview

The JPA, embarked on this Title XVI Feasibility Study to identify a preferred project to improve local water supply reliability and drought resilience, and effectively eliminate discharges to Malibu Creek in most circumstances, a current practice that will become very costly due to new regulations without commensurate public benefit. Two approaches are evaluated to enable JPA to capture all of its unused recycled water available during winter low irrigation demand season (1) an indirect potable reuse project and (2) a seasonal storage project.

The indirect potable reuse project, herein referred to as the **"Pure Water Project"**, would produce up to 5,151 acre-feet per year of new, local, drought-resilient water supply. The project includes delivery of recycled water to a proposed advanced water treatment facility (AWTF) where proven technology would be used to purify the water and augment imported drinking water supplies stored at the existing Las Virgenes Reservoir. Water from the reservoir is treated and disinfected at the Westlake Filtration Plant (WLFP) prior to distribution. The use of purified recycled water from a municipal water reclamation facility for augmenting a reservoir that is designated as a source of domestic water supply is defined as surface water augmentation (SWA).

The State Water Resource Control Board, Division of Drinking Water (SBDDW) regulations for surface water augmentation using recycled water (SBDDW-16-02) were adopted by the SWRCB on March 6, 2018 under Resolution No. 2018-0014 (herein referred to as SWA Regulations). The Pure Water Project must meet all requirements as set forth in the SWA Regulations, including but not limited to applying to the Regional Board for a permit, obtaining a permit, the operation of a Surface Water Source Augmentation Project (SWSAP), and complying with the terms and conditions of the Regional Board permit.

The seasonal storage project would convey surplus recycled water to the currently dormant Encino Reservoir during the low-demand winter season for use during the high-demand summer season. Encino Reservoir is owned by Los Angeles Department of Water and Power (LADWP) and is not currently in service because of challenges meeting the requirements of the Surface Water Treatment Rule. This project, referred to herein as the **"Encino Reservoir Project"**, would be developed in cooperation with the City of Los Angeles.

The Pure Water Project and the Encino Reservoir Project were developed through a collaborative, stakeholder-driven process that involved over 17 organizations with various roles in the Malibu Creek Watershed. Six conceptual alternatives were developed and evaluated by the stakeholders. The Pure Water Project was identified as the best option to meet the project objectives with the Encino Reservoir Project identified as an alternative approach.

The purpose of this Title XVI Feasibility Study is to evaluate the Pure Water Project and the Encino Reservoir Project alternatives, leveraging preliminary planning studies, the finalized SWA Regulations and findings from recent engineering and planning studies. The work includes evaluating the supply and demand balance for recycled water, appropriate treatment methods, regulatory requirements, treatment plant siting options, pipeline alignments, reservoir hydrodynamics, environmental considerations, and estimated costs and benefits to identify a proposed Title XVI Project.

1.3 Identification of the Non-Federal Project Sponsor(s)

The project sponsor is the Las Virgenes-Triunfo Joint Powers Authority (JPA), a partnership between LVMWD and TSD. The JPA operates the Tapia Water Reclamation Facility (TWRF or Tapia WRF) that provides wastewater treatment service for approximately 100,000 residents in the LVMWD and TSD services areas. The JPA will own and operate the proposed Project.

LVMWD provides potable water, recycled water, and wastewater collection services for over 75,000 people. The district is a member public agency of the Metropolitan Water District of Southern California (MWD) and purchases water directly from MWD. LVMWD serves as the JPA's Administering Agent.

TSD provides wastewater collection services for over 30,000 people in east Ventura County. The district also provides potable and recycled water service in select areas. Potable water supplies are purchased from the Calleguas Municipal Water District (CMWD), a member public agency of MWDSC (JPA 2013).

1.4 Description of the Study Area and an Area/Project Map

Describe study area in terms of both the site-specific project area where the reclaimed water supply will be needed and developed, and any reclaimed water distribution systems.

The study area includes the service areas of LVMWD and Triunfo, located in the northwestern portion of Los Angeles County and the southeastern portion of Ventura County. The JPA's service area, shown in Figure 1-1, generally consists of the Malibu Creek Watershed and small portions of the Los Angeles River Watershed.

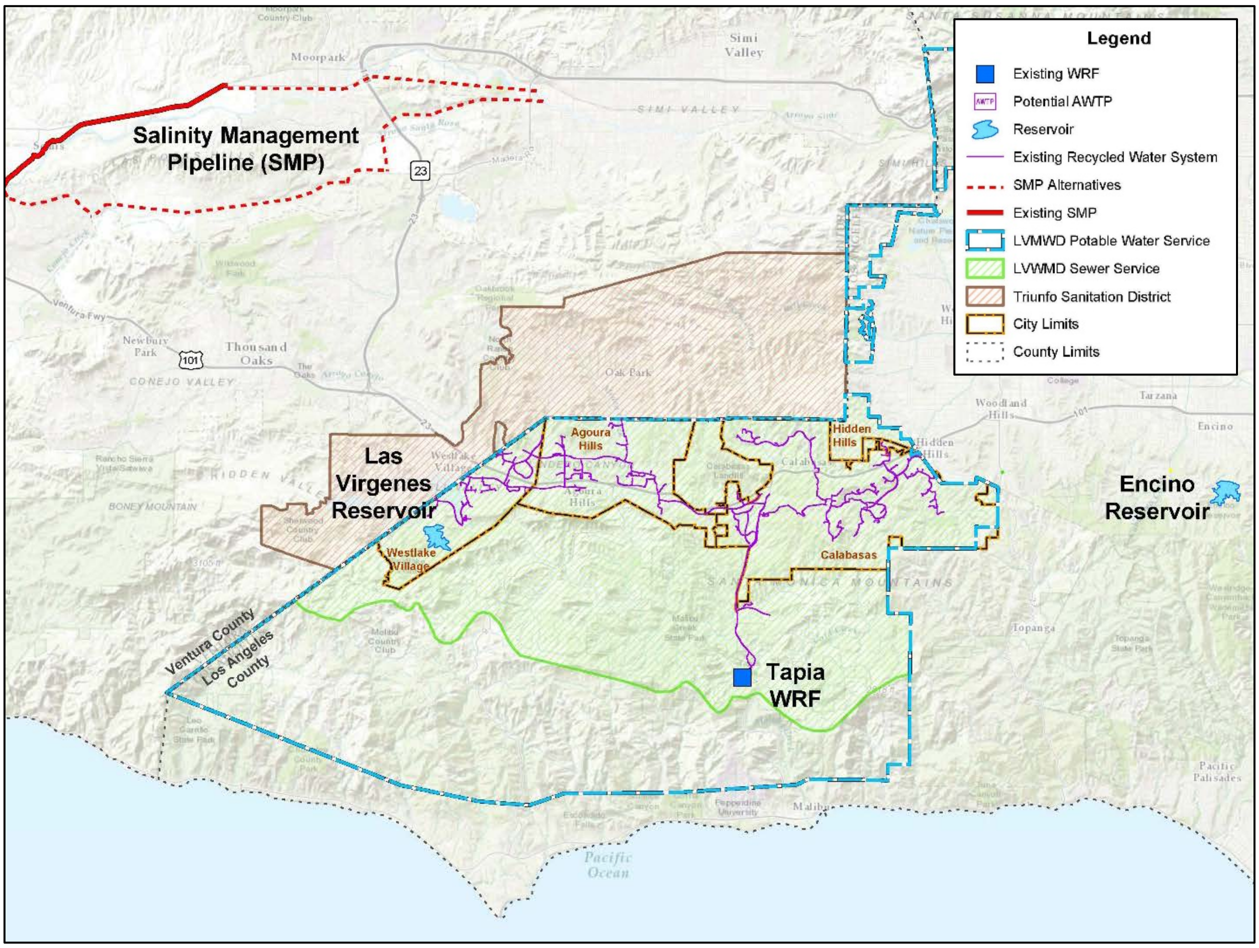
The agencies comprising the JPA have a long history of providing recycled water from TWRF in their respective service areas, serving their first customers in the early 1970s. In the case of LVMWD, 20% of current annual water demand is met with recycled water and over 65% of all wastewater treated is used for recycled water irrigation. The recycled water is primarily used for landscape irrigation of schools, parks, streets and highway medians, property association common areas and golf courses through its extensive recycled water distribution system. Figure 1-1 shows the existing recycled water system.

The Pure Water Project would convert surplus recycled water produced at TWRF to a new local water supply that would benefit the service areas of both agencies. LVMWD provides potable water service to its entire service area and TSD provides potable water service to the Oak Park portion of its service area. In both cases, 100% of the potable water is imported from the State Water Project and purchased from the MWD. The Pure Water Project would include a new advanced water treatment facility (AWTF) located in proximity to the Las Virgenes Reservoir and the existing recycled water conveyance system. A new connection to the regional Salinity Management Pipeline (SMP), also shown in Figure 1-1, would be needed to dispose of concentrate from the reverse osmosis process.

Stored purified water would blend with imported supplies and be available for potable use in the JPA service areas.

The Encino Reservoir Project would require minimal additional treatment beyond the existing Title 22 process and new conveyance facilities to and from Encino Reservoir. Stored recycled water would only be available for non-potable use.

Figure 1-1: Study Area



Section 2 Background

Describe key water resource management problems and needs for which water reclamation and reuse may provide a solution, including the following information. All projections shall be reasonable and for a minimum of 20 years.

The JPA has been working to resolve three critical water resource management problems related to (1) their dependence on imported water supplies, (2) the seasonal imbalance in their supply and demand for recycled water and (3) the constraints related to discharges to Malibu Creek. Increasing water reuse presents an opportunity to address and resolve each of these issues.

2.1 Project Description

The problem and need for a Water Reclamation and Reuse Project

The development of new, local drought-resilient water supplies is needed in the JPA service area to address the following three significant problems.

First, recycled water is the only local water supply within the JPA service area; there is no groundwater of sufficient quantity or quality for municipal use. Every acre-foot of recycled water that is beneficially used offsets an equivalent acre-foot of imported water from the State Water Project. Importing water from the State Water Project to the service area is very energy intensive, as compared to locally purified recycled water, and places additional strains on the sensitive Sacramento-San Joaquin Bay Delta. In addition, due to the combination of highly variable surface water runoff supply, continuing declines in the populations of delta smelt and winter-run chinook salmon in the Sacramento-San Joaquin Bay Delta, sea level rise, seismic activity, and subsidence, which threaten the Delta and its functionality as the hub of California's water system, imported water sources from the State Water Project will be less reliable and more costly in the future.

Second, the seasonal variation of recycled water demand presents a significant operational challenge to maximizing beneficial reuse. Recycled water demands, which consists mostly of irrigation, are high in the warm summer months and low in the cooler winter months, while wastewater flows, which are comprised mostly of urban indoor water return flows, remain relatively constant throughout the year. Lacking seasonal storage for the excess recycled water produced during winter months, the JPA releases the valuable resource to Malibu Creek, which drains to the Pacific Ocean after passing through Malibu Lagoon.

Third, releasing the unused recycled water to Malibu Creek is a practice that is not sustainable. Aside from the fact that the resource is too valuable to waste, increasingly stringent regulatory standards for water body impairments, particularly those for nutrients, cannot be achieved without additional advanced treatment. A *2013 U.S. EPA Malibu Creek and Lagoon Total Maximum Daily Load for Sedimentation and Nutrients to Address Benthic*

Community Impairments established new in-stream limits of 1.0 mg/L total nitrogen and 0.1 mg/L total phosphorous for Malibu Creek. These extremely low nutrient standards cannot be met with conventional wastewater treatment, even when producing Title 22 tertiary treated recycled water. Advanced treatment, including reverse osmosis, is required to meet the standards. As such, discharge of the excess recycled water to Malibu Creek is no longer a viable option absent additional advanced treatment for nutrient removal.

The proposed project alternatives seek to address these problems by maximizing utility of the available recycled water supply, which will offset demands for imported water and eliminate discharges of recycled water to Malibu Creek.

2.2 Current and Projected Water Supplies

Include water rights, potential sources of additional water (other than the proposed Title XVI project) and plans for new facilities.

LVMWD has very limited natural water resources and currently relies on four water supply sources: imported potable water from MWDSC and Ventura County Waterworks District (VCWWD), recycled water from the TWRF, local groundwater from the Thousand Oaks Area Basin (which is only used to supplement source water supply for TWRF), and surface runoff into the Las Virgenes Reservoir (derived from the Santa Monica Mountains). The distribution of supply is dominated by imported water (~84%), followed by recycled water (~16%) with a minor contribution from VCWWD (~0.5%). LVMWD has developed these water resources to provide increased water reliability and efficient water use to help meet the water demand of the LVMWD service area into the future.

TSD/ Oak Park Water Service (herein referred to as the "TSD-OPWS") similarly has limited natural water resources, and the only source of potable water that TSD-OPWS utilizes is imported water through Calleguas Municipal Water District (CMWD). Recycled water supply is also available from the TWRF for non-potable irrigation use.

LVMWD's 2015 Urban Water Management Plan (UMWP) and the TSD-OPWS 2015 UWMP document currently available supplies and predict planned future supplies for a 25-year period, as summarized in Table 2-1.

Table 2-1: Current and Projected JPA Water Supplies (AFY)

Water Supply Source	2015	2020	2025	2030	2035	2040
LVMWD Existing Supplies						
Imported						
MWD[(a)]	19,467	22,412	23,396	24,423	25,495	26,613
Box Canyon (VCWWD 8) [(b)]	16	19	19	19	19	19
Woolsey (VCWWD 17) [(b)]	101	112	112	112	112	112
Local Groundwater [(c)]	0	0	0	0	0	0
Recycled Water [(d)]	4,240	4,255	4,269	4,284	4,299	4,314
LVMWD Existing Supplies	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**
LVMWD Planned Supplies [(e)]	**0**	**0**	**0**	**0**	**0**	**0**
Total LVMWD Supplies	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**
TSD-OPWS Existing Supplies						
Imported (from MWD) [(f)]	1,981	3,000	3,000	3,000	3,000	3,000
Recycled Water [(g)]	1,036	1,360	1,360	1,360	1,360	1,360
TSD-OPWS Existing Supplies	**3,017**	**4,360**	**4,360**	**4,360**	**4,360**	**4,360**
TSD-OPWS Planned Supplies	**0**	**0**	**0**	**0**	**0**	**0**
Total TSD OPWS Supplies	**3,017**	**4,360**	**4,360**	**4,360**	**4,360**	**4,360**
Total JPA Supplies	**26,841**	**31,159**	**32,158**	**33,201**	**34,289**	**35,423**

Sources: 2015 UWMPs (Kennedy/Jenks 2016 and RMP 2016)
(a) Imported supplies from MWDSC are assumed to be equal to total LVWMD demands less other imported water supplies.
(b) Interconnections with these agencies provide potable water to two geographically isolated areas not currently connected to the LVMWD distribution system. Projections based on historical average supplies.
(c) Groundwater underlying the LVMWD service area has poor water quality and is solely used to augment the recycled water system. Groundwater quantities used are accounted for in recycled water supplies and are therefore set to 0 to avoid double counting.
(d) Existing recycled water supplies are set equal to the lesser of recycled water supplies or demands.
(e) Potential planned/future supplies for an IPR or Seasonal Storage project (Title XVI projects explored herein) are not reflected in this table.
(f) 2015 supply reflects actual volume purchased from CMWD (SWP/Colorado River Aqueduct). Projected supplies represent estimate of reasonably available volume purchase from CMWD. CMWD does not contract with its retail purveyors to limit or guarantee imported water availability. The volume entered (3,000 AFY) is a reasonable, normal year estimate of imported water available from MWDSC through CMWD, but not a contractual supply (RMP 2016).
(g) Delivered through TSD/CMWD/OPWS-TSD, and assuming future expansion of CMWD

MWD has invested significantly in the development of a diverse resource mix to ensure continued reliability of its supplies. Based on the 2015 MWDSC UWMP, MWDSC anticipates having supplies sufficient to reliably meet JPA water demands through 2040 during average, single-dry, and multiple-dry years. The JPA is interested in pursuing local, sustainable and reliable water supply projects, such as the Title XVI project alternatives explored herein, to provide additional reliability beyond imported supplies in the future.

The LVMWD and TSD-OPWS continue to explore and implement improvements to their potable water systems to enhance operations and reliability. Pipeline, storage, and pumping upgrade projects will improve potable water infrastructure to meet existing and projected demands, however, these projects will not change the availability of existing supplies or result in new supplies (Kennedy/Jenks 2016).

Due to the fact that the TSD-OPWS service area is built out and the population is not expected to increase over the planning horizon, there are no capital projects in progress or planned to increase the quantity of water supply to the area (RMP 2016).

Other than the proposed Title XVI project, there are no plans for new facilities to develop additional water supplies.

2.2.1 *Imported Water Supplies*

LVMWD receives the imported supplies on its eastern side and then distributes it to its customers through its potable water distribution system. LVMWD maintains three connections to the MWDSC system: (LV1) West Valley Feeder No. 1, (LV2) Calabasas Feeder and (LV3) West Valley Feeder No. 2. LVMWD's total instantaneous imported water supply capacity is 33,000 gallons per minute (gpm), or 73 cubic feet per second (cfs).

During planned and unplanned MWDSC outages, LVMWD also utilizes an interconnection to the Los Angeles Department of Water and Power (LADWP), which was enabled through an agreement with MWDSC and LADWP. LADWP provides supply at two distinct connections, one at Kittridge Street and one at Germain Street (Kenned/Jenks 2016).

In addition to the imported water connections with MWDSC, LVMWD also receives a small amount of treated imported water from the City of Simi Valley/Ventura County Waterworks District 8 and Ventura County Waterworks District 17. On average these supplies account for less than one percent of LVMWD's potable water deliveries. Interconnections with these agencies provide potable water to two small areas in the hills west of the San Fernando Valley, Woolsey Canyon and Box Canyon. These areas are geographically isolated, and currently not connected to the rest of the LVMWD distribution system. However, LVMWD may connect these customers to the main potable water distribution system in the future (Psomas 2005).

TSD-OPWS purchase imported water through CMWD, primarily from the State Water Project, though Colorado River water serves as a secondary supply source during water supply deficiencies. MWDSC delivers the State Water Project water after treatment at the Joseph Jensen Treatment Plant in Granada Hills and Colorado river water after treatment at the F.E. Weymouth Treatment Plant, located in the City of La Verne (RMP 2016).

2.2.2 *Potable Water Reservoir*

LVMWD owns and operates the Las Virgenes Reservoir, located just south of Westlake Village (Figure 1-1). This potable water reservoir has a total capacity of 9,600 AF and provides storage to balance differences between seasonal potable supply and demands. This reservoir is filled with treated imported water and is withdrawn and replenished as needed. In low demand season LVMWD puts water into the reservoir, while in high demand season LVMWD draws upon the reservoir to meet the increased demands. In addition to serving as a seasonal storage facility, the reservoir also provides emergency storage capacity that can be used during imported water outages.

Water withdrawn from the reservoir is treated and disinfected at the Westlake Filtration Plant. The plant is rated for 18 million gallons per day (mgd) and typically operates during periods of peak demand in the summer. The total volume of the reservoir typically fluctuates by several hundred to more than 1,000 AF each year. Since its creation, the reservoir has remained at a volume of approximately 7,300 AF, but occasionally drops below 4,000 AF during dry months, and reaches over 9,000 AF when recharge water is purchased from MWDSC.

While the reservoir's watershed area does not supply a significant source of water in most years, it is estimated that sufficient runoff is typically produced to offset evaporative losses. Based on an assumed watershed area of 550 acres, the watershed is estimated to receive about 770 AF annually, whereby average evaporation losses are estimated at about 700 AFY. Due to the uncertainties of runoff volumes and minimal contribution to overall water supplies, this runoff is not accounted for in LVMWD supplies listed in Table 2-1 (Kenned/Jenks 2016).

2.2.3 *Potable Water Interconnections*

Currently, LVMWD and Calleguas Municipal Water District (CMWD) are currently in the process of developing a joint interconnection between their potable water systems. The interconnection would enable delivery of potable water from one agency to the other if imported water supply was interrupted and would enable LVMWD to receive water from CMWD to support winter refill of Las Virgenes Reservoir. This project is anticipated to enable the exchange of approximately 870 AFY and will enable LVMWD to fill the Las Virgenes Reservoir by an additional 1,300 AFY. This additional water would serve as an alternative to purchasing water from MWDSC during summer months (Kenned/Jenks 2016).

Overall, this interconnection will increase reliability of the potable water system of both agencies, however, this would not create a new source of water supply for either agency.

2.2.4 *Groundwater Supplies*

Currently, LVMWD operates two groundwater wells in the Thousand Oaks Area Groundwater Basin; Westlake Well 1 and Westlake Well 2, which are located along Lindero Canyon Road, South of Highway 101. The combined capacity of these two wells is approximately 1.15 mgd, or 800 gpm. Due to high levels of iron and manganese, groundwater pumped from these wells needs to be treated first. To avoid the need of a separate treatment facility, the pumped groundwater is discharged into the sewer collection system only when additional recycled water is needed. After mixing and conveyance, this water is treated at the TWRF, at which point it is used to supplement the recycled water system (Kenned/Jenks 2016).

Groundwater is not a source of potable water to the TSD-OPWS (RMP 2016).

2.2.5 *Recycled Water Supplies*

Recycled water is discussed in Section 3.

2.2.6 *Water Rights*

There are no legal or institutional barriers related to the availability or ownership of the excess recycled water that would interfere with the project.

Under Water Code section 1210 "The owner of a wastewater treatment plant…shall hold the exclusive right to the treated waste water as against anyone who has supplied the water discharged into the waste water collection and treatment system...". The JPA is the owner of the TVWRF and has made no arrangements nor agreements to transfer jurisdiction of rights to the wastewater.

2.3 Current and Projected Water Demands

Table 2-2 summarizes current and projected water demands in the JPA service area for a 25-year period, based on information provided in the 2015 LVMWD UWMP and the 2015 TSD-OPWS UWMP. Potable water demands are met through the potable water distribution system and recycled water demands are met through the recycled water distribution system. Projected demands account for anticipated population estimates and planned new developments (Kennedy/Jenks 2016 and RMP 2016)

Table 2-2: Current and Projected JPA Water Demands (AFY)

Demands	2015	2020	2025	2030	2035	2040
LVMWD Estimated Demands						
Potable Water Demands	19,585	22,543	23,527	24,554	25,626	26,744
Recycled Water Demands [(a)]	4,240	4,255	4,269	4,284	4,299	4,314
Total LVMWD Demands	**23,825**	**26,798**	**27,796**	**28,838**	**29,925**	**31,058**
TSD-OPWS Estimated Demands						
Potable Water Demands	2,159	2,535	2,535	2,535	2,535	2,535
Recycled Water Demands [(b)]	1,036	1,120	1,140	1,140	1,140	1,140
Total TSD OPWS Demands	**3,195**	**3,655**	**3,675**	**3,675**	**3,675**	**3,675**
Total JPA Demands	**27,020**	**30,453**	**31,471**	**32,513**	**33,600**	**34,733**
Total LVMWD Supplies [(c)]	23,824	26,798	27,796	28,838	29,925	31,058
Total TSD-OPWS Supplies [(c)]	3,017	4,361	4,362	4,363	4,364	4,365
Total JPA Supplies [(c)]	**26,841**	**31,159**	**32,158**	**33,201**	**34,289**	**35,423**
Difference (Supply - Demand)	**-179**	**706**	**687**	**688**	**689**	**690**

Sources: 2015 UWMPs (Kennedy/Jenks 2016 and RMP 2016)

(a) Includes non-potable recycled water demands within LVMWD service area only.
(b) Includes planned expansion in the OPWS area's recycled water system.
(c) See Table 2-1.

2.4 Water Quality

Water Quality Concerns for the Current and Projected Water Supplies

2.4.1 *Current Supply Water Quality*

The JPA meets much of its existing potable water demands with imported water from the State Water Project, which is derived from rain and snow from the Sierra Nevada, Cascade, and Coastal mountain ranges and conveyed via a system of natural and artificial channels and pipelines. Imported SWP water is generally of high quality with low levels of TDS, sulfate, hardness, iron and manganese, and consistently meets all federal and state water quality standards as reported in the annual Water Quality Report (LVMWD 2014).

On occasion, the JPA may receive water from the Colorado River Aqueduct, which consists of a 242-mile aqueduct delivering water from the Colorado River at Lake Havasu. The water quality of Colorado River water deliveries is typically lower than water delivered from the State Water Project, but consistently meets all federal and state water quality standards.

As previously noted, the JPA receives water primarily from MWD's Jensen Plant (100% SWP water), and on occasion from the Weymouth Plant (combination of SWP and Colorado River water). A summary of constituents in these two treatment plants is provided in Table 2-3.

Table 2-3: Select Parameters from MWDSC 2016 Water Quality Report

Parameter	Unit	State MCL	Public Health Goals (NL)	Reported	Jensen Plant	Weymouth Plant
Turbidity	NTU	TT=1	N/A	Highest	0.05	0.03
Nitrate (as nitrogen)	ppm	10	10	Range Average	0.6 – 0.9 0.8	ND ND
Chloride	ppm	200	N/A	Range Average	89-97 93	103 103
Sulfate	ppm	500	N/A	Range Average	86-104 95	256-259 258
Total Dissolved Solids (TDS)	ppm	1,000	N/A	Range Average	377-423 400	650-659 655
Hardness (as $CaCO_3$)	ppm	N/A	N/A	Range Average	126-132 129	293-306 300
Total Organic Carbon	ppm	N/A	N/A	Range Highest RAA	1.8-2.8 2.2	1.7-2.8 2.5
N-Nitrosodimethylamine (NDMA)	ppt	N/A	3 (10)	Range	ND	ND-2.7

Sources: 2016 Water Quality Table from the MWDSC Annual Drinking Water Quality Report.
http://www.mwdh2o.com/PDF_About_Your_Water/2.3.1_Annual_Water_Quality_Report.pdf
Acronyms: NTU (Nephelometric Turbidity Units), TT (Treatment Technique) MCL (Maximum Contaminant Level), NL (Notification Level), N/A (Not Available), ppm (parts per million), ppt (parts per trillion)

The water quality reports of the Ventura County Waterworks Districts providing water to LVMWD also show that delivered water quality is high and well below the State drinking water standards (VCWWD 8 and 17, 2015).

LVMWD provides additional disinfection and filtration at the Westlake Filtration Plant, for stored imported water in Las Virgenes Reservoir before distribution through the potable water system. The plant only operates when: (1) water is drawn from the reservoir in the high-demand summer months, (2) there are planned maintenance shutdowns by MWDSC or (3) the supply of water from MWDSC may be unexpectedly interrupted during an emergency. The plant, however, is always in "standby mode" and can be on-line within hours. Filtration at the plant is accomplished through 12 filtration units containing diatomaceous earth filtration media. The filtered water is then disinfected with chloramines. While in operation, the filtration plant is controlled by state certified, skilled treatment plant operators and a complex automated monitoring system, to ensure safe and consistent water quality. Reservoir supplies have historically been of very high quality. LVMWD does not currently experience and does not foresee issues with water quality from this reservoir (Kennedy/Jenks 2016).

As previously discussed, LVMWD local groundwater is limited in supply and the quality is not suitable to be used as potable water source without substantial treatment. Thus, groundwater is used only to augment the source water supply for TWRF.

While recycled water is not a source of the JPA's potable water supplies, its reliability and hence its quality, is important for continuing to offset non-potable water demands. Recycled water comprises nearly 20 percent of LVMWD's total water use on an annual basis and over 30 percent of TSD-OPWS's total water use on an annual basis. The recycled water is stored in an open reservoir, which can often times result in increased levels of particulate matter, which could potentially impact its usability. However, the JPA has had success with using non-clogging sprinklers and valve controllers where problems with particulate matter have been experienced. No other water quality issues related to recycled water have been identified to pose problems in the JPA service area (Kennedy/Jenks 2016). Section 3 includes an additional discussion about the associated water quality and treatment requirements for the existing recycled water supply.

It is recognized that the TSD-OPWS own and operate storage and distribution systems only, and therefore can focus only on operational/distribution parameters, bacteriological, disinfection by products and corrosivity.

Based on current conditions and knowledge, water quality is not anticipated to affect JPA's water supply reliability. JPA receives and expects to continue to receive high quality imported water. However, as water quality issues are constantly evolving, LVMWD and TSD-OPWS will take appropriate steps to continue providing safe, high quality water supplies, to the extent feasible.

2.4.2 *Projected Supply Water Quality*

The projected supply for the Pure Water Project would be purified water produced at an advance water treatment plant that receives recycled water from the TWRF. The water quality requirements for a reservoir augmentation project are governed by SWA Regulations (SBDDW-16-02), which were adopted by the SWRCB on March 6, 2018. A summary of potential water quality requirements for reservoir augmentation is provided in Section 3.

The projected supply for the Encino Reservoir Project would be recycled water from the TWRF, which would have the same water quality requirements as the current recycled water supply.

2.5 Existing and Future Resources

Current and Projected Wastewaters and Disposal Options Other Than the Proposed Title XVI Project. Include plans for new wastewater facilities, including projected costs.

Currently, 100 percent of the wastewater in the JPA service area is collected and treated to disinfected tertiary recycled water standards at the TWRF. Excess treated water effluent from TWRF is discharged to two local waterways. The primary disposal method is discharge into Malibu Creek during the months of November to April. Excess effluent, beyond what can be discharged to Malibu Creek, is discharged to the Los Angeles River, via the Arroyo Calabasas, which requires pumping over the Calabasas grade.

Discharges from the TWRF are regulated under an NPDES permit (Order No. R4- R4-2017-0124) issued by the Los Angeles Regional Water Quality Control Board. Under the existing permit, the JPA is generally prohibited from discharging to Malibu Creek from April 15 to November 15. However, when the creek flow drops below 2.5 cubic feet per second (cfs) during this period, LVMWD is required to release recycled water from TWRF to provide water pools (habitat) for the endangered steelhead trout.

Current and future wastewater flow projections area summarized in Table 2-4. TSD accounts for approximately 30% of the total contribution to the TWRF on average (RMP 2016). The remaining 70% is derived from wastewater collected in LVMWD's service area. The treatment capacity of TVWRF is sufficient for projected wastewater flows through 2040. New wastewater treatment facilities are not planned at this time.

Table 2-4: Current and Projected Wastewater Flows (AFY)

Wastewater	2015	2020	2025	2030	2035	2040
Wastewater Flows						
Influent to TWRF [(a)]	8,550	8,181	9,374	10,741	12,308	14,103
Recycled Water Demands [(b)]						
LVMWD	4,240	4,255	4,269	4,284	4,299	4,314
TSD-OPWS	1,036	1,120	1,140	1,140	1,140	1,140

Source: 2015 UWMP (Kennedy/Jenks 2016)

(a) Wastewater flows from LVMWD and TSD combined. 2015 value includes supplemental groundwater in 2015 and retreat water. Actual sewage flows were 6,854. Projected flows do not include groundwater supplement.
(b) Demands may be met by potable water in summer months when insufficient recycled water is available.
(c) Discharges were not projected as part of the UWMPs.

The JPA has explored long-range plans to beneficially use all of the JPA's recycled water and to effectively discontinue discharges to Malibu Creek. In July of 2015, a Plan of Action was approved for the effort by the JPA Board of Directors, which includes exploration of the Pure Water Project and the Encino Reservoir Project to increase reuse via IPR and seasonal storage, respectively. These projects are the focus of this Title XVI Feasibly Study.

Section 3 Water Reclamation and Reuse Opportunities

Address the opportunities for water reclamation and reuse in the study area, and identify the sources of water that could be reclaimed

The JPA has produced various studies over the years to explore opportunities to maximize reuse of recycled water from the TWRF, including expansion of their existing purple pipe system by constructing seasonal storage to meet peak summer demands and exploring potable reuse through augmentation of a local reservoir. For each of these expansion opportunities, the primary source of water to be reclaimed is derived from wastewater produced within the JPA service area, with groundwater and potable water supplementing the system when needed to meet peak demands. This section describes the identified uses for recycled water, the future water market, and the requirements, challenges and opportunities to expand reuse.

3.1 Identified Uses for Reclaimed Water

Description of all uses for reclaimed water or categories of potential uses. Environmental restoration, fish and wildlife, groundwater recharge, municipal, domestic, industrial, agricultural, power generation, and recreation. Identify any associated water quality, and associated treatment requirements.

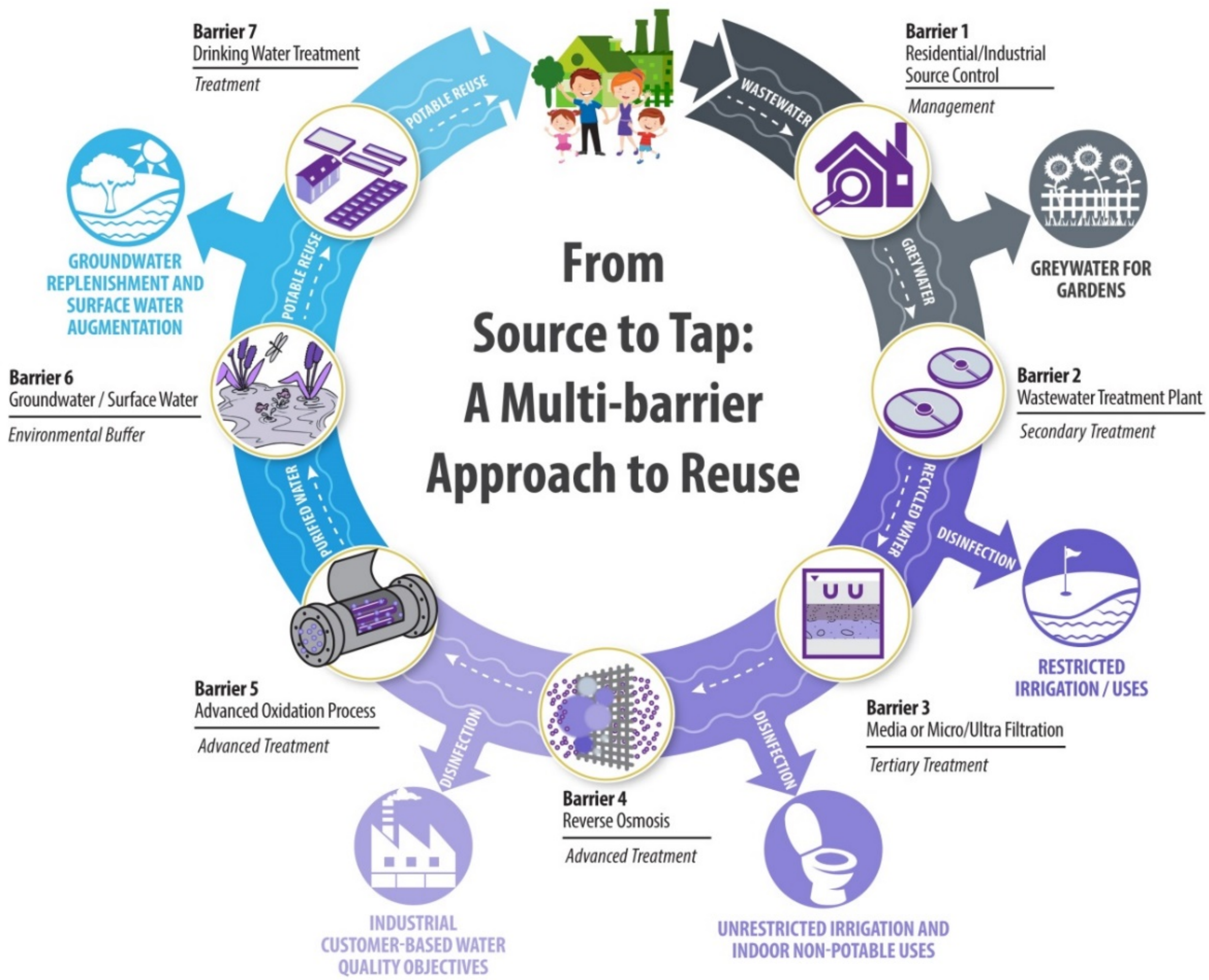
Recycled water begins as wastewater and undergoes a series of treatment steps, using a multi-barrier approach, to remove organic matter and pollutants. The production and use of recycled water must adhere to strict regulations stipulating the levels of treatment, allowable types of reuse and water quality requirements. Figure 3-1 illustrates the multi-barrier approach to reuse, highlighting the increasing level of treatment necessary to produce the right quality of water for the right use. This section discusses current and potential future uses of recycled water from the TWRF.

3.1.1 Current Uses

The TWRF currently produces tertiary-treated disinfected recycled water that meets the standards specified in Title 22 of the California Code of Regulations (CCR) for unrestricted non-potable use. **Non-potable reuse (NPR)** refers to the use of municipal wastewater for a specific purpose other than drinking, such as landscape irrigation, industrial uses, and agriculture or for environmental benefits. Non-potable reuse usually requires an independent "purple pipe" distribution system for conveying recycled water to customers separate from the potable supply.

Approximately 60% of the recycled water produced at the TWRF is applied towards non-potable uses, including irrigation of green belts, parks, schools, homeowner's association (HOA) common areas, and golf courses. Recycled water is also used at the TWRF, Pepperdine University, Rancho Las Virgenes Composting Facility and Rancho Las Virgenes Farm (RMC 2012). LVMWD is required to release water to Malibu Creek to support endangered Southern Steelhead when streamflow drop below 2.5 cubic feet per second (cfs) as measured by a County of Los Angeles stream gage. Approximately 4,000 AF/year is currently discharged to Malibu Creek.

Figure 3-1: Multi-Barrier Approach to Reuse



Current average production of recycled water is approximately 10,600 acre-feet per year or 9.5 million gallons per day (MGD). Average recycled water sales from 2001 to 2015 was approximately 6,500 AFY. Table 3-1 shows the historical amount of recycled water produced at the TWRF, recycled water sales and potable water used to supplement the recycled water system when demands exceeded supplies. While the supply of recycled water from the wastewater system and TWRF remains relatively constant throughout the year, the demand for recycled water fluctuates greatly between the summer peak season and the winter season. Potable water is used to supplement the recycled water when supplies are insufficient to meet demands.

Table 3-1: Recycled Water Production, Sales and Supplements (2001 to 2017)

Year	Recycled Water Production		Recycled Water Sales		Potable Water Supplement	
Unit	(AFY)	(MGD)	(AFY)	(MGD)	(AFY)	(MGD)
2001	11,118	9.9	6,111	5.5	170	0.2
2002	10,156	9.1	6,924	6.2	111	0.1
2003	9,679	8.6	6,402	5.7	177	0.2
2004	9,798	8.7	6,800	6.1	139	0.1
2005	9,840	8.8	6,318	5.6	137	0.1
2006	9,775	8.7	6,551	5.8	194	0.2
2007	9,840	8.8	7,202	6.4	239	0.2
2008	9,908	8.8	7,123	6.4	508	0.5
2009	9,126	8.1	6,091	5.4	355	0.3
2010	9,238	8.2	5,790	5.2	60	0.1
2011	9,081	8.1	5,997	5.4	214	0.2
2012	8,705	7.8	6,562	5.9	573	0.5
2013	8,834	7.9	7,358	6.6	998	0.9
2014	8,279	7.4	7,084	6.3	1,021	0.9
2015	7,060	6.3	5,894	5.3	530	0.5
Maximum	**11,118**	**9.9**	**7,358**	**6.6**	**1,021**	**0.9**
Minimum	**7,060**	**6.3**	**5,790**	**5.2**	**60**	**0.1**
Average	**9,362**	**8.4**	**6,547**	**5.8**	**362**	**0.3**

Source: BODR (MWH 2016) and supplemental data provided by the JPA.

The TWRF produced disinfected tertiary-treated recycled water that complies with the Title 22 of the CCR and the Los Angeles Regional Water Quality Control Board (Los Angeles RWQCB). The use of recycled water is regulated under Water Reclamation Requirements contained in Order No. 87-086 which was later readopted on May 12, 1997, through General Order No.97-072. Table 3-2 summarized recycled water quality at the TWRF.

Table 3-2: Recycled Water Quality at TWRF

Parameter	Units	Average	Max
Ammonia (as N)	µg/L	97	440
BOD (5-day @ 20° C)	mg/L	1.7	4.6
Boron	mg/L	0.39	0.48
Chloride	mg/L	160	182
Copper (Total Recoverable)	µg/L	4.974	16
Cyanide	µg/L	1.82	10
Nickel (Total Recoverable)	µg/L	3.5	5
[Nitrate + Nitrite] (as N)	mg/L	7	9.9
Orthophosphate (as P)	mg/L	2.3	3.4
Sulfate	mg/L	192	281
TDS	mg/L	744	860
Total Suspended Solids	mg/L	1.69	9.9
Turbidity	NTU	<1	7

Source: BODR (MWH 2016) and supplemental data provided by the JPA.
Note: Data summarizes TWRF effluent concentrations recorded at Tapia Effluent Pump Station (TEPS) between November 2010 and December 2014. NTU = Nephelometric Turbidity Unit. µg/L = micrograms per liter

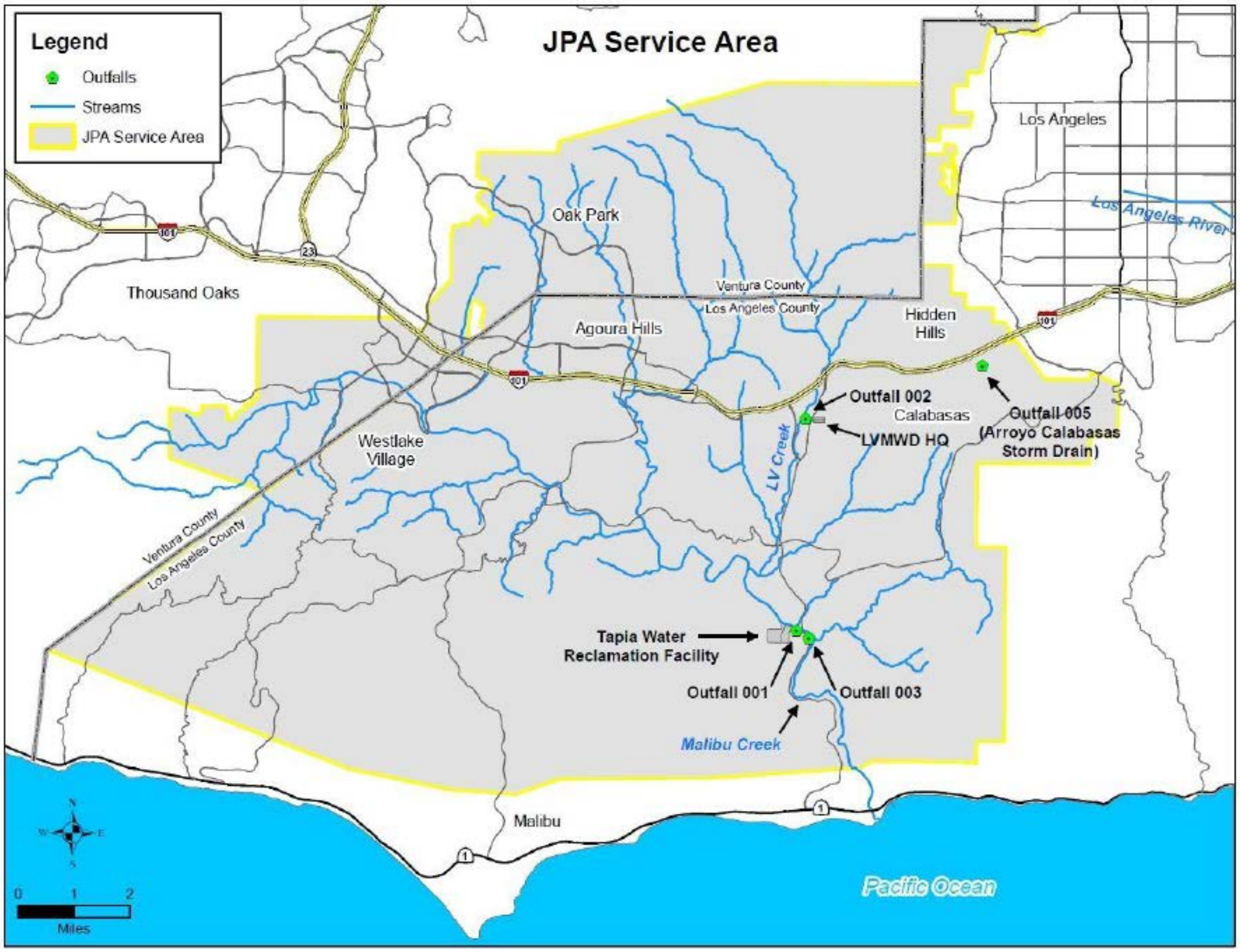
3.1.2 Discharge Limitations

Recycled water in excess of demands is discharged into Malibu Creek and the LA River pursuant to Tapia's waste discharge requirements (WDRs) contained in Order No. R4-2017-0124 and NPDES Permit No. CA0056014, adopted by the Los Angeles RWQCB on June 1, 2017. Figure 3-2 shows the locations of discharge points within the JPA service area (LARWQCB Order No. R4-2017-0124).

Recycled water discharge to Malibu Creek is prohibited from April 15th to November 15th of each year to minimize the contribution of TWRF's discharge to breaching of sandbars at the mouth of Malibu Lagoon, which would impact both wildlife and human health beneficial uses. During the discharge prohibition periods, recycled water in excess of demands is disposed of by pumping/discharge to the Los Angeles River and spray field application.

The TWRF's NPDES permit includes limits of 8 milligrams per liter (mg/L) of nitrate + nitrite as nitrogen and 3 mg/L of phosphorous. The nitrogen limit was based on the 2003 U.S. Environmental Protection Agency (EPA) Nutrient Total Maximum Daily Load (TMDL) for the Malibu Creek Watershed and the phosphorous limit was performance based. In August 2009, the District completed the construction of nitrification and denitrification (NDN) facilities at the TWRF to meet the final effluent limitations (RMC 2012).

Figure 3-2: Points of Discharge in JPA Service Area



Source: LARWQCB Waste Discharge Requirements for the Las Virgenes Municipal Water District, Tapia Water Reclamation Facility, Order No. R4-2017-0124

3.1.3 Potential Future Uses

This section described potential future non-potable and potable uses of recycled water based on prior studies conducted by the JPA.

3.1.3.1 Future Non-Potable Uses

The JPA's current recycled water system has successfully connected most of the easily accessible, high-demand NPR customers in the JPA's service area. Thus, future expansion is limited by available supply, cost, and existing system capacity. Recycled water supply is expected to grow moderately over the next two decades, driven by new developments connecting to the sewer system and conversion of septic systems to sewers. The feasibility of serving future uses is contingent on the infrastructure requirements and associated costs to connect new users.

Expansion of the existing NPR system has been explored as part of the 2014 RWMP Update (HDR 2014) and the BODR (MWH 2016), which looked at opportunities to expand the system through infill development and recycled water main extensions.

- **Infill development** assumes that new NPR customers would be added as inflows to the TWRF increase. Infill development uses are primarily for landscape irrigation and is estimated to add up to 20 percent to existing demands.
- **Extension of the existing recycled water system** would aim to serve large irrigation customers within and outside of the JPA service area. Extension uses would include golf courses, schools, landscape irrigation and some commercial sites. Specific customers are identified in Section 3.2.1.

The need to supplement the recycled water system with potable water during the hot summer months is a significant cost and a major deterrent to adding customers with peak irrigation demands. Creating seasonal storage would negate the need for potable water supplement by addressing the seasonal imbalance of supply and demand. The Encino Reservoir Project would provide an opportunity to increase the amount of supply available for irrigation uses by storing winter flows for delivery in high demands months. The Encino Reservoir Projects would enable the JPA to store the excess recycled water to meet the supply gap in the summer months.

3.1.3.2 Future Potable Uses

Potable reuse refers to the intended use of highly treated or purified municipal wastewater to augment a water supply that is used for drinking and all other purposes. Unplanned potable reuse, where one community draws raw water supplies downstream from discharges from wastewater treatment plants, is regulated by federal discharge requirements. Planned potable reuse involves a more formal public process and regulatory consultation program to implement the purposeful introduction of recycled water or highly purified recycled water into an untreated or treated drinking water supply source. Prior planning efforts by the JPA have identified the augmentation of surface water at Las Virgenes Reservoir as a future potable use opportunity.

The Pure Water Project would enable the JPA to fully utilize the excess recycled water by treating it at a new advanced water treatment plant and supplementing potable supplies stored at Las Virgenes Reservoir. Outflows from the reservoir would be treated at the Westlake Filtration Plant (WLFP) and distributed through the drinking water system for all potable uses.

The Pure Water Project, would be governed by SWA Regulations (SBDDW-16-02), included in Appendix G, which require achieving:

1) An initial minimum theoretical retention time of no less than 180 days (calculated as total monthly volume divided by total monthly outflow); however, an alternative minimum theoretical retention time of less than 180 days but no less than 60 days may be considered for approval.

2) A dilution requirement in the reservoir of 100:1 (one percent by volume), or 10:1 (ten percent by volume) with an additional 1-log microbial pathogen treatment to demonstrate the percent of recycled water withdrawn from the reservoir, by volume, during any 24-hour period.

The SWA Regulations also include pathogen and chemical control requirements at the AWTF. The treatment criteria for pathogens are based on the dilution of the discharged advanced treated water achieved in the reservoir. Table 3-3 summarizes the removal criteria required for enteric virus, *Cryptosporidium*, and *Giardia* that are to be met by the wastewater and advanced water treatment facilities, upstream of the reservoir. If there is less than 10:1 dilution available in the reservoir, then the project is not classified as SWA and would likely be defined as a direct potable reuse project.

Table 3-3: Surface Water Augmentation Pathogenic Microorganism Control

Dilution	Enteric Virus Removal	Cryptosporidium Removal	Giardia Removal
Dilution ≥ 100:1	8-log	7-log	8-log
100:1 ≥ Dilution ≥ 10:1	9-log	8-log	9-log
Dilution < 10:1	Not classified as surface water augmentation		

Note: removal requirements to be met by wastewater and advanced water treatment based on SWA Regulations

The initial minimum theoretical retention time is 180 days. As noted above, a project can submit an alternative compliance plan if the retention time is between 60 days and 180 days. In the following equation, V_{total} is the volume in the reservoir at the end of the month and Q_{out} is the total outflow from the reservoir during that month.

$$\tau = \frac{V_{total}}{Qout} \geq 180\ days$$

3.2 Water Market

Water Market Available to Utilize Recycled Water to be Produced

The market for the recycled water produced at the TWRF has historically been limited to non-potable reuse for urban irrigation, golf courses and other commercial uses. The opportunity to grow the NPR market is limited by recycled water supply, seasonal storage and the economic viability of connecting new NPR customers.

Potable reuse offers great promise because the recycled water market is drastically expanded to include potable water customers. Together, the JPA member agencies serve potable water to a population of nearly 84,000, consisting of approximately 25,000 service connection. The potable water demand for the customers is approximately 24,000 AF/year.

This section describes the market procedures used and the associated potential users identified to utilize recycled water produced at the TWRF.

3.2.1 Identification of Potential Users

Define the expected use, peak use, on-site conversion costs, and desire to use recycled water for each potential user, including consultation with potential recycled water customers and letters of intent if available.

Potential customers, identified in the BODR, include infill development, non-potable users in route to Encino Reservoir and an extension in Woodland Hills, as shown in Figure 3-3. These customers would only be pursued for the Encino Reservoir Project, where available recycled water flows would be stored in the winter months and conveyed back to the JPA service area to meet peak summer demands. The estimated demands are summarized in Table 3-4.

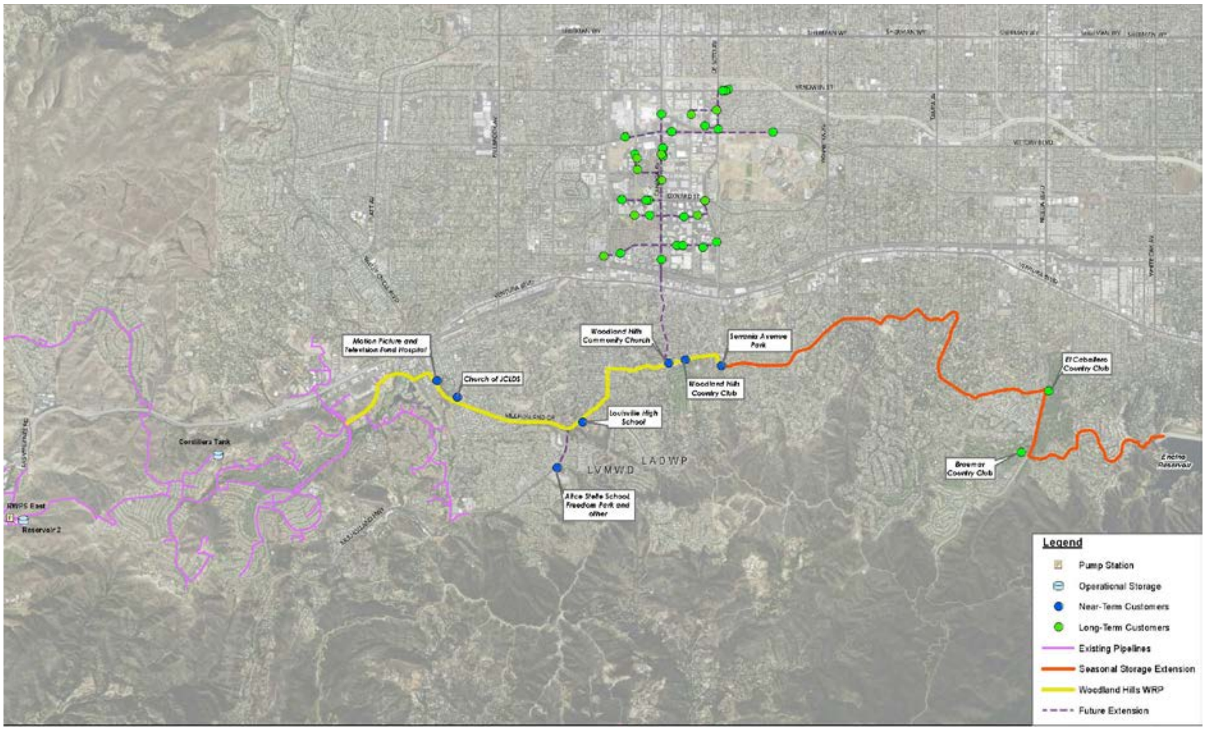
The Pure Water Project assumes there would be no expansion of the existing recycled water distribution system. Existing recycled water customers would be supplied, but addition of new recycled water customers would be limited.

Table 3-4: Estimated Demands for NPR Users for Encino Reservoir Project

Potential Non Potable Use Areas	Estimated Demands[1] (AFY)
Infill development within LVMWD	740
Thousand Oaks Boulevard Extension	251
Oak Park HOA Conversions	207
Westlake Conversions (schools/parks)	130
Woodland Hills GC Extension	477
El Caballero Country Clubs	590
Total Demand	**2,395**

[1] 2016 BODR (MWH 2016), including Appendix K

Figure 3-3: Potential NPR Users for Encino Reservoir Project



Source: Appendix K of BODR (RMC 2015)

The demands shown in Table 3-4 are based on meter data, estimated landscaped area, and user type. Peaking factors were developed for these prior studies, including a maximum day demand peaking factor of 1.9 and a peak hour peaking factor of 3.0. Based on these factors, the peak day demand and peak hour demand for the Encino Reservoir Project are shown in Table 3-5.

Table 3-5: Potential Peak Demands for Encino Storage Project

Demand	(AFY)	(MGD)	(gpd)	(gpm)
Average Annual	2,395	-	-	-
Average Day	6.6	2.1	2,140,000	1,780
Maximum Day	12.5	4.1	4,060,000	3,390
Peak Hour	37.4	12.2	12,180,000	10,160

Serving existing irrigation sites with recycled water requires on-site evaluations and identification of retrofit requirements, which must comply with local guidelines and permit/code requirements. Most of the landscape irrigation systems in the JPA service area are metered separately from the potable system and could be easily retrofitted to receive recycled water by following the guidelines in Title 17 of the California Code of Regulations (CCR). Mixed meters that serve both the irrigation and potable system are more complex to retrofit; however, for larger users such as schools or commercial/industrial areas with significant landscaping demands, retrofits can still be cost effective. Existing buildings that have not been constructed with dual-plumbing systems can be complex and expensive to retrofit, and therefore, such sites would only be considered potential customers if they have a high demand use such as a cooling tower that can be easily separated from the potable water system.

On-site conversion costs would range from $5,000 to $20,000 dollars per site depending on the size and use at a given site and would be incurred as a one-time capital cost (2014 RWMP). The JPA has historically worked with their recycled water customers to identify a mutually agreeable approach to fund customer retrofits. Options include a pay-and-go approach, applying for funding through MWDSC's on-site conversion program[1], or upfront payment by the distributing agency reimbursed by the customer paying potable rates until the capital is paid back by the deferred recycled water discount.

At this time LVMWD and TSD have not consulted with potential recycled water customers beyond their normal outreach activities.

3.2.2 Market Assessment Procedure

Describe the market assessment procedure applied

The first step of the market assessment includes an analysis of current, historical and future projected volumes of recycled water produced and consumed. The amount of excess recycled water available for seasonal storage, non-potable and potable reuse is the difference between the amount of recycled water produced today and in the future and current recycled water demands.

Future use of recycled water is influenced by the seasonal imbalance in the supply and demand for recycled water. Since the majority of the District's recycled water is used for irrigation, peak demands occur during the warm summer month and drop to near zero during the cool winter months. With only minimal operational storage for recycled water (no seasonal storage), the excess recycled water cannot be retained during the winter for use in the summer. As a result, the excess recycled water is released to Malibu Creek, draining to the Pacific Ocean.

Figure 3-4 shows historical recycled water supplies and sales (demand) from January 2013 through November 2015. The area between the two trend lines represents the amount of excess recycled water available (winter months) and the amount of shortage (summer months). Future annual production from the TWRF is estimated to increase to 13,400 acre-feet (12.0 MGD) by 2030 and recycled water sales are anticipated to increase to 8,800 AFY by 2030. The gap in

[1] http://bewaterwise.com/OnSite_Pilot_Program.shtml

summer shortfalls and winter excess in supply will continue without a new market for recycled water.

For the Encino Reservoir Project, the excess recycled water can be stored in the winter and re-introduced into the recycled water system to meet summer demands. The amount of reuse would be limited by the additional users that are connected through infill and expansion of the recycled water system. The market assessment considers which users are cost effective to connect.

Figure 3-4: Historical Monthly Volume of Recycled Water Produced and Sold

Source: BODR (MWH 2016)

For the Pure Water Project, the excess recycled water would be conveyed to an AWTF and the purified water would augment Las Virgenes Reservoir. Reject water from the reverse osmosis process (herein referred to as brine) would be disposed of via the Calleguas Municipal Water District (CMWD) Salinity Management Pipeline (SMP), previously shown in Figure 1-1. The market assessment for SWA includes an evaluation of Las Virgenes Reservoir to determine if compliance with SWA Regulations for indirect potable reuse via reservoir augmentation can be accomplished. Among the critical items are the volume of water to be purified, treatment process required, size of the Reservoir, estimated detention time, dilution factor, and reservoir hydrodynamics. Preliminary hydrodynamic modeling evaluations for Las Virgenes Reservoir (FSI 2018) indicate that indirect potable reuse via reservoir augmentation is viable.

The amount of excess recycled water available for advanced treatment and potable reuse is an important element of the project. Table 3-6 provides a summary of the key data and assumptions applied to estimate the anticipated yield for the Encino Reservoir and Pure Water Projects.

Table 3-6: Available Recycled Water Projections

Year	Total Supply from TWRF and Imported Water Supplement [1] (AFY)	Existing Demand[2] (AFY)	Available Supply for Project (AFY)[3]	Project Yield (AFY)
Encino Reservoir Alternative				
Year 1	7,347 – 9,650	6,547	800 – 3,102	0
Year 20	10,877 – 12,607	6,547	4,330 – 6,060	2,395[4]
Pure Water Alternative				
Year 1	7,347 – 9,650	6,547	1,819 – 3,272	1,546 – 2,781[5]
Year 20	10,877 – 12,607	6,547	4,330 – 6,060	3,605 – 4,609[5]

[1] Source: BODR (MWH 2016)
[2] Based on the 2001-2015 average
[3] For the Encino Reservoir Project, the available supply accounts for existing demand and 400 AFY of seepage loss at the Encino Reservoir. For the Pure Water Project, the available supply accounts for existing demand on a monthly basis, which incorporates seasonal variability in existing demand.
[4] Additional 2,395 AFY demand from customers shown in Figure 3-3 and listed in Table 3-5.
[5] For the Pure Water Project, the project yield accounts for the AWTF plant capacity and 15% water loss due to RO brine. Brine minimization, which could increase project yield, is not included but potential technologies are evaluated in Appendix E.

Water stored in Encino Reservoir would be used to meet recycled water demands, including both peak summertime needs and future demand growth. However, these needs will not fully utilize the net surplus water stored in the reservoir. This unallocated surplus recycled water will remain in the reservoir until a customer is identified or discharge is required to maintain reservoir water level. There are multiple options for how this unallocated surplus water can be addressed, including new recycled water customers, discharge to the sewers, or discharge to the Los Angeles River. (MWH 2016)

3.3 Potential Project Challenges

Inhibitors may be physical, monetary, converting systems for reused water, or public acceptance. Identify methods or community incentives to stimulate recycled water demand, and methods to eliminate obstacles.

There are inherent challenges associated with the expansion of a non-potable reuse system as well as the introduction of a potable reuse program.

For non-potable reuse expansion with the Encino Reservoir Project:

- Infrastructure expansion to connect new customers beyond the existing purple pipe system and convey water to and from Encino Reservoir is expensive to construct and operate. Construction impacts to the local community, environmental permitting (CEQA), right-of-way acquisitions, and easements would be challenging given the amount of above and below ground facilities that would be constructed as part of the project. The JPA has dealt with many of the issues through the successful expansion of their existing recycled water program and would apply similar methods to address obstacles as they arise.
- The rehabilitation of Encino Reservoir, which has been out of regular service since 2002, could face engineering challenges to restore to service. Seismic upgrades and facility improvements for operations would need to be defined and could be costly to implement. Funding from state and federal agencies would be pursued to cover the costs, and this project may be competitive since it offers and unique opportunity to restore an existing asset for seasonal storage.
- Given that the Encino Reservoir is owned by LADWP, the ability to negotiate favorable institutional agreements would make or break this project. Extensive coordination with LADWP would be the cornerstone of the Encino Reservoir Project and coordination with other regulatory agencies (including DDW and the RWQCB) would be integral to implementation. The JPA has initiated discussions with LADWP as part of the 2016 BODR process, and LADWP agreed in concept to the use of Encino Reservoir for this purpose. However, they also indicated that it would be necessary to perform a seismic study of the reservoir's dam and that other seismic studies have higher priority, so it would be several years before the study was initiated. LADWP will not consider agreeing to the project until the study is complete.
- Though public perception for non-potable reuse is generally favorable, any new construction or water project is like to solicit community interest and some opposition. The JPA is committed to taking a proactive approach to stakeholder engagement for all their capital improvement projects, and they are particularly vigilant in their efforts to promote, educate, and inform the community about the benefits of recycled water.

For potable reuse via surface water augmentation for the Pure Water Project:

- Infrastructure associated with an AWTF, new pipelines and a new brine line would be expensive to construct. Similar to the Encino Reservoir Project, construction impacts to the local community, environmental permitting (CEQA), right-of-way acquisitions, and easements would be challenging given the amount of above and below ground facilities that would be constructed as part of the project. The JPA has dealt with many of the issues through the successful expansion of their existing recycled water program and other capital improvement projects and would apply similar methods to address obstacles as they arise.

- Interagency coordination would be a significant effort due to the number of state and local agencies required to implement the project. Entities include CMWD, who owns and operates the SMP, local cities for encroachment permits, and regulatory agencies (including DDW and the RWQCB) for implementation of potable reuse. The JPA has initiated discussions with these agencies and is committed to continued conversations to address issues and negotiate agreements.
- Public perception for a potable reuse project can be a significant barrier to overcome. The JPA has taken a proactive approach to stakeholder engagement, retaining a communication firm specializing in water programs to involve the community, NGOs and local leaders to help navigate the political, social, and technical hurdles that will need to be overcome in order to implement a successful surface water augmentation project.

3.4 Stakeholders

Identification of all the water and wastewater agencies that may have jurisdiction in the potential service area or over the sources of reclaimed water that are desired.

The JPA has jurisdiction over the wastewater produced at the TWRF and will ultimately own and operate the proposed Project. Per Water Code section 1210, the JPA has the right to all water produced at the TWRF and therefore all water produced by the project.

The following agencies have jurisdiction over the delivery of water, wastewater and/or recycled water in their respective service areas and may be identified as stakeholders or interested parties, depending on the project implemented:

- Metropolitan Water District of Southern California (MWDSC) is a regional wholesaler of water with jurisdiction over their 26-member agencies, including LVMWD and CMWD.
- Cities of Agoura Hills, Calabasas, Hidden Hills and Westlake Village are unincorporated cities of LVMWD's service area that receive water from LVMWD and recycled water from the JPA.
- Los Angeles County – unincorporated areas, receive water from LVMWD and recycled water from the JPA.
- Los Angeles Department of Water and Power has jurisdiction over water and power delivered within their service area and owns Encino Reservoir and an interconnection to MWDSC that LVMWD uses during planned and unplanned MWDSC outages.

As part of the 2016 BODR process, the JPA took a proactive approach to expand stakeholder engagement. Representatives of the following organizations actively participated in the BODR stakeholder process:

- Senator Fran Pavley's Office
- Supervisor Sheila Kuehl's Office
- Heal the Bay
- Los Angeles Waterkeeper
- National Park Service
- California State Parks
- City of Calabasas
- City of Thousand Oaks
- Malibu Creek MS4 Watershed Management Committee
- Mountains Restoration Trust
- Santa Monica Mountains Conservancy
- Resource Conservation District of the Santa Monica Mountains
- Santa Monica Mountains Fund
- Los Angeles Department of Water and Power
- Calleguas Municipal Water District
- Camrosa Water District
- Metropolitan Water District of Southern California

The 2016 BODR stakeholders continue to be kept appraised on the status of the Encino Reservoir and Pure Water Projects.

3.5 Potential Sources of Water to be Reclaimed

All potential sources including impaired surface and groundwater sources.

The primary source of water to be reclaimed is municipal wastewater from the JPA service area that is treated at the TWRF. As previously discussed in Section 2.2.2, non-potable groundwater is sometimes conveyed to the sewer system, where it is eventually treated at the TVWRF and used to supplement the recycled water system during peak irrigation months when there is insufficient supply to meet all demands. Potable water is also periodically used to supplement the recycled water system and meet peak summer demands.

Stormwater capture offers another opportunity to increase inflows into the TWRF to increase the available supply of recycled water in the winter months. The diversion of stormwater as a supplement source water for the Pure Water Project is evaluated in Appendix D.

3.6 Source Water Facilities

Description and location of the source water facilities, including capacities, existing flows, treatment processes, design criteria, plans for future facilities, and quantities of impaired water available to meet new reclaimed and reused water demands.

The TWRF is the primary source water facility for the project, with a design capacity of 16 mgd, though due to permit limitations on nutrients[2], its current treatment capacity is on the order of 12 mgd (HDR 2014). The TWRF produces disinfected tertiary treated water that meets standards as defined by Title 22 of the CCR for "unrestricted reuse" (Appendix A). Specific treatment processes are discussed in Section 3.8. The average recycled water

[2] The critical discharge limits are monthly average concentrations of 8 mg/l for nitrate plus nitrite, and 2.3 mg/l for ammonia.

produced over the last fifteen years was approximately 9,300 AFY (8.35 mgd). The TVWRF will have sufficient capacity for either project alternative without further modification.

Table 3-7 lists the various supplemental supplies that are relied upon when the supply from TWRF alone is insufficient to meet the recycled water demand. Figure 3-5 show schematically the point of connections with each supplement source of supply.

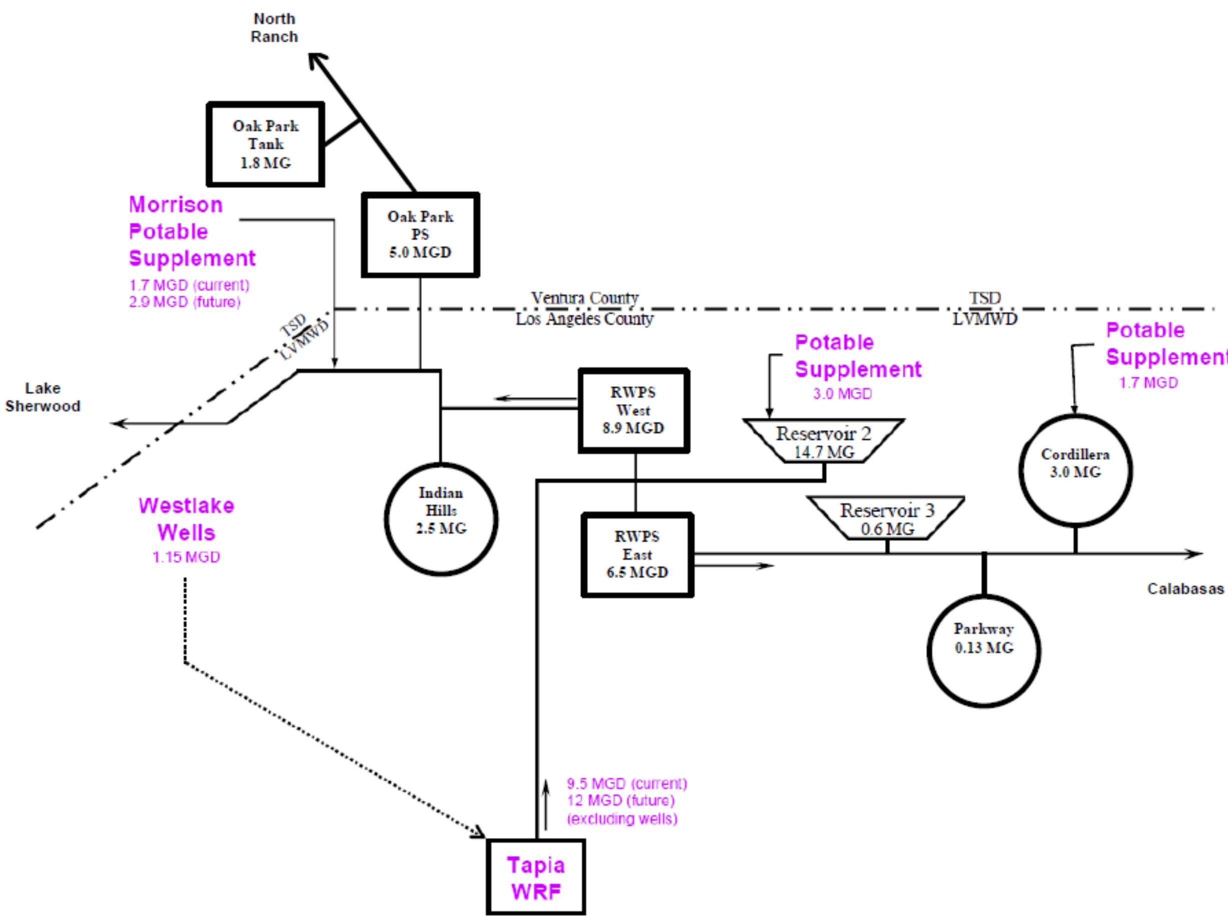
There are no comparable supplemental facilities in the TSD service area, primarily because TSD uses less recycled water than it produces. Supplemental potable water can be used to fill the water storage reservoirs and ponds at Lake Sherwood and North Ranch Golf Course, which are then used to irrigate the courses, should additional supply be needed. The 2014 RWMP identified the Oak Park RW tank as a potential future location for a potable water supplement to provide increased reliability and flexibility for the TSD service area (HDR 2014).

Table 3-7: Supplement Facilities to the Recycled Water System

Facility	Description	Capacity
Westlake Wells	Two (2) wells in Westlake Village with a nominal capacity of 400 gpm per well. Due to high iron and manganese concentrations, pumped groundwater is conveyed to the TWRF, via existing trunk sewers, for treatment prior to blending with recycled water flows	1.15 mgd (max) 0.75 mgd (average)
Morrison Potable Supplement	Constructed in 2001 to provide energy-efficient potable water supplement to the Western Recycled Water System. Water is taken from the inlet/outlet pipeline that feeds Morrison Tank, flows through an air gap into a covered concrete sump, and is pumped into the distribution system that is regulated by the Indian Hills Tank. The pump station has two (2) pumps with a nominal capacity of 2,000 gpm, but currently only one pump can be run at a time due to capacity limitations at the inlet/outlet pipeline.	1.7 mgd (current) 2.9 mgd (future)
Potable Supplement (Reservoir 2)	Supplies the Las Virgenes Valley Recycled Water System via a permanent buried pipe from the 1235-ft potable system via an air gap into a stand-pipe at the reservoir. Originally designed for 1,000 gpm. Air containment at the pump station reduces capacity to 400 gpm. This facility is rarely used. In addition, a temporary pipe on the surface from the 1235-ft potable system via an air gap at pipe end at the spillway into the reservoir can provide another 2,100 gpm.	3.0 mgd
Potable Supplement (Corillera)	Supplies the Eastern Recycled Water System via a dedicated buried pipeline from the 1650-ft potable system. An automatic flow control and permanent air gap can provide up to 1,200 gpm to the tank.	1.7 mgd

Source: (HDR 2014)

Figure 3-5 Schematic of JPA and Calleguas Recycled Water Systems



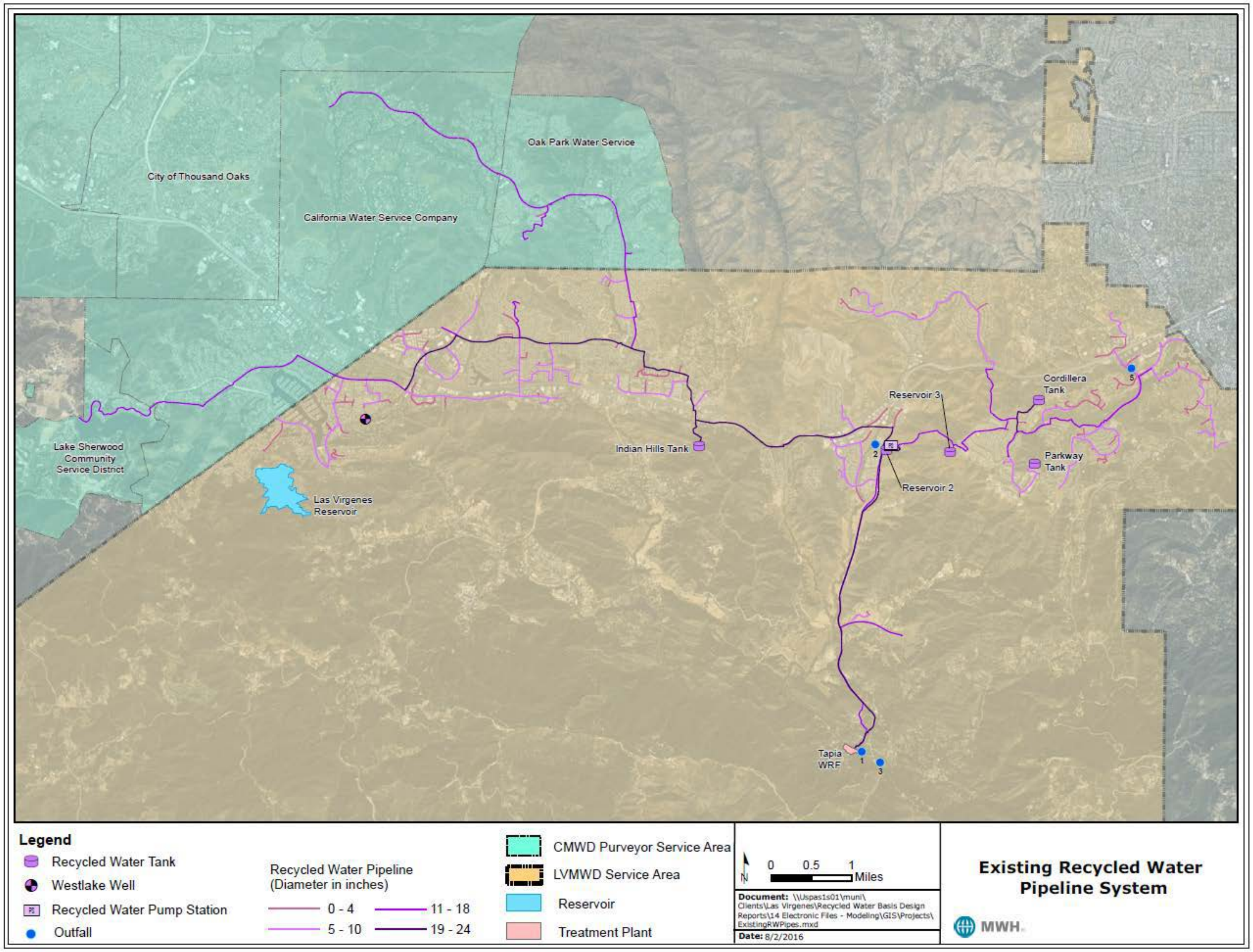
Source: (HDR 2014)

3.7 Existing Water Reuse

Description of the current water reuse taking place. Include a list of reclaimed water uses, types and amount of reuse, and a map of existing pipelines and use sites.

The JPA currently reuses 100% of the available summer flows produced at the TWRF and 70% of the annual flow on average, based on data from 2001 to 2015. In 2015 the over 83% of the recycled water produced was reused by customers in the JPA service area to offset potable demand. The recycled water meets Title 22 requirements for “unrestricted reuse”, which is suitable for unrestricted irrigation of landscapes, residential front yards, agricultural crops, golf courses, parks, cemeteries, and playing fields. Existing uses and amounts are presented in Section 3.1.1. Figure 3-6 illustrates existing pipelines and use sites.

Figure 3-6: Exiting Recycled Water System (2016 BODR)



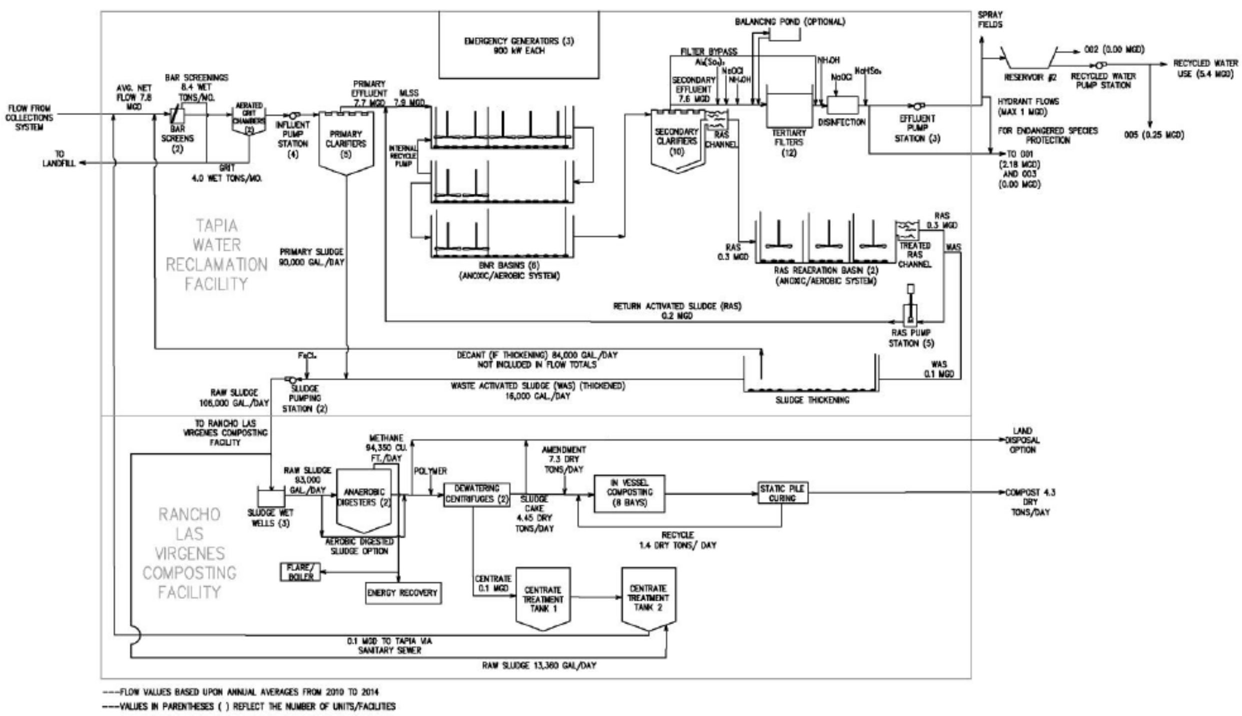
Source: (MWH 2016)

3.8

Summary of water reclamation and reuse technology currently in use, and opportunities for development of improved technologies.

The current tertiary treatment processes at the TVWRF include: coarse screening, grit removal, primary sedimentation, secondary treatment, tertiary treatment, chlorination, and dechlorination. For secondary treatment, TWRF uses an activated sludge process with nitrification and denitrification (NDN), followed by secondary clarification. Tertiary treatment includes coagulation, flocculation and filtration through anthracite media. Sodium hypochlorite solution is added for effluent disinfection, and sodium bisulfate is added for dechlorination prior to discharge to live streams. Figure 3-7 shows a schematic of the treatment train process at TWRF.

Figure 3-7: TWRF Flow Schematic



Source: LARWQCB Waste Discharge Requirements for the Las Virgenes Municipal Water District, Tapia Water Reclamation Facility, Order No. R4-2017-0124

The District recently evaluated alternative disinfection systems to reduce TTHM and DCBM limits for surplus recycled water discharges to Malibu Creek and the LA River, independent of the recycled water expansion project. The District selected chloramination as the preferred disinfection alternative and improvements have been completed.

Potential additional technologies considered for the project include the addition of a post-treatment facility at the proposed seasonal storage site for the Encino Reservoir Project and advanced treatment prior to surface water augmentation for the Pure Water Project.

For the Encino Reservoir Project, flows from TWRF could augment the reservoir without additional treatment because Encino Reservoir is not a source of municipal drinking water supply. However, it would be beneficial to provide additional treatment for outflows from the reservoir to remove any algae or debris from the open-air reservoir. Typically, filtration and disinfection are added at the outlet of a seasonal storage reservoir to prevent clogging of sprinklers or growth in distribution systems, which would provide quality assurance for customers and protect equipment and facilities within the recycled water distribution system.

Implementation of the Pure Water Project would require advanced treatment processes to achieve the necessary levels of public health required for potable reuse via SWA. Table 3-8 summarizes the expected treatment process standards that would be applicable for SWA based on the SWA Regulations (SBDDW-16-02).

Table 3-8: Anticipated Treatment Process Standards for SWA

Parameter	Criteria
Pathogen Removal	8-7-8 log removal credits (enteric virus, *Giardia, Cryptosporidium*, respectively) using at least three treatment barriers - if dilution is 1% advanced purified water of reservoir volume 9-8-9 log removal credits (enteric virus, *Giardia, Cryptosporidium*, respectively) using at least three treatment barriers - if dilution is 10% advanced purified water of reservoir volume
Oxidation	0.5 log removal of 1,4-Dioxane, minimum
Drinking Water Standards	Meet all drinking water maximum contaminant levels (MCLs) in advanced purified water; quarterly for primary MCLs and contaminants with notification levels (NL); annually for secondary MCLs

' Based the final SWA Regulations adopted on March 6, 2018 (SBDDW-16-02)

Table 3-9 describes treatment technologies that can be considered for SWA. In California, reverse osmosis is generally expected to serve as the central element of a multi-barrier treatment system; however, non-membrane systems, such as biological activated carbon in combination with ozone are also being explored in areas where brine disposal is cost prohibitive.

There are a variety of options available for pretreatment and advanced oxidation. For example, ultraviolet light and hydrogen peroxide are frequently used together for advanced oxidation. Alternatively, there may be value is evaluating the use of ultraviolet light and chlorine.

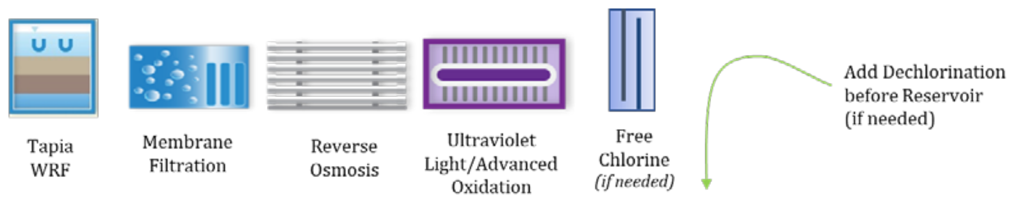
Table 3-9: Summary of Advance Treatment Technologies

Treatment Process	Description
Microfiltration/ Ultrafiltration (MF/UF)	A membrane-based, pressure-driven separation process that provides a barrier to the passage of solids and microorganisms. MF/UF does not remove salts (i.e., Total Dissolved Solids [TDS]) or other dissolved constituents like ammonia. For potable reuse applications, the primary goal of MF/UF is to provide pre-treatment for the reverse osmosis (RO) membranes, and to remove suspended particulate matter.
Reverse Osmosis (RO)	A membrane-based, high pressure-driven separation process that provides a barrier to the passage of particles, colloids, organics, bacteria and pathogens, and the vast majority of dissolved salts. RO produces a very low-TDS product stream and a high-TDS concentrate stream. Initially, RO was considered to be completely effective at removing all pathogens and chemicals; however, with improving analytical methods, a few trace organic compounds have been detected in RO permeate. This gave rise to the required advanced oxidation process following RO (discussed below).
Ultraviolet (UV) Disinfection	Treatment by applying a broad spectrum of radiation with intense peaks at certain wavelengths. UV light penetrates an organism's cell walls and disrupts the cell's genetic material, making reproduction impossible. With the proper dosage, UV irradiation has proven to be an effective disinfectant for bacteria, protozoa, and virus in water, while not contributing to the formation of disinfection byproducts (DBPs).
UV-based Advanced Oxidation Process (AOP)	Treatment by applying light in the presence of an auxiliary oxidant that has been added to the wastewater, such as hydrogen peroxide, ozone or chlorine. Photo-excited oxidants quickly degrade to form highly-reactive free radicals, which are strong oxidants capable of degrading most natural and synthetic organic compounds present in wastewater. The design of a UV-AOP typically requires UV doses in great excess of those needed for disinfection alone.
Ozone	To generate ozone (O_3), energy is added to oxygen (O_2), splitting the molecules into individual atoms which then collide with oxygen forming ozone. Ozone is then bubbled into water where it oxidizes compounds directly or forms hydrogen peroxyl (HO_2) and hydroxyl (OH) radicals, which oxidize certain contaminants.
Biological activated carbon (BAC)	A biologically enhanced granular activated carbon (GAC) process that removes dissolved organics through adsorption by the activated carbon and biodegradation by bacteria attached on the activated carbon. Biologically activated carbon (BAC) has not been used in a full-scale potable reuse project in California to date but is currently being pursued for the City of San Diego's SWA project. BAC filtration is often used after ozonation.
Chlorine-based Disinfection (free chlorine)	The most common disinfection technology in wastewater treatment and reuse. Chlorine inactivates a diverse group of pathogens, including viruses, and residual chlorine prevents pathogen re-growth during storage and distribution. Free chlorine disinfection can be implemented to achieve virus and *Giardia* credits at multiple places in a potable reuse treatment train. Currently.

Ozone can also be introduced for pre-oxidation to provide additional virus inactivation, though no permitted projects have utilized ozone as an approved pathogen barrier for potable reuse at this time, however Monterey One Water is in the process of negotiating a log removal value (LRV) credit with the DDW for their groundwater replenishment project.

Anticipated pathogen removal credits for a typical AWTF that includes microfiltration (MF), reverses osmosis (RO), and ultraviolet based advanced oxidation process (UV/AOP) with free chlorine addition is shown in Figure 3-8. The AWTF process assumed for implementation of the Pure Water Project is further described in Section 4.

Figure 3-8: Anticipated Log-Reduction for Each SWA Treatment Step



Pathogen	WWTP[1]	MF	RO[2]	UV/AOP	Free Chlorine[3]	Total	Log Removal Requirement[4]
Virus	2	0	2	6	6	16	8 to 9
Giardia	2	4	2	6	0	14	7 to 8
Cryptosporidium	1	4	2	6	0	13	8 to 9

1 LRV credit of 1-2 logs is possible for secondary wastewater treatment with biological nutrient removal.
2 LRV credits for RO could potentially range from 1.5 to 3.5 and are assigned on a project specific basis by DDW.
3 LRV credits for virus could range from 1 to 6 and for giardia could range from 0 to 3 depending on contact time.
4 Based on SWA Regulation (SBDDW-16-02) pathogenic microorganism control criteria. Removal requirement would be function of dilution achieved in the reservoir and site-specific conditions. Prior version of the regulations included removal credits at a drinking water treatment plant (4/3/2 V/G/C); however, the final SWA Regulations set forth pathogen removal requirements at the end of the AWTF treatment train.

Section 4 Description of Alternatives

Description of other water supply alternatives considered to accomplish the objectives to be addressed by the proposed Title XVI project. Include benefits to be gained by each alternative, total project cost, life cycle cost, and corresponding cost of the project water produced expressed in dollars per million gallons (MG), and/or dollars per acre-foot. An appraisal level cost estimate, or better, is acceptable for these alternatives.

This section describes the alternatives evaluated to determine the selection of the proposed Title XVI project that could be implemented by the District. The project alternatives evaluated include Alternative 1 - Pure Water Project and Alternative 2 - Encino Reservoir Project, with sub alternatives presenting variations in facility siting and conveyance alignments. Each alternative would serve to meet the Project objectives to improve local water supply reliability and drought resilience, and effectively eliminate discharges to Malibu Creek.

A comparison of the recommended Project alternative to alternative water supplies for the District is described in Section 5. Selection of the proposed Title XVI project is described in Section 6.

4.1 Non-Federal Funding

Description of the non-Federal funding condition. The reasonably foreseeable future actions that the non-Federal project sponsor would take if Federal funding were not provided for the proposed water reclamation and reuse project, including estimated costs.

The JPA, as the project sponsor, would be responsible for non-Federal funding and would own and operate the proposed Project. The JPA is actively seeking funding from a variety of sources including local, state and Federal funding. Should Federal funding not be provided for the selected Project, the JPA would rely on alternative funding vehicles at a state and local level, including grants and low-interest loans. A portion of the project would be financed through rates and revenues from JPA customers.

4.2 Project Objectives

Statement of the objectives all alternatives are designed to meet.

The Project would seek to address two over-arching objectives:

1) develop a new, local source of drought-resilient water supply to offset demands of imported water; and
2) effectively eliminate discharges of recycled water to Malibu Creek for compliance with new, stringent regulatory standards.

The two Projects alternatives evaluated herein were developed to take a technically innovative approach, leveraging regional cooperation, to solve the ever-growing water shortage and discharge compliance issues in the JPA service area. Specified project objectives and design requirements are listed below.

4.2.1 *Flow Projections*

The supply objectives for the project are to decrease reliance on imported water supply by:

- Producing up to 4,600 AFY of new, local, drought-resilient water supplies through potable reuse (Pure Water Project)
- Serving an additional 2,395 AFY demand for new non-potable reuse customers inside and outside the District's service area (Encino Reservoir Project)

A summary of the key data and assumptions applied to estimate the anticipated yield for the Encino Reservoir and Pure Water Projects is previously shown in Table 3-6.

4.2.2 *Design Criteria*

Facilities for the Project alternatives are developed based on the design criteria presented in Table 4-1. The project yield for the Pure Water Project is based on the available supply, design capacity of the AWTF, and recovery rate of the overall treatment system.

The AWPF design capacity is 6.0 mgd, which is intended to capture more than 95 percent of available excess supply on a daily basis. The Encino Reservoir design flow is intended to convey the projected maximum recycled water supply to Encino Reservoir in the wintertime when there is no recycled water demand. The stored water will then be available during peak summer demands eliminating the need to supplement the recycled water with groundwater and imported water.

Table 4-1: Design Criteria

Design Criteria	Unit	Pure Water Project	Encino Reservoir
Year 1 Average Project Yield	AFY	2,092	0
Year 20 Average Project Yield	AFY	4,129	2,395
Average Annual Project Yield[1]	AFY	3,100	1,200
AWTF Design Flow (Purified)	mgd	6.0	n/a
Encino Reservoir Design Flow	Mgd	n/a	11.0
MF Recovery Rate (return to TWRF)	%	95	n/a
3-Stage RO Recovery Rate	%	85	n/a
Brine Disposal Rate	%	15	n/a
Pipeline Maximum Velocity	fps	8	8
Pipeline Minimum Velocity	fps	2	2
Hazen-Williams Coefficient (Steel)	--	100-120	100-120
Hazen-Williams Coefficient (Plastic)	--	110-140	110-140
High Pressure Pipelines	psi	n/a	>260
Pump Efficiency	%	80	80
Motor Efficiency	%	95	95

Notes: AFY = acre-foot per year; mgd = million gallons per day (peak flow); fps = feet per second.

[1] The average annual project yield is utilized to calculate the unit cost ($/AFY) of each alternative. This differs from the BODR approach, which utilized the maximum project yield in Year 2 as the flow basis for calculating unit cost.

4.2.3 *Cost Assumptions*

Feasibility-level estimates of cost are provided for each alternative, including capital and annual O&M costs. Costs are based on the assumptions presented in Table 4-2. Capital costs consist of construction costs, construction contingencies, and engineering & administration costs. Annualized unit capital costs are calculated based on a 30-year duration, 3 percent interest rate, and average annual project yield. Annual unit O&M costs are developed based on the average annual project yield for years 1 through 20 of project operation. The total unit costs are expressed as a summation of the annualized unit capital costs and annual unit O&M costs.

Additional detail about the basis for the cost estimates, including detailed alternative cost sheets are provided in Appendix C. Unit Life-cycle costs and additional economic analyses are presented in Section 5.

Table 4-2: Cost Assumptions

Item	Value	Unit
Capital Cost Annualization Project Life	30	years
O&M Cost Project Duration	20	years
Dollar Value (Year)	2018	--
Capital Cost Annualization Interest Rate	3	%
Cost Escalation	0	%
Construction Contingency (% of Construction Cost)	30	%
Engineering & Design Cost (% of Construction Cost with Contingency Included)	10	%
Non-Contract Costs (% of Construction Cost with Contingency Included) [1]	10	%
O&M Contingency	10	%
Pump Station Cost [2]	$6,000	$/hp
6-inch Standard Pipeline Cost [2]	$120	$/LF
10-inch Standard Pipeline Cost [2]	$187	$/LF
12-inch Standard Pipeline Cost [2]	$214	$/LF
20-inch Standard Pipeline Cost [2]	$342	$/LF
24-inch Standard Pipeline Cost [2]	$390	$/LF
24-inch High-Pressure Pipeline Cost [2]	$534	$/LF
Trenchless Pipeline Crossings [3]	$815,213	each
Energy Cost	$0.13	$/kWh
AWTF Energy Consumption	5.7	kWh/1000 gal
Labor Cost	$75	$/hr

All costs are shown in 2018 dollars.

hp = horsepower; LF = linear foot; kWh = kilowatt hour; gpd = gallons per day; AFY = acre-feet per year

1) Includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, and program management
2) Based on unit costs established in BODR, shown in 2018 dollars
3) For pipeline crossings of highways, railroads, and water streams. Cost is based on LVMWD Backbone Improvement Project in 2015, shown in 2018 dollars

4.2.4 *Operational Objectives*

For the Pure Water Project, Las Virgenes Reservoir would be utilized to supplement potable water supplies and operated to maximize reuse of available water from the AWTF. The Project would be to enable the JPA to utilize available recycled water flows throughout the year by operating the AWTF at discrete flow rates to accommodate supply changes. Stepwise increases and decreases in total flow processed would be accomplished using on-site storage at the AWT facility and at Reservoir 2 to equalize variable hourly, daily, or weekly flows.

For the Encino Reservoir Project, Encino Reservoir would be utilized to balance seasonal recycled water supplies and demands by providing approximately 3,100 AF of storage capacity. The Project would improve current operations by enabling the JPA to reduce or eliminate the use of groundwater and potable water to supplement the existing recycled water system.

4.2.5 *Regulatory Objectives*

The regulatory objectives for both projects include enabling the JPA:

- Reduce annual discharges of effluent to Malibu Creek,
- Comply with all applicable regulatory requirements,
- Comply with discharge prohibition from April 15th to November 15th of every year, and
- Comply with minimum flow requirements for endangered steelhead trout habitat in Malibu Creek.

4.3 Supply and Effluent Management Alternatives Previously Considered

Description of other water supply alternatives considered to accomplish the objectives to be addressed by the proposed Title XVI project. Include benefits to be gained by each alternative, total project cost, life cycle cost, and corresponding cost of the project water produced expressed in dollars per million gallons (MG), and/or dollars per acre-foot. An appraisal level cost estimates, or better, is acceptable for these alternatives.

The JPA have explored various other supply and effluent management alternatives to address water supply needs and discharge compliance requirements.

- **Conservation** – Ongoing conservation and Demand Management Measures (DMM) implemented by LVWMD and TSD contribute to meeting demand reduction goals and maintaining high levels of water use efficiency. LVMWD and TSD has a robust DMM program that includes implementation of water waste prevention ordinances, metering, conservation pricing, public education and outreach, programs to assess and manage distributions system real loss, and water conservation program coordination and staffing support. LVMWD is committed to implementing water conservation and recycling programs to maximize sustainability in meeting future water needs for its customers.
- **Imported Water Supply and Redundancy -** The JPA will continue to import water from MWDSC directly and through interconnections with regional agencies. LVMWD maintains

interconnections to potable supplies that can be utilized during emergencies or MWDSC planned outage and continues to seek new regional interties that may be mutually beneficial. As previously discussed in Section 2.2, these include existing connections with LADWP, City of Simi Valley/Ventura County Waterworks District 8 and Ventura County Waterworks District 17, and a potential future connection with CMWD. The availability of imported water is anticipated to be able to satisfy JPA future demands; however, the cost of imported water will continue to increase over time and the JPA will not increase its local control of their own water supply.

- **Increased groundwater pumping with Desalination –** As previously discussed in Section 2, groundwater supplies in the JPA service area are characterized by elevated TDS concentrations in addition to high iron and manganese concentrations. Due to water quality and quantity issues, the conversion of this groundwater use for potable supplies is not considered a feasible option at the moment (Kennedy/Jenks 2016).
- **Seawater Desalination -** LVMWD has evaluated opportunities for using desalinated water in future supply options. However, at this time it is not considered practical nor economically feasible to implement a seawater desalination. While located near the Pacific Ocean, in comparison to many other water purveyors, the topography of JPA's service area would not be conducive to pumping desalinated water from the ocean.
- **Transfers and Exchanges –** there are currently no transfers or exchanges planned at this time (Kennedy/Jenks 2016).
- **Capital Improvement Projects (CIP) –** LVMWD and TSD continues to implement potable water system improvements to enhance system operations and reliability. Similarly, the JPA implements recycled water system improvements to enhance system operations and reliability. CIPs, though critical to daily operations and meeting current demands, will not alone achieve the project objectives.

Although these concepts offer some benefits to supply and effluent management and could potentially address some of the objectives listed in Section 4.2, these efforts alone would fall short addressing the JPA's long term needs and in many cases the concepts are not viable. Thus, this feasibility focuses on two recycled water project alternatives, as described in the following section.

4.4 Recycled Water Project Alternatives

Description of the proposed Title XVI project. Include detailed project cost estimate; annual operation, maintenance, and replacement cost estimate; and life cycle costs shall be provided with sufficient detail to permit a more in-depth evaluation of the project, including non-construction costs. In this regard, the cost estimates shall clearly identify expenditures for major structures and facilities, as well as other types of construction and non-construction expenses, and shall be based on calculated quantities and unit prices. The estimated costs shall also be presented in terms of dollars per MG, and/or dollars per acre-foot of capacity, so as to facilitate comparison of the alternatives. References, *design data, and assumptions must be identified. The level of detail shall be as required for feasibility studies in RM D&S, Cost Estimating (FAC 09-01).*

The recycled water projects alternatives evaluated as part of this Title XVI Feasibility Study encompass two different approaches to enable JPA maximize the use of recycled water available during winter low irrigation demand season. Alternative 1 – Pure Water Project is an indirect potable reuse project to supplement potable water supplies in Las Virgenes Reservoir with purified water and Alternative 2 – Encino Reservoir Project is a seasonal storage project to utilize Encino Reservoir for storage of tertiary recycled water to expand non-potable reuse. The alternatives evaluated are shown in Figure 4-1, summarized in Table 4-3 and described in the following sections.

Figure 4-1: Recycled Water Project Alternatives

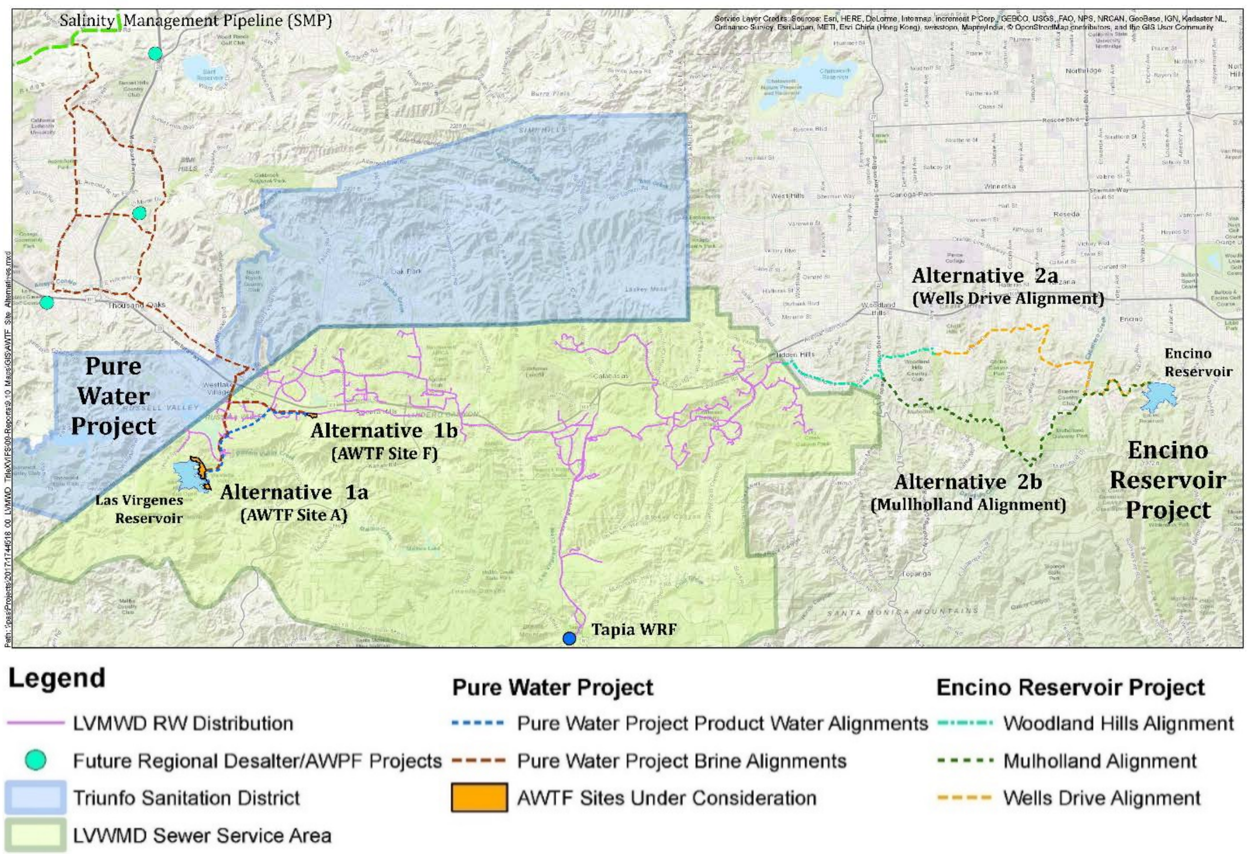


Table 4-3: Recycled Water Projects Alternatives

Alternative	Sub Alt	Alt	Source Water Alignment	Product Water Alignment	Brine Alignment	Waste Alignment
Alt 1: Pure Water Project	Alt 1a: AWTF near Las Virgenes Reservoir	1a	Lindero Canyon Road to Site A	Along Las Virgenes Reservoir	Site A to SMP via Thousand Oaks Road	Site A to LA County Sewer via Access Road
	Alt 1b: AWTF at Agoura Rd Site	1b	Agoura Road to Site F	Lindero Canyon Road to Las Virgenes Reservoir	Site F to SMP via Thousand Oaks Road	Site F to LA County Sewer via Agoura Road
Alt 2: Encino Reservoir Project	Alt 2a: Mulholland Drive	2a	Wells Drive	n/a	n/a	n/a
	Alt 2b: Wells Drive	2b	Mulholland Drive	n/a	n/a	n/a

4.5 Alternative 1 - Pure Water Project

The Pure Water Project would produce an average of 3,100 AFY of new, local, drought-resilient water supply. The project includes delivery of recycled water to a proposed advanced water treatment facility (AWTF) where proven technology would be used to purify the water and augment imported drinking water supplies stored at the existing Las Virgenes Reservoir. Water from the reservoir is treated and disinfected at the WLFP prior to distribution. The use of purified recycled water from a municipal water reclamation facility for augmenting a reservoir that is designated as a source of domestic water supply is defined as a surface water augmentation (SWA) project. Figure 4-2 illustrates facilities associated with the Pure Water Project alternatives. Figure 4-3 presents a general flow schematic for the project. The following sections discuss general treatment, AWTF siting, brine disposal and reservoir operations considerations followed by specific facility requirements and costs for Site A and 1b.

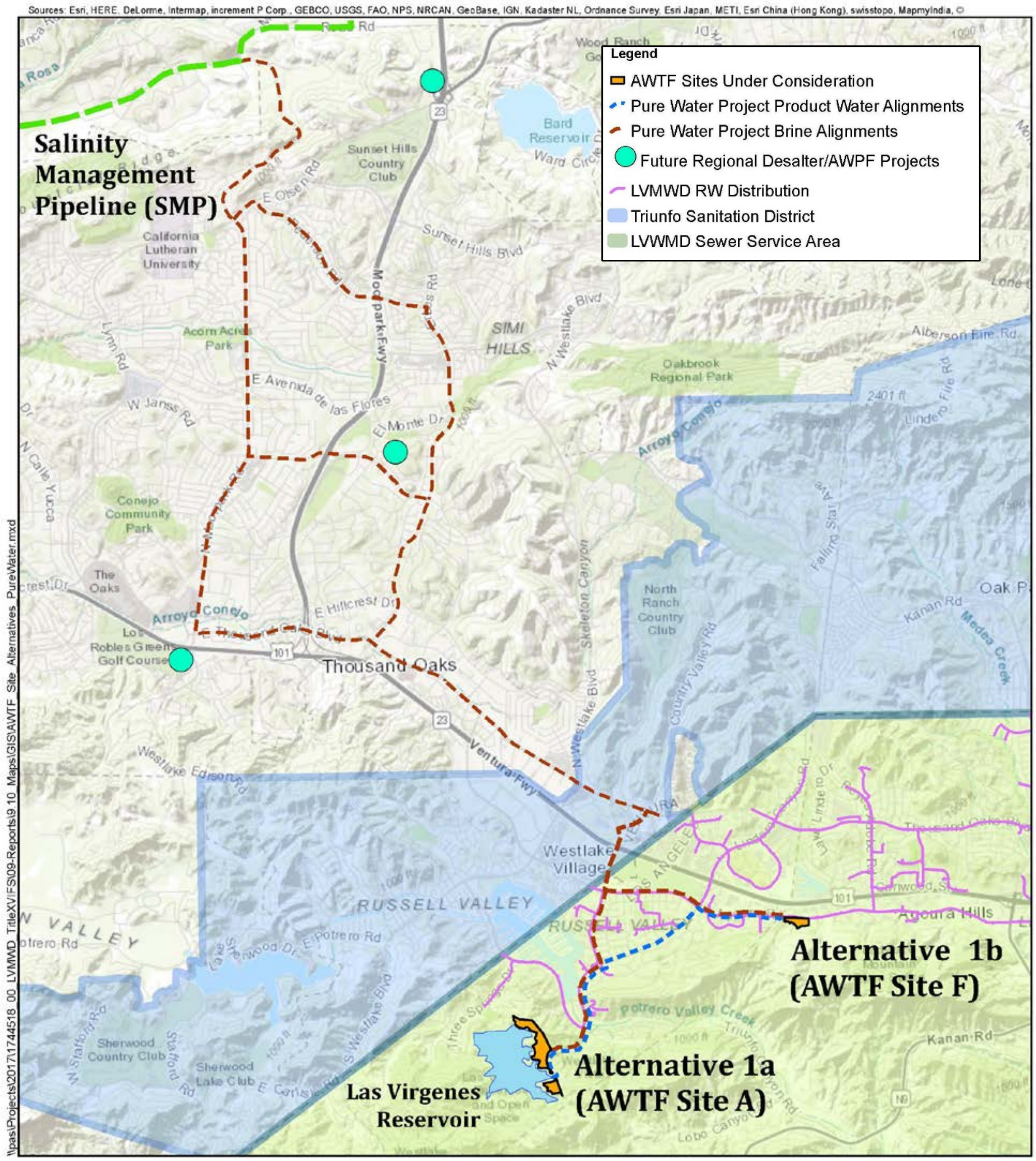
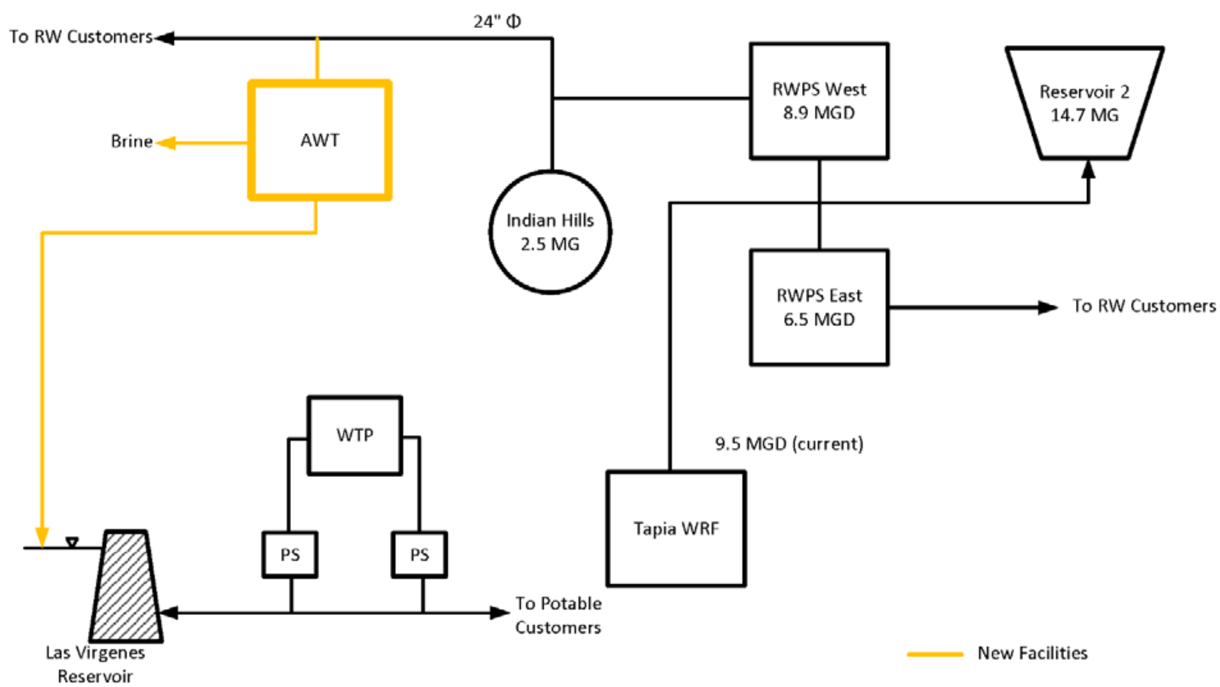

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, ©
Legend
AWTF Sites Under Consideration
Pure Water Project Product Water Alignments
Pure Water Project Brine Alignments
Future Regional Desalter/AWPF Projects
LVMWD RW Distribution
Triunfo Sanitation District
LVWMD Sewer Service Area
Salinity Management Pipeline (SMP)
Alternative 1b (AWTF Site F)
Alternative 1a (AWTF Site A)
Las Virgenes Reservoir
Thousand Oaks
Westlake Village
RUSSELL VALLEY
SIMI HILLS
Bard Reservoir
Sunset Hills Country Club
California Lutheran University
Conejo Community Park
North Ranch Country Club
Oakbrook Regional Park
Sherwood Country Club
Sherwood Lake Club
Los Robles Green Golf Course
Agoura Hills
Moorpark Fwy
Ventura Fwy

Figure 4-3: Pure Water Project Flow Schematic



Source: BODR 2016

4.5.1 *Treatment Process*

The treatment processes for the Pure Water Project are selected to meet SWA Regulations (SBDDW-16-02), previously discussed in Sections 3.1 and 3.8. The regulations set forth process requirements for RO and AOP (described in Table 3-9) to achieve specified log removal values (LRV) (listed in Table 3-8) for pathogen reduction at the end of the treatment train.

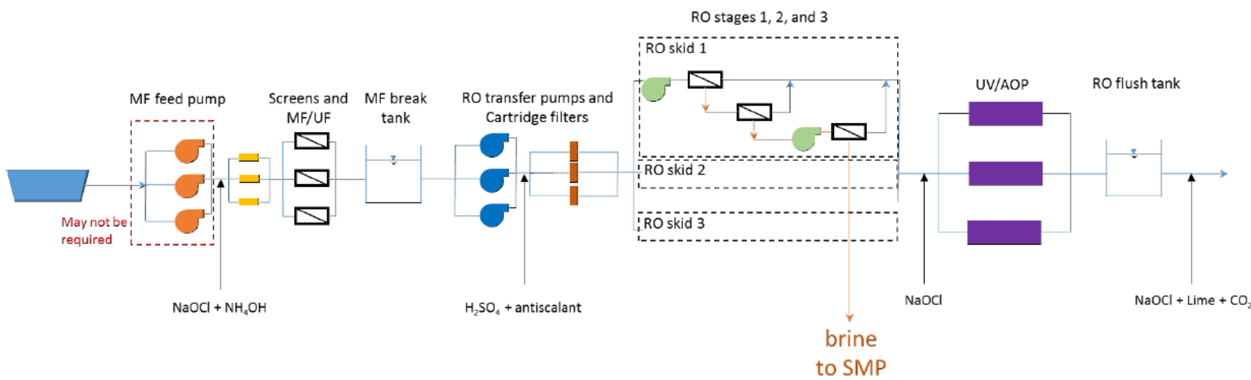
Based on hydrodynamic modeling of Las Virgenes Reservoir (FSI 2018), the Project would be able to meet regulatory requirements for reservoir retention and achieve dilution greater than 100:1 under all but an extreme emergency scenario (Trussell 2018). Appendix H includes a cover letter briefing of the modeling results performed by the Pure Water Project.

Incorporation of a diffuser at the point of discharge may serve to prevent exceedance of the 100:1 dilution threshold, though future modeling would be required to confirm this assumption (Trussell 2018). For the purpose of this Feasibility Study, it is assumed that the project would need to meet LRVs of 8/7/8 for virus, cryptosporidium, giardia, respectively. Operational considerations for the Reservoir are further discussed in Section 4.5.4.

The AWT treatment train would include MF/UF, 3-stage RO for high recover (85%) and UV/AOP with stabilization and chlorination (if-needed) prior to pumping to the Las Virgenes Reservoir

(MWH/Stantec 2016), as illustrated in Figure 4-4. Table 4-4 lists the assumptions for the AWTF based on information obtained from prior studies (MWH/Stantec 2016, CDM Smith 2017, Woodard & Curran 2017).

Figure 4-4: Proposed AWT Treatment Train for the Pure Water Project



Source: MWH/Stantec 2016

An AWTF demonstration program is underway by the JPA to test several approaches to purification and provide engineering data to guide selection of the most effective protocols for purifying the effluent water from the TWRF and to secure regulatory approval (CDM 2017). The findings from the demonstration program may result in future modifications to the proposed AWT treatment train.

Table 4-4: AWTF Facility Component Description and Assumptions

Component	Description	Facility Sizing
Overall Operations	Operates during irrigation off-peak season (October to May)	Influent flow =7.4 mgd Product water capacity = 6.0 mgd
Chemical storage	30-day chemical storage (i.e. deliveries once per month).	Chemical systems are summarized in Table 4-5
Influent Feed	Delivered on demand from tertiary distribution system when supply is available; with existing system storage providing diurnal buffer.	Influent flow = 7.4 mgd Effluent flow = 7.4 mgd
Membrane Filtration (MF)	Microfiltration or ultrafiltration, assumed pressurized hollow fiber membrane with 95% recovery. Includes feed water strainers, and a membrane backwash system with pumps and an air scour system as part of a clean-in-place system (CIP).	Influent flow = 7.4 mgd Effluent flow = 7.1 mgd

Table 4-4 (con't): AWTF Facility Component Description and Assumptions

Component	Description	Facility Sizing
Reverse Osmosis (RO)	3-stage configuration, assumed thin-film composite polyamide membranes with 85% recovery. Includes an RO feed tank and pumps, booster pumps with energy recovery devices between stages, and RO flush pumps before and after CIPs or during shut downs.	Influent flow = 7.1 mgd Effluent flow = 6.0 mgd
UV-Advanced Oxidation Process (AOP)	Either 1 medium-pressure or 2 low-pressure UV reactors with oxidant (hydrogen peroxide and/or free chlorine)	Influent flow = 6.0 mgd Effluent flow = 6.0 mgd
Post Stabilization and Chlorination (Water Conditioning)	Chemical conditioning as described in Table 4-5 for remineralization of purified water. Assumes no decarbonator tower.	
Purified Water	Collected in a clearwell with minimal storage capacity. Conveyed to reservoir on demand (as water is produced).	Effluent flow = 6.0 mgd
Waste Disposal – RO Concentrate	RO concentrate conveyed to brine disposal conveyance system. Pressure from RO feed pumps (95-105 psi) will provide sufficient head to convey RO concentrate to SMP.	Brine flow = 1.1 mgd Assumes no brine concentration technology
Waste Disposal – Other wastes (e.g. MF backwash, strainer backwash, CIP waste, sampling waste, etc.)	Collected in a wet well with 6-hr holding capacity. Conveyed to sewer system for disposal	Waste flow = 0.5 mgd 7% of influent flow
Staffing	Facility staffed by 3 full-time equivalents and includes an on-site control room. On-site staff accommodations (locker room, break room, parking). It is assumed that some existing JPA staff will be cross-trained to operate the AWTF.	

Sources: MWH/Stantec 2016, CDM Smith 2017, Woodard & Curran 2017.

The AWT treatment processes require the dosing of various reagents, as shown in Figure 4-4. A dedicated chemical storage area would be identified at the site and injection equipment provided for each chemical feed, as summarized in Table 4-5.

Table 4-5: Chemical System Summary

Reagent	Injection Point	Purpose	Equipment	Dose Range (mg/L)
Sodium Hypochlorite	MF Feed	Chloramine residual	Plastic tank and peristaltic pumps	2 to 5*
	UV/AOP Feed	Oxidant (alternative)		4 to 5*
	Product Water	Chlorine residual		0.5 to 3*
Ammonia	MF Feed	Chloramine residual	Plastic tank / IBC totes and peristaltic pumps	0.7 to 1.6**
Sulfuric Acid	RO Feed	Scaling control	Steel tank and diaphragm pumps	0 to 100
	UV/AOP Feed	pH control for Cl_2 AOP		0 to 15
Antiscalant	RO Feed	Scaling control	Plastic tank / IBC totes and peristaltic pumps	1 to 5
Hydrogen Peroxide	UV/AOP Feed	Oxidant (alternative)	Plastic tank and peristaltic pumps	6 to 10
Carbon Dioxide	Product Water	Post-stabilization	Gas tank and side-stream saturator	0 to 50
Lime	Product Water	Post-stabilization	Lime silo, batch tank, and slurry injection	60 to 100

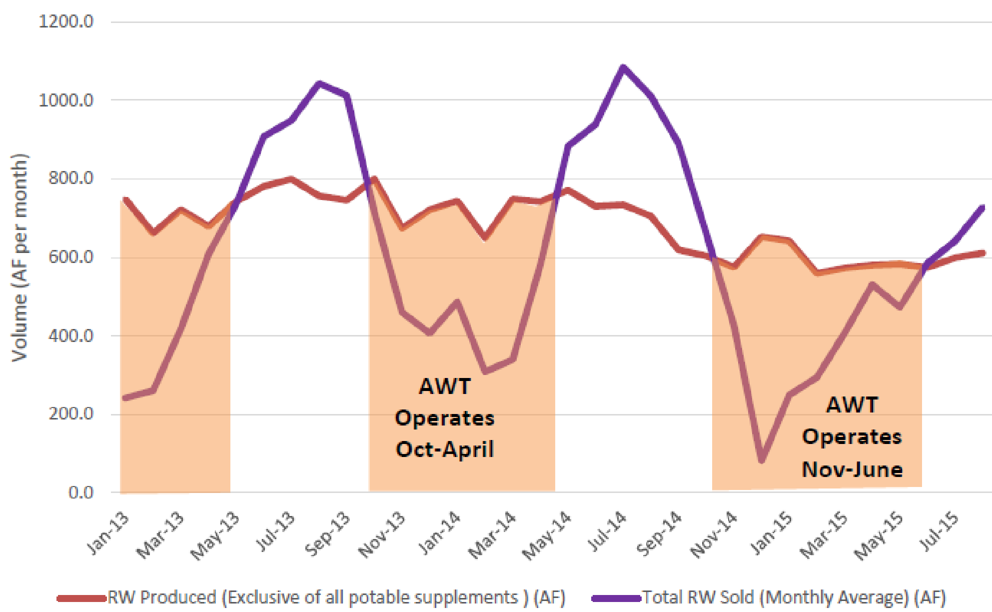
Source: MWH/Stantec 2016

Intermittent chemicals are required in addition to the chemical feeds listed Table 4-5, which would also be stored in the chemical area and conveyed via transfer pumps to the place of use. These additional chemicals include (MWH/Stantec 2016):

- *Sodium Hypochlorite* for MF system cleaning cycles.
- *Citric Acid* for low-pH MF system and RO system cleaning cycles. Proprietary cleaning solutions can also be used for this purpose.
- *Sodium Hydroxide* for high-pH MF system and RO system cleaning cycles, as well as to neutralize low-pH cleaning solutions.
- *Sulfuric Acid* to neutralize high-pH cleaning solutions. *Sodium Bisulfite* to quench residual oxidant as water is pulled from the RO Flush Tank to flush the RO skids; and to make up pickling solutions for long-term storage of the MF or RO skids when the AWT facility is offline.

The AWTF operation would vary by season, treating excess recycled water after existing non-potable demands are met. Figure 4-5 illustrates how the AWTF would be operated, where the facility would ramp up and down incrementally by bringing portions of the treatment train online as supply becomes available. Appropriate shut-down and storage procedures would need to be followed to maintain the life of treatment equipment, particularly for the UF/RO membranes and UV reactors.

Figure 4-5: Seasonal Operation based on Historical Recycled Water Demand



Source: MWH/Stantec 2016

Additional protocols for off-spec and emergency operations are integral to obtaining regulatory approval for the AWTF. "Off-spec" water occurs when treatment is not in compliance with regulatory requirements. It is assumed that discharge of off-spec water would be accomplished through (1) immediately suspending the delivery of tertiary water to the AWTF, (2) utilization of existing storage in the recycled water system to delay flows to the AWTF and (3) discharge of excess water from TWRF via LA River, sewer diversion and spray fields. In addition, the design of the AWT would allow recirculation of off-spec water to re-treat flows. Future discussions with Regional Board and DDW would confirm the acceptability of this approach.

Based on current discharge requirements for MWDSC water into Las Virgenes Reservoir, for the purpose of this study it is similarly assumed that dechlorination would not be required prior to release of purified water to the Reservoir. Future discussions with Regional Board would confirm discharge requirements.

4.5.2 *AWTF Siting*

A comprehensive *AWTP Preliminary Siting Study Report* (Siting Study) was conducted to evaluate candidate sites for the AWTF based on technical and institutional considerations (Woodard & Curran 2018). The AWTF components and capacities identified in the BODR are the basis of the assumptions for the Siting Study. The Siting Study also took into consideration the following ten policy principals developed by the JPA for AWTF siting:

1. Involve the City and the Community in the development and design of facilities.
2. Preserve the natural beauty of the site.
3. Reserve a portion of the property for public benefit in coordination with the City of Agoura Hills
4. Minimize the impact to oak trees and other natural resources on the property.
5. Design the facilities with architecture compatible with the surrounding area.
6. Minimize the overall footprint of the facility.
7. Provide for the on-site treatment and/or capture of stormwater.
8. Keep the community and recreational users informed of any project-related activities that may affect them.
9. Minimize the potential for noise or light to emanate from the site.
10. Utilize renewable energy sources to offset demands at the site.

The outcome of the Siting Study was the identification of a short list of six candidate sites. Based on discussions with the JPA, the Site A and Site F (shown in Figure 4-2), which received the highest overall scores in the Siting Study, have moved forward for further consideration as part of this Feasibility Study.

Site A is located on the edge of Las Virgenes Reservoir in an open space area in the City of Westlake Village. LVMWD owns the parcel. A new access road would be required to reach the site and avoid driving through residential streets for truck access to the site (AECOM 2012). The yellow shape in Figure 4-6 shows the mostly likely area where the AWTF would be located.

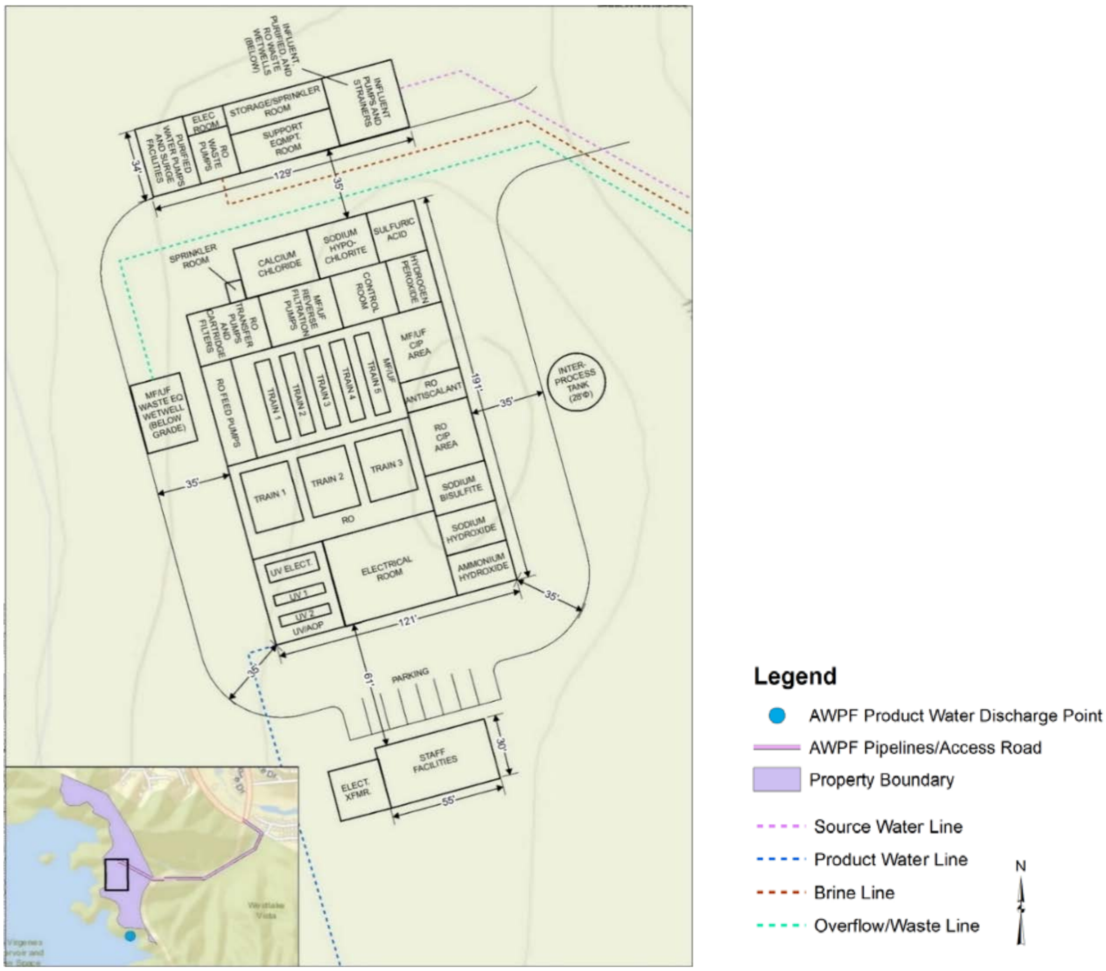
Figure 4-6: Potential AWTF at Site A

Source: Modified from figure in AWT Siting Study - Appendix D (Woodward & Curran 2018)

A conceptual AWTF facility layout at Site A is shown in Figure 4-7. The layout is based on the AWTF facility assumptions listed in Table 4-4. It is adapted from the AWTF layout developed for Site F in the *AWTP Preliminary Siting Study*, prepared by Woodard & Curran in July 2017. The additions of chrloramines, frequently applied after UV treatment in the AWTF to control microbial grown in pipelines leading to a reservoir, could possibly be avoided at Site A due to the proximity to the point of discharge. This would have the benefit of reducing the inorganic nitrogen loading to the Reservoir and minimize the formation of nitrosamines (NWRI 2018).

The remote location of this site and its prior use as a borrow site for materials that were used for dam construction, would likely provide more flexibility of layout options than Site F in terms avoiding sensitive areas and meeting setback requirements. Due to the geology of the site, including the presence of hard rock and available material for backfill, excavation would be challenging, and facilities would likely need to be constructed above ground to the greatest extent possible to minimize grading and excavation costs. Geotechnical investigations would be required to confirm the site conditions and provide the appropriate excavation, fill, structural backfill and compaction requirements. Height limitations would also apply to minimize obstruction of views around the reservoir. LVMWD currently owns the property, so there would be no cost to acquiring the site. Other challenges include limited access to basic utilities and environmental compliance due to potential endangered species habitat in the vicinity of the site.

Figure 4-7: Potential AWTF Layout at Site A



Source: Layout of facilities adapted from Woodward & Curran 2017

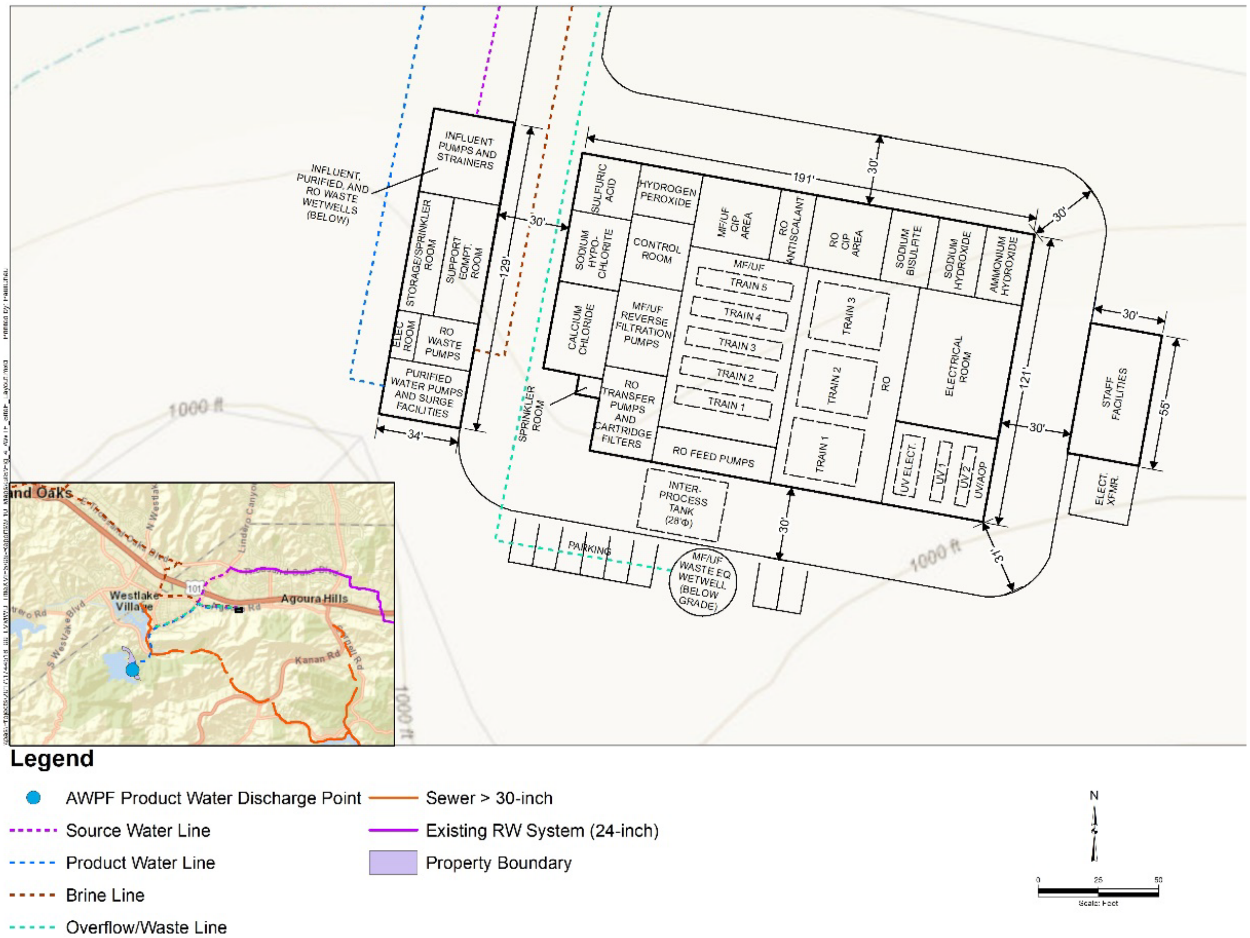
Site F is located on an empty lot in a business park/office retail zone off Agoura Road in the City of Agoura Hills. The JPA adopted the Negative declaration for the purchase of this property (30800 Agora Road) in August 2017 and authorized purchase of the property at the March 5, 2018 Board Meeting the Board. The potential routes for an access road do not require driving through residential streets for truck access to the site and there is immediate access to basic utilities. Challenges include close proximity to some sensitive receptors (e.g. neighborhoods and schools) and moderate hurdles related to environmental compliance. The yellow shape in Figure 4-8 shows the mostly likely area where the AWTF would be located.

Figure 4-8: Potential AWTF at Site F

Source: Modified from figure in AWT Siting Study - Appendix D (Woodward & Curran 2018)

A conceptual AWTF facility layout at Site F, shown in Figure 4-9, was developed as part of the Siting Study to support the decision to acquire the property (Woodard & Curran 2017). The layout is based on the AWTF facility assumptions listed in Table 4-4.

Figure 4-9: Potential AWTF Layout at Site F



Source: Modified from Woodward & Curran 2017

The Site F layout was developed as part of the Siting Study (Woodard & Curran 2017) and similarly took into consideration ten policy principals developed by the JPA for AWTF siting. The site assumes that the western area of the property would be reserved for public benefit. Flood control easements and riparian areas would be avoided. The layout makes use of multi-level placement of wet wells and other facilities to minimize the overall footprint and assumes soil nail wall construction to minimize the affected area during construction. The layout observes all setback requirements and would be configured to minimize impacted trees and the height of necessary retaining walls. Space would be allocated for on-site capture of stormwater from the site, though infiltration may not be feasible per the geotechnical reports. It is assumed that the retaining wall would be constructed with a natural-appearing facade and that an architectural style compatible with the surrounding community would be utilized for the buildings that house AWTF facilities (Woodard & Curran 2017).

4.5.3 *Brine and Waste Disposal*

Reject water, or brine, from the RO process would be disposed of via a pipeline from the AWTF to the Salinity Management Pipeline in Ventura County. Residuals from the AWTF, other than brine, would be disposed of via a connection from the AWTF to the sanitary sewer. On-site stormwater would be connected to the county storm drain or to a stormwater management area if available.

The anticipated water quality of the brine was estimated based on water quality from the TWRF, assumed minimum instantaneous rejected flow conditions based on 85% recovery. An assessment of brine minimization options is explored in TM #1 included in Appendix E.

4.5.4 *Reservoir Operations and Modeling*

A range of operating scenarios were evaluated as part of a Modeling Study prepared for the JPA under a separate contract (Trussell 2018 and FSI 2018) to maximize the operational flexibility of the Pure Water Project and meet regulatory requirements. Appendix H includes a cover letter briefing of the modeling results performed by the Pure Water Project.

Three reservoir operational scenarios were developed to support the development of a calibrated hydrodynamic model, by Flow Science Inc. of the reservoir to understand mixing and adherence to dilution criteria within the reservoir (FSI 2018). The operational scenarios were developed to bracket the intended use of the Reservoir with the Pure Water Project and to maximize operational flexibility by considering 'boundary' conditions. These are conditions that achieve SWA regulatory requirements but are up against the boundary of the regulations or possible uses of the project. Table 4-6 provides a summary of the three reservoir operational scenarios, which are described in the bullets that following (Trussell 2018).

Table 4-6: Modeling Results for Operational Scenarios

SCENARIO	Purified water inflow (mgd)	WLFP Withdrawal (MGD)	Theoretical retention time (months)	Theoretical Retention Time Regulatory Objective (months)	Predicted Lowest Minimum Dilution for All Traces[1]
Routine	AWTF flows during winter and Filtration Plant flows during summer. No modeling required.				
Boundary	1.7	5.0	8.5	> 6.0	77:1
Emergency	6.0	15.0	2.4	> 2.0	69:1

Source: Modeling Study (Trussell 2018)

[1] Estimated based on approximately 30 tracer release simulations. The shortest predicted lag time from the introduction of purified water to the inlet of the WFLP was 0.6 days.

- Routine: The first operational scenario considers the Pure Water Project as developed in the 2016 BODR. During winter months, available potable reuse water would be discharged to the Reservoir when the WLFP is not in service. Then during summer months, the WLFP would operate (i.e., drawing water from the Reservoir). Because input of the purified water would not occur simultaneously with the operation of the WLFP, the primary regulatory parameters, dilution and retention time, are less applicable and no modeling was required to demonstrate compliance with the SWA Regulations.

- Boundary: The second operational scenario considers operating the WLFP through a full winter, while simultaneously providing potable reuse water to the reservoir. In this scenario, during the summer, irrigation demand would still be prioritized and there would be minimal input to the Reservoir. In addition, to represent a worst-case scenario in terms of dilution, no other water source would enter the reservoir (e.g., no MWDSC water received). In effect, this scenario represents the most consistent use of the Pure Water Project by incorporating all available purified water, including during the shoulder months (in Spring and Fall) when excess recycled water is available and the WLFP is under normal operating conditions
- Emergency: The third and final scenario considers an emergency scenario, where the MWDSC feeder line to the Reservoir is inoperable, either for long-term maintenance or as a result of failure and the WLFP must come on-line at a high capacity. In this scenario, the maximum amount of purified water would be produced by the AWTF (6 mgd), and the WLFP would produce the maximum amount of drinking water (15 MGD).

Overall, the hydrodynamic modeling results were favorable, indicating that the Pure Water Project would be in compliance with the SWA Regulations for retention and dilution.

As shown in Table 4-6, under all operational scenarios considered, the theoretical retention regulatory objective of greater than 2 months (60-days) would be met. The emergency scenario is above the minimum allowable retention time of 2 months but below the 4-month threshold, which triggers additional log removal of pathogens (previously discussed in Section 3.1.3).

As part of the Modeling Study, after calibrating and running the model for the operational scenarios, pulses of tracer were injected into the reservoir, at regular intervals, to simulate the anticipated movement of augmented purified water. For all tracer simulations (over 60 conducted in total), there were only three that resulted in values less than the minimum dilution of 100:1. In each case, a strong wind from the southeast pushed the warmer purified the inlet of the WLFP along the surface of the reservoir, essentially resulting in the purified water short-circuiting through the Reservoir.

Possible solutions to avoid the low dilution conditions include a submerged purified water discharge point (the model simulated a surface discharge) or improved aeration in the reservoir, which would have other water quality benefits. Alternatively, an additional log removal capacity could be added to the treatment train to reduce the allowable minimum dilution to 10:1.

Future studies and modeling efforts were recommended by the Modeling Study to confirm the modeling results, via an Independent Advisory Panel (IAP), and guide the identification of a preferred discharge location, discharge facility type and placement of an aerator to improve mixing.

The first IAP meeting was held on was held on May 4, 2018 to solicit feedback on (1) the results of initial reservoir modeling efforts and (2) the feasibility of the Pure Water Project to comply with reservoir requirements of the SWA Regulations. The IAP provided favorable feedback and concluded that the preliminary reservoir model analysis and scenarios are reasonable and that the proposed Project as presented to the Panel, appears to be capable of complying with the SWA Regulations (NWRI 2018). Appendix I includes a memorandum summarizing the findings and recommendations from the NWRI IAP from the May 4th meeting.

Alternatives 1a and 1b, described in the following sections assume a submerged multi-port diffuser located as indicated in Figure 4-10 and that one additional log removal of pathogens would be needed at the AWTF to operate under emergency conditions.

Figure 4-10: Las Virgenes Reservoir – Existing and Potential Future Facilities

Source: Modeling Study (Trussell 2018). The Pure Water Project would benefit from an alternative placement of existing aerators, or possibly the addition of another aerator, to improve mixing and increase dilution.

4.5.5 *Alternative 1a – Pure Water Project with AWTF near the Reservoir*

Site A would produce an average of 3,100 AFY of purified water supply at an AWTF located near the Las Virgenes Reservoir at Site A, previously shown in Figure 4-6. An extension pipeline would be constructed to convey tertiary water from the existing non-potable recycled water system to serve as influent to the AWTF. A new purified water pipeline would be constructed to convey water produced at the AWTF to the Reservoir. A new brine pipelines would convey reject water from the AWTF to the SMP. Purified water stored in the Reservoir would co-mingle with imported drinking water supplies, also stored in the Reservoir would be released for treatment and disinfection at the WLFP prior to distribution to the drinking water system.

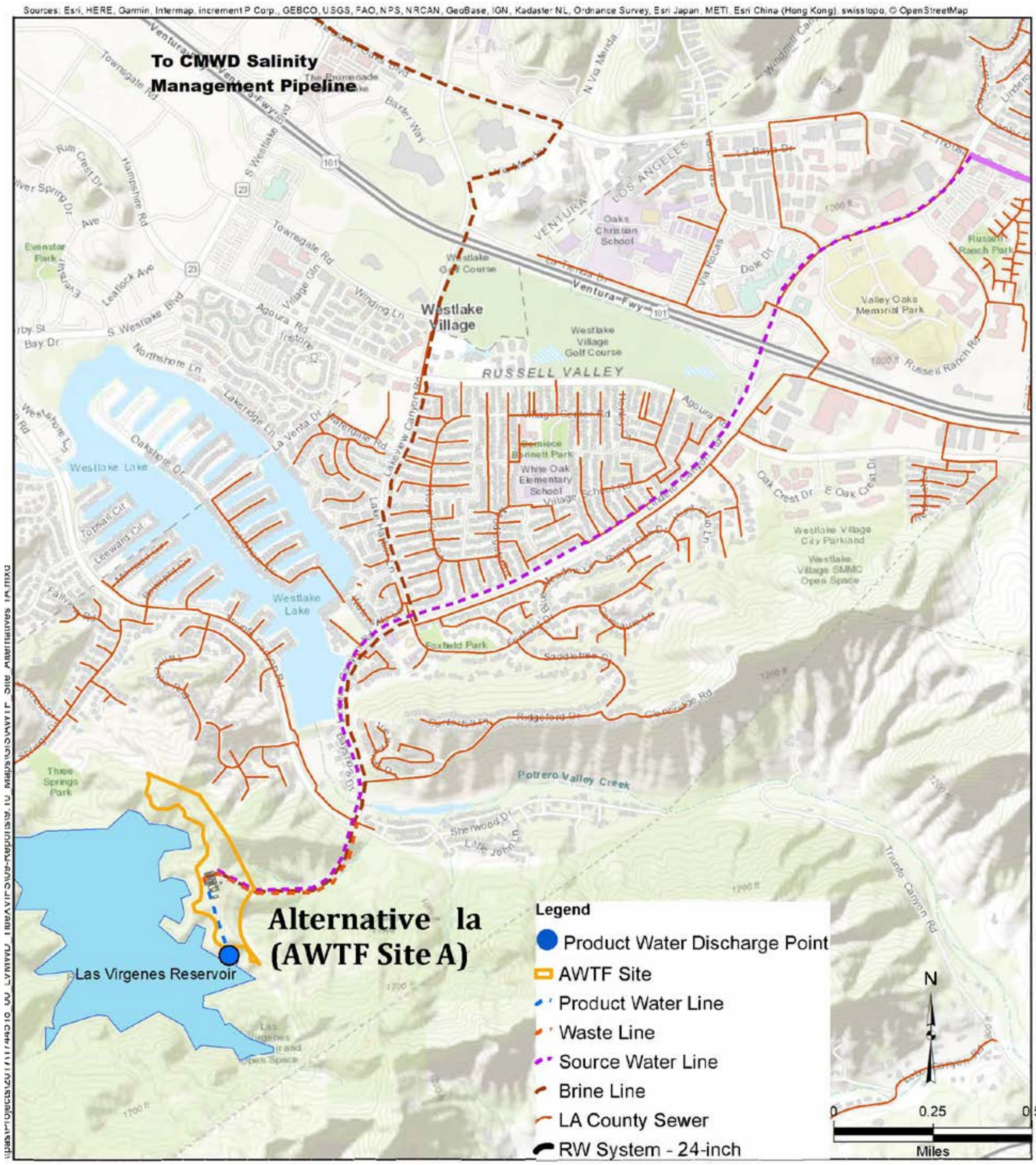
Site A project components include the following:

- **Treatment Facilities:** 6.0-mgd capacity AWTF, including MF/RO/UV/AOP process train and associated chemical feed systems, wet wells, inter-process pumps and other appurtenances. An average level of architectural treatment is assumed. Brine concentration or minimization technology is not included in this alternative.
- **Pipelines:** 3.0 miles of 24"-dia tertiary influent pipeline, 0.2 miles of 20"-dia purified water pipeline, 12 miles of 12"-dia brine pipeline, and 0.5 miles of 6"-dia waste pipeline.
- **Pump Stations:** no pump stations are required to convey various flows to and from the AWTF based on a preliminary hydraulic analysis.
- **Other Major Facilities:** two mixing aerators in Las Virgenes Reservoir and a product water diffuser.
- **Project Yield:** 3,100 AFY of purified water produced on average, starting at 2,092 in Year 1 and increasing to 4,129 by Year 20.
- **Total Project Capital Cost:** $118 million.
- **Annual O&M Cost:** $3.4 million, based on energy, chemical usage and additional labor to operate and maintain the project facilities. Less $4.6 million in imported water savings.

This alternative project would efficiently utilize existing assets in combination with new infrastructure to significantly increase the use of a new, local, drought-resilient water supply. The AWTF site is located in disturbed area, a former borrow site, owned by the LVMWD, thus, requiring minimal construction in undisturbed areas. This diversion of wastewater effluent for recycled water production would eliminate discharges of recycled water to Malibu Creek, helping the JPA to meet their NPDES discharge requirements.

Figure 4-11 illustrates the location of major project components. Previously presented Figure 4-2 provides a larger scale map that shows the full brine alignment, including alternative alignments and Figure 4-7 shows a closeup of treatment facilities at the AWTF site. Detailed feasibility-level estimates of cost tables are provided in Appendix C. Life-cycle costs and additional economic analyses are presented in Section 5.

Figure 4-11: Site A – Pure Water Project with AWTF near Reservoir



4.5.6 *Alternative 1b – Pure Water Project with AWTF at Site F*

Alternative 1b would produce up an average of 3,100 AFY of purified water supply at an AWTF located on Agoura Road at Site F, previously shown in Figure 4-6. An extension pipeline would be constructed to convey tertiary water from the existing non-potable recycled water system to serve as influent to the AWTF. A new purified water pipeline would be constructed to convey water produced at the AWTF to the Reservoir. A new brine pipelines would convey reject water from the AWTF to the SMP. Purified water stored in the Reservoir would co-mingle with imported drinking water supplies, also stored in the Reservoir would be released for treatment and disinfection at the WLFP prior to distribution to the drinking water system.

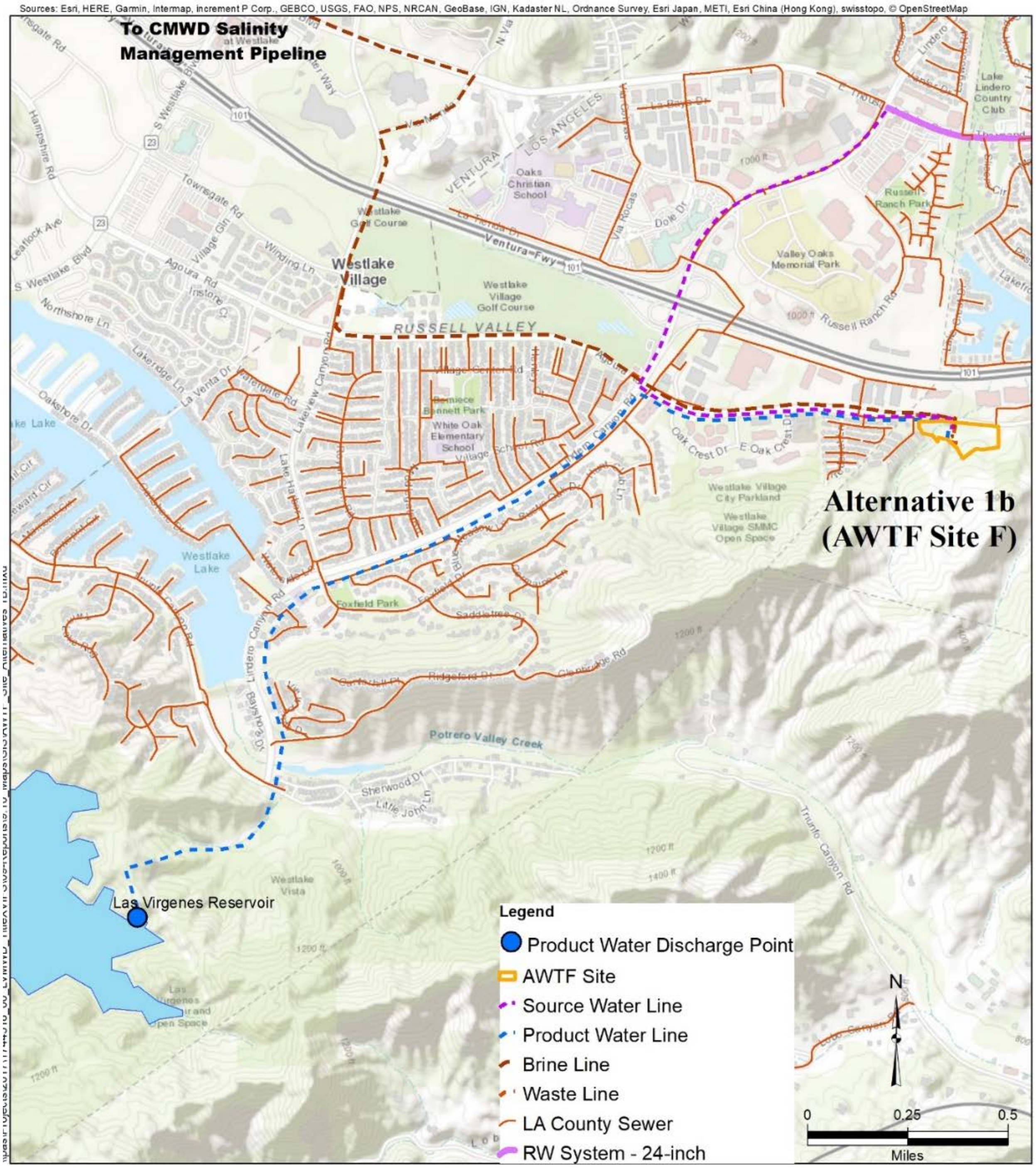
Alternative 1b project components include the following:

- **Treatment Facilities:** 6.0-mgd capacity AWTF, including MF/RO/UV/AOP process train and associated chemical feed systems, wet wells, inter-process pumps and other appurtenances. An average level of architectural treatment is assumed. Brine concentration or minimization technology is not included in this alternative.
- **Pipelines:** 1.7 miles of 24"-dia tertiary influent pipeline, 2.9 miles of 20"-dia purified water pipeline, 12 miles of 12"-dia brine pipeline, and 1.9 miles of 6"-dia waste pipeline.
- **Pump Stations:** one 375-HP pump station to convey product water from the AWTF to the Reservoir, one 6-HP pump station to convey waste flows from the AWTF to a nearby Los Angeles County sewer. Pump stations are not required to convey source water or brine flows based on a preliminary hydraulic analysis.
- **Other Major Facilities:** two mixing aerators in Las Virgenes Reservoir and a product water diffuser.
- **Project Yield:** 3,100 AFY of purified water produced on average, starting at 2,092 in Year 1 and increasing to 4,129 by Year 20.
- **Total Project Capital Cost:** $123 million.
- **Annual O&M Cost:** $3.4 million, based on energy, chemical usage and additional labor to operate and maintain the project facilities. Less $4.6 million in imported water savings.

This alternative project would efficiently utilize existing assets in combination with new infrastructure to significantly increase the use of a new, local, drought-resilient water supply. This diversion of wastewater effluent for recycled water production would eliminate discharges of recycled water to Malibu Creek, helping the JPA to meet their NPDES discharge requirements.

Figure 4-12 illustrates the location of major project components. Previously presented Figure 4-2 provides a larger scale map that shows the full brine alignment, including alternative alignments and Figure 4-7 shows a closeup of treatment facilities at the AWTF site. Detailed feasibility-level estimates of cost tables are provided in Appendix C. Life-cycle costs and additional economic analyses are presented in Section 5.

Figure 4-12: Alternative 1b – Pure Water Project with AWTF on Agoura Road at Site F



4.6 Alternative 2 - Encino Reservoir Project

The Encino Reservoir Project would convey surplus recycled water from the TWRF to the currently dormant Encino Reservoir during the low-demand winter season for use during the high-demand summer season. Encino Reservoir is owned by Los Angeles Department of Water and Power (LADWP) and is not currently in service because of challenges meeting the requirements of the Surface Water Treatment Rule and concerns about the seismic stability of the dam. This project would be developed in cooperation with the City of Los Angeles. Figure 4-13 illustrates facilities associated with the Encino Reservoir Project alternatives and Figure 4-14 presents a general flow schematic for the project. The following sections discuss general treatment, demand and reservoir operational considerations followed by specific facility requirements and costs for Alternative 2a and 2b.

Figure 4-13: Encino Reservoir Project Alternatives

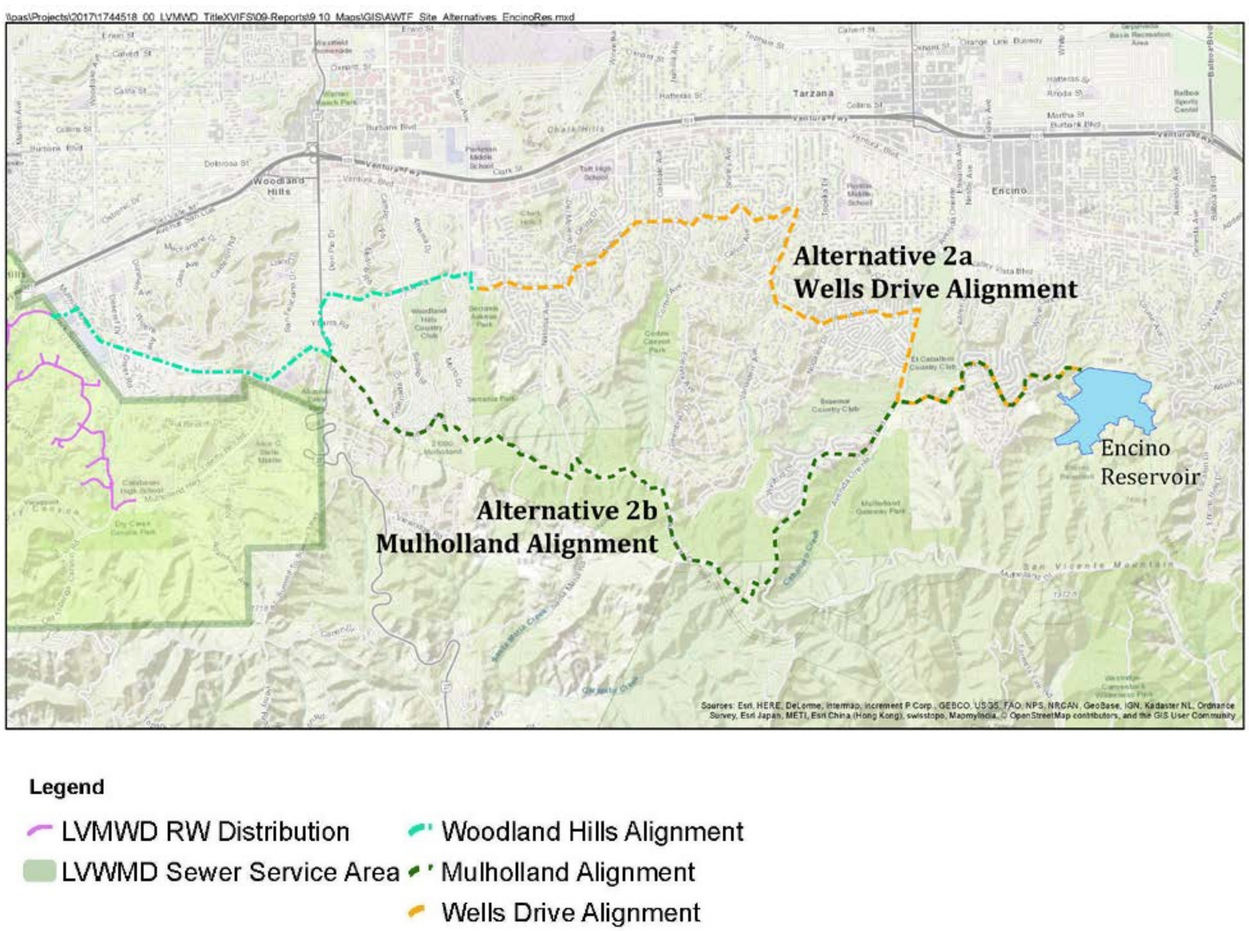
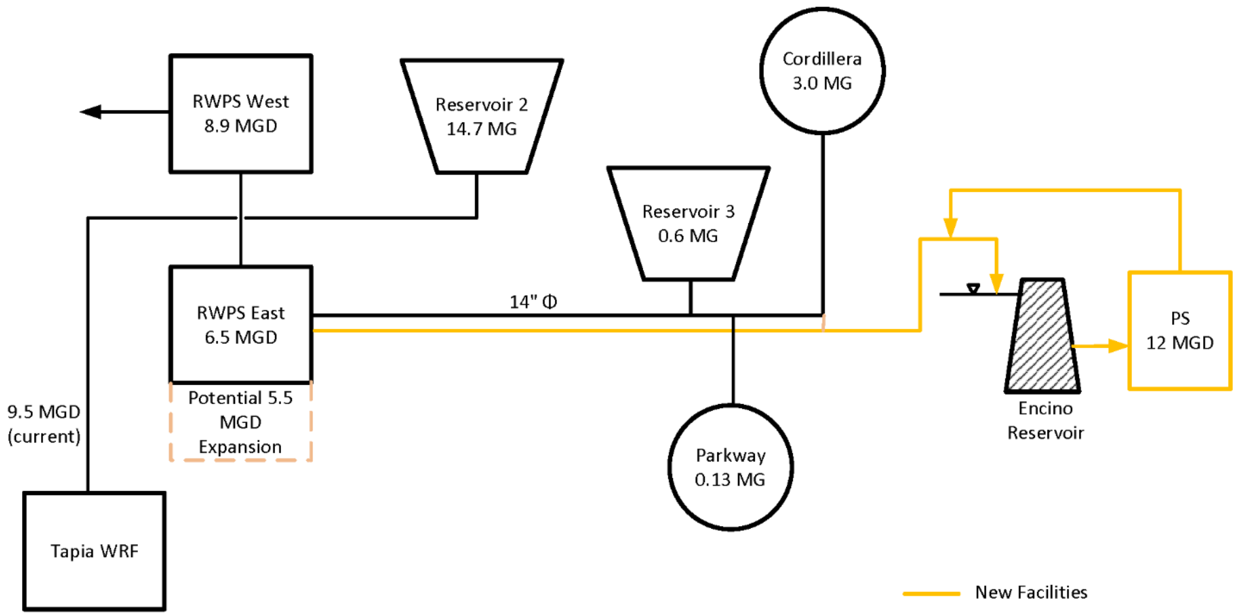


Figure 4-14: Encino Reservoir Project Flow Schematic



Source: BODR (MWH 2016)

As illustrated in the flow schematic, a new parallel recycled water pipeline would be constructed to convey tertiary water from the existing Recycled Water Pump Station (RWPS) East to Encino Reservoir. The new pipeline would also be connected to the existing system to be able to convey stored water from Cordillera Tank. The RWPS East would be expanded and a new pump station would be constructed at Encino Reservoir, location shown in Figure 4-15, to return recycled water to the existing non-potable recycled water system to serve existing and future customers.

Figure 4-15: Proposed Encino Reservoir Pump Station Location

Source: BODR (MWH 2016)

4.6.1 *Treatment*

The Encino Reservoir Project would receive Title 22 recycled water from the TWRF that already meets standards for unrestricted non-potable reuse. However, additional treatment facilities would be constructed at Encino Reservoir to improve water quality of outflows from the reservoir to remove any algae or debris from the open-air reservoir. Treatment facilities would include filtration and disinfection to prevent clogging of sprinklers or growth in distribution systems, which would provide quality assurance for customers and protect equipment and facilities within the recycled water distribution system.

Filtration would be achieved by self-cleaning strainers housed at the new Encino Reservoir Pump Station constructed as part of this project. Wash water generated from self-cleaning the strainers would be discharged to the on-site sewer (MWH 2016).

Disinfection would be added via a new liquid chlorine injection system downstream of the new Encino Reservoir Pump Station to control biological growth in the recycled water pipelines. An arrangement could potentially be made with LADWP to use the existing gaseous chlorine system already on-site, which was designed to chlorinate the emergency release of water from the reservoir (MWH 2016); however, for the purpose of this study, it is assumed a new chlorination system would be constructed.

These facilities would be monitored remotely, and periodic operation and maintenance activities would be performed during weekly site visits coordinated through LADWP (MWH 2016).

4.6.2 *Demands*

The Encino Reservoir Project would provide an opportunity to increase the amount of supply available for irrigation uses by storing winter flows for delivery in high demands months. The Encino Reservoir Project would enable the JPA to store excess recycled water in the winter months to meet the supply gap in the summer months rather than relying upon potable water supplements to fill the gap. As discussed in Section 3.2.1, and previously shown in Figure 3-3, demands would include new infill development, non-potable users along the alignment to Encino Reservoir, and an extension to serve new customers in Woodland /Hills. The estimated growth in non-potable demand would be 2,395 AFY (2.1 mgd) on average. As previously described in Table 3-6, this would result in a total non-potable demand of 8,942 AFY (8 mgd) for tertiary recycled water from the TWRF.

4.6.3 *Encino Reservoir*

The 168-foot-tall earth dam at Encino Reservoir was constructed in 1924 and is routinely inspected by the Division of Safety of Dams (DSOD). The reservoir capacity is 9,789 AF, however LADWP typically maintained a volume of about 7,300 AF for operation until it was taken out of regular service in 2002. In 2005, a new filtration plant and pumping station were constructed next to the reservoir to meet the new surface water treatment regulations and LADWP currently only uses Encino Reservoir as emergency water storage for use during severe seismic events or other catastrophic water system failures (MWH 2016)

Pursuit of the Encino Reservoir Project would necessitate the completion of the seismic study to identify additional rehabilitation requirements for the dam, modifications to the outflow from the reservoir to provide an alternate drain in case of emergency and likely a change in its use as an emergency supply. Furthermore, institutional agreements and extensive coordination with LADWP would be the cornerstone of the Encino Reservoir Project.

For the purpose of this study, it is assumed that engineering, operational and institutional issues could be overcome, and it would be viable to repurpose Encino Reservoir for tertiary recycled water storage.

4.6.4 *Reservoir Operations*

At the most simplistic level, reservoir operations for the project would consist of (1) filling Encino Reservoir with surplus water available from TWRF on a daily basis and (2) conveying stored water from Encino Reservoir back to the recycled water distribution to satisfy peak demands on days when demand exceeds supply. In practice, however, reservoir operations would be much more complicated. Reservoir operations would need to carefully balance the need to maintain adequate storage capacity, address water quality issues and utilize unallocated surplus recycled waters supplies. The following bullets summarize these considerations, based on the findings in the BODR.

- **Maintaining Adequate Storage Capacity:** The BODR developed a high-level reservoir operations model based on available data and the supply and demand assumptions for the project. The rate of evaporation from the reservoir was assumed to be approximately equal to the rate of precipitation and runoff over the long term. An average loss of 400 AFY was assumed to account for seepage from the reservoir (MWH 2016). The BODR estimated that the average amount of capacity required in Encino Reservoir to store surplus required water would be approximately 3,100 AF (MWH 2016). Due to climatic conditions, water conservation efforts and economic conditions, variation in supply and demand, the range of required storage would be between 1,400 and 5,000 AF. The pursuit of an Encino Reservoir Project would require the development of a robust, calibrated reservoir operations model to anticipate the amount of storage necessary from year to year and a proactive plan to maintain capacity for stormwater runoff into the reservoir.
- **Addressing Water Quality Issues:** Another component of reservoir operations would be to maintain suitable water quality in the reservoir for outflows to re-enter the recycled water distribution system. A key to maintaining high water quality would be to prevent anoxic conditions that can exacerbate algae growth and cause odor or other water quality issues. The BODR assumed implementation of an aeration and mixing system, consisting of two air compressors and a grid of distribution piping anchored just above the reservoir bottom, to be constructed as part of the Encino Reservoir Project to help meet oxygen demand (MWH 2016). Furthermore, it was assumed that a water quality sampling plan and model would be created to confirm compliance with Title 22 requirements as part of the project.
- **Utilizing Unallocated Surplus Recycled Supplies.** The BODR looked at multiple alternatives to utilize the unallocated surplus recycled water that would be stored in the reservoir as part of an overall reservoir operations strategy. Options could include (1) discharge to the Donald C Tillman Water Reclamation Plant (DCTWRP) for use by LADWP, (2) a raw wastewater connection to the sewer system that would discharge to the DCTWRP, (3) a connection to the Sepulveda recycled water system, (4) connection to new customers or (5) drainage to the Los Angeles River. A preferred alternative was not identified in the BODR.

For the purpose of this study it is assumed that future efforts would be needed to develop a robust reservoir operations model, establish a water quality sampling plan and identify a preferred approach for utilizing unallocated recycled water surplus supplies. Facilities and costs for these efforts cannot be defined at this time. The Encino Reservoir Project alternatives do, however, include an aeration and mixing system as described above.

4.6.5 *Alternative 2a – Encino Reservoir Project Mulholland Alignment*

Alternative 2a would convey surplus recycled water to Encino Reservoir along the Woodland Hills and Mulholland alignments (Figure 4-13), resulting in an additional 2,395 AFY of non-potable reuse at buildout (1,200 AFY on average). The project would rely on a combination of existing conveyance infrastructure and new pipelines and pump stations to convey water to and from Encino Reservoir.

New pipelines would include a combination of standard pressure and high-pressure pipelines (for pressures in excess of 260 pounds per square inch (psi) (MWH 2016)). The 2016 BODR included DigAlert utility search and a preliminary geotechnical investigation to assess utility corridors, soil quality, fault lines and other geological considerations at a high-level as part of the preliminary assessment of pipeline alignments. Future studies would be needed to confirm assumptions and support design efforts should this alternative move forward.

New pump stations and pipelines are sized to carry the maximum day surplus recycled water flow during the winter months (12 mgd) to Encino Reservoir and to meet peak irrigation demands (11 mgd) from the reservoir during the summer months (per Appendix K of the BODR). The RWPS East would require a 5.5 mgd increase from the existing capacity (6.5 mgd) to meet project design flows. Additional treatment facilities would be sized to meet the peak hourly irrigation demands to maintain water quality re-entering the recycled water distribution system, as discussed in Section 4.6.1.

Alternative 2a project components include the following:

- **Treatment Facilities:** strainers and chlorination system at Encino Reservoir, including associated appurtenances.
- **Pipelines:** 9.9 miles of 24”-dia tertiary pipeline (standard pressure) and 5.2 miles of 20”-dia tertiary pipeline (high pressure)
- **Other Major Facilities:** RWPS East upgrade (1,000 Hp), a new pump station at Encino Reservoir (2,500 Hp), and reservoir mixing system.
- **Project Yield:** 1,200 AFY of new recycled water demand on average, with 2395 AFY of new demand by Year 20.
- **Total Project Capital Cost:** $88 million.
- **Annual O&M Cost:** $730,000 per year, based on energy, chemical usage and additional labor to operate and maintain the filters. Less $700,000 per year in imported water savings and less $500,00 per year due to revenues from additional recycled water sales

This alternative project would efficiently utilize existing assets in combination with new infrastructure to significantly increase the use of a local, drought-resilient water supply. The RWPS East expansion site would be located in disturbed area. New facilities at Encino Reservoir (pump station, strainers and chlorine system) and along the Mullholland Alignment (storage tank and additional pump station) would require acquisition of approximately 1 acre of land. The Mulholland alignment would impact fewer residential neighborhoods but would have a higher maximum elevation than the wells alignment (Alternative 2b) requiring an additional storage tank and pump station along the alignment (see hydraulic profile in Appendix B).

This diversion of wastewater effluent for recycled water production would eliminate discharges of recycled water to Malibu Creek, helping the JPA to meet their NPDES discharge requirements.

Figure 4-13 illustrates the location of major project components. Detailed feasibility-level estimates of cost tables are provided in Appendix C. Life-cycle costs and additional economic analyses are presented in Section 5.

4.6.6 *Alternative 2b – Encino Reservoir Project Wells Drive Alignment*

Alternative 2b would convey surplus recycled water to Encino Reservoir along the Woodland Hills and Mulholland alignments (Figure 4-13), resulting in an additional 2,395 AFY of non-potable reuse. The project would rely on a combination of existing conveyance infrastructure and new pipelines and pump stations to convey water to and from Encino Reservoir.

New pipelines would include a combination of standard pressure and high-pressure pipelines (for pressures in excess of 260 pounds per square inch (psi) (MWH 2016)). The 2016 BODR included DigAlert utility search and a preliminary geotechnical investigation to assess utility corridors, soil quality, fault lines and other geological considerations at a high-level as part of the preliminary assessment of pipeline alignments. Future studies would be needed to confirm assumptions and support design efforts should this alternative move forward.

New pump stations and pipelines are sized to carry the maximum day surplus recycled water flow during the winter months (12 mgd) to Encino Reservoir and to meet peak irrigation demands (11 mgd) from the reservoir during the summer months. The RWPS East would require a 5.5 mgd increase from the existing capacity (6.5 mgd) to meet project design flows. Additional treatment facilities would be sized to meet the peak hourly irrigation demands to maintain water quality re-entering the recycled water distribution system, as discussed in Section 4.6.1.

Alternative 2b project components include the following:

- **Treatment Facilities:** strainers and chlorination system at Encino Reservoir, including associated appurtenances.
- **Pipelines:** 5.4 miles of 24”-dia tertiary pipeline (standard pressure) and 9.9 miles of 24”-dia tertiary pipeline (high pressure)
- **Other Major Facilities:** RWPS East upgrade (500 Hp), a new pump station along the pipeline alignment (1,200 Hp) and a new pump station at Encino Reservoir (2,500 Hp). Storage tank (1 MG) and reservoir mixing system.
- **Project Yield:** 1,200 AFY of new recycled water demand on average, with 2,395 AFY of new demand by Year 20.
- **Total Project Capital Cost:** $108 million.

- **Annual O&M Cost:** $1 million per year, based on energy, chemical usage and additional labor to operate and maintain the filters. Less $700,000 per year in imported water savings and less $500,00 per year due to revenues from additional recycled water sales

This alternative project would efficiently utilize existing assets in combination with new infrastructure to significantly increase the use of a local, drought-resilient water supply. The RWPS East expansion site would be located in disturbed area. New facilities at Encino Reservoir (pump station, strainers and chlorine system) and along the Mullholland Alignment (storage tank and additional pump station) would require acquisition of approximately 1 acre of land.

This diversion of wastewater effluent for recycled water production would eliminate discharges of recycled water to Malibu Creek, helping the JPA to meet their NPDES discharge requirements.

Figure 4-13 illustrates the location of major project components. Detailed feasibility-level estimates of cost tables are provided in Appendix C. Life-cycle costs and additional economic analyses are presented in Section 5.

4.7 Waste-Stream Discharge Treatment and Disposal Water Quality Requirements

Description of waste-stream discharge treatment and disposal water quality requirements for the proposed Title XVI project.

For Alternative 1 -Pure Water Project, the primary waste-stream from the AWTF would be the brine generated from the RO unit. As previously discussed in Section 4.5.3, brine would be disposed of via the CMWD Salinity Management Pipeline (SMP). Brine water quality requirements would be dictated by CMWD, the discharge permittee, to ensure that their discharge permit water quality limits would consistently be met. A Pure Water Demonstration Project is being developed, which will provide an opportunity for the JPA to directly test high recovery RO options and characterize the brine to determine its compatibility for discharge to CMWD's SMP.

Other residuals from the AWTF would be disposed of via a connection from the AWTF to the sanitary sewer, and water quality requirements would be set by the JPA.

For Alternative 2 – Encino Reservoir Project, the only waste-stream would be wash water generated from self-cleaning the strainers, which would be discharged to the on-site sewer (MWH 2016). There are no anticipated water quality issues related to this discharge.

4.8 Alternative Measures and Technologies

Description of at least two alternative measures, or technologies available for water reclamation, distribution, and reuse for the project under consideration. These alternatives must be approvable by the state(s) or tribal authorities in which the project will be located.

For Alternative 1 – Pure Water Project, alternative measures and technologies considered include brine minimization and stormwater capture.

- Brine minimization can provide benefits by reducing the volume of brine required for discharge and increasing the amount of available purified water produced. Appendix E provides additional details about four alternative technologies for brine minimization, including the costs, benefits and limitations of each.
- Stormwater capture by treating dry weather flows from the local stormwater municipal discharge (MS4) permittees presents another opportunity to increase inflows in into the AWTF. Appendix D provides and overview of potential stormwater capture projects. These alternative measures and technologies are further discussed in Section 6

For Alternative 2 – Encino Reservoir Project, additional measures and technologies were not identified.

Section 5 Economic Analysis

A Title XVI feasibility study report must include an economic analysis of the proposed Title XVI project relative to other water supply alternatives that could be implemented by the non-Federal project sponsor. This assessment needs to identify the degree to which the water recycling and reuse alternative is cost-effective, and the economic benefits that are to be realized after implementation. The study lead must submit the following information for the economic analysis in a Title XVI feasibility study report.

5.1 Existing Conditions and Future Projections

The economic analysis included in the feasibility study report shall describe the conditions that exist in the area and provide projections of the future with, and without, the project. Emphasis in the analysis must be given to the contributions that the plan could make toward alleviation of economic problems and the meeting of future demand.

The JPA services area has been previously described in Section 1.4. A large portion of the service area is undeveloped land characterized by open space in the Santa Monica Mountains, mostly held in public ownership as state and national parks, which would not require water service (2015 UWMP). The development pattern in recent years has been predominantly commercial/offices along the freeway corridor with some modest residential development and growth in smaller tracts and on private parcels.

As previously presented in Table 2-2, the potential growth in potable demands in the JPA service area is estimated to increase by just 28% between 2015 and 2040. The 2015 UWMPs (Kennedy/Jenks 2016 and RMP 2016) predict that continued implementation of aggressive water conservation actions, including for purposes of meeting GPCD targets, could potentially reduce demands going forward. Implementation of the Purified Water Project would directly improve the reliability of potable water supplies in the JPA service area and offset imported water purchases needed to meet existing and future projected potable demands.

The potential growth in recycled water demands would be limited to new extensions from the existing recycled water system, conversion of existing potable water demand to recycled use and ultimately available recycled water supply during the peak irrigation season. The Purified Water Project would see minimal increases in new non-potable water customers. The Encino Reservoir Project would make additional recycled water supply available in the summer months to allow for more non-potable users to be connected. Conversion of potable water customers to recycled water would similarly improve the reliability water supplies and offset imported water purchases needed to meet existing and future projected potable demands.

If no project were implemented, the District would continue to purchase MWDSC water at Tier 1 commodity rates to meet increased potable demands. Thus, the economic analysis accounts avoided costs, from reduced MWDSC purchases, as a direct annual O&M savings for both the Pure Water and Encino Reservoir Projects. Imported water reliability assumptions and costs are further detailed in Appendix C.

For the Encino Reservoir Project, the revenues from additional recycled water sales is also included as an annual O&M cost saving.

5.2 Cost Comparison of Alternatives

The Title XVI feasibility study must include a cost comparison of alternatives that would satisfy the same demand as the proposed Title XVI project. Alternatives used for comparison must be likely and realistic, and developed with the same standards with respect to interest rates and period of analysis.

This section provides a cost comparison for the alternatives described in Section 4. Table 5-1 compares the construction cost of facility components and details annual and life cycle unit costs based on the stated project yield for each alternative. Figure 5-1 and Figure 5-2 graphically compare costs between alternatives. Appendix C provides detailed capital, and O&M cost sheets for each alternative.

Table 5-1: Cost Comparison of Alternatives

	Pure Water Project		Encino Reservoir Project	
Alternative	Alt 1a AWTF Site A	Alt 1b AWTF Site F	Alt 2a Wells Drive Alignment	Alt 2b Mulholland Alignment
Average Annual Project Yield (AFY)	**3,100**	**3,100**	**1,200**	**1,200**
Facility Component (Loaded Costs)				
Treatment	$80,600,000	$76,100,000	$1,600,000	$1,600,000
Pipelines	$35,600,000	$38,600,000	$56,000,000	$62,200,000
Pump Station	$0	$3,600,000	$29,600,000	$37,800,000
Storage	NA	NA	NA	$4,700,000
Mixing System	$1,700,000	$1,700,000	$800,000	$800,000
Brine Discharge Station	$500,000	$500,000	NA	NA
Subtotal Construction *(with Markups and Contingency)*	$118,400,000	$120,500,000	$88,000,000	$107,100,000
Land Acquisition	$0	$2,100,000	$0	$1,000,000
Project Capital Cost Total ($)	**$118,400,000**	**$122,600,000**	**$88,000,000**	**$108,100,000**
Annualized Unit Capital Costs ($/AF)	$1,949	$2,018	$3,742	$4,591
Annual O&M Cost ($/yr)	$3,400,000	$3,400,000	$700,000	$1,000,000
Unit O&M Cost ($/AF)	$1,100	$1,100	$580	$830
Unit Imported Water Savings Cost[1] ($/AF)	-$1,488	-$1,488	-$588	-$588
Unit Additional RW Sales[2] ($/AF)	NA	NA	-$425	-$425
Unit Life Cycle Cost ($/AF)	**$1,561**	**$1,630**	**$3,309**	**$4,407**

Note:

[1] For the Encino Reservoir Project, the unit imported water savings is lower because it only applies to buildout demands in the JPA service area (474 AFY for infill demand and Oak Park HOA conversations).

[2] Additional recycled water sales are assumed to apply to the average annual project yield (1,200 AFY)

Figure 5-1: Alternative Capital Cost and Project Yield Comparison

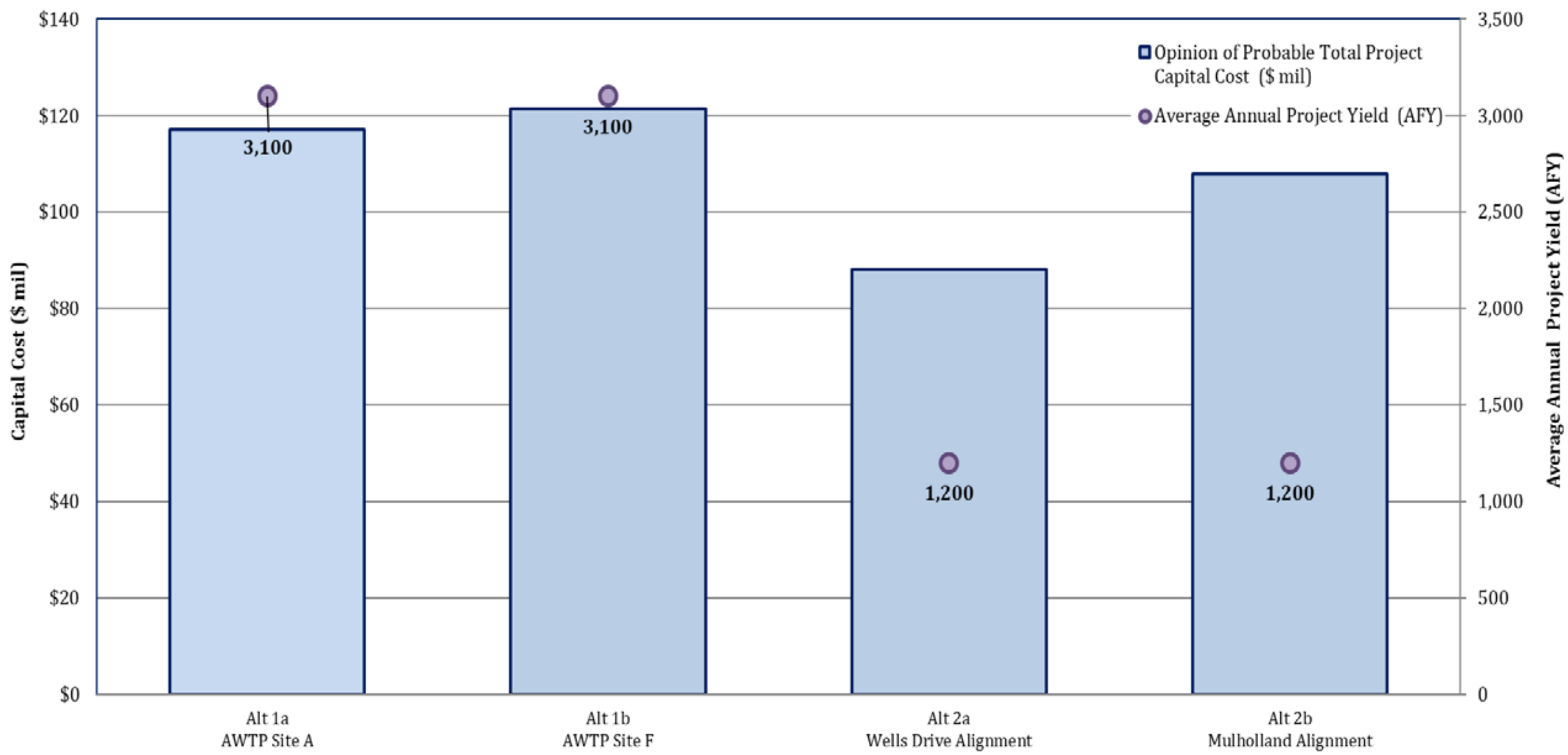
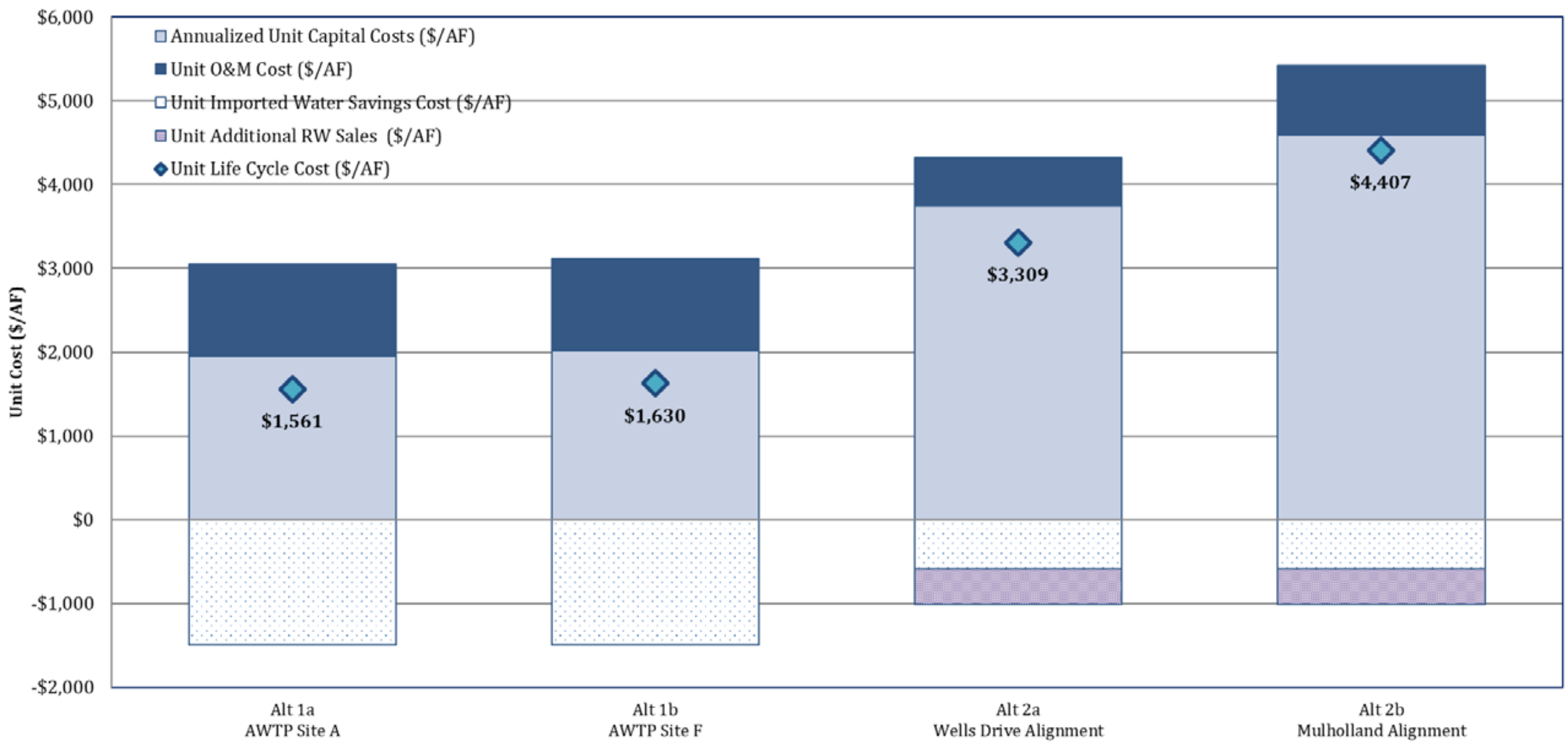


Figure 5-2: Alternative Unit Life Cycle Cost Comparison



5.3 Substitute Project Cost Opinion ("No Project")

When a Title XVI project provides water supplies for municipal and industrial use, the benefits of the Title XVI project can be measured in terms of the cost of the alternative most likely to be implemented in the absence of the project. This is assuming that the two alternatives would provide comparable levels of service.

In the absence of the Project (i.e. the "No Project Alternative), the JPA would continue to develop, expand or explore possible opportunities to increase local supply resiliency through the efforts described in Section 4.3. The costs associated with the No Project alternative include the following:

- Continued purchases of treated MWDSC water at Tier 1 commodity rates to meet increased potable demands,
- Advanced nutrient removal for TMDL compliance for future discharges of unused recycled water from TWRF to Malibu Creek, including solids handling improvements, and
- Disposal costs associated with unused recycled water from TWRF via alternative means during the prohibition period (May to October).

The cost of purchasing water is the most significant cost element in customer water rates. As a public agency, all funds collected for water service by LVMWD are used to benefit the customer by purchasing water from MWD, operating and maintaining the delivery system, implementing water conservation related programs and for repair and replacement projects necessary to maintain the District's extensive potable water infrastructure (RMC 2012 – Appendix E). Appendix C provides a 30-year projection of anticipated MWDSC Tier 1 rates. Imported water savings is previously included as an annual savings for the Alternative 1 and 2 cost estimates in Section 5.2 and is therefore not included as part of the "No Project" cost.

Due to the established new in-stream limits of 1.0 mg/L total nitrogen and 0.1 mg/L total phosphorous for Malibu Creek in the 2013 TMDL, advanced treatment of tertiary recycled water from the TWRF would be necessary for nutrient removal. It is assumed that a 6-mgd RO facility would be added near the TWRF and a brine line would be required to convey reject water from the RO process to the SMP as well as a new pipeline to convey purified water from the AWTF to the point of discharge. TMDL Compliance with Advanced Nutrient Removal was explored as part of the Plan of Action (MWH 2015), which estimated capital costs of $100 to $120 million and O&M costs of $3 to $4 million per year (see Appendix C.4). There would also be additional costs associated with solids handling improvements for increased disposal, with estimated capital costs for $30 million and O&M costs of $1 million per year (Hazen 2016).

Even with advanced treatment, excess recycled water produced at the TWRF beyond non-potable demands, would continue to be used at the Rancho Las Virgenes Composting Facility spray fields and/or disposed of to the LA River or diverted to the City of Los Angeles, Bureau of Sanitation (BOS) raw sewage system, during the prohibition period. The projected costs associated with disposing unused recycled water is based on historical costs pump to the LA River or fees to discharge into the BOS sewer, as detailed in Appendix C.5. This cost would only be applied to excess recycled water from May to October.

Table 5-2 summarizes the No Project Alternative costs. For the purpose of this economic analysis, it is assumed that these activities would continue for 20 years, the assumed project duration for Alternatives 1 and 2 and applies the same cost assumptions presented in Table 4-2.

Table 5-2: No Project Alternative Costs

No Project Alternative	Range of Costs		
TMDL Compliance for Discharge of Winter Excess Flow to Malibu Creek[1]			
Capital Cost ($mil)	$130	to	$150
O&M Cost ($mil per year)	$4	to	$5
Excess Recycled Water (Nov to Apr) (AF)[2]	2,400	to	4,040
TMDL Compliance Unit Cost ($/AF)	$3,300	to	$3,927
Disposal of Sumer Excess Flows[3]			
Excess Recycled Water (May to Oct) (AF)	60	to	1,150
Project Disposal Total Cost ($mil per year)	$0.01	to	$0.17
Project Disposal Unit Cost ($/AF)	$150	to	$150
Unit life Cycle Cost ($/AF)	**$3,450**	**to**	**$4,077**

1 Estimated cost for advanced nutrient removal and brine disposal from Scenario Concept #1 of the Recycled Water Seasonal Storage Plan of Action (MWH 2015) plus additional costs for solids handling improvements for increased disposal (Hazen 2016).
2 Excess recycled water for Year 1 to Year 20.
3 Estimated unit cost based on historical disposal costs for Rancho spray fields, pumping to LA River and BOS raw sewage disposal.

The No Project unit life cycle cost of $3,450 to $4,077 per AF is higher than both the Pure Water Project alternative unit life cycle cost of $1,561 to $1,630 per AF and the Encino Reservoir Project Alternative 2a unit life cycle cost of $3,309 per AF.

5.4 Qualitative Benefits and Considerations

Some Title XVI project benefits may be difficult to quantify; for example, a drought tolerant water supply, reduced water importation, and other social or environmental benefits. These benefits shall be documented and described qualitatively as completely as possible. These qualitative benefits can be considered as part of the justification for a Title XVI project in conjunction with the comparison of project costs described above.

5.4.1 *Live Stream Discharge for Environmental Benefit*

Currently the JPA is required to discharges water from the TWRF to Malibu Creek for habitat maintenance under certain conditions. This discharge requirement will remain in place, but most comply with the 2013 TMDL.

Under the No Project Alternative, all unused recycled water would be advance treated for nutrient removal and discharged to Malibu Creek during the allowable discharge period. Under the Project Alternatives, discharges to Malibu Creek would be eliminated.

Under the Project Alternatives, discharges to Malibu Creek would be eliminated.

5.4.2 *Other Non-Quantifiable Benefits*

Other Non-Quantifiable benefits are listed in Table 5-3.

Table 5-3: Qualitative Benefits for Project Alternatives

Benefit	Pure Water Project	Encino Reservoir Project	No Project
Reduce reliance on imported water	Significantly reduces dependence	Somewhat reduces dependence	Does not reduce
Increases use of local water source	Maximizes use of local supply	Increases use of local supply	Does not increase
Reduces Discharge to Malibu Creek	Eliminates discharges	Eliminates discharges	Requires additional treatment to maintain discharges
Provides increased seasonal flexibility	Provides year-round flexibility for IPR	Provides seasonal flexibility for NPR	Does not provide
Maximizes Beneficial Reuse	Retains full benefit for JPA customers	Retains some benefit for new RW customers	Does not provide
Saves Energy	Significantly offsets demand for energy intensive imported water	Somewhat offsets demand for energy intensive imported water	Does not provide
Reuses Existing Infrastructure	Efficiently utilizes existing assets in combination with new infrastructure	Somewhat utilizes existing assets in combination with new infrastructure	Does not expand current uses
Forward Thinking	Visionary and consistent with JPA Board's adopted Guiding Principals	Expansion of current use only	Is not forward thinking
Offers Regional Benefits	Reduces regional demands on imported water supplies	Offers unallocated surplus for regional use	No regional benefits
Removes Salt from Basin	Removes salts via new brine line	Does not remove	Removes salts via new brine line

Section 6 Selection of the Proposed Title XVI Project

Provide a justification of why the proposed Title XVI project is the selected alternative in terms of meeting objectives, demands, needs, cost effectiveness, and other criteria important to the decision. Reduction, postponement, or elimination of development of new or expanded water supplies. Reduction or elimination of the use of existing diversions from natural watercourses, or withdrawals from aquifers. Reduction of demand on existing Federal water supply facilities. Reduction, postponement, or elimination of new or expanded wastewater facilities

6.1 JPA Guiding Principles

The JPA desires to fully and beneficially reuse its recycled water, and adopted the following principals to guide the investigation of Project alternatives:

1. **Maximize Beneficial Reuse by:**
   1.1. Being an environmental steward
   1.2. Reducing existing potable water use
   1.3. Reducing discharge to Malibu Creek and Los Angeles River
   1.4. Encouraging infill use in both service areas
   1.5. Providing regional benefits
   1.6. Creating water supply reliability

2. **Seek Cost Effective Solutions by:**
   2.1. Seeking funding from grants, matching funds and partnerships
   2.2. Engaging permitting and regulatory agencies early and often
   2.3. Each partner sharing in outside funding
   2.4. Each partner funding their share
   2.5. Being on time, on schedule and within budget
   2.6. Analyzing impacts and benefits of the project from each partners perspective

3. **Seek Partnerships beyond the JPA by:**
   3.1. Considering multiple uses such as; recreation and education
   3.2. Creation of open space
   3.3. Engaging stakeholders early and often
   3.4. Considering additional partners that will purchase recycled water

4. **Gain Community Support by:**
   4.1. Engaging and educating the public and stakeholders
   4.2. Being transparent
   4.3. Making public safety a top priority

5. **Govern with a Partnership by:**

5.1. Using the JPA Agreement as a guiding document
5.2. Communicating openly and frequently
5.3. Being committed to the project
5.4. Equitably allocating costs and sharing benefits from both partners perspective

6. **Be Forward Thinking by considering the possibilities of:**
   6.1. Expanding the recycled water system beyond the JPA service area
   6.2. Exterior residential reuse
   6.3. Exterior and interior use for new and remodeled commercial projects
   6.4. Indirect potable reuse
   6.5. Direct potable reuse

6.2 Comparison of Project Alternatives

The BODR (MWH 2016) and Recycled Water Seasonal Storage Plan of Action (MWH 2015) engaged key stakeholders to define project goals and key metrics for evaluating alternatives. Four workshops were conducted in 2015 and 2016 to guide the project alternatives from conception to the two project alternatives presented in this Study. Projects were compared based on their ability to meet the six guiding principles, achieve project objectives and address potential risk identified by the stakeholders. The results of the stakeholder workshops conducted during the BODR are presented in Figure 6-1, and are applicable to the Projects as described in this Study.

I

	Pure Water Project	Encino Reservoir
Guiding Principles		
Maximize Beneficial Reuse	22	5
Seek Cost Effective Solutions	22	11
Seek Partnerships beyond JPA	15	12
Gain Community Support	23	5
Govern with a Partnership	14	10
Be Forward Thinking	32	1
Subtotal	**128**	**44**
Average	**21**	**7**
Objectives		
Reuse 100% of Our Water	25	7
Regional Partnerships	12	15
Public Support for Project	16	14
Cost/Benefit	21	9
Beneficial to Water Users Including Rate Payers	25	6
Maximize Funding Sources	16	12
Public Perception and Acceptance	12	18
Eliminate Unreasonable Use and Waste of Water	20	8
Transparency	18	6
Seasonal and Diurnal Equalization	17	8
Balance of Supply and Demand (Right Balance)	26	4
Reduce Reliance on Imported Water	30	2
Regulatory Constraints and Framework	7	19
TMDL Compliance in Malibu Creek and Santa Monica Bay	14	6
Regulations	9	18
Sustainability	26	5
Siting of Reservoirs and other Infrastructure	16	11
Protecting Beneficial Uses in Malibu Creek	16	4
Environmental Stewardship and Leadership	23	3
Subtotal	**349**	**175**
Average	**18**	**9**
Risk Concerns		
NIMBY	19	7
Agency Coordination	25	5
Project Costs	8	21
Demand	27	3
Water Quality	25	6
Drinking Water Standards	20	11
YUCK (Public Perception)	15	18
Brine Disposal	14	18
CEQA	18	6
Politics	21	5
Right of Way/LAND	17	10
Subtotal	**209**	**110**
Average	**19**	**10**
Grand Total	**686**	**329**
n	**36**	**36**
Average	**19**	**9**

Source: MWH 2016 (adapted from Figure 6-5)

6.3 Selection of the Proposed Title XVI Project

Both project alternatives were deemed to offer value to the JPA; however, based on the stakeholder workshop project evaluation results, the Pure Water Project scored twice as high as the Encino Reservoir Project. Based on the outcomes of the stakeholder workshops, staff recommended the selection of the Pure Water Project based on the following major factors (JPA 2016):

1) Indirect potable reuse (IPR) is visionary and forward-thinking, consistent with the JPA Board's adopted Guiding Principles.

   One of the six Guiding Principles adopted by the Board was to "Be forward thinking by considering the possibilities of ... indirect potable reuse". As the science, technology and public acceptance of indirect potable reuse rapidly evolve and water resources become increasingly scarce, solutions involving potable reuse represent visionary, forward-thinking options for the future.

2) The Pure Water Project involves the best and highest use of the JPA's recycled water resource and retains the full benefit of the resource for the JPA's customers.

   Opportunities for expanding the traditional uses of recycled water such as landscape irrigation are relatively limited. Indirect potable reuse allows excess recycled water previously discharged to Malibu Creek to be developed into a drought-proof local drinking water resource, reducing the demand for imported water supplies.

3) Potential risks, as identified by the stakeholders, are more effectively avoided with the Pure Water Project.

   As a part of the third stakeholder workshop (MWH 2016), participants were polled to identify the scenario that better avoided the risks identified in the first workshop. By nearly a two-to- one margin, stakeholders indicated that the Pure Water Project more effectively avoided the identified risks.

4) Stakeholder polling identified the Pure Water Project as the preferred alternative.

   During the third stakeholder workshop (MWH 2016), participants were polled to identify the scenario that was preferred when considering the JPA Board-adopted Guiding Principles, stakeholder developed objectives and stakeholder-identified risks. Overwhelmingly, the stakeholders identified the Pure Water Project as the preferred alternative. For example, 32 stakeholders preferred the Pure Water Project with respect to consistency with the guiding principle for "be forward thinking"; whereas, only one stakeholder preferred the Encino Reservoir Project for this purpose. Also, 30 stakeholders thought the Pure Water Project better addressed the objective to "reduce reliance on imported water"; whereas, only two identified the Encino Reservoir Project for this objective. Overall, the Pure Water Project was found to be preferred by nearly a two-to-one margin when considering the Guiding Principles, objectives and risk avoidance.

9) By offsetting the escalating cost to purchase imported water, the Pure Water Project provides substantially greater long-term economic value to the JPA.

   Although the Pure Water Project requires a large initial capital investment, its unit life cycle cost ranges from $1,500/AF to $1,600/AF as compared to approximately $3,300.AF to $4,400/AF for the Encino Reservoir Project. The substantially lower life cycle unit cost for the Pure Water Project *is due to larger offsets for the purchase of costly imported water as well as the greater project yield.*

10) The Pure Water Project can be completed in sufficient time to achieve compliance with the terms for implementation of the 2013 Malibu Creek and Lagoon TMDL for Sedimentation and Nutrients to Address Benthic Community Impacts; whereas, timing for The Encino Reservoir Project remains uncertain.

    The Implementation Plan for TMDL was approved by the State Board on February 22, 2017, setting compliance milestones for the JPA. The compliance schedule encompasses 13.5 years and specifies interim milestones to meet final winter waste load allocations by November 16, 2030. The Pure Water Project can be accomplished within this timeframe.

    The timing for the Encino Reservoir Project remains uncertain and hinges on addressing the following three LADWP concerns with re-purposing Encino Reservoir for recycled water seasonal storage: (1) effect of recycled water in the reservoir on LADWP's ability to use the stored water as an emergency supply, (2) ability to manage runoff of stormwater tributary to the reservoir, and (3) completion of a seismic stability study of Encino Dam. LADWP representatives have indicated that the seismic study will not be completed for several years because other higher priority dams need attention first.

On August 1, 2016 the JPA governing Board selected the Pure Water Project as the preferred alternative (herein also referred to as the proposed Title XVI project). The Pure Water Project will provide a significant new and sustainable potable water supply that will reduce the JPA's reliance on imported water and the need to develop other water supplies. With reduced imported water usage, which is supplied from the State Water Project, the fragile Bay Delta ecosystem will be less strained. By replacing energy intensive imported water, there will be energy savings and an overall reduction in greenhouse gases. The Pure Water Project will efficiently utilize existing assets in combination with new infrastructure to reduce costs, reduce impacts associated with new construction and significantly increase the use of a new, local, drought-resilient water supply.

The recommended Project does not influence existing Federal water supply facilities or the need for new wastewater facilities.

Section 7 Environmental Consideration and Potential Effects

The review of a Title XVI feasibility study report does not require National Environmental Policy Act (NEPA) compliance. The Department of the Interior categorical exclusion 1.11 "Activities which are educational, informational, advisory, or consultative to other agencies, public and private entities, visitors, individuals or the general public" applies to Reclamation's consultative review, and preparation of the Title XVI feasibility study reports. As stated in Paragraph 1. Scope, Reclamation is not making a recommendation to go forward with the proposed Title XVI project, nor is Reclamation using the Title XVI feasibility study report to propose an action to the Congress

The purpose of this preliminary environmental evaluation is to identify expected environmental impacts from construction and operation of the proposed Pure Water Project. This evaluation also describes the level of environmental documentation that will be needed to comply with the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA). Findings from previously prepared environmental documents relevant to the proposed Title XVI Project are discussed and referenced in this section.

This section focuses on the preliminary environmental evaluation of the proposed AWTF facility (to be located at Site A near Las Virgenes Reservoir or Site F at Agoura Road), which is the primary above ground facility associated with the proposed Title XVI project. Since pipelines alignments have not been confirmed at this time and would generally be installed below ground within roadway rights-of-ways, it is unlikely that pipeline construction would have considerable environmental issues and it is assumed that alignment specific impacts would be identified as part of future studies. Similarly, pump station locations outside of the AWTF location have not been confirmed at this time, and would likely require a small footprint, thus it is assumed that environmental considerations would be revisited during future siting studies.

Supporting environmental documentation is included in Appendix F.

7.1 NEPA and Federal Law Compliance

7.1.1 *Potentially Significant Environmental and Cultural Impacts*

Discussion whether, and to what extent, the proposed Title XVI project will have potentially significant impacts on endangered or threatened species, public health or safety, natural resources, regulated waters of the United States, or cultural resources.

Potential environmental and cultural impacts related to construction and operation of the proposed Title XVI project are discussed in the following subsections. A brief description of anticipated construction and operation activities is provided, and the extent to which these activities have potential to cause a significant impact is evaluated.

Construction activities associated with the proposed Title XVI project would include grading, excavation, installation of pipelines, pump stations, and installation of AWTF building and equipment (e.g. associated chemical feed systems, wet wells, pumps, mixing aerators) and diffusers in the reservoir. Pipeline installation would primarily occur along existing roadways, or existing rights of way by means of open cut trenching, except in sensitive areas such as stream crossings or roadway boundary crossings, where directional drilling or similar methods would be used. Operation and maintenance activities would include mechanical and chemical treatment of wastewater, to meet SWA regulatory requirements, and energy and material use associated with facility operations. Ancillary impacts may be associated with augmentation of potable water supplies, as well as reduction in potable water use from groundwater and surface water.

The proposed Title XVI project construction activities are anticipated to have short-term impacts to endangered or threatened species, water quality, hydrology, natural resources, waters of the United States, and cultural resources. Short-term construction impacts can be mitigated by methods such as utilizing trenchless technologies for sensitive areas, performing biological and cultural surveys, and implementing best management practices.

This section addresses environmental considerations associated with the following:

- Endangered or Threatened Species
- Public Health or Safety
- Natural Resources
- Waters of the United States
- Cultural Resources

Endangered or Threatened Species

Based on review of available literature, and the USFWS IPac database, the presence of threatened and endangered species may occur at both proposed AWTF sites (Site A and Site F).

Site A and Site F: are expected to require surveys for threatened or endangered species (USFWS, 2018b). Threatened or endangered species present at Site A and Site F may include *Polioptila californica* (threatened), *Vireo bellii pusillus* (endangered), *Empidonax traillii extimus* (endangered), *Rana draytonii* (threatened), *Streptocephalus woottoni* (endangereded), *Branchinecta lynchi* (threatened), *Astragalus brauntonii* (endangered), *Orcuttia californica* (endangered), *Dudleya abramsii ssp. parva* (threatened), *Rorippa gambellii* (endangered), *Arenaria paludicola* (endangered), *Dudleya cymosa ssp. ovatifolia* (threatened), *Navarretia fossalis* (threatened), and *Dudleya verity* (threatened). Supporting information regarding endangered species can be found in the IPac Resource Lists in Appendix F.

Site A: would overlap with critical habitat for *Pentachaeta lyonii*. Biological surveys may be required in concert with future NEPA and CEQA documentation to determine the presence/absence of these sensitive species (USFWS. 1997. 2000. 2001. 2005. 2015.2018a. 2018b. 2018c.). Prior studies looked at use of this site for a tank and concluded that the expectation for environmental impacts to be less than significant with the implementation of mitigation measures for construction of an above ground facility near Site A and access road to the site (AECOM 2010 and 2012). The BODR (MWD 2016) and siting study (Woodard & Curran 2018 also included a very preliminary environmental review of Site A using the IPac planning tool with similar findings to those reported herein.

Site F: has been explored as part of the acquisition of the 30800 Agoura Road site. A Draft Initial Study/Negative Declaration (Envicom 2017) was prepared, which references a lack of suitable habitat on the site for most special-status plant species but mentions the known occurrence of Ojai *navarretia*. The same report mentions that no endangered or threatened wildlife species were observed on site during previous biological surveys. The Draft Initial Study/Negative Declaration is also included in Appendix F.

Because construction of pipeline alignments would generally be conducted within existing disturbed rights-of-way, it is unlikely that pipeline construction would impact or would disturb known or unknown endangered or threatened species. It is assumed that alignment specific impacts would be identified as part of future studies.

Public Health or Safety

Short-term construction activities associated with implementation of the Pure Water Project may cause short-term air emissions, increased noise levels, increased traffic and similar impacts. These impacts are expected to be mitigated by implementation of best management practices and would be similar for Site A or Site F.

Purified water produced by the AWTF would meet all SWA regulatory requirements (as defined in SBDDW-16-02) and would be protective of the environment and public health. A Title 22 Engineering Report would be developed for the Pure Water Project, which would describe the JPA's plan for compliance with the California Code of Regulations (CCR) Title 22 Water Recycling Criteria, including SWA regulations and to request approval from DDW for the project. A water quality monitoring plan would also be developed to identify constituents that will be monitored in the AWTF produce water, Las Virgenes Reservoir and Westlake Filtration Plant and the frequency for monitoring and analysis for each location (NWRI 2018).

Natural Resources

Site A and Site F: Several migratory birds may be affected by implementation of the proposed Title XVI project (USFWS, 2018b). Impacts are expected to be less than significant. Mitigation efforts would be identified in the CEQA process. Both sites have Chaparral habitat (RMC/Woodard & Curran 2017).

Site A: the prior use as a borrow site for materials that were used for dam construction has left this site with limited vegetation. From aerial photos of the site it appears that impacts to trees could be easily avoided. This site does have some grassland habitat (Woodard & Curran 2018).

Site F: the Draft Initial Study/Negative Declaration (Envicom, 2017) concludes that six large Oak trees may be affected by implementation of an AWTF at this location. Mitigation efforts such as avoidance or replanting are expected to reduce impacts.

Because construction of pipeline alignments would generally be conducted within existing disturbed rights-of-way, it is unlikely that pipeline construction would impact natural resources. It is assumed that alignment specific impacts would be identified as part of future studies.

Supporting information regarding natural resources can be found in the Ipac Resource Lists in Appendix F.

Waters of the United States

Site A and Site F: future CEQA compliance studies should include a wetland jurisdictional determination, as well as consultations with USACE, CDFW, and RWQCB. AWTF site layouts would avoid jurisdictional features (RMC/Woodard & Curran 2017).

Site A: is in the vicinity of jurisdictional Waters of the United States, including the Las Virgenes Reservoir: a Laucestrine, Limnetic deepwater lake, with an unconsolidated bottom, that is permanently flooded and impounded (USFWS. 2018c). This site does not have streams, is not located in a wetland, and could be potentially located in a flood hazard zone due to its location adjacent to the reservoir (Woodard & Curran 2018).

Site F: is in the vicinity of a stream with classification R4SBC, a Riverine Intermittent Streambed that is seasonally flooded. Site F includes three jurisdictional features: three natural drainages and one artificial drainage, and one artificial seasonal wetland (RMC/Woodard & Curran 2017). A National Hydrology Dataset (NHD) flow line exists on the parcel, but it is not located in a wetland and it is not located within a flood hazard zone (Woodard & Curran 2018).

Pipeline alignments have not been finalized but would have potential to cross jurisdictional features. It is anticipated that crossings of jurisdictional features would use trenchless technology to mitigate direct impacts to waters of the United States. therefore, it is anticipated that these impacts would be largely avoided or minimized. By constraining work to the right-of-way of existing roadways, where possible, most jurisdictional features would be avoided. Depending on the methods used, pipeline crossings of streams and wetlands may be subject to the Clean Water Act (CWA), including the acquisition of appropriate USACE and RWQCB permits and USFWS consultation, as appropriate. Permits will be required by CDFW for all stream crossings, regardless of crossing method.

Cultural Resources

Site A: the prior use as a borrow site for materials that were used for dam construction indicate that there is a significant amount of prior disturbance at this location. General plans do not indicate a cultural resource at this site (Woodard & Curran 2018).

Site F: the Draft Initial Study/Negative Declaration (Envicom, 2017) maintains that the site does not contain known archaeological or paleontological resources, or unique geologic features, or human remains. An archeological survey, completed in 2000, and an archaeological test excavation are referenced.

Because construction of pipeline alignments would generally be conducted within existing disturbed rights-of-way, it is unlikely that pipeline construction would impact cultural resources. It is assumed that alignment specific impacts would be identified as part of future studies.

The California Historical Resources Information System (CHRIS) Center was contacted regarding potential cultural and historic resources in the vicinity of the proposed Title XVI project, however, they were unresponsive. It is recommended to follow up this agency as part of the CEQA evaluation to identify potential cultural and historical resources near planned facilities.

7.1.2 *Additional and Unique Environmental Risks*

Discussion whether, and to what extent, the project will have potentially significant environmental effects, or will involve unique or undefined environmental risks.

No additional or unique environmental risks were identified by the initial environmental review.

7.1.3 *Environmental and Cultural Compliance Measures*

Description of the status of required Federal, state, tribal, and/or local environmental compliance measures for the proposed Title XVI project, including copies of any documents that have been prepared, or results of any relevant studies.

Table 7-1 provides an overview of environmental requirements identified in previous studies and during this environmental review that are expected to be required for the proposed Title XIV project.

7.1.4 *NEPA Compliance Measures*

Any information available that would assist with assessing the measures that may be necessary to comply with NEPA, and other applicable Federal, state or local environmental laws such as the Endangered Species Act or the Clean Water Act.

Due to the potential for federal funding for construction of the proposed Title XVI project, The NEPA compliance would be required. LVMWD would serve as the lead agency for NEPA as well as CEQA compliance.

To meet NEPA and CEQA compliance requirements, LVMWD would prepare a joint Environmental Assessment (EA) or an Environmental Impact Statement (EIS), depending on the level of significant impacts findings. The EA/ EIS would evaluate biological resources, cultural resources, water quality, hydrology, land use, seismic, traffic, and other issues of environmental concern to assess potential impacts of the proposed Title XVI project.

Table 7-1: Overview of Regulatory Permitting Requirements

Agency	Regulation	Trigger	Permit
USACE	Section 404 of the CWA	Impacts to Waters of the U.S.	404 Authorization (Nationwide or Individual) Permit)
USFWS/ NOAA	Section 7 of the FESA	Impacts to federally listed species and/or critical habitat where a federal agency has discretionary action	Biological Opinion; jeopardy decision; incidental take permit
CDFG	Section 1602 of the Fish and Game Code	Impacts to Waters of the State	Streambed Alteration Agreement (1602 Permit)
CDFG	Section 2080.1 of the CESA	Impacts to State-listed species that are included in a FESA permit	Consistency Determination
CDFG	Section 2081 of the CESA	Impacts to State-listed species	Incidental Take Permit
RWQCB	Section 401 of the CWA	Impacts to Waters of the U.S.	401 Water Quality Certification
RWQCB	Section 402 of the CWA	Construction; dewatering	NPDES Permit (General Construction Permit)
RWQCB	Porter-Cologne Act	Impacts to Waters of the State	Waste Discharge Requirement

Table 7- (con't): Overview of Regulatory Permitting Requirements

Agency	Regulation	Trigger	Permit
SBDDW	Title 22, CCR Division 4, Chapter 3 - Articles 1, 5, 7 Chapter 17 – Article 9	A project involving the planned placement of recycled municipal wastewater into a surface water reservoir that is used as a source of domestic drinking water supply, for the purpose of supplementing the source of domestic drinking water supply.	SWA Project permit (for the water recycling agency) and a SWA public water system (PWS) domestic water supply permit
SHPO	Section 106 of the NHPA	Section 404 Permit	106 Compliance

Source: modified from RMC 2012

7.1.5 *Regional Water Supply and Quality Effects*

Discussion of how the proposed Title XVI project will affect water supply and water quality from the perspective of a regional, watershed, aquifer, or river basin condition.

The proposed Title XVI project would augment the supply of water to be stored at the existing Las Virgenes Reservoir. This diversion of wastewater effluent for recycled water production would eliminate discharges of recycled water to Malibu Creek, helping the JPA to meet their NPDES discharge requirements. Based on hydrodynamic modeling of Las Virgenes Reservoir (FSI 2018), the Project would be able to meet SWA regulatory requirements for reservoir retention.

The following actions have been taken to meet water quality requirements:

- During the summer of 2017, the LVR hydrodynamic model was developed and a tracer study was conducted to calibrate the hydrodynamic modeling (FSI 2018). Within the first six months of Pure Water Project operations, another tracer study will be conducted to meet permitting requirements.
- The JPA has a current source control program, which will be enhanced in the future to identify chemicals of concern and potential sources of these chemicals in the sewershed, describe the monitoring and outreach programs, and outline the response plan for identified constituents as part of the Pure Water Program (NWRI 2018).
- The JPA currently monitors recycled water produced at the Tapia WRF. Future monitoring programs will be developed as part of the Pure Water Program to meet all permit requirements.
- Existing operational plans will be updated, as appropriate, to incorporate new facilities, critical control points and chain of command for the Pure Water Project, including the appropriate training and certification for personnel.

In addition, the proposed Title XVI project has the potential to improve water quality by (NWRI 2018):

- **Reducing Salinity –** as a result in a net export of salts from the Malibu Creek Watershed, thereby producing long-term benefits for groundwater and surface water in the region.
- **Reducing bromide -** as a result of RO treatment, the bromide content of the purified water will be lower than that of imported water. The lower bromide content should decrease the production of brominated disinfection byproducts (which are more toxic than their chlorinated analogues) at the WLFP and facilitate compliance with regulatory limits on disinfection byproducts.

7.1.6 *Public Outreach and Involvement*

Discussion of the extent to which the public was involved in the feasibility study, and a summary of comments received, if any.

Public outreach and involvement was not conducted as part of this Feasibility Study but will be completed as Pure Water Project moves forward. The JPA has retained a communications firm to engage with the community. Stakeholder engagement was also conducted as part of the BODR (MWD 2016), as discussed in Section 3.4, and a Stakeholder Workshop Evaluation was completed to inform project alternative selection, as discussed in Section 6.2.

7.1.7 *Historical Impacts and Mitigation*

Description of the potential effects the project may have on historic properties. Discussion must include potential mitigation measures, the potential for adaptive reuse of facilities, an analysis of historic preservation costs, and the potential for heritage education, if necessary.

No potential effects on historic properties were identified. Both proposed AWTF sites (Site A and Site F) are on undeveloped land.

Site A: is zoned for open space (Woodard & Curran 2018).

Site F: is zoned for business park / office retail (Woodard & Curran 2018).

Section 8 Legal and Institutional Requirements

The Title XVI feasibility study shall identify any legal or institutional requirements, or barriers to implementing the proposed Title XVI project.

8.1 Potential Water Rights Issues (Compliance with State Water Law)

Analysis of any water rights issues potentially resulting from implementation of the proposed water reclamation and reuse project. All proposed Title XVI projects must comply with state water law.

A determination of rights to treated wastewater is required prior to long-term project expenditures. Ownership of the rights to wastewater is addressed in three separate state laws or codes, summarized below, that cover property and water rights as well as changes to instream flows if discharge of treated wastewater occurs.

- Clean Water and Water Bond Law of 1978 established that treated wastewater is the property of the treatment facility that produced it and that this property could be sold or transferred for beneficial use regardless of detriment to downstream users.
- California Department of Fish and Game Code, Section 1600 covers changes to surface waters and could be relevant to protect fish or wildlife resources in the event that a project changes the flow regime in a water body.
- Water Code (WC), Sections 1210, 1211 and 1702 address different aspects of wastewater ownership as follows
  - ✓ WC Section 1210 describes the ownership of treated wastewater from within and outside of the watershed of discharge and that discharged water that supports instream or riparian habitat may accrue environmental water rights that supersede those of the treatment plant owner.
  - ✓ WC Section 1211 addresses changes in point of discharge, place of use or purpose of use of treated wastewater to surface water bodies similar to changes required of appropriative water rights.
  - ✓ Since the Legislature did not intend either WC Section 1210 or 1211 to affect the rights of downstream water users to the treated wastewater under common law (i.e. statutory “no-injury” rule), WC section 1702 codifies the common law no injury rule and therefore should be interpreted consistently with case law that interprets and applies the common law rule.

Under Water Code Section 1210 “The owner of a wastewater treatment plant…shall hold the exclusive right to the treated waste water as against anyone who has supplied the water discharged into the waste water collection and treatment system...”. The JPA is the owner of the TWRF and has made no arrangements nor agreements to transfer jurisdiction of rights to the wastewater. Thus, there are no anticipated issues related to water or wastewater rights resulting from the implementation of the Pure Water Project.

Under Water Code Section 1211 " Prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater, the owner of any wastewater treatment plant shall obtain approval of the board for that change." Potential considerations related to discharge requirements to Malibu Creek are discussed in Sections 8.6 and 8.7.

Water Codes Section 1702 would not apply since there are no downstream legal users from the Tapia WRF.

In all cases, the advice of legal counsel for individual determinations and the development of the most equitable and least detrimental projects for all affected parties are recommended.

8.2 Legal and Institutional Requirements

E.g., contractual water supply obligations, Indian trust responsibilities, water rights settlements, regional water quality control board requirements), state, and/or local requirements with the potential to affect implementation of the project. Title XVI projects using Reclamation project water must address contractual requirements as described in RM Policy, Reuse of Project Water (WTR P09).

Contractual water supply obligations are defined in various agreements between the LVMWD, TSD and existing water users in the JPA service area. In addition, a new agreement with CMWD allowing the discharge of brine to the SMP would be required.

The following key agreements are necessary to proceed with project implementation:

1. Joint Powers Authority between the District and TSD - In 1964, the District and TSD formed a JPA to jointly own and operate the TWRF. The JPA also operates a complex distribution system consisting of pipelines, pump stations, tanks and reservoirs, and associated appurtenances to deliver recycled water to users in areas of Calabasas, Agoura Hills, Westlake Village and other areas in Los Angeles and Ventura Counties. Within TSD, the service area includes Lake Sherwood and Oak Park/North Ranch. A portion of the existing recycled water system will be used for conveyance of source water to the AWTF.
2. The construction of a brine line will require an agreement between the JPA and CMWD for disposal of brine to the SMP. A sample discharger agreement for construction and use of the SMP discharge service connection is posted on CMWD's Salinity Management Pipeline Website[3] along with other documents and forms that would be required to dispose of brine from the AWTF. Discussions with CMWD on this and other issues are on-going.

[3] http://smp.calleguas.com/

3. LVWMD and CMWD executed an agreement for interconnection between their potable water systems on March 10, 2015 (amended on February 13, 2018), stating the intent to construct an interconnection to enable delivery of potable water from one agency to the other in the case of an interruption in imported water supplies and for LVWMD to receive water from CMWD to support winter refill of Las Virgenes Reservoir. This would also enable TSD to receive their share of purified water via CMWD as the wholesaler.

8.3 Multi-Jurisdictional or Interagency Agreements

Discussion of the need for multi-jurisdictional or interagency agreements, any coordination undertaken, and any planned coordination activities.

The JPA will coordinate with various State and Local Agencies to implement the Pure Water Project. This coordination may involve regulatory approval, encroachment permits, negotiation of agreements to provide services, cost sharing agreements, funding partnerships and other items. A summary of coordination needs is presented in Table 8-1.

Table 8-1: Summary of Interagency Coordination Considerations

Agency	Coordination Considerations
Calleguas Municipal Water District (CMWD)	CMWD is the owner and operator of the SMP, which is the primary option for disposal of brine from the AWTF. All brine must meet water quality discharge requirements for the SMP and brine discharge agreement will be required. Coordination with CMWD will also be needed for water supply exchanges.
City Thousand Oaks	An encroachment permit will be needed from the City of Thousand Oaks for brine pipeline construction. In addition, the City of Thousand Oaks may have an interest in participating in the brine pipeline construction, as they are currently considering several wellhead treatment systems to remove salt from brackish groundwater. If brine cannot be discharged to the SMP, as an alternate source of disposal an agreement would be needed to allow discharge of brine to the City's wastewater collection system, and for treatment of the brine at the Hill Canyon WWTP. Preliminary discussions with the City indicate this would be similar to an industrial discharge agreement, but complications may arise due to downstream water use by Camrosa Water District.
Division of Drinking Water (DDW)	The State Board DDW and the Regional Board regulate potable reuse and will serve as the lead agencies in approving surface water augmentation with purified water. DDW surface water augmentation requirements will be incorporated into the NPDES permit issued by the RWQCB. DDW will also regulate the project through modification of the water supply permits which regulate water supply operations of agencies that derive water supply from the reservoir. Modification by DDW of the existing LVMWD and CMWD water supply permits would be required as part of the overall reservoir augmentation program to reflect the new source.

Table 8-1 (con't): Summary of Interagency Coordination Considerations

Agency	Coordination Considerations
Regional Water Quality Control Board (RWQCB)	Subject to EPA concurrence, the RWQCB has approval over the NPDES discharge permit which will regulate the discharge to the reservoir. The NPDES permit will implement applicable state and federal water quality standards and will incorporate applicable surface water augmentation regulations recommended by DDW.
City of Westlake Village	New pipelines would be constructed in the City of Westlake Village to convey tertiary recycled water to the AWTF, purified water to Las Virgenes Reservoir, and brine to the SMP. An encroachment permit would be needed to construct these pipelines, including traffic control plans. The potential AWTF site (Alt 1a) near the Reservoir is located on District property in the City of Westlake Village, if selected, the facility would be exempt from local building codes and planning ordinances but would still require input from the City.
City of Agoura Hills	The potential AWTF site (Alt 1b) in the City of Agoura Hills would be exempt from local building codes and planning ordinances but would still require input from the City. If this site is selected, an encroachment permit would be needed to construct tertiary, purified and brine pipelines in public streets.
Camrosa Water District	The City of Thousand Oaks has an existing agreement with Camrosa Water District for use of the Hill Canyon WWTP effluent. This agreement does not prohibit the City from accepting brine but may be an issue requiring resolution should brine disposal to the SMP not be possible.
Department of Transportation (CalTrans)	An encroachment permit would be needed from CalTrans to cross Highways 101 and 23 for a 24-inch source water pipeline and an 8-inch brine pipeline. The source water pipeline crosses Highway 101 at Lindero Canyon Road and the brine pipeline crosses Highway 101 at Lakeview Canyon Road and Highway 23 at Thousand Oaks Boulevard.

Source: MWH 2016

8.4 Permitting Procedures

Discussion of permitting procedures required for the implementation of water reclamation projects in the study area, and any measures that the non-Federal project sponsor can implement that could speed the permitting process.

The SWRCB adopted the proposed regulations for surface water augmentation using recycled water on March 6, 2018 under Resolution No. 2018-0014, which added to Title 22, California Code of Regulations, Division 4, Chapter 3 (herein referred to as SWA Regulations). The Pure Water Project must meet all permitting requirements as set forth in the SWA Regulations, including but not limited to applying to the Regional Board for a permit, obtaining a permit, the operation of a Surface Water Source Augmentation Project (SWSAP), and complying with the terms and conditions of the Regional Board permit.

The JPA has already taken the steps to meet the SWA regulatory permitting requirements.

- During the summer of 2017, the LVR hydrodynamic model was developed and a tracer study was conducted to calibrate the hydrodynamic modeling (FSI 2018). Within the first six months of operations, another tracer study will be conducted to meet permitting requirements.
- The JPA has a current source control program, which will be enhanced in the future to identify chemicals of concern and potential sources of these chemicals in the sewershed, describe the monitoring and outreach programs, and outline the response plan for identified constituents as part of the Pure Water Program (NWRI 2018).
- The JPA currently monitors recycled water produced at the Tapia WRF. Future monitoring programs will be developed as part of the Pure Water Program to meet all permit requirements.
- Existing operational plans will be updated, as appropriate, to incorporate new facilities, critical control points and chain of command for the Pure Water Project, including the appropriate training and certification for personnel.

The JPA has solicited the support of the National Water Research Institute (NWRI) to convene an Independent Advisory Panel (IAP) to provide a third-party peer review of the technical, scientific, regulatory, and policy aspects of the proposed Project. An IAP meeting was held on May 4, 2018 to solicit feedback on (1) the results of initial reservoir modeling efforts and (2) the feasibility of the Pure Water Project to comply with reservoir requirements of the SWA Regulations. Based on the information presented at the May 4th meeting, the Panel concluded the following (NWRI 2018):

- The JPA's Board of Directors and executive leadership appear committed to appropriate planning and investment to ensure regional water supply reliability.
- The proposed Project effectively addresses the necessary water supply, regulatory, and environmental considerations.
- The preliminary reservoir model analyses and scenarios are reasonable and provided the Panel with valuable insight into the proposed Project.
- The proposed Project, as presented to the Panel, appears to be capable of complying with the SWA Regulations.

The JPA has contracted with Trussell Technologies in conjunction with Flow Science to perform additional work to carry out many of the next steps and recommendations put forth by the IAP panel, included but not limited to an AWTF discharge diffuser assessment, reservoir modeling probabilistic analysis, and a regulatory pathway memorandum. The JPA's proactive approach to obtain expert panel review and the Panel's conclusions should serve to expedite the permitting process.

The potential environmental impacts of the proposed Pure Water Project will be assessed in accordance with CEQA and NEPA requirements. The District will take all necessary steps to initiate the CEQA and NEPA compliance process, in a timely manner.

8.5 Unresolved Issues

Discussion of any unresolved issues associated with implementing the proposed water reclamation and reuse project, how and when such issues will be resolved, and how the project would be affected if such issues are not resolved.

Unresolved issues include receiving project approvals and permits for construction and operation of facilities for reservoir augmentation in addition to meeting all requirements as stipulated in the SWA Regulations. Completion of CEQA/NEPA compliance requirements will be satisfied prior to construction.

The JPA is committed to conducting the necessary studies and completing all documentation to achieve regulatory compliance and obtain approval for project activities. The JPA will work with their consultant team and utilize the IAP as-needed to resolve issues as they arise, such that the project would be able to navigate around technical or regulatory obstacles should they arise.

8.6 Current and Projected Wastewater Discharge Requirements

Identification of current and projected wastewater discharge requirements resulting from the proposed Title XVI project (e.g., brine disposal).

The current wastewater discharge requirements and projected wastewater flows are discussed in Section 2.5. The District currently manages treated wastewater using various combinations of five different disposal options, which include:

1) discharge to Malibu Creek during the wet season,
2) non-potable reuse via the existing recycled water system,
3) diversion of raw wastewater to the City of Los Angeles Sewer System,
4) diversion of recycled water to the LA River, and
5) diversion of recycled water to spray fields on vacant lands.

Recycled water in excess of demands is discharged into Malibu Creek and the LA River pursuant to Tapia WRF's waste discharge requirements (WDRs) contained in Order No. R4-2017-0124 and NPDES Permit No. CA0056014. conditions. Surface water discharges to Malibu Creek must comply with current and future stringent nutrient Total Maximum Daily Load (TMDL) discharge permit requirements, including:

- **Current Discharge Limitations.** The current nutrient TMDL limits include 8 mg/L for nitrate+nitrite-N and 3 mg/L for total phosphorus.

- **2022 Discharge Limitations.** The JPA must comply with new summer limits (April 15-November 15) of 1 mg/L total nitrogen and 0.1 mg/L total phosphorus by May 16, 2022.
- **2030 Discharge Limitations.** The JPA must comply with new winter limits (November 16-April 14) of 4 mg/L total nitrogen and 0.2 mg/L total phosphorus by November 16, 2030.

During the summer months, the JPA is required to maintain a minimum flow in Malibu Creek of 2.5 cfs, based on a determination from the California Department of Fish and Game, National Marine Fisheries Service, and the U.S. Fish and Wildlife Service (as described in the TMDL Implementation Plan in the JPA's WDR and NPDES Permit). In order to achieve the appropriate water quality for the supplemental river water, the JPA is currently considering multiple options for additional treatment and dilution to meet the summer waste load allocations (WLAs) by 2022. Selection, design and construction of the treatment process to meet the water quality requirements during the summer months is not part of the proposed Title XVI project.

Implementation of the proposed Title XVI project would allow the JPA to beneficially use most, if not all, of the JPA's excess recycled water and to effectively discontinue discharges to Malibu Creek in the winter months. The Project would therefore achieve compliance with the winter WLAs as described in their WDR and NPDES Permit.

8.7 Wastewater Discharge Rights

Description of rights to wastewater discharges resulting from implementation of the proposed Title XVI project.

Under Section C, Part 1 of Order No. R4-2017-0124, the permit states that the order may be modified, revoked and reissued, or terminated for cause, for a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge. Since the proposed Title XVI project involves a reduction in discharges to Malibu Creek and the LA River, the District may need to discuss modifications to the NPDES and WDR permits with the RWQCB and DDW. Discussions with the RWQCB and DDW on this and other issues are on-going.

Section 9 Financial Capability of Sponsor

At the Title XVI feasibility study stage, Reclamation must request enough information to determine that the non-Federal project sponsor is likely to demonstrate financial capability if the project moves to construction. Reclamation will request more detailed information to make a determination that the non-Federal project sponsor is financially capable of funding the non-Federal share of the project's costs before a funding agreement covering construction can be executed. Accordingly, the following information is required to be included in the Title XVI feasibility study report.

9.1 Proposed Project Schedule

A proposed implementation schedule for the proposed Pure Water Project is illustrated in Figure 9-1. This schedule is based in part on the compliance schedule and milestone dates to achieve compliance with the winter WLAs as described in the Tapia WRF WDR and NPDES Permit (Order R4-2017-0124), previously discussed in Section 8.6.

9.2 Non-Federal Project Sponsor Preparedness

Discussion of the willingness of the non-federal project sponsor to pay for its share of capital costs and the full operation, maintenance, and replacement costs.

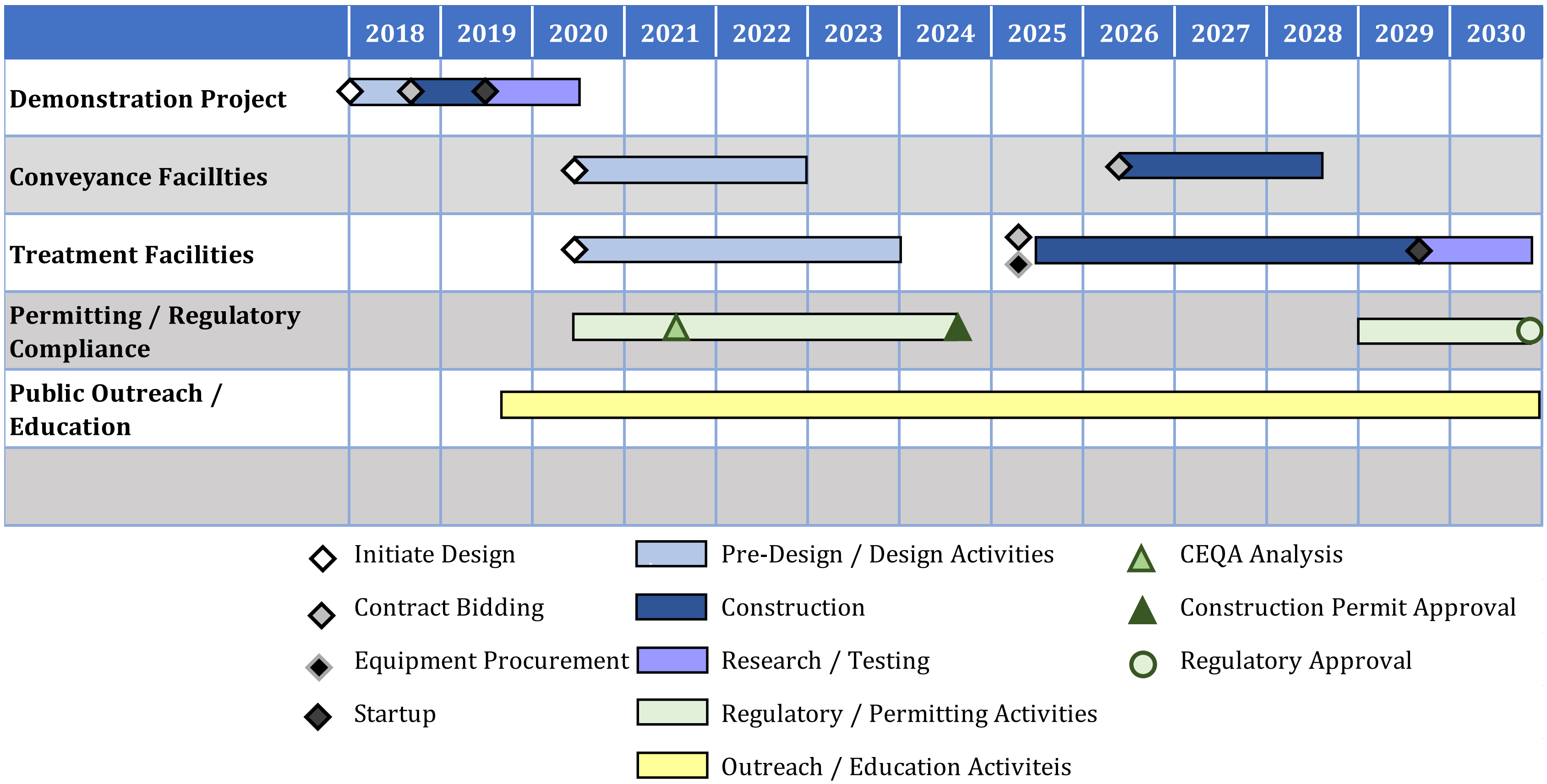
The JPA would fund its share of the costs in the following way. Capital costs are assumed to be allocated between LVMWD and TSD based on a 70.6%/29.4% split with O&M costs following the same allocation (PFM 2017).

Pre-construction costs are expected to be funded through a combination of cash contributions from LVMWD and TSD and grants, to the extent they are available, based on the cost allocation framework (PFM 2017).

Construction costs are expected to be funded through a combination of grants, loans and municipal bonds. Potential funding partners may be identified, as-appropriate, depending on the potential for a Public Private Partnership (P3) or Regional Consortium to make the Project more cost-effective and/or to reduce risk. The JPA will pursue funding through available grants, low-interest loan programs and partnerships for the Project construction at the appropriate time.

The JPA would fund full operation, maintenance, and ongoing replacement costs through ongoing rates and charges. At this point, a method for allocating costs among the applicable service types: potable water, recycled water, and sanitation has not been developed. As the Project moves forward, this allocation method will be developed in order to properly determine cost impacts on each respective customer class (PFM 2017).

Figure 9-1: Proposed Pure Water Project Implementation Schedule



9.3 Funding Plan

A plan for funding the proposed water reclamation and reuse project's construction, operation, maintenance, and replacement costs, including an analysis of how the non-federal project sponsor will pay construction and annual operation, maintenance, and replacement costs.

The JPA developed a Pure Water Project Preliminary Financial Feasibility Report for the (PFM 2017) based on preliminary costs developed in the BODR (MWH 2016), which is included in Appendix J. The Project Financing Plan details the following:

Estimated capital expenditures necessary for construction of the Project and the preliminary capital cost allocation framework between the JPA members.

- Potential funding sources available for the Project and potential funding scenarios to establish a range of financing alternatives for the project.
- Required revenue increases for LVMWD and TSD and the total revenue increase required to support each of the funding scenarios.
- The process for continuing to refine the financial analysis as it pertains to future financial plan updates.

The Project Financing Plan estimated that the Project could be financed with an increase in the range of $1.80 to $8.00 per customer per month (in 2016 dollars) for LVMWD and TSD customers (PFM 2017). For this modest cost increase, the Project would create a new, local, sustainable and drought-proof drinking water supply while avoiding significant costs associated with meeting increasingly stringent regulatory requirements for discharges into Malibu Creek and continued reliance on imported water supplies.

The Project Financing Plan would be revised during the design phase, when pipeline alignments, AWPF and other facility components and costs are further refined, and a Project governance structure is established to confirm cost allocation methods between member agencies and services.

As previously discussed, pre-construction costs would be funded entirely with cash contributions from LVMWD and TSD until the construction phase is initiated. As the initial date of construction nears, a more robust Project Financing Plan would need to be developed based on contemporary market conditions and available funding sources (PFM 2017).

9.4 Federal and Non-Federal Funding and Restrictions

Description of all federal and non-federal sources of funding and any restrictions on such sources. For example, minimum or maximum cost-share limitations. Generally, for Title XVI authorized projects, the federal cost share is limited to 25 percent, or $20,000,000, whichever is less.

A summary of potential funding sources and scenarios are evaluated in the Project Financing Plan in Appendix J. If Title XVI funding is available and authorized; the Project could seek up to $20 million in federal funding. The remaining non-federal match would be derived from a combination of pay-go contributions, state and local grants, state or federal loans, and/or municipal bonds (PFM 2016). The JPA would evaluate available funding options at the appropriate time when project costs and agreements are further refined, and the Project is closer to construction.

Section 10 Research Needs

At a minimum, the report must include a statement on whether the proposed water reclamation and reuse project includes basic research needs, and the extent that the proposed Title XVI project will use proven technologies and conventional system components. The following information is required only if further research is necessary to implement the proposed Title XVI project.

The proposed Title XVI project will use a combination of proven technologies and conventional system components along with the potential to explore innovative areas of research. The AWTF will rely on proven advanced treatment processes to meet SWA Regulations (previously described in Section 4.5.1). Conveyance of flows to and from the AWTF will consist of conventional conveyance components (e.g. pipelines and pump stations) implemented via industry standard design and construction practices.

There are three potential areas of research that could be beneficial to the proposed Project:

(4) brine minimization technologies,
(5) brine chemical stabilization strategies, and
(6) stormwater capture opportunities.

Basic research needs are discussed in the following sections. Appendix D includes an assessment of stormwater capture opportunities and Appendix E compares the performance and cost of different brine concentration alternatives. This section describes considerations for the next steps to further explore opportunities to enhance the proposed Title XVI project through research.

10.1 Research Needs and Objectives

Description of research needs associated with the proposed water reclamation and reuse project, including the objectives to be accomplished through research.

Disposal of brine reject from the RO process is a significant cost associated with the project. The volume of brine produced drives the size of the 12-mile brine pipeline (influencing capital costs) as well as the energy requirements and brine discharge fees (incurred as annual costs). Improving recovery rates has the additional benefit of increasing project yield. The objective of additional research of brine minimization technologies would be to identify opportunities to achieve a higher RO recovery rate to reduce infrastructure, energy and disposal costs associated with disposal of brine through CMWD's SMP.

A related research area of interest is brine chemical stability within the conveyance pipeline. In each brine minimization process, the concentration of particles can increase to the point of super saturation, resulting in particles precipitating out of solution. Once discharged from the brine minimization process, there is an offset in time before precipitation can begin. Once this time period ends, brine begins to precipitate in the line, resulting in clogging that can be difficult to identify the location of, costly to clean and can reduce the effective capacity of the brine pipeline. The objective of this type of research project would be to identify pretreatment and/or chemical addition/control solutions for stabilizing brine generated from the RO process.

Appendix E provides a comparison of brine minimization technologies and recommends further analysis of multistage concentrator and closed circuit reverse osmosis (CCRO), with a focus on balancing water recovery rates with brine stabilization to ensure no precipitation in the brine line occurs while brine fees are kept to a minimum. Furthermore, the additional water quality analyses that would be performed as part of a research project would improve the accuracy of the expected recovery rates, capital and operational costs, as well as potential issues and costs related to brine disposal in the SMP. The JPA is currently embarking on an AWTF Demonstration Project, which is exploring brine minimization technologies to meet these objectives.

The availability of source water supply is a limiting factor in the proposed Title XVI project yield. A stormwater capture project provides an opportunity to store and divert stormwater to the sanitary sewer for additional treatment at the Tapia WRF and to increase available flows to the AWTF. Additional regional benefits may be realized through flow reduction, improved water quality, groundwater recharge and habitat enhancement. Appendix D explores current stormwater projects being explored through the Malibu Creek Watershed Enhanced Watershed Management Program (MCEWMP) and by local stormwater management entities, to assess at a high-level, opportunities to divert stormwater as a supplemental source water for the proposed project. The objective of additional research into stormwater capture opportunities would be to further explore project development options by working with MCWEWMP developers that are leading the projects, investigating funding options and confirm technical assumptions related feasibility, potential stormwater yield, and costs.

10.2 Reclamation's Participation

Description of the basis for reclamation participation in the identified research.

Brine minimization can potentially have a significantly positive effect on project yield, facility sizing, and cost savings, which will positively impact Reclamation as a project sponsor.

Brine stabilization will address a significant brine disposal O&M issue, which can be applied on other Reclamation projects that utilize RO treatment, including potable reuse and brackish groundwater applications.

Expansion of stormwater capture in the Malibu Creek Watershed aligns with the objectives of Reclamation's Los Angeles Basin Study (BOR and LACFCD 2016), which is assessing the region's major water conservation and flood risk mitigation infrastructure to prepare for future drivers that may impact water supply, such as changes to climate and population.

10.3 Researchers

Identification of the parties who will administer and conduct necessary research.

The JPA would administer and lead research projects for brine minimization and stabilization.

A stormwater capture research project would be developed in collaboration with the MCWEWMP developers, County of Los Angeles Department of Public Works Los Angeles County Flood Control District (LACFCD), and local stormwater management entities, such as Agoura Hills, Calabasas, and Westlake Village. At this time, it is uncertain who would lead, administer and conduct the necessary research.

10.4 Research Timeframe

Identification of the timeframe necessary for completion of necessary research.

Research projects related to brine minimization and stabilization would be conducted in the next 1 to2 years in order to inform the final design of the AWTF. Initial investigation into these research areas is already being explored as part of the JPAs Demonstration Project.

The MCEWMP, (LACFCD et. Al 2016), was developed to comply with requirements of the Los Angeles County Municipal Separate Storm Sewer System (MS4) Permit Order No. R4-2012-0175. According to the 2016 MCEWMP, the stormwater capture projects being considered are slated for design in December 2019. Should the JPA pursue collaborative or independent research to enhance stormwater capture to supplement source water supplies, it would be beneficial to initiate a feasibility assessment in the next 1 to 2 years to align with the greater MCEWMP.

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Appendix A: Allowable Uses in California

Non-Potable Recycled Water Use	Treatment Level: Disinfected Tertiary Recycled Water	Treatment Level: Disinfected Secondary 2.2 Recycled Water	Treatment Level: Disinfected Secondary 23 Recycled Water	Treatment Level: Undisinfected Secondary Recycled Water
Irrigation for:				
Food crops where recycled water contacts the edible portion of the crop, including all root crops Parks and playgrounds School grounds Residential landscaping Unrestricted-access golf courses Any other irrigation uses not specifically prohibited by other provisions of the *California Code of Regulations*	ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
Food crops, surface-irrigated, above-ground edible portion, not contacted by recycled water	ALLOWED	ALLOWED	NOT ALLOWED	NOT ALLOWED
Cemeteries Freeway landscaping Restricted-access golf courses Ornamental nursery stock and sod farms with unrestricted public access Pasture for milk animals for human consumption Nonedible vegetation with access control to prevent use as a park, playground or school grounds	ALLOWED	ALLOWED	ALLOWED	NOT ALLOWED
Orchards with no contact between edible portion and recycled water Vineyards with no contact between edible portion and recycled water Non food-bearing trees, including Christmas trees not irrigated less than 14 days before harvest Fodder and fiber crops and pasture for animals not producing milk for human consumption Seed crops not eaten by humans Food crops undergoing commercial pathogen-destroying processing before consumption by humans Ornamental nursery stock, sod farms not irrigated less than 14 days before harvest	ALLOWED	ALLOWED	ALLOWED	ALLOWED
Supply for impoundment:				
Nonrestricted recreational impoundments, with supplemental monitoring for pathogenic organisms	ALLOWED[2]	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
Restricted recreational impoundments and publicly accessible fish hatcheries	ALLOWED	ALLOWED	NOT ALLOWED	NOT ALLOWED
Landscape impoundments without decorative fountains	ALLOWED	ALLOWED	ALLOWED	NOT ALLOWED
Supply for cooling or air conditioning:				
Industrial or commercial cooling or air conditioning involving cooling tower, evaporative condenser, or spraying that creates a mist	ALLOWED[3]	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
Industrial or commercial cooling or air conditioning not involving cooling tower, evaporative condenser, or spraying that creates a mist	ALLOWED	ALLOWED	ALLOWED	NOT ALLOWED

Recycled Water Use	Treatment Level: Disinfected Tertiary Recycled Water	Disinfected Secondary 2.2 Recycled Water	Disinfected Secondary 23 Recycled Water	Undisinfected Secondary Recycled Water
Other Uses:				
Flushing toilets and urinals Priming drain traps Industrial process water that may contact workers Structural fire fighting Decorative fountains Commercial laundries Consolidation of backfill material around potable water pipelines Artificial snow making for commercial outdoor use Commercial car washes, not heating the water, excluding the general public from the washing process	ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
Industrial process water that will not come into contact with workers Industrial boiler feed Nonstructural fire fighting Backfill consolidation around nonpotable piping Soil compaction Mixing concrete Dust control on roads and streets Cleaning roads, sidewalks and outdoor work areas		ALLOWED	ALLOWED	
Flushing sanitary sewers				ALLOWED

1 Refer to the full text of the version of California Department of Public Health's "Regulations Related to Recycled Water", published on January 13, 2017. This chart is only an informal summary of uses allowed in that publication. The most current Title 17 and Title 22 regulations can be downloaded from: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/rwstatutes_20170113.pdf

2 With "conventional tertiary treatment." Additional monitoring for two years or more is necessary with direct filtration.

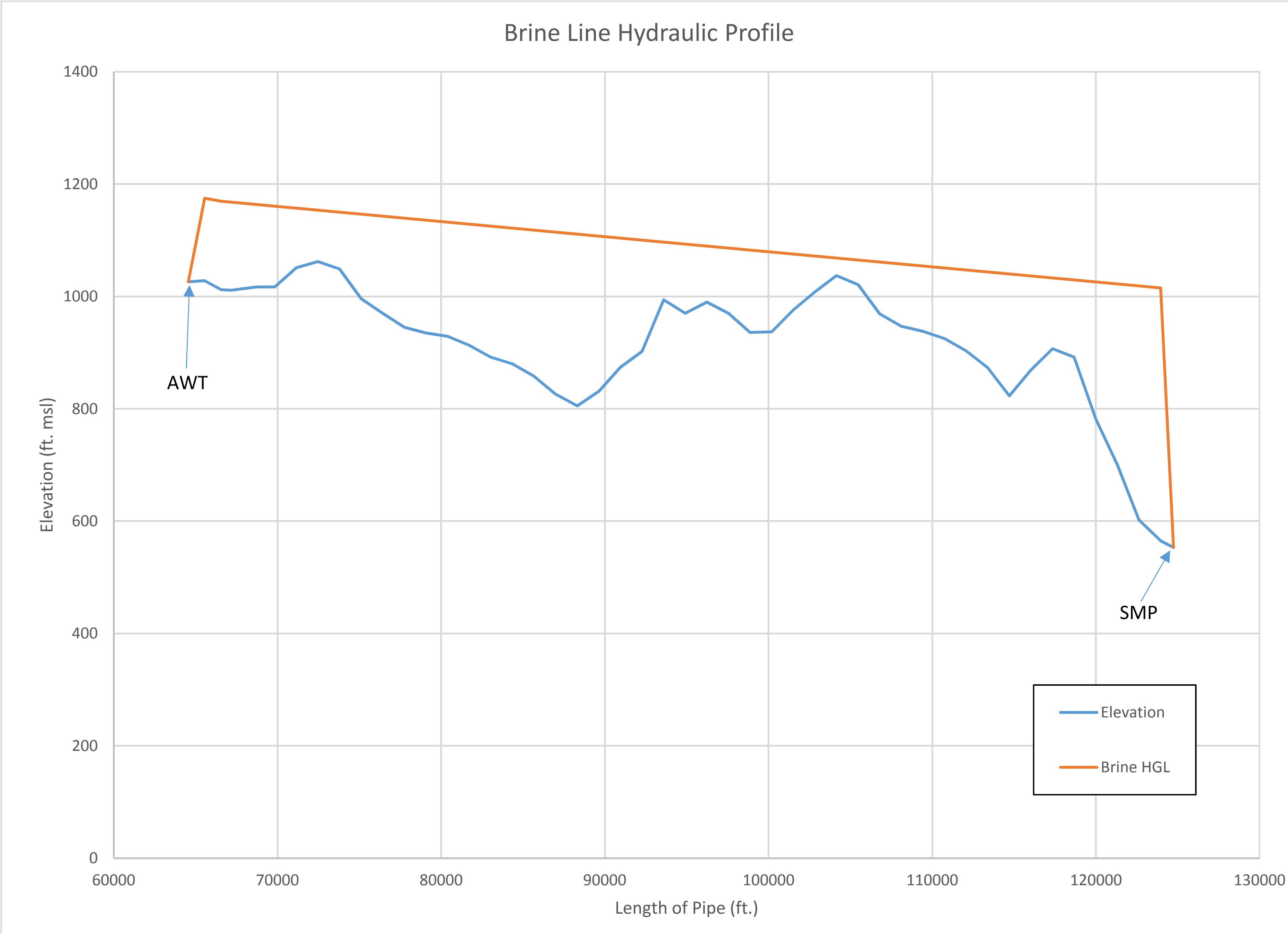
3 Drift eliminators and/or biocides are required if public or employees can be exposed to mist.

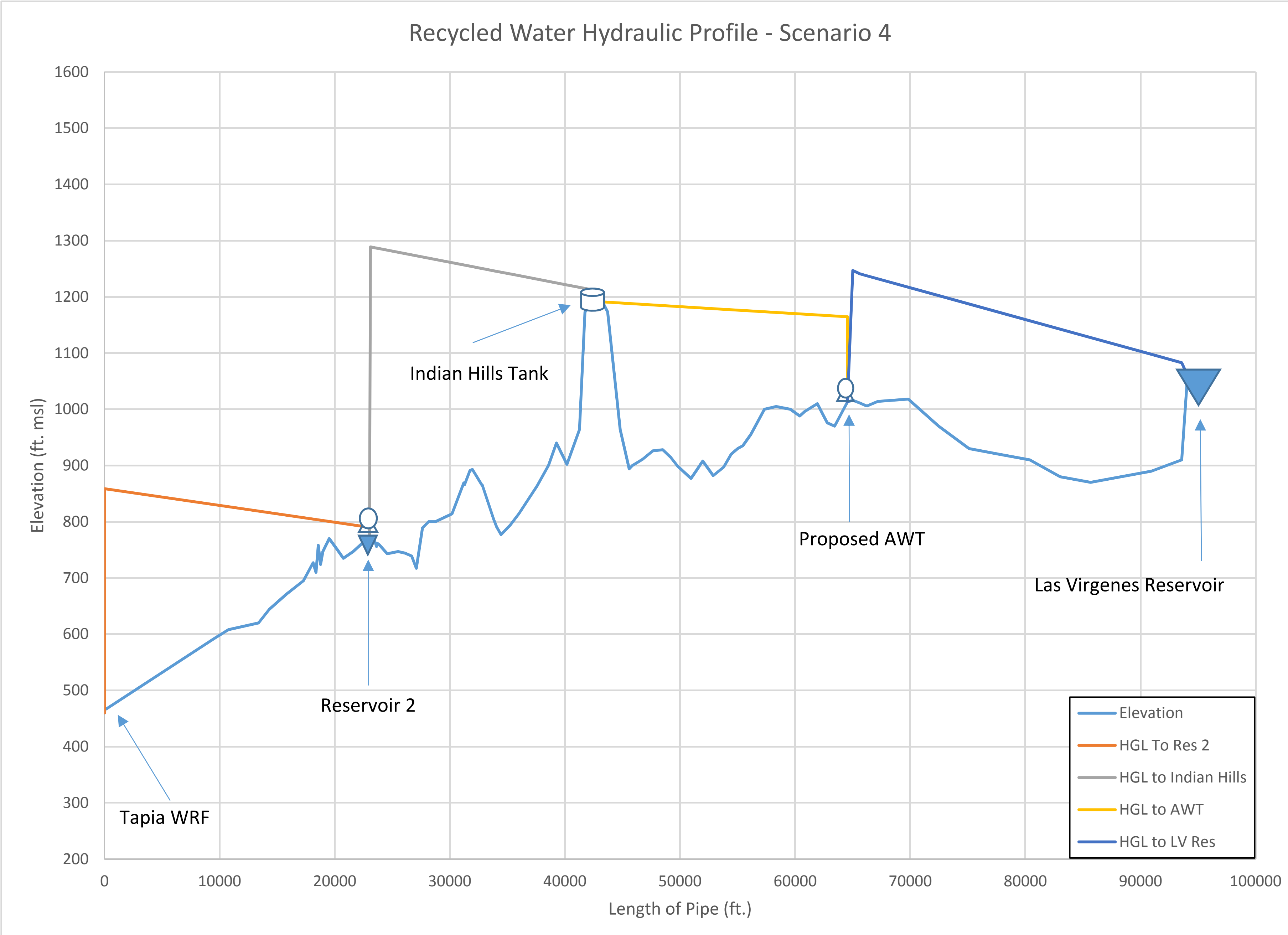
Potable Reuse

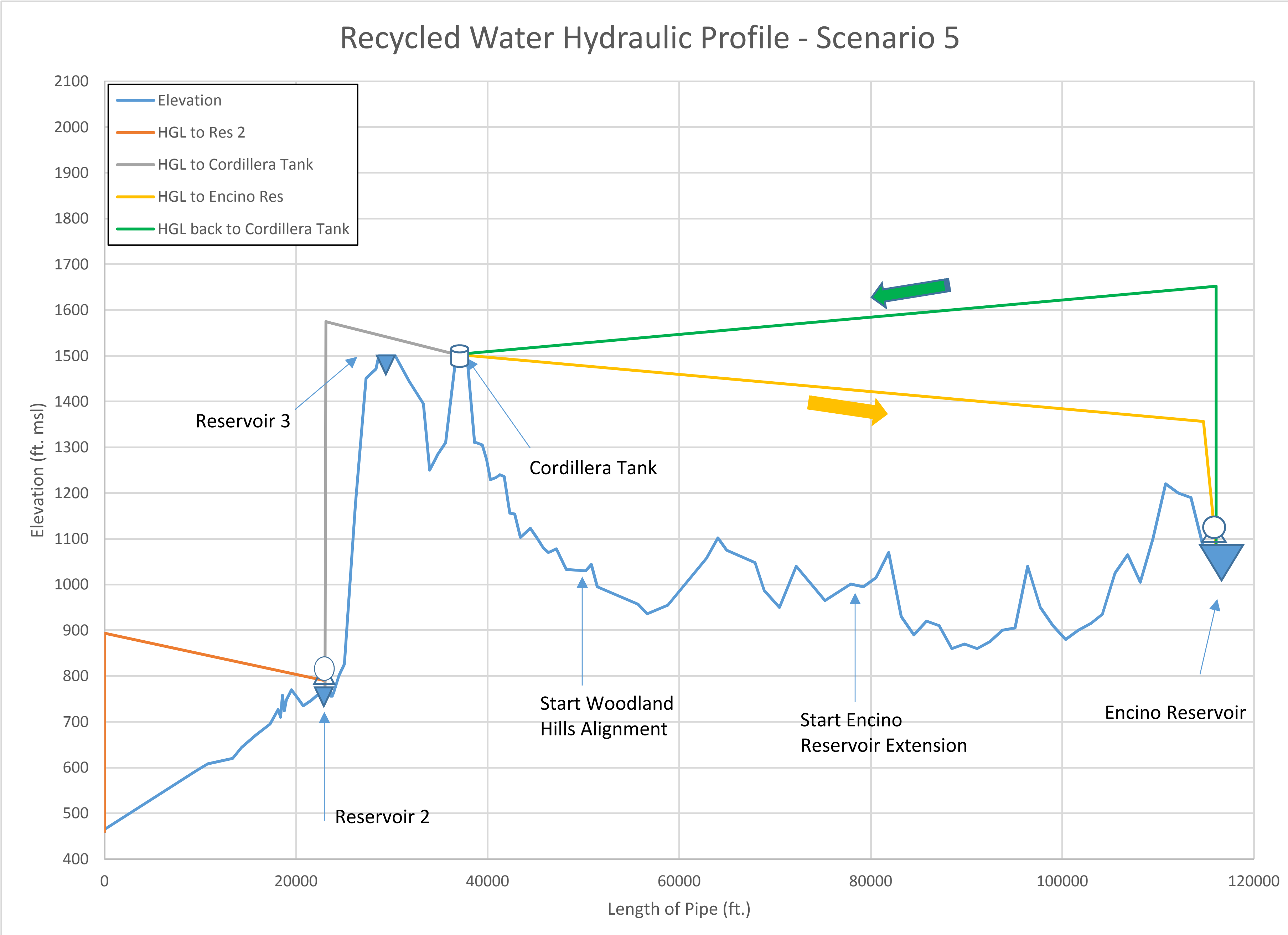
- Refer to the June 18, 2014 final Groundwater Recharge Guidelines, available from the DDW website at: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/gwreplenishmentregulation/DPH-14-003EFinalText.pdf
- Refer to the State Water Board adopted resolution for SWA Regulations (SBDDW-16-02) adopted on March 6, 2018 (included in Appendix G) and available at: https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2018/rs2018_0014_with_regs.pdf

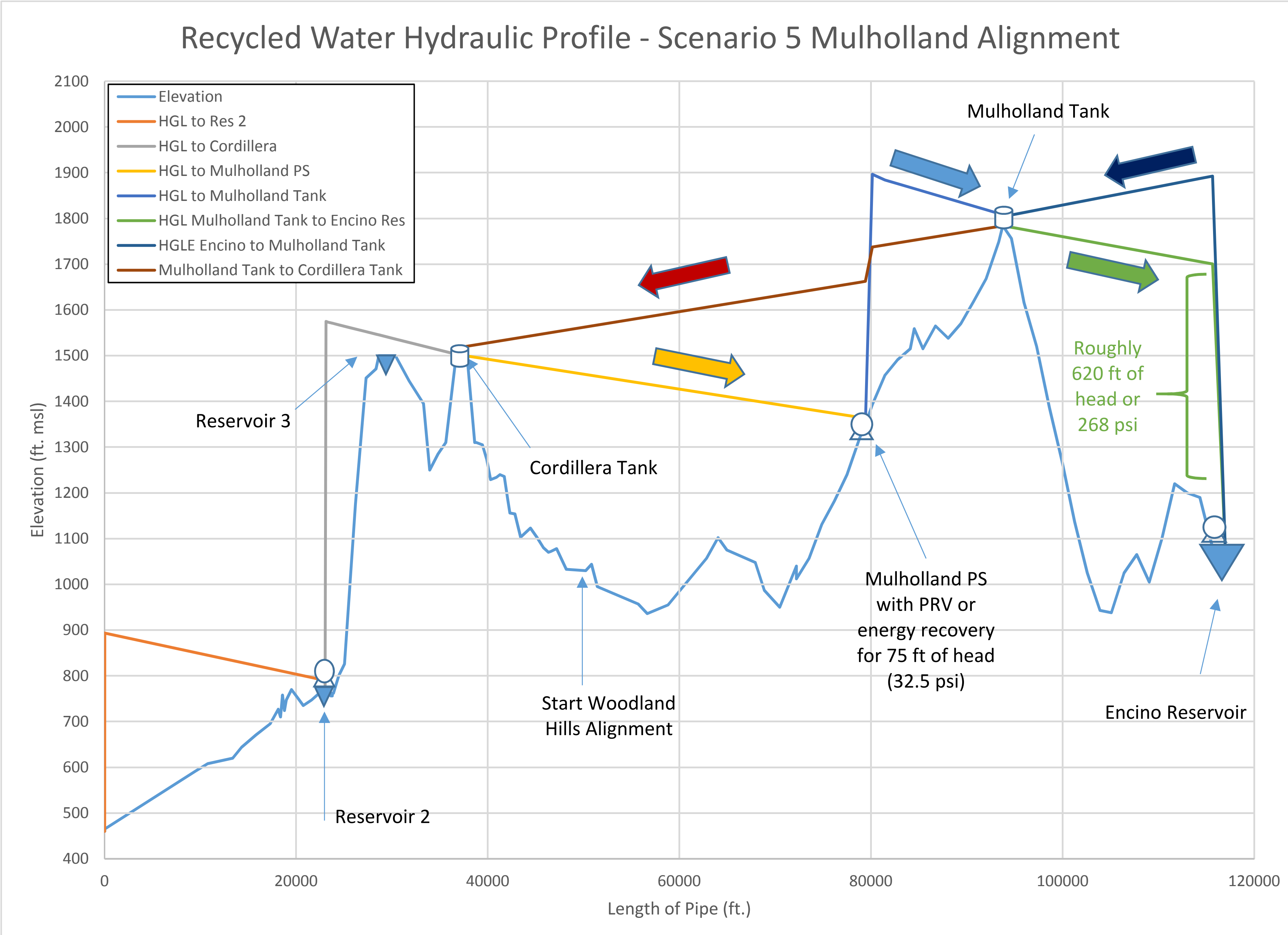
Appendix B: Engineering Calculations

Includes relevant excerpts from the Recycled Water Seasonal Storage – Basis of Design Report (BODR) Appendix C - Engineering Calculations (MWH 2016)


Brine Line Hydraulic Profile
Elevation (ft. msl)
1400
1200
1000
800
600
400
200
0
60000
70000
80000
90000
100000
110000
120000
130000
Length of Pipe (ft.)
AWT
SMP
Elevation
Brine HGL


Recycled Water Hydraulic Profile - Scenario 4
Elevation (ft. msl)
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
Length of Pipe (ft.)
Indian Hills Tank
Proposed AWT
Las Virgenes Reservoir
Reservoir 2
Tapia WRF
Elevation
HGL To Res 2
HGL to Indian Hills
HGL to AWT
HGL to LV Res


Recycled Water Hydraulic Profile - Scenario 5
Elevation
HGL to Res 2
HGL to Cordillera Tank
HGL to Encino Res
HGL back to Cordillera Tank
Elevation (ft. msl)
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
0
20000
40000
60000
80000
100000
120000
Length of Pipe (ft.)
Reservoir 3
Cordillera Tank
Start Woodland Hills Alignment
Start Encino Reservoir Extension
Encino Reservoir
Reservoir 2


Recycled Water Hydraulic Profile - Scenario 5 Mulholland Alignment
Elevation
HGL to Res 2
HGL to Cordillera
HGL to Mulholland PS
HGL to Mulholland Tank
HGL Mulholland Tank to Encino Res
HGLE Encino to Mulholland Tank
Mulholland Tank to Cordillera Tank
Mulholland Tank
Reservoir 3
Cordillera Tank
Roughly 620 ft of head or 268 psi
Mulholland PS with PRV or energy recovery for 75 ft of head (32.5 psi)
Start Woodland Hills Alignment
Encino Reservoir
Reservoir 2
Elevation (ft. msl)
Length of Pipe (ft.)
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
0
20000
40000
60000
80000
100000
120000

Appendix C: Engineers Opinion of Probable Costs

The U.S. Bureau of Reclamation (Reclamation) policy requires the preparation of an estimate of the construction and project costs from the time of the initial preliminary investigation, through feasibility, final design, and construction, until all construction is complete (Reclamation 2007a).

- Reclamation standards utilized for estimating project costs consist of the following:
- FAC TRMR-8, Policy - Cost Estimating, (Reclamation 2006a)
- FAC TRMR-9, Directives & Standards - Cost Estimating (Reclamation 2006b),
- FAC 09-01, Directives & Standards - Cost Estimating (Reclamation 2007a),
- FAC 09-02, Directives & Standards - Construction Cost Estimates and Project Cost Estimates (Reclamation 2007b),
- BGT 01-04, Directives & Standards - Instructions on Budgeting for Construction – Estimates, Schedules, and Supporting Documents (Reclamation 1995a), and
- BGT 01-05, Directives & Standards - Instructions on Budgeting for Operation and Maintenance – Estimates, Schedules, and Supporting Documents (Reclamation 1995b)

This Appendix describes the basis for the feasibility-level cost estimates for the Title XVI project alternatives (as described in Sections 4 and 5).

C.1 Basis for Cost Estimating Assumptions

An engineer's opinion or probable costs was generated for the engineering work completed for the Title XVI project alternatives to allow for an economic and financial analysis of the project alternatives. The cost assumptions and the resulting construction cost estimates are presented in Section 4. The Financial Analysis, performed in accordance with Title XVI guidelines, are presented in Section 5 of the report.

This Appendix contains detailed cost sheets for each alternative. Only the major components common to each project were incorporated in the cost estimates, including: supply pipelines, treatment plant improvements, system storage components, distribution piping, and additional distribution pump station capacity. The estimates also include allowance, contingency, and non-contract costs such as engineering, legal and license fees, and engineering construction services, as described in Section 4.2.3.

Costs are broken down for capital and operation and maintenance (O&M) costs. As discussed in Section 5 of the report, the annual O&M costs are used in conjunction with the anticipated life cycle of project components to evaluate the project economic feasibility.

All present worth costs are based on cost indices that are measures of the average change in process over time. For this study, the Engineering News Record's (ENR) Construction Cost Index

(CCI) for Los Angeles is used. This index is widely used for studies and estimates of construction projects and is published quarterly in ENR. All costs in this study are based on an May 2018 CCI of 11,935. Costs are based on an evaluation of recent construction cost experience by each of the participating agencies for their region. Where additional cost guidance from national cost indices was considered, these costs were similarly increased to match a CCI of 11,936.

C.1.1 Feasibility-Level Capital Cost Estimate

Construction Contract Costs

The following assumptions were applied to estimate facility construction contract costs:

- **Distribution Pipelines:** Pipeline costs were based on a unit cost for each pipe size (i.e. dollar per inch-diameter linear foot) using conventional dry trenching techniques. An increased unit cost was applied for major crossings.
- **Pump Stations:** Pumping costs were estimated based on brake horsepower requirements, assuming a redundancy factor, outside pumps with an enclosed control building. Land acquisition costs for pump stations were not included in the cost estimate.
- **Advance Water Treatment Facility:** Cost estimates were based on a recently bid AWTF for the Pure Water Monterey groundwater replenishment program. The unit cost ($/mgd) was scaled using the six-tenths factor (cost1/cost2= $(\text{size1}/\text{size2})^{0.6}$). This accounts for efficiencies gained with economics of scale.
- **Encino Reservoir Treatment:** Cost estimates were based on strainers and chlorination system for outflow from the reservoir, as estimated in the BODR.
- **Other Capital Costs:** for reservoir facilities and a brine discharge station were based on from professional experience.

Allowance, Contingencies and Non-Contract Costs

An Opinion of Probable Total Project Capital Costs was estimated based on the Reclamation Directives and Standards and Engineering Research Center guidelines, which prescribe the following allowances, contingencies and non-contract cost percentages to be applied to the total estimated feasibility level total construction contract costs:

- **BOR Construction Contingencies:** a markup of 30 percent was applied to the Subtotal Capital Construction Cost to cover differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible changes in plans, and other uncertainties.
- **Engineering and Design:** a markup of 10 percent was applied to the Subtotal Construction Cost with Contingencies to account for costs associated with design, specifications and bid documents.
- **<u>Non-Contract Cost:</u>** a markup of 10 percent was applied to the Subtotal Construction Cost with Contingencies to account for the costs of work or services provided by

consultants/contractors in support of the project. This cost item reflects distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.

- **Land Acquisition:** estimated or known cost to purchase property not owned by the JPA.
- **Total Project Capital Cost:** The sum of the Subtotal Construction Cost with all markups, contingencies, and land acquisition costs. Opinion of Probable Construction Costs plus Non-Contract costs. The Opinion of Probable Total Project Capital Cost is often called the Construction Cost by Reclamation.

C.1.2 Feasibility-Level O&M Cost Estimate

For the Title XVI projects, the operations and maintenance (O&M) costs are estimated to include the following items:

- Power costs for conveyance and treatment
- Chemical costs for treatment
- Brine discharge fees for disposal into the Calleguas MWD's Salinity Management Pipeline (SMP)
- Maintenance, repair and replacement costs for treatment and conveyance facilities
- Labor Costs for treatment and other maintenance activities (including conveyance and storage facility)
- Westlake WTP capacity costs incurred
- Contingency of 10% to cover unknown and miscellaneous costs

C.2 Imported Water Cost Assumptions

The project yield from each alternative represents an offset in imported water purchases. Thus, there is an avoided cost associated with reduced imported water purchases. A unit imported water purchase price applied is based on the average rate of MWDSC Tier 1 treated water over 20 years based on 5% per annum escalation rate (inflation not included) (PFM 2016),

Table C.1: Estimated Imported Water Rates for MWDSC Tier 1 Treated Water

Year	MWDSC Rate ($/AF)
2016	$ 900
2017	$ 945
2018	$ 992
2019	$ 1,042
2020	$ 1,094
2021	$ 1,149
2022	$ 1,206
2023	$ 1,266
2024	$ 1,330
2025	$ 1,396
2026	$ 1,466
2027	$ 1,539
2028	$ 1,616
2029	$ 1,697
2030	$ 1,782
2031	$ 1,871
2032	$ 1,965
2033	$ 2,063
2034	$ 2,166
2035	$ 2,274
AVERAGE	$ **1,488**

C.3 Capital and O&M Cost Tables

Detailed engineer's opinion of probable costs for each alternative are included herein. Unit costs, quantities and references are shown by line item in the following cost sheets for each alternative.

Table C.2: Alternative 1a - Engineer’s Opinion of Probable Cost

Engineers Opinion of Probable Cost
Pure Water Project - AWTF Site A

KENNEDY/JENKS CONSULTANTS

Study:	Title XVI Feasibility Study	**Prepared By:**	MR/PC
Project:	Las Virgenes Municipal Water District	**Date Prepared:**	May-2018
AWTF Location	AWTF near Las Virgenes Reservoir (Site A)	**K/J Proj. No.**	1744518.00
Estimate:	Conceptual Level Cost-Analysis	**ENR**	11,936
			(2018 LA)

Max Design Capacity	7.4	mgd (BODR 2016)
MF Recovery	95%	
Primary RO Recovery	85%	
Brine Minimization Recovery	0%	No Brine Minimization
Total Recovery	81%	
Max Product Capacity	6.0	mgd (BODR 2016)
Average Available Recycled Water Supply	3,648	AFY
Average Product Water Production	3,100	AFY (assumes MF backwash routed to Tapia WRF and recycled)

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes/Source
Facility Capital Construction Costs						
1.0	**Advanced Water Treatment Facility (AWTF)**				**51,643,253**	
1.1	AWTF	7.4	mgd	$ 6,200,000	45,880,000	includes all components of the AWTF, including a pre-fabricated building; unit cost based on M1W Pure Water low bid; BODR estimate = $46.7M
1.2	Architectural Refinement Allocation	29,147	sq ft	$ 100	2,914,700	Allocation for more refined archtectural design for buildings at this site, unit cost provided by LVMWD on 5/25/18
1.3	Access Road Construction	1	LS	$ 2,848,553	2,848,553	LVMWD Alternative Road Alignment Study Triunfo Canyon Road to Tank Site C (March 2012), AECOM, escalated to 2018
1.4	Dechlorination at Reservoir	0	LS	$ 200,000	0	chemical injection, chemical storage, mixing system
1.5	Brine Minimization	0	LS	$ 1,605,000	0	Desalitech quote + 50% installation cost
2.0	**Pipelines**				**22,837,377**	Sept 2016 ENR Index 11,178
2.1	Tertiary Source Water Pipeline to AWTF from 24-inch RW	15,800	LF	$ 390	6,157,967	24 in-diameter $16.2 per inch-dia-LF (2016 BODR, escalated to 2018)
2.2	Purified Water Pipeline to Reservoir	900	LF	$ 342	307,525	20 in-diameter $17.1 per inch-dia-LF (2016 BODR, escalated to 2018)
2.3	Brine Pipeline to SMP - Southern Alignment	63,800	LF	$ 214	13,625,048	12 in-diameter $17.8 per inch-dia-LF (2016 BODR, escalated to 2018)
2.4	Waste Pipeline to Sewer	2,510	LF	$ 120	301,200	6 in-diameter $20.0 per inch-dia-LF
2.5	Major Crossings (freeway or flood control)					
	Dual Pipe Crossing	3	EA	$ 815,213	2,445,638	Hwy 101 twice (source water and brine pipelines) and Hwy 23 once (brine pipeline); 2015 Backbone Improvement Project Bid Summary, escalated to 2018
						July 2015 ENR Index 10981
3.0	**Pump Station**				**0**	
3.1	Recycled Water PS to AWPF	0	HP	$ 6,000	0	Can flow by gravity
3.2	Purified Water PS to Reservoir	0	HP	$ 6,000	0	Can flow by gravity
3.3	Brine PS to SMP	0	HP	$ 6,000	0	assumes 95 psi of pressure from RO system
3.4	Waste PS to Sewer	0	HP	$ 6,000	0	Can flow by gravity
4.0	**Reservoir Facilities**				**1,067,794**	
4.1	Mixing Aerators & Product Water Diffuser	1.0	LS	$ 1,067,794	1,067,794	2016 BODR, allowance, escalated to 2018
5.0	**Brine Discharge Station**				**350,000**	
5.1	Brine Discharge Station	1.0	LS	$ 350,000	350,000	Average discharge station cost, CMWD SMP Information for Potential Dischargers, Updated Jan 2016
	Subtotal Construction Cost				**$75,898,424**	includes Contractor OH&P
6.0	USBR Construction Contingencies	@	30%		22,769,527	% of construction cost to cover minor differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible minor changes in plans, and other uncertainties.
	Subtotal with Construction Contingencies				**$98,667,951**	
7.0	Engineering and Design	@	10%		9,866,795	% of Construction Cost Subtotal with Contingencies (includes design, specifications and bid documents)
8.0	USBR Non-Contract Costs	@	10%		9,866,795	% of Construction Cost Subtotal with Contingencies (includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.)
	Subtotal with Markups and Contingency				**$118,401,542**	
						construction start = 2023 end = 2029
	Land Acquisition	1.0	LS	$ -	0	LVWMD owns this property - no purchase costs required
	Opinion of Probable Total Project Capital Cost				**$118,401,542**	Annualized Escalated Cost based on Project Life ($/AF) = $1,949
	Annualized Unit Capital Costs ($/AF)				**$1,949**	project life = 30 interest rate = 3%

Item No.	Description	Qty	Units	Total Annual Costs $/Unit	Total	
Annual Operations and Maintenance Costs						
1.0	**Power Costs**					
1.1	Process Equipment	1,188,826	1000xgal	5.70	kWh/1000 gal	Reference: EVMWD IPR Study
		6,776,310	kWh/yr	0.13	$880,920	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.2	Source Water Pump Station	0	kWh/yr	0.13	$0	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.3	Product Water Pump Station	0	kWh/yr	0.13	$0	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.3	Brine Pump Station	0.000	kW/AF			
		0	kWh/yr	0.13	$0	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.4	Overflow/Waste Pump Station	0.000	kWh/yr	0.13	$0	
1.5	RWPS West Additional Flows	3,648	AF	25.00	$91,209	Unit cost from 2016 BODR
2.0	**Chemical Costs**	1.0	LS	276,700	$276,700	BODR, 2016 App H Scenario 4 O&M Cost Summary; includes MF, RO, UV-AOP, Post-treatment, membrane storage
3.0	**Brine Discharge Fees**					
3.1	Brine Discharge Rate	548	AF	779.4	$427,403	Brine discharger outside CMWD service area, CMWD SMP Information for Potential Dischargers, Updated Jan 2016
3.2	Discharge Station O&M	1.0	LS	45,000	$45,000	CMWD SMP Information for Potential Dischargers, Updated Jan 2016
3.3	Discharge Station Replacement Cost	1.0	LS	13,860	$13,860	0.33% of station construction cost per month, CMWD SMP Information for Potential Dischargers, Updated Jan 2016
4.0	**Maintenance & Replacement of Consumables**					
4.1	Consumables	1	LS	186,600	$186,600	BODR, 2016 App H Scenario 4 O&M Cost Summary; 2% of equipment cost, assumed allowance
4.2	Maintenance	1	LS	228,200	$228,200	BODR, 2016 App H Scenario 4 O&M Cost Summary; includes MF, RO, UV for consumables
4.3	Mixing System	9,500	AF	25	$237,500	BODR, 2016, Table 4-15; "Growth represents the change in storage (AF) per year"
5.0	**Labor Costs**					
5.1	Labor for AWTF	6,240	hrs/yr	75	$468,000	BODR, 2016, Table 4-15; labor & maintenance 3.1 FTE
5.2	Other Labor (pipeline, PS)	1,560	hrs/yr	75	$117,000	25% of AWTF labor 0.8 FTE
6.0	**Westlake WTP**	498.0	AF	150.00	$74,700	BODR, 2016 - Capacity cost incurred to run WTP more frequently
7.0	**Scope and Estimating Contingency**	@	10.0%		$304,709	BODR 2016, Asssumed Allowance
	Annual O&M Costs ($/year)				**$3,351,801**	
	Annual Unit O&M Costs ($/AF)				**$1,080**	
Annual Savings						
8.0	**Imported Water Savings**	3,100	AF	1,488	4,612,701	Average Rate based on 5% per annum escalation rate of MWDSC Tier 1 treated water over 20 years (inflation not included)
	Imported Water Savings ($/AF)				**$1,488**	Serves to reduce the annual unit cost

Total Net Annual Unit Cost (Capital + O&M - Savings)	**$1,541**

Table C.3: Alternative 1b - Engineer's Opinion of Probable Costs

Engineers Opinion of Probable Cost
Pure Water Project - AWTF Site F

KENNEDY/JENKS CONSULTANTS

Study:	Title XVI Feasibility Study	**Prepared By:**	MR/PC
Project:	Las Virgenes Municipal Water District	**Date Prepared:**	May-2018
AWTF Location	AWTF at Agoura Rd Site (Site F)	**K/J Proj. No.**	1744518.00
Estimate:	Conceptual Level Cost-Analysis	**ENR**	11,936
		(2018 LA)	

Max Design Capacity	7.4	mgd (BODR 2016)
MF Recovery	95%	
Primary RO Recovery	85%	
Brine Minimization Recovery	0%	
Total Recovery	81%	
Max Product Capacity	6.0	mgd (BODR 2016)
Average Available Recycled Water Supply	3,648	AFY
Average Product Water Production	3,100	AFY (assumes MF backwash routed to Tapia WRF and recycled)

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes/Source
Facility Capital Construction Costs						
1.0	**Advanced Water Treatment Facility (AWTF)**				<u>48,794,700</u>	0
1.1	AWTF	7.4	mgd	$ 6,200,000	45,880,000	includes all components of the AWTF, including a pre-fabricated building; unit cost based on M1W Pure Water low bid; BODR estimate = $46.7M
1.2	Architectural Refinement Allocation	29,147	sq ft	$ 100	2,914,700	Allocation for more refined archtectural design for buildings at this site, unit cost provided by LVMWD on 5/25/18
1.4	Access Road Construction	0.0	LS	$ 2,848,553	0	LVMWD Alternative Road Alignment Study Triunfo Canyon Road to Tank Site C (March 2012), AECOM, escalated to 2018
1.4	Dechlorination at Reservoir	0.0	LS	$ 200,000	0	chemical injection, chemical storage, mixing system
1.5	Brine Minimization	0.0	LS	$ 1,605,000	0	Desalitech quote + 50% installation cost
2.0	**Pipelines**				<u>24,763,727</u>	
2.1	Tertiary Source Water Pipeline to AWTF from 24-inch RW B	9,200	LF	$ 390	3,585,651	24 in-diameter $16.2 per inch-dia-LF (2016 BODR, escalated to 2018)
2.2	Purified Water Pipeline to Reservoir	15,200	LF	$ 342	5,193,749	20 in-diameter $17.1 per inch-dia-LF (2016 BODR, escalated to 2018)
2.3	Brine Pipeline to SMP - Southern Alignment	62,800	LF	$ 214	13,411,490	12 in-diameter $17.8 per inch-dia-LF (2016 BODR, escalated to 2018)
2.4	Waste Pipeline to Sewer	1,060	LF	$ 120	127,200	6 in-diameter $20.0 per inch-dia-LF
2.5	Major Crossings (freeway or flood control)					
	Dual Pipe Crossing	3	EA	$ 815,213	2,445,638	Hwy 101 twice (source water and brine pipelines) and Hwy 23 once (brine pipeline); 2015 Backbone Improvement Project Bid Summary, escalat
3.0	**Pump Station**				<u>2,286,000</u>	
3.1	Recycled Water PS to AWPF	0	HP	$ 6,000	0	Can flow by gravity
3.2	Purified Water PS to Reservoir	375	HP	$ 6,000	2,250,000	2+1
3.3	Brine PS to SMP	0	HP	$ 6,000	0	assumes 95 psi of pressure from RO system
3.4	Waste PS to Sewer	6	HP	$ 6,000	36,000	1+1
4.0	**Reservoir Facilities**				<u>1,067,794</u>	
4.1	Mixing Aerators & Product Water Diffuser	1.0	LS	$ 1,067,794	1,067,794	2016 BODR, allowance, escalated to 2018
5.0	**Brine Discharge Station**				<u>350,000</u>	
5.1	Brine Discharge Station	1.0	LS	$ 350,000	350,000	Average discharge station cost, CMWD SMP Information for Potential Dischargers, Updated Jan 2016
	Subtotal Construction Cost				**$77,262,221**	includes Contractor OH&P
6.0	USBR Construction Contingencies	@	30%		23,178,666	% of construction cost to cover minor differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible minor changes in plans, and other uncertainties.
	Subtotal with Construction Contingencies				**$100,440,888**	
7.0	Engineering and Design	@	10%		10,044,089	% of Construction Cost Subtotal with Contingencies (includes design, specifications and bid documents)
8.0	USBR Non-Contract Costs	@	10%		10,044,089	% of Construction Cost Subtotal with Contingencies (includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.)
	Subtotal with Markups and Contingency				**$120,529,065**	
						construction start = 2023 end = 2029
	Land Acquisition	1.0	LS	$ 2,100,000	2,100,000	LVWMD owns this property - no purchase costs required
	Opinion of Probable Total Project Capital Cost				**$122,629,065**	Annualized Escalated Cost based on Project Life ($/AF) = $2,018
	Annualized Unit Capital Costs ($/AF)				**$2,018**	project life = 30 interest rate = 3%

Annual Operations and Maintenance Costs

Item No.	Description	Qty	Units	Total Annual Costs $/Unit	Total	
1.0	**Power Costs**					
1.1	Process Equipment	1,188,826	1000xgal	5.70	kWh/1000 gal	Reference: EVMWD IPR Study
		6,776,310	kWh/yr	0.13	880,920	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.2	Source Water Pump Station	0	kWh/yr	0.13	0	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.3	Product Water Pump Station	0.018	kW/AF			
		488,808	kWh/yr	0.13	$63,545	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.4	Brine Pump Station	0.000	kW/AF			
		0	kWh/yr	0.13	$0	BODR, 2016 App H Scenario 4 O&M Cost Summary for unit cost
1.5	Waste Pumps	0.009	kW/AF			
		20,135	kWh/yr	0.13	$2,618	MF backwash =5%; RO CIP and other wastes = 2%; total = 7% waste flow
1.6	RWPS West Additional Flows	3,648	AF	25.00	$91,209	Unit cost from 2016 BODR
2.0	**Chemical Costs**	1.0	LS	276,700	276,700	BODR, 2016 App H Scenario 4 O&M Cost Summary; includes MF, RO, UV-AOP, Post-treatment, membrane storage
3.0	**Brine Discharge Fees**					
3.1	Brine Discharge Rate	548	AF	779.4	$427,403	Brine discharger outside CMWD service area, CMWD SMP Information for Potential Dischargers, Updated Jan 2016
3.2	Discharge Station O&M	1.0	LS	45,000	$45,000	CMWD SMP Information for Potential Dischargers, Updated Jan 2016
3.3	Discharge Station Replacement Cost	1.0	LS	13,860	$13,860	0.33% of station construction cost per month, CMWD SMP Information for Potential Dischargers, Updated Jan 2016
4.0	**Maintenance & Replacement of Consumables**					
4.1	Consumables	1	LS	186,600	186,600	BODR, 2016 App H Scenario 4 O&M Cost Summary; includes MF, RO, UV for consumables
4.2	Maintenance	1	LS	228,200	228,200	BODR, 2016 App H Scenario 4 O&M Cost Summary; 2% of equipment cost, assumed allowance
4.3	Mixing System	9,500	AF	25	237,500	BODR, 2016, Table 4-15; "Growth represents the change in storage (AF) per year"
5.0	**Labor Costs**					
	Labor for AWTF	6,240	hrs/yr	75	468,000	BODR, 2016, Table 4-15; labor & maintenance
	Other Labor (pipeline, PS)	1,560	hrs/yr	75	117,000	25% of AWTF labor
6.0	**Westlake WTP**	498.0	AF	150.00	74,700	BODR, 2016 - Capacity cost incurred to run WTP more frequently
7.0	**Scope and Estimating Contingency**	@	10.0%		311,325	BODR 2016, Asssumed Allowance
	Annual O&M Costs ($/year)				**$3,424,580**	
	Annual Unit O&M Costs ($/AF)				**$1,100**	

Annual Savings						
8.0	**Imported Water Savings**	3,100	AF	1,488	4,612,701	Average Rate based on 5% per annum escalation rate of MWDSC Tier 1 treated water over 20 years (inflation not included)
	Imported Water Savings ($/AF)				**$1,488**	Serves to reduce the annual unit cost

Total Net Annual Unit Cost (Capital + O&M - Savings)	**$1,630**

Table C.4: Alternative 2a - Engineer's Opinion of Probable Costs

Engineers Opinion of Probable Cost
Encino Reservoir Project - Wells Drive Alignment

KENNEDY/JENKS CONSULTANTS

Study:	Title XVI Feasibility Study	**Prepared By:**	MR/PC		
Project:	Las Virgenes Municipal Water District	**Date Prepared:**	May-2018	Average Supply to Encino Reservoir	3,573 AFY
Treatment:	Near Encino Reservoir	**K/J Proj. No.**	1744518.00	Ave Supply from Encino Reservoir	3,173 AFY (400 AFY of seepage loss)
Estimate:	Conceptual Level Cost-Analysis	**ENR**	11,936 (2018 LA)	RW Delivered:	1,200 Average Annual Reuse (AFY); 0 AFY in 2016 to 2,395 AFY in 2

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes/Source
Facility Capital Construction Costs						
1.0	**Treatment at Encino Reservoir**				**1,000,000**	
1.2	Strainers and Chlorination System	1.0	LS	$ 1,000,000	1,000,000	LVMWD BODR 2016 - Table 5-5; post-reservoir, but before irrigation, housed at Encino Res. PS
2.0	**Pipelines**					
2.1	**Tertiary Pipelines**				**35,920,000**	
	24" Standard Pressure Pipeline	52,400	LF	$ 390	20,422,623	24 in-diameter $389.7 per LF (BODR, 2016), escalated to 2018
	24" High Pressure Pipeline	27,500	LF	$ 534	14,682,164	24 in-diameter $533.9 per LF (BODR, 2016), escalated to 2018
2.2	Major Crossings (freeway or flood control)	1	EA	$ 815,213	815,213	Hwy 26 crossing; 2015 Backbone Improvement Project Bid Summary, escalated to 2018
3.0	**Pump Station**				**19,000,000**	BODR, 2016 - Table 5-3, 5-5
3.1	Pump Station at Encino Reservoir	2,500	HP	$ 6,000	15,000,000	4+1
3.2	RWPS East Upgrade	1,000	HP	$ 4,000	4,000,000	1+1
4.0	**Reservoir Mixing System**	1.0	LS	$ 500,000	**500,000**	LVMWD BODR 2016 - Table 5-5
	Subtotal Construction Cost				**$56,420,000**	includes Contractor OH&P
6.0	USBR Construction Contingencies	@	30%		16,926,000	% of construction cost to cover minor differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible minor changes in plans, and other uncertainties.
	Subtotal with Construction Contingencies				**$73,346,000**	
7.0	Engineering and Design	@	10%		7,334,600	% of Construction Cost Subtotal with Contingencies (includes design, specifications and bid documents)
8.0	USBR Non-Contract Costs	@	10%		7,334,600	% of Construction Cost Subtotal with Contingencies (includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.)
	Subtotal with Markups and Contingency				**$88,015,200**	
						construction start = 2022 end = 2024
	Land Acquisition	0.0	LS	$ 1,000,000	0	Land acquisition not required
	Opinion of Probable Total Project Capital Cost				**$88,015,200**	Annualized Escalated Cost based on Project Life ($/AF) = $3,742
	Annualized Unit Capital Costs ($/AF)				**$3,742**	project life = 30 interest rate = 3%

Item No.	Description	Qty	Units	Total Annual Costs $/Unit	Total	
Annual Operations and Maintenance Costs						
1.0	**O&M Costs**					BODR, 2016 - Table 5-6 (for all)
1.1	RWPS East Pump Station	3,573	AF	105	$375,191	
1.2	Encino Pump Station	1,200	AF	60	$72,000	
1.3	Treatment	1,200	AF	70	$84,000	
1.4	Mixing System	6,000	AF	25	$150,000	
2.0	**Contingency**	@	10.0%		$53,119	
	Annual O&M Costs ($/year)				**$734,310**	
	Annual Unit O&M Costs ($/AF)				**$600**	
Annual Savings						
8.0	**Imported Water Savings**	474	AF	1,488	704,553	Average Rate based on 5% per annum escalation rate of MWDSC Tier 1 treated water over 20 years (inflation not included)
9.0	**Additional RW Sales**	1,200	AF	425	510,000	Average additional RW demand
	Imported Water Savings ($/AF)				**$1,012**	Serves to reduce the annual unit cost

Total Net Annual Unit Cost (Capital + O&M - Savings)	**$3,330**

Table C.5: Alternative 2b - Engineer's Opinion of Probable Costs

Engineers Opinion of Probable Cost
Encino Reservoir Project - Mulholland Alignment

KENNEDY/JENKS CONSULTANTS

Study:	Title XVI Feasibility Study	**Prepared By:**	MR/PC			
Project:	Las Virgenes Municipal Water District	**Date Prepared:**	May-2018	Average Supply to Encino Reservoir	3,573	AFY
AWTF Location	Near Encino Reservoir	**K/J Proj. No.**	1744518.00	Ave Supply from Encino Reservoir	3,173	AFY (400 AFY of seepage loss)
Estimate:	Conceptual Level Cost-Analysis	**ENR**	11,936 (2018 LA)	RW Delivered:	1,200	Average Annual Reuse (AFY); 0 AFY in 2016 to 2,395 AFY in 2

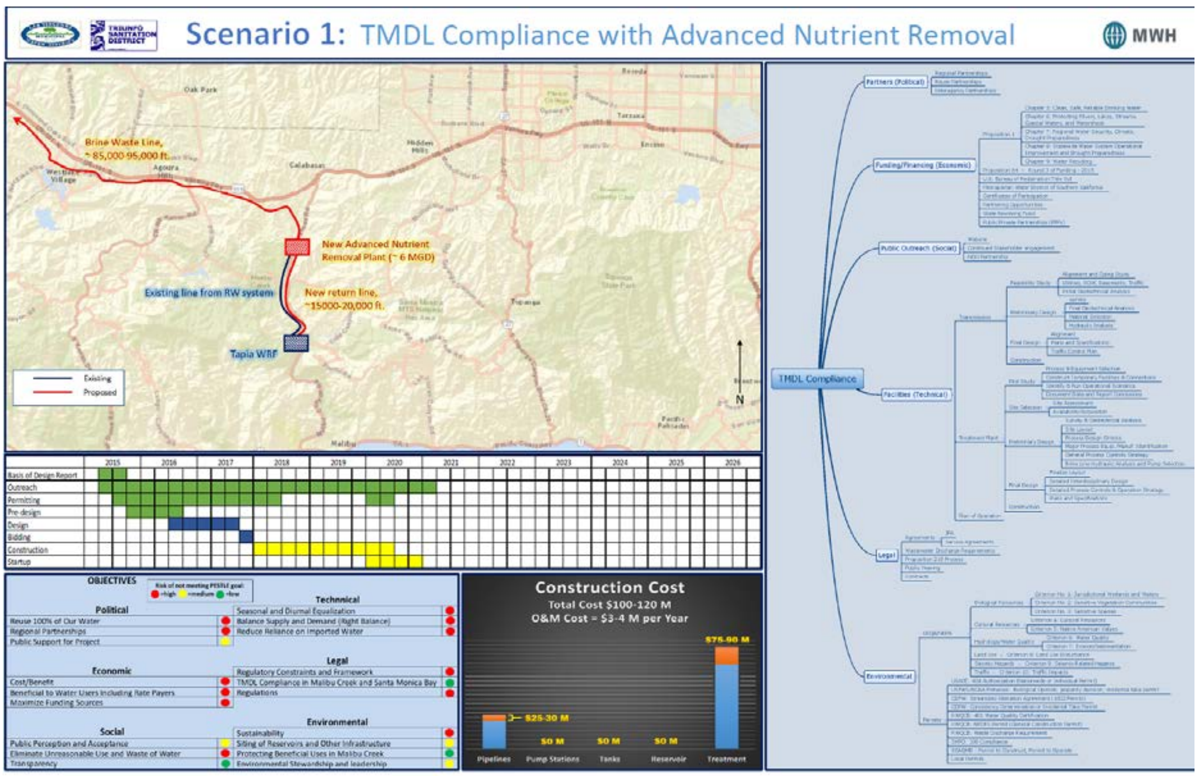
Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes/Source
Facility Capital Construction Costs						
1.0	**Treatment at Encino Reservoir**				1,000,000	
1.2	Strainers and Chlorination System	1.0	LS	$ 1,000,000	1,000,000	LVMWD BODR 2016 - Table 5-5; post-reservoir, but before irrigation, housed at Encino Res. PS
2.0	**Pipelines**				39,874,574	
2.1	**Tertiary Pipelines**					
	24" Standard Pressure Pipeline	28,300	LF	$ 390	11,029,776	24 in-diameter $ 390 per LF (BODR, 2016), escalated to 2018
	24" High Pressure Pipeline	52,500	LF	$ 534	28,029,586	24 in-diameter $ 534 per LF (BODR, 2016), escalated to 2018
2.2	Major Crossings (freeway or flood control)	1	EA	$ 815,213	815,213	Hwy 26 crossing; 2015 Backbone Improvement Project Bid Summary, escalated to 2018
3.0	**Pump Station**				24,200,000	BODR, 2016 - Table 5-3, 5-5
3.1	Pump Station at Encino Reservoir	2,500	HP	$ 6,000	15,000,000	
3.2	RWPS East Upgrade	500	HP	$ 4,000	2,000,000	
3.3	Pump Station on Mulholland	1,200	HP	$ 6,000	7,200,000	
4.0	**Storage**				3,000,000	
4.1	Storage Tank	1	MG	$ 3,000,000	3,000,000	BODR, 2016 - tank required at highest elevation point along alignment
5.0	**Reservoir Mixing System**	1.0	LS	$ 500,000	500,000	LVMWD BODR 2016 - Table 5-5
	Subtotal Construction Cost				$68,574,574	includes Contractor OH&P
6.0	USBR Construction Contingencies	@	30%		20,572,372	% of construction cost to cover minor differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible minor changes in plans, and other uncertainties.
	Subtotal with Construction Contingencies				$89,146,947	
7.0	Engineering and Design	@	10%		8,914,695	% of Construction Cost Subtotal with Contingencies (includes design, specifications and bid documents)
8.0	USBR Non-Contract Costs	@	10%		8,914,695	% of Construction Cost Subtotal with Contingencies (includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.)
	Subtotal with Markups and Contingency				$106,976,336	
						construction start = 2022 end = 2024
	Land Acquisition	1.0	LS	$ 1,000,000	1,000,000	Required for Mulholland PS and Mulholland Tank; BODR Figure 5-6
	Opinion of Probable Total Project Capital Cost				$107,976,336	Annualized Escalated Cost based on Project Life ($/AF) = $4,591
	Annualized Unit Capital Costs ($/AF)				$4,591	project life = 30 interest rate = 3%

Item No.	Description	Qty	Units	Total Annual Costs $/Unit	Total	
Annual Operations and Maintenance Costs						
1.0	**O&M Costs**					BODR, 2016 - Table 5-6 (for all)
1.1	RWPS East Pump Station	3,573	AF	105	$375,191	
1.2	Encino Pump Station	1,200	AF	60	$72,000	
1.3	Mulholland Pump Station	3,573	AF	70	$250,128	
1.4	Treatment	1,200	AF	70	$84,000	
1.5	Mixing System	6,000	AF	25	$150,000	
3.0	**Contingency**	@	10.0%		93,132	
	Annual O&M Costs ($/year)				$1,024,451	
	Annual Unit O&M Costs ($/AF)				$900	
Annual Savings						
8.0	**Imported Water Savings**	474	AF	1,488	704,553	Average Rate based on 5% per annum escalation rate of MWDSC Tier 1 treated water over 20 years (inflation not included)
9.0	**Additional RW Sales**	1,200	AF	425	510,000	BODR, 2016, year 1 sales to golf courses
	Imported Water Savings ($/AF)				$1,012	Serves to reduce the annual unit cost

Total Net Annual Unit Cost (Capital + O&M - Savings)	**$4,479**

C.4 TMDL Compliance with Advanced Nutrient Removal

Scenario 1, developed as part of the Recycled Water Seasonal Storage Facility – Plan of Action (MWH 2015) was used to estimate treatment and conveyance costs for the No Project Alternative, described in Section 5.3.



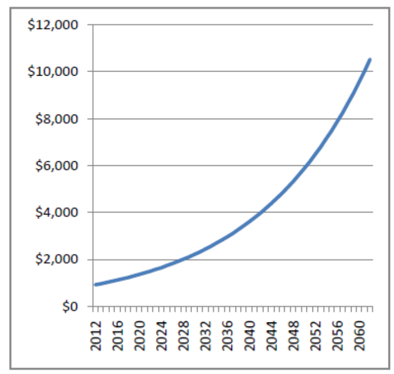
The No Project Alternative also included costs for solids disposal as estimated in the Tapia Water Reclamation Facility – Evaluation of Process Improvements for Proposed Phase I and Phase II Effluent Limit (Hazen 2016) – Tables 8.1 and 10.1.

C.5 Disposal Costs for Effluent Management

Disposal costs associated with unused recycled water from TWRF via alternative means during the prohibition period (May to October) were estimated based on the Recycled Water Seasonal Storage Project Feasibility Study. Appendix C (RMC 2012).

Description: The table below calculates the average annual costs of the current RW disposal methods.

	Current RW Disposal Methods		
	Rancho Spray Fields Annual Costs	**LA River Disposal** Annual Costs	**BOS Raw Sewage Diversion** Annual Costs
2001			
2002			
2003	$ 113,251		$ 110,139
2004	$ 217,746		$ 62,523
2005	$ 202,836		$ 179,375
2006	$ 248,037	$ 35,481	$ 214,854
2007	$ 266,329	$ 18,900	$ 22,296
2008	$ 197,485	$ 554	$ 163,220
2009	$ 227,160	$ 53,226	
2010	$ 221,145	$ 16,411	
Average =	$ 211,749	$ 24,914	$ 125,401



Appendix D: Stormwater Capture

Kennedy/Jenks 2018a. Technical Memorandum (TM) Pure Water Project Las Virgenes - Preliminary Evaluation of Stormwater Diversion

5 September 2018

Technical Memorandum (TM)

To: Mr. David R. Lippman, P.E.

From: Sachi Itagaki, P.E. & Rachel Morgan, EIT

Reviewer: Dawn Taffler, P.E.

Subject: Pure Water Project Las Virgenes - Preliminary Evaluation of Stormwater Diversion

K/J 1744518*00

This Technical Memorandum (TM) is prepared as part of the Pure Water Project Las Virgenes - Title XVI Feasibility Study, prepared by the Las Virgenes – Triunfo Joint Powers Authority (JPA) under a grant from the U.S. Bureau of Reclamation (BOR) Water Reclamation and Reuse (Title XVI) Program.

1.0 Introduction

The JPA is exploring the feasibility of Indirect Potable Reuse (IPR) to further treat recycled water from the Tapia Water Reclamation Facility (Tapia WRF) at a new Advance Water Treatment Facility (AWTF) and to convey the purified water to Las Virgenes Reservoir to supplement the drinking water supply. This project, referred to as the Pure Water Project, will complement the JPA's existing, and successful, recycled water program, which beneficially reuses nearly all available recycled water produced at the Tapia WRF during the summer months for irrigation of golf courses, green belts, parks and schools. The Title XVI Feasibility Study is evaluating alternatives to help the JPA address a major challenge related to the seasonal imbalance in the supply and demand for recycled water.

The purpose of this Technical Memorandum (TM) is to identify and evaluate opportunities to divert stormwater as a supplemental source water for the Pure Water project. This assessment of stormwater diversion opportunities is performed at a conceptual-level to provide a high-level assessment of the potential volume of stormwater that could be captured and to provide an order-of-magnitude cost of the stormwater capture. Additional studies would be needed to confirm the viability and cost effectiveness of a stormwater diversion project to increase the yield of the Pure Water Project.

2.0 Local Stormwater Setting

2.1 Stormwater Permitting

The federal Clean Water Act of 1972 (CWA) created the National Pollutant Discharge Elimination System (NPDES), which addresses non-point source pollution to improve water quality through permits such as the Municipal Separate Storm Sewer System (MS4) permit. Additionally, Section 303(d) of the CWA requires states, territories, and authorized tribes to develop a list of impaired waters (termed the "303(d) list") to establish priority rankings and develop Total Maximum Daily Loads (TMDLs) for the waterbodies on the list. TMDLs establish a receiving waterbody target for a pollutant that will allow the waterbody to meet water quality standards for that pollutant.

The Las Virgenes – Triunfo Joint Powers Authority (JPA) operates the Tapia WRF that provides wastewater treatment service for approximately 100,000 residents in the Las Virgenes Municipal Water District (LVMWD) and Triunfo Sanitation District (TSD) service areas.

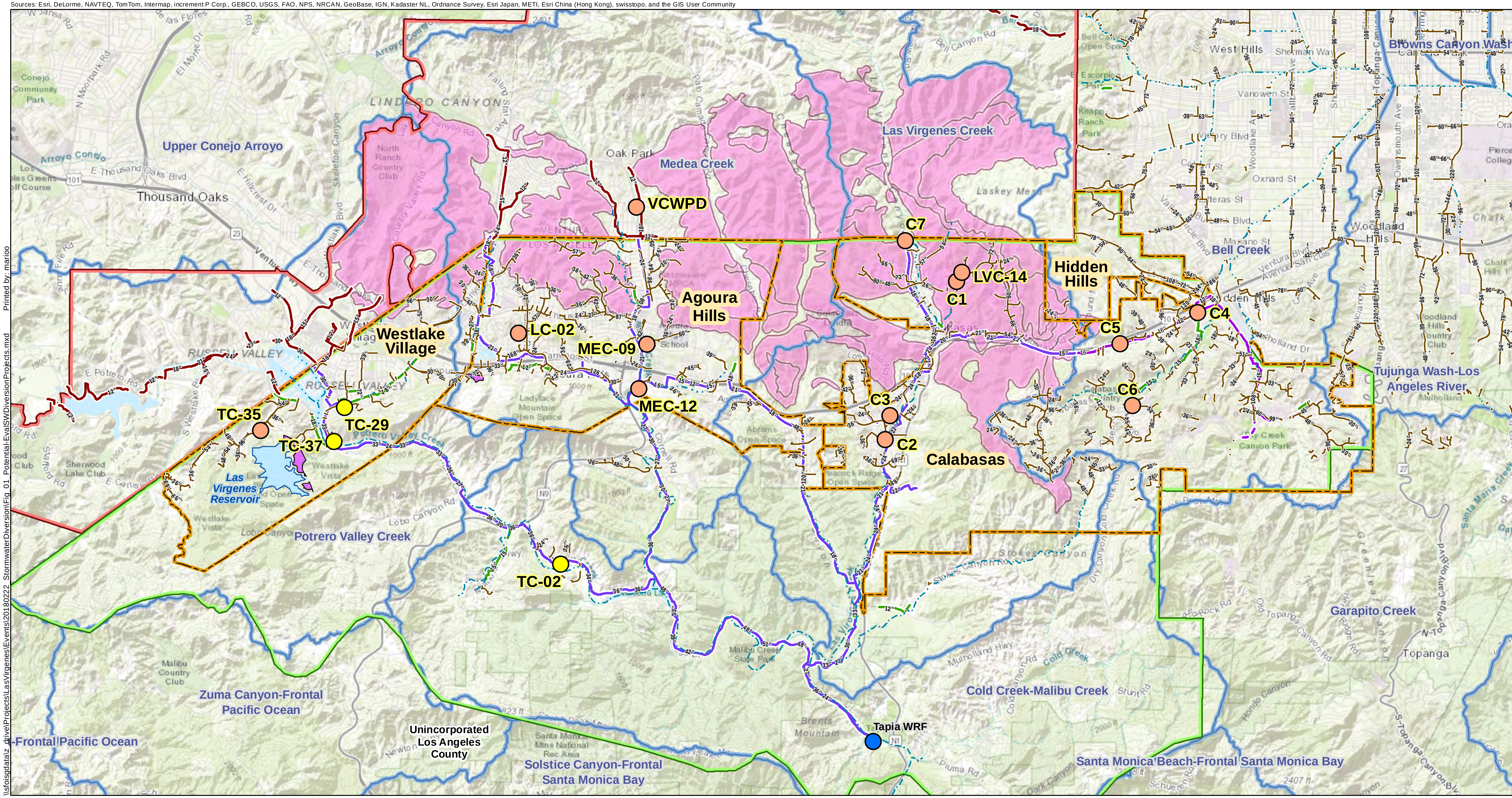
The LVMWD and TSD service areas are located within the Malibu Creek watershed, which is in both Ventura County and Los Angeles County. Malibu Creek is 303(d)-listed for bacteria and EPA adopted a bacteria TMDL for Malibu Creek in 2003. Implementation of the TMDL is summarized in the Integrated Total Maximum Daily Load Implementation Plan for the Malibu Creek Watershed (CDM 2007).

LVMWD's service area includes the Cities of Agoura Hills, Calabasas, and Westlake Village as well as unincorporated Los Angeles County (LA County). These cities and unincorporated LA County are co-permittees on an MS4 permit along with the Los Angeles County Flood Control District, LA County (with the exception of the City of Long Beach), and 81 other incorporated cities (Order No. R4-2012-0175 as amended by State Water Board Order WQ 2015-0075 and Los Angeles Water Board Order R4-2012-0175-A01). The cities and LA County are also the owners/operators of the stormwater infrastructure within LVMWD's service area. TSD's service area is within Ventura County which is regulated under MS4 permit Order No. R4-2009-0057 which also implements the Malibu Creek TMDL.

2.2 Geologic Setting

The Monterey/Modelo geologic formation affects portions of the LVMWD service area. As summarized in the Enhanced Watershed Management Program for Malibu Creek Watershed (MCWEWMP; 2016), the Monterey/Modelo formation is a potential source of water quality impairments due to marine sediments that naturally contain sulfate, metals, phosphorus, nitrogen, selenium; collectively, runoff from areas in the Monterey/Model formation are higher in salinity. Research completed by others indicates that receiving water bodies are impaired by natural groundwater discharges that originate in the Monterey/Modelo formation (MCWEWMP; 2016). The Tapia WRF may not be designed to manage these water quality issues, and therefore potential

Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community



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Legend

- Potential Stormwater Diversion Projects - Not Evaluated Further
- Potential Stormwater Diversion Projects - Evaluated
- Tapia WRF
- AWTF Sites Under Consideration
- TSD Sanitary Sewer Pipelines
- LA County Sewer Pipelines
- JPA Sewers Pipelines
- LVMWD Sewers Pipelines
- LA County Stormdrain
- LA County Natural Drainage
- LA County Open Channel
- Watershed Boundary
- Monterey Modelo Geologic Formation
- LVWMD Sewer Service Area
- Triunfo Sanitation District
- City Limits

Project ID	Project
C1	Gates Canyon Park
C2	Las Virgenes Creek Diversion
C3	Green Street - Malibu Hills Road
C4	Green Street - Old Town Calabasas
C5	Green Street - Calabasas Road
C6	Green Street - Parkway Calabasas
C7	Green Street - Las Virgenes Road
TC-02	Bioretention
LVC-14	Infiltration Chamber/Stormwater Harvest and Use
TC-37	Infiltration Basin
MEC-12	Streamflow Capture Facility - Infiltration Chamber/Stormwater Harvest and Use
TC-35	Stormwater Harvest and Use
LC-02	Infiltration Chambers/Stormwater Harvest and Use
MEC-09	Stormwater Harvest and Use
TC-29	Infiltration Chambers
VCWPD	Green Streets - Kanan Rd, Oak Park

N

0 3,000 6,000

Scale: Feet

Kennedy/Jenks Consultants

LVMWD Title XVI Feasibility Study

Potential Stormwater Diversion Projects

K/J 1744518*00
August 2018

Figure 1

impacts from the Monterey/Modelo formation were considered when evaluating stormwater capture projects in this technical memorandum, as described below. The approximate extent of the Monterey/Modelo formation is presented on Figure 1.

3.0 Identify Stormwater Capture Opportunities

Local stormwater management entities, including Agoura Hills, Calabasas, and Westlake Village, and Ventura County for the portion of Malibu Creek watershed, provided information on stormwater and surface water quality, their stormwater and sewer collection systems, and planned stormwater quality improvement projects. The information provided herein is based on conversations with the City of Calabasas, a consultant representing the City of Westlake Village, and LVMWD and information from Ventura County. Agoura Hills did not respond to inquiries and requests for information. Agoura Hills, Calabasas, and Westlake Village were involved in the preparation of the Enhanced Watershed Management Program for Malibu Creek Watershed (MCWEWMP, 2016), which also includes potential stormwater quality improvement projects that were developed to meet the TMDL in Malibu Creek. Ventura County is also implementing a water quality improvement project in the Oak Park area using Proposition 84 funding, which is included in this memorandum for completeness. Most stormwater quality issues occur either during first flush rainfall events throughout the wet season and/or dry season runoff that may occur likely from over irrigation. Wet season runoff presents the greatest opportunity for improving the yield of the Pure Water Project.

The stormwater quality improvement projects provided by the individual cities are typically smaller projects that treat runoff in low impact development (LID) best management practices (BMPs) from areas such as street segments and/or parking lots that are often the source of first flush contaminants. These smaller project types include replacing roadway medians with biofiltration and replacing impervious areas with pervious pavements to allow for infiltration. Many of the stormwater quality improvement projects in the MCWEWMP tended to treat larger drainage areas (40 to over 1,000 acres) to provide a broader regional benefit. Each stormwater quality improvement project also represents potential opportunities to store and divert stormwater to the sanitary sewer for additional treatment at the Tapia WRF. The potential water quality BMP projects included in the evaluation for adaptability as a water diversion/storage facility are summarized in Table 1 and presented on Figure 1.

Table 1: Screening of Potential Stormwater Projects in LVMWD Service Area

Project Identifier (b)	City (b)	Project (b)	Project Type (b)	Latitude (b)	Longitude (b)	Description (b)	Capital Cost (b)	Are Project and Drainage Basin in Modelo Formation Area?	Distance to Nearest LVMWD Pipeline (a) (feet)	Size of Nearest LVMWD Pipeline (a) (inches)	Owner of Nearest LVMWD Pipeline (a)	Drainage Area (ac) (b)	Estimated Quantity of Stormwater Available for Diversion (acre-feet/year) (c)	Estimated Project Flexibility	Design Date Presented in MCW EWMP (b)	Completion Date Presented in MCW EWMP (b)
TC-02	LA County	Bioretention	Bioretention	34.111991	-118.773912	Bioretention with benefits of flow reduction, groundwater recharge, habitat. BMP volume: 0.875 AF. Drainage area: 62 ac	$1,992,000	No	210	36	LVMWD Gravity Main	62	5.92	Upsize potential appears limited. Based on high level review of project vicinity there could be potential for installing a second similar project to the West on Mullholand Hwy, to capture water from the adjacent drainage area, but that would be a separate project.	12/2019	07/2021
TC-37	Westlake Village	Infiltration Basin	Infiltration Basin	34.132785	-118.821033	Benefits: flow reduction, groundwater recharge. BMP volume: 3.18 AF. Drainage area: 42 ac	$2,287,000	No	165	33	LVMWD Gravity Main	42	4.44	Upsize potential appears limited based on topography and resulting drainage areas.	12/2019	07/2021
TC-29	Westlake Village	Infiltration Chambers	Infiltration Chamber	34.138637	-118.818853	Benefits: flow reduction, groundwater recharge. BMP volume: 0.54 AF. Drainage area: 95 ac	$1,216,000	No	400	18	LA County Sewer Pipeline (LVMWD gravity main also nearby)	95	9.71	Upsize potential appears limited. Depends on ability to capture larger drainage area at same project site.	12/2019	07/2021
MEC-09	Agoura Hills	Stormwater Harvest and Use	Harvest and Use	34.149941	-118.756386	Benefits: flow reduction, water supply. BMP volume: 0.96 AF. Drainage area: 332 ac	$1,961,500	No	510	18	LVMWD Gravity Main	332	28.37	Estimated quantity is fairly high. Upsize potential is uncertain. May require alternative site to capture larger drainage area.	07/2017	12/2017
C4	City of Calabasas	Green Street - Old Town Calabasas	Infiltration/green street	34.155998	-118.642516	Replace medians with bio-filtration systems to alleviate water damage to road and improve permeability.	unknown	No	100	18	LA County Sewer Pipeline	0.50	0.05			
C6	City of Calabasas	Green Street - Parkway Calabasas	Biofiltration	34.139922	-118.655949	Replace medians with bio-filtration systems to alleviate water damage to road and improve permeability.	unknown	No	300	15	LA County Sewer Pipeline	0.50	0.05			
VCWPD	Ventura County Public Works Agency	Oak Park Green Streets Urban Retrofit Project	2 Biofilters on Kanan Road and 10 distributed Modular Wetlands	34.173611	-118.758611	Install biofilters along Kanan Road and 10 modular wetlands distributed in drainages near Medea Creek; Prop 84 funding received; upsizing potential very limited	unknown	No	100	18	Triunfo SD	20	2.11			
C2	City of Calabasas	Las Virgenes Creek Diversion	Diversion, Treatment, Infiltration	34.133829	-118.706996	Flow diversion project -- designed to divert, filter, and infiltrate up to 1,350 gallons per minute (3 cubic feet per second), which was estimated to be ten times the observed dry weather flow rates during the 2003 study period. Designed to divert and capture small rain events in addition to dry weather flow. The facility treats dry season runoff from an approximately 670 acre watershed of mixed urban (including landfill and freeway uses) and open space areas that flows through an existing 102" diameter storm drain (PD1851) into Las Virgenes Creek, ultimately entering Surfrider Beach via Malibu Creek and Lagoon.	unknown	No	--	102	Las Virgenes Creek					
C5	City of Calabasas	Green Street - Calabasas Road	Infiltration/green street	34.150534	-118.658566	Replace impervious surface with permeable surfaces to allow infiltration. Surface soil had high infiltration rate of 0.14 per hour *(units not specified)* .	unknown	No	45	16	LVMWD Force Main					
C3	City of Calabasas	Green Street - Malibu Hills Road	Biofiltration	34.137889	-118.706052	Replace median sections with three bio-filtration medians to alleviate drainage issues. Surface soil had very low infiltration rates. Bioswale included underdrain.	unknown	No	465	12						
TC-35	Westlake Village	Stormwater Harvest and Use	Harvest and Use	34.134513	-118.836231	Benefits: flow reduction, water supply. BMP volume: 1.1 AF. Drainage area: 447 ac	$2,380,000	No	655	12						
LC-02	Agoura Hills	Infiltration Chambers/Stormwater Harvest and Use	Infiltration & Harvest and Use	34.151652	-118.783018	Benefits: flow reduction, groundwater recharge or water supply. BMP volume: 0.86 AF. Drainage area: 31 ac	$2,623,000	No	1610							
C1	City of Calabasas	Gates Canyon Park	Harvest and Use	34.161072	-118.69247	Stormwater capture project -- capture approx. 300,000 cubic feet of stormwater per year for use as park irrigation. Previously recycled water was used for irrigation.	unknown	Yes								
C7	City of Calabasas	Green Street - Las Virgenes Road	Bioswale	34.168041	-118.703177	Replace an unpaved road shoulder with a vegetated swale, AC pavement parking, and a trail.	unknown	Yes								
MEC-12	Agoura Hills	Streamflow Capture Facility - Infiltration Chamber/Stormwater Harvest and Use	Infiltration & Harvest and Use	34.142258	-118.758044	Benefits: flow reduction, groundwater recharge or water supply. BMP volume: unknown. Drainage area: 1,619 ac	$4,449,000	Yes (Drainage basin)								
LVC-14	LA County/City of Calabasas	Infiltration Chamber/Stormwater Harvest and Use	Infiltration & Harvest and Use	34.162695	-118.691379	Benefits: flow reduction, groundwater recharge or water supply. BMP volume: 3 AF. Drainage area: 378 ac	$4,150,000	Yes								

Notes:

(a) Locations of tie-ins/wyes unknown. Reasonable estimate of pipeline pathway selected, but appropriateness of proposed pipeline connections requires additional information to confirm. Cutoff distance for evaluation was 1,000 feet.

(b) Values prepared by others and were presented in the MCW EWMP as 2016 $-. Not prepared by Kennedy/Jenks.

(c) Based on values presented in the MCW EWMP.

Bold = evaluated projects

Project not evaluated further because it fails this criteria for the purpose of this evaluation.

Responses prepared by Kennedy/Jenks.

4.0 Project Evaluation

Initial screening criteria were established to evaluate whether the identified water quality BMP presented an opportunity to be adapted to function for water diversion/storage suitable for the Pure Water Project. Project opportunities were evaluated for the following criteria:

1. Proximity to an existing sanitary sewer pipeline and size of existing sanitary sewer pipeline.
2. Quantity of stormwater estimated to be available for diversion.
3. Location of project and associated drainage basin with respect to the Modelo formation area (i.e., less likely to be impacted by salts in the formation)
4. Project flexibility. The following factors will be taken into account when assessing the project against this criterion:
    - If the project has potential to be upsized to add additional storage and increase the estimated quantity, it will be reflected here.
    - If the project is at a late stage and therefore it is unlikely to be modified, it will be reflected here.
    - Potential for project partner.

Table 1 presents the results of the project screening to arrive at a short list of projects for further evaluation. Two primary assumptions guided the approach to additional evaluation of the remaining project opportunities:

1. It was assumed that the water quality BMP footprint presented in the MCWEWMP represented the available space at the project location.
2. It was initially assumed that gravity conveyance to convey stormwater to the existing sewer was desirable , and therefore available depth for stormwater storage construction was estimated based on a minimum pipe slope for gravity flow (0.5%) and the estimated distance to the existing sanitary sewer pipeline. Feedback from LVMWD indicated that a small pump station in order to control flows into the sanitary sewer was desirable and included for costing; flow control will have to be evaluated in greater detail in the future.

Therefore, the approach for adapting a water quality BMP focused on increasing storage by increasing the depth of the water quality BMP, rather than increasing the footprint, while still allowing for discharge by gravity or a small pump station. The depth available for construction and the footprint available for the BMP were then provided to a vendor to determine the estimated maximum quantity of stormwater that could be captured for storage and diverted to the existing sewer for each location. A device for stormwater storage was selected in order to maximize the storage in a given footprint.

Based on the vendor information, there are opportunities to increase BMP storage capacity at TC-37 and TC-29; although site constraints at TC-02 may restrict storage capability. Information provided in the MCWEWMP for the water quality BMP and MCWEWMP project cost estimates, pipeline length and stormwater storage information provided by the vendor are summarized in Table 2. Vendor information is provided in Attachment 3.

Table 2: Additional Project Evaluation

Project Identifier (b)	Information Obtained from MCW EWMP										Estimated by Kennedy/Jenks			Estimated by Vendor
	Project Type (b)	Artificial Fill (af) (b)	Alluvium/ Colluvium (Qal/Qc) (b)	Bedrock Formation (b)	Depth Groundwater Encountered (feet below ground surface) (b)	Infiltration Rates (inches per hour) (a, b)	BMP Footprint (acre) (b)	BMP Volume (acre-feet) (b)	BMP Volume (cubic feet) (b)	EWMP Capital Cost Estimate for Water Quality BMP (b)	Distance to Nearest LVMWD Pipeline (feet) (c)	Minimum Pipe Elev Loss to Accommodate Gravity Flow (minimum 0.5% slope)	Estimated - Depth Available for Storage Construction (feet)	Vendor-Estimated Volume Based on Estimated Available Depth (acre-feet)
TC-02	Bioretention	Approx. 8 to 14 ft bgs (Clayey sand to Wellgraded GRAVEL with Silt and Sand)	Not Encountered	Below approx. 8 to 14 ft bgs (Conejo Volcanic Formation Coarse Ash Tuff)	Not encountered in explored depth (20 ft bgs), which was limited by LA County encroachment permit conditions	0.5 - 2.8	0.19	0.875	38,200	$2,132,423	220	1.10	3.9	0.4
TC-37	Infiltration Basin	Approx. 0 to 4 ft bgs (Clayey SAND with gravel)	Approx. 4 to 18 ft bgs (Sandy CLAY to Clayey SAND with gravel)	Below approx. 17 ft bgs (Topanga Formation Shale)	13 - 15 Interpreted as perched condition resting on underlying bedrock formation encountered at 19 - 21 ft bgs	0.1 - 0.7	1.59	3.18	138,600	$2,448,218	165	0.83	12	10.6
TC-29	Infiltration Chamber	Not Encountered	(Clayey SAND with gravel)	Not Encountered	Not encountered due to shallow hand exploration refusal (at 6 ft bgs), but assumed shallow due to observed bedrock	< 0.1 - 0.8	0.27	0.54	23,600	$1,301,720	315	1.58	6.42	1.2

Notes:

(a) Infiltration rates corrected for lateral flow only, as recommended by LA County LIDBMPG (2014).

(b) Values prepared by others and were presented in the MCW EWMP. Not prepared by K/J. Escalated from 2016 costs.

(c) Locations of tie-ins/wyes unknown. Reasonable estimate of pipeline pathway selected, but appropriateness of proposed pipeline connections requires additional information to confirm. Cutoff distance for evaluation was 1,000 feet.

Responses prepared by Kennedy/Jenks.

Responses provided by vendor. See Attachment 3.

5.0 Estimated Stormwater Availability

An estimate of stormwater availability has been calculated based on the drainage area to each water quality BMP/storage facility, the estimated average annual rainfall of 16 inches/year in the Malibu Creek and adjusting for percent of urbanization to provide a potential maximum stormwater available as shown in Table 3. Since capture of the maximum stormwater from a drainage area is unlikely, a more conservative estimate of stormwater availability based on the estimate made in the Malibu Creek Watershed TMDL of flow from residential areas is also provided. This provides a range of stormwater availability which will need to be refined in future analyses.

Table 3: Estimate of Stormwater Availability

Project	Location	Drainage Area	Estimated % Urbanized	Potential Maximum Available Stormwater (AFY) (a)	Estimated Stormwater from Residential Areas Per TMDL (AFY) (b)
Bioretention (TC-02)	LA County	62 acres	60%	50	6.8
Infiltration Basin (TC-37)	Westlake Village	42 acres	75%	42	4.6
Infiltration Chamber (TC-29)	Westlake Village	95 acres	70%	89	10.4

Notes:

(a) Average precipitation in Malibu Creek Watershed is 16 inches per year (Ref. Malibu Creek Watershed TMDL) applied to the entire drainage area multiplied by % urbanized which was made from reviewing the aerial photographs of the project areas provided in Attachment 1.

(b) From Malibu Creek Watershed TMDL (Page 2-10) which estimated that 13 percent or 9,100 Acres of total watershed area is residential and assuming 90% capture of precipitation and 40 percent efficient storage, a maximum potential of up to 1,000 AFY of reuse of stormwater from the 9,100 acres of residential land uses. Applying ratio of 1,000 AFY/9,100 Acres to project drainage areas provides a more conservative estimate of stormwater available

To put the stormwater availability in perspective with available recycled water, the Tapia WRF average production has been approximately 9,400 acre-feet per year (AFY) of recycled water from 2001-2015. Thus an additional 50 AFY of stormwater would have increased the RW production at Tapia WRF by less than 1%. However, if all of the stormwater captured water were made available for the Pure Water Project, which anticipates an average available recycled water supply of 4,330 AFY in 2035, then the additional 50 AFY of stormwater would increase purified water production by just over 1%. Additional analysis based on actual storage and rainfall estimates can refine the available stormwater which could result in increased stormwater yields.

6.0 Summary and Next Steps

Based on the high-level screening of the available information from existing projects, a summary of the top three projects, including MCWEWMP costs for water quality BMPs and incremental costs for adding storage and conveyance pipelines and pump station is provided in Table 4. MCWEWMP costs were escalated from 2016 to 2018 using the ENR Los Angeles index. As detailed in Attachment 4, Vendor provided storage costs were supplemented with excavation costs, pipeline and pump station costs and contingencies to arrive at an estimated incremental project cost to accommodate additional storage and diversion of stormwater. As limited information was available for the capital costs for the MCWEWMP (backup information provided in Attachment 5), to be conservative at this screening stage, it is assumed that the incremental capital costs would be added to the MCWEWMP to realize the combined estimated storage volume. In reality, there are likely economies of scale that would be achieved by designing and building the facilities as a single project. Cost sharing between agencies and available funding would also be an important consideration for the viability of a larger project.

Table 4: Summary of Top Three Projects

Project Location and Description	BMP Footprint (Acres)	Water Quality BMP Volume (AF) [a]	MCWEWMP Estimated Capital Cost [b]	Vendor-Estimated Incremental Storage Volume (AF)	Estimated Incremental Capital Cost for Storage and Diversion of Stormwater[c]
Bioretention (TC-02) LA County Benefits: flow reduction, groundwater recharge, habitat. Drainage area: 62 acres	0.19	0.875	$2,132,000	0.4	$1,220,000
Infiltration Basin (TC-37) Westlake Village Benefits: flow reduction, groundwater recharge. Drainage area: 42 acres	1.59	3.18	$2,448,000	10.6	$6,937,000
Infiltration Chamber (TC-29) Westlake Village Benefits: flow reduction, groundwater recharge. Drainage area: 95 acres	0.27	0.54	$1,302,000	1.2	$1,536,000

Notes:

(a) Estimated volume presented in the MCWEWMP. Potential opportunities to increase BMP size to increase capture, as indicated by the vendor-estimated incremental storage volume.

(b) Estimated cost presented in the MCWEWMP to implement the water quality BMP volume, escalated to 2018 based on ENR indices. This cost would be in addition to the estimated incremental capital cost for storage and diversion of stormwater to provide additional supply for the Pure Water Project.
(c) See Appendix 4 for detailed cost estimates. This cost would be in addition to the estimated MCWEWMP cost to achieve the combined water quality BMP with the vendor-estimate incremental storage volume.

Estimated storage volumes are based on the available space and are targeted at capturing runoff from individual storms or a series of small storms. The actual runoff captured in a year is a function of the number and size (i.e return interval) of storms. The storage volume estimate can be further refined to target a certain storm size. For example, TC-37 has a large footprint, 1.59 Acres, which contributes to the high cost of storage; an evaluation to optimize the storage relative to the storms that occur on average could result in a more cost-effective storage opportunity at this location.

The estimated costs presented in Table 4 are based on many assumptions. Additional project development and confirmation of assumptions, as summarized in the next steps below, is necessary to increase confidence in the viability of adapting a water quality BMP for storage. The storage facilities are sized to maximize storage capacity within the available footprint and considering the depth restrictions which should be refined to consider pumped flow to control sanitary sewer peaks. Further integration and refinement of the storage and conveyance with the water quality treatment BMP is anticipated to reduce the costs of implementation and to optimize the yield of stormwater capture.

Based on the potential stormwater available as summarized in Table 3 and an initial cost estimate for incremental storage, the TC-29 infiltration chamber offers the best value in terms of the of incremental volume of storage added at a low cost. TC-37, in contrast, offers the greatest potential volume but at a high overall cost. These two projects may warrant future effort to refine and assess feasibility, as discussed in the next steps that follow.

<u>A list of some potential next steps to further explore project development options follows:</u>

1. Contact the MCEWMP developers that are leading the top three projects to better understand project status including:
    a. Stage of project (i.e. planning, including CEQA, design, construction, land/easement acquisition, permitting, etc.). Per the MCEWMP, which was prepared in 2016, the projects in Table 3 are slated for design in December 2019.
    b. Schedule for project development/implementation
    c. Status of funding for project development/implementation
    d. Discuss opportunities for participation especially during planning/pre-design when it is easiest to influence the project development to enhance stormwater capture.
    e. Identify major issues that influence implementation that LVMWD could assist with.

2. Reach out to the Greater Los Angeles County Region Integrated Regional Water Management Plan (IRWM) to discuss funding for these projects through:
    a. Prop 1 Stormwater funding[1],
    b. Prop 1 IRWM, and
    c. Other future funding such as from Proposition 68 and November 2018 Water Bond.

3. Continue more detailed technical evaluation including:
    a. Confirm elevations of ground surface in area of water quality BMPs and locations of sanitary sewer manholes and inverts relative to project location to verify gravity flow assumptions,
    b. Confirm depth and subsurface conditions assumptions for feasibility of additional storage and to conceptualize flow control through stormwater pumping,
    c. Conduct further hydrologic/precipitation evaluation to confirm potential stormwater yield,
    d. Coordinate and optimize storage facility with water quality BMP development,
    e. Evaluate whether a pipeline only or more limited storage is a more cost effective means of enhancing yield, and
    f. Evaluate whether refined, concurrent cost estimating of water quality treatment and storage could result in potential cost savings.

If upon further investigation, the projects in Table 4 are deemed infeasible to pursue because of institutional or other issues, the other projects in Table 1 can be re-evaluated and/or additional new projects can be identified and developed in locations where the storm drain system and the sanitary sewer system are in relative proximity to each other.

Attachments:

- Attachment 1: Enhanced Watershed Management Program for Malibu Creek Watershed, Excerpts from Appendix A – Project Maps
- Attachment 2: Enhanced Watershed Management Program for Malibu Creek Watershed, Excerpts from Appendix C – Regional BMP Sites Geotechnical Report
- Attachment 3: Vendor-Provided Information
- Attachment 4: Capital Cost Estimates
- Attachment 5: Enhanced Watershed Management Program for Malibu Creek Watershed, Section 8 – Structural Control Measures Cost Estimates

[1] http://dpw.lacounty.gov/wmd/irwmp/Prop1SWRP.aspx

References

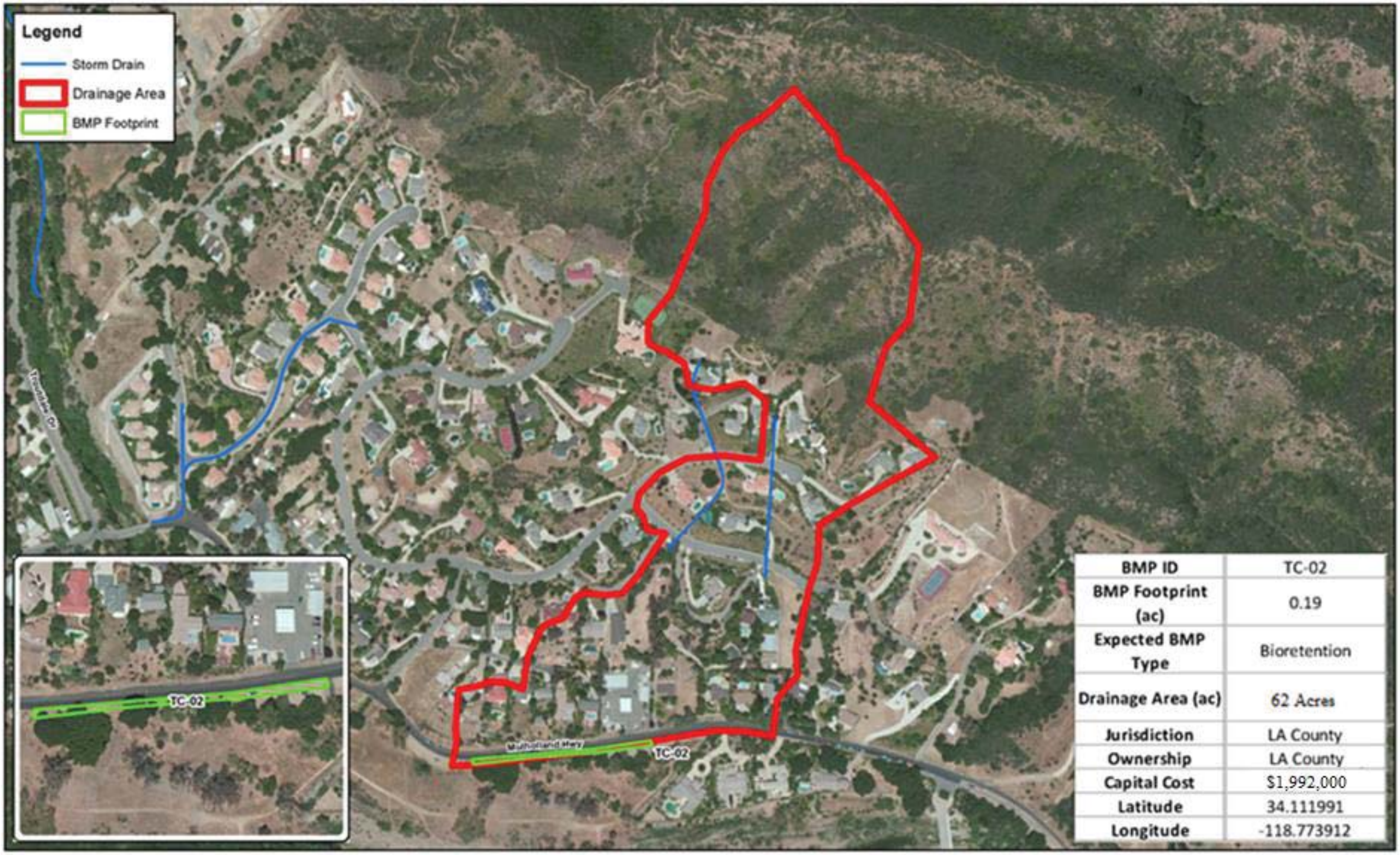
CDM. 2007. Integrated Total Maximum Daily Load Implementation Plan for the Malibu Creek Watershed. February 27. Prepared for the Los Angeles County Department of Public Works.

2016. Enhanced Watershed Management Program for Malibu Creek Watershed. January 26.

Attachment 1

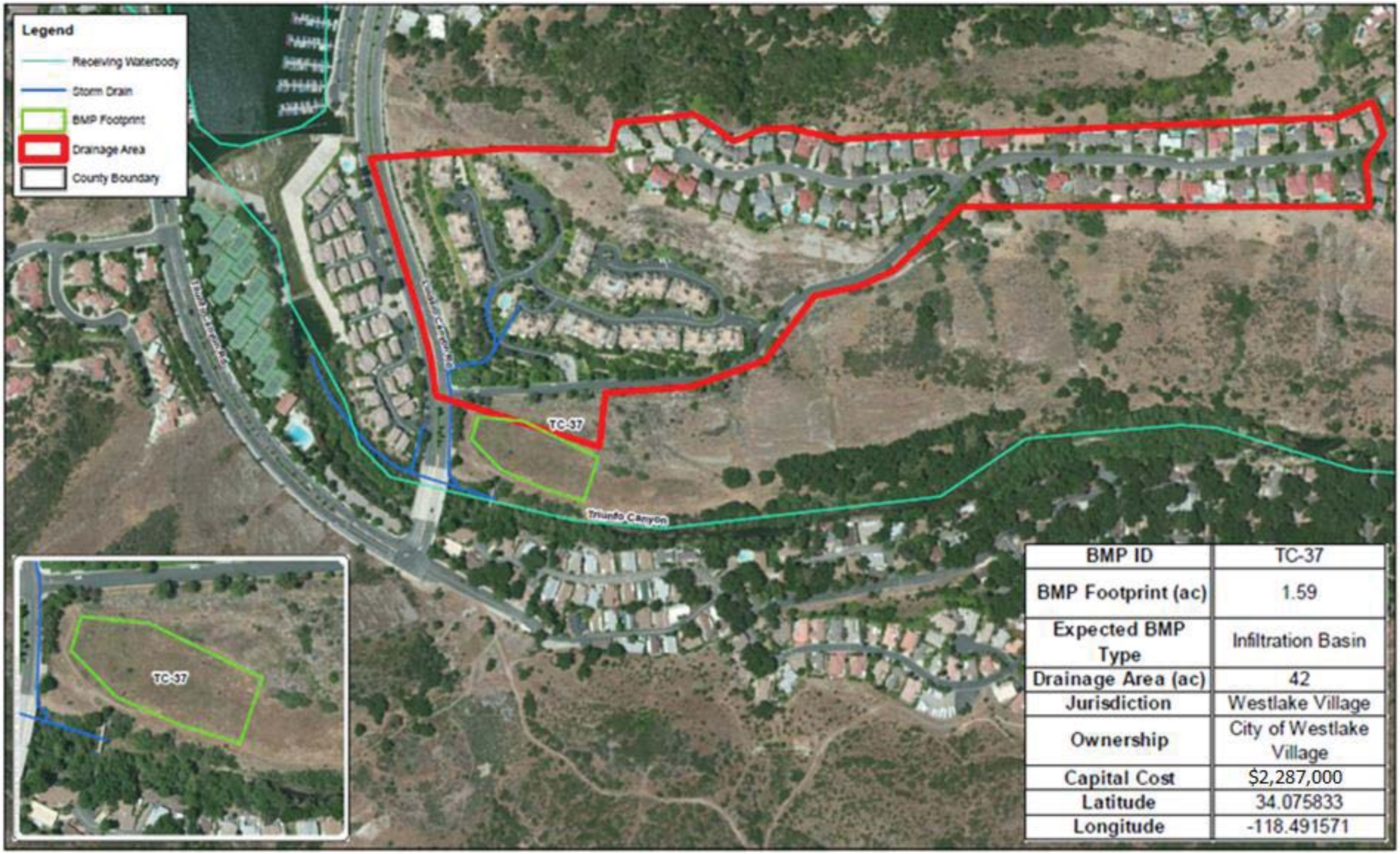
Enhanced Watershed Management Program for Malibu Creek Watershed,
Excerpts from Appendix A – Project Maps

SITE: TC-02



BMP ID	TC-02
BMP Footprint (ac)	0.19
Expected BMP Type	Bioretention
Drainage Area (ac)	62 Acres
Jurisdiction	LA County
Ownership	LA County
Capital Cost	$1,992,000
Latitude	34.111991
Longitude	-118.773912

SITE: TC-37



BMP ID	TC-37
BMP Footprint (ac)	1.59
Expected BMP Type	Infiltration Basin
Drainage Area (ac)	42
Jurisdiction	Westlake Village
Ownership	City of Westlake Village
Capital Cost	$2,287,000
Latitude	34.075833
Longitude	-118.491571

SITE: TC-29

BMP ID	TC-29
BMP Footprint (ac)	0.27
Expected BMP Type	Infiltration Chamber
Drainage Area (ac)	95
Jurisdiction	Westlake Village
Ownership	City of Westlake Village
Capital Cost	$1,216,000
Latitude	34.138637
Longitude	-118.818853

Attachment 2

Enhanced Watershed Management Program for Malibu Creek Watershed,
Excerpts from Appendix C – Regional BMP Sites Geotechnical Report

Appendix C: Regional BMP Sites Geotechnical Report

FUGRO CONSULTANTS, INC.

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June 12, 2015
Project No. 04.62150019

RBF Consulting
14725 Alton Parkway
Irvine, California 92618-4117

Attention: Mr. Daniel Apt, Vice President

Subject: Geotechnical Data Report, Site Exploration and Percolation Testing Results, Enhanced Watershed Management Program (EWMP), Malibu Creek Watershed, Los Angeles County, California

Dear Mr. Apt:

Fugro Consultants, Inc. (Fugro) is pleased to present this letter-report summarizing our percolation testing program for the Malibu Creek Enhanced Watershed Management Program (EWMP) in Los Angeles County, California. This report summarizes our findings for the eight proposed Best Management Practice (BMP) site locations assessed during this study, referred to herein as TC-29, TC-35, TC-37, LC-02 and LVC-14, MEC-09, MEC-12 and TC-02. This letter-report was prepared in fulfillment of Fugro's contract to perform services under our Professional Services Agreement with RBF Consulting (RBF) dated April 8, 2015, and completes our work for the project.

PROJECT DESCRIPTION

Our understanding of the proposed project is based upon a review of the Request for Proposals (RFP) issued by the City of Calabasas, a field tour of all of the subject sites on March 16, 2015, and assumptions summarized herein. The City of Calabasas is serving as the lead agency for this project, which will serve all of the Malibu Creek Watershed Permitees (Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village, County of Los Angeles, Los Angeles County Flood Control District, and Caltrans).

The EWMP will attempt to address requirements established by the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System Permit (MS4 Permit) Order No. R-4-2012-0175. We understand that the EWMP will involve enhancements to the existing drainage infrastructure by employing Best Management Practices (BMPs) designed to infiltrate surface water runoff into the alluvial soils present at the proposed sites. Based on information provided by RBF Consulting (RBF), we expect that the BMPs will consist of basins for extended detention and infiltration, infiltration chambers, and green streets. Fugro was tasked to review existing data, perform project-specific field and laboratory programs, and prepare this data report. Information gathered from this work will aid in the feasibility assessment and design of infiltration-related BMPs at the proposed improvement sites. A list of the proposed BMP site locations for the project is provided below in Table 1.

Table 1. Summary of Proposed BMP Locations

Site Name	Site Location	Proposed BMP
TC-35	Three Springs Park, Three Springs Drive between Shell Creek Place and Bowman Knoll	Infiltration Basin
TC-37	Open space owned by City of Westlake Village, near intersection of Lindero Canyon Road and Ridgeford Drive	TBD
LC-02	Reyes Adobe Park, near intersection of Rainbow Crest Drive and Fair Grange Drive	Infiltration Basin
LVC-14	Gates Canyon Park, near intersection of Thousand Oaks Boulevard and Mountain View Drive	Extended Detention Basin
TC-29	Foxfield Park, near intersection of Foxfield Drive and River Farm Drive	Infiltration Chambers
MEC-12	County of Los Angeles Flood Control Maintenance Yard, near intersection of Agoura Road and Cornell Road	TBD
MEC-09	Chumash Park, near intersection of Medea Valley Drive and Agoura Glen Drive	Infiltration Chambers
TC-02	Mulholland Highway between Careful Avenue and Outlet Trail	Super Green Street

The general site locations that were explored and completed as part of this letter-report are shown on Plate 1 - Vicinity Map. The locations are shown in more detail on Plates 2a through 2h - Exploration Location Map.

WORK PERFORMED

Our work scope included planning and coordination, data review, site exploration, in-situ percolation testing, laboratory testing, and reporting as described in our proposal dated April 2, 2015. The following sections summarize our site assessment and reporting efforts for the project.

Planning and Coordination

After receiving authorization to begin work our staff began coordinating with our drilling subcontractor to initiate field work. Our personnel visited each site to perform a preliminary site reconnaissance, during which we noted site access constraints, visible utilities and general geomorphology. We also delineated the proposed drilling areas with stakes and white paint and contacted Underground Services Alert (USA) to request that local member agencies identify and mark the locations of their facilities.

Two proposed sites (MEC-12 and TC-02) lie within the Los Angeles County Department of Public Works (LA County) public Right-of-Way (ROW). Our staff coordinated with LA County personnel to obtain access and encroachment permits to work within the ROW.

Before mobilizing equipment and staff for field work we prepared a project-specific health and safety plan for the use of all on-site personnel and subcontractors.

Data Review

Our staff reviewed pertinent existing geotechnical exploration data, historical groundwater data, and geologic maps to gain a preliminary understanding of the subsurface conditions at the proposed BMP locations. That data aided us in interpreting the conditions encountered during drilling and provided additional reference for the historical groundwater levels and potential fluctuations that may be experienced at the proposed sites.

Subsurface Exploration

As discussed in our proposal, our exploration and field testing scope included a program of drilling two exploratory drill holes to a maximum of 30 feet of depth and constructing three temporary percolation test wells to a maximum of 15 feet of depth at each site. The exploration drill holes were terminated at depths of less than 30 feet if groundwater was encountered or the drilling met refusal due to hard bedrock/boulder conditions. Drilling was terminated at 20 feet or shallower at sites MEC-12 and TC-02 in compliance with Los Angeles County encroachment permit conditions. After completing the two exploration drill holes, Fugro personnel coordinated with RBF staff to determine preferred depth intervals for the percolation tests and constructed the temporary test wells accordingly as described later in this report.

Fugro performed a total of 29 drill hole explorations and three (3) test pit explorations at the proposed BMP sites between April 14 and June 2, 2015. The test pits were excavated at site TC-29 (Foxfield Park) in lieu of mechanical drill holes due to site access constraints. Appendix A provides the details of our exploration means and methods as well as logs of the conditions encountered.

Percolation Testing

We performed the percolation tests using falling head borehole and shallow excavation percolation test procedures as described in the Los Angeles County Low Impact Development Best Management Practices Guideline for Design, Investigation, and Reporting [LA County LIDBMPG] (2014). The following subsections detail our means and methods.

Drill Hole Percolation Test Well Construction. Drilling work for the three percolation wells planned at each site was completed after determining the required percolation test depth intervals. Upon drilling to the required test depth interval, we placed several inches of drain rock at the bottom of each hole, set a 2-inch diameter perforated polyvinyl-chloride (PVC) casing, and backfilled the annular space within the test interval with drain rock to prevent the sidewalls from caving during the test. The test wells constructed in drilled holes were installed through the hollow-stem-augers as recommended by the testing procedure. The augers were extracted as annular backfill was placed.

The percolation test wells at site TC-29 (where exploration was limited to hand dug test pits) were constructed in the bottom the hand-dug excavations. At those locations, we excavated a 1-foot by 1-foot test hole to a depth of 1-foot and placed approximately 2 to 3 inches of drain rock at the bottom of the excavated hole. Temporary well casing was not installed at those locations.

Pre-Soak. After constructing the temporary percolation test wells/holes, water was added through the casing or directly to the excavation to saturate the anticipated test intervals and allowed to percolate into the test holes before initiating testing. If necessary, our field staff refilled the test holes with water to the top of the test intervals and maintained the water level for at least 4 hours to re-saturate the soils prior to initiating the test.

Percolation Measurements. After the pre-soak period, we refilled the test well/hole with water to the top of the test interval and began the percolation testing period. Once the initial water level was set, our field staff took readings of the water surface level inside the casing (or in the shallow test hole) using a water level sounder or engineering tape at regular time intervals of approximately 30 minutes (the actual time intervals were recorded with each reading). The measurement intervals were determined in accordance with the LA County LIDBMPG (2014) and the water column was restored to the original level after each reading, if necessary. Our personnel collected a minimum of 8 readings at each test well/hole or until the measured rate stabilized over at least 3 consecutive readings (less than 10 percent difference between minimum and maximum measurements).

Abandonment. After testing was complete, we removed perforated PVC casing and left the drain rock in the holes. We backfilled the drilled holes and test pits to the ground surface with cuttings generated during excavation and hand tamped the soil backfill. The grass in disturbed turf areas was replaced after backfilling. Holes within the LA County ROW were backfilled with 1-1/2 sack sand-cement slurry in compliance with the permit standard conditions.

Laboratory Testing

Laboratory tests were performed on selected driven split spoon Standard Penetration Test (SPT) and California-type samples to estimate engineering characteristics of the various earth materials encountered. The methods used are described in Appendix B accompanying the test results.

FINDINGS

The following subsections describe the earth materials and groundwater conditions encountered during exploration at each site location. Our findings are also summarized in Table 2, presented later in this section.

Site TC-35

Earth Materials. During exploration at site TC-35, our on-site personnel noted approximately 4 to 5 feet of lean clay and clayey sand with gravel that we interpret as artificial fill materials that was likely placed during site development for the park. Drilling encountered colluvial deposits generally consisting of lean clay to clayey sand with gravel underlying the artificial fill materials. The colluvial materials extended to the ultimate depth explored of 16 feet bgs.

Groundwater Conditions. Groundwater was encountered at both deep drill hole explorations excavated at site TC-35. After allowing the water level within each hole to rise for a few hours after drilling, our personnel measured water levels at 13 feet and 9.4 feet bgs at drill holes TC-35-DH-01 and TC-35-DH-02, respectively. Based upon the encountered water level, we understand that RBF has concluded that the proposed infiltration basin at this site will not be feasible.

Site TC-37

Earth Materials. The earth materials encountered at site TC-37 generally consisted of approximately 4 feet of artificial fill materials likely placed during grading for the nearby roads, residences, and lake. The fill materials appeared to have been derived from onsite alluvial soils and consisted of clayey sand with gravel. Alluvial soils were encountered below the artificial fill and extended to depths of approximately 17 to 18 feet bgs. The alluvial soils generally consist of lean clay and silt with varying quantities of sand and gravel. Drilling met refusal on-site at depths of 19-1/2 feet and 21 feet bgs in gray shale bedrock material. The bedrock appears consistent with Upper Topanga Formation as described and mapped nearby by Dibblee (1993).

Groundwater Conditions. Groundwater was encountered in the two deep drill hole explorations at site TC-37. After allowing the water level within each hole to rise during the 2 to 3 hours spent constructing percolation test wells, our personnel measured water levels at 15.5 feet and 13 feet bgs at drill holes TC-37-DH-01 and TC-37-DH-02, respectively. We interpret groundwater conditions encountered in the drill holes to be representative of a perched condition within the alluvium and resting on the underlying bedrock formation a few feet below.

Site LC-02

Earth Materials. The subsurface materials encountered at site LC-02 generally consist of approximately 19 to 25 feet of alluvium overlying siltstone bedrock. The alluvium generally consists of sandy clay with gravel to clayey gravel with sand. However, we note that the alluvium encountered at drill hole DH-01 consisted largely of silty sand and sandy silt, indicating variable conditions across the site. The gravel observed in the alluvial soils appears to consist of volcanic rock and was likely derived from Conejo Volcanic geologic units mapped in the area and outcrop nearby. We interpret the siltstone bedrock materials encountered underlying the alluvium to be consistent with Upper Topanga Formation as described by Dibblee (1993).

Groundwater Conditions. Groundwater was encountered in drill holes LC-02-DH-02 and LC-02-Perc-03 but not encountered in drill hole LC-02-DH-01. Free water was initially encountered in LC-02-DH-02 at approximately 26 feet at LC-02-DH-02, and rose over 3 to 4 hours to about 15.7 feet bgs. Upon returning to the site the following day to perform infiltration testing, groundwater was encountered at a depth of 9 feet bgs at LC-02-Perc-03. In our opinion, groundwater at this site location exists in a perched condition with groundwater perched on the underlying bedrock. We note that it is possible that groundwater was not encountered in drill hole LC-02-DH-01 due to the low permeability of the alluvial materials and the limited time (between drilling and abandonment) for groundwater to seep into the bore hole. We also note that Dibblee (1993) maps a fault trace near the proposed site and subsurface structure related to faulting may also have contributed to the variable groundwater conditions encountered at the site.

Site LVC-14

Earth Materials. At proposed site location LVC-14, our personnel observed approximately 4 to 5 feet of artificial fill materials overlying alluvial deposits. The alluvial materials extend down to the ultimate depths explored of 31 feet bgs. The artificial fill materials generally consist of clay to sandy lean clay that was likely derived from the underlying alluvium. We anticipate the fill materials were probably placed during development of the park facilities and

Thousand Oaks Boulevard. The underlying alluvium generally consists of lean clay to sandy lean clay with lenses of sandy silt and clayey sand present at depth.

Groundwater Conditions. Groundwater was encountered in both drill hole explorations at site LVC-14. We initially encountered wet conditions during drilling at depths of approximately 28 feet bgs. We left the holes open for 2 to 3 hours while constructing percolation test wells to allow for water to continue to seep into the bore holes. After that time, water levels were measured at depths of approximately 22.1 and 19 feet bgs at locations LVC-14-DH-01 and LVC-14-DH-02, respectively.

Site TC-29

Earth Materials. We interpret the subsurface materials encountered at site TC-29 to be in-place alluvial soils. The soils generally consist of clayey sand with gravel, cobbles and boulders. The oversize rock in the alluvium appears consistent with the nearby Conejo Volcanics as mapped by Dibblee (1993) and that outcrop near the site. The alluvial soils extend to the ultimate depth explored of 6 feet bgs. The subsurface conditions at this site were explored using hand dug test pits and exploration below a depth of 6 feet was not possible due to the presence of cobbles and boulders.

Groundwater Conditions. Water was not encountered in the test pit explorations excavated at site TC-29. However, based upon local geologic conditions and site observations, bedrock is likely close to the ground surface at this site location and will act as a relatively impervious surface. Therefore, we expect that the water table likely lies relatively shallow near the site and in the absence of a site-specific measurement we recommend that the groundwater level at this site location be assumed consistent with the historical data (CGS, 2000).

Site MEC-12

Earth Materials. At site MEC-12 our personnel observed a surficial veneer of artificial fill materials approximately 2 feet thick overlying alluvium to the ultimate depths explored of approximately 21 feet bgs. The artificial fill materials generally consist of sandy lean clay to clayey sand containing some gravel and appear to have been placed during previous site development. Our explorations indicate that the alluvium present below the artificial fill materials generally consists of clayey sand to sandy lean to fat clay. A layer of poorly graded sand with silt was encountered at dill hole MEC-12-DH-2 at a depth of approximately 14 feet bgs and appears to represent a localized lense of primarily coarse-grained material.

Groundwater Conditions. Water was encountered in drill hole MEC-12-DH-02 at approximately 12.3 feet bgs. We interpret the water encountered at that location to be representative of a perched condition within the permeable sand lense encountered at approximately 14 feet bgs. The other exploration locations did not encounter that saturated sand seam and showed no indication of free water during or after drilling.

Site MEC-09

Earth Materials. Our personnel observed a few feet of artificial fill materials overlying in-place alluvium and Topanga Formation bedrock at site MEC-09. The artificial fill encountered on-site consists of fat clay to fat clay with sand, similar to the underlying alluvial soils present at the site. Those fill materials are likely derived from underlying alluvium that was disturbed during previous residential and park development. The Topanga Formation bedrock underlying the alluvial soils appears to consist of soft, moderately to intensely weathered claystone and was encountered at approximately 13 feet bgs and extending to the ultimate depth explored at the site of approximately 21 feet bgs.

Groundwater Conditions. Water was encountered as shallow as about 7 feet bgs within the alluvium encountered at drill hole location MEC-09-DH-01. The hole was left open overnight to allow the water level to fully stabilize and measured the following day at approximately 6.9 feet. That water level likely represents a perched condition within the alluvial soils overlying the Topanga Formation claystone bedrock. Based upon the encountered water level, we understand that RBF has concluded that the proposed infiltration basin at this site will not be feasible.

Site TC-02

Earth Materials. Site TC-02 appears to lie in an area of roadway fill placed during the construction of Mulholland Highway. Based on observations during drilling, we anticipate that the encountered artificial fill directly overlies Conejo Volcanic bedrock materials present below about 9 to 14 feet bgs and extending to the ultimate depth explored of about 21 feet bgs. The fill materials generally consist of a few feet of clayey sand overlying a mixture of sand, silt and gravel. The Conejo volcanic bedrock materials encountered within the drill holes appear to consist of moderately weathered to decomposed coarse ash tuff ranging from soft to locally hard. Observed outcrop on adjacent cut slopes indicates that the material is intensely fractured and appears massive. Our staff also noted the presence of basalt and volcanic breccia outcrop along the nearby cut slope. Those materials are likely also locally present underlying the site.

Groundwater Conditions. Water was not encountered in the drill hole explorations excavated at site TC-02. We anticipate that water may periodically exist in a perched condition the encountered bedrock at approximately 8 to 10 feet bgs; however, we note that those bedrock materials appear to be somewhat permeable in nature due to intense weathering and fracturing.

Table 2. Generalized Summary of Encountered Subsurface Conditions

Site ID	Artificial Fill (af)	Alluvium/Colluvium (Qal/Qc)	Bedrock Formation	Groundwater
TC-35	Approx. 0 to 4 ft bgs (Lean CLAY to Clayey SAND with gravel)	Below approx. 4 ft bgs (Lean CLAY to Clayey SAND with gravel)	Not Encountered	Approx. 9 to 13 ft bgs
TC-37	Approx. 0 to 4 ft bgs (Clayey SAND with gravel)	Approx. 4 to 18 ft bgs (Sandy CLAY to Clayey SAND with gravel)	Below approx. 17 ft bgs (Topanga Formation Shale)	Approx. 13 to 15 ft bgs
LC-02	Not Encountered	Approx. 0 to 24 ft bgs (Silty SAND, Sandy SILT and Sandy CLAY)	Below approx. 19 to 24 ft bgs (Topanga Formation Siltstone)	Approx. 9 to 16 ft bgs
LVC-14	Approx. 0 to 5 ft bgs (Lean CLAY to Sandy Lean CLAY)	Below approx. 5 ft bgs (Sandy Lean CLAY with lenses of Clayey Sand and Sandy SILT)	Not Encountered	Approx. 19 to 22 ft bgs
TC-29	Not Encountered	(Clayey SAND with gravel)	Not Encountered	Not Encountered
MEC-12	Approx. 0 to 2 ft bgs (Clayey SAND to Sandy Lean CLAY)	Below approx. 2 ft bgs (Clayey SAND to Sandy Lean to Fat CLAY)	Not Encountered	Approx. 12 to 13 ft bgs
MEC-09	Approx. 0 to 2 ft bgs (Fat CLAY to Fat CLAY with Sand)	Approx. 2 to 13 ft bgs (Fat CLAY to Fat CLAY with Sand)	Below approx. 13 ft bgs (Topanga Formation Claystone)	Approx. 7 ft bgs
TC-02	Approx. 8 to 14 ft bgs (Clayey sand to Well-graded GRAVEL with Silt and Sand)	Not Encountered	Below approx. 8 to 14 ft bgs (Conejo Volcanic Formation Coarse Ash Tuff)	Not Encountered

Historical High Water

Plates 3a through 3c - Historic High Groundwater Map indicate the proposed site locations with respect to historically high groundwater levels assessed by the California Geological Survey (CGS) and provided in relevant Seismic Hazard Evaluation Open-File Reports (1997, 2000, 2001). Those data indicate that sites TC-35, TC-37, TC-29, and MEC-12 all lie within alluviated valley areas where groundwater has been historically measured to as shallow as about 10 feet bgs. Site TC-02 appears to lie at the boundary of the alluvial valley as shown on Plate 3c. The other sites lie outside of the interpreted groundwater depth contour areas.

We also attempted to access well data available from the California Department of Water Resources but did not find groundwater level measurements in the vicinity of the proposed sites.

Although water was measured deeper than indicated on Plate 3 at sites TC-35, TC-37, MEC-12 and TC-02, we note that the region has recently experienced a significant drought period and the current water levels may not represent the future groundwater levels at the sites. We suggest that the design team anticipate water levels (at least on a periodic basis) as shallow as the historic highs shown on Plate 3.

Percolation Results

Table 3 summarizes the corrected and uncorrected results of the percolation testing program for this project. The corrected values are adjusted as recommended by the LA County LIDBMPG for lateral flow associated with the borehole percolation test method only. Other factors for test redundancy, siltation and plugging are not included. Our measurements are considered accurate to about 1/10-inch. At RBF's direction, percolation testing was not conducted at sites TC-35 and MEC-09 due to shallow groundwater conditions.

Table 3. Field Percolation Testing Results

Site ID	Test Well ID	Test Depth Interval (feet bgs)	Testing Date	Test Interval Soil Classification	Percolation Rate (in/hr)[1]	
					Uncorrected (Field Data)	Corrected[2] (Infiltration Rate)
TC-37	TC-37-Perc-01	3 to 4-1/2	04/15/2015	(SC) with gravel	1.1	0.2
	TC-37-Perc-02	2-1/2 to 4		(GC) with sand	3.8	0.7
	TC-37-Perc-03	3 to 4-1/2		(SC) with gravel	0.5	0.1
LC-02	LC-02-Perc-01	6 to 7-12	04/16/2015	(GC) with sand	0.2	<0.1
	LC-02-Perc-02	6 to 7-12		(GC) with sand	0.2	<0.1
	LC-02-Perc-03[3]	13-1/2 to 15		Siltstone	<0.1[3]	<0.1
LVC-14	LVC-14-Perc-01	5 to 6-1/2	04/23/2015	Sandy (CL)	<0.1	<0.1
	LVC-14-Perc-02	6-1/2 to 8		Sandy (CL)	0.2	<0.1
	LVC-14-Perc-03	13-1/2 to 15		(SC)	<0.1	<0.1
TC-29	TC-29-Perc-01	3 to 4	04/24/2015	(SC) with gravel	0.3	0.1
	TC-29-Perc-02	5 to 6		(SC) with gravel	2.3	0.8
	TC-29-Perc-03	4 to 5		(SC) with gravel	0.2	<0.1
MEC-12	MEC-12-Perc-01	3.5 to 5	06/02/2015	(SC)	0.2	<0.1
	MEC-12-Perc-02	1-1/2 to 3		(SC)	0.2	<0.1
	MEC-12-Perc-03	2-1/2 to 4		(CL) with sand	0.2	<0.1
TC-02	TC-02-Perc-01	2-1/2 to 4	06/03/2015	(SC)	14.2	2.8
	TC-02-Perc-02	8-1/2 to 10		Coarse Ash Tuff	2.9	0.5
	TC-02-Perc-03	2-1/2 to 4		(SC) with gravel	6.0	1.2

1) Taken as the average of the final three test measurements.
2) Reported "corrected" values include lateral flow reduction factor only.
3) Test interval likely below water table or seeping perched water, rising water conditions during testing.

The measured percolation and corrected infiltration rates obtained from in-situ testing suggest that the soils at the explored sites (except site TC-02) generally exhibit a low propensity to infiltrate surface water. With the exception of test wells TC-37-Perc-02 and TC-29-Perc-02, the corrected infiltration rates fall below the minimum threshold of 0.3 in/hr recommended by the LA County LIDBMPG (2014) for the design of BMPs that rely on infiltration. The higher rates measured from test wells TC-37-Perc-02 and TC-29-Perc-02 suggest that lenses of material are present that may infiltrate water at a higher rate than measured at the other wells. The soils at site TC-02 generally appear more permeable than the other proposed BMP locations. The corrected infiltration rates suggest that infiltration BMPs are more feasible at that site location due to the permeable fill materials present below the ground surface.

Laboratory measured fines contents ranged from 12 percent (TC-02) to 92 percent (MEC-09). Although upon initial inspection the corrected infiltration rates appear low with respect to the gravel classifications at some locations, we note that the corrected infiltration rates are in general agreement with soil classification ranges as provided by Terzaghi and Peck (1996). Some potential explanations for the low in-situ testing rates may include the following:

- Laboratory tested soil samples may not be representative of the field percolation test interval. In addition, gravel was present in many of the collected samples and the gravel can artificially reduce the fines content and suggest the soil is more coarse grained that it actually is;
- The HSA drilling used for field percolation testing may have disturbed or smeared the excavation sidewalls impacting the percolation test rates; however, the drilling was performed in accordance with the test method and a similar disturbance would likely occur during BMP construction.

We also performed laboratory permeability testing on selected samples from sites TC-02 and MEC-12 for general comparison with the infiltration rates obtained from in-situ testing. Those results are provided in Appendix B on Plates B-4a through B-4d - Hydraulic conductivity.

Infiltration BMPs relying upon some infiltration component to manage storm water flow should be set back from any structural foundation for buildings or other site structures (e.g., retaining walls) by 10 feet to reduce the potential for moisture intrusion. In addition, measures to maintain subgrade stability in pavement or hardscape areas (such as geogrid reinforcement or increased aggregate base thickness) will be required if infiltration is incorporated into the design of those elements.

LIMITATIONS

This report has been prepared for the exclusive use of RBF Consulting and its agents for the specific application to the proposed Malibu Creek Enhanced Watershed Management Program (EWMP) in Los Angeles County, California. The findings presented herein were prepared in accordance with generally accepted geotechnical engineering practices of the project region. No other warranty, express or implied, is made.

Soil and rock deposits will vary in type, strength, and other geotechnical properties between discreet sample intervals, and points of observation and exploration. Additionally, groundwater and soil moisture conditions can also vary seasonally or for other reasons. Therefore, we do not and cannot have complete knowledge of the subsurface conditions underlying the site. The data presented in this report are based upon the findings at the points of exploration, and interpolation or extrapolation of information between and beyond the locations of observation, and are subject to confirmation during construction.

The scope of our services presented in this report did not include any environmental site assessment for the presence or absence of hazardous/toxic/biological materials in the soil, groundwater, surface water, or the presence of wetlands or the presence of environmentally sensitive areas, endangered or candidate wildlife or vegetation, or culturally significant zones within the project area. Any statements or absence of statements in this report or data presented herein regarding odors, unusual or suspicious items, or conditions observed are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous/toxic assessment.

CLOSURE

We appreciate the opportunity to provide geotechnical services to RBF Consulting on this regionally important project. If you have any questions regarding the contents of this letter or require additional information, please contact us.

Sincerely,

FUGRO CONSULTANTS, INC.

Justin R. Martos, P.E.
Senior Staff Engineer

Reviewed By:

Keith P. Askew, G.E.
Principal Geotechnical Engineer

Attachments: Plate 1 - Vicinity Map
Plates 2a through 2h - Exploration Location Maps
Plates 3a and 3c - Historic High Groundwater Maps
Appendix A - Subsurface Exploration
Plates A-1 through A-17 - Logs of Drill Holes
Plates A-18 and A-19 - Logs of Test Pits
Plates A-20 through A-31 - Logs of Drill Holes
Plate A-32 - Key to Terms & Symbols Used on Logs
Appendix B - Laboratory Testing
Plates B-1a through B-1c - Summary of Laboratory Test Results
Plates B-2a through B-2d - Grain Size Curves
Plate B-3 - Plasticity Chart
Plates B-4a through B-4d - Hydraulic Conductivity

Copies Submitted: (PDF) Addressee

REFERENCES

California Department of Conservation, Division of Mines and Geology [CGS] (1997), Seismic Hazard Zone Report for the Calabasas 7.5-minute Quadrangle, Los Angeles and Ventura Counties, California, Seismic Hazard Zone Report 06.

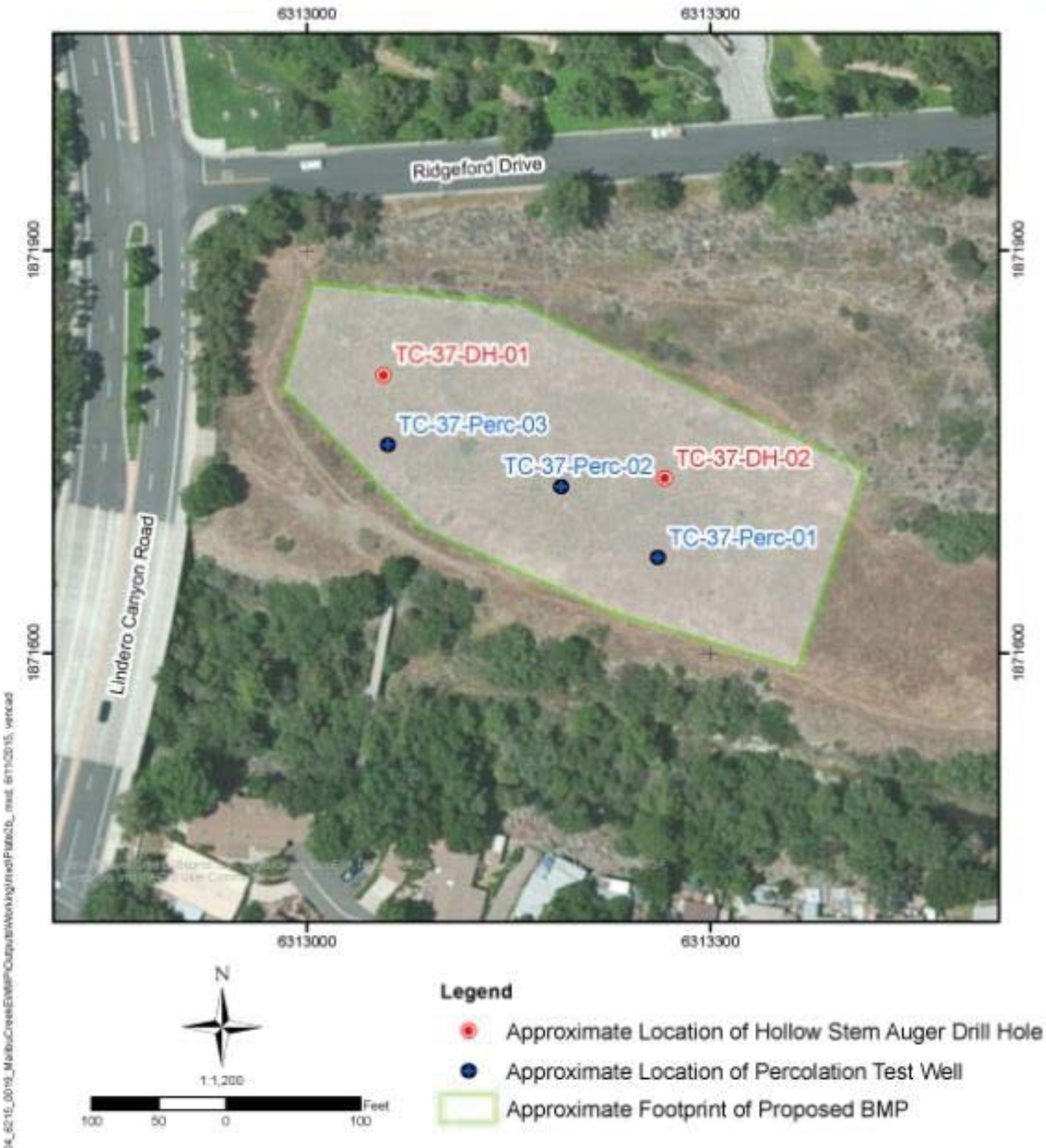
_____ (2000), Seismic Hazard Zone Report for the Thousand Oaks 7.5-minute Quadrangle, Ventura and Los Angeles Counties, California, Seismic Hazard Zone Report 042.

_____ (2001), Seismic Hazard Zone Report for the Point Dume 7.5-minute Quadrangle, Los Angeles and Ventura Counties, California, Seismic Hazard Zone Report 056.

County of Los Angeles (2014), Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting, Administrative Manual, County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division, Document No. GS200.1, December 31.

Dibblee, T.W., Helmut, E.E. (1993). Geologic Map of the Thousand Oaks Quadrangle, Ventura and Los Angeles Counties, California, Dibblee Geological Foundation, Map #DF-49, 1:24,000 scale, December.

Terzaghi, K., Peck, R. B., and Mesri, G., (1996), Soil Mechanics in Engineering Practice, Third Edition, 1996.



Legend

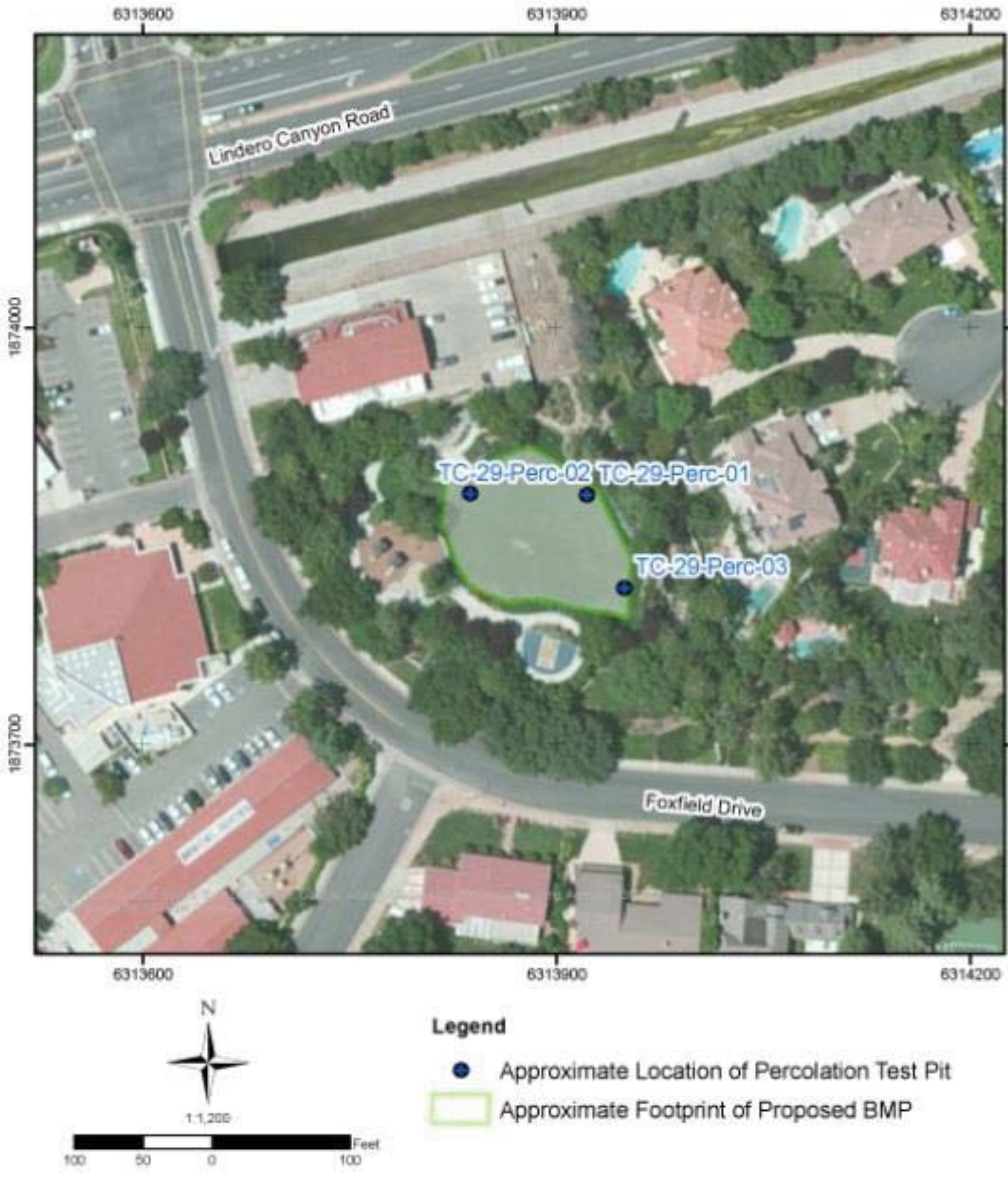
- Approximate Location of Hollow Stem Auger Drill Hole
- Approximate Location of Percolation Test Well
- Approximate Footprint of Proposed BMP

EXPLORATION LOCATION MAP - TC-37

Malibu Creek EWMP

Los Angeles County, California

PLATE 2b



EXPLORATION LOCATION MAP - TC-29
Malibu Creek EWMP
Los Angeles County, California

PLATE 2e

Legend

- Approximate Location of Hollow Stem Auger Drill Hole
- Approximate Location of Percolation Test Well
- Approximate Footprint of Proposed BMP

EXPLORATION LOCATION MAP - TC-02
Malibu Creek EWMP
Los Angeles County, California

PLATE 2h

Attachment 3

Vendor-Provided Information

SP360-SL Model

NOTES

MATERIALS
Materials used in this work shall conform to ACI (American Concrete Institute)

CONCRETE
28 Day Compressive 5000 psi (Minimum)
Self-Consolidating per ACI 237R-07
ASTM C1611/C1611M-14 Standard Test Method for Slump Flow
Lifting Strength 2000 psi (Minimum)

REINFORCING STEEL
Reinforcing Bars shall conform to: ASTM A615, Grade 60
Reinforcing Mesh shall conform to: ASTM A1064, Grade 70
Reinforcing Cover: 1.5” minimum

DESIGN
Designed in accordance with the AASHTO Standard Specifications, 7th Edition for HS-20 Live Load.

FOR MORE INFORMATION CONTACT PRECON PRODUCTS AT 805-527-0841.

STORM PRISM SP360

Standard System Calculation Sheet

Date: 7/3/2018

Project: **John Lewis project**

Location: TC-02

Customer: ?

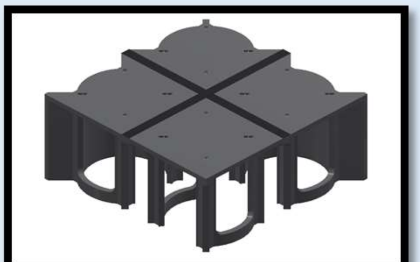
Contact: ?

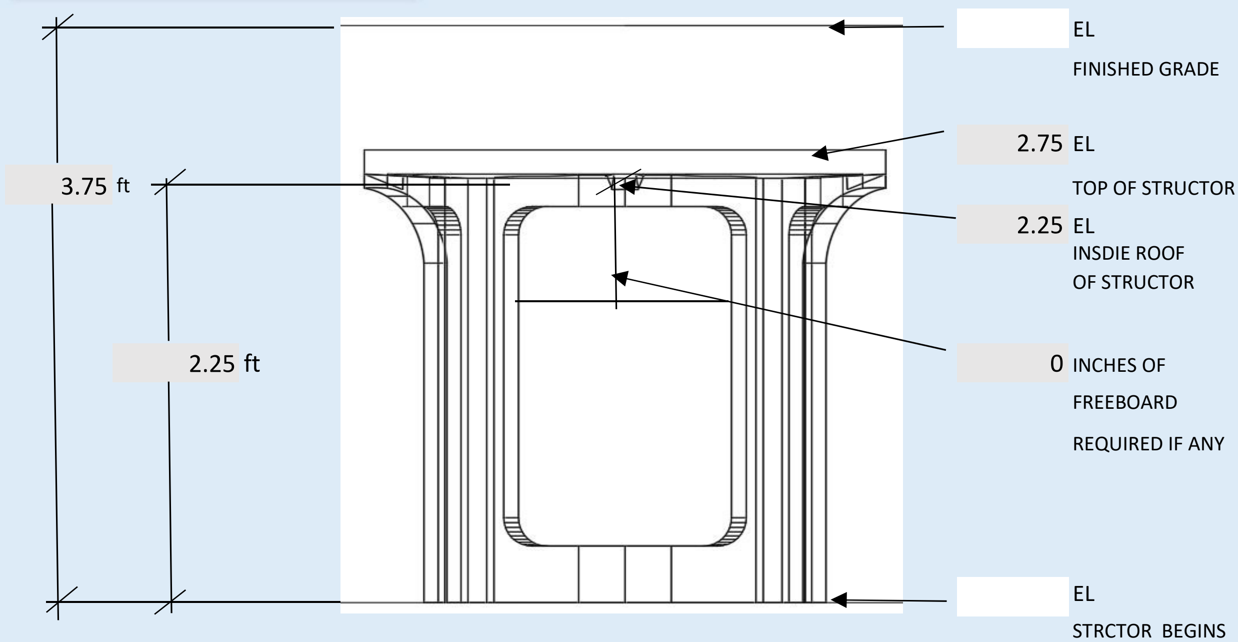
Contact Info:

SL System	
Inside Hight	27 in

Ring and Cover
Ring and Cover

Type of unit	Number of Units	Inside Hight in Inches	Inches of Freeboard	Per unit: Weight per Unit	Yards per Unit	Volume in Cubic FT Per Unit	Volume of Freeboard	Net Volume per unit	Totals: Yards per Total line Units	Volume with out Freeboard	Volume with Freeboard
Corner	4	27	0	7193	1.80	94.73	0.00	94.73	7.19	378.92	378.92
Center	81	27	0	7148	1.79	128.35	0.00	128.35	144.75	10396.03	10396.03
Side	36	27	0	7851	1.96	79.33	0.00	79.33	70.66	2856.03	2856.03
System Totals									222.61	13630.98	13630.98





note: red added by Kennedy/Jenks

STORM PRISM SP360

Standard System Calculation Sheet

Date: 7/3/2018

Project: **John Lewis project**

Location: TC-37

Customer: ?

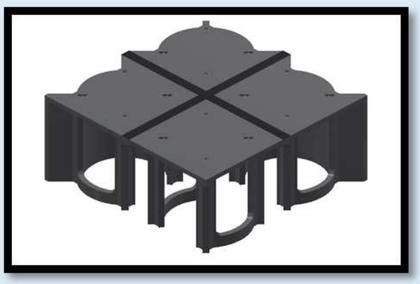
Contact: ?

Contact Info:

SL System	
Inside Hight	90 in

Ring and Cover
Ring and Cover

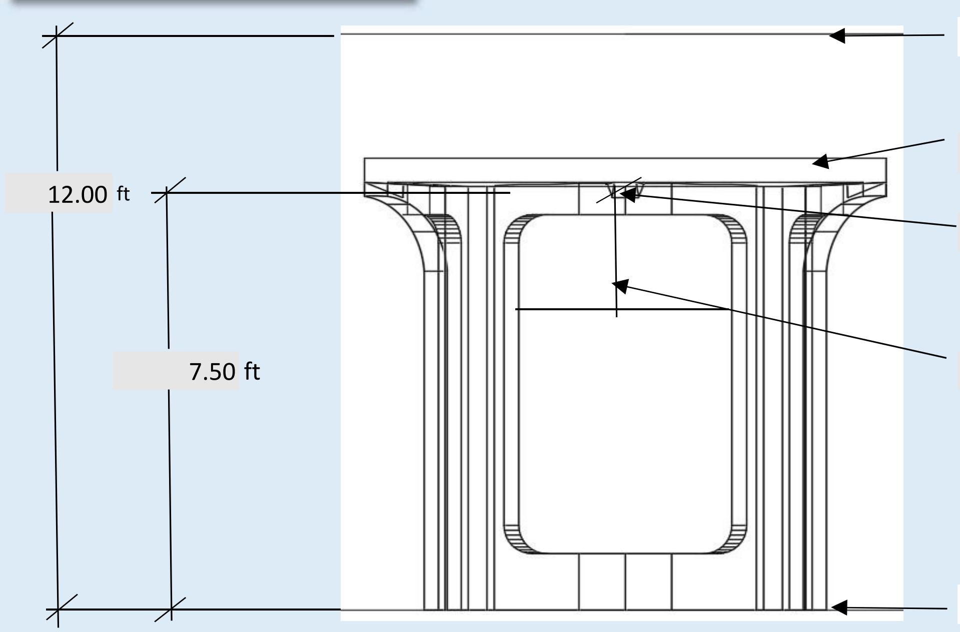
Type of unit	Number of Units	Inside Hight in Inches	Inches of Freeboard	Per unit: Weight per Unit	Yards per Unit	Volume in Cubic FT Per Unit	Volume of Freeboard	Net Volume per unit	Totals: Yards per Total line Units	Volume with out Freeboard	Volume with Freeboard
Corner	4	90	0	13898	3.47	322.94	0.00	322.94	13.90	1291.76	1291.76
Center	930	90	0	10232	2.56	443.79	0.00	443.79	2378.99	412720.39	412720.39
Side	122	90	0	12945	3.24	380.08	0.00	380.08	394.81	46369.58	46369.58
System Totals									2787.71	460381.73	460381.73



Notes:

Based on 1.59 acres max 256' x 264' Depth 90" inside open bottom

Total storage including 12" rock = 487,381 cf



note: red added by Kennedy/Jenks

Project: **John Lewis project**

Location: TC-29

Customer: ?

Contact: ?

STORM PRISM SP360

Standard System Calculation Sheet

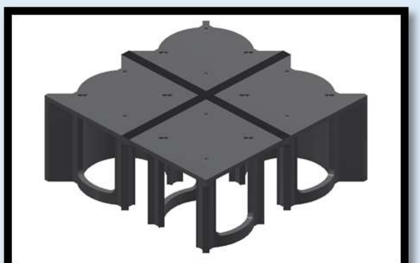
Date: 7/3/2018

Contact Info:

SL System	
Inside Hight	57 in

Ring and Cover	
Ring and Cover	

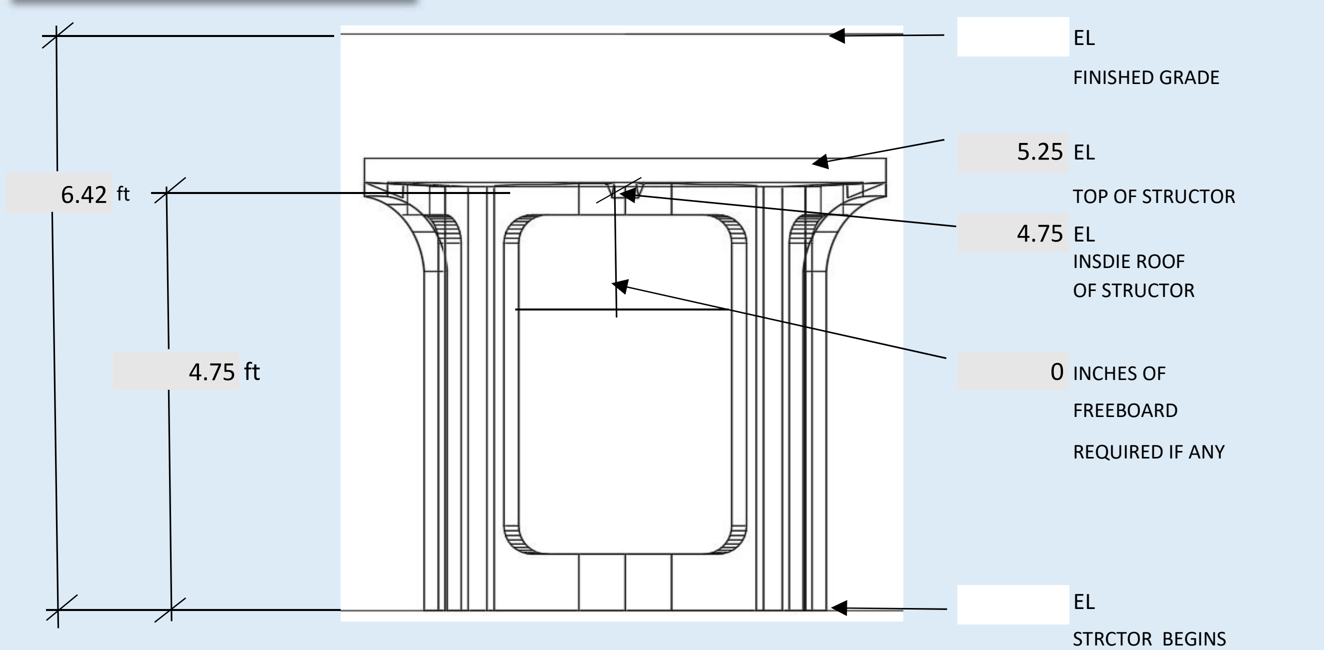
Type of unit	Number of Units	Inside Hight in Inches	Inches of Freeboard	Per unit: Weight per Unit	Per unit: Yards per Unit	Per unit: Volume in Cubic FT Per Unit	Per unit: Volume of Freeboard	Per unit: Net Volume per unit	Totals: Yards per Total line Units	Totals: Volume with out Freeboard	Totals: Volume with Freeboard
Corner	4	57	0	10400	2.60	203.40	0.00	203.40	10.40	813.58	813.58
Center	132	57	0	8618	2.15	278.55	0.00	278.55	284.40	36768.00	36768.00
Side	46	57	0	10109	2.53	238.66	0.00	238.66	116.26	10978.53	10978.53
System Totals									411.06	48560.11	48560.11



Notes:

Based on 0.27 acres max 104' x 112' Depth 57" inside open bottom

~~Total storage including 12" rock = 487,381 cf~~ vendor copy error; storage for TC-37



note: red added by Kennedy/Jenks

Attachment 4

Capital Cost Estimates

Engineers Opinion of Probable Cost
Stormwater BMP - TC-02

KENNEDY/JENKS CONSULTANTS

Study:	Title XVI Feasibility Study	**Prepared By:**	RM/SI
Project:	Las Virgenes Municipal Water District	**Date Prepared:**	Sep-2018
Treatment:	Stormwater BMP - TC-02	**K/J Proj. No.**	1744518.00
Estimate:	Conceptual Level Cost-Analysis		

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes/Source
Facility Capital Construction Costs						
1.0	**Excavation**				**34,200**	**NOTE: This cost is a preliminary, order-of-magnitude type cost based on many assumptions. Additional project development is needed to increase confidence in cost estimate.See next steps proposed in Section 5 of the TM.**
1.1	Excavate for BMP	1,425	CY	$ 12	17,100	
1.2	Haul & Dispose of Excavated Soil	1,425	CY	$ 12	17,100	
2.0	**Pipelines**					
2.1	**Connect to Sewer**				**223,904**	
2.1.1	18" Pipeline	220	LF	$ 313	68,904	18 in-diameter $ 17.40 per inch-dia-LF (2016 BODR, escalated to 2018)
2.1.2	Connect to Sewer	1	EA	$ 5,000	5,000	
2.1.3	Low lift sewer pump station	1	EA	$ 150,000	150,000	Assumed 0.5 MGD at 35' head
3.0	**Stormwater Storage BMP**				**460,000**	
3.1	Storage Product Cost per Vendor	1	LS	$ 400,000	400,000	estimated cost for StormPrism product, based on vendor-provided information, incl. shipping - 88'x88'
3.2	Vendor Constructability contingency	@	15%		60,000	
	Subtotal Construction Cost				**$718,104**	
4.0	USBR Construction Contingencies	@	30%		215,431	% of construction cost to cover minor differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible minor changes in plans, and other uncertainties.
	Subtotal with Construction Contingencies				**$933,535**	
5.0	Engineering and Design	@	10%		93,354	% of Construction Cost Subtotal with Contingencies (includes design, specifications and bid documents)
6.0	USBR Non-Contract Costs	@	20%		186,707	% of Construction Cost Subtotal with Contingencies (includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.)
	Estimated Incremental Capital Cost for Storage and Diversion of Stormwater				**$1,213,596**	
	Land Acquisition	0.0	LS	-	0	Land acquisition not included
	MCWEWMP Estimated Capital Cost	1	LS	$ 2,132,000	2,132,000	Cost reported in 2016 MCWEWMP. Escalated to 2018 based on ENR index. Includes utility relocation, contingency, mobilization/demobilization, permitting, construction management, and engineering and planning.
	Combined MCWEWMP costs and incremental costs				**$3,345,596**	

Engineers Opinion of Probable Cost
Stormwater BMP - TC-37

KENNEDY/JENKS CONSULTANTS

Study:	Title XVI Feasibility Study	**Prepared By:**	RM/SI
Project:	Las Virgenes Municipal Water District	**Date Prepared:**	Sep-2018
Treatment:	Stormwater BMP - TC-37	**K/J Proj. No.**	1744518.00
Estimate:	Conceptual Level Cost-Analysis		

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes/Source
Facility Capital Construction Costs						
1.0	**Excavation**				**793,035**	**NOTE: This cost is a preliminary, order-of-magnitude type cost based on many assumptions. Additional project development is needed to increase confidence in cost estimate.See next steps proposed in Section 5 of the TM.**
1.1	Excavate for BMP	33,043	CY	$ 12	396,517	
1.2	Haul & Dispose of Excavated Soil	33,043	CY	$ 12	396,517	
2.0	**Pipelines**					
2.1	**Connect to Sewer**				**206,678**	
2.1.1	18" Pipeline	165	LF	$ 313	51,678	18 in-diameter $ 17.40 per inch-dia-LF (2016 BODR, escalated to 2018)
2.1.2	Connect to Sewer	1	EA	$ 5,000	5,000	
2.1.3	Low lift sewer pump station	1	EA	$ 150,000	150,000	Assumed 0.5 MGD at 35' head
3.0	**Stormwater Storage BMP**				**3,105,000**	
3.1	Storage Product Cost per Vendor	1	LS	$ 2,700,000	2,700,000	estimated cost for StormPrism product, based on vendor-provided information, incl. shipping; 256'x264'
3.2	Vendor Constructability contingency	@	15%		405,000	
	Subtotal Construction Cost				**$4,104,713**	
4.0	USBR Construction Contingencies	@	30%		1,231,414	% of construction cost to cover minor differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible minor changes in plans, and other uncertainties.
	Subtotal with Construction Contingencies				**$5,336,126**	
5.0	Engineering and Design	@	10%		533,613	% of Construction Cost Subtotal with Contingencies (includes design, specifications and bid documents)
6.0	USBR Non-Contract Costs	@	20%		1,067,225	% of Construction Cost Subtotal with Contingencies (includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.)
	Estimated Incremental Capital Cost for Storage and Diversion of Stormwater				**$6,936,964**	
	Land Acquisition	0.0	LS	-	0	Land acquisition not included
	MCWEWMP Estimated Capital Cost	1	LS	$ 2,448,000	2,448,000	Cost reported in 2016 MCWEWMP. Escalated to 2018 based on ENR index. Includes utility relocation, contingency, mobilization/demobilization, permitting, construction management, and engineering and planning.
	Combined MCWEWMP costs and incremental costs				**$9,384,964**	

Engineers Opinion of Probable Cost
Stormwater BMP - TC-29

KENNEDY/JENKS CONSULTANTS

Study:	Title XVI Feasibility Study	**Prepared By:**	RM/SI
Project:	Las Virgenes Municipal Water District	**Date Prepared:**	Sep-2018
Treatment:	Stormwater BMP - TC-29	**K/J Proj. No.**	1744518.00
Estimate:	Conceptual Level Cost-Analysis		

Item No.	Description	Qty	Units	Total Costs $/Unit	Total Capital Cost	Notes/Source
Facility Capital Construction Costs						
1.0	**Excavation**				**79,701**	**NOTE: This cost is a preliminary, order-of-magnitude type cost based on many assumptions. Additional project development is needed to increase confidence in cost estimate.See next steps proposed in Section 5 of the TM.**
1.1	Excavate for BMP	3,321	CY	$ 12	39,850	
1.2	Haul & Dispose of Excavated Soil	3,321	CY	$ 12	39,850	
2.0	**Pipelines**					
2.1	**Connect to Sewer**				**253,658**	
2.1.1	18" Pipeline	315	LF	$ 313	98,658	18 in-diameter $ 17.40 per inch-dia-LF (2016 BODR, escalated to 2018)
2.1.2	Connect to Sewer	1	EA	$ 5,000	5,000	
2.1.3	Low lift sewer pump station	1	EA	$ 150,000	150,000	Assumed 0.5 MGD at 35' head
3.0	**Stormwater Storage BMP**				**575,000**	
3.1	Storage Product Cost per Vendor	1	LS	$ 500,000	500,000	estimated cost for StormPrism product, based on vendor-provided information, incl. shipping; 104'x112'
3.2	Vendor Constructability contingency	@	15%		75,000	
	Subtotal Construction Cost				**$908,359**	
4.0	USBR Construction Contingencies	@	30%		272,508	% of construction cost to cover minor differences in actual and estimated quantities, unforeseeable difficulties at the site, changed site conditions, possible minor changes in plans, and other uncertainties.
	Subtotal with Construction Contingencies				**$1,180,866**	
5.0	Engineering and Design	@	10%		118,087	% of Construction Cost Subtotal with Contingencies (includes design, specifications and bid documents)
6.0	USBR Non-Contract Costs	@	20%		236,173	% of Construction Cost Subtotal with Contingencies (includes distributive cost items such as facilitating services, investigations, environmental compliance, archeological considerations, public outreach, program management, etc.)
	Estimated Incremental Capital Cost for Storage and Diversion of Stormwater				**$1,535,126**	
	Land Acquisition	0.0	LS	-	0	Land acquisition not included
	MCWEWMP Estimated Capital Cost	1	LS	$ 1,302,000	1,302,000	Cost reported in 2016 MCWEWMP. Escalated to 2018 based on ENR index. Includes utility relocation, contingency, mobilization/demobilization, permitting, construction management, and engineering and planning.
	Combined MCWEWMP costs and incremental costs				**$2,837,126**	

Attachment 5

Enhanced Watershed Management Program for Malibu Creek Watershed, Section 8 – Structural Control Measures Cost Estimates

8 Structural Control Measures Cost Estimate

Estimated costs for structural watershed control measures include consideration of planning, design, permits, construction, operation and maintenance, and other factors as appropriate. BMP implementation (and associated cost) is primarily based on TMDL compliance schedules, with key milestones in December 2017 (nutrient TMDL), July 2021 (bacteria TMDL) and the final program compliance in March 2032.

This section also describes potential funding sources and outlines a financial strategy to implement the EWMP. Each of the stakeholders in the MCW currently supports their stormwater program through the general fund. At this point in time it appears that this method of funding will not be able to fully support implementation of the EWMP, even at the first key milestone in December 2017. Accordingly, a significant effort will be required to assemble a package of funding from a variety of sources to meet the program objectives.

8.1 Regional BMP Cost Summary

Unit cost detail for each BMP can be found in Appendix D. Regional BMPs capital and life cycle costs were priced by using conceptual designs as discussed in Appendix D. Factors that influence the whole life cycle cost include project scale and unit costs, retrofit verses new construction (or construction associated with other improvements), regulatory requirements, site suitability, state of the economy, land cost, and soil type. Whole life cost includes the cost for operation and maintenance, which may exceed the initial capital investment.

The tributary area to each BMP, BMP type, and the BMP volume or size served as the basis for the project construction cost estimates. The Whole Life Cost estimate assumed a level of maintenance consistent with local practices and includes annual maintenance inspections, intermittent corrective maintenance, and an allowance for periodic major maintenance. The cost of annual maintenance is estimated to be 2% of the estimated capital cost. Permitting and utility relocation were each estimated at 3% of the capital cost while Planning and Design were estimated at 20%. Construction management was estimated as 15% of the construction cost.

Table 44 outlines the proposed cost for each regional BMP. For more details of the 20-year whole life cycle cost of each BMP refer to Appendix D: Regional BMP Cost Details.

Table 44: Regional BMP Cost Summary

BMP	Footprint (ac)	BMP Type	Estimated Capital Cost	Estimated Annual O&M
LVC-14	0.49	Regional EWMP Project - Infiltration/Harvest and Use	$4,150,000	$50,000
TC-35	0.55	Harvest and Use	$2,379,786	$28,331
MEC-12	0.21	Infiltration/Harvest and Use	$4,448,577	$52,959
LC-02	0.43	Infiltration/Harvest and Use	$2,623,361	$31,230
TC-29	0.27	Infiltration	$1,216,370	$14,481
TC-37	1.59	Infiltration	$2,286,810	$27,224
TC-02	0.19	Bioretention	$1,992,000	$24,000
MEC-09	0.48	Harvest and Use	$1,961,478	$23,351
Total Regional BMP Cost			**$21,058,382**	**$251,576**

8.2 Green Street Cost Summary

Green streets are a major component of the compliance strategy for the EWMP. The cost for green street implementation has been estimated using the cost equations from SUSTAIN. The SUSTAIN cost function for bioretention with underdrains and without can be found in Section 6.3.3 Cost Functions. The costs in this tool are based on retrofitting a stormwater BMP into existing infrastructure. This cost basis should provide a conservative estimate since future green street implementation will be incorporated into road improvement projects.

Table 45 shows a summary estimate for green streets with bioretention to be implemented in the MCW. The location of green street implementation is conceptual, and will be determined in each subwatershed during implementation based on site feasibility, which includes right of way availability, traffic constraints and opportunities, and local soil conditions. Green streets are defined as street segments with either bioretention or biofiltration treating the tributary area. Underdrains are needed in areas where soil permeability is low. Locations requiring underdrains were estimated through a review of soil mapping for the watershed.

Table 45: Green Street Capital Cost Estimate

BMP Scenario	BMP Surface Area (ac)	BMP Unit Cost ($/ft^2)	Cost Estimate
Bioretention-No Underdrain	29.47	$68	$86,686,151
Bioretention-With Underdrain	6.00	$84	$21,957,453
Green Streets Total	**35.47**		**$108,643,604**

8.3 Cost Summary for Private BMPs

Public Regional and green street (distributed) BMPs are not sufficient by themselves to achieve compliance with receiving water standards. A conceptual BMP cost model was developed for application on private property, with the objective of closing the identified compliance gap. The concept BMP cost model assumes that infiltration, extended detention, and bioretention will be used on private parcels with the specific BMP type to be determined according to local site conditions. To estimate capital and whole life costs for the conceptualized BMP, per cubic foot of treatment volume for each of the three selected treatment BMPs were averaged to arrive at a single unit price estimate. Since the BMPs will be constructed on private land, a land cost of $5M per acre was also included[28].

The implementation of the Private BMPs will be more complex since easements will need to be acquired from private parties, or cost and maintenance agreements will need to be developed with local property owners. Accordingly, these BMPs are slated to be constructed in the later portions of the EWMP implementation schedule.

The RAA model indicates that an additional 26 acre-feet of treatment volume is needed after implementation of green streets and regional BMPs in the watershed, to achieve compliance with receiving water standards. The estimated cost to treat this additional volume of water can be found in Table 46.

Table 46: Private BMP Cost Estimate

BMP Scenario	BMP Land Area (Ac)	Estimated Cost
Private Regional	8.66	$68,386,190

8.4 Cost Summary for EWMP Implementation

The total capital cost of the EWMP is the sum of the regional BMPs, green streets and BMPs on private land. The combined cost of these three compliance elements will be expended by the final compliance date of this plan, March 2032. The capital cost and average annual cost (operations and maintenance) for each element is provided in Table 47.

Table 47: EWMP Compliance Cost Summary

BMP Scenario	Capital Cost ($)	Annual O&M Cost ($)
Regional	21,058,000	251,000
Green Streets	108,643,000	2,173,000
Private Regional	68,386,190	1,368,000
Total	**198,087,190**	**3,792,000**

The program capital costs are broken down by jurisdiction and by compliance milestone year and are provided in Table 48. The table identifies the costs to be expended under each BMP category for each jurisdiction by each of the compliance dates identified and a total cost by jurisdiction and by BMP category.

[28] Based on the regional privately owned cost function from the SUSTAIN model.

Table 48: EWMP Capital Compliance Cost Summary by Jurisdiction

Agency	Year/ Milestone	Regional BMPs ($M)	Green Streets ($M)	Private Regional BMPs ($M)	Total Per Jurisdiction ($M)
Agoura Hills	2017	4.59	11.221	0.000	15.811
	2021	4.45	35.849	29.12	69.42
	2035	0.000	0.000	0.000	0.000
Calabasas	2017	0.000	4.258	0.000	4.258
	2021	0.000	21.632	10.97	32.602
	2035	0.000	0.000	0.000	0.000
Hidden Hills	2017	0.000	0.201	0.000	0.201
	2021	0.000	0.379	0.22	0.599
	2035	0.000	0.000	0.000	0.000
Unincorporated Los Angeles County	2017	4.15	1.156	0.00	2.548
	2021	1.99	9.074	25.28	36.34
	2035	0.000	0.000	1.653	1.653
Westlake Village	2017	0.000	0.707	0.000	0.707
	2021	5.88	24.163	1.15	31.19
	2035	0.000	0.000	0.000	0.000
EWMP Total		**21.06**	**108.64**	**68.39**	**198.09**

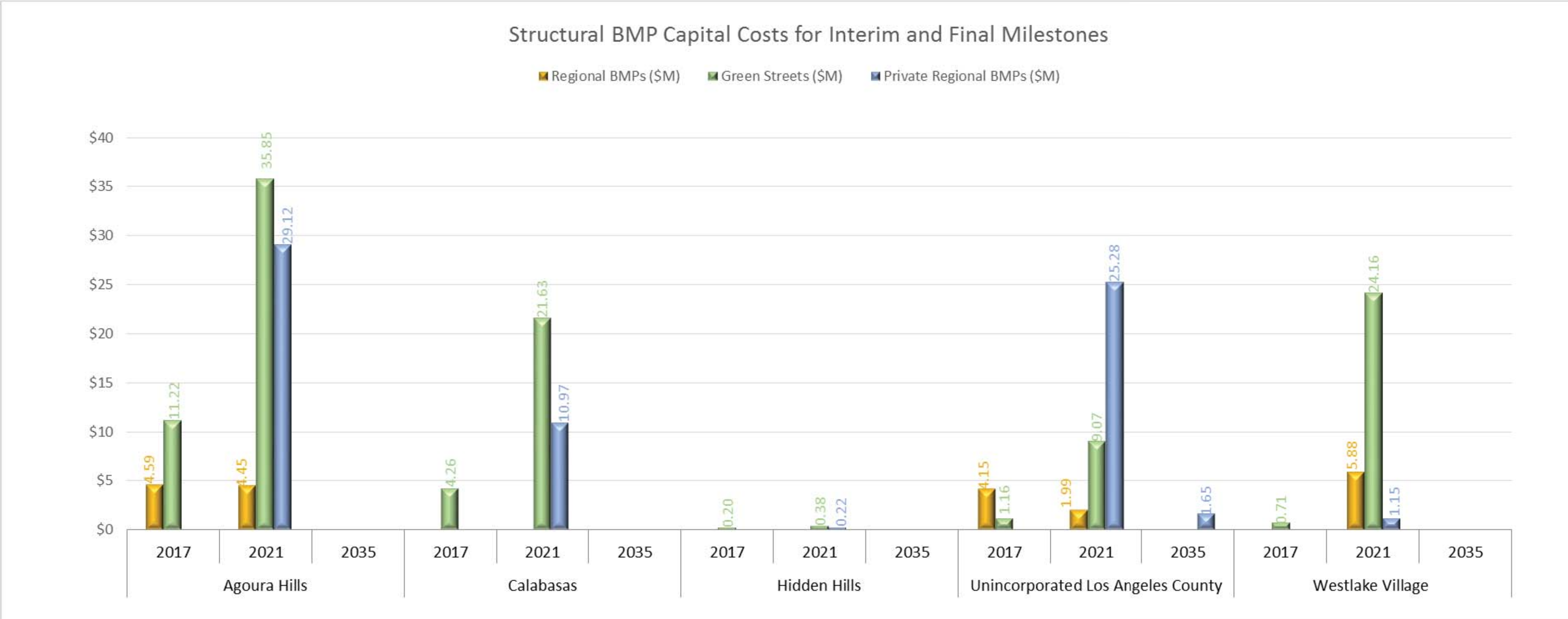


Figure 41: Capital Costs for Structural BMPs by Each Milestone per Jurisdiction

8.5 Funding Options and Strategy

The purpose of this section is to present the financial strategy for addressing the additional costs of compliance with the 2012 MS4 permit to implement the extensive set of BMPs or "recipe for compliance", identified in Section 6.

The financial strategy for implementing the EWMP consists of the identification of existing funding sources and a process for identifying future funding sources for the estimated costs that are not covered by existing funding sources.

8.5.1 Existing Funding Sources

The agencies within this group historically utilized general funds to support their stormwater programs and will continue to do so. However, the cost estimates exceed expected available general fund revenue for stormwater programs. Therefore, the cities will be pursuing funds from multiple, additional sources.

The County has an ongoing collective budget of $10.1 million for 140 unincorporated areas. Additional funds for projects are allocated on an annual basis from the General Fund and other sources. In Fiscal Year 2015-16, the total allocation from the General Fund for stormwater management was $23 million. Additional funds from other sources, including the Gasoline Tax, Solid Waste Fund, Prop C, Prop A Local Return Funds, and Measure R, provide for ongoing MCM compliance activities.

The LACFCD allocated a budget of $33 million from the Flood Fund for all LACFCD territories within Los Angeles County MS4 in Fiscal Year 2015-16.

8.5.2 Potential Funding Sources

Several potential funding sources could be used alone, or in combination, to fund the EWMP. Some of these sources are temporary in nature (such as grants), and do not require repayment but may require in-kind or matching funds. Other sources require repayment of principle and interest on the amount borrowed (bonds). The identified funding options and constraints are shown in Table 49. Some of the funding options reviewed here reference the study, "Stormwater Funding Options, Providing Sustainable Water Quality Funding in Los Angeles County," dated October 14, 2014.

Table 49: Potential Funding Strategies

Type	Background	Potential	Process	Conditions	Challenges
Local Fee Programs	In place in some Cities in the County	Unknown. Fees historically receive significant scrutiny by the voters	Requires a Proposition 218 process and approval by 2/3rds margin in a popular vote	May consider amendments to refuse contracts and street sweeping contracts for some pollutants.	Achieving voter approval
Enhanced Infrastructure Financing Districts (EIFD)s	Government entity created by City or County to construct or improve infrastructure, governed by a public financing authority (PFA) to use a portion of property taxes from the participating jurisdictions or other fees or investments to fund regional infrastructure projects	Signed into law in Fall 2014, will allow cross jurisdictional projects to collaboratively fund improvements affecting water problems which don't follow jurisdictional boundaries	• Determine if the prerequisites are met, • ID projects, stakeholders, district members • Establish PFA • Formalize EIFD • Develop Infrastructure Financing Plan (IFP) • Review with public • Adopt IFP and begin work	• Receive Finding of Completion (FOC) • Certify no SA assets under litigation will benefit • Comply with State Controller's asset transfer review	New concept which will need time to become standard practice will require educating local decision makers of the benefits of EIFDs
State Revolving Fund (SRF) Loans	Funding source for any city county or district to fund projects including stormwater treatment, water reclamation and wastewater treatment systems	Continuously available for application	Application available online on SWRCB site,	Limitations apply to types of projects eligible	Limited supply of funds
Bonds	Traditional infrastructure bonds	Vary by project funding needs and jurisdiction	Traditional bond development and approval processes	Vary by type of bond and details	Lack of public support from lack of knowledge of infrastructure funding shortcomings. Timelines of bond issuance process don't always match project timelines

Type	Background	Potential	Process	Conditions	Challenges
Prop 1. Grants	The bond measure approved by voters in fall of 2014 will enact the Water Quality, Supply, and Infrastructure Improvement Act of 2014	$7.5 billion law to be enacted, funds generated by the act will become available under a variety of programs and through various agencies and timelines	Prop 1 Water Bond contained: • $520 million to improve water quality for "beneficial use," for reducing and preventing drinking water contaminants • $1.495 billion for competitive grants for multi-benefit ecosystem and watershed protection and restoration projects • $810 million for expenditures on, and competitive grants and loans to, integrated regional water management projects • $2.7 billion for water storage projects, dams and reservoirs • $725 million for water recycling and advanced water treatment technology • $900 million for competitive grants and loans for groundwater contamination cleanup • $395 million for flood management projects	Will vary by program, information about availability will be arriving from different agencies administering funds in 2015. Governor’s budget calls for spending $532 million in 2015 of Prop 1 funds	Will vary by program

Type	Background	Potential	Process	Conditions	Challenges
IRWM Grants	Grant funding program for projects related to all aspects of water resources, including multi-jurisdiction projects	Stormwater management projects are eligible for funding	• Application process overseen by DWR. • Applications for the current round of Prop 84 funding will be due in fall of 2015, draft program guidelines to be released in spring 2015 • $1.1 billion in spending from the 2006 flood bond Prop 1E proposed in Governor's 2015 budget	To be outlined in guidelines	Limited supply of funds
Climate Change/Greenhouse Gas Emission Funding	AB32 established a comprehensive emission reduction program, including a "cap and trade" program that will auction emission credits creating up to $3billion annually, investment of these funds will be potential funding source	Emission trading funds investment plan does include "water use and supply" projects that reduce GHG as eligible	Emission trading market still developing	Still to be determined	Role of stormwater projects in the cap and trade program and quantification of associated emission reduction is still to be determined
Special Assessment Districts	Developed by watershed or sub-watershed to pay for EWMP improvements and maintenance	Tailored to local watershed and community needs.	Resolution of Intention. Financing mechanism formed under The California Streets and Highways Code, Division 10 and 12	Requires approval of a majority of the landowners based on the stated financial obligations, to finance the improvements constructed or acquired by the District.	Proposition 218 ballots must be mailed to each property owner within the district. The majority must vote in favor for formation.
Collaborative opportunities with Other Agencies	Mutually beneficial program partnerships to share resources and meet regulatory requirements	Will be well suited to be developed via the EIFD process above	Varies on type of jurisdictions or entities included	Varies on type of jurisdictions or entities included	Case by case management can be resource intensive
Public/Private Partnerships	Synergistic partnerships to develop funding opportunities	Vary by jurisdictions, smaller scale projects may be more attainable or allow proof of concept	Vary by project type and scale	Vary by project	May not be repeatable or of sufficient scale to justify public resource expenditure

8.5.3 MCW Funding Strategy

The MCW EWMP Group members will utilize the following process to maximize opportunities to obtain the necessary funding. As noted in Table 49, constraints and challenges exist for all of the potential funding strategies. As a result, while the MCW EWMP Group will implement the following process to attempt to gather the needed funding resources. Additionally, to the extent additional funding is obtained earlier in the implementation schedule, those resources will be utilized to implement additional actions.

Step 1: Implement procedures to maximize water quality benefits from existing maintenance and public agency processes. Examples of this include incorporating green streets into all major new roads projects and incorporating consideration of water quality benefits into all new flood control projects.

Step 2: Pursue multi-benefit projects. Stakeholders will work closely with each other, within their internal departments, and with local water agencies to identify projects that can be jointly funded or supported to enhance local water supplies, and increase public support through aesthetic enhancement, transit, active transportation and other community benefits.

Step 3: Pursue grant funding opportunities. The MCW EWMP Group will incorporate identified EWMP projects into the Integrated Regional Water Management Plan and any other planning documents necessary to make them eligible for state grant funding. Additionally, the agencies will evaluate opportunities to obtain other types of grants for funding projects.

Step 4: When funds are needed, the stakeholders can pursue bond financing or obtaining a loan.

Step 5: If additional funds are needed, the County and Flood Control District may pursue initiating a stormwater fee and/or developing an Enhanced Infrastructure Financing District (EIFD).

Appendix E: Brine Minimization

Kennedy/Jenks 2018b. Technical Memorandum (TM) Pure Water Project Las Virgenes - Brine Recovery Evaluation

5 September 2018

Final Technical Memorandum (TM)

To: Mr. David R. Lippman, P.E.

From: Steve Diamond, P.E. & Alan Bracewell, EIT

Reviewers: Paul Chau, P.E. and Dawn Taffler, P.E.

Subject: Pure Water Project Las Virgenes - Brine Recovery Evaluation

K/J 1744518*00

This Technical Memorandum (TM) is prepared as part of the Pure Water Project Las Virgenes - Title XVI Feasibility Study, prepared by the Las Virgenes – Triunfo Joint Powers Authority (JPA) under a grant from the U.S. Bureau of Reclamation (BOR) Water Reclamation and Reuse (Title XVI) Program.

1.0 Introduction

The JPA is exploring the feasibility of Indirect Potable Reuse (IPR) to further treat recycled water from the Tapia Water Reclamation Facility (Tapia WRF) at a new Advance Water Treatment Facility (AWTF) and to convey the purified water to Las Virgenes Reservoir to supplement the drinking water supply. This project is referred to as the Pure Water Project.

The assumptions herein build upon the Basis of Design Report (BODR) (MWH 2016), which initially defined the Pure Water Project and AWTF processes. A follow-on Demonstration Project Preliminary Design Report (CDM 2017) further refined the AWTF processes and highlighted the need to further research brine minimization opportunities to achieve a reverse osmosis (RO) system recovery above 93%. Reducing brine generation would reduce the infrastructure, energy and disposal costs associated with disposal of brine through Calleguas Municipal Water District's (CMWD) Salinity Management Pipeline (SMP).

The purpose of this Technical Memorandum (TM) is to compare the performance and cost of different brine concentration alternatives, as well as the default case of no additional treatment. Technologies reviewed include: (1) two-stage primary RO (baseline – no brine minimization), (2) two-stage primary RO combined with a single-stage secondary RO (multi-stage concentrator), (3) closed-circuit RO (CCRO), (4) electrodialysis reversal (EDR), and (5) advanced electrodialysis reversal (Advanced EDR). This TM includes the following:

- **Overview of Brine Minimization Technologies**: Descriptions of treatment processes, including process schematic and discussion of benefits and limitations.
- **Evaluation of Brine Minimization Technologies**: Comparison of vendor brine minimization modeling based on expected feed water quality. Evaluation of treatment technologies based on non-cost and cost factors.
- **Summary and Findings**: Findings and conclusions based on assessments.

2.0 Overview of Brine Minimization Technologies

2.1 Two-Stage Reverse Osmosis (Baseline - No Brine Minimization)

RO is a pressurized, energy intensive, membrane desalination process. RO uses semipermeable membranes to remove most dissolved ionic contaminants in water by size and charge exclusion. A typical RO system consists of two RO stages to increase overall system recovery. Each stage, depending on the water quality and number of modules, typically produces 50%-60% treated water, or permeate, and 40%-50% concentrated reject water, or brine. As the flow to the second stage is about half the flow to the first stage, the percent water recovered from the second stage is 25%-30% of the total flow. The two stages result in a total system recovery of 75%-80%.

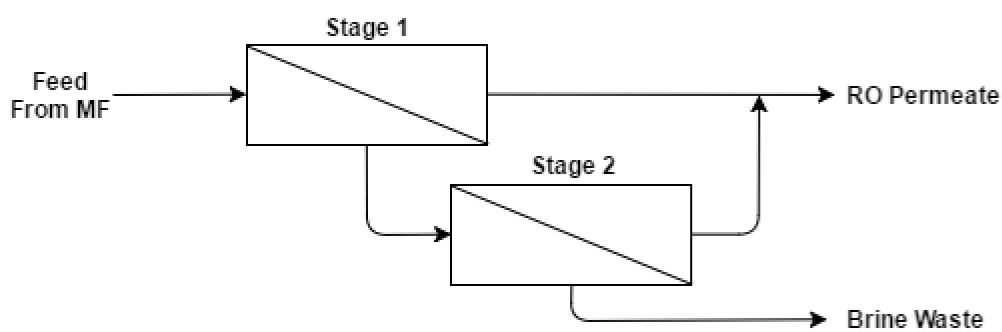


Figure 1: Two-stage RO Schematic

For this TM, two-stage reverse osmosis is used as the baseline “no brine minimization” scenario. In prior studies (CDM 2017 and MWH 2016), a third single-stage RO unit was assumed for further brine minimization. This configuration is discussed in the following section, 2.2.

2.2 Multi-stage Concentrator

A multi-stage RO brine concentrator consists of a two-stage primary RO system followed by a single-stage secondary RO system used to increase water recovery and reduce the amount of brine waste (Figure 2). The addition of the third stage can increase the RO system recovery from 75% - 80% to 85% - 90%. The BODR assumed that a three-stage RO would achieve 85% recovery (MWH/Stantec 2016), while the Demonstration Project assumed that a three-stage RO could achieve 92.5% recovery (CDM 2017).

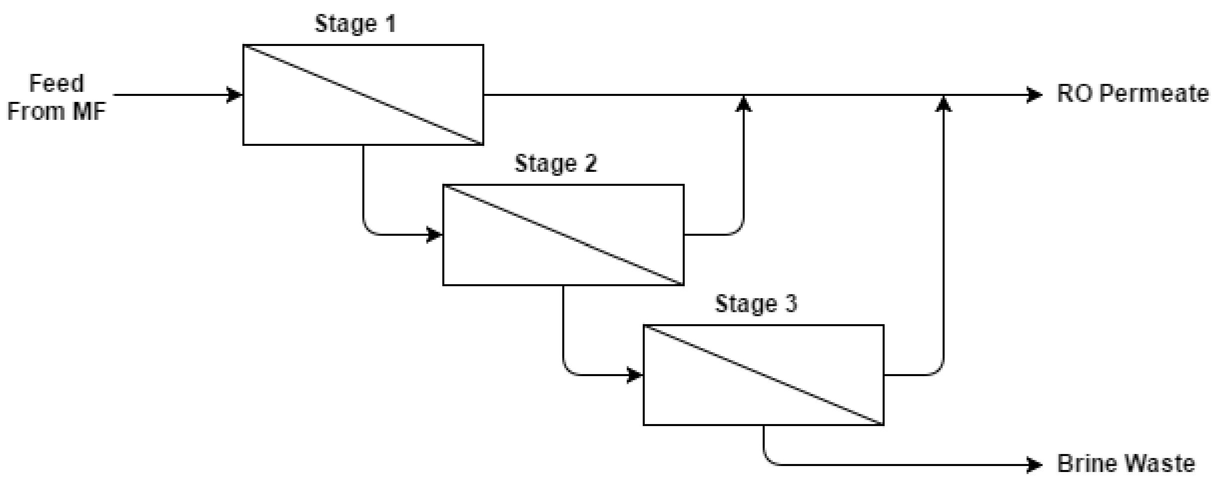


Figure 2: Multi-stage RO Brine Concentrator Schematic

The addition of the third RO is schematically simplistic, but requires additional equipment, process controls, and chemicals. Booster and brine recirculation pumps are needed to maintain required feed pressures, and feed and permeate flowrates. Due to the potential for increased membrane scaling in the second and especially third RO stages from concentrated calcium and silica, the distribution of pressure and flow within the membrane stages must be carefully controlled. Antiscalants would need to be added to control scaling, but dosing must be carefully monitored to prevent overdosing which can greatly reduce the membrane life.

2.3 Closed Circuit Reverse Osmosis (CCRO)

Desalitech offers a CCRO system that can recover over 95 percent of the water treated, minimizing water waste. Conventional RO systems recover the majority of the water in a single pass, which results in elements at the tail end of the system being exposed to the most concentrated water and higher degrees of membrane fouling and scaling. In certain conventional RO installations, these membranes are scaled so severely and frequently that they are regularly disposed of and replaced as opposed to being cleaned and returned to service. The CCRO semi-batch process recirculates the feed water until a target recovery is achieved, allowing the entire membrane surface to be exposed to similar salt concentrations, thereby minimizing the impact of localized scaling/fouling and increasing overall system recovery. Figure 3 shows a schematic of the Desalitech CCRO system treating brine from a conventional single-stage RO system.

In regard to CCRO operation, the concentrate from the CCRO system is recirculated to the front of the process using a recirculation pump. The concentrate is recirculated at a relatively high crossflow rate to minimize the accumulation of salts at the membrane surface, thereby minimizing the scaling potential and increasing the water flux. The CCRO system also adjusts the hydraulic operating pressure based on the osmotic pressure of the solution to maintain a lower and more consistent water flux resulting in reduced membrane fouling and more optimized energy use. During normal operation, the system operates at an equal feed and permeate flow. At a software-based setpoint, the system automatically flushes out the concentrate, and returns to normal operation mode. CCRO can achieve 75 - 95% recovery.

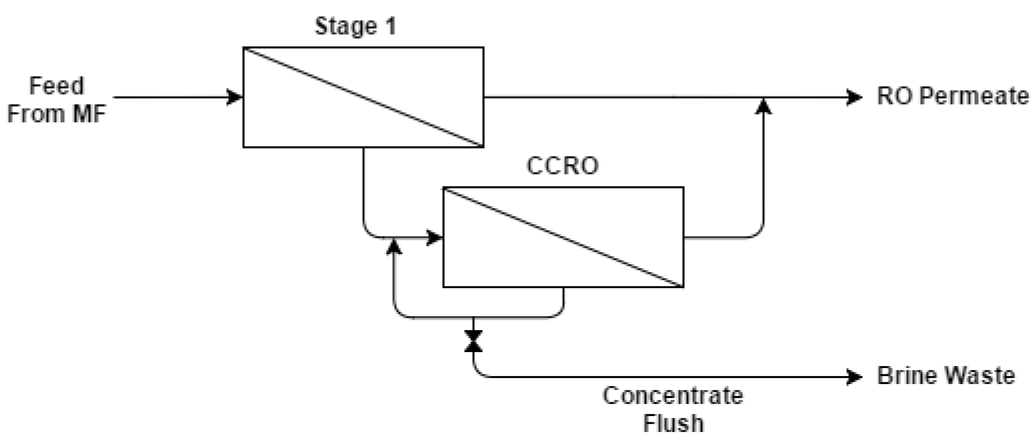


Figure 3: Closed Circuit Reverse Osmosis Schematic

Advantages of the CCRO system include lower energy consumption than traditional RO, operational flexibility, and potential for reduced usage of antiscalants. During a CCRO batch, the system is closed allowing pressure to buildup. Any pressure remaining after a pass is utilized in the next pass, resulting in less energy usage per pass. Antisclant is also retained during a batch minimizing the amount of scalant that must be added. When a batch is complete, both the pressure and scalant in the system is wasted and cannot be reused for the next batch. Modifying the number of passes in a batch allows the operator to control the percent recovery of the system. The main disadvantage of CCRO is the proprietary nature of the system.

2.4 Electrodialysis Reversal (EDR)

Electrodialysis (ED) is an electrically driven membrane process that uses direct-current (DC) voltage potential to drive ions through a semi-permeable membrane. The ED membrane stack (Figure 4) consists of hundreds of pairs of cation and anion selective membranes. As the source water flows parallel to the cation and anion membrane pairs, the potential gradient induces the cations to migrate toward the cathode through the cation membranes, and the anions to migrate toward the anode through the anion membranes. The cations and anions accumulate in the reject water side of the membranes, and low total dissolved solids (TDS) (and low ionic contaminant) product water is produced. In ED Reversal (EDR), the electric field polarity is regularly reversed to flush scale-forming ions off of the membranes and electrodes.

Unlike other membrane treatment processes such as RO and nanofiltration (NF), the EDR system product water does not pass through the semipermeable membrane. This reduces the potential for particulate fouling on the EDR membrane surface. However, as the process only removes cations and anions, product water from the system may still contain potentially harmful organic chemicals. This requires the product water from EDR to return to the head of the AWTF for further treatment. Depending on the current density, residence time, and feed water chemistry, water recovery can be between 70 and 90%. EDR is typically only used for lower TDS waters as cost increases with increased salinity.

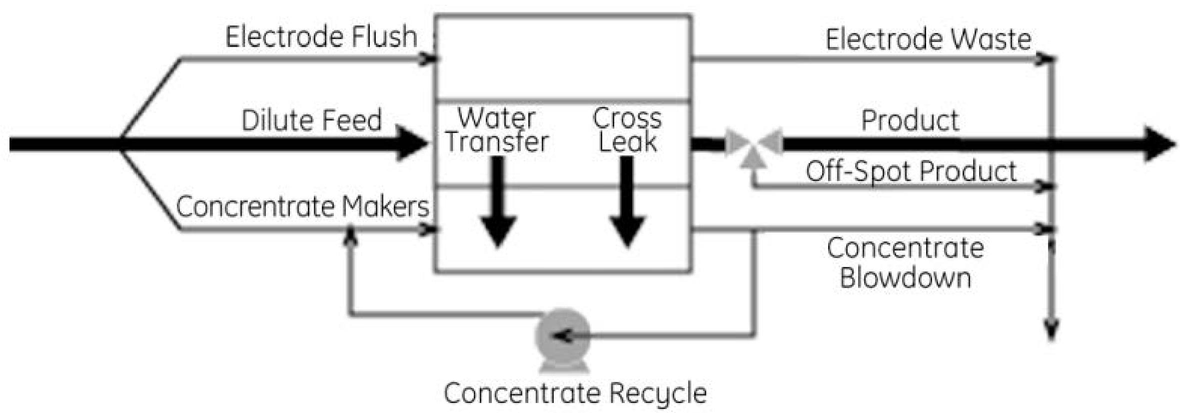


Figure 4: EDR System Schematic

2.5 Advanced Electrodialysis Reversal

Advanced electrodialysis reversal is similar to EDR, but operates on highly scaling and high TDS waters by modifying the properties of the membrane. For example, Saltworks Salt Splitter Stack uses a monovalent anion selective membrane with a monovalent cation selective membrane to remove sodium with sulfate and calcium with chloride to produce non-scaling waste streams which can be disposed (Figure 5). The product water from this process is fed to a RO membrane which can operate at higher recoveries (between 70% - 90%) due to the removal of the scalants.

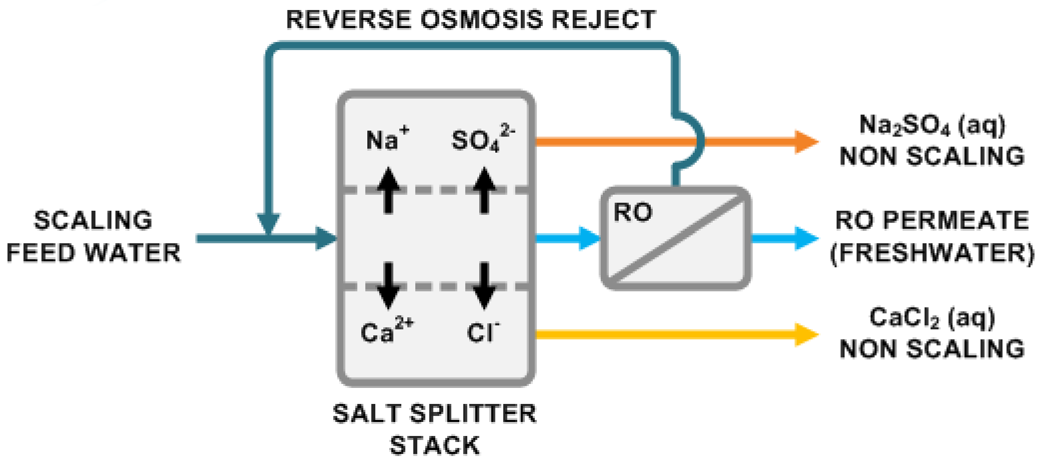


Figure 5: Advanced EDR Schematic

Advantages of this process are the reduction in chemical addition required to prevent scaling on the RO membrane and the high recoveries that can be achieved. Drawbacks include the complexities of operating two different technologies and the capital costs of purchasing both an EDR and RO system.

2.5 Brine Stabilization

In each brine minimization process, the concentration of particles can increase to the point of super saturation, resulting in particles precipitating out of solution. In zero liquid discharge (ZLD) processes, the precipitation of particles is the end goal. However, as the JPA has access to a regional brine line, the cost of ZLD is higher than brine reduction and discharge to the brine line. Once discharged from the brine minimization process, there is an offset in time before precipitation can begin. Once this time period ends, brine begins to precipitate in the line, resulting in clogging that can be difficult to identify the location of and costly to clean.

There are two primary approaches to brine stabilization to avoid participation in the brine line:

1. **Pretreatment:** One option to prevent precipitation in the brine line is pretreatment before brine minimization. Desalitech's ReFlow Closed Circuit MicroFiltration (CCMF) uses physical chemical preconditioning before a continuous feed, semi-batch microfiltration system. This process softens the water, lowering the TSS that reaches the RO membranes. Softening has the advantage of reducing the potential for super saturation in the RO brine effluent while also increasing the RO recovery rate.

2. **Chemical Addition/Control:** Another option is to carefully manage the chemical characteristics of the brine that is discharged by chemical addition and/or control of the system recovery. If the langelier saturation index (LSI) and pH are kept in the right ranges

along the brine line, precipitate would not form. This can be accomplished by dosing antiscalant based on the recovery rate, LSI, and pH of the process.

In both scenarios, the potential for precipitate to form in the brine line still exists. Both brine stabilization options would benefit from a monitoring program to detect the formation of scale. This can be done by conducting a mass balance between the start and end of the brine line. Any losses in the brine line mean scale is forming in the line and changes should be made to prevent further scaling from occurring. Further study of brine stabilization and precipitate monitoring should be conducted to fully evaluate the advantages and disadvantages of the options available.

3.0 Evaluation of Brine Minimization Technologies

This section describes the non-cost and cost factors used to evaluate brine minimization technologies.

3.1 Evaluation of Technologies using Non-cost Factors

Non-cost factors considered include the following:

i. **Experience, Installations, and Permitting:** This factor addresses maturity of the technology, number of statewide installations, and experience with similar technologies. It is assumed that permitting for proven technologies would be easier than for emerging technologies.

ii. **Ease of O&M:** This factor includes relative ease of operating and maintaining the treatment facilities for each option. Included in this factor is the amount of operator labor and frequency of maintenance activities for successful operation of the facilities.

iii. **Water Quality and Recovery:** This factor addresses the robustness of the technology to meet the treated water goals at desired water recovery rates.

iv. **Footprint and Constructability:** This factor addresses the overall footprint requirements for each technology and potential constructability issues that could arise at the well site, which is located in a highly developed area.

Qualitative scores for each of the non-cost factors were assigned to each of the technologies. Each technology was ranked as low, medium or high; with high indicating a more favorable view of the technology with respect to the factor and low indicating a less favorable view. Relative scores were assigned based on information provided by technology vendors as well as Kennedy/Jenks' experience. The results of the non-cost analysis are shown in Table 1 below:

Table 1: Comparison of Brine Minimization Technologies Using Non-Cost Factors

Technology	Multi-Stage Concentrator	CCRO	Electrodialysis Reversal	Advanced EDR
Brine Reduction/Recovery (range)	75 - 94%	75 - 95%	70% - 90%	70% - 90%
Experience, Installations, and Permitting	High	Medium	High	Low
Ease of O&M & Flexibility	Medium	High	Medium	Low
Water Quality	High	High	Medium	Medium
Footprint and Constructability	High	Medium	Low	Low
Non-Cost Ranking	**1**	**1**	**2**	**3**

Note: The 2-stage RO system associated with the Baseline option is excluded from this comparison because it is not considered a brine minimization technology.

EDR and advanced EDR scored low in water quality as these technologies do not provide a physical barrier and as such the water would be required to recirculate to the front of the plant for additional treatment. Advanced EDR was eliminated from further consideration because it scored lowest on non-cost factors and preliminary cost estimates indicated that it would not be cost-competitive with the other technologies. Although the standard EDR does not provide a physical barrier to some contaminants, it remained in the screening evaluation due to its low scaling potential and compatibility with low TDS feed waters. Two-stage reverse osmosis is not included in this table as it is not considered a brine minimization technology.

3.2 Evaluation of Technologies using Cost Estimates

The treatment cost was estimated for the remaining three brine minimization technologies and the baseline of no brine minimization. Capital and O&M costs, including chemical and electrical consumption, were compiled from vendor-provided information. Treatment cost estimates were developed based on the following assumptions:

- Only treatment costs directly associated with each treatment technology were included in the estimation. Other project costs including site civil; water quality testing and monitoring; land procurement; and construction costs were not included because they were assumed to be equal across technologies.
- Electrical costs: $0.13/kWh
- Influent design capacity flow rate to AWTF: 7.4 MGD
- Annual volume of influent based on seasonal operation: 3,648 acre-feet per year (AFY)

- Brine minimization feed: 1.76 MGD

Table 2 summarizes the assumed flow rates and recoveries for the baseline and each technology. Tables 3, 4 and 5 list capital and O&M costs, respectively.

Table 2: Comparison of Flow Rates and Recoveries

Technology	2-Stage RO (Baseline)	Multi-Stage Concentrator	Closed Circuit Reverse Osmosis	Electrodialysis Reversal
AWTF Influent (MGD)	7.4	7.4	7.4	7.4
MF Effluent at 95% Recovery (MGD)	7.03	7.03	7.03	7.03
Primary RO Recovery, Two-Stage (%)	75%	75%	75%	75%
Primary RO Permeate (MGD)	5.27	5.27	5.27	5.27
Primary RO Concentrate (MGD)	1.76	1.76	1.76	1.76
Secondary Recovery (%)	n/a	50%	80%	75%
AWTF Product Water (MGD)	5.27	6.15	6.68	6.59
RO Concentrate (MGD)	1.76	0.88	0.35	0.44
Net Plant Recovery	71%	83%	90%	89%
Total Produced Water (AF)	2,590	3,030	3,290	3,240
Brine Discharged (AF)	870	440	180	220

Table 3: Estimated Capital Costs (2018 dollars)

Technology	Unit	2-Stage RO (Baseline – No Brine Minimization)	Multi-Stage Concentrator	CCRO	EDR
RO + Brine Minimization Equipment Capital Cost[1]	($M)	$2.7	$3.4	$3.7	$3.9
Brine Line Diameter[2]	(in)	12	8	6	6
Brine Line Capital Cost[3]	($M)	$13.5	$9.8	$7.6	$7.6
Total Capital Costs	**($M)**	**$16.2**	**$13.2**	**$11.3**	**$11.5**

[1] Includes equipment purchasing only for RO and brine minimization systems.
[2] Brine line length was assumed to be approximately 12 miles, based on the average distance to the SMP along the southern alignment from Site A and F, being considered as part of the Title XVI Feasibility Study.
[3] Estimated $-inch-diameter linear foot of pipeline installed based on the BODR (MWH 2016) unit costs updated to 2018.

Table 4: Annual O&M Costs (2018 dollars)

Technology	Unit	2-Stage RO (Baseline – No Brine Minimization)	Multi-Stage Concentrator	CCRO	EDR
Energy Usage	($/yr)	$210,000	$140,000	$160,000	$410,000
Antiscalant	($/yr)	$63,000	$63,000	$63,000	$63,000
Membranes	($/yr)	$21,000	$26,000	$23,000	$66,000
Brine Discharge Fee[1]	($/yr)	$640,000	$340,000	$170,000	$200,000
Total Annual Cost	**($/yr)**	**$940,000**	**$570,000**	**$420,000**	**$740,000**

[1] Based on a brine discharge fee of $500/AF for 29.4% of brine "in the service area" and $750/AF for 70.6% of brine "out of the service area" plus a fixed fee of $45,000 per year per Resolution No. 1728: A resolution pursuant to Ordinance No. 19 establishing rates for discharge to the SMP.

A life cycle unit cost was developed based on the annualized capital cost plus annual O&M cost divided by the estimated project yield (i.e. product water produced). Capital costs, from Table 3, were annualized based on the following equation and assumptions.

$$\text{Annualized Capital Cost} = \text{Capital Cost} \times \frac{(i \times ((i+1)^n)}{(1+i)^n - 1}$$

Where: n = facility life of 20 years
i = interest rate of 3%

Table 5: Life Cycle Costs and Cost Ranking

Technology	Unit	2-Stage RO (Baseline – No Brine Minimization)	Multi-Stage Concentrator	CCRO	EDR
Annualized Capital Costs[1]	($M)	$1.1	$0.9	$0.8	$0.8
Annual O&M Costs[2]	($M)	$0.9	$0.6	$0.4	$0.7
Product Water Flow	(AFY)	2,590	3,030	3,290	3,240
Life Cycle Unit Cost	**($/AF)**	**$790**	**$490**	**$360**	**$470**
Cost Ranking		**3**	**2**	**1**	**2**

[1] Includes equipment purchasing for RO and brine minimization systems plus brine line capital costs.
[2] Includes energy, chemicals and replacement costs for RO and brine minimization systems plus annual brine discharge fees.

In Tables 2 and 3, the recoveries and capital costs for the three brine minimization technologies are very similar. However, due to the absence of key constituents in the water quality data, the recoveries could increase or decrease. Conducting additional analyses on silica and other constituents would help to narrow the recovery rates and differentiate the technologies. Compared to the base case of no brine minimization, although the brine reduction technologies increase capital cost, the overall cost decreases due to the reduction in the brine line size.

A similar analysis is shown in Table 4 regarding annual costs. Although energy usage, antiscalant, and membrane costs are higher for the brine minimization technologies, the reduced brine discharge fee, on a yearly basis, makes brine reduction a cheaper option. On an annual cost basis, EDR has a much higher energy usage than the other technologies.

Table 5 looks at the life cycle cost based on a twenty-year facility life with an interest rate of 3% and shows that CCRO is the most economical due to its lower energy cost followed by EDR and multi-stage concentrator. All three brine reduction technologies have lower capital costs due to the smaller brine line installation cost and lower brine discharge fee.

4.0 Summary and Findings

Four brine minimization technologies were reviewed against the baseline of no treatment: multistage concentrator, closed circuit reverse osmosis (CCRO), electrodialysis reversal (EDR), and advanced electrodialysis reversal (Advanced EDR). Advanced EDR was removed from the analysis due to its high capital cost and low ranking for non-cost factors. Standard EDR remained in the screening evaluation due to its low scaling potential and compatibility with low TDS feed waters. The remaining technologies were evaluated, and the overall results are presented in Table 6.

Table 6: Overall Rankings

Technology	2 Stage RO (Baseline)	Multistage Concentrator	CCRO	EDR
Non-Cost Ranking	1	1	2	2
Cost Ranking	3	2	1	2
Overall Ranking	**2**	**1**	**1**	**2**

Multistage concentrator and CCRO had the highest overall ranking followed by two stage RO and EDR. Multistage concentrator had the highest non-cost score due to its high score in experience, installations, and permitting while CCRO had the lowest cost ranking due to its low electricity usage.

Further analysis of these two technologies is recommended with a focus on balancing water recovery rates with brine stabilization to ensure no precipitation in the brine line occurs while brine fees are kept to a minimum. Finally, performing a detailed water quality analysis would improve the accuracy of the expected recovery rates, capital and operational costs, as well as potential issues and costs related to brine disposal in the SMP.

References

CDM Smith, 2017. Recycled Water Seasonal Storage Demonstration Project - Preliminary Design Report. Prepared for the Las Virgenes-Triunfo JPA. June 20, 2017.

MWH 2016. Recycled Water Seasonal Storage – Basis of Design Report (BODR). Prepared for the Las Virgenes Triunfo Joint Powers Authority. September 2016.

Appendix F: Initial Environmental Review

This appendix provides supporting information for the environmental considerations and potential effects as discussed in Section 7. The following documents are included herein:

- IPac Resource List Site A
- IPac Resource List Site F
- Draft Initial Study / Negative Declaration for Site A (Envicom 2017)

IPa **U.S. Fish & Wildlife Service** K

IPaC resource list - Site A

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information. K

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

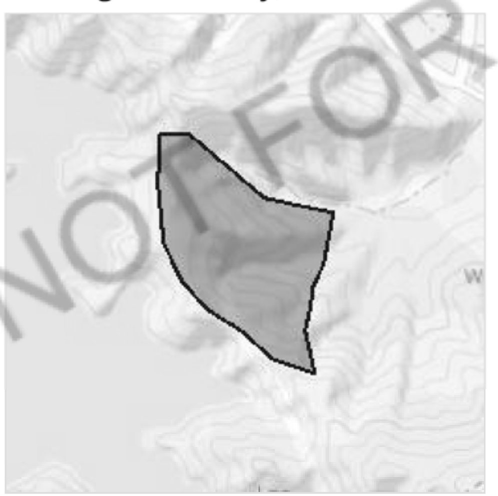
Project information

NAME

Las Virgenes Pure Water Project (Proposed Site A)

LOCATION

Los Angeles County, California



Local office

Ventura Fish And Wildlife Office K

(805) 644-1766
(805) 644-3958

2493 Portola Road, Suite B
Ventura, CA 93003-7726

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following: K

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. K Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds K

NAME	STATUS K

Coastal California Gnatcatcher *Polioptila californica californica* — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8178

Least Bell's Vireo *Vireo bellii pusillus* — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/5945

Southwestern Willow Flycatcher *Empidonax traillii extimus* — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6749

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Crustaceans

NAME	STATUS
Riverside Fairy Shrimp *Streptocephalus woottoni* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8148	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plan s

NAME	STATUS
Braunton's Milk-vetch *Astragalus brauntonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5674	Endangered

California Orcutt Grass Orcuttia californica | Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4923

Conejo Dudleya Dudleya abramsii ssp. parva | Threatened
No critical habitat has been designated for this species. K
https://ecos.fws.gov/ecp/species/4871

Gambel's Watercress Rorippa gambellii | Endangered K
No critical habitat has been designated for this species. K
https://ecos.fws.gov/ecp/species/4201

Lyon's Pentachaeta Pentachaeta lyonii | Endangered K
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/4699

Marsh Sandwort Arenaria paludicola | Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2229

Santa Monica Mountains Dudleyea Dudleya cymosa ssp. ovatifolia | Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2538

Spreading Navarretia Navarretia fossalis | Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1334

Verity's Dudleya Dudleya verityi | Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4342

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Lyon's Pentachaeta Pentachaeta lyonii https://ecos.fws.gov/ecp/species/4699#crithab K	Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing K appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/ K birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/ conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf K

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, clickKon the PROBABILITY OF PRESENCE SUMMARY at t K top of your listKto see when t ese birdK are most likeKy to be present and breeding in your project area. K

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS

ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Allen's Hummingbird Selasphorus sasin — Breeds Feb 1 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9637

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Costa's Hummingbird Calypte costae — Breeds Jan 15 to Jun 10
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9470

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Nuttall's Woodpecker P co es nu all — Breeds Apr 1 to Jul 2
his is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

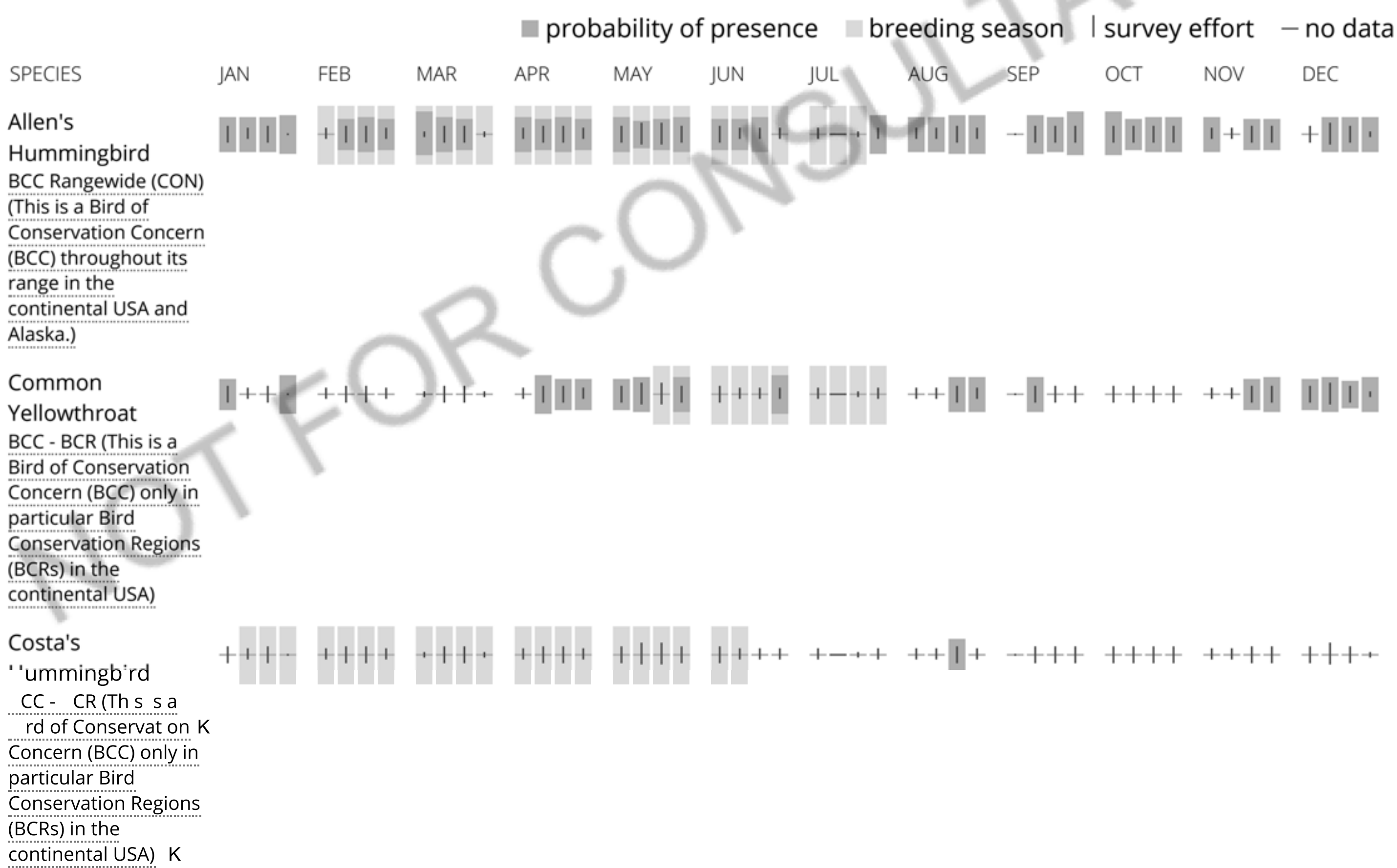
Breeding Season ( )
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

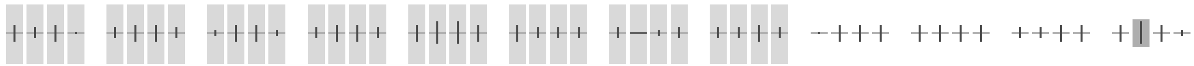
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

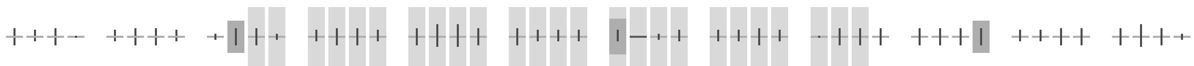
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



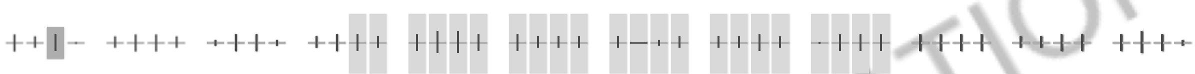
Golden Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Lawrence's Goldfinch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

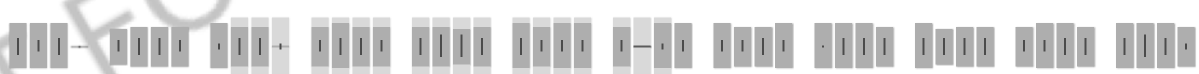


Lewis's Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



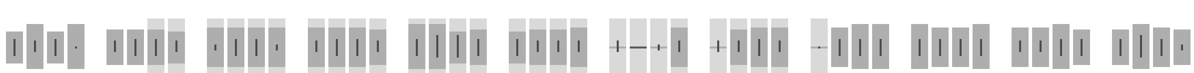
Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Oak Titmouse
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Rufous Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes rKeasures that can help avoid and minimize impacts to all birds at any K location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge NetworK (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

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How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird K on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range K anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit K the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Facilities

Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations K

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions K

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions K

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the K geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

IPaC **U.S. Fish & Wildlife Service** Z

IPaC resource list - Site F

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS Z office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

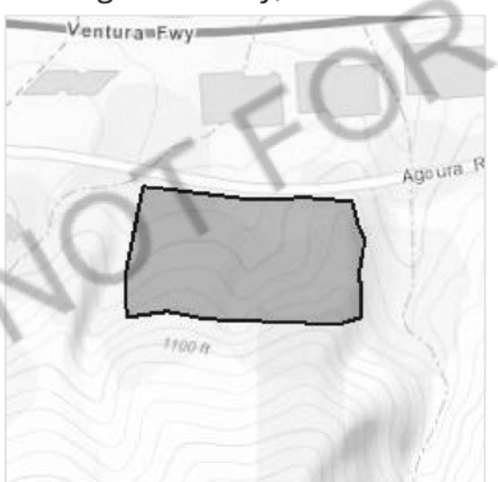
Project information

NAME

Las Virgenes Pure Water Project (Proposed Site F)

LOCATION

Los Angeles County, California



Local office

Ventura Fish And Wildlife Office Z

(805) 644-1766
(805) 644-3958

2493 Portola Road, Suite B Z
Ventura, CA 93003-7726 Z

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following: Z

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction. Z

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds Z

NAME	STATUS Z

Coastal California Gnatcatcher Polioptila californica californica — Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8178

Least Bell's Vireo Vireo bellii pusillus — Endangered

There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/5945

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered Z

There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6749

Amphibians

NAME	STATUS
California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Crustaceans

NAME	STATUS
Riverside Fairy Shrimp Streptocephalus woottoni There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8148	Endangered
Vernal Pool Fairy Shrimp Branchinecta lynchi There is **final** critical habitat for this species. Your locaZon is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

lowering Plants

NAME	STATUS Z
Braunton's Milk-vetch Astragalus brauntonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5674	Endangered Z

California Orcutt Grass Orcuttia californica — Endangered Z
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4923

Conejo Dudleya Dudleya abramsii ssp. parva — Threatened
No critical habitat has been designated for this species. Z
https://ecos.fws.gov/ecp/species/4871

Gambel's Watercress Rorippa gambellii — Endangered
No critical habitat has been designated for this species. Z
https://ecos.fws.gov/ecp/species/4201

Lyon's Pentachaeta Pentachaeta lyonii — Endangered Z
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/4699

Marsh Sandwort Arenaria paludicola — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2229

Santa Monica Mountains Dudleyea Dudleya cymosa ssp. ovatifolia — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2538

Spreading Navarretia Navarretia fossalis — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1334

Verity's Dudleya Dudleya verityi — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4342

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds Z

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing Z appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/ Z conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf Z

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITYZOF PREZSENCE SUMMARY at the top of yoZur list to see when theZse birds are most likely to be present and breeding in yoZur project area.

NAMZE Z	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES

THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.) Z

Allen's Hummingbird Selasphorus sasin — Breeds Feb 1 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9637

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Costa's Hummingbird Calypte costae — Breeds Jan 15 to Jun 10 Z
This is a Bird of Conservation Concern (BCC) only in particular Bird Z Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9470

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is Bird f C nserv ti n C ncern (BCC) nly in p rticul r Bird C nserv ti n egi ns (BC s) in the c ntinent l USA Z
https://ec s.fws.g v/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15 Z
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere Z

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5 Z

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA Z
https://ecos.fws.gov/ecp/species/4243

Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10 Z

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total n mber of s rvey events for that week. For example, if in week 12 there were 20 s rvey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season ( )

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

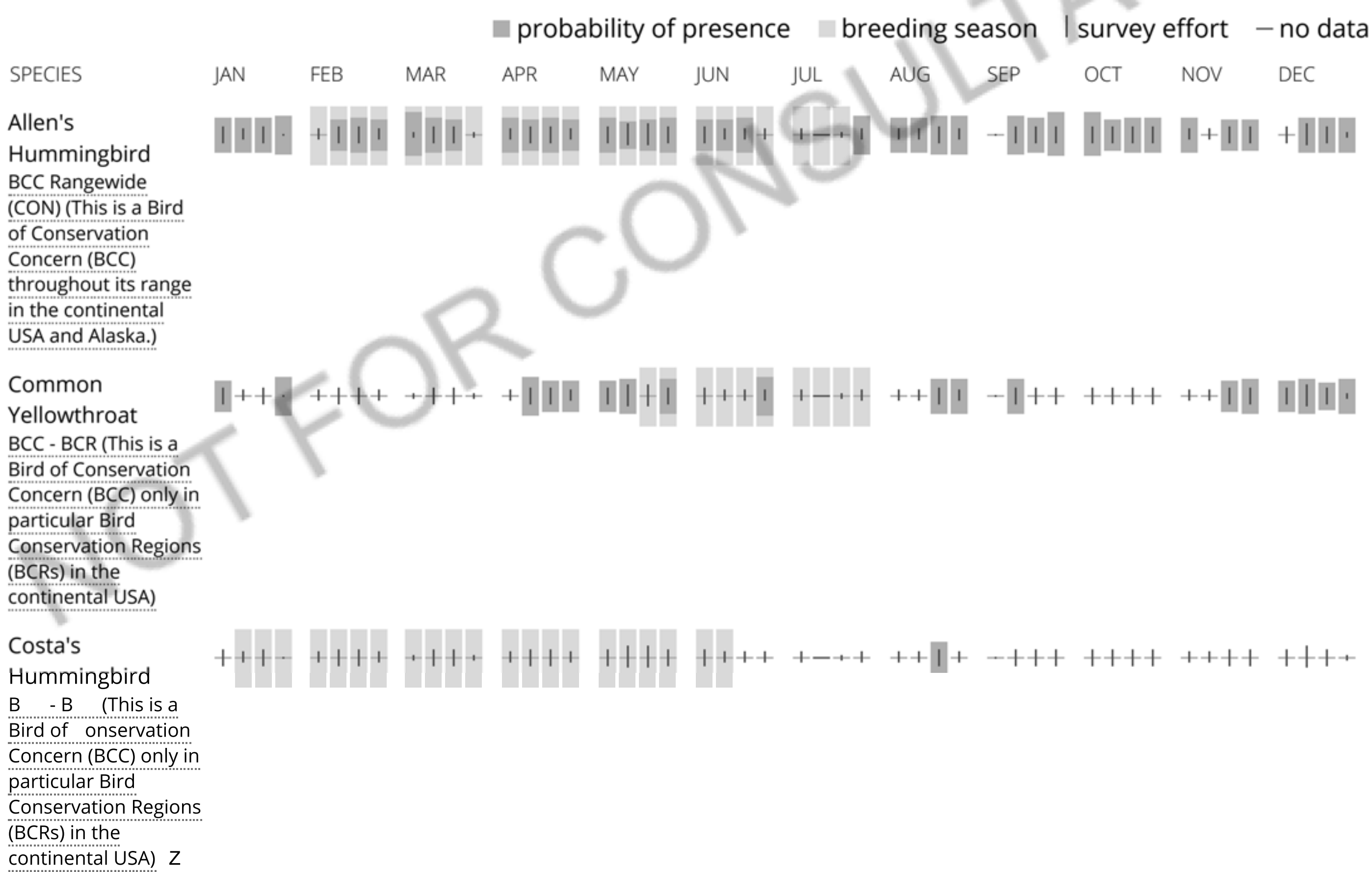
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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Spotted Towhee Z
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Wrentit
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Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

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How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds Z guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur Z in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

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1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range Z anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions Z

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

JPA Acquisition of:

30800 Agoura Road

Draft Initial Study/Negative Declaration

City of Agoura Hills

PREPARED FOR:
Las Virgenes - Triunfo Joint Powers Authority
4232 Las Virgenes Road
Calabasas, California 91302
Attention: John Zhao, Principal Engineer
(818) 251-2230

PREPARED BY:
envicom CORPORATION
4165 E. Thousand Oaks Blvd., Suite 290
Westlake Village, California 91362
Contact: Laura Kaufman, Director of Environmental Services
(818) 879-4700

July 2017

JPA ACQUISITION OF 30800 AGOURA ROAD PROJECT

DRAFT
INITIAL STUDY/NEGATIVE DECLARATION

Prepared for:

LAS VIRGENES-TRIUNFO JOINT POWERS AUTHORITY
4232 Las Virgenes Rd.
Calabasas, CA 91302
Contact: John Zhao, Principal Engineer
818-251-2230

Prepared by:

ENVICOM CORPORATION
4165 E. Thousand Oaks Blvd. Suite 290
Westlake Village, CA 91362
Contact: Laura Kaufman, Director of Environmental Services
818-879-4700

Reference: # 47-755-101

July 2017

SECTION

FIGURES

1.0 INTRODUCTION

The Las Virgenes Municipal Water District (LVMWD, or "District") and the Triunfo Sanitation District together form the Las Virgenes-Triunfo Joint Powers Authority (JPA), which is considering the purchase of the subject property located at 30800 Agoura Road in the City of Agoura Hills. The JPA, as lead agency, has conducted an Initial Study, pursuant to the California Environmental Quality Act (CEQA) Statute and Guidelines,[1] to determine the potential environmental impacts, if any, of the action.

CEQA REVIEW

The JPA, as lead agency under CEQA, has determined an Initial Study should be prepared to evaluate potential environmental impacts of this proposed action and determine the appropriate CEQA document to be prepared for the proposed purchase and maintenance of the property based on existing local conditions and applicable regulations. As lead agency, the JPA has assumed responsibility for preparing this document.

The term "project" has a specific meaning the CEQA context. The distinction between the everyday use of the term and the specific CEQA meaning is very important for determining whether an action is subject to CEQA compliance or not.[2] Section 15378 of the State CEQA Guidelines provides the following definition of a project:

> (a) "Project" means the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, and that is any of the following:
>
> > (1) An activity directly undertaken by a public agency including but not limited to public works construction and related activities clearing or grading of land, improvement to existing public structures, enactment and amendment of zoning ordinances, and the adoption and amendment of local General Plans or elements thereof pursuant to Government Code Sections 65100-65700.
> >
> > (2) An activity undertaken by a person which is supported in whole or in part through public agency contacts, grants subsidies, or other forms of assistance from one or more public agencies.
> >
> > (3) An activity involving the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.

Section 15378(b) of the State CEQA Guidelines clarifies what a project does not include. Because Section 15378(b) of the State CEQA Guidelines does not explicitly exclude the purchase of property from the definition of a project, the JPA has prepared this Initial Study to evaluate potential environmental impacts, if any.

SITE HISTORY

The site is the location of the previously proposed Park at Ladyface Mountain Senior Apartments project,[3] which would have developed a 46-unit senior housing apartment complex on the site. On September 1, 2016, the City Planning Commission held a public hearing on the previously proposed project to consider

[1] California Public Resources Code, Division 13. Environmental Quality, Section 21000 et seq., California Environmental Quality Act (CEQA); and California Code of Regulations, Title 14, Guidelines for the Implementation of the California Environmental Quality Act, Section 15000 et seq., (State CEQA Guidelines).

[2] Craig Stevens and Nisha Chauhan, California Association of Environmental Professionals, CEQA Portal Topic Paper, Project Description, 3/23/2016, accessed May 19, 2017, at https://ceqaportal.org/topic_papers.cfm

[3] Case Nos. GPA-01219-2016; 08-SPA-001; 08-CUP-001; SIGN- 01270-2016; 08-VAR-002(A, B & C); 08-OTP-004; and VTTM 71742.

the project, which would have required multiple City approvals including a General Plan Amendment and Zoning Change. Following the closure of the public hearing, the applicant, Agoura Hills Center Properties, LLC, withdrew the project applications and no action was required of the Planning Commission.

The JPA is now considering purchase of the subject property. While this property is one of several sites that may be needed for a future water supply project, the selection of this site and the proposed components and potential design of the facilities are not currently known. Therefore, this Initial Study considers the only the potential purchase of the property. The Fire Department requires fuel modification and brush clearance on the project site, which would continue with the JPA purchase of the property. These activities are collectively referred to as “maintenance” in this document. Should the JPA approve the purchase and propose water supply facilities on the site, additional CEQA review would occur at the time the plans are proposed, to determine the type of CEQA documentation warranted.

2.0 FINDINGS OF THIS INITIAL STUDY

The JPA finds that based on the Initial Study/Environmental Checklist and the accompanying discussion provided in Section 4.0, the proposed purchase and continued fuel modification and brush clearance of the subject property would have no significant adverse effect on the environment regarding the environmental factors listed below and no mitigation measures would be required. The following Initial Study/Environmental Checklist indicates potential for the purchase and maintenance of the subject property to result in environmental impacts with a brief explanation of how the significance of potential impacts was determined for each issue area. For each issue addressed in Section 4.0, the purchase and continued fuel modification and brush clearance of the subject property has been determined to have "No Impact;" therefore, no mitigation measures would be required and the JPA has prepared this Negative Declaration. Future projects on the subject property would be reviewed under separate CEQA analysis.

3.0 PROJECT DESCRIPTION

The JPA is considering the purchase and routine maintenance of the property located at 30800 Agoura Road ("subject property") in the City of Agoura Hills ("City"), California. Routine maintenance consists of the continuation of existing fuel modification and brush clearance on the subject property as required by the County of Los Angeles Fire Department. The JPA is considering purchase of the property as one of several potential sites for facilities that may be needed for a future water supply project. The future use and improvements of the property are currently unknown, and would therefore be covered under separate CEQA review. The scope of this CEQA analysis is limited to the purchase of the property and continued fuel modification and brush clearance of the current undeveloped condition of the subject property ("site").

3.1 SITE LOCATION AND EXISTING LAND USES

The subject property is located at 30800 Agoura Road within the western portion of the Ladyface Mountain Specific Plan between Reyes Adobe Road and the westerly City limits on the south side of Agoura Road. Regionally, the City is located in the eastern Conejo Valley between the Simi Hills and Santa Monica Mountains in western Los Angeles County as shown in **Figure 1, Regional Location Map**. The site is located in Township 1 North, Range 18 West of the U.S. Geological Survey (USGS) Thousand Oaks Quadrangle 7.5-Minute Series (Topographic) Map as shown in **Figure 2, Local Setting Map**. U.S. Highway 101 is approximately 650 feet north of the site.

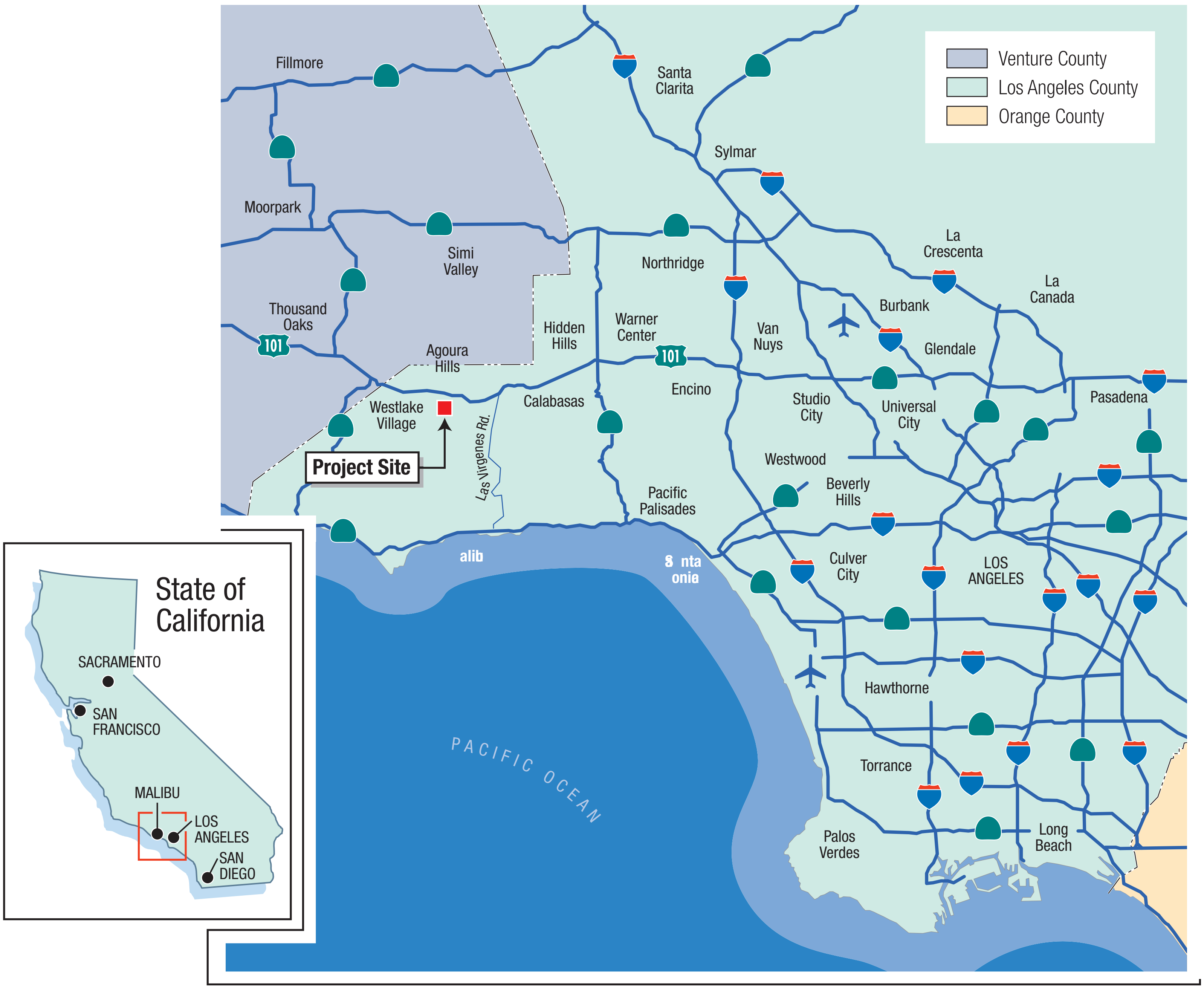
The subject property consists of a 7.1-acre vacant parcel, Assessor Parcel Number (APN 2061-001-025). **Figure 3, Site Boundaries - Fuel Modification and Brush Clearance**, provides an aerial photograph of existing conditions at the site. Existing fuel modification and brush clearance would continue over portions of the site (i.e., the frontage along Agoura Road and discing the western portion of the site adjacent to the Lexington Apartments to the west), as required by the Los Angeles County Fire Department and shown in Figure 3, Site Boundaries - Fuel Modification and Brush Clearance. The existing condition of the subject property is vacant land with oak trees, native vegetation, and non-native vegetation. An undeveloped parcel is located adjacent to the east of site, with the Conrad N. Hilton Foundation headquarters to the east of that property. An office building with associated surface parking is located north the site across from the site frontage along Agoura Road. The Lexington Apartments are adjacent to the site's western boundary. Undeveloped open space in the foothills of Ladyface Mountain lies to the south.

The City provides development guidance through General and Specific Plans as well as zoning. The following classifications are provided for the site:

- **Existing General Plan Designation:** Planned Development (PD) District
- **Existing Zoning:** Planned Development (PD) – Ladyface Mountain Specific Plan
- **Ladyface Mountain Specific Plan**

PROJECT COMPONENTS

The proposed activity is limited to the JPA's purchase of the subject property and routine maintenance of the site in the current, undeveloped condition and the existing General Plan Designation and Zoning. Maintenance would consist of fuel modification and brush clearance as previously approved and required by the Los Angeles County Fire Department. In Los Angeles County, abatement of hazardous vegetation (weeds and brush) is a joint enforcement and clearance effort between the County Departments of Fire and the Agricultural Commissioner/Weights and Measures (ACWM). Generally, fuel modification refers to the thinning or removal of flammable vegetation around habitable structures to create defensible space and



JPA AQ IS T ON OF 30800 AGOURA ROAD

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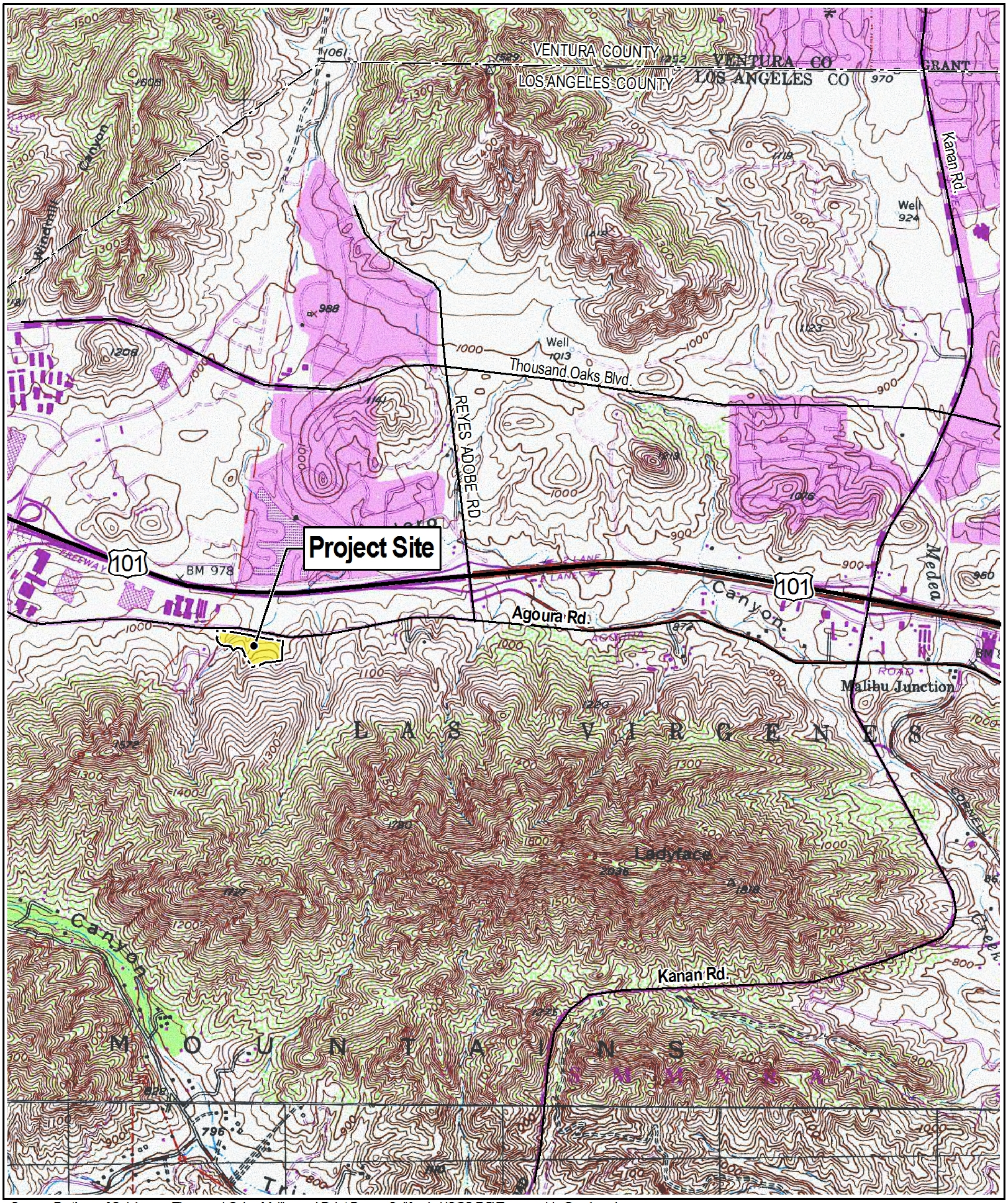
FIGURE 1



Source: Portions of Calabasas, Thousand Oaks, Malibu and Point Dume, California USGS 7.5' Topographic Quadrangle maps.

JPA ACQUISITION OF 30800 AGOURA ROAD

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Local Setting Map

0 1,000 2,000 Feet

FIGURE 2

Source: GoogleEarth Pro, Oct. 2, 2016.

JPA ACQUISITION OF 30800 AGOURA ROAD

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Site Boundaries - Fuel Modification and Brush Clearance

0 100 200 Feet

FIGURE 3

is required by the County Fire Department.[4] Brush clearance refers to the removal of hazardous vegetation (weeds and brush), often along the shoulders fire access roads. Given there is no existing or proposed habitable structure on the subject property, the continuation of brush clearance would be carried out by the property owner or ACWM. Brush clearance would extend 10 feet from Agoura Road and up to 200 feet from the existing Lexington Apartments on the adjacent property as shown in Figure 3, Site Boundaries – Fuel Modification and Brush Clearance.

No physical changes to the site (e.g., grading, landscaping, drainage facilities, hardscape, buildings, structures, parking, signage, or other amenities) are proposed.[5] The purchase and continued fuel modification and brush clearance of the site would result in no oak tree encroachments or removals. Further, no discretionary approvals, aside from the decision by the Las Virgenes-Triunfo JPA to approve the purchase, would be required. As the purchase and continued fuel modification and brush clearance of the site would maintain the subject property in the existing condition, the JPA would not request any approvals from the City for the purchase of the site. Future projects on the subject property would be reviewed under separate CEQA analysis.

3.2 REQUIRED APPROVALS

The purchase and continued fuel modification and brush clearance of the site may require the following approvals from the following agencies:

- Las Virgenes-Triunfo JPA - Approval of site purchase.

3.3 OBJECTIVE

The objective for the for purchase and maintenance of the site is as follows:

- Purchase and maintain the subject property in the property's existing vacant condition.

[4] County of Los Angeles Fire Department Forestry Division, A Firewise Landscape Guide for Creating and Maintaining Defensible Space, 2011, accessed May 10, 2017, at: https://www.fire.lacounty.gov/wp-content/uploads/2014/02/Fuel-Modification-Plan-Guidelines-8-10-11.pdf

[5] LVMWD, John Zhao, Principal Engineer, Email correspondence with Envicom Corporation, May 17, 2017.

4.0 INITIAL STUDY / NEGATIVE DECLARATION

Las Virgenes Municipal Water District Joint Powers Authority

CALIFORNIA ENVIRONMENTAL QUALITY ACT
INITIAL STUDY AND CHECKLIST

1. **Project title:**
Las Virgenes-Triunfo JPA Acquisition of 30800 Agoura Road

2. **Lead agency name and address:**
Las Virgenes-Triunfo JPA
c/o Las Virgenes Municipal Water District Facilities & Operations Office
4232 Las Virgenes Rd.
Calabasas, CA 91302

3. **Contact person and phone number:**
John Zhao, LVMWD, Principal Engineer
818-251-2230

4. **Project location:**
30800 Agoura Road
Agoura Hills, CA 91301

5. **Project sponsor's name and address:**
Las Virgenes-Triunfo JPA
c/o Las Virgenes Municipal Water District Facilities & Operations Office
4232 Las Virgenes Rd.
Calabasas, CA 91302

6. **General plan designation:**
Planned Development District

7. **Zoning:**
Ladyface Mountain Specific Plan - PD

8. **Description of project:**
Purchase and continue existing routine fuel modification and brush clearance at the subject property. See Section 2.0 above for details.

9. **Surrounding land uses and setting:**
The subject property lies within the Ladyface Mountain Specific Plan area. Surrounding land uses are as follows: to the north, Agoura Road and existing commercial office buildings with surface parking lots; to the east, an undeveloped vacant parcel and the Conrad N. Hilton Foundation headquarters; to the south, vacant open space within the Ladyface Mountain Specific Plan; and to the west, the Lexington Agoura Hills Apartments.

10. **Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.):**
None.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would not be potentially affected by the proposed purchase and maintenance of the site, as indicated by the checklist on the following pages no environmental factors would be potentially affected.

☐	Aesthetics	☐	Agriculture and Forestry Resources	☐	Air Quality
☐	Biological Resources	☐	Cultural Resources	☐	Geology /Soils
☐	Greenhouse Gas Emissions	☐	Hazards & Hazardous Materials	☐	Hydrology / Water Quality
☐	Land Use / Planning	☐	Mineral Resources	☐	Noise
☐	Population / Housing	☐	Public Services	☐	Recreation
☐	Transportation/Traffic	☐	Tribal Cultural Resources	☐	Utilities / Service Systems
☐	Mandatory Findings of Significance				

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☒ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed Project. Therefore, an EIR Addendum will be prepared.

________________________________ Date:

Signature

____

Name and Title

Las Virgenes Municipal Water District, for Las Virgenes-Triunfo JPA

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
I.	**AESTHETICS.** Would the project:				
a.	Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b.	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a scenic highway?	☐	☐	☐	☒
c.	Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d.	Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

a-c. **No Impact**. The 7.1-acre site is located within the western portion of the Ladyface Mountain Specific Plan Area in the northern foothills of Ladyface Mountain within the City, which is located in the eastern Conejo Valley between the Simi Hills and the Santa Monica Mountains in western Los Angeles County. The areas to the south and east of the site are vacant. The northern site boundary fronts Agoura Road. The topography of the subject property has an average slope of 16 to 20 percent, rising from an elevation of approximately 950 feet above mean sea level (msl) at the northerly property line to about 1,015 feet above msl at the southern property line. Gradually steepening foothills on the northwestern side of Ladyface Mountain are visible through the site to the south. The existing general appearance of the site includes riparian, grassland, and oak woodland vegetation. The site is approximately 650 feet south of a portion of United States Highway (U.S.) 101 eligible for designation as a State scenic highway but has not been designated as such by the County of Los Angeles General Plan.[6] Existing business park development and vegetation on the north side of Agoura Road obstruct southward directed views from U.S. 101 toward the site. The City's General Plan identifies Agoura Road as a "valuable scenic resource" that provides scenic views of Ladyface Mountain. Southward views of the site from Agoura Road are characterized by rolling grassland, mature oak woodland, and riparian areas. The Ladyface Mountain Specific Plan states that the existing oak trees "contribute to the natural beauty of the Ladyface Mountain setting."[7] The existing visual character of the site in southward directed views from Agoura Road consists of open space on the slopes of Ladyface Mountain in the background.

Consistent with existing conditions, the flammable brush along the Agoura Road frontage and up to 200 feet from the Lexington Apartments would be periodically cleared as required by the County of Los Angeles Fire Department. Continuation of this existing brush clearance is not a changed condition, and this action would nevertheless have no impact on scenic resources or the existing visual character at the site. Given the purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site, there would be no impact on scenic vistas, scenic resources, or visual character.

d. **No Impact**. The purchase and continued fuel modification and brush clearance of the site does not propose any reflective surfaces or lighting that could create a new source of substantial light or glare which could adversely affect day or nighttime views in the area. Therefore, the purchase and continued fuel modification and brush clearance of the site would have no lighting or glare impacts.

---

6 County of Los Angeles General Plan, Fig. 9.7, Scenic Highways, Department of Regional Planning, March 2017.
7 City of Agoura Hills Planning Department, Ladyface Mountain Specific Plan, pg. 18.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
II. AGRICULTURE AND FORESTRY RESOURCES. Would the project:				
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b. Conflict the existing zoning for agricultural use, or a Williamson Act Contract?	☐	☐	☐	☒
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

a-e. **No impact**. The site is not used for agricultural or farmland purposes and does not contain forest lands. The site does not contain Prime Farmland, Unique Farmland, or Farmland of Statewide Importance.[8] The site is zoned for Planned Development, not agricultural use. The City does not have agricultural zoning or Williamson Act Contract land. There would be no conflict with zoning for agricultural use or with a Williamson Act contract and the purchase and continued fuel modification and brush clearance of the site would not convert agricultural lands to non-agricultural use. The site does not contain forest land and therefore could not convert forest land to non-forest use. Therefore, there would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
III. AIR QUALITY. Would the project result in:				
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒

[8] California Department of Conservation, Farmland Mapping and Monitoring Program, Los Angeles County Important Farmland Map, 2014, http://www.conservation.ca.gov/dlrp/fmmp/Pages/LosAngeles.aspx, accessed May 9, 2017.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
c.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d.	Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e.	Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

a-e. No Impact. The site is within the South Coast Air Basin ("Basin") under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The SCAQMD is required to monitor air pollutant levels to ensure compliance with state and federal air quality standards and, if standards are not met, to develop compliance strategies. Although the Basin is classified as being in "nonattainment" of the ozone and two of the Particulate Matter (PM) 2.5 standards, the Air Quality Management Plan provides the latest control strategies to achieve attainment as expeditiously as practicable.[9]

Because no construction is proposed and no change in operating conditions would occur, the purchase and continued fuel modification and brush clearance of the site would not create a change in emissions. Therefore, the purchase of the property would have no impact with regard to SCAQMD construction or operational thresholds or on the attainment status of the Basin. There would be no impact on air quality.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
IV.	**BIOLOGICAL RESOURCES.** Would the project:				
a.	Have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b.	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in the City or regional plans, policies, regulations by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c.	Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒

9 South Coast Air Quality Management District, "Clean Air Plans," http://www.aqmd.gov/home/library/clean-air-plans (accessed May 9, 2017).

d.	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f.	Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?	☐	☐	☐	☒

a. **No Impact.** Based on the previously prepared biological resource technical studies on file with the City[10], there are 27 special-status species (meeting the definition of special-status for CEQA analysis), consisting of 13 plants and 14 animals, within the five-mile radius of the site. The subject property includes the following vegetation types:

- Annual Grasslands dominated by non-native grasses and forbs, with scattered native species, covers the majority of the site.
- Valley Oak Woodland, generally along the southern portion of the site and the drainage adjacent and to the west of the proposed Building B.
- Coast live oak woodland in the southern portion of the site.
- Willow riparian woodland (*Salix* spp.) surrounding the most prominent on-site drainage (i.e., the blue-line stream).
- Coastal sage scrub and shrubland patches dominated by California sagebrush (*Artemesia californica*) and California buckwheat (*Eriogonum fasciculatum*) within and along the southern property line.

A total of 130 vascular plant species were identified during surveys of the site. Eighty-seven of the plants observed were naturally occurring native species and 43 were non-native or introduced, representing moderate diversity of native species and a significant proportion of non-natives. Most special-status plant species known to occur in the region are precluded from occurring at the site due to lack of suitable habitat. Also, given the intensity and correct timing of the 2014 rare plant survey and 2013 springtime field survey, as well as the negative results of prior surveys of the site by in November 2010, October 2010, and June 2006, most potentially occurring species can be confirmed as absent or their potential for occurrence is low.

Most special-status plant species known to occur in the region are precluded from occurring at the site due to lack of suitable habitat. Other than the Ojai navarretia, no other special-status plant species are known to occur or are expected to occur at the site, based on a potential for occurrence analysis and the negative results of spring botanical surveys of the site conducted in 2014, 2013, and 2006. However, rare plant surveys conducted in 2014 detected 181 individual Ojai navarretia plants on the subject property. This species was placed on the California Native Plant Society's List as 1B.1 (Very Threatened), in April 2008, and remains on the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) list as Rare Plant Rank 1B.1 (April 2016). The soils in area likely contain Ojai navarretia seed in the seed bank, and the number above ground plants is anticipated to vary each season depending on growing conditions. Based on the 2014 survey, the Ojai navarretia are outside the

[10] Biological Resources Inventory and Impact Analysis, Envicom Corporation, July 31, 2013, letter report, May 2014, Oak Tree Report, The Oak Collaborative, September 2013.

200 foot fuel modification zone associated with the existing Lexington Apartments and the 10 foot brush clearance along Agoura Road.

No wildlife species listed as Endangered, Threatened, California Fully-Protected, or as a California Species of Special Concern have been observed during previous biological surveys of the site. The Biological Resources Inventory and Impacts Analysis found that 32 special-status animals, including four reptiles, 17 birds, and 11 mammals were determined to have at least some potential to occur at the site with varying probabilities ranging from high to very low.

The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site, existing brush clearance would continue 10 feet from the site frontage with Agoura Road and up to 200 feet from the existing Lexington Apartments on the adjacent parcel to the west. Previous approval for the Lexington Apartments and the Agoura Road Widening project established the existing fuel modification areas.[11] Existing fuel modification would not change with the JPA's purchase of the property, therefore the proposed purchase of the property would have no impact with regard to removal of vegetation.

b. **No Impact**. The subject property contains Nine native and two non-native plant communities and CDFW jurisdictional areas. There are three natural drainages (Drainages 1, 2, and 3), a man-induced or man-made drainage (Drainage 4), and a man-induced seasonal wetland. Only Drainage 1, which is identified as a "blue-line" stream on the 7.5 USGS Thousand Oaks quadrangle map, contains significant riparian habitat. The Biological Resources Inventory and Jurisdictional Delineation identified this riparian habitat as Red Willow – Arroyo Willow/Mulefat Woodland (*Salix laevigata – Salix lasiolepis/Baccharis salicifolia*), a California Department of Fish and Wildlife Natural Community of Special Concern (Envicom, 2013). The southern extent of Drainage 1 is within the 200-foot fuel modification limits extending on to the site from the existing Lexington Apartments on the adjacent parcel to the west. Existing fuel modification activity would not change with the JPA's purchase of the property, therefore the proposed purchase of the property would have no impact with regard to CDFW jurisdictional areas.

c. **No Impact.** Jurisdictional areas include three natural drainages (Drainages 1, 2, and 3), a man-induced drainage (Drainage 4), and a man-induced seasonal wetland associated with Drainage 2. Given the proximity of the seasonal wetland adjacent to Agoura Road and the completion of the Agoura Road Widening project in 2016, the continuation of brush clearance within 10 feet south of Agoura Road could affect vegetation within the seasonal wetland. Such periodic impacts would not involve the direct removal, filling, or hydrological interruption of the wetland, would not constitute substantial adverse effects. Given that the continuation of the existing brush clearance along the Agoura Road frontage would not change with the JPA's purchase of the property, the proposed purchase of the property would have no impact with regard to federally protected wetlands.

d. **No Impact**. The term wildlife corridor describes physical connections that allow wildlife to move between areas of suitable habitat in both undisturbed landscapes or landscapes fragmented by urban development. The site lacks aquatic habitat for the movement of migratory fish species. The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site and would therefore have no impact on the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors.

e. **No Impact**. Oak trees are present on the subject property. Although oak trees meeting the criteria specified in the City's Oak Tree Preservation Ordinance are protected, the purchase and continued

[11] Documents available upon request from the City Planning Department.

fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site, involve no oak tree removals or encroachments, and would therefore not conflict with any local policies or ordinances protecting biological resources.

f. **No Impact**. There are no habitat conservation plans that apply to the site.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
V. CULTURAL RESOURCES: Would the project:				
a. Cause a substantial adverse change in significance of a historical resource as defined in CEQA Section 15064.5?	☐	☐	☐	☒
b. Cause a substantial adverse change in significance of an archaeological resource pursuant to CEQA Section 15064.5?	☐	☐	☐	☒
c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒

a-d. **No Impact**. The site is vacant and does not contain historical resources or known archaeological or paleontological resources, unique geologic features, or human remains.[12] The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site and would therefore have no impact on potential archaeological or paleontological resources, unique geologic features, or human remains.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
VI. GEOLOGY AND SOILS. Would the project:				
a. Exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:				
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii. Strong seismic ground shaking?	☐	☐	☐	☒
iii. Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv. Landslides?	☐	☐	☐	☒
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒

[12] Phase I Archaeological Survey, W & S Consultants, August 2000, and Phase II Archaeological Test Excavation, January 2001.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
d.	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e.	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

a. i-iv. No Impact. The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site and would therefore have no impact with regard to exposure of people or structures to potential substantial adverse effects involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure including liquefaction, or landslides.

b. No Impact. The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site and would therefore have no impact with regard to substantial soil erosion or the loss of topsoil.

c-d. No Impact. The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site, proposes no structural development, and would therefore have no impact with regard to soil stability or expansiveness.

e. No Impact. The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the vacant site, does not propose use of a septic system, and would therefore have no impact regarding septic tank or alternative wastewater disposal system use.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
VII.	**GREENHOUSE GAS EMISSIONS.** Would the project:				
a.	Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☒
b.	Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

The City is within the South Coast Air Basin under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The SCAQMD has not adopted GHG emissions thresholds that apply to land use projects where the SCAQMD is not the lead agency and the City has not adopted any specific GHG emissions reduction plan or GHG emissions thresholds. Therefore, any potential future development would be evaluated based on the SCAQMD's recommended and preferred option threshold for all land use types of 3,000 metric tons $C0_2E$ per year, which has been used in past CEQA analyses prepared for projects in the City.[13]

[13] South Coast Air Quality Management District, Interim CEQA GHG Significance Threshold for Stationary Sources, Rules and Plans, December 5, 2008, accessed May 10, 2017, at: http://www.aqmd.gov/docs/default-source/ceqa/handbook/greenhouse-gases-(ghg)-ceqa-significance-thresholds/ghgboardsynopsis.pdf?sfvrsn=2

a-b. No Impact. The purchase and continued fuel modification and brush clearance of the site would maintain existing conditions at the vacant site that include the use of machinery for routine fuel modification and brush clearance. Such routine maintenance would be infrequent, small in scale, and a continuation of existing conditions. Given that the purchase of the subject property would not generate new vehicle trips from new construction and does not propose any building floor space, construction and operational emissions cannot be estimated and would be limited to the periodic use of machinery for brush clearance. Such periodic use of machinery for routine maintenance would not generate greenhouse gas emissions that may have a significant impact on the environment or conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. Therefore, the purchase and continued fuel modification and brush clearance of the site would have no impact from greenhouse gas emissions.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
VIII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for the people residing or working in the area?	☐	☐	☐	☒
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

a-c. **No Impact**. The purchase and continued fuel modification and brush clearance of the site would maintain existing conditions. The ownership of the site would not involve the routine transport, use, or disposal of hazardous materials, the release of hazardous materials into the environment, or the emission or handling of hazardous or acutely hazardous materials; there are no existing or planned schools within one-quarter mile of the subject property. Therefore, the purchase and continued fuel modification and brush clearance of the site would have no impact regarding hazardous materials.

d. **No Impact**. No known sites contaminated with hazardous materials are located near the site.[14] No Superfund sites are located within one mile of the site and no properties that contain potential or recognized contamination with hazardous materials are located within one-quarter mile of the site. Furthermore, no underground or aboveground storage tanks observed on-site. To validate these results from 2000, the following databases were consulted in May of 2017 for known hazardous materials contamination near the site:

- Superfund Enterprise Management System (SEMS) database;
- State Water Resources Control Board's GeoTracker database;
- Department of Toxic Substances Control's EnviroStor database; and
- California Environmental Protection Agency's "Cortese" list.

Consistent with the findings of the Phase I ESA, no listed sites on these databases occur within one-quarter mile of the site. Therefore, the site would not be located on a site included on a list of hazardous materials sites, there would be no impact.

e-f. **No Impact.** The site is not located within an airport land use plan and is not within the vicinity of an airport or private airstrip, therefore, the purchase and continued fuel modification and brush clearance of the site would have no impact.

g. **No Impact.** The continued fuel modification and brush clearance of existing site conditions would not impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan. There would be no adverse effects.

h. **No Impact.** Although the City is located in a High Fire Hazard Severity area, the purchase and continued fuel modification and brush clearance of the site would maintain the existing vacant site and does not propose any structures. Routine site maintenance would include the continuation of fuel modification and brush clearance to reduce wildland fire risks; therefore, the purchase and maintenance of the site would have no impact with regard to wildland fires.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
IX. HYDROLOGY AND WATER QUALITY. Would the proposal result in:				
a. Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒

[14] Phase I Environmental Site Assessment, APN# 2061-001-025 and 30800 Block of Agoura Road, Agoura Hills, California, Gorian & Associates, Inc., October 2000.

b.	Substantially deplete groundwater supplies or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned land uses for which permits have been granted)?	☐	☐	☐	☒
c.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off site?	☐	☐	☐	☒
e.	Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f.	Otherwise substantially degrade water quality?	☐	☐	☐	☒
g.	Place housing within a 100-year flood plain as mapped on federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h.	Place within a 100-year flood plain structures, which would impede or redirect flood flows?	☐	☐	☐	☒
i.	Expose people or structures to a significant risk of loss, inquiry or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j.	Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

a-f. **No Impact.** The purchase of the subject property would maintain the existing undeveloped condition of the site and would therefore have no impact with regard to the violation water quality standards or waste discharge requirements, substantial groundwater depletion, substantial alteration of the existing drainage pattern in a manner that could result in substantial erosion or siltation on- or off-site or increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off site, create runoff water that could exceed the capacity of existing stormwater drainage system, or otherwise substantially degrade water quality.

g-j. **No Impact**. The purchase of the subject property does not propose housing within a 100-year flood plain or structures within a 100-year flood plain which could impede or redirect flood flows. The site is not located within a flood plain[15] and does not propose structures that could expose people to a significant risk of loss, inquiry or death involving flooding, including flooding as a result of the failure of a levee or dam, or inundation by seiche, tsunami, or mudflow.

[15] U.S. Dept. of Homeland Security, Federal Emergency Management Agency, Flood Insurance Rate Map, Los Angeles County, California, Map #06037C1243F, Sept. 26, 2008, FEMA Flood Map Service Center, accessed May 10, 2017, at http://msc.fema.gov/portal/search#searchresultsanchor

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
X. LAND USE AND PLANNING. Would the project:				
a. Physically divide an established community?	☐	☐	☐	☒
b. Conflict with applicable land use plan, policy or regulation of an agency with jurisdiction over the project (including but not limited to the general plan, specific plan, coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c. Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

a. **No Impact.** The purchase of the subject property would maintain the existing conditions of the vacant site and no development would occur. Therefore, the purchase of the subject property would not physically divide an existing community.

b. **No Impact**. The purchase and continued fuel modification and brush clearance of the site would maintain the existing conditions of the site consistent with the existing General Plan designation, Ladyface Mountain Specific Plan, and Zoning. Therefore, there would be no impact related to conflicts with applicable plans, policy, or regulations.

c. **No Impact.** The site is not located within, and does not include, a habitat conservation plan or natural community conservation plan, there would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XI. MINERAL RESOURCES. Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

a-b. **No Impact.** As indicated in the City General Plan, according to the California Division of Mines and Geology, no significant mineral deposits are known to exist within the City.[16] The site is within the City limits, does not contain a known mineral resource that would be of value to the region and the residents of the state, and would not result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

[16] City of Agoura Hills Planning Department, Final General Plan Update March 2010, Ch. 4, Natural Resources, pg. 4-20.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XII. NOISE. Would the project result in:				
a. Exposure of persons to or generation of noise in level in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b. Exposure of people to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

a-d. **No Impact**. The purchase and maintenance of the site would maintain the existing condition of the vacant site and would involve no new construction activities. Routine maintenance for fuel modification and brush clearance would continue within the timeframes allowed by existing City ordinances. Therefore, the purchase and maintenance of the site would have no impact regarding exposure of persons to, or generation of, noise in level in excess of standards established in the local general plan or noise ordinance, exposure of people to or generation of excessive groundborne vibration or groundborne noise levels, a substantial permanent increase in ambient noise levels in the site vicinity above levels existing without the purchase and maintenance of the site, or a substantial temporary or periodic increase in ambient noise levels in the site vicinity above levels existing without the purchase and maintenance of the site.

e-f. **No Impact.** The site is not located within an airport land use plan and is not within the vicinity of an airport or private airstrip and would therefore have no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XIII. POPULATION AND HOUSING. Would the project:				
a. Induce substantial population growth in an area either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
b.	Displace substantial numbers of existing housing necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c.	Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

a-c. **No Impact.** The continued fuel modification and brush clearance of the existing condition of the vacant site would not provide new homes or additional jobs in the area, and therefore would not directly induce substantial population growth. The purchase and continued fuel modification and brush clearance of the site would not introduce new roads or utilities that would indirectly induce population growth in the area. The purchase and continued fuel modification and brush clearance of the site would not displace existing housing or people. Therefore, there would be no impact with regard to population and housing.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XIV.	**PUBLIC SERVICES.** Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
	a. Fire protection?	☐	☐	☐	☒
	b. Police protection?	☐	☐	☐	☒
	c. Schools?	☐	☐	☐	☒
	d. Parks?	☐	☐	☐	☒
	e. Other public facilities?	☐	☐	☐	☒

a. **No Impact**. The purchase of the subject property would maintain existing conditions at the vacant site and would therefore result in no increase in demand for fire protection services that could cause adverse physical impacts associated with the provision of new or physically altered fire protection facilities. Given the site would remain unimproved with no habitable structures, the property owner or Weed Hazard and Integrated Pest Management Bureau of the County Agricultural Commissioner would be responsible for continued brush clearance.

b.-e. **No Impact.** The purchase of the subject property would not construct new housing or generate residents or employees in the area. Therefore, the purchase and continued fuel modification and brush clearance of the site would not increase demand for police services or the use of schools, parks, libraries, or other public facilities. No new or physically altered governmental facilities would be required to provide these services and there would be no impact.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XV. RECREATION.				
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

a-b. No Impact. The purchase of the subject property would not construct new housing or generate residents or employees in the area. Therefore, the purchase of the subject property would not require the expansion of recreational facilities or increase the use of existing recreational facilities and would have no impact on recreation.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVI. TRANSPORTATION/CIRCULATION. Would the project:				
a. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d. Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e. Result in inadequate emergency access?	☐	☐	☐	☒
f. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

a-f. **No Impact**. The purchase of the subject property would maintain the existing condition of the vacant site, generate no vehicle tips, and would therefore not conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system or an applicable congestion management program. The site is not located within an airport land use area and would have no impact on air traffic patterns. The JPA would maintain the existing condition of the vacant site and would therefore not increase hazards due to a design feature or incompatible uses, result in inadequate emergency access, or conflict with adopted policies plants or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities. Therefore, the purchase and continued fuel modification and brush clearance of the site would have no impact on transportation and circulation.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVII. TRIBAL CULTURAL RESOURCES. Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
b. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

a-b. **No Impact**. The purchase and continued fuel modification and brush clearance of the site would maintain existing conditions at the vacant site, does not propose new construction, and would therefore result in no impact on potential tribal cultural resources.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVIII. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
b.	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c.	Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d.	Have sufficient water supplies available to serve the project from existing entitlements and resource, or are new or expanded entitlements needed?	☐	☐	☐	☒
e.	Result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f.	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g.	Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

a-b. **No Impact**. The purchase and continued fuel modification and brush clearance of the site would maintain existing conditions at the vacant site, does not propose new construction, would not generate wastewater, demand water, or require the construction of new stormwater drainage facilities. The purchase and site maintenance would not generate solid waste that would exceed the permitted capacity of area landfills. Vegetation removed for fuel modification and brush clearance would be properly disposed in compliance with federal, state, and local statues and regulations related to solid waste. Therefore, the purchase and continued fuel modification and brush clearance of the site would result in no impact on utilities and service systems.

		Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVIII.	**MANDATORY FINDINGS OF SIGNIFICANCE.**				
a.	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
b.	Does the project have impacts which are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects).	☐	☐	☐	☒

c.	Does the project have environmental effects which cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

a. No Impact. As evaluated above, the purchase and continued fuel modification and brush clearance of the subject property would have no impact on these environmental factors.

b. No Impact. As noted in the analysis of each of the environmental issues above, purchase of the subject property would have "No Impact." No impacts were determined to be "Potentially Significant" or "Less Than Significant with Mitigation Incorporated" so no mitigation measures are needed to reduce impacts to below the level of significance. Therefore, the purchase and continued fuel modification and brush clearance of the subject property would have no impacts which are individually limited, but cumulatively considerable.

c. No Impact. Generally, impacts to human beings are associated with air quality, hazards and hazardous materials, and noise impacts. As shown in the preceding analysis, the purchase and continued fuel modification and brush clearance of the subject property would result in no impact to these environmental factors. Therefore, the purchase and continued fuel modification and brush clearance of the subject property would not have substantial adverse effects on human beings, either directly or indirectly.

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Appendix G: SWA Regulations (SBDDW-16-02)

STATE WATER RESOURCES CONTROL BOARD - RESOLUTION NO. 2018-0014

ADOPTING THE PROPOSED REGULATIONS FOR SURFACE WATER AUGMENTATION USING RECYCLED WATER

Includes excerpts from Title 22, California Code of Regulations (CCR)

- Division 4, Chapter 3 - Articles 1, 5, 7
- Division 4, Chapter 17 – Article 9

TITLE 22, CALIFORNIA CODE OF REGULATIONS

DIVISION 4, CHAPTER 3

ARTICLE 1. Definitions

Adopt Section 60301.120 as follows:

§60301.120. Augmented Reservoir.

"Augmented Reservoir" means a surface water reservoir used as a source of domestic drinking water supply that receives recycled municipal wastewater from a Surface Water Source Augmentation Project (SWSAP).

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Amend Section 60301.450 as follows:

§60301.450. Indicator Compound.

“Indicator Compound” means an individual chemical in ~~a GRRP's~~ municipal wastewater that represents the physical, chemical, and biodegradable characteristics of a specific family of trace organic chemicals; is present in concentrations that provide information relative to the environmental fate and transport of those chemicals; may be used to monitor the efficiency of trace organic compound~~s~~ removal by treatment processes; and provides an indication of treatment process failure.

NOTE: Authority cited: Sections 13521, 13562 and 13562.5, Water Code; and Section~~s~~ ~~131052 and 131200~~116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561 and 13562.5, Water Code.

Adopt Section 60301.850.5 as follows:

§60301.850.5. Surface Water.

As used in this Article and Article 5.3 of this Chapter, "Surface Water" has the same meaning as defined in section 64651.83 of Chapter 17.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60301.851 as follows:

§60301.851. Surface Water Source Augmentation Project or SWSAP.

"Surface Water Source Augmentation Project" or "SWSAP" means a project involving the planned placement of recycled municipal wastewater into a surface water reservoir that is used as a source of domestic drinking water supply, for the purpose of supplementing the source of domestic drinking water supply.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60301.852 as follows:

§60301.852. Surface Water Source Augmentation Project Public Water System or SWSAP PWS.

"Surface Water Source Augmentation Project Public Water System" or "SWSAP PWS" means a public water system that plans to utilize or is utilizing an augmented reservoir as a source of drinking water and is responsible for complying with the requirements of Chapter 17 and the applicable requirements of this Chapter.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60301.853 as follows:

§60301.853. Surface Water Source Augmentation Project Water Recycling Agency or SWSAP WRA.

"Surface Water Source Augmentation Project Water Recycling Agency" or "SWSAP WRA" means an agency that is subject to a Regional Water Quality Control Board's (Regional Board's) water-recycling requirements applicable to a Surface Water Source Augmentation Project (SWSAP) and is, in whole or part, responsible for applying to the Regional Board for a permit, obtaining a permit, the operation of a SWSAP, and complying with the terms and conditions of the Regional Board permit and the requirements of this Chapter.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

ARTICLE 5.3. Indirect Potable Reuse: Surface Water Augmentation

Adopt Section 64320.300 as follows:

Section 6~~4~~0320.300. Application.

The requirements of this Article apply to a Surface Water Source Augmentation Project Water Recycling Agency (SWSAP WRA) involved in the planned placement of recycled municipal wastewater into a surface water reservoir that is used, in whole or in part, as a source of domestic drinking water supply by a public water system pursuant to Article 9, Chapter 17, of this Division.

Adopt Section 60320.301 as follows:

§60320.301. General Requirements.

(a) Prior to augmentation of a surface water reservoir using a SWSAP, each SWSAP WRA and each SWSAP PWS participating in the SWSAP shall submit a joint plan to the State Board and Regional Board for review and written approval. At a minimum, the joint plan shall address the elements in paragraphs (1) and (2) below. The joint plan shall be signed by each person with authority or responsibility to operate the SWSAP, comply with the requirements of this Article, and ensure that each SWAP WRA and SWAP PWS implements the actions designated in the joint plan. In the event of any subsequent change in applicable authority, responsibility, operation, or ownership of a SWSAP WRA or SWSAP PWS, including the addition of any SWSAP WRA or SWSAP PWS participant in the SWSAP, a revised joint plan shall be submitted to the State Board and Regional Board for review and written approval, and the revised joint plan shall be signed by all participants. A revised joint plan shall also be submitted to reflect any change in the information provided pursuant to paragraphs (1) and (2) below, and to address any State Board or Regional Board concerns. A revised joint plan required by this section shall be submitted not less than sixty (60) days prior to the effective date of any change required by this section to be addressed in a revised joint plan.

(1) Corrective actions to be taken in the event that a delivery of recycled municipal wastewater from the SWSAP to an augmented reservoir fails to meet the water quality requirements of this Article.

(2) The procedures a SWSAP WRA will implement for notifying a SWSAP PWS, State Board, and Regional Board of:

(A) operational changes that may adversely affect the quality of the recycled municipal wastewater to be delivered to an augmented reservoir, and

(B) the events and corresponding corrective actions required to be identified in paragraph (1).

(b) Prior to design and operation of a SWSAP, a SWSAP WRA shall demonstrate to the State Board and Regional Board that the SWSAP WRA possesses adequate financial, managerial, and technical capability to assure compliance with this Article.

(c) Prior to augmentation of a surface water reservoir using a SWSAP, a SWSAP WRA shall demonstrate to the State Board and Regional Board that all treatment processes are installed and can be operated by the SWSAP WRA, as designed, to achieve their intended function. A protocol describing the actions to be taken to meet this subsection shall be included in the engineering report submitted pursuant to section 60323, Article 7 of Chapter 3.

(d) If a SWSAP WRA fails to complete compliance monitoring required by this Article, compliance may be determined by the State Board or Regional Board based on available monitoring data~~ available to, and assumptions made by, the State Board or Regional Board~~.

(e) A SWSAP WRA shall ensure that the recycled municipal wastewater used for a SWSAP is from a wastewater management agency that is not in violation of the effluent limits or water quality requirements that pertain to surface water augmentation pursuant to this Article, as incorporated in the wastewater management agency's Regional Board permit.

(f) When a SWSAP WRA has been required by this Article or directed by the State Board or Regional Board to suspend augmentation of a surface water reservoir for any reason, augmentation of the surface water reservoir shall not resume until the SWSAP WRA has obtained written authorization to resume augmentation of the reservoir from the State Board and Regional Board.

(g) Reports required by this Article to be submitted by a SWSAP WRA or SWSAP PWS to the Regional Board or State Board shall be in writing.

(h) Unless specified otherwise, the term “quarter”, as used in this Article, refers to a calendar quarter.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.302 as follows:

§60320.302. Advanced Treatment Criteria.

A SWSAP WRA shall ensure the continuous treatment, with full advanced treatment meeting the criteria in this section, of the entire recycled municipal wastewater stream prior to its delivery to an augmented reservoir. Full advanced treatment is the treatment of an oxidized wastewater, as defined in section 60301.650, using a reverse osmosis and an oxidation treatment process that, at a minimum, meets the criteria of this section.

(a) A SWSAP WRA shall select for use a reverse osmosis membrane such that:

(1) each membrane element used in the SWSAP has achieved a minimum rejection of sodium chloride of no less than 99.0 percent (99.0%) and an average (nominal) rejection of sodium chloride of no less than 99.2 percent (99.2%), as

demonstrated through Method A of ASTM International's method D4194-03 (2014) using the following substitute test conditions:

(A) a recovery of permeate of no less than 15 percent (15%);

(B) sodium chloride rejection is based on three or more successive measurements, after flushing and following at least 30 minutes of operation having demonstrated that rejection has stabilized;

(C) an influent pH no less than 6.5 and no greater than 8.0;

(D) an influent sodium chloride concentration of no greater than 2,000 mg/L, to be verified prior to the start of testing; and

(E) an applied pressure no greater than 225 pounds per square inch (psi); and

(2) during the first twenty weeks of full-scale operation the membrane produces a permeate with no more than five percent (5%) of the sample results having TOC concentrations greater than 0.25 mg/L (or an alternative surrogate parameter and corresponding limit approved by the State Board), as verified through monitoring no less frequent than weekly.

(b) For the reverse osmosis treatment process, a SWSAP WRA shall propose, for State Board review and written approval, on-going performance monitoring (e.g., conductivity, TOC, etc.) that indicates when the integrity of the process has been compromised. The proposal shall include at least one form of continuous monitoring, as well as the associated surrogate and/or operational parameter limits and alarm settings that indicate when the integrity has been compromised.

(c) To demonstrate a sufficient oxidation treatment process has been designed for implementation, the SWSAP WRA shall conduct testing demonstrating that an oxidation treatment process will provide no less than 0.5-$\log_{10}$ (69 percent) reduction of 1,4-dioxane.

(1) A SWSAP WRA shall submit a testing protocol, as well as the subsequent results, to the State Board for review and written approval. The testing shall include challenge or spiking tests, using 1,4-dioxane, to demonstrate the proposed oxidation

treatment process will achieve the minimum 0.5-$\log_{10}$ reduction under the proposed oxidation treatment process's normal full-scale operating conditions.

(2) A SWSAP WRA shall establish, and submit to the State Board for review and written approval, surrogate and/or operational parameters that indicate whether the minimum 0.5-$\log_{10}$ 1,4-dioxane reduction design criterion is being met. At least one surrogate or operational parameter shall be capable of being monitored continuously, recorded, and have associated alarms that indicate when the process is not operating as designed.

(d) During full-scale operation of the oxidation treatment process designed pursuant to subsection (c), a SWSAP WRA shall continuously monitor the surrogate and/or operational parameters established pursuant to subsection (c)(2). A SWSAP WRA shall implement, in full-scale operation, the oxidation treatment process as designed pursuant to subsection (c).

(e) Within sixty (60) days after completing the first 12-months of full-scale operational monitoring pursuant to subsection (d), a SWSAP WRA shall submit a report to the State Board and Regional Board that includes:

(1) results of surrogate and/or operational parameter monitoring conducted pursuant to subsection (d);

(2) a description of the efficacy of the surrogate and/or operational parameters to reflect the reduction criterion for 1,4-dioxane; and

(3) a description of actions taken, or yet to be taken, if any of the following occurred during the first 12 months of operation:

(A) the 1,4-dioxane reduction did not meet the associated design criteria in subsection (c), as indicated by the on-going continuous operational surrogate and/or operational parameter monitoring;

(B) if 1,4-dioxane was present, the continuous surrogate and/or operational parameter monitoring failed to correspond to the reduction criterion for 1,4-dioxane; and

(C) any failure, interruption, or other incident that may have resulted in insufficient oxidation treatment having occurred.

(f) Within sixty (60) days after completing the initial 12 months of operation of the reverse osmosis process (or alternative process approved pursuant to 60320.330), a SWSAP WRA shall submit a report to the State Board and Regional Board describing the effectiveness of the treatment, process failures that occurred, and actions taken in the event the on-going monitoring, conducted pursuant to subsection (b), indicated that process integrity was compromised.

(g) Each quarter, a SWSAP WRA shall calculate what percent of results of the quarter's monitoring, conducted pursuant to subsections (b) and (d), did not meet the surrogate and/or operational parameter limits established to assure proper on-going performance of the reverse osmosis and oxidation processes. If the percent is greater than ten, within forty-five (45) days after the end of the quarter a SWSAP WRA shall:

(1) submit a report to the State Board and Regional Board that identifies the reason(s) for the failure, if known, and describes the corrective actions planned or taken to reduce the percent to ten percent (10%) or less; and

(2) consult with the State Board and Regional Board and, if directed by the State Board or Regional Board, comply with an alternative monitoring plan approved by the State Board and Regional Board.

(h) Each month a SWSAP WRA shall collect samples representative of the effluent of the advanced treatment process under normal operating conditions and have the samples analyzed for contaminants having MCLs and notification levels (NLs). After 12 consecutive months with no results exceeding an MCL or NL, a SWSAP WRA may apply to the State Board and Regional Board for a reduced monitoring frequency. The reduced monitoring frequency for a contaminant with an MCL shall be no less than quarterly. With State Board and Regional Board approval, m~~M~~onitoring conducted pursuant to this subsection may be used in lieu of the monitoring (for the same contaminants) required pursuant to sections 60320.312 and 60320.320. ~~The effluent of the advanced treatment process may not exceed an MCL.~~ If an MCL or NL is exceeded, the SWSAP WRA shall take the follow-up actions for MCL and NL exceedances required pursuant to section 60320.312 and section 60320.320(b), respectively.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.304 as follows:

§60320.304. Lab Analyses.

(a) An analysis for a contaminant having a primary or secondary MCL shall be performed using a drinking water method approved by the State Board for the contaminant, by a laboratory that at the time of the analysis has a valid certificate from the State Board for the analytical method used.

(b) Analyses for chemicals other than those having primary or secondary MCLs shall be described in the SWSAP WRA's Operation Plan prepared pursuant to section 60320.322.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.306 as follows:

§60320.306. Wastewater Source Control.

A SWSAP WRA shall ensure that the recycled municipal wastewater used for a SWSAP shall be from a wastewater management agency that:

(a) administers an industrial pretreatment and pollutant source control program; and

(b) implements and maintains a source control program that includes, at a minimum;

(1) an assessment of the fate of State Board-specified and Regional Board-specified chemicals and contaminants through the wastewater and recycled municipal wastewater treatment systems,

(2) chemical and contaminant source investigations and monitoring that focuses on State Board-specified and Regional Board-specified chemicals and contaminants,

(3) an outreach program to industrial, commercial, and residential communities within the portions of the sewage collection agency's service area that flows into the water reclamation plant subsequently supplying the SWSAP, for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source, and

(4) a current inventory of chemicals and contaminants identified and evaluated pursuant to this section, including new chemicals and contaminants resulting from new sources or changes to existing sources, that may be discharged into the wastewater collection system.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.308 as follows:

§60320.308. Pathogenic Microorganism Control.

(a) A SWSAP WRA shall design and operate SWSAP treatment processes such that the recycled municipal wastewater delivered to an augmented reservoir for use by a SWSAP PWS receives treatment as follows:

(1) For a SWSAP PWS implementing the requirements of section 64668.30(c)(1) of Chapter 17, the treatment train shall reliably achieve at least 8-$\log_{10}$ enteric virus reduction, 7-$\log_{10}$ *Giardia* cyst reduction, and 8-$\log_{10}$ *Cryptosporidium* oocyst reduction, consisting of at least two separate treatment processes for each pathogen (i.e., enteric

virus, *Giardia* cyst, or *Cryptosporidium* oocyst). A separate treatment process may be credited with no more than 6-$\log_{10}$ reduction, with at least two processes each being credited with no less than 1.0-$\log_{10}$ reduction. A single treatment process may receive $\log_{10}$ reduction credits for one or more pathogens.

(2) For a SWSAP PWS implementing the requirements of section 64668.30(c)(2) of Chapter 17, the treatment train shall reliably achieve at least 9-$\log_{10}$ enteric virus reduction, 8-$\log_{10}$ *Giardia* cyst reduction, and 9-$\log_{10}$ *Cryptosporidium* oocyst reduction, consisting of at least three separate treatment processes for each pathogen (i.e., enteric virus, *Giardia* cyst, or *Cryptosporidium* oocyst). A separate treatment process may be credited with no more than 6-$\log_{10}$ reduction, with at least three processes each being credited with no less than 1.0-$\log_{10}$ reduction. A single treatment process may receive $\log_{10}$ reduction credits for one or more pathogens.

(3) The State Board may increase the minimum enteric virus, *Giardia* cyst, and *Cryptosporidium* oocyst $\log_{10}$ reductions required in paragraphs (1) and (2) as a result of a SWSAP PWS relying on additional treatment to obtain State Board approval of an alternative minimum theoretical retention time pursuant section 64668.30(b) of Chapter 17.

(b) The SWSAP WRA shall validate each of the treatment processes used to meet the requirements in subsection (a) for their log reduction by submitting a report for the State Board's review and written approval, or by using a challenge test approved by the State Board, that provides evidence of the treatment process's ability to reliably and consistently achieve the log reduction. The report and/or challenge test shall be prepared by engineer licensed in California with at least five years of experience, as a licensed engineer, in wastewater treatment and public water supply, including the evaluation of treatment processes for pathogen control. The SWSAP WRA shall propose and include in its Operations Plan prepared pursuant to section 60320.322, on-going monitoring using the pathogenic microorganism of concern or a microbial, chemical, or physical surrogate parameter(s) that verifies the performance of each treatment process's ability to achieve its credited log reduction.

(c) If the applicable pathogen reduction in subsection (a) is not met based on the on-going monitoring required pursuant to subsection (b), within 24 hours of its knowledge of an occurrence, the SWSAP WRA shall investigate the cause and initiate corrective actions. If there is a failure to meet the pathogen reduction criteria longer than 4 consecutive hours or more than a total of 8 hours during any 7-day period, the SWSAP WRA shall, within 24 hours of its knowledge of such a failure, notify the State Board, Regional Board, and each SWSAP PWS utilizing the augmented reservoir. Failures of shorter duration shall be reported to the Regional Board no later than 10 days after the month in which the failure occurred.

(d) The SWSAP WRA shall, within 24 hours of its knowledge, notify the State Board, Regional Board, and each SWSAP PWS utilizing the augmented reservoir and, unless directed otherwise by the State Board and the Regional Board, discontinue delivery of recycled municipal wastewater to the SWSAP augmented reservoir if:

(1) pursuant to the pathogen reduction requirements in subsection (a)(1), the effectiveness of the treatment train to reduce enteric virus is less than 6-$\log_{10}$, *Giardia* cysts reduction is less than 5-$\log_{10}$, or *Cryptosporidium* oocysts reduction is less than 6-$\log_{10}$,

(2) pursuant to the pathogen reduction requirements in subsection (a)(2), the effectiveness of the treatment train to reduce enteric virus is less than 7-$\log_{10}$, *Giardia* cysts reduction is less than 6-$\log_{10}$, or *Cryptosporidium* oocysts reduction is less than 7-$\log_{10}$, or

(3) effectiveness of the treatment train to reduce enteric virus, *Giardia* cysts, or *Cryptosporidium* oocysts is less than a $\log_{10}$ reduction value derived from deducting 2-$\log_{10}$ from each of the minimum enteric virus, *Giardia* cyst, and *Cryptosporidium* oocyst $\log_{10}$ reductions required pursuant to subsection (a)(3).

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.312 as follows:

§60320.312. Regulated Contaminants and Physical Characteristics Control.

(a) Each quarter a SWSAP WRA shall collect samples (grab or 24-hour composite) representative of the recycled municipal wastewater delivered to the augmented reservoir and have the samples analyzed for:

(1) the inorganic chemicals in Table 64431-A, Chapter 15;

(2) the radionuclide chemicals in Tables 64442 and 64443, Chapter 15;

(3) the organic chemicals in Table 64444-A, Chapter 15;

(4) the disinfection byproducts in Table 64533-A, Chapter 15.5; and

(5) lead and copper.

(b) Each year, in the same quarter, the SWSAP WRA shall collect at least one representative sample (grab or 24-hour composite) of the recycled municipal wastewater delivered to the augmented reservoir and have the sample(s) analyzed for the secondary drinking water contaminants in Tables 64449-A and 64449-B of Chapter 15.

(c) If a result of the monitoring performed pursuant to subsection (a) exceeds a contaminant's MCL or action level (for lead and copper), the SWSAP WRA shall collect another sample within 72 hours of notification of the result and have it analyzed for the contaminant as confirmation.

(1) For a contaminant whose compliance with its MCL or action level is not based on a running annual average, if the average of the initial and confirmation sample exceeds the contaminant's MCL or action level, or the confirmation sample is not collected and analyzed pursuant to this subsection, the SWSAP WRA shall notify the State Board and Regional Board within 24 hours and initiate weekly monitoring until four consecutive weekly results are below the contaminant's MCL or action level. If at any time a result causes, or would cause, a running four-week average of weekly results to exceed the contaminant's MCL or action level, the SWSAP WRA shall notify the State Board, each SWSAP PWS utilizing the augmented reservoir, and Regional Board within

24 hours and immediately suspend delivery of the recycled municipal wastewater to the augmented reservoir.

(2) For a contaminant whose compliance with its MCL is based on a running annual average, if the average of the initial and confirmation sample exceeds the contaminant's MCL, or a confirmation sample is not collected and analyzed pursuant to this subsection, the SWSAP WRA shall initiate weekly monitoring for the contaminant until the running four-week average of results no longer exceeds the contaminant's MCL.

(A) If the running four-week average exceeds the contaminant's MCL, a SWSAP WRA shall describe the reason(s) for the exceedance and provide a schedule for completion of corrective actions in a report submitted to the State Board and Regional Board no later than 45 days following the quarter in which the exceedance occurred.

(B) If the running four-week average exceeds the contaminant's MCL for sixteen consecutive weeks, a SWSAP WRA shall notify the State Board, Regional Board, and each SWSAP PWS utilizing the augmented reservoir within 48 hours of knowledge of the exceedance and, if directed by the State Board or Regional Board, suspend delivery of the recycled municipal wastewater to the augmented reservoir.

(d) If the annual average of the results of the monitoring performed pursuant to subsection (b) exceeds a contaminant's secondary MCL in Table 64449-A or the upper limit in Table 64449-B, the SWSAP WRA shall initiate quarterly monitoring of the recycled municipal wastewater for the contaminant and, if the running annual average of quarterly-averaged results exceeds a contaminant's secondary MCL or upper limit, describe the reason(s) for the exceedance and any corrective actions taken a report submitted to the Regional Board no later than 45 days following the quarter in which the exceedance occurred, with a copy concurrently provided to the State Board. The annual monitoring in subsection (b) may resume if the running annual average of quarterly results does not exceed a contaminant's secondary MCL or upper limit.

(e) If four consecutive quarterly results for asbestos are below the detection limit in Table 64432-A for asbestos, monitoring for asbestos may be reduced to one sample every three years. Quarterly monitoring shall resume if asbestos is detected.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564, 13565 and 13567, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.320 as follows:

§60320.320. Additional Chemical and Contaminant Monitoring.

(a) Each quarter, a SWSAP WRA shall sample and analyze the recycled municipal wastewater delivered to the augmented reservoir, for the following:

(1) Priority Toxic Pollutants (chemicals listed in 40 CFR section 131.38, "Establishment of numeric criteria for priority toxic pollutants for the State of California", as the foregoing may be amended) specified by the State Board, based on the State Board's review of the SWSAP engineering report; and

(2) Chemicals specified by the State Board, based on its review of the SWSAP engineering report, the results of the augmented reservoir monitoring conducted pursuant to section 60320.326, and the results of the assessment performed pursuant to section 60320.306(b)(1).

(b) Each quarter, a SWSAP WRA shall sample and analyze the recycled municipal wastewater delivered to the augmented reservoir for State Board-specified chemicals having notification levels (NLs). If a result exceeds an NL, within 72 hours of notification of the result the SWSAP WRA shall collect another sample and have it analyzed for the contaminant as confirmation. If the average of the initial and confirmation sample exceeds the contaminant's NL, or a confirmation sample is not collected and analyzed pursuant to this subsection, the SWSAP WRA shall initiate weekly monitoring for the contaminant until the running four-week average of results does not exceed the NL and the State Board and Regional Board determine weekly monitoring may cease.

(1) If a running four-week average exceeds the contaminant's NL, the SWSAP WRA shall describe the reason(s) for the exceedance and provide a schedule for completion of corrective actions in a report submitted to the Regional Board no later than 45 days following the quarter in which the exceedance occurred, with a copy concurrently provided to the State Board.

(2) If a running four-week average exceeds the contaminant's NL for sixteen consecutive weeks, the SWSAP WRA shall notify the State Board, Regional Board, and each SWSAP PWS utilizing the augmented reservoir within 48 hours of knowledge of the exceedance.

(c) A SWSAP WRA may reduce monitoring for the chemicals in this section to once each year following State Board written approval based on the State Board's review of no less than the most recent two years of results of the monitoring performed pursuant to this section.

(d) Each year, the SWSAP WRA shall monitor the recycled municipal wastewater delivered to the augmented reservoir for indicator compounds specified by the State Board or Regional Board based on the following:

(1) a review of the SWSAP WRA's engineering report;

(2) the inventory developed pursuant to section 60320.306(b)(4);

(3) an indicator compound's ability to characterize the performance of the treatment processes for removal of chemicals; and

(4) the availability of a test method for a chemical.

(e) A chemical or contaminant detected as a result of monitoring conducted pursuant to this section shall be reported to the State Board and Regional Board no later than the end of the quarter following the quarter in which the SWSAP WRA is notified of the results. If directed by the State Board or Regional Board, the SWSAP WRA shall monitor the recycled municipal wastewater delivered to the augmented reservoir for chemicals or contaminants detected pursuant to section 60320.326.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.322 as follows:

§60320.322. SWSAP Operation Plan.

(a) Prior to operation of a SWSAP, a SWSAP WRA shall submit an Operation Plan to the State Board and Regional Board and receive written approval of the plan from the State Board and Regional Board. At a minimum, the Operation Plan shall identify and describe the operations, maintenance, analytical methods, monitoring necessary for the SWSAP to meet the requirements of this Article, and the reporting of monitoring results to the State Board and Regional Board. The plan shall also identify an on-going training program that includes the elements of the training required pursuant to subsection (b) of this section. A SWSAP WRA shall implement the Operation Plan and update the Operation Plan to ensure that the Operation Plan is, at all times, representative of the current operations, maintenance, and monitoring of the SWSAP. The SWSAP WRA shall make the Operation Plan immediately available to the State Board or Regional Board for review upon request.

(b) Prior to operation of a SWSAP, a SWSAP WRA shall, at a minimum, demonstrate to the State Board and Regional Board that the personnel operating and overseeing the SWSAP operations have received training in the following:

(1) The proper operation of the treatment processes utilized pursuant to sections 60320.302 and 60320.308;

(2) The California Safe Drinking Water Act and its implementing regulations; and

(3) The potential adverse health effects associated with the consumption of drinking water that does not meet California drinking water standards.

(c) At all times recycled municipal wastewater is delivered to the augmented reservoir, the SWSAP WRA shall ensure that all treatment processes are operated in a manner that provides optimal reduction of all chemicals and contaminants including:

(1) microbial contaminants;

(2) regulated contaminants identified in section 60320.312; and

(3) chemicals and contaminants required pursuant to section 60320.320.

(d) Within six months following the first year of optimizing treatment processes pursuant to subsection (c) and anytime thereafter operations are optimized that result in a change in operation, the SWSAP WRA shall update the SWSAP Operation Plan to include the changes in operational procedures and submit the Operation Plan to the State Board and Regional Board for review.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.326 as follows:

§60320.326. Augmented Reservoir Monitoring.

(a) Prior to augmentation of a surface water reservoir using a SWSAP, the SWSAP WRA, in coordination with the SWSAP PWS, shall identify monitoring locations in the augmented reservoir, for State Board review and written approval. The identified monitoring locations must be representative, throughout the volume of the surface water reservoir impacted by the SWSAP, at a minimum, of the following:

(1) Differing water quality conditions across the horizontal extent of the surface water reservoir;

(2) Each level in the surface water reservoir corresponding to the depths in which water may be withdrawn; and

(3) The surface water reservoir’s epilimnion and hypolimnion.

(b) Prior to augmentation of a surface water reservoir using a SWSAP, each month, the SWSAP WRA shall collect samples for no less than 24 consecutive months, from the monitoring locations established pursuant to subsection (a). The samples shall be analyzed for the contaminants in tables 64449-A and B of Chapter 15, total organic carbon (TOC), total nitrogen, *E. coli,* total coliform bacteria, temperature, dissolved oxygen, chlorophyll a, total and dissolved phosphorus, and other State Board-specified chemicals and contaminants based on a review of the SWSAP WRA's engineering report and the results of the assessment performed pursuant to section 60320.306(b)(1).

(c) The SWSAP WRA shall continue to conduct monthly monitoring pursuant to subsection (b) for no less than the initial 24 months a SWSAP WRA is delivering recycled municipal wastewater to an augmented reservoir. In addition, the on-going monitoring required by this section shall include State Board-specified chemicals and contaminants based on SWSAP operations and the results of recycled municipal wastewater monitoring conducted pursuant to this Article.

(d) After completion of the 24-months of monthly monitoring conducted pursuant to subsection (c) and consultation with each SWSAP PWS utilizing the reservoir as a source of drinking water, a SWSAP WRA may apply to the State Board for reduced on-going monitoring. The SWSAP WRA shall obtain State-Board written approval prior to implementation of the reduced monitoring. The reduced on-going monitoring frequency may be no less than once every 12 months.

(e) Notwithstanding subsection (b), (c), and (d), based on the results of reservoir monitoring, the State Board may require a SWSAP WRA to ~~shall~~ monitor for any State Board-specified chemicals or contaminants, at the locations and frequencies specified by the State Board.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.328 as follows:

§60320.328. Reporting.

(a) By July 1st of each year, a SWSAP WRA shall provide a report to the State Board and Regional Board, and make a copy of the report available to each SWSAP PWS affected by the SWSAP. Each SWSAP PWS shall be notified by direct mail and/or electronic mail of the availability of the report. The report shall be prepared by an engineer licensed in California and experienced in the fields of wastewater treatment and public water supply, or California-licensed engineers collectively having the experience. The report shall include the following:

(1) A summary of the SWSAP compliance status with the monitoring requirements and criteria of this Article during the previous calendar year;

(2) For any violations of this Article during the previous calendar year;

(A) the date, duration, and nature of the violation,

(B) a summary of any corrective actions and/or suspensions of delivery of recycled municipal wastewater to an augmented reservoir resulting from a violation, and

(C) if uncorrected, a schedule for and summary of all remedial actions;

(3) Any detections of monitored chemicals or contaminants, and any observed trends in the monitoring results of the augmented reservoir required pursuant to section 60320.326;

(4) A description of any changes in the operation of any unit processes or facilities;

(5) A description of any anticipated changes, along with an evaluation of the expected impact of the changes on subsequent unit processes;

(6) The estimated quantity and quality of the recycled municipal wastewater to be delivered for the next calendar year, as well as the quantity delivered during the previous three years; and

(7) A summary of the measures taken to comply with section 60320.306 and 60320.301(e), and the effectiveness of the implementation of the measures.

(b) No less frequently than every five years from the date of the initial approval of the engineering report required pursuant to section 60323, Article 7 of Chapter 3, the SWSAP WRA shall update the engineering report to address any SWSAP changes from the previous engineering report, and submit the report to the State Board and Regional Board. The update shall include, but not be limited to, the anticipated increases in delivery of recycled municipal wastewater and a description of the expected impact the increase will have on the SWSAP WRA's ability to meet the requirements of this Article.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

Adopt Section 60320.330 as follows:

§60320.330. Alternatives.

(a) A SWSAP WRA may use an alternative to a requirement in this Article if the SWSAP WRA:

(1) demonstrates to the State Board that the proposed alternative provides an equivalent or better level of performance with respect to the efficacy and reliability of the removal of contaminants of concern to public health, and ensures at least the same level of protection to public health;

(2) receives written approval from the State Board prior to implementation of the alternative; and

(3) if required by the State Board or Regional Board, conducts a public hearing on the proposed alternative, disseminates information to the public, and receives public comments.

(b) The demonstration in subsection (a)(1) shall include the results of a review of the proposed alternative by an independent scientific advisory panel, approved by the State Board, that includes, but is not limited to, a toxicologist, a limnologist, an engineer licensed in California with at least three years of experience in wastewater treatment and public drinking water supply, a microbiologist, and a chemist.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Section 116271, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564 and 13565, Water Code; and Section 116551, Health and Safety Code.

DIVISION 4, CHAPTER 17

ARTICLE 9. Indirect Potable Reuse: Surface Water Augmentation

Adopt Section 64668.05 as follows:

Section 64668.05. Application.

In addition to meeting the applicable requirements of this Chapter, a water supplier whose approved surface water source of supply is augmented utilizing a Surface Water Source Augmentation Project (SWSAP) shall meet the requirements of this Article and the applicable requirements of Article 5.3 of Chapter 3. For the purpose of this Article, the water supplier shall be referred to as a Surface Water Source Augmentation Project Public Water System (SWSAP PWS).

Adopt Section 64668.10 as follows:

Section 64668.10. General Requirements and Definitions.

(a) Unless noted otherwise, as used in this Article, the following terms are defined as follows:

(1) “Augmented Reservoir” has the same meaning as defined in section 60301.120, Article 1, Chapter 3.

(2) “Surface Water Source Augmentation Project” or “SWSAP” has the same meaning as defined in section 60301.851, Article 1, Chapter 3.

(3) “Surface Water Source Augmentation Project Public Water System” or “SWSAP PWS” has the same meaning as defined in section 60301.852, Article 1, Chapter 3.

(4) "Surface Water Source Augmentation Project Water Recycling Agency” or “SWSAP WRA" has the same meaning as defined in section 60301.853, Article 1, Chapter 3.

(b) Prior to using an augmented reservoir as a source of supply, a SWSAP PWS shall submit an application for a domestic water supply permit or permit amendment, and have an approved joint plan with a SWSAP WRA, as required pursuant to section

60320.301(a) of Article 5.3, Chapter 3. The SWSAP PWS shall revise its emergency plan and operations plan required pursuant to sections 64660(c)(2) and 64661 to include the elements of the joint plan and, at a minimum, include the means of providing an alternative source of domestic water supply, a State Board-approved treatment mechanism, or other actions to be taken, to ensure a reliable supply of water is delivered that meets all drinking water standards, in the event that the surface water from the augmented reservoir, as a result of a SWSAP:

(1) Could not be or has not been treated to meet California drinking water standards;

(2) Has been degraded to the degree that it is no longer a safe source of drinking water, as determined by the State Board; or

(3) Receives water that fails to meet the requirements of section 60320.308(d) of Article 5.3, Chapter 3.

(c) A SWSAP PWS shall demonstrate to the State Board and Regional Board that the SWSAP PWS has sufficient control over the operation of an augmented reservoir to ensure its ability to comply with the requirements of this Article and the applicable requirements in Article 5.3 of Chapter 3.

(d) A SWSAP PWS with knowledge of a SWSAP WRA failing to meet a requirement of the SWSAP WRA's permit or a requirement of Chapter 3, Article 5.3, shall immediately notify the State Board.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Sections 116271 and 116375, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564, 13565 and 13567, Water Code; and Sections 116275, 116365, 116375, 116385, 116390, 116400, 116525, 116530, 116535, 116540, 116550, 116551, and 116735, Health and Safety Code.

Adopt Section 64668.20 as follows:

§64668.20. Public Hearings.

A SWSAP PWS may not use an augmented reservoir without a domestic water supply permit or permit amendment for the use of the augmented reservoir as an approved surface water source, and unless the SWSAP PWS facilitates at least three public hearings held by the State Board and the SWSAP PWS does the following:

(a) In coordination with and with the assistance of the SWSAP WRA, develop information to be provided to the public at the public hearings and on the SWSAP PWS's Internet Web site. The information shall include, but not be limited to:

(1) descriptions of the SWSAP;

(2) identification of the municipal wastewater source for the SWSAP;

(3) descriptions of the treatment processes, monitoring, contingency plans; and

(4) the anticipated State Board and Regional Board permit provisions applicable to the SWSAP.

(b) Provide the State Board, for its review and written approval, the information the SWSAP PWS develops pursuant to subsection (a). Following the State Board's approval of the information, the SWSAP PWS shall place the information on a Web site managed and operated by the SWSAP PWS, and in a repository (such as a local public library) in a manner that provides at least 30 days of public access to the information prior to each public hearing. For each of the public hearings, the SWSAP PWS shall make copies of the information available to the public.

(c) No less than 30 days prior to placing the information required pursuant to subsections (a) and (b) in a repository, notify its customers and all public water systems that may receive drinking water impacted by the SWSAP of the following;

(1) the location and hours of operation of the repository,

(2) the Internet address where the information may be viewed,

(3) the purpose of the public hearing and the repository, along with a brief description of the project,

(4) the manner in which the public can provide comments, and

(5) the date, time, and location of the public hearing; and

(d) Deliver the public notification required pursuant to subsection (c), in a manner to reach all public water systems and persons whose source of drinking water may be impacted by the SWSAP. The manner of delivery shall be by direct mail and using one or more of the following methods:

(1) local newspaper(s) publication of general circulation; and/or

(2) television and/or radio broadcast locally.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Sections 116271 and 116375, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564, 13565 and 13567, Water Code; and Sections 116275, 116365, 116375, 116385, 116390, 116400, 116530, 116535, 116550, 116551, and 116735, Health and Safety Code.

Adopt Section 64668.30 as follows:

§64668.30. SWSAP Augmented Reservoir Requirements.

(a) The SWSAP PWS shall ensure that prior to augmentation of a surface water reservoir by a SWSAP, the surface water reservoir to be used as an augmented reservoir was in operation as an approved surface water supply pursuant to this Chapter for a period of time sufficient to establish a baseline record of the surface water reservoir's raw water quality, including but not limited to the monitoring required pursuant to section 60320.326 of Chapter 3, and treated drinking water quality. A surface water reservoir shall have been operating as an approved surface water source for at least five years prior to receiving recycled municipal wastewater from a SWSAP, unless approved otherwise in writing by the State Board, but in no case less than two years.

(b) The SWSAP PWS shall ensure that a surface water reservoir used as an augmented reservoir has a minimum theoretical retention time of no less than that which has been approved by the State Board. Monthly, the SWSAP PWS shall calculate and record the theoretical retention time. The theoretical retention time shall be the value (in units of days) resulting from dividing the volume of water in the surface water reservoir at the end of each month, by the total outflow from the surface water reservoir during the corresponding month. The total outflow shall include, but not be limited to, all outflows and withdrawals from the surface water reservoir. An initial approved minimum theoretical retention time may be no less than 180 days.

(1) If a month's theoretical retention time is determined to be less than its approved theoretical retention time, the SWSAP PWS shall, by the end of the subsequent month, submit a report to the State Board and Regional Board describing the corrective actions to be taken to ensure future theoretical retention times will be no less than its approved theoretical retention time.

(2) A SWSAP PWS may apply to the State Board, for written approval, for a reduced on-going alternative minimum theoretical retention time of less than 180 days, but no less than 60 days. The SWSAP PWS's application shall include all information requested by the State Board for its consideration of a proposed alternative minimum theoretical retention time, including the following:

(A) Evidence that the SWSAP PWS and SWSAP WRA have reliably and consistently met the requirements of this Article and Article 5.3, Chapter 3, under varying operating conditions;

(B) At the proposed alternative minimum theoretical retention time; the maximum anticipated recycled municipal wastewater flow to the surface water reservoir, the total anticipated outflows from the reservoir, and the total available flows of approved reservoir sources of supply;

(C) The maximum percent, by volume, of recycled municipal wastewater that will be delivered to the surface water reservoir during any 24-hour period, in accordance with subsection (c), at the proposed alternative minimum theoretical retention time;

(D) A description of total proposed treatment and total $\log_{10}$ reduction for enteric virus, *Giardia* cysts, and *Cryptosporidium* oocysts. For proposed alternative minimum theoretical retention times less than 120 days, no less than one log$_{10}$ reduction of such pathogens beyond that otherwise required pursuant to this Article and Article 5.3, Chapter 3, shall be provided;

(E) The ability to adequately respond to potential SWSAP treatment failures in a timely manner, such that there is no interruption of drinking water, meeting all applicable standards, supplied to customers; and

(F) A demonstration that the alternative minimum theoretical retention time provides, based on information provided pursuant to this paragraph (paragraph (2)), an equivalent or better level of protection of public health than otherwise required pursuant to this Article and Article 5.3, Chapter 3. If required by the State Board, the SWSAP PWS's demonstration shall include a review by an independent scientific advisory panel approved by the State Board.

(c) Prior to augmentation, and whenever requested to do so by the State Board based on information that previous tracer studies or hydrodynamic modeling may not accurately reflect current conditions, the SWSAP PWS shall demonstrate to the State Board, utilizing tracer studies and hydrodynamic modeling, that at all times under all operating conditions, the volume of water withdrawn from the augmented reservoir to be ultimately supplied for human consumption contains no more than:

(1) one percent, by volume, of recycled municipal wastewater that was delivered to the surface water reservoir during any 24-hour period, or

(2) ten percent, by volume, of recycled municipal wastewater that was delivered to the surface water reservoir during any 24-hour period, with the recycled municipal wastewater delivered by the SWSAP WRA having been subjected to additional treatment producing no less than a 1-log$_{10}$ reduction of enteric virus, *Giardia* cysts, and *Cryptosporidium* oocysts, as noted pursuant to section 60320.308(a)(2). With regard to the additional treatment:

(A) The additional treatment need not be a unique type of process from other treatment processes utilized by the SWSAP WRA to meet the requirements of section 60320.308~~, but shall be independent of and not reliant on the other treatment processes~~.

(B) The SWSAP PWS, in consultation with the SWSAP WRA, shall obtain the additional treatment process information necessary for demonstrating that the requirements of section 60320.308(a)(2) of Chapter 3 and this paragraph will be met.

(d) To verify that the requirements of subsection (c) are being met, within the first six months of operation, under hydraulic conditions representative of normal SWSAP operations, the SWSAP PWS shall initiate a tracer study utilizing an added tracer. The results of the tracer study shall be used to validate the hydrodynamic modeling required in subsection (c). Prior to performing the tracer study, the SWSAP PWS shall submit a tracer study protocol for State Board review and written approval. The SWSAP PWS shall perform the verification required by this subsection whenever requested by the State Board.

(e) Notwithstanding a change in operation allowed pursuant to the SWSAP PWS's domestic water supply permit, prior to initiating a change in operation, including physical changes to the surface water reservoir, that may impact the hydraulic characterization utilized to determine compliance with the requirements of this section, the SWSAP PWS shall notify the State Board and;

(1) demonstrate that the hydraulic characterization used to comply with this section remains valid under the changed operation, or

(2) if requested by the State Board, demonstrate compliance pursuant to this section under the new hydraulic conditions.

(f) Unless directed otherwise by the State Board, a SWSAP PWS shall utilize an independent scientific advisory panel to meet the requirements of this section pertaining to the hydraulic characterization of the reservoir, including tracer study verifications and hydraulic modeling used to demonstrate compliance with subsection (c). The independent scientific advisory panel shall be approved by the State Board and include, at a minimum, a limnologist with experience modelling the hydraulic characterization of surface water reservoirs, or a limnologist and an individual with experience modelling the hydraulic characterization of surface water reservoirs. The SWSAP PWS shall allow

State Board representatives, as guests, to join all independent scientific advisory panel meetings and discussions.

(g) Prior to augmentation of a surface water reservoir using a SWSAP, a SWSAP PWS shall submit a plan, for State Board review and approval, describing the actions the SWSAP PWS will take to assess and address potential impacts resulting from the introduction of advanced treated water into the SWSAP PWS's surface water treatment plant and, indirectly, into the drinking water distribution system. At a minimum, the plan shall address:

(1) maintaining chemical and microbial stability in the drinking water distribution system as the drinking water quality changes with anticipated increasing fractions of advanced treated water;

(2) maintaining treatment effectiveness throughout the surface water treatment plant as the source water quality changes with anticipated increasing fractions of advanced treated water in the reservoir;

(3) assessments to be performed prior to and during operation of the SWSAP with respect to paragraphs (1) and (2); and

(4) assessment outcomes of which the SWSAP PWS will notify the State Board.

NOTE: Authority cited: Sections 13521 and 13562, Water Code; and Sections 116271 and 116375, Health and Safety Code. Reference: Sections 13520, 13522, 13522.5, 13523, 13523.1, 13524, 13560, 13561, 13564, 13565 and 13567, Water Code; and Sections 116275, 116365, 116375, 116385, 116390, 116400, 116530, 116535, 116550, 116551, and 116735, Health and Safety Code.

Appendix H: Reservoir Modeling

Trussell Technologies Inc. (Trussell 2018). Cover Letter Briefing – Modeling Results for the Las Virgenes Reservoir for Pure Water Program. Prepared for the Las Virgenes-Triunfo JPA. January 26, 2018.

Cover Letter Briefing
Las Virgenes Metropolitan Water District
Modeling Results for the Las Virgenes Reservoir for Pure Water Program

1 INTRODUCTION

This letter provides an overview of the modeling report prepared by Flow Sciences, Inc. at the direction of Trussell Technologies, Inc. in support of the Las Virgenes-Triunfo Joint Powers Authority (JPA) proposed surface water augmentation project (Pure Water). The Pure Water project involves taking excess recycled wastewater as generated at the Tapia Water Reclamation Facility, treating it through an advanced water treatment facility (AWTF), and conveying it to the Las Virgenes Reservoir (Reservoir) for eventual reuse. As required by the draft surface water augmentation regulations, any proposed project requires a calibrated hydrodynamic model of the reservoir in order to understand the mixing and dilution criteria within the reservoir itself. This effort represents the calibration of the hydrodynamic model, modeled results for several operational scenarios, and recommendations for next steps.

2 MODEL CALIBRATION

The project team selected a 3-D numerical modeling platform known as the Estuary, Lake, and Coastal Ocean Model or ELCOM. ELCOM was developed by the Center for Water Research at the University of Western Australia and is widely used throughout the world for modeling aquatic environments. Several inputs are needed to tailor ELCOM to the Las Virgenes Reservoir and this process is known as the calibration of the model:

Bathymetric Survey
One of the first steps in calibrating the model is to incorporate the correct shape of the Reservoir. To do this, a bathymetric survey of the Reservoir was performed by collecting data with a boat-mounted multibeam swath-sounding sonar system. This survey provided accurate bathymetry for the model as of March 2017.

Weather Data
The JPA provided data from a weather station located on the downside of a slope from the Westlake Filtration Plant. This data consisted of solar radiation, air temperature, wind speed, wind direction, relative humidity, and rainfall between January 1, 2015 and December 31, 2016.

The project team noted that the location of the weather station may result in interferences from the slope. In order to have as few potential interferences as possible, the project team recommends moving the weather station to the island within the Reservoir to ensure weather data is more representative.

Inflows and Outflows
The Reservoir has two main inflows and one main outflow:

- Inflows
  - Imported water from Metropolitan Water District of Southern California
  - Recirculating flow for the Westlake Filtration Plant
- Outflow
  - Raw water supply to the Westlake Filtration Plant

Flows (in and out) occur at or nearby the inlet/outlet tower located in the northwest corner of the Reservoir (Figure 1).

Aerator Operation
The Reservoir has two aerators (Figure 1) which are operated in the summer to provide partial vertical mixing near the inlet tower to the filtration plant. The JPA provided the air flow rates of both aerators for January 1, 2015 to December 31, 2016.

In performing the bathymetric survey, the project team noted that the Reservoir has two distinct troughs (see Figure 3) and both aerators are located within the northwestern-most trough (Figure 1). To improve mixing throughout the entire Reservoir, the project team recommends adding an aerator within the second trough. Improving mixing would increase dilution and minimize the impact of the Pure Water project on the Westlake Filtration Plant operations.

Figure 1 – Las Virgenes Reservoir Map

Model Calibration
Flow Science incorporated these various inputs into the model and was then able to accurately simulate water movement within the Reservoir. Figure 2 shows that the simulated water temperature over the depth of the reservoir matches the measured data.

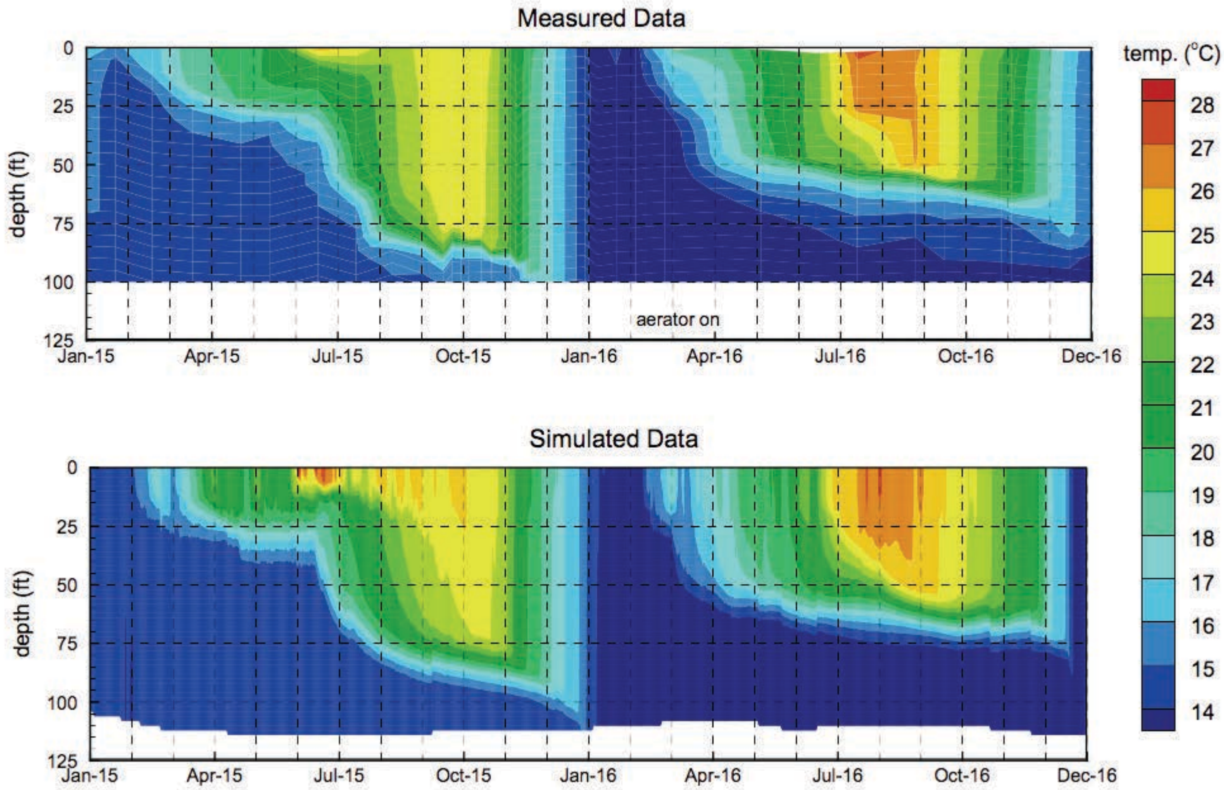

Figure 2 – Color Map Comparing Water Temperature over Depth with Time from Measured and Simulated Data

3 OPERATIONAL SCENARIOS

In order to understand how the Pure Water project will affect the Reservoir operations, the project team developed several scenarios to assess regulatory compliance.

Regulatory Compliance
The project team targeted two regulatory requirements as part of the modeling effort. The first is the theoretical retention time of the reservoir, as defined by the following equation:

$$Theoretical\ retention\ time = \frac{Volume\ of\ the\ Las\ Virgenes\ Reservoir}{Flow\ out\ of\ reservoir} \geq 6\ months$$

The regulations allow for some relaxing of this 6-month threshold. Retention times as low as 4 months can be approved with an additional log removal of pathogens with treatment and retention times as low as 2 months can be approved with written approval from the State Board. All operational scenarios developed were in compliance with this regulation. In the case of the routine and boundary year scenarios, the 6-month retention time was met. In the case of the emergency scenario, a minimum 2-month retention time was targeted.

The second requirement in the regulation is in regard to dilution in the reservoir. Any withdrawal of water from the reservoir can comprise no more than 10% (10:1 dilution) of the potable reuse water discharged into the reservoir during any prior 24-hour period. If the dilution is between 10:1 and 100:1, an additional log removal of pathogens is required. Table 1 provides a summary of the dilution requirement. The dilution obtained within the reservoir is the key output from each modeled operational scenario.

Table 1. Draft Dilution Requirement

DILUTION	ENTERIC VIRUS REMOVAL	*CRYPTOSPORIDIUM* REMOVAL	*GIARDIA* REMOVAL
Dilution > 100:1	12-log	10-log	10-log
100:1 > Dilution > 10:1	13-log	11-log	11-log
Dilution < 10:1	Not classified as surface water augmentation		

Operational Scenarios

With the regulatory requirements as a guideline, three operational scenarios were developed to bracket the intended use of the Reservoir with the Pure Water project and maximize flexibility by considering ‘boundary’ conditions. These are conditions that still meet the draft regulations but are up against the boundary of the regulations or possible uses of the project. Table 2 provides a summary of the three scenarios.

Table 2. Summary of Considered Scenarios

SCENARIO	PURIFIED WATER INFLOW (MGD)	WFP WITHDRAWAL (MGD)	THEORETICAL RETENTION TIME (MONTHS)	THEORETICAL RETENTION TIME REGULATORY OBJECTIVE (MONTHS)
Routine	AWTF flows during winter and Filtration Plant flows during summer. No modeling required.			
Boundary	1.7	5.0	8.5	> 6.0
Emergency	6.0	15.0	2.4	> 2.0

<u>Routine</u>: The first operational scenario considers the Pure Water project as it was developed in the concept report. During winter months, available potable reuse water will be discharged to the Reservoir. Then during summer months, the Westlake Filtration Plant would operate (i.e., drawing water from the Reservoir). Because input of the potable reuse water is not occurring simultaneously with the operation of the

Westlake Filtration Plant, the primary regulatory parameters, dilution and retention time, are less applicable and no modeling was required.

Boundary: The second operational scenario considers operating the Westlake Filtration Plant through a full winter, while simultaneously providing potable reuse water to the reservoir. In this scenario, during the summer, irrigation demand is still prioritized and there is minimal input to the Reservoir. In addition, to represent a worst-case scenario in terms of dilution, no other water source enters the reservoir (e.g., no MWD water received). In effect, this scenario represents the most aggressive regular use of the Pure Water project by incorporating all available potable reuse water, including the shoulder months (in Spring and Fall) where reuse water is available and the filtration plant is online.

Emergency: The third and final scenario considers an emergency scenario, where the MWD feeder line to the Reservoir is inoperable, either for long-term maintenance or as a result of failure. In this scenario, the maximum amount of potable reuse water is produced by the AWTF, 6 MGD, and the Westlake Filtration Plant produced the maximum amount of drinking water, which is 15 MGD. Flow Science then ran the model for approximately 7.4 months and stopped when the water level in the reservoir hit the inlet/outlet towers minimum withdrawal level of 1,000 feet. This scenario has a theoretical retention time of 2.4 months—above the minimum allowable retention time of 2 months but below the 4-month threshold which triggers additional log removal of pathogens.

4 MODELING RESULTS

Once the model was calibrated and the operational scenarios were established, model runs were performed, and pulses of tracer were injected into the reservoir, at regular intervals. Each pulse of tracer lasted 24-hours, per the regulations. The potable reuse water was introduced into the reservoir as a surface discharge along the northwest bank of the reservoir and one aerator was moved to the second low point in the reservoir to improve mixing. Figure 3 shows the locations of the aerators and the potable reuse water entry point.

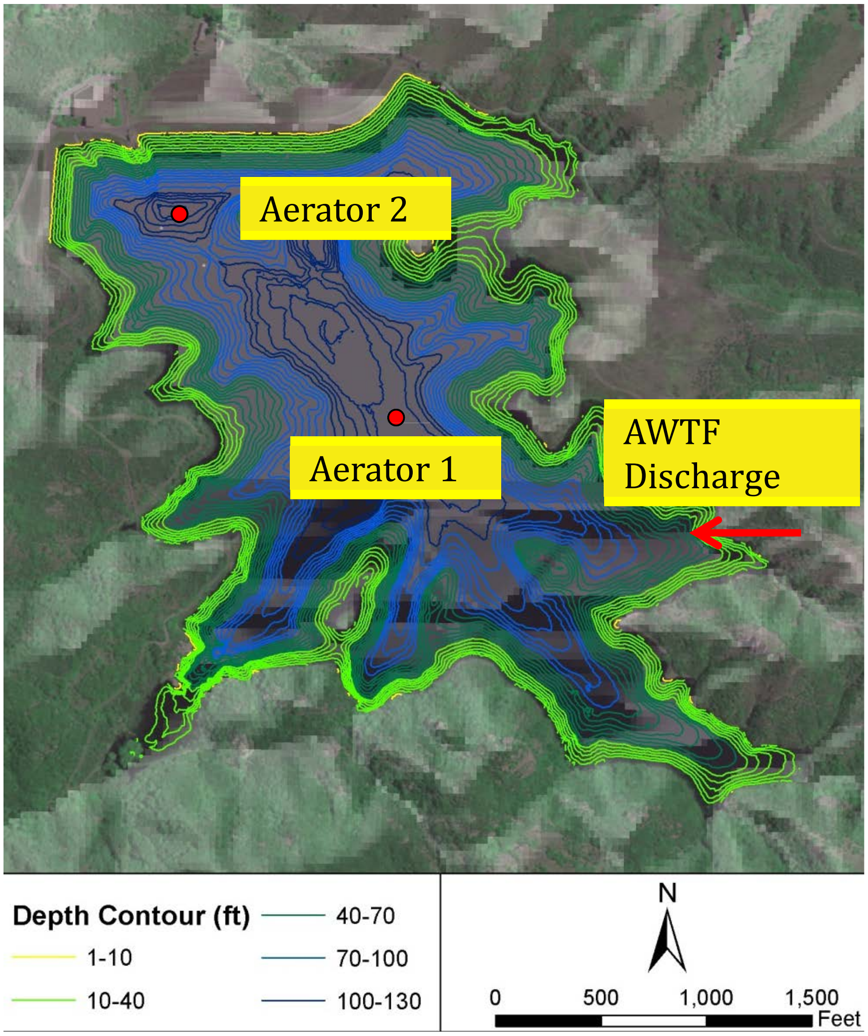

Figure 3 – Location of Potable Reuse Water Discharge and Aerators

Boundary Year Scenario

Figure 4 shows an example model run with the released tracer in the water. Modeling runs showed that when strong winds come from the southeast, the potable reuse water gets pushed along the water surface directly from the discharge point to the filtration plant's inlet tower. This phenomenon resulted in one exceedance beyond the 100:1 dilution threshold. The minimum dilution was 77:1, still well below the minimum 10:1 value that is required in the regulations. Figure 5 shows the modeled output of this tracer release that had a minimum dilution below the 100:1 dilution threshold.

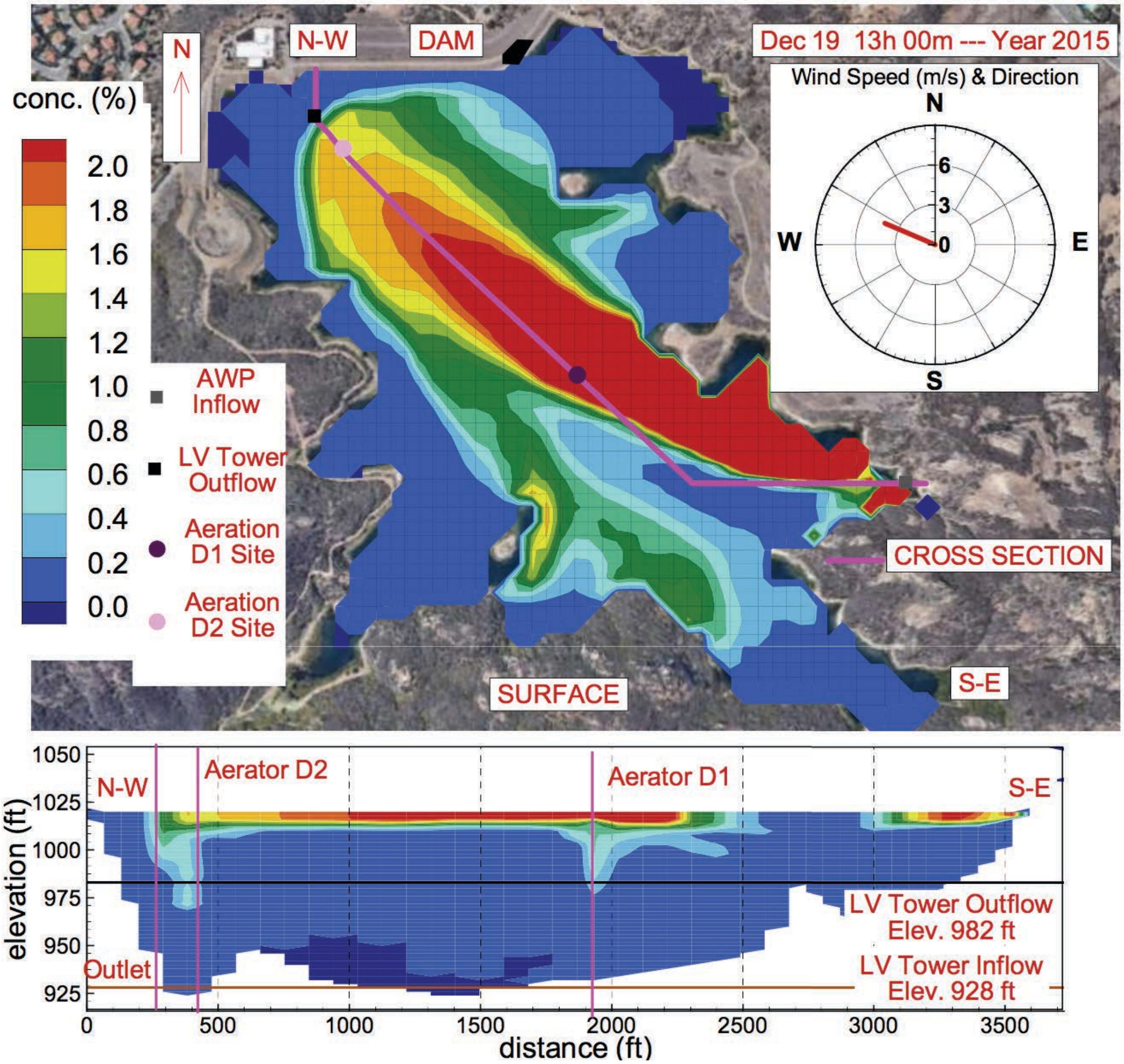

Figure 4 – Example model run with release of 24-hour tracer pulse

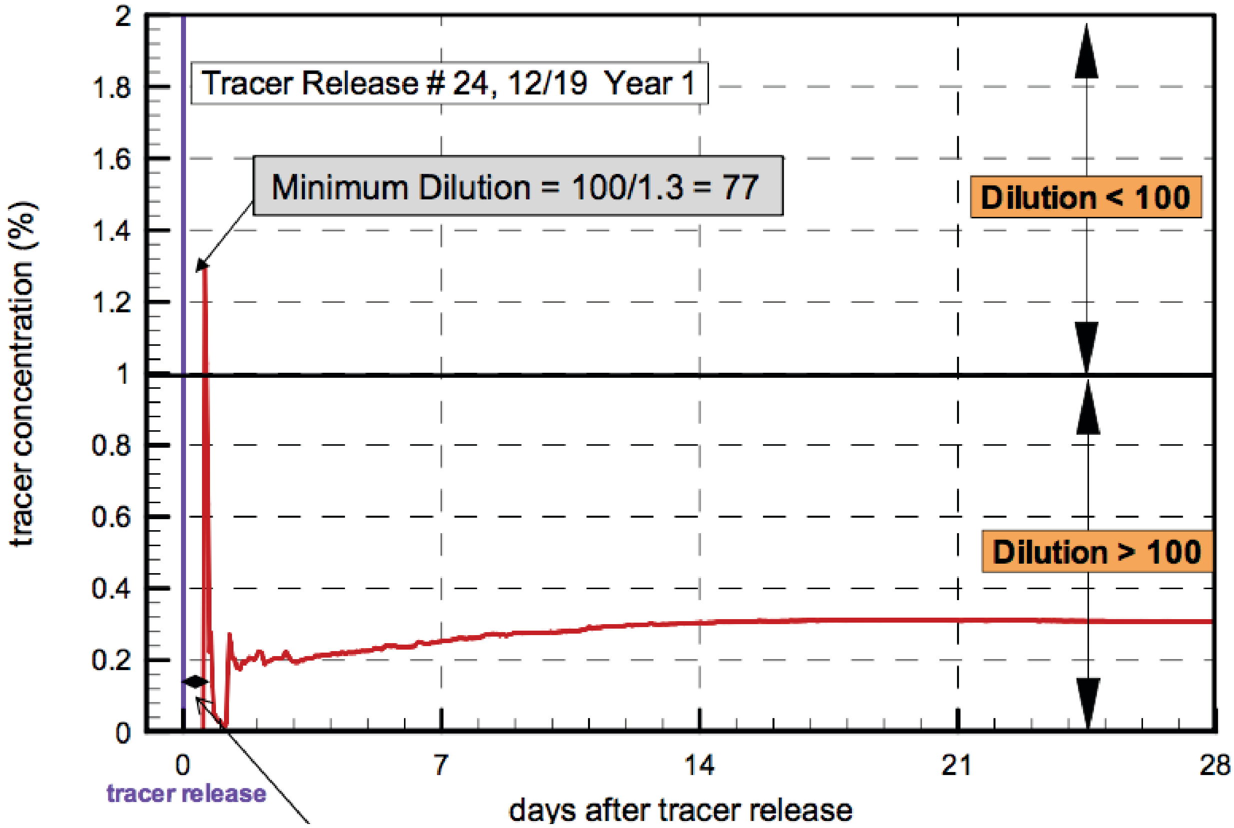

Figure 5 – Worse case modeled results for Boundary Condition (77:1 minimum dilution)

Emergency Scenario
The emergency scenario showed similar results as compared with the boundary condition scenario. Again, when winds come from the southeast, the potable reuse water short-circuits through the reservoir. In this case, two tracer releases exceeded the 100:1 dilution threshold. Again, none of these dilution values are above the minimum dilution of 10:1 as required by the regulations.

Potential Future Scenarios
The modeling results show a slight exceedance of the 100:1 dilution threshold. A potential solution includes the incorporation of a diffuser discharge at the bottom of the reservoir for the potable reuse water input. This would have the benefit of immediately mixing the warmer potable reuse water with the reservoir and lessen the impact of short circuiting. It is likely this would prevent any exceedance of the 100:1 dilution threshold, although future modeling runs with a diffuser should be performed to confirm this.

5 SUMMARY AND RECOMMENDATIONS

A range of operating scenarios were evaluated with the aim of maximizing the operational flexibility of the Pure Water project. The results of these conditions were favorable and indicate that the Pure Water project should be in compliance with the draft surface water augmentation regulations with all operational scenarios considered.

The following are recommendations and next steps for the Reservoir modeling:

- Move the weather station to ensure a representative location of wind speed and direction is obtained
- Move or add an aerator to the second trough in the Reservoir to improve mixing
- Perform a tracer release in the Reservoir and simulate the same tracer release in the model to validate the model (regulatory requirement)
- Assess the impact of a diffuser on the potable reuse water discharge to improve mixing and prevent short-circuiting to the Westlake Filtration Plant's inlet tower

References

State Water Resources Control Board, 2015. Regulations Related to Recycled Water. California Code of Regulations, Titles 22 and 17, Titles 22 and 17.

Appendix I: Independent Advisory Panel

National Water Research Institute (NWRI) 2018. Final Memorandum - NWRI Independent Advisory Panel for Las Virgenes-Triunfo Pure Water Project: Findings and Recommendations from the Panel Meeting held May 4, 2018. Prepared for the Las Virgenes-Triunfo JPA. June 26, 2018.

FINAL MEMORANDUM

Date: June 26, 2018

To: David Pedersen, General Manager, Las Virgenes Municipal Water District

From: Amy Childress, Ph.D.
Chair, NWRI Independent Advisory Panel for Las Virgenes-Triunfo Pure Water Project

Kevin M. Hardy, J.D., Executive Director, National Water Research Institute

Subject: NWRI Independent Advisory Panel for Las Virgenes-Triunfo Pure Water Project: Findings and Recommendations from the Panel Meeting held May 4, 2018

The National Water Research Institute (NWRI) is pleased to provide this consensus memorandum of the findings and recommendations of the NWRI Independent Advisory Panel (Panel) to review the Las Virgenes-Triunfo Pure Water Project (Project), a proposed indirect potable reuse project involving surface water augmentation (SWA) of the Las Virgenes Reservoir in Westlake Village, California.

The Panel was established by NWRI in 2018 at the request of the Las Virgenes-Triunfo Joint Powers Authority to provide a third-party peer review of the technical, scientific, regulatory, and policy aspects of the proposed Project. Members of the Panel included:

- Panel Chair: Amy Childress, Ph.D., University of Southern California
- Michael Anderson, Ph.D., University of California, Riverside
- Richard Bull, Ph.D., MoBull Consulting
- William Mitch, Ph.D., P.E., Stanford University
- Matthew Verbyla, Ph.D., San Diego State University

Biographies of the Panel Members are provided in **Attachment A.**

A meeting of the Panel was held on May 4, 2018, at the Las Virgenes Municipal Water District in Calabasas, California. The objectives of the meeting included:

- Provide the Panel with an overview of the Pure Water Project, including historical information and drivers for the project.

- Present information to assist the Panel in evaluating both (1) the validity of the Reservoir Model and (2) the results of various operational scenarios evaluated by the Reservoir Model.

- Solicit Panel feedback on (1) the results of the Reservoir Model and (2) the feasibility of the Pure Water Project to comply with reservoir requirements of the SWA regulations.

The meeting agenda is provided in **Attachment B**, and meeting attendees are listed in **Attachment C**.

All six Panel members reviewed pre-meeting documents, participated at the meeting and an on-site tour of the Las Virgenes Reservoir and Westlake Filtration Plant, and prepared and reviewed this memorandum before it was finalized.

PROJECT BACKGROUND

The Las Virgenes Municipal Water District (LVMWD) and the Triunfo Sanitation District (TSD) created the Las Virgenes-Triunfo Joint Powers Authority (JPA) in 1964 to plan and support construction, operations, and maintenance for a joint wastewater treatment system. Beginning in 1972, the JPA began serving recycled water treated at the Tapia Water Reclamation Facility (WRF) to customers for landscape irrigation. All water produced by the 12-million gallons per day (MGD) facility is treated to Title 22 standards for disinfected tertiary recycled water.

Although the Tapia WRF generates a steady supply of recycled water, the quantity required to meet the community's irrigation needs varies significantly between the dry summer months and the wetter months of winter. In the winter, excess recycled water not needed by customers is discharged to surface water or sprayed on fields maintained by the JPA in conformance with applicable permit conditions. Surface water discharges must comply with stringent nutrient Total Maximum Daily Load (TMDL) discharge permit requirements for Malibu Creek and Malibu Lagoon, including:

- <u>Current Discharge Limitations.</u> The current nutrient TMDL limits include 8 mg/L for nitrate+nitrite-N and 3 mg/L for total phosphorus. According to an established permit and creek flow monitoring protocols, no discharge is allowed from April 15 to November 15 unless flows in Malibu Creek drop below 2.5 cubic feet per second.

- <u>2022 Discharge Limitations</u>. The JPA must comply with new summer limits (April 15-November 15) of 1 mg/L total nitrogen and 0.1 mg/L total phosphorus by May 16, 2022.

- <u>2030 Discharge Limitations.</u> The JPA must comply with new winter limits (November 16-April 14) of 4 mg/L total nitrogen and 0.2 mg/L total phosphorus by November 16, 2030.

To optimize local water production, reduce reliance on imported water, support recognized beneficial uses of Malibu Creek and Lagoon, and comply with increasingly stringent discharge limitations, the JPA is seeking to undertake a water supply augmentation project that can provide multiple benefits to the community.

The proposed Project includes building a new Advanced Water Treatment Plant (AWTP) to treat recycled water from the Tapia WRF to drinking water standards. The advanced treated water will be piped to the Las Virgenes Reservoir (Reservoir) for blending and additional treatment at the Westlake Filtration Plant. Ultimately, the proposed Project has the potential to provide up to 15 percent of the drinking water supply for the JPA's customers. Refer to Figure 1 for a schematic of the proposed Project.

Figure 1. Schematic of the Las Virgenes-Triunfo Pure Water Project (Credit: Trussell Technologies).

The proposed Project must comply with the SWA regulations recently approved by the California State Water Resources Control Board. The SWA process involves adding advanced treated water to a surface water reservoir that is used as a source of drinking water (SWRCB, 2018). The SWA regulations include requirements for dilution and retention time in the reservoir, advanced treatment criteria, and minimum log reduction values for pathogens (i.e., enteric virus, *Giardia*, and *Cryptosporidium*).

Las Virgenes Reservoir receives imported water from the Metropolitan Water District of Southern California (MWD). Owned and operated by LVMWD, the Reservoir provides seasonal and emergency storage for the service area. As part of the proposed Project, a three-dimensional (3D) hydrodynamic model was developed and calibrated to evaluate the dilution of advanced treated water in the Reservoir and to ensure future compliance under different operating scenarios. Specifically, three operating scenarios were used:

- **Routine Scenario**: Recycled water from the Tapia WRF is discharged into the Reservoir during winter months, and water is withdrawn from the Reservoir during the summer months for treatment at the Westlake Filtration Plant. That is, the input of recycled water to the Reservoir and withdrawal of water from the Reservoir do not occur simultaneously.

- **Boundary Scenario**: The Westlake Filtration Plant operates continuously throughout the year. In the winter and "shoulder" (i.e., spring and fall) months, recycled water produced by the Tapia WRF is discharged to the Reservoir. In the summer, recycled water is used to meet irrigation demand, resulting in minimal input of recycled water to the Reservoir. No other water source (e.g., MWD water) enters the Reservoir in this scenario.

- **Emergency Scenario**: The feeder line that delivers imported water from MWD to the Reservoir becomes inoperable. In this scenario, both the AWTP and Westlake Filtration Plant are operated at their maximum capacities of 6 MGD and 15 MGD, respectively.

Prior to the meeting, the Panel received a technical report titled *Las Virgenes-Triunfo Joint Powers Authority Pure Water Program: Las Virgenes Reservoir Model Calibration and Results*, prepared by Trussell Technologies, Inc. The document provided background information about the proposed Project and SWA regulations, but focused on the 3D hydrodynamic model, specifically: the development of the model, three operating scenarios, results and conclusions of the hydrodynamic modeling, and next steps for the Project.

PANEL FINDINGS AND RECOMMENDATIONS

The Panel's findings and recommendations for the proposed Project are based on information provided in the technical report prepared by Trussell Technologies, presentations made by the project team at the Panel meeting, and tour of Las Virgenes Reservoir and Westlake Filtration Plant.

1. General Comments

- The Panel appreciated the informative and well-organized technical report prepared by Trussell Technologies and the meeting presentations prepared by the project team.

- The tour of Las Virgenes Reservoir and Westlake Filtration Plant was helpful to the Panel's review process.

2. Project Background and Drivers

- The Panel appreciated the excellent presentation on the background of the proposed Project and the history of the JPA.

- The Panel supports the JPA's efforts to diversify its water portfolio with advanced treated water.

- It is important to recognize that the proposed Project is the first SWA project in Los Angeles County and that it differs from the two existing SWA projects in California: (1) The City of San Diego's Pure Water Program, and (2) Padre Dam Municipal Water District's East County Advanced Water Purification Program. Considerations related to environmental discharges, water supply, water reuse, seasonal operation, and other factors are unique to the proposed Project.

- The proposed Project has a number of benefits, as highlighted during the presentation. The Panel identified additional possible benefits, including:

    - **Reduction in bromide**. As a result of reverse osmosis (RO) treatment, the bromide content of the advanced treated water will be lower than that of imported water. The lower bromide content should decrease the production of brominated disinfection byproducts (which are more toxic than their chlorinated analogues) at the Westlake Filtration Plant and facilitate compliance with regulatory limits on disinfection byproducts.

  - **Reduction in salinity**. The Project will result in a net export of salts from the Malibu Creek Watershed, thereby producing long-term benefits for groundwater and surface water in the region.

- The JPA could consider the potential for beneficial reuse of the RO brine as opposed to disposal via the brine discharge pipeline. For example, Santa Clara Valley Water District is evaluating the use of engineered treatment cells (i.e., a gradient of wetlands with increasingly higher salinity) with eventual discharge in the San Francisco Bay as part of a Reverse Osmosis Concentrate Management Study. Given the brackish nature and valuable habitat of Malibu Creek and Malibu Lagoon, a similar strategy for the provision of brackish water habitat prior to ocean discharge could be an alternative to the brine discharge pipeline.

- It would be useful to identify the locations of the fields that are sprayed with excess recycled water not needed by customers in the winter and clarify any regulations pertaining to the recycled water that is sprayed.

3. Project Facilities

- Siting the AWTP adjacent to the Reservoir could have benefits for water quality. Specifically, the addition of chloramines – frequently applied after ultraviolet (UV) treatment in the AWTP to control microbial growth in pipelines leading to a reservoir – could possibly be avoided, which would reduce the inorganic nitrogen loading to the Reservoir and minimize the formation of nitrosamines.

- Operating the AWTP only during the summer may present several challenges to the Project. The project team should evaluate the implications associated with staffing, resources, operator process sensitivity and situational awareness, and the intermittent operation of membrane (and other treatment) processes.

4. California's Surface Water Augmentation Regulations

- The Panel appreciated the excellent summary of the SWA regulations. In particular, the table on Slide 18 on "Treatment Requirements" was informative.

- The current program and future plans for source control should be described in upcoming presentations and reports. For instance, it will be necessary to identify the chemicals of concern and potential sources of these chemicals in the sewershed, describe the monitoring and outreach programs, and outline the response plan for identified constituents. These communications should emphasize developing an accurate understanding of Project benefits among customers using applicable public health and JPA service standards as context.

- It is important to develop a monitoring plan that specifically identifies the constituents that will be monitored in the AWTP product water, Las Virgenes Reservoir, and Westlake Filtration Plant, and the frequency of monitoring and analysis for each location.

5. Reservoir Model: Build and Calibration

- The Panel believes the Reservoir Model Approach presented by the Project Team is valid. The Model reasonably reproduces temperature and water level in Las Virgenes Reservoir. Next steps should involve the development of a tracer test and validation of the ELCOM model using tracer results with respect to hydrodynamics and dilution in the Reservoir.

- The installation of the second weather station and comparison with existing weather station data will be important for future hydrodynamic modeling. Because information derived from these weather stations will be a factor contributing to public health decisions, the JPA should site each weather station with technical rigor.

- The Panel suggests that the Project Team consider conducting a sensitivity analysis of the model outputs (minimum dilution and theoretical retention time, V/Q) relative to the inputs of the hydrodynamic model, particularly wind and aeration, because these variables will affect dilution at the Reservoir outlet.

- A diagram of the Reservoir showing typical currents would be useful to the process of locating the outfall. It may be possible to identify locations where currents would convey the discharge away from the Westlake Filtration Plant under most conditions.

- While graphic representations of predicted and observed Reservoir surface elevations are helpful, the Panel recommends that more detailed statistics regarding calibration to the surface elevation data be provided. In particular, the scale for water surface elevation on Slide 15 makes it difficult to ascertain goodness-of-fit. Visually, it appears that some modest improvements in the water budget might be achieved through the consideration of local runoff, seepage, etc.

    - Perhaps further qualification is warranted of the statement that "precipitation and runoff from the surrounding area [are] roughly equal to seepage and evaporation in normal years" (see page 13 of the technical report).

6. Reservoir Model: Modeled Conditions and Results

- The Routine Scenario, in which advanced treated recycled water is discharged to the Reservoir during the winter and water is withdrawn from the Reservoir for treatment at Westlake Filtration Plant during the summer, represents a unique operational strategy compared with the other SWA projects currently under development. Because of the asynchronous nature of discharge and withdrawal, simulations for this scenario were not conducted. While the Panel agrees that an extensive modeling analysis is not warranted, some consideration of the switch-over period from discharge to withdrawal would be helpful. Modeling analyses indicate that there are conditions in which the initial project design fails to meet the 100:1 dilution criterion, so seemingly there would be a finite probability that this situation could occur during the switch-over period in the spring. Under such circumstances, it may be necessary to define the minimum time interval that must elapse after the discharge of advanced treated water to the Reservoir has ended and before withdrawal to the filtration plant can begin to avoid possible non-compliance. Numerical tracer test results can be used to develop the relationship between the minimum dilution ratio and time-to-peak concentration. A plot or regression of these data should define the minimum time interval that must elapse after discharge of advanced treated water to the Reservoir has ended and before withdrawal to the filtration plant can begin. This interval is expected to be quite short, likely on the order of 1 to 2 days, but should be rigorously defined. If the project is demonstrated to achieve at least 100:1 dilution at all times, then the establishment of a minimum time interval would not be necessary.

- Future modeling efforts could follow one of the following two approaches:

    - Option 1: Modify the design of the diffuser/aerator system and/or the inlet configuration such that the model predicts that dilution criterion would be met in even the most challenging meteorological conditions under the Boundary Scenario.

    - Option 2: If it is not possible to maintain a dilution ratio above 100:1 under all meteorological conditions for all scenarios, then an operational framework that defines when withdrawal to the Westlake Filtration Plant can occur is necessary. The framework would ideally be based on real-time hydrodynamic modeling. Alternatively, a regression of the dilution ratio with respect to meteorological and hydraulic conditions should be developed. In this case, the confidence interval of the regression slope should be considered.

- Following the completion of the tracer test and validation of the hydrodynamic model with data from the new weather station, the project team should develop a probabilistic analysis of the dilution ratios achieved at the Westlake Filtration Plant intake under the range of operational, meteorological, and water column conditions (e.g., depth, stratification, etc.) of the Reservoir.

    - A probabilistic model could improve predictions of the likelihood of failure based on various environmental conditions beyond the ones that were simulated.

    - The probabilistic model also can facilitate choosing between the two options presented above. For example, if the risk of failing to meet the 100:1 dilution criterion is high, Option 1 should be selected; however, if the risk is low (for example, one day every two years), Option 2 may be preferable and/or more cost-effective.

- The operation of aerators has been demonstrated to mix the water column and increase the dilution of a pulse of off-specification water. It is valuable to note that aerators also help reduce taste and odor, algal blooms, and toxins in a reservoir, and can improve the treatability of raw water. The Panel does not believe that Solar Bees™ installed at the Reservoir would provide sufficient turbulent-kinetic energy to mix a reservoir of this depth.

7. Conclusions

Based on the information presented at this meeting, the Panel concluded the following:

- The JPA's Board of Directors and executive leadership appear committed to appropriate planning and investment to ensure regional water supply reliability.
- The proposed Project effectively addresses the necessary water supply, regulatory, and environmental considerations.
- The preliminary model analyses and scenarios are reasonable and provided the Panel with valuable insight into the proposed Project.
- The proposed Project, as presented to the Panel, appears to be capable of complying with the SWA regulations.

8. References

SWRCB (2018). *A Proposed Framework for Regulating Direct Potable Reuse in California*. State Water Resources Control Board, Sacramento, CA.

ATTACHMENT A: PANEL MEMBER BIOGRAPHIES

Amy Childress, Ph.D. (Panel Chair), is a Professor and the Director of Environmental Engineering at University of Southern California in Los Angeles. She has more than 25 years of experience researching membrane processes for water treatment, wastewater reclamation, and desalination. Most recently, she investigated membrane contactor processes for innovative solutions to contaminant and energy challenges; pressure-driven membrane processes as industry standards for desalination and water reuse; membrane bioreactor technology; and colloidal and interfacial aspects of membrane processes. Childress has directed research funded by federal, state, and private agencies, including the California Department of Water Resources, National Science Foundation, Electric Power Research Institute, and Strategic Environmental Research and Development Program. She also has received several awards, including the Bureau of Reclamation's More Water Less Concentrate Stage 1 Challenge, Association of Environmental Engineering and Science Professors Outstanding Publication Award, and a National Science Foundation CAREER Award, and has served as President of the Association of Environmental Engineering and Science Professors. She is currently a co-editor of *Desalination* and serves on several national committees. Childress received a B.S. degree in Civil Engineering from the University of Maryland, and an M.S. and a Ph.D. from the University of California, Los Angeles

Michael Anderson, Ph.D., is a Professor of Applied Limnology and Environmental Chemistry at University of California, Riverside, where he has taught courses since 1990. Anderson currently serves as Divisional Dean for Agriculture and Natural Resources, and previously served as Chair of the Department of Environmental Sciences. His research focuses on applied limnology and lake/reservoir management; surface water quality and modeling; fate of contaminants in waters, soils, and sediment; and environmental chemistry. He recently served as a member of the NWRI Expert Panel on Surface Water Augmentation and Potable Reuse, Independent Advisory Committees for indirect potable reuse projects for the City of San Diego and Padre Dam Municipal Water District, Salton Sea Science Advisory Committee, and the U.S. Environmental Protection Agency's Harmful Algal Blooms Grant Panel. He also served as Associate Editor for *Lake and Reservoir Management* from 2004-2017. Anderson received a B.S. in Biology from Illinois Benedictine College, an M.S. in Environmental Studies from Bemidji State University, and a Ph.D. in Environmental Chemistry from Virginia Tech.

Richard Bull, Ph.D., currently works as a Consulting Toxicologist and researcher with MoBull Consulting (Richland, WA), where he conducts studies on the chemical problems encountered in water for water utilities and for federal, state, and local governments. He became Professor Emeritus at Washington State University upon his retirement in 2003. Formerly, he served as a senior staff scientist at the U.S. Department of Energy's Pacific Northwest National Laboratory; Professor of Pharmacology and Toxicology at Washington State University; and Director of the Toxicology and Microbiology Division in the Cincinnati Laboratories for the U.S. Environmental Protection Agency (USEPA). His early research focused on central nervous system effects of heavy metals and progressed to studies of carcinogenic and toxicological effects of disinfectants and disinfection byproducts, halogenated solvents, acrylamide, and other contaminants of drinking water. He has served on international scientific working groups of the World Health Organization, and the International Agency for Research on Cancer, which addresses carcinogenic activity on environmental contaminants and medical devices. Bull served several terms as a member of the USEPA's Science Advisory Board and as Chair of the Drinking Water Committee and served as a member and/or chair of several committees convened by the National Academy of Sciences.

Bull received a Ph.D. in Pharmacology from the University of California San Francisco and a B.S. in Pharmacy from the University of Washington.

William Mitch, Ph.D., P.E., is a Professor in the Civil and Environmental Engineering Department at Stanford University, which he joined in 2013, after 13 years in the Chemical Engineering faculty at Yale University. His current research includes chemicals of concern associated with wastewater recycling and prevention of the formation of nitrogen-based disinfection byproducts. Mitch has authored more than 90 peer-reviewed journal articles, and the February 2018 cover of *Environmental Science and Technology* featured his interdisciplinary approach to identify disinfection byproducts, improve assessment techniques, and minimize risks from chemicals and pathogens in drinking water. He has served on the U.S. Environmental Protection Agency Scientific Advisory Board's Drinking Water Committee since 2010 and on several advisory panels as an expert on nitrosamines. Mitch received a Ph.D. In Civil and Environmental Engineering from University of California, Berkeley, and is a professional engineer in the State of California.

Matthew E. Verbyla, Ph.D., is an Assistant Professor of Environmental Engineering at San Diego State University, where he teaches courses related to sanitation, wastewater treatment, and microbiological processes for environmental engineering, and directs the Safe WaTER Research Group. His research aim is to understand the health-related microbiological processes in engineered natural systems and water, sanitation, and hygiene (WASH) systems, especially those that incorporate water reuse and resource recovery. Verbyla currently serves as co-editor for the Sanitation Technologies group of the Global Water Pathogens Project, an initiative led by UNESCO and Michigan State University to produce an online open access platform for scientific knowledge on pathogens in water. Verbyla received a B.S. in Civil Engineering from Lafayette College, a Ph.D. in Environmental Engineering from the University of South Florida, and a postdoctoral research assignment with the LCE virus group at École Polytechnique Fédérale de Lausanne in Switzerland.

ATTACHMENT B: PANEL MEETING AGENDA

NATIONAL WATER RESEARCH INSTITUTE

Independent Advisory Panel for
Las Virgenes-Triunfo Pure Water Project

May 4, 2018

AGENDA

LOCATION	CONTACTS
Las Virgenes Municipal Water District Board Room 4232 Las Virgenes Road Calabasas, CA 91302-1994	NWRI Office: (714) 378-3278 Kevin Hardy: (760) 801-9111 (cell) Dawna Hernandez: (949) 345-9999 (cell) Suzanne Sharkey: (949) 258-2093 (cell)

The NWRI Independent Advisory Panel was established to provide expert review of the reservoir modeling results for the Las Virgenes-Triunfo Pure Water Project as proposed by the Las Virgenes-Triunfo Joint Powers Authority in Calabasas, California.

MEETING OBJECTIVES

- Provide the Panel with an overview of the Pure Water Project, including historical information and drivers for the project.
- Present information to assist the Panel in evaluating both (1) the validity of the Reservoir Model and (2) the results of various operational scenarios evaluated by the Reservoir Model.
- Solicit Panel feedback on (1) the results of the Reservoir Model and (2) the feasibility of the Pure Water Project to comply with reservoir requirements of the Surface Water Augmentation regulations.

08:00 am	Welcome and Introductions	Kevin M. Hardy, National Water Research Institute (NWRI)
08:15 am	Projection Background, Drivers, and Overview	David Pedersen (LVMWD) and Shane Trussell (Trussell Tech)

09:00 am	Overview of California's Surface Water Augmentation Regulation	Brian Pecson (Trussell Tech)
09:30 am	Reservoir Model: Build and Calibration	Bryan Trussell (Trussell Tech)
10:00 am	**BREAK**	
10:15 am	Reservoir Model: Modeled Conditions and Results	Shane Trussell (Trussell Tech)
11:00 am	Open Discussion / Q & A	Facilitated by Kevin Hardy
11:30 am	**WORKING LUNCH / Continue Discussion**	
12:15 pm	Depart District Offices for Las Virgenes Reservoir (32601 Torchwood Place)	
1:30 pm	Return to District	
2:00 pm	Panel-Only Working Session	Facilitated by Panel Chair and NWRI
4:30 pm	Report Out to Project Team	Facilitated by Panel Chair
5:00 pm	**ADJOURN**	

ATTACHMENT C: PANEL MEETING ATTENDEES

Panel Members

- Amy Childress, Ph.D., University of Southern California (Panel Chair)
- Michael Anderson, Ph.D., University of California, Riverside
- Richard Bull, Ph.D., MoBull Consulting
- William Mitch, Ph.D., P.E., Stanford University
- Matthew Verbyla, Ph.D., San Diego State University

National Water Research Institute

- Kevin M. Hardy, Executive Director
- Dawna Hernandez, Event Manager
- Suzanne Sharkey, Water Resources Scientist and Project Manager (remote access)
- Gina Vartanian, Communications Manager

Las Virgenes Municipal Water District

- Brett Dingman, Water Reclamation Manager
- David Lippman, Director of Facilities and Operations
- Joe McDermott, Resource Conservation and Public Outreach
- David Pedersen, General Manager
- John Zhao, District Principal Engineer

Trussell Technologies Project Team

- Shane Trussell
- Bryan Trussell
- Brian Pecson
- Chao-Chun Yang
- Li Ding (remote access)

Los Angeles Regional Water Quality Control Board

- Cris Morris, Watershed Regulatory Section Chief
- Steven Webb, Municipal Permitting

State Water Resource Control Board, Division of Drinking Water

- Randy Barnard, Recycled Water Unit Chief (remote access)
- Brian Bernados, Technical Specialist (remote access)
- Dmitriy Gizburg, Southern California Drinking Water Field Operations Branch
- Saeed Hafeznezami, Technical Operations Section
- Jeff O'Keefe, Chief, Los Angeles Region
- Shu-Fang Orr, Southern California Drinking Water Field Operations Branch
- Erica Wolski, Technical Operations Section (remote access)

Other Consultants to Las Virgenes Municipal Water District

- Dawn Taffler, Kennedy Jenks (remote access)

Appendix J: Project Financing Plan

PFM Financial Advisors LLC (PFM) 2017. Preliminary Financial Feasibility Report. Prepared for the Las Virgenes - Triunfo Joint Powers Authority on MEXH 21, 2017.

Las Virgenes – Triunfo Joint Powers Authority

Preliminary Financial Feasibility Report

March 21, 2017

PFM FINANCIAL ADVISORS LLC

601 South Figueroa Street, Suite 4500
Los Angeles, CA 90017
(213) 489-4075

www.pfm.com

TABLE OF CONTENTS

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Executive Summary

The proposed Pure Water Project (the "Project") will create a new, local, sustainable and drought-proof drinking water supply through the purification of the Las Virgenes – Triunfo Joint Powers Authority's (the "JPA") surplus recycled water and process it through an advanced treatment facility; then store it at the Las Virgenes Reservoir for later use as drinking water. This process is known as indirect potable reuse ("IPR") and discussed in greater detail in Scenario 4 in the Basis of Design Report ("BODR") dated September 2016 prepared by MWH. The Project would reduce the need to discharge excess recycled water to Malibu Creek and is intended to diversify the region's water supply and reduce dependence on imported water by generating up to 6 million gallons per day ("mgd") of new drinking water. Total construction costs of the Project are estimated to be approximately $95,313,000 million (2016 Dollars) as detailed in the BODR and Section 1 of this Financial Feasibility Report ("Financial Report")

By creating a new source of locally controlled, uninterruptable drinking water, the Project results in reduced reliance on the Metropolitan Water District of Southern California ("MWD") for imported water. The avoided costs associated with reduced dependence on the MWD are the primary financial benefits of the Project and are discussed in detail in this Financial Report. Additional regional environmental benefits of the Project include ecosystem protection and reduced discharge into Malibu Creek.

This Financial Report is comprised of six sections. Section 1 details the estimated capital expenditures necessary for construction of the Project and the preliminary capital cost allocation framework between the JPA members. Section 2 follows with a discussion of potential funding sources available for the Project. Pre-construction costs are expected to be funded through a combination of cash contributions from Las Virgenes MWD ("LV") and Triunfo Sanitation District ("TSD") and grants to the extent they are available based on the cost allocation framework. Funding for the construction of the Project is expected to come from grants, State Revolving Fund ("SRF") and Water Infrastructure Finance and Innovation Act ("WIFIA") loans, and municipal bonds; however, the availability of grant funding and the SRF loan interest rates are unknown at this time. Section 3 analyzes a set of potential funding scenarios in order to establish a range of financing alternatives for the project. Section 4 analyzes the required revenue increase for LV and TSD and the total revenue increase required to support each of the funding scenarios identified in Section 3.

Section 5 of this Financial Report outlines the process for continuing to refine the financial analysis as it pertains to future financial plan updates. Section 6 presents a summary and conclusion. It should be noted that LV and TSD will be responsible for reducing discharge to Malibu Creek in the future due to regulatory requirements regardless of whether or not the added step of constructing the advanced treatment facility is undertaken. As such, the Pure Water Project represents only an incremental increase in costs compared to what will be necessary to meet regulatory requirements.

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1. Capital Expenditures

Capital Costs. The projected capital costs for the Project facilities are comprised of construction costs and soft costs. These costs were developed as part of the BODR, and detailed information on the development of these costs can be found in that study. A high level summary of how these costs were developed is provided below.

Construction costs were calculated for the Advanced Water Treatment ("AWT") facility, recycled water pipelines, brine discharge pipeline and the mixing system at the reservoir, and are presented in the table below. A lump sum was assumed for the land acquisition necessary for the AWT facility. The construction cost of the AWT facility is a sum of the costs needed for process equipment, equipment installation, pumping and storage and the plant building itself. A number of these fees were developed from vendor quotes specific to the requirements of the AWT facility, while equipment installation costs were determined as a percentage of equipment costs.

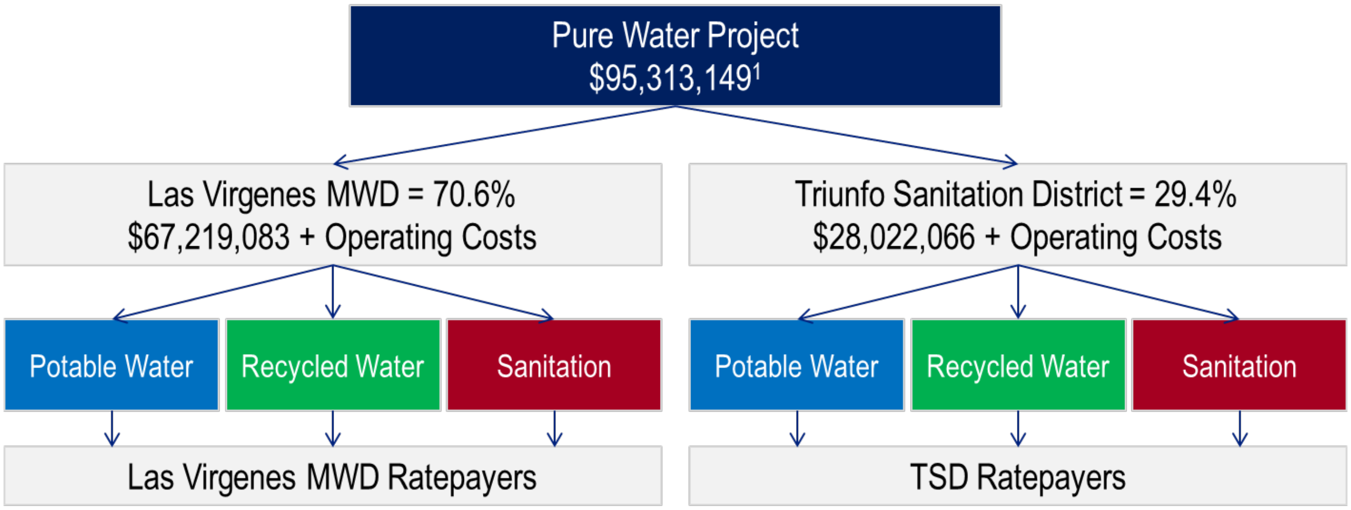
Additionally, contingencies were added for contractor overhead and profit, scope and estimating, and soft costs such as engineering and administrative fees. A breakout of the Project construction costs is detailed in the following table:

Pure Water Project Construction Costs (2016 Dollars)	
Description	Estimated Cost
Advance Water Treatment ("AWT") Facility	$46,721,000
Land Acquisition	$2,000,000
AWT Inlet Pipeline	$1,460,000
AWT Outlet Pipeline	$6,400,000
Brine Line	$10,500,000
Mixing System	$1,000,000
Subtotal	$68,081,000
Contingency (25%)	$17,020,250
Soft Costs (Engineering & Admin - 15%)	$10,212,150
Estimated Total Costs[1]	$95,313,149

[1]Totals may not add due to rounding

It is currently expected that the bulk of the Project's costs would occur during the construction phase which is expected to take place in 2025 through 2030.

Cost Allocation Framework. Capital costs are assumed to be allocated between LV and TSD based on a 70.6%/29.4% split with O&M costs following the same allocation.



At this point, a method for allocating costs among the applicable service types: potable water, recycled water, and sanitation has not been developed. Rather, this report focuses on the impact the Project will have on each member of the JPA at an aggregate level. As the Project moves forward, this allocation method will be developed in order to properly determine cost impacts on each respective customer class.

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2. Funding Sources

Funding for the Project is expected to come from a variety of sources, including but not limited to cash contributions from LV and TSD, grants, low-cost loans from the state revolving fund and if available, federally subsidized loan programs, and long-term debt. The Project is eligible for grants and subsidized loans and the objective of the financing plan is to secure the most favorable mix of funding that results in the lowest cost of capital for the Project. A discussion of potential funding sources is provided below. The availability of subsidized capital fluctuates based on a number of factors including demand from other borrowers, state and federal budget constraints, and evolving application processes. As such, there can be no assurance that the Project will be eligible for grants and subsidized loans at the time the JPA is seeking capital financing.

Grants. At times, grants from state and federal agencies are available to help fund capital intensive water supply and wastewater projects. Availability of these funds vary from year to year, however, it is expected that at least some funding for the Project would be available in the form of grants. Grants are the cheapest source of funding as they do not have to be repaid, however, they do bear administrative costs.

State Revolving Fund Loans (“SRF”). SRF Loans are loans with state subsidized interest payments made to assist agencies in funding water and wastewater related projects. If available, these types of loans provide a much less expensive means of funding capital intensive projects than other forms of debt, including publicly issued debt or bank loans. As of January 2017, funding from the State Water Resources Control Board SRF Loan program is available at a rate of approximately 1.67%.

Federally Subsidized Loan Programs. The Environmental Protection Agency (“EPA”) has announced the implementation the Water Infrastructure Finance and Innovation Act (“WIFIA”) program which is intended to accelerate investment in water and wastewater infrastructure by providing long-term, low cost, supplemental credit assistance for water and wastewater projects of national and regional significance. WIFIA will fund up to 49% of a project’s eligible costs at interest rates equal to contemporary Treasury rates plus one basis point. The WIFIA program received initial budget authority in December 2016 and is currently accepting letters of interest for projects seeking funding. At this stage, the financing scenarios evaluated in this Financial Report do not assume WIFIA loans as a source of funding; however, WIFIA loans may be available in the future.

Tax-Exempt Bonds. LV and TSD (either on a standalone basis or through a pooled financing) have the option of accessing funding via tax-exempt debt in the public capital markets. Public market debt comes in a variety of different forms that can broadly be broken down into two categories: variable rate and fixed rate options, both of which would be available to and can be used to complement financing obtained through grants or the state and federal loan programs.

Variable rate debt has interest rates that fluctuate, typically in direct correlation with a market index such as the London Interbank Offered Rate (“LIBOR”) or the Securities Industry and Financial Markets Association (“SIFMA”) index. Interest rates reset periodically on predetermined dates (typically daily, weekly or monthly), which accounts for the variable nature of the debt. Although variable rate debt opens the issuer to interest rate risk as interest rates can rise above planned levels, variable rates have historically resulted in a lower cost of debt than fixed rate alternatives.

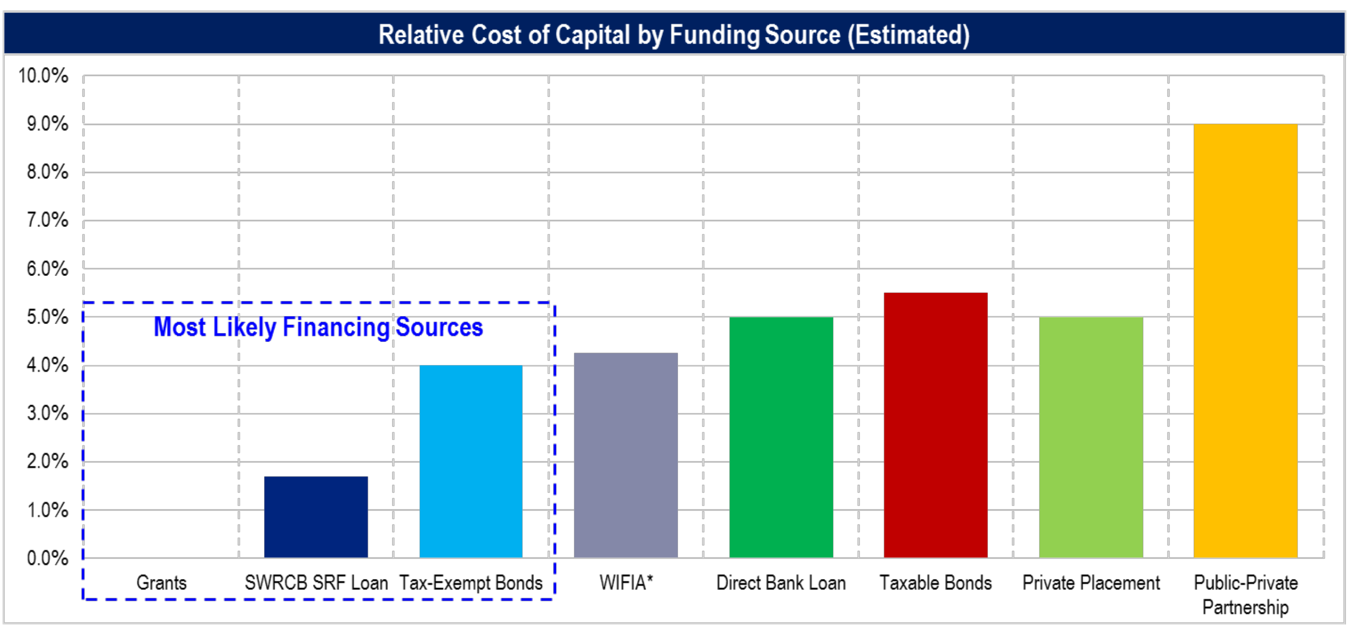
Fixed rate debt, which in the case of TSD and LV would most likely be in the form of tax-exempt revenue bonds, is debt that has interest rates that do not change over the life of the debt; hence they are “fixed”. In today’s market, interest rates on fixed rate debt are near historical lows making today an extremely attractive time to finance capital projects.

Taxable Bonds. Similar to tax-exempt bonds, LV and TSD have the option of accessing funding via the public capital markets through taxable bonds. Taxable debt, while more expensive than its tax-exempt counterpart, offers additional flexibility in terms of its allowable uses. For instance, if the Project was expected to directly benefit an entity in the private sector, the JPA would be unable to utilize tax-exempt debt as a source of funding. It is not expected that taxable debt will be needed as a funding source for the project as the Project provides public benefits.

Direct Bank Loans & Private Placements. In order to minimize disclosure and administrative burden on the JPA, LV, and TSD, Direct Bank Loans and Private Placements may be a worthwhile alternative to traditional publicly offered municipal bonds. Direct Bank Loans and Private Placements will have similar characteristics to publicly issued debt in terms of structure but will be purchased directly by a bank or privately placed with investor(s). Typically, these structures are slightly more expensive than tax-exempt municipal bonds, but the actual differential will be dependent on contemporary market dynamics. However, the increase in agencies utilizing these programs over the past five years has attracted the attention of the Municipal Securities Rulemaking Board ("MSRB") and the Securities and Exchange Commission ("SEC") which may result in increased reporting requirements in the future. PFM will monitor these dynamics as the need for additional funding arises leading up to the construction phase.

Public Private Partnership. The JPA may also be able to finance the Project through a public private partnership ("P3") in which case the Project would at least in part be funded through the infusion of funds from a private third party in the form of private equity. In general, private equity is significantly more expensive than municipal debt, whether tax-exempt or taxable. While the cost of capital may be higher in a public private partnership, other important issues, such as construction overruns and operating risks may be allocated to the private party in exchange for the higher expected returns. P3 arrangements are complicated and require careful negotiations on the part of public agencies to ensure performance and risks are allocated commensurate with funding. Depending on the project and the specific circumstances associated with a project, a P3 arrangement can result in lower life cycle risk adjusted costs – even with a higher cost of capital.

The chart below summarizes the estimated relative cost of capital by funding source.



* WIFIA = Water Infrastructure Finance and Innovation Act. Relationship between WIFIA and tax-exempt varies based on transaction structure and relative interest rates.

3. Funding Scenarios

As discussed in Section 2 there is a wide array of funding sources that may be utilized to finance the Project. In order to evaluate the potential costs associated with the available financing options, three scenarios were developed to illustrate the range of funding costs based on the mix of funding sources.

In each of the scenarios described below, it is assumed that outlay for Project needs commences in 2017 and ends in 2030 with operation beginning in 2031. It is also assumed the repayment period for any debt issued is 30 years.

Scenario 1. In this scenario, funding comes from pay-go contributions of $20.0 million, grants of $15.0 million, and an SRF loan of $60.3 million. The assumed interest rate on the SRF loan is 1.663%, consistent with today's available funding. While the rates available on SRF loans will fluctuate over time, this Financial Report assumes that interest rates available through the SRF loan program will be below the Project's cost of capital should it obtain financing in the public capital markets. During the State of California's fiscal crisis in 2009-10, the cost of borrowing through the SRF program was above the cost of capital for many A/AA rated entities within the state. Notwithstanding this dislocation, the Scenario 1 funding structure is reasonably likely for the Project (i.e. mix of pay-go, grants and SRF loans) and represents a structure that maximizes the use of low-cost, subsidized financing.

Scenario 2. In Scenario 2, funding comes from pay-go contributions of $15.0 million, grants totaling $10.0 million, a SRF Loan of $35.0 million, and $35.3 million from tax-exempt municipal bonds. The interest rate on municipal bonds is assumed to be the average AA rated 20-Year MMD spot rate, corresponding to the expected weighted average lifespan of any debt issued, since the inception of the MMD index, approximately 4.00%. Scenario 2 illustrates the incremental cost associated with a shift in the capital structure away from subsidized financing to the capital markets in the form of publicly issued bonds.

Scenario 3. Scenario 3 replaces the funding from SRF Loans and grants in Scenario 2 with tax-exempt municipal bonds issued in the public capital markets. Scenario 3 represents the highest cost of capital considered (assuming the Project is entirely eligible to be financed on a tax-exempt basis) and provides a likely book-end in terms of the maximum relative cost increase vis-à-vis a scenario that relies more heavily on pay-go, grant or SRF funding.

A summary of the three scenarios is provided in the table below.

Potential Funding Scenarios (2016 Dollars)			
Scenario	Scenario 1	Scenario 2	Scenario 3
Funding Sources	Grants / SRF	Grants / SRF/ T-E Bonds	T-E Bonds
Total Capital Cost		$95,313,149	
Pay-Go Contribution	$20,000,000	$15,000,000	$10,000,000
Grant Funding	$15,000,000	$10,000,000	$0
SRF Loan (1.66%)	$60,313,149	$35,000,000	$0
Municipal Bond (4.00%)	N/A	$35,313,149	$85,313,149
Repayment period	30 Years	30 Years	30 Years

Detailed tables showcasing each scenario's funding needs by funding source and project participant are shown below. As seen in the tables, borrowing (whether SRF Loans or tax-exempt debt) is not expected to be needed until 2025 when construction begins in earnest. Each scenario assumes costs are allocated 70.6% to LV and 29.4% to TSD as described in the Cost Allocation Framework section.

Las Virgenes MWD Funding Sources ($000s)														
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Scenario 1															
Pay Go	$412	$412	$412	$412	$412	$687	$687	$687	$2,571	$2,571	$2,571	$1,536	$500	$250	$14,120
Grants	$309	$309	$309	$309	$309	$515	$515	$515	$1,929	$1,929	$1,929	$1,152	$375	$188	$10,590
SRF Loans	$0	$0	$0	$0	$0	$0	$0	$0	$10,949	$10,949	$10,949	$6,539	$2,129	$1,065	$42,581
Bonds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$721	$721	$721	$721	$721	$1,202	$1,202	$1,202	$15,449	$15,449	$15,449	$9,227	$3,004	$1,502	$67,291
Scenario 2															
Pay Go	$433	$433	$433	$433	$433	$721	$721	$721	$1,611	$1,611	$1,611	$962	$313	$157	$10,590
Grants	$288	$288	$288	$288	$288	$481	$481	$481	$1,074	$1,074	$1,074	$641	$209	$104	$7,060
SRF Loans	$0	$0	$0	$0	$0	$0	$0	$0	$6,354	$6,354	$6,354	$3,795	$1,236	$618	$24,710
Bonds	$0	$0	$0	$0	$0	$0	$0	$0	$6,411	$6,411	$6,411	$3,829	$1,247	$623	$24,931
Total	$721	$721	$721	$721	$721	$1,202	$1,202	$1,202	$15,449	$15,449	$15,449	$9,227	$3,004	$1,502	$67,291
Scenario 3															
Pay Go	$721	$721	$721	$721	$721	$1,202	$1,202	$1,052	$0	$0	$0	$0	$0	$0	$7,060
Grants	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
SRF Loans	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Bonds	$0	$0	$0	$0	$0	$0	$0	$150	$15,449	$15,449	$15,449	$9,227	$3,004	$1,502	$60,231
Total	$721	$721	$721	$721	$721	$1,202	$1,202	$1,202	$15,449	$15,449	$15,449	$9,227	$3,004	$1,502	$67,291

TSD Funding Sources ($000s)														
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Scenario 1															
Pay Go	$172	$172	$172	$172	$172	$286	$286	$286	$1,071	$1,071	$1,071	$640	$208	$104	$5,880
Grants	$129	$129	$129	$129	$129	$214	$214	$214	$803	$803	$803	$480	$156	$78	$4,410
SRF Loans	$0	$0	$0	$0	$0	$0	$0	$0	$4,560	$4,560	$4,560	$2,723	$887	$443	$17,732
Bonds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$300	$300	$300	$300	$300	$500	$500	$500	$6,434	$6,434	$6,434	$3,842	$1,251	$625	$28,022
Scenario 2															
Pay Go	$180	$180	$180	$180	$180	$300	$300	$300	$671	$671	$671	$401	$130	$65	$4,410
Grants	$120	$120	$120	$120	$120	$200	$200	$200	$447	$447	$447	$267	$87	$43	$2,940
SRF Loans	$0	$0	$0	$0	$0	$0	$0	$0	$2,646	$2,646	$2,646	$1,580	$515	$257	$10,290
Bonds	$0	$0	$0	$0	$0	$0	$0	$0	$2,670	$2,670	$2,670	$1,594	$519	$260	$10,382
Total	$300	$300	$300	$300	$300	$500	$500	$500	$6,434	$6,434	$6,434	$3,842	$1,251	$625	$28,022
Scenario 3															
Pay Go	$300	$300	$300	$300	$300	$500	$500	$438	$0	$0	$0	$0	$0	$0	$2,940
Grants	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
SRF Loans	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Bonds	$0	$0	$0	$0	$0	$0	$0	$62	$6,434	$6,434	$6,434	$3,842	$1,251	$625	$25,082
Total	$300	$300	$300	$300	$300	$500	$500	$500	$6,434	$6,434	$6,434	$3,842	$1,251	$625	$28,022

4. Revenue Requirement Impact

This section analyzes the net change necessary in the respective revenue requirements for LV and TSD as a result of financing and constructing the Project. The key assumptions underpinning the revenue requirement impact are segmented into two categories: Project-specific internal assumptions and external avoided-cost (benefit) assumptions. Internal assumptions are those over which the Project has control and include capital costs and accompanying mix of funding sources, annual operations and maintenance expenses and production/capacity of the Project. As the primary benefit in terms of avoided cost associated with the Project stem from a reduction in the need for imported water from the MWD, assumptions need to be made regarding the level of avoided costs which are external to Project stakeholders.

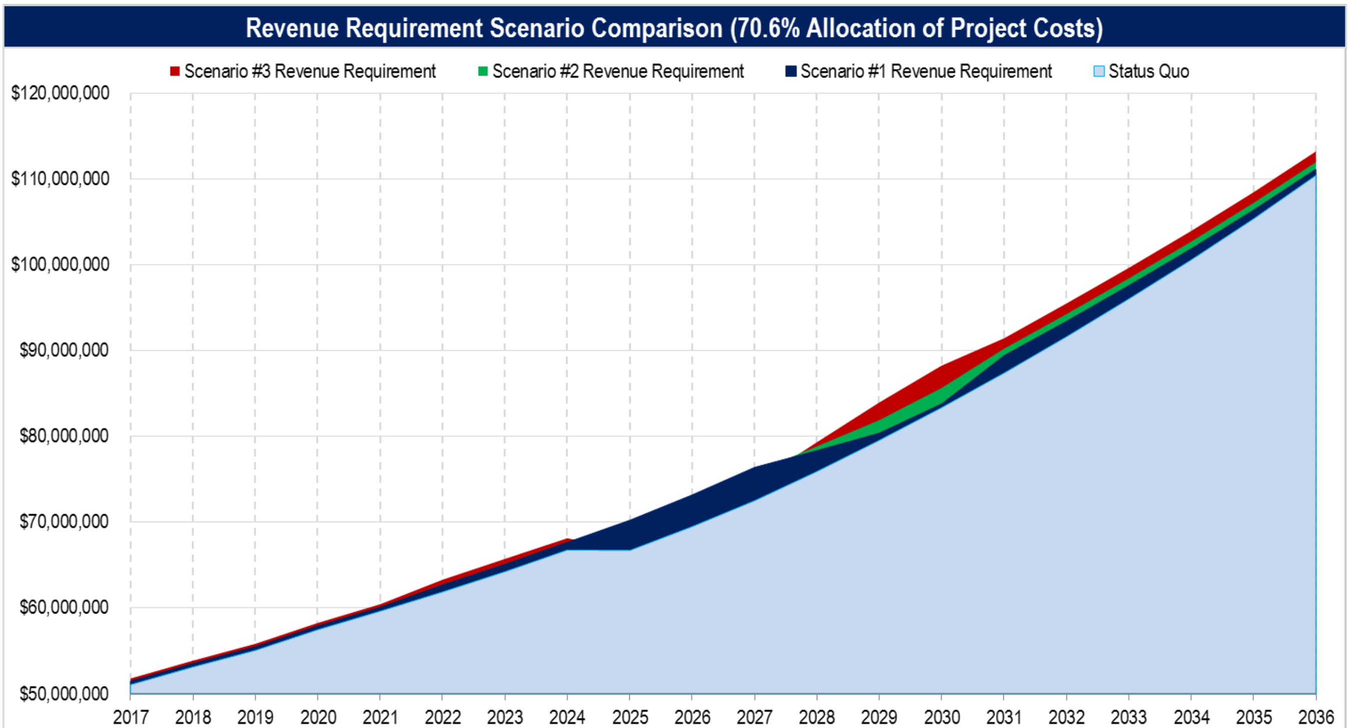
Annual Operations and Maintenance. O&M costs were categorized into fixed and variable costs, as shown in the table below. Fixed costs are classified as costs that do not vary with production output. These include labor and maintenance costs at the AWT facility, along with the reservoir mixing system. Variable costs are directly impacted by growth changes in the quantity of water treated at the AWT facility. Variable costs include energy and chemical costs at the AWT facility and energy costs at the RWPS West. The brine discharge fee is directly dependent on the quantity of brine production. A brine discharge facility maintenance cost is also needed, as further discussed in the Seasonal Storage Project – Basis of Design Report. Additionally, an increase in reservoir fill from the AWT facility would result in greater use of the Westlake FP, thus increasing O&M costs. O&M costs for Year 1 of operation are based largely on current supply and demand values. Based on these assumptions, O&M costs for the first year of operation are estimated to be approximately $2,663,000 escalated at 2.0% per year.

Pure Water Project Construction Costs (2016 Dollars)			
Description	Quantity (Acre Feet)	Unit Price ($/AF)	Estimated Cost
Fixed Costs			
AWT (Fixed)	2,637	$365	$962,505
Mixing System	9,500	$25	$237,500
Brine Discharge Facility		Lump Sum	$45,000
Fixed Subtotal			$1,245,005
Contingency (10%)			$124,501
Estimated Total Fixed Costs			**$1,369,506**
Variable Costs			
RWPS West	3,102	$25	$77,550
AWT (Variable)	2,637	$300	$791,100
Westlake Filtration Plant	498	$150	$74,700
Brine Discharge Fee	465	$500	$232,500
Subtotal			$1,175,850
Contingency (10%)			$117,585
Estimated Total Variable Costs			**$1,293,435**
Estimated Total O&M			**$2,662,941**

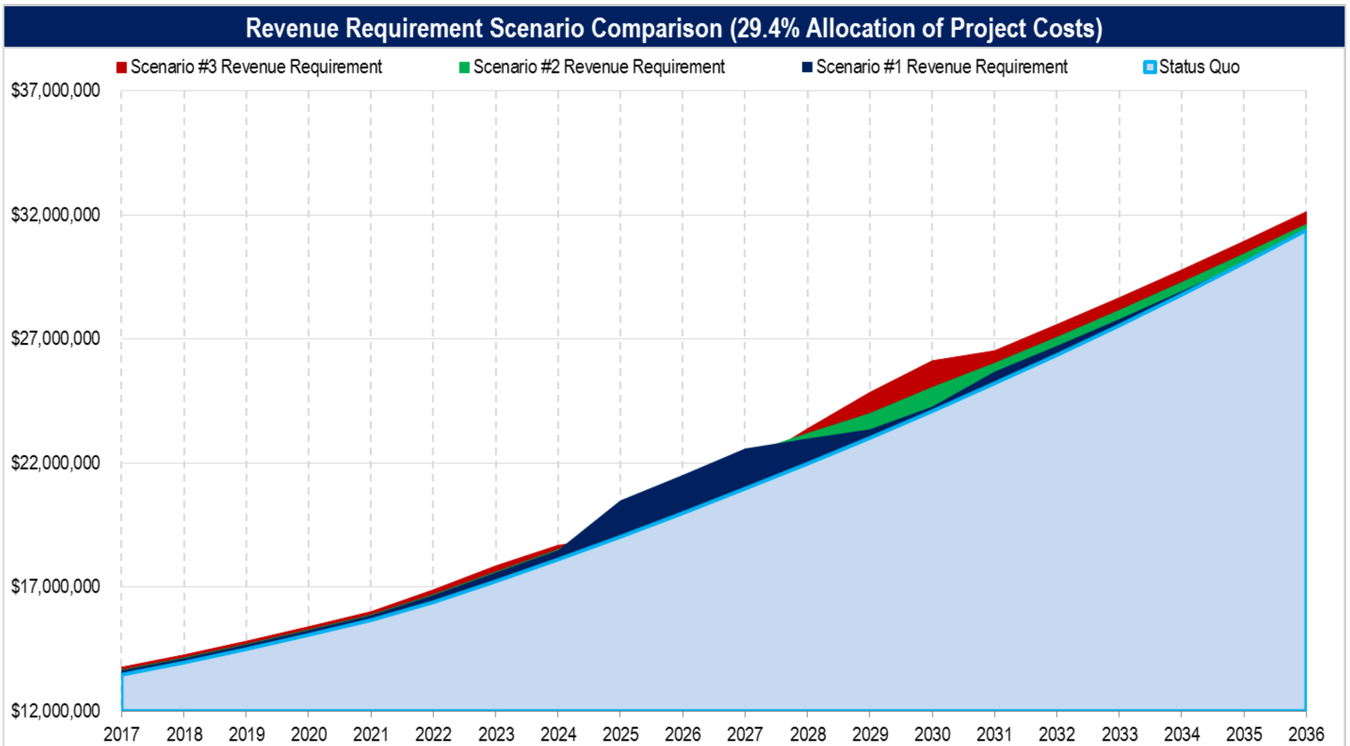
Avoided MWD Imported Water Costs. By creating a new source of locally controlled, uninterruptable drinking water, the Project results in reduced reliance on the MWD for imported water. The avoided costs associated with reduced dependence on the MWD is the primary financial benefit of the Project.

The avoided MWD costs were determined based on the expected production of purified water from the Pure Water Project offsetting imported water. The MWD avoided cost is calculated by taking the expected production of purified water (2,637 AF increasing by 70 AF per year through the projection horizon) and multiplying it by the projected treated MWD rate. The projected MWD rate was assumed to increase at 5% over the existing Tier 1 Treated Water Rate. Further, no assumption regarding future charges in the MWD rate structure have been analyzed.

Las Virgenes MWD Revenue Requirement Impact. Compared to a status quo alternative, the Pure Water Project adds between $1.3 million to $2.6 million (2016 dollars) to Las Virgenes MWD's revenue requirement in 2031 which is when the Project is expected to become operational. Las Virgenes currently has 27,805 equivalent residential units in its system, therefore, assuming no change in the number of connections in the future, the estimated impact is $3.90 to $7.78 per month in today's dollars per equivalent residential unit. A graph showing the impact each scenario has on Las Virgenes' revenue requirement through a 20-year projection horizon is shown below.



Triunfo Sanitation District Revenue Requirement Impact. Compared to a status quo alternative, the Pure Water Project adds between $0.3 million to $0.8 million (2016 dollars) to TSD's revenue requirement in 2031. TSD currently has 13,410 equivalent residential units in its system, this results in an increased cost of approximately $1.87 to $5.23 per month in today's dollars. A graph showing the impact each scenario has on TSD's revenue requirement through a 20-year projection horizon is shown below.



The impact the Project has on LV's and TSD's respective revenue requirements and the corresponding customer bill impacts vary over time and are largest for years requiring substantial pay-go capital contributions. The table below shows how these impacts vary over time in both nominal and 2016 dollars.

Customer Bill Impacts						
Scenario	2021 Bill Impact		2026 Bill Impact		2031 Bill Impact	
	LVMWD	TSD	LVMWD	TSD	LVMWD	TSD
2016 Dollars						
1	$1.20	$1.04	$8.24	$7.11	$3.90	$1.87
2	$1.26	$1.09	$5.91	$5.11	$5.46	$3.22
3	$2.10	$1.81	$1.85	$1.61	$7.78	$5.23
Nominal Dollars						
1	$1.39	$1.20	$11.07	$9.56	$6.07	$2.92
2	$1.46	$1.26	$7.95	$6.86	$8.51	$5.01
3	$2.43	$2.10	$2.48	$2.16	$12.12	$8.15

It should be noted that the change in revenue requirements is based on the status quo or "no change" alternative. But, as previously noted, LV and TSD will be required to make additional investments in the future to meet regulatory requirements. As such, the change in per equivalent residential unit cost shown above would likely occur even without the benefits associated with the AWT.

5. Next Steps

Continued development of the Financing Plan and further refinement of this report will require increased certainty with respect to components of the Project governance structure as well as finalized cost allocation methods with respect to both split between member agencies and amongst services.

As noted previously, this Financing Report assumes that the Project will be funded entirely with cash contributions from Las Virgenes MWD and TSD until the construction phase is initiated. As the initial date of construction nears, a more robust Financing Plan will need to developed based on contemporary market conditions and available funding sources.

6. Conclusion

The Pure Water Project will create a new, local, sustainable and drought-proof drinking water supply through the purification of the region's recycled water as well as meet regulatory requirements to reduce discharge into Malibu Creek. Based on current assumptions, as outlined in this Preliminary Financing Report, it is estimated the Project can be financed with a modest impact on LV and TSD customers in the range of $1.80 to $8.00 per customer per month in 2016 dollars.

Kennedy/Jenks Consultants