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FINAL
Preliminary Design Report for the Recycled Water System Phase 2B

October 2015

Prepared for

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

K/J Project No. 1544236.00

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Section 1: Introduction

The Castaic Lake Water Agency (CLWA) is seeking opportunities to expand their existing recycled water system to offset potable water demands and improve water supply reliability. This Preliminary Design Report (PDR) provides an evaluation of opportunities and design considerations to develop Phase 2B of the recycled water system. This section provides background information on CLWA and the existing recycled water program, discusses the objectives of the PDR and describes the nexus with previous studies.

1.1 Background

The following subsections describe the local purveyors operating in the Santa Clarita Valley and the water supply reliability as it pertains to recycled water.

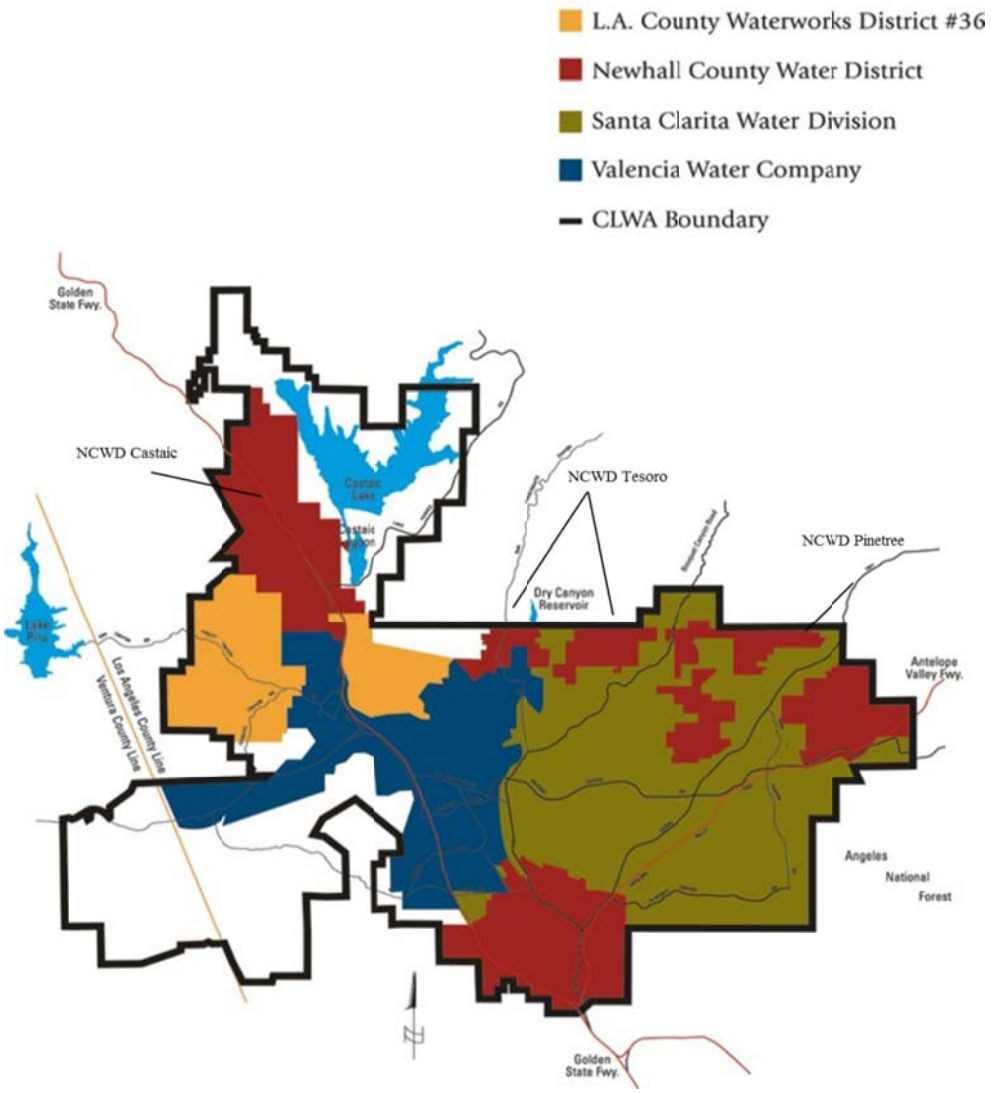
1.1.1 Local Purveyors

CLWA has a contract with the State of California to purchase water from the State Water Project (SWP) and wholesale it to the following four (4) domestic water purveyors in the Santa Clarita Valley:

1. Los Angeles County Waterworks District No. 36 (LACWD)
2. Newhall County Water District (NCWD)
3. Santa Clarita Water Division (SCWD)
4. Valencia Water Company (VWC)

The imported water is delivered to Castaic Lake through SWP facilities, which serves as the terminal reservoir of the SWP's West Branch. Water from Castaic Lake is treated at the CLWA's Earl Schmidt Filtration Plant or the Rio Vista Water Treatment Plant and is delivered to the domestic water purveyors through transmission mains owned and operated by CLWA. The CLWA service area is shown in Figure 1-1.

Figure 1-1: CLWA and Purveyor Service Areas



1.1.2 Water Supply Reliability

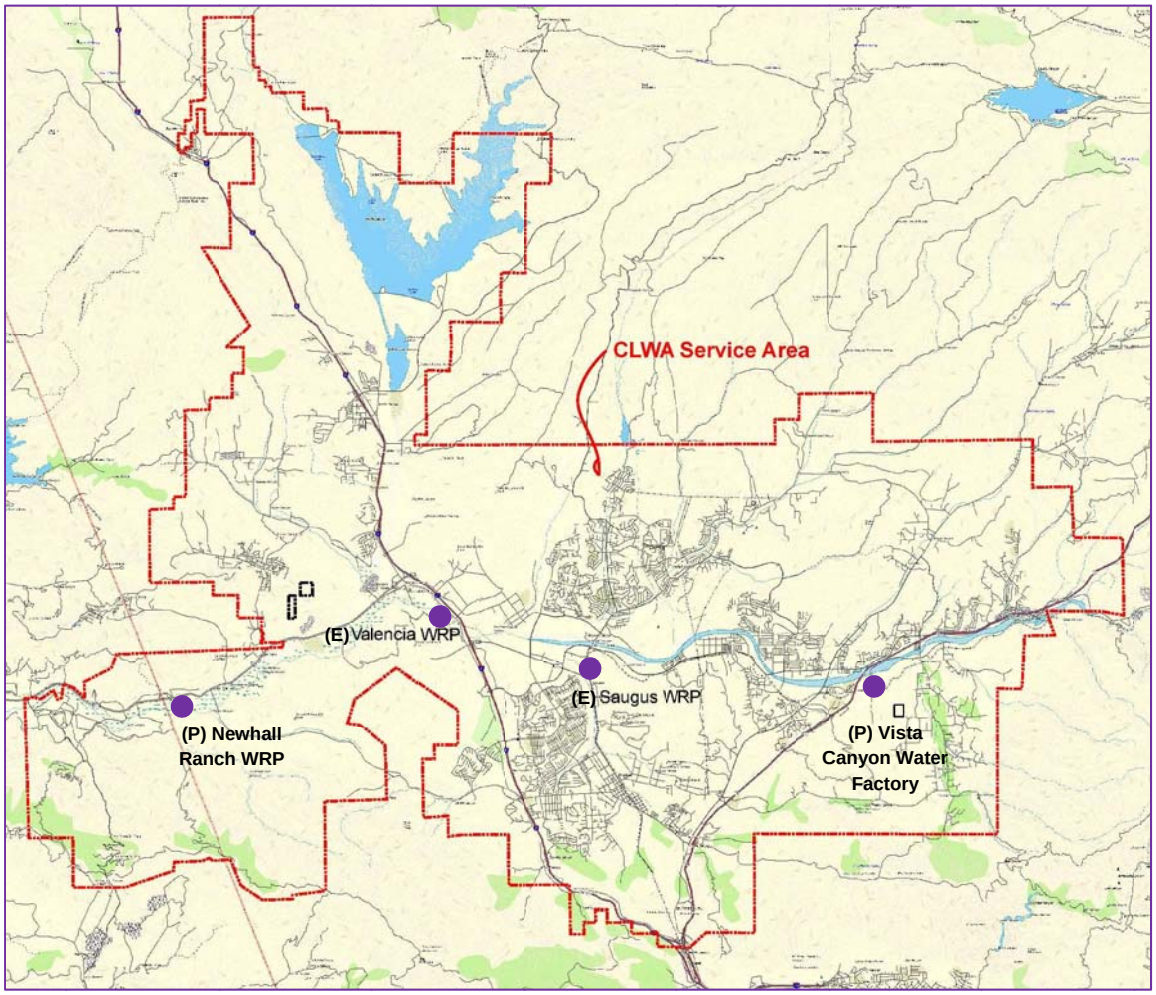
The four (4) water purveyors LACWD, NCWD, SCWD and VWC, primarily serve municipal and industrial (M&I) customers. Approximately 50 percent of the M&I demand within CLWA's service area is met with imported water from the SWP. The reliability of the SWP supply is subject to availability, which is a function of present and past years' precipitation and snowpack, and more recently regulatory cutbacks. Imported water deliveries can be curtailed during dry periods. When sufficient imported water is not available, the balance of demand is met with local groundwater supplies. However, local groundwater may also be limited in some areas, highlighting the need for additional reliable sources of water to meet current and future demands under all hydrologic conditions.

CLWA recognizes that recycled water is a critical component of their water supply portfolio. Implementing and expanding the recycled water system in the CLWA service area provides a reliable source of water year round that can help offset reliance on imported water and local groundwater.

The Sanitation Districts of Los Angeles County (LACSD) own and operate two (2) water reclamation plants within the CLWA service area: 1) Saugus Water Reclamation Plant (WRP) and 2) Valencia WRP. The locations of these facilities are shown on Figure 1-2. The water at each plant is treated to tertiary standards prior to discharge in the Santa Clara River. The Newhall Ranch development and Vista Canyon development are also planning to construct water reclamation facilities to produce tertiary recycled water. Non-potable water from these sources may be incorporated into the CLWA recycled water system.

By utilizing the effluent from these existing and planned water reclamation facilities, CLWA can more effectively allocate its potable water and increase the reliability of water supplies in the Santa Clarita Valley.

Figure 1-2: Potential Sources of Recycled Water



(E) Existing Facility, (P) Proposed Facility

1.1.3 Existing Recycled Water System

CLWA currently serves recycled water to Valencia Water Company through the Recycled Water System Phase 1 facilities which include: the Valencia Water Reclamation Plant (WRP) Recycled Water Pump Station; the Recycled Water Tank in the Westridge development; and approximately 15,600 feet of recycled water pipelines. Annual recycled water usage has averaged 415 acre-feet per year (AFY) for the last 10 years. Ninety percent of water use is between May and October, during the irrigation season.

1.2 Objectives and Drivers

The **primary objectives** of this Phase 2B PDR is to identify a preferred alternative to utilize recycled water from the Vista Canyon Water Factory and provide preliminary design criteria to support the next steps for implementation (including design and environmental documentation).

The **primary drivers** include the schedule for the Vista Canyon development, the ongoing drought, and the funding for recycled water projects currently available under Proposition 1.

1.3 Approach

The approach for this PDR is to:

- Assess available recycled water supplies,
- Identify potential recycled water demands in the Phase 2B service area,
- Evaluate pumping, conveyance and storage needs,
- Develop recycled water design criteria,
- Summarize Phase 2B implementation considerations,
- Estimate probable construction costs, and
- Recommend a Phase 2B project.

Considerations, assumptions, approach and findings for the above elements are provided in greater detail in the following sections of this report.

1.4 Previous Studies

The following reports evaluated potential opportunities for recycled water use in the CLWA service area.

1.4.1 Recycled Water Master Plans -1993 and 2002

An initial Reclaimed Water System Master Plan (RWMP) was completed for CLWA in 1993 (Kennedy/Jenks, 1993) and an update to the 1993 RWMP was completed in 2002 (Kennedy/Jenks, 2002) to address the changes in the area that had occurred in the last preceding decade. The information developed in the 2002 RWMP was largely drawn from the 1993 RWMP supplemented with contacts from CLWA, LACSD, local water purveyors, the City of Santa Clarita, the County of Los Angeles, oil company representatives, and potential water users. Additional analysis and computer modeling were performed as part of the Master Plan update. Water demand characteristics were also updated through discussions with potential users. The updated data and computer modeling were used to develop a revised cost-effective recycled water system. Construction costs and a construction schedule were included in the update.

The 2002 RWMP evaluated the following:

- Existing and Projected Land Uses
- Existing and Projected Potable Water Supply and Demand
- Regulatory and Permitting Requirements
- Potential Recycled Water Sources, Demands and Constraints
- Seasonal Storage Opportunities
- Recommended Recycled Water System Facilities and Costs
- Funding and Financing Opportunities
- Implementation Considerations and Phasing Plan

The 2002 RWMP recognized that current WRP production is not anticipated to be adequate to meet the total recycle demands of the CLWA service area. However, as potable water demands increase, recycled water production would similarly increase, thereby becoming more available to support non-potable uses in lieu of imported potable water or groundwater. The implementation plan outlined in the 2002 RWMP was phased to utilize the increases in plant production.

The implementation phases were prioritized based on the status of the users (existing or future), the anticipated construction schedule of future users, and the proximity of the users to the recycled water source. Phase 2 of the recycled water system, as presented in the 2002 RWMP, included a variety of recycled water uses in the existing developed area between the I-5 Freeway and the Valencia City Center. Phase 2 was separated into two (2) sub-phases -Phase 2A and 2B.

1.4.2 2007 EIR for the CLWA Recycled Water Master Plan

A Program Environmental Impact Report (EIR) for the RWMP was prepared in 2007 (Bon Terra, 2007) to evaluate the potential impacts on the environment resulting from the implementation of the 2002 RWMP. The EIR discusses alternatives to the proposed project and includes a mitigation program that would offset, minimize, or otherwise avoid significant environmental impacts. In accordance with Section 15126.6 of the CEQA Guidelines, the EIR includes an analysis of a reasonable range of alternatives that could feasibly attain the basic objectives of the project and evaluates the comparative merits of the alternatives (CLWA, 2007).

The alternatives considered in the EIR include:

- Alternative 1: No Project
- Alternative 2: Increased Potable Water Deliveries
- Alternative 3: Purchase of Desalinated Water
- Alternative 4A: Reduced Capacity RWMP with Potable Water Deliveries
- Alternative 4B: Reduced Capacity RWMP with Desalinated Water

1.4.3 Phase 2A Preliminary Design Report

Phase 2A of the CLWA Recycled Water Program was based on the use of recycled water from the Saugus WRP to serve approximately 500 acre-feet per year (AFY) to existing customers within CLWA's service area. A PDR (Kennedy/Jenks, 2009) and a Mitigated Negative Declaration (Impact Sciences, 2011) was completed for Phase 2A; however, the project was delayed due to the following obstacles:

1. **Permit Requirements:** Making any change in the point of discharge, place of use, or purpose of use of treated wastewater from the Saugus WRP requires filing a petition with the State Water Board Division of Water Rights (under California Water Code § 1211). This process can take upwards of one year to receive approval.
2. **Dependences on other Projects:** The preferred Phase 2A alternative relies on the reuse of a section of the Newhall Lateral that crosses the Santa Clara River. This pipeline segment

would only be available for recycled water once a new section of the Castaic Conduit is installed, and that project is in the design phase at this time.

The concept for Phase 2A was recently re-evaluated to consider the use of recycled water from the Valencia WRP (Kennedy/Jenks, 2015). This alternative was explored to circumvent the aforementioned obstacles since CLWA has rights to up to 1,600 AFY of recycled water from the Valencia WRP. Three purveyors (VWC, SCWD and NCWD) are working collaboratively to take the next steps to plan and design Phase 2A.

1.4.4 Phase 2B Prior Planning Efforts

Previous Phase 2B planning efforts had considered conveying recycled water from the Saugus WRP via the rehabilitation of the Honby Pump Station, conversion of an existing abandoned 14-inch potable water pipeline and construction of a new storage reservoir. This alternative is not being pursued since recycle supply from the Vista Canyon Water Factory will be available in 2017 whereas supply from the Saugus WRP would require a lengthy permit process. Phase 2B is developed in detail in this PDR to extend the recycled water system to the eastern portion of CLWA's service area using recycled water from the Vista Canyon Water Factory.

1.4.5 Water Resources Reconnaissance Study

CLWA and the local water retailers commissioned a Water Resources Reconnaissance Study (Recon Study) to evaluate alternatives for expanding local supplies to offset future periodic occurrences of significant shortfalls in imported water supplies (Carollo, 2015). The Recon Study provided an initial assessment of groundwater recharge with recycled water through surface spreading into the alluvial aquifer and groundwater injection into the deeper Saugus formation with aquifer storage and recovery. While each of these alternatives has different regulations, they would both be governed through the recently finalized Groundwater Recharge Reuse Regulations.

Section 2: Recycled Water Supply and Demand

The development of the recycled water system is dependent upon the quantity and quality of recycled water available. The fully implemented CLWA Recycled Water System may utilize recycled water from LACSD's Saugus and Valencia WRPs, the proposed Newhall Ranch WRP and the proposed Vista Canyon Water Factory (previously shown in Figure 1-2). Based on discussions with the purveyors and local developers, the source of recycled water for Phase 2B would be the proposed Vista Canyon Water Factory, currently under construction at the Vista Canyon development site. This section provides an overview of the Vista Canyon Water Factory design concept, anticipated recycled water quantity and quality, the market for recycled water in the Phase 2B service area and demand scenarios developed to match potential customers with the available supply.

2.1 Recycled Water from Vista Canyon

Vista Canyon is a 185-acre mixed-use Transit Oriented Development currently under construction in Santa Clarita that includes up to 1,100 residential units and up to 950,000 square feet of commercial units. The estimated potable water demand for Vista Canyon is approximately 300,000 gallons per day (gpd) or 334 acre-feet per year (AFY).

To offset some of the potable water demand, the project includes a recycled water facility, herein referred to as the Vista Canyon Water Factory, which would produce Title 22 tertiary disinfected recycled water for non-potable use. The excess recycled water produced could be used to supply a portion of the CLWA recycled water system.

The groundbreaking ceremony for Vista Canyon was held in July 2015 and Phase One of the project is anticipated to be completed in 2017, including the Vista Canyon Water Factory.

2.1.1 Vista Canyon Water Factory Design Concept

The Vista Canyon Water Factory will be constructed as a "turn-key" facility, to be owned and operated by the City of Santa Clarita.

The facility will be a scalping plant with no solids treated on-site and waste activated sludge treatment at the Santa Clarita Valley Sanitation District's (SCVSD) existing facilities downstream. The treatment process begins with pumping to the plant, screening, flow equalization, extended aeration activated sludge, disc filtration, and UV disinfection (Dexter Wilson, 2015).

Key Vista Canyon Water Factory components include:

- Influent pump station
- Screen
- Aeration tanks
- Solids separation
- Aeration
- Filters

- Ultraviolet disinfection
- Effluent storage
- Effluent pumps
- Percolation ponds

Wastewater will be pumped to the headworks, where it passes through an Aeromod extended aeration activated sludge process. The water will then enter an aeration tank before flowing into the sedimentation tank. Polymer will be added to the wastewater to coagulate the solids and allow them to settle. The remaining water will pass through filters to remove fine particulate matter. All solid material will be sent to the SCVSD facility for disposal via the sanitary sewer.

Ultraviolet light will be used to disinfect the filtered water. Sodium hypochlorite will be added to water being sent to the recycled water distribution system to prevent slime growth. Water that is bypassed and sent to the percolation ponds will not have added sodium hypochlorite. Rather than bypassing excess water to the percolation ponds, the excess water will be treated and conveyed to the CLWA recycled water system to meet irrigation demands. The Water Factory will include 100,000 gallon storage tank and effluent pumps sized to meet peak hourly recycled demand within the Vista Canyon development.

2.1.2 Recycled Water Quantity

The Vista Canyon Water Factory is projected to treat an average flow of 392,000 gpd (approximately 440 AFY) of wastewater, consisting of flows from Vista Canyon (approximately 214,000 gpd) and raw water extracted from LACSD's sewer line. Solids generated will be discharged to the existing sewer and treated at the Valencia WRP. Title 22 tertiary disinfected recycled water will be produced at full design capacity from the start (392,000 gpd or 440 AFY), taking wastewater from an existing sewer interceptor that serves existing development upstream of the project site (Impact Sciences, 2010).

Table 2-1 summarizes the monthly distribution of recycled water produced at the Vista Canyon Water Factory, used by Vista Canyon and the remaining available for Phase 2B.

Table 2-1: Recycled Water Supply

Month	Annual Supply (MGD)	Annual Supply (AF)	Vista Canyon Demand (AF)	Available for Phase 2B (AF)
Jan	0.032	36.1	6.5	29.6
Feb	0.031	34.3	6.1	28.2
Mar	0.033	37.3	9.1	28.2
Apr	0.032	36.1	11.4	24.7
May	0.033	37.3	14.6	22.7
Jun	0.032	36.1	15.9	20.2
July	0.033	37.3	16.7	20.6
Aug	0.033	37.3	16.7	20.6
Sept	0.033	37.3	14.8	22.5
Oct	0.033	37.3	12.0	25.3
Nov	0.032	36.1	7.0	29.1
Dec	0.033	37.3	6.0	31.3
Annual TOTAL	**0.392**	**440**	**137**	**303**

MGD = million gallons per day (on average)

2.1.3 Recycled Water Quality

Landscape irrigation is the dominant potential use for recycled water in the Phase 2B area. Table 2-2**Error! Reference source not found.** compares the anticipated water quality with irrigation water quality standard guidelines as presented in the AWWA – CA/NV Section, Guidelines for the Onsite Retrofit of Facilities Using Disinfection Tertiary Recycled Water (AWWA, 1997). Estimated concentrations from the Vista Canyon Water Factory are not available for all parameters. In many cases, primary, secondary and tertiary wastewater treatment processes do not treat for the parameters listed in Table 2-2 (unless reverse osmosis or a comparable desalting technology is used). Thus, the recycled water concentration for dissolved solids is similar to the potable water quality. Water effluent quality in Table 2-2 assumes the blended potable water consists of 50% imported water and 50% groundwater (Dexter Wilson, 2015a).

As shown in Table 2-2, the anticipated recycled water quality from the Vista Canyon Water Factory does not have any parameters within the "severe" category. The salinity of the water falls within the slight to moderate category. Effects due to salinity can be minimized by providing adequate soil drainage. Foliar absorption can be minimized by using a drip or subsurface irrigation system which is recommended for sensitive plants.

Table 2-2: Anticipated Recycled Water Quality and Irrigation Objectives

Parameter	Anticipated Recycled Water Concentration, mg/L	Landscape Irrigation Degree of Use Restriction[a,c] None	Slight to Moderate	Severe
TDS	713	<450	**450 - 2,000**	>2,000
Chloride	96	<70	**70 - 355**	>355
Sulfate	110	n/a	n/a	n/a
Nitrate (as NO_3)[b]	<10	< 5	5 - 30	> 30
Boron	0.69	**<3.6**	3.6 - 7.2	>7.2

(a) Source: Guidelines for the On-site Retrofit of Facilities using Disinfected Tertiary Recycled Water (AWWA, 1997).
(b) Landscape irrigation objectives correspond to nitrate as N.
(c) Red text indicates the expected use restriction category of the Vista Canyon Water Factory recycled water.

2.2 Recycled Water Market Assessment

A preliminary evaluation of potential recycled water demands for Phase 2B was performed using 2013 meter data provided by the Santa Clarita Water Division (SCWD) and estimated demands for the Vista Canyon (Dexter Williams, 2015a) and Sand Canyon (Dexter Williams, 2015b) development. Due to the limited supply of recycled water available from the Vista Canyon Water Factory, the customers were grouped into three areas (South, North, and Sand Canyon Extension) to develop scenarios that maximize use of the available supply.

- Southern Area = customers south of River and East of CA-14
- Northern Area = customers north of the River and West of the Vista Canyon Development
- Sand Canyon Extension = along Soledad Canyon Road until the corner of Sand Canyon Road

It was initially assumed that Vista Canyon demands would be served directly from the Vista Canyon Water Factory through an independent pump station. Vista Canyon is therefore not included as a customer for the market assessment. The Vista Canyon demands are already accounted for in the calculation of the available supply for the Phase 2B project (Table 2-1).

Figure 2-1 illustrates the three customer areas and the location of meters included with each customer group. Table 2-3 lists the potential Phase 2B recycled water demands associated with landscape irrigation for major customers within each of the three areas.

Figure 2-1: Phase 2B Recycled Water Market Assessment

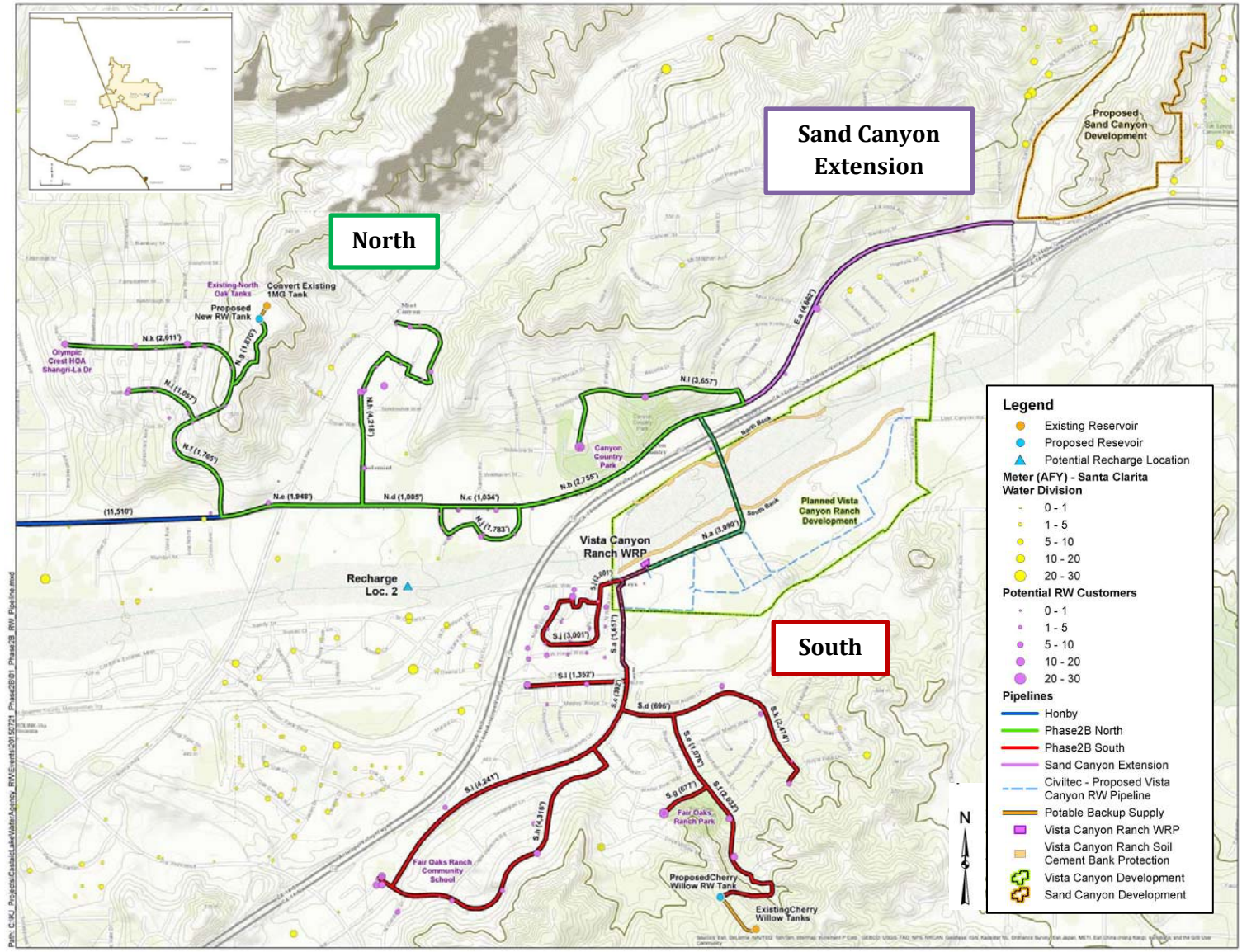


Table 2-3: Phase 2B Potential Customers Demands

Area	Major Customer	Ave Annual Demand (gpm)	Ave Annual Demand (AFY)	Max Day Demand (gpm)	Peak Hourly Demand (gpm)
South	Fair Oaks Ranch Park	27.9	45.0	63.6	190.8
	Wren Drive Landscaping	77.7	125.5	177.5	532.5
	Lost Canyon Road to School	59.2	95.5	135.0	405.0
	HOA loop by Jakes Way	58.2	93.9	132.7	398.1
	Medle Ridge Drive Landscaping	23.2	37.5	53.0	158.9
	Scott Ln Landscaping	14.1	22.7	32.1	96.2
	Total Demand (South)	**260.2**	**420**	**593.8**	**1781.4**
North	Vista Canyon Pipeline Across River	1.1	1.8	2.5	7.5
	Soledad Canyon Road	32.4	52.3	73.9	221.7
	Shangri-La Drive	6.5	10.5	14.9	44.7
	Fire Road to Storage	3.1	5.0	7.0	21.1
	Mint Canyon	47.1	76.1	107.6	322.8
	Nathan Hill Drive	16.4	26.5	37.5	112.6
	Olympic Crest HOA	31.2	50.4	71.3	213.9
	Canyon County Park	30.5	49.2	69.6	208.9
	Total Demand (North)	**168.5**	**272**	**384.4**	**1153.1**
Sand Canyon Extension	Soledad Canyon Road Landscaping	9.0	14.6	20.7	62.0
	Sand Canyon Planned Development	58.5	94.4	133.5	400.4
	Total Demand (Sand Canyon)	**67.5**	**109**	**154.1**	**462.4**

The average annual demand represents actual usage from 2013 meter data. The max day demand is calculated based on a peaking factor of 2.25 applied to average day demand. The peak hour demand, used to size conveyance facilities, is estimated based on the max day demand occurring over an 8-hour irrigation period per day. A list of meters by pipeline segment and purveyor is provided in Appendix A.

These customer demands were used to populate the hydraulic model and size facilities to meet hydraulic requirements (Section 3-4).

2.3 Phase 2B Demand Scenarios

The production of recycled water would remain relatively constant year-round while irrigation demands peak in the summer months. Thus, four demand scenarios were analyzed to compare

supply and demand. Table 2-4 summarizes the major customers and demands if all customers were to be served for each demand scenario.

Table 2-4: Summary of Phase 2B Demand Scenarios

Demand Scenarios	Major Customers	Ave Annual (AFY)	Max Day (gpm)	Peak Hour (gpm)
Scenario 1 – North	Northwest Customers	272	384	1153
Scenario 2– South	Southern Customers	420	594	1781
Scenario 3 – North w/ Sand Canyon	Northwest Customers + Sand Canyon Development	381	539	1522
Scenario 4 – South w/ Sand Canyon	Southern Customers + Sand Canyon Development	529	748	2150

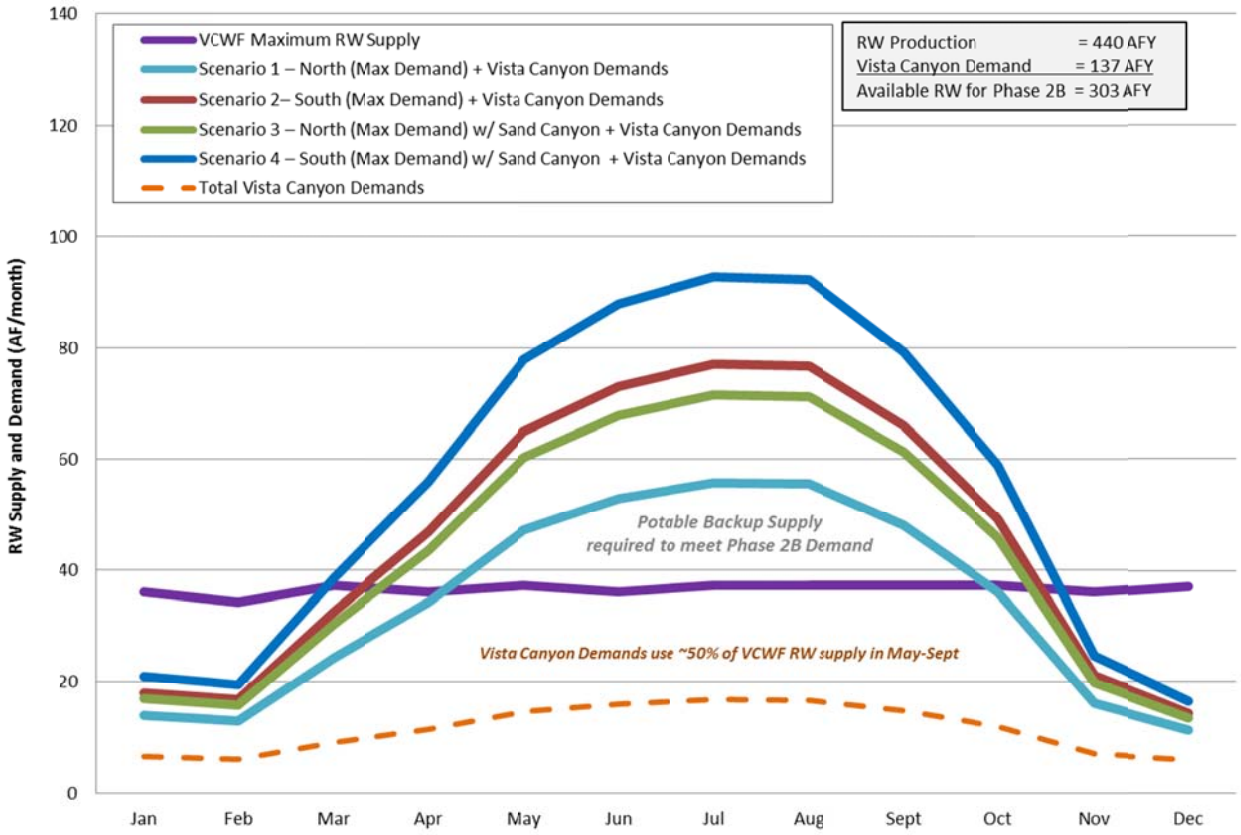
The first scenario, Scenario 1, provides water to the northwest customers. This scenario requires either the conversion of the Eastern North Oaks Tank from potable water to recycled water or construction of a new tank at an adjacent pad (Figure 2-1).

Scenario 2 delivers water to southern customers and Fair Oaks Ranch Community School. This scenario requires construction of a new Cherry Willow recycled water tank.

Scenarios 3 and 4 build on Scenarios 1 and 2, respectively, adding projected demands for Sand Canyon Development. Phase 2B would deliver recycled water to the southwest corner of the development and it is assumed the developer would construct conveyance, pumping and storage to distribute recycled water for non-potable uses.

Figure 2-2 illustrates the monthly demand for the four scenarios, along with the maximum Vista Canyon recycled water production. The supply can satisfy the demands of the Vista Canyon community for the winter months of November through March. Outside of that period, the demand exceeds the supply. The area between the curves and the purple maximum supply line represents the amount of potable backup supplies needed during the high-demand summer months.

Figure 2-2: Monthly Recycled Water Supply and Demand Scenarios



Of the four scenarios, Scenario 1 (North) has the lowest demand but would still require nearly 75 AFY of backup potable supply and would leave approximately 100 AFY of unused effluent to be discharged during the winter months. Scenario 2 (South) would require nearly 200 AFY of backup potable supply and would leave approximately 80 AFY of unused effluent to be discharged during the winter months. Adding the Sand Canyon Development, which has a demand of approximately 95 AFY would increase the potable backup supply requirements by nearly the same amount, since the majority of the development's demand would occur in the summer months when no additional recycled water would be available. Appendix A includes monthly supply and demand tables for the four demand scenarios.

Figure 3-1 clearly illustrates that reducing the number of customers served to match the peak monthly recycled water production would minimize the amount of potable backup water required. This would have the added benefit of simultaneously reducing project costs by minimizing the amount of pipelines required to distribute recycled water. Alternatives are developed in Section 3 to match supply and demands to support the cost-effective development of a Phase 2B recycled water system.

Section 3: Phase 2B Alternative Evaluation

Alternatives were developed to evaluate the most cost-effective use of the excess recycled water produced by the Vista Canyon Water Factory by matching the monthly available recycled water supply with monthly non-potable demands for select SCWD customers. A hydraulic model was developed to size conveyance and storage facilities to meet hydraulic and operational requirements. An opinion of probable construction costs is developed to compare the capital costs and annualized unit cost of each alternative.

3.1 Phase 2B Alternatives

The Phase 2B alternatives are summarized in Table 3-1 and illustrated in Figure 3-1.

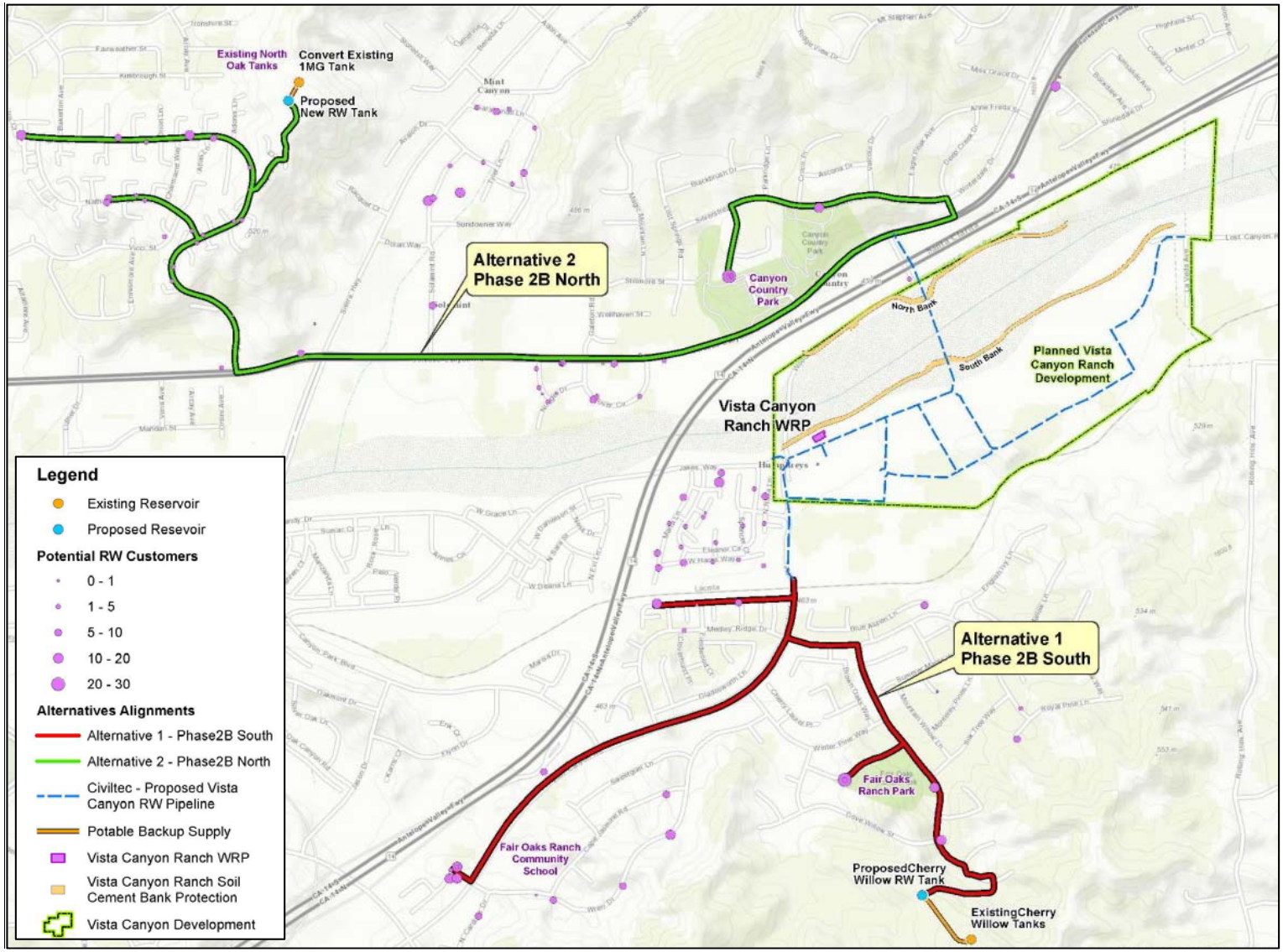
Table 3-1: Summary of Phase 2B Alternatives

Alternative	Major Customers	Ave Annual (AFY)	Max Day (gpm)	Peak Hour (gpm)
Alternative 1 – Phase 2B South	Fair Oaks Park, Fair Oaks Ranch Community School, The Ranch at Fair Oaks Nearby HOAs	**163**	**231**	**692**
Alternative 2 – Phase 2B North	Canyon County Park Nearby HOAs	**196**	**277**	**830**

Alternative 1 serves customers on the south side of the Santa Clara River. Major facilities include a pump station at Vista Canyon, a transmission pipeline up Cherry Willow Drive to a new recycled water tank constructed just downhill of the existing potable Cherry Willows Tanks, and distribution pipelines to serve major customers. The blue dashed pipeline, shown in Figure 3-1, would convey recycled water and would be constructed and paid for by the developer, Vista Canyon Ranch LLC.

Alternative 2 serves customers on the north side of the Santa Clara River. Major facilities include a pump station at Vista Canyon, a transmission pipeline along Soledad Canyon Road and up Shangri-La Drive to a new recycled water tank constructed adjacent to the potable North Oaks Tanks, and distribution pipelines to serve major customers. Reuse of a portion of the 14-inch Honby pipeline from Lost Canyon to Shangri-La Drive was considered for Alternative 2; however, due to the limited segment that would be reused and the uncertainty of the pipeline condition, reuse of the Honby pipeline is not being considered for Phase 2B. The blue dashed pipeline shown in Figure 3-1 would convey recycled water along a new bridge over the Santa Clara River, constructed and paid for by the developer, Vista Canyon Ranch LLC.

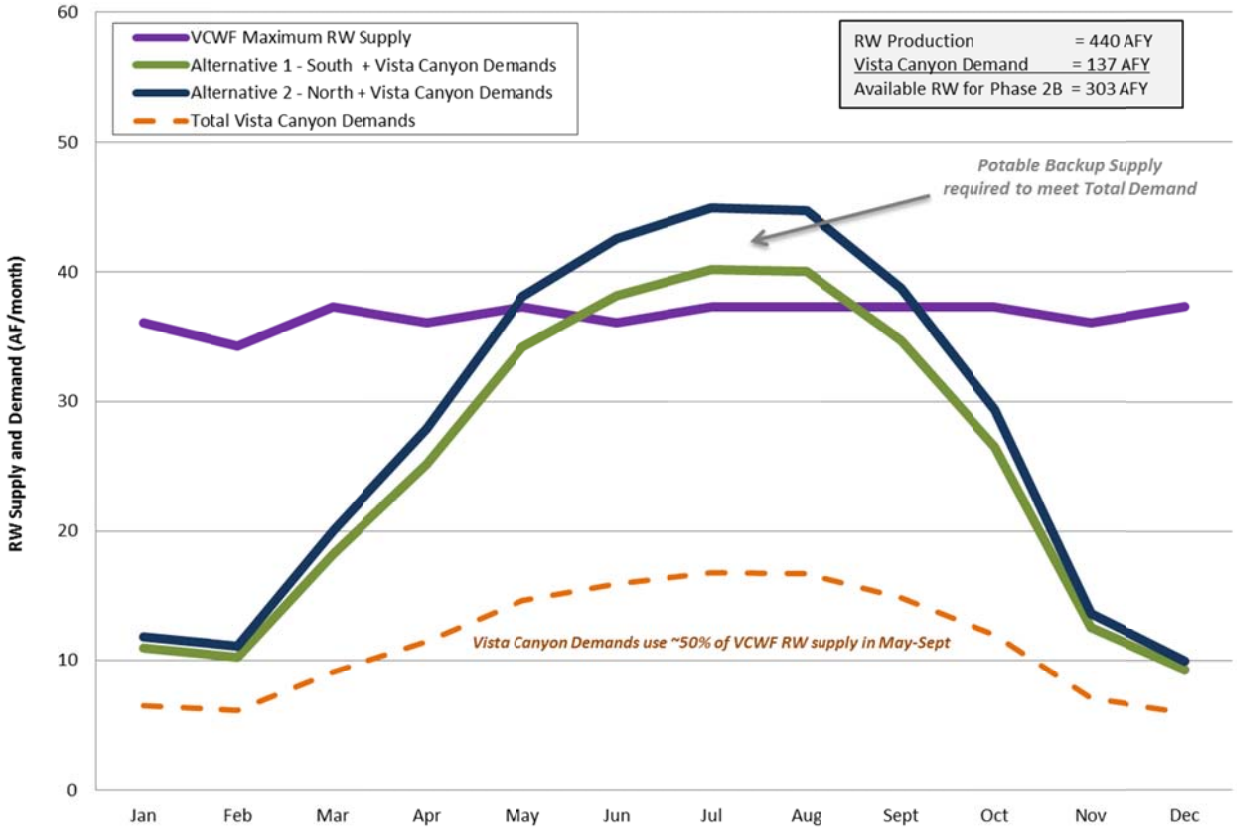
Figure 3-1: Phase 2B Alternatives



A backup potable supply would be provided at each of the recycled water storage tanks to maintain flow through the distribution system during interruption of recycled water production to meet customer demands. A connection to the potable water system would require an air gap separation to protect the potable water system from cross connection to the recycled water system

With the elimination of customers along the South and North alignments, the water demand decreases to more closely match the recycled water supply provided by the Vista Canyon Water Factory. Figure 3-2 shows the monthly supply and demand for the two alternatives.

Figure 3-2: Monthly Recycled Water Supply and Demand Alternatives



By design, both alternatives minimize the need for potable backup supply to meet the summertime irrigation demands. Alternative 1 and 2 would require approximately 8 AFY and 24 AFY on average, respectively. During the winter months, if the Vista Canyon Water Factory continues to operate at full capacity, approximately 150 and 130 AFY of unused effluent would need to be discharged for Alternatives 1 and 2 respectively. Appendix A includes monthly supply and demand tables for the two alternatives.

3.2 Hydraulic Modeling

3.2.1 Overview of Model Approach

In order to identify system pressures and pipeline velocities within the Phase 2B Alternatives, a hydraulic model was developed using Innovyze Infowater software.

A steady-state simulation was utilized to evaluate system pressures and pipeline velocities under a gravity feed operating scenario where peak hourly demands are met with water from the storage tank and the pump station is off. Peak hourly demand is defined as three times maximum day demand and reflects the understanding that recycled water customers would be limited to an 8 hour irrigation window from 10 pm to 6 am on a daily basis.

The pipeline diameters are sized to meet peak hourly demand with a maximum velocity criterion of 6 feet per second (ft/s). The backbone pipeline, defined for this project as the pipeline that is in the direct flow line from the pump station to the storage tank, has a minimum pipe diameter of 8-inch. Distribution pipelines, which include all non-backbone pipelines, have a minimum pipe diameter of 6-inch.

For both Alternatives 1 and 2, the backbone pipeline diameter is 8-inch and the distribution pipeline diameter is 6-inch. Figure B-1 in Appendix B: shows the simulated pressures and pipeline velocities from the steady-state model. There is significant pressure in some parts of the system due to the approximate 300-foot grade difference from the storage tanks to the pump stations. Customers would be provided with pressure reducing valves to reduce pressure at the delivery point to an acceptable level.

An extended period simulation (EPS) was utilized to evaluate the storage tank and pump station operations under both average day and maximum day demands. The Vista Canyon demands, which consists of both irrigation and indoor plumbing demands, are also included as part of this simulation. The Vista Canyon irrigation demands are assumed to occur within the same 8-hour window as the Phase 2B irrigation demands; which is from 10 p.m. to 6 a.m. on a daily basis, while the indoor plumbing demands, which are provided for retail, office and commercial space, and public toilets, are assumed to primarily occur during working hours (9 am to 5 pm). The pumps operate based on level control at the tank. When the tank water level is at 3 feet, one pump would turn on, and when the tank water level at 2 feet, the second pump would turn on. When tank water level is at 27 feet, one pump would turn off, and when the tank water level is at 28 feet, the second pump would turn off. The maximum water level is 30 feet.

Figures B-4 through B-7 in Appendix B: show the system demands and change in tank storage over time for both Alternatives 1 and 2. The storage tanks for both Alternatives 1 and 2 are able to sustain average daily demands on a continual basis. However, for the maximum daily demand analysis shown in Figures B-6 and B-7, the water level for both tanks continuously drops over the 7-day period. The Alternative 1 tank reaches a water level of zero after approximately 50 hours

(slightly past 2 days), and the Alternative 2 tank reaches a water level of zero after approximately 75 hours (slightly past 3 days). Under maximum daily demand, there is not sufficient recycled water supply from the Water Factory to sustainably operate over a long-term period. If maximum daily demand occurs over a prolonged period of time, the recycled water system will need to be supplemented with potable water to meet all demand.

3.2.2 Storage Requirements

Storage is used to meet peak customer demands and diurnal demand fluctuations while allowing for constant recycled water treatment production. Storage requirements are based on providing storage for 1.5 times the maximum day demand (MDD). Storage would provide storage redundancy and flexibility on a daily basis but would not be sufficient in the event of a partial or complete treatment plant shutdown. Instead, standby service would be provided from potable water via air-gap connections at the storage reservoir.

Storage Requirements for Alterative 1 – South

A new tank would be constructed at the Cherry Willows site (shown in Figure 3-1) to store recycled water for Alternative 1. The site sits at an approximate ground elevation of 1,755 feet. Site space is limited, but there appears to be sufficient space to accommodate the proposed tank. Height limitations for the tank would also need to be confirmed. This tank site is located relatively close to the Vista Canyon Development. The access to this site is through neighborhood and up a direct fire trail road. The hydraulic model identified the need for 0.5 MG of storage for Alternative 1.

Storage Requirements for Alterative 2 – North

A new tank could be constructed at the North Oaks Tank Site (shown in Figure 3-1) to store recycled water for Alternative 2. The site sits at a ground elevation of 1,743 feet. The existing pad at this location is larger than the Cherry Willows site, and could likely accommodate more than 1 MG of storage. Thus, it may be possible orient a smaller reservoir on the existing pad and reserve space for another tank in the future (either potable or future RW). The hydraulic model identified the need for 0.6 MG of storage for Alternative 1.

A variation for Alternative 2 could include converting the existing potable 1 MG North Oaks Tank to recycled water. Factors to consider when assessing the feasibility and cost of retrofitting an existing tank include: age of tank, height to diameter ratio (i.e. sloshing height code restrictions), tank cell thicknesses, need for a ring wall, seismic risk and foundation. Costs for retrofitting an existing tank can be equal to or more than constructing a new tank.

3.2.3 Pumping Requirements

The recycled water pump station at the Vista Canyon Water Factory must be capable of pumping to the storage location for either alternative. The pump station is sized to pump the full treatment plant capacity from the Vista Canyon Water Factory up to the recycled water tank, which is 272 gpm. This will allow maximum utilization of available recycled water supply. Maintaining the ability

to convey 100 percent of the recycled water produced to storage is critical to meeting peak irrigation demands during the summer in the evening irrigation hours. Note that the plant capacity of the Vista Canyon Water Factory is less than the projected maximum day demand of both Alternatives 1 and 2, which are 692 gpm and 830 gpm respectively. This pump sizing approach differs from the Vista Canyon development approach, which is sized to meet peak hour demand for a closed system.

Pump station demand requirements for Alternatives 1 and 2 are listed in Table 3-2 and design criteria is further described in Section 4.2.The pump station is designed to pump the design capacity of 272 gpm with two pumps.

Table 3-2: Phase 2B Alternative Pump Station Requirements at Vista Canyon Water Factory

Alternative	Configuration	Capacity (gpm)	Total Horsepower (Hp)[1]
Alt 1 - South	2 duty + 1 standby	272	45
Alt 2 - North	2 duty + 1 standby	272	45

[1] Total horsepower shown is for three pumps combined; each pump is sized for 15 Hp. Total capacity shown is for a two-pump operation.

3.2.4 Piping Requirements

The pipeline diameters for the Phase 2B Alternatives 1 and 2 are shown in Table 3-3. For both alternatives, an 8-inch diameter pipeline is necessary for the backbone, and 6-inch diameter pipelines are necessary for the distribution branches. Piping design criteria are identified in Section 4.3 and additional information is provided in Appendix B.

Table 3-3: Phase 2B Alternative pipeline diameters

Alternative	Pipeline	Diameter (inches)	Pipeline length (ft)
Alt 1 - South	Backbone Transmission	8	5,000
	Distribution Branches	6	6,100
Alt 2 - North	Backbone Transmission	8	10,400
	Distribution Branches	6	7,350

It is assumed that the blue dashed pipeline, shown in Figure 3-1, would be constructed and paid for by Vista Canyon to convey recycled water to the point of connection with the Phase 2B system and would be sized to match the backbone transmission pipeline.

3.3 Phase 2B Alternative Costs

An Engineers' Opinion of Probable Construction Cost is developed to compare Alternatives 1 and 2. Construction costs are converted to net present value annualized cost using basic assumptions about discount rates and life expectancy of project components. Annualized costs are divided by

the annual recycled water delivery to obtain a uniformly derived unit cost of water in dollars per acre-foot ($/AF).

3.3.1 Engineers' Opinion of Probable Construction Cost

Construction costs are estimated for each alternative at an AACE International Opinion of Probable Construction Cost (OPCC) Class 5 level representing Planning to Feasibility level information with an estimated accuracy range between -30 percent and +50 percent, using assumptions stated herein. During the final design stages, the estimates should be updated to reflect materials, labor costs, and the bidding climate.

The following assumptions were used to develop the unit costs:

- Pipe material: PVC for diameters less than or equal to 20-inch.
- Pipe installation: typical open trench cut and cover, depth of 4.5 feet cover or less and normal "Watch Manual" traffic control.
- Bore & Jack Installation: typical bore & jack construction utilizing a 30-inch casing.
- Storage tank: above ground cylindrical steel tank
- Pump Station: assumes 2 duty pumps + 1 standby, 15 Hp per pump, constant speed vertical turbines located above the proposed wet well (adjacent to the planned Vista Canyon pump station). Electrical, instrumentation and SCADA modifications have been included.
- Markups: 10% for mobilization and insurance, 9% for materials tax, 12% for subcontractor markup, 15% for contractor overhead and profit, and 30% contingency.
- Escalation: 2% per year for two years to the midpoint of construction.
- Easements and permitting are not included.
- Relocation of other existing facilities to accommodate new pipeline is not included.

Unit cost estimates are based on price quotes provided by pipe manufacturers and/or distributors, bid price of projects within the last two years with similar scope of work, published cost data, and engineering judgment. The detailed cost estimates are included in Appendix C.

The Engineer's estimate of probable construction cost for the Phase 2B Alternatives 1 and 2 are shown in Table 3-4.

Table 3-4: Phase 2B Alternatives Engineers' Opinion of Probable Construction Cost

Facility Component	Alt 1 – Phase 2B South	Alt 2 – Phase 2B North
Pipelines	$2,520,000	$4,830,000
Storage Tank*	$1,570,000	$1,810,000
Pump Station	$720,000	$720,000
Total Probable Construction Cost ($)	**$4,810,000**	**$7,360,000**
Range +50%	$7,215,000	$11,040,000
Range -30%	$3,367,000	$5,152,000

** Assumes construction of new RW storage tank on existing pad with a potable backup connection*

3.3.2 Annualized and Unit Capital Costs

An annualized capital cost is estimated based on the distributing the construction cost over the life of the project based on the following equation:

$$\text{Annualized Capital Cost} = \text{Capital Cost} \times \frac{(i \times (i+1)^n)}{(1+I)^n - 1}$$

Where: n = project life or facility life (30 years)
i = interest rate (4%)

The unit capital cost is calculated by dividing the annualized capital cost by the anticipated volume of recycled water delivered per year (in AFY). The annualized and unit capital costs for the Phase 2B Alternatives 1 and 2 are presented in Table 3-5.

Table 3-5: Summary of Annualized and Unit Capital Cost

Phase 2B Alternative	Ave Annual Demand (AFY)	Estimated Construction Cost* ($ mil)	Annualized Construction Cost ($ mil/year)	Annual Unit Cost ($/AF)
Alt 1 – Phase 2B South	163	$4.8	$0.3	$1,700
Alt 2 – Phase 2B North	196	$7.4	$0.4	$2,200

** Assumes construction of new RW storage tank on existing pad with a potable backup connection*

The North alternative is approximately 50% more expensive than the South alternative, due to the additional pipeline lengths and increased storage volume required. Details of the Opinion of Probable Construction Cost are included in Appendix C.

3.4 Phase 2B Preferred Alternative

Alternative 1 – Phase 2B South is identified as the preferred alternative based on the following benefits:

- Lower capital cost than Alternative 2.
- Lower annualized unit cost than Alternative 2.
- Allows for development of an independent recycled water system south of the Santa Clara River.
- All pipelines can be constructed within existing right of way.
- Storage tank pad is already developed.
- Construction could be fast-tracked to align with the Vista Canyon development schedule.
- Less potable water required as a backup to meet total demand.
- Potential to use staging areas already disturbed as part of the Vista Canyon construction activities.

Two variations of Alternative 1 were considered to provide information to support discussions with the developer, Vista Canyon Ranch LLC regarding sharing facilities and to assess the potential benefits of providing a higher capacity system in anticipation of the potential to interconnect to a larger recycled water system that is fed by LACSD's Valencia or Saugus WRPs. These sub-alternatives are described in the following sections.

3.4.1 Sub-Alternative 1a – Phase 2B South + Vista Canyon

Sub-Alternative 1a is explored to identify the facility sizing requirements and costs to combine the Phase 2B South recycled water conveyance system with the Vista Canyon system. This would allow for one pump station at Vista Canyon to convey all produced recycled water and would eliminate the need for diurnal storage and a separate pump station at the Vista Canyon Water Factory. Since the demands for Vista Canyon were already taken into consideration in assessing the available supply for Phase 2B, there would be no change in the potable backup supply required or the unused recycled water that would be discharged. The pump station requirements would remain the same, since the Alternative 1 design assumed pump station capacity and pressure requirements to convey the entire flow produced at the Vista Canyon Water Factory to storage. Incorporation of Vista Canyon demands requires a larger backbone pipeline and a larger storage tank and additional pumping time (O&M) to convey the demands to the storage tank.

Cost sharing considerations with Vista Canyon to serve Vista Canyon demands include: (1) need for additional pipeline capacity and more storage (2) increased O&M for pumping, (3) elimination of the pump station and storage facilities at the Vista Canyon Water Factory, and (4) the potential to obtain grant funding for the combined system. Additional discussions are needed to develop mutually agreeable terms for cost sharing and responsibility for future ownership, operations and maintenance of all facilities.

The hydraulic model was used to simulate a steady-state flow scenario using a larger backbone pipeline diameter of 10 inches. A pressure/velocity map is shown in Figure B-8 of Appendix B:. There is significant pressure in some parts of the system due to the approximate 300-foot grade difference from the storage tanks to the pump stations. Customers can be provided with pressure reducing valves to reduce pressure at the delivery point to an acceptable level.

The facility sizing information is summarized in Table 3-6.

3.4.2 Sub-Alternative 1b – Phase 2B South + Vista Canyon + Nearby Customers

Sub-Alternative 1b is explored to identify the facility sizing requirements and costs to combine the Phase 2B South recycled water conveyance system with the Vista Canyon system and also provide additional transmission capacity to serve nearby customers identified in Demand Scenario 2. This concept would allow for a future interconnection to a larger recycled water system via the pipeline Vista Canyon is planning to construct along a bridge crossing the Santa Clara River. If this pipeline is used, or if another larger transmission main is constructed along this right of way, the Phase 2B

system could potentially receive additional recycled water to serve most if not all of the customers in the vicinity.

An initial estimate of the backbone pipeline diameter and additional storage was assessed using the hydraulic model. It was determined that for Sub-Alternative 1b, a backbone pipeline diameter of 14 inches is required.

The facility sizing information is summarized in Table 3-6.

3.4.3 Summary of Preferred Alternative Variations

The Preferred Phase 2B Alternative 1 and sub-alternative variations 1a and 1b are summarized in Table 3-6.

Table 3-6: Summary of Preferred Alternative Variations

Alternative	RW Demand (AFY)	Potable Backup (AFY)	New Cherry Willow RW Storage (MG)	Backbone Pipeline Diameter (inch-dia)	Pump Station (Max gpm, Total HP)
Alt 1 - Phase 2B South	163	8	0.5	8 inch-dia	2duty+1standby 272 gpm 45 HP
Alt 1a - Phase 2B South + Vista Canyon	300	8	1.0	10 inch-dia	2duty+1standby 272 gpm 45 HP
Alt 1b - Phase 2B South + Vista Canyon + Nearby Customers	**557**	195	1.7	14 inch-dia	2duty+1standby 272 gpm 45 HP

Alternative 1a demand is nearly 2 times the Alternative 1 demand; however, volume of potable backup supply is the same because Alternative 1 assumed that the available recycled water supply already accounted for serving Vista Canyon demands first. Alternative 1 and 1a require the same pump station requirements to lift and convey 100 percent of the recycled water produced at the Vista Canyon Water Factory. The larger capacity storage tank and backbone pipeline allow for additional conveyance of Vista Canyon supply to and from storage to eliminate the need for onsite diurnal storage at Vista Canyon. Alternative 1a benefits the overall program by avoiding duplication of infrastructure at the Vista Canyon Water Factory and realizing associated operations and maintenance efficiencies.

Alternative 1b demand is nearly 2 times the recycled water demand that Alternative 1a serves and nearly 2/3 of the additional demand would initially be met by potable backup supply. Similar to Alternatives 1 and 1a, the pump station requirements would remain the same, as it is assumed that any additional recycled water conveyed through the system would be added to the pipeline at a

pressure sufficient to reach the Cherry Willow Tank. The upsizing of the storage tank and backbone pipeline would allow for additional conveyance of recycled water from an additional supply (such as LACSD's Valencia WRP) if interconnected with the Phase 2B system. The storage tank and backbone pipeline would be sized to store and convey the peak hour demand for all nearby customers, including Vista Canyon. Alternative 1b benefits the potential future build out of the CLWA Recycled Water Program by providing the means to utilize the Cherry Willow Tank to float with a future North Oaks Tank; however, there may be hydraulic and operational challenges related to operating the system in this way. There would be significant additional costs for the distribution pipeline required to connect to all nearby customers. Also, it is not certain when or if this interconnectivity may occur, thus the system could be operating far under capacity for an undetermined period of time, which could result in inefficiencies, water quality issues and stranded or unused assets.

3.5 Phase 2B Preferred Alternative Costs

As described in Section 3.3, an Engineers' Opinion of Probable Construction Costs is developed to compare Preferred Alternatives 1 and 1a. Costs for Alternative 1b are not included due to the limitations of oversizing facilities without assurance that a future interconnection with another recycled water supply would be realized. Construction costs are converted to net present value annualized costs using basic assumptions about discount rates and life expectancy of project components. Annualized costs are divided by the annual recycled water delivery to obtain a uniformly derived unit cost of water in dollars per acre-foot ($/AF). The construction costs and annualized unit costs are summarized in Table 3-7 and additional detail is provided in Appendix C.

Table 3-7: Summary of Preferred Alternative Variation Costs

Facility Component	Alt 1 – Phase 2B South	Alt 1 A Phase 2B South
Pipelines	$2,519,155	$2,652,814
Storage Tank	$1,574,830	$2,465,110
Pump Station	$716,556	$716,556
Total Probable Construction Cost ($)	**$4,810,000**	**$5,830,000**
Range +50%	$7,215,000	$8,745,000
Range -30%	$3,367,000	$4,081,000
Unit Costs		
Probable Construction Cost ($mil)	**$4.8**	**$5.8**
Annualized Construction Cost ($mil/yr)	**$0.3**	**$0.3**
Average Annual Demand (AFY)	**163**	**300**
Annual Unit Cost ($/AF)	**$1,700**	**$1,100**

Providing additional storage and conveyance for Vista Canyon adds between $0.75 million and $1.5 million in capital costs; however, the annual unit cost drops by approximately $600/AFY (35% reduction). Alternative 1a benefits the overall program by avoiding duplication of infrastructure at the Vista Canyon Water Factory and realizing associated operations and maintenance efficiencies. Additionally, the incorporation of the Vista Canyon demands into the project may provide a more compelling story for pursuing grant funding, since the total potable offset realized is greater.

Alterative 1a – Phase 2B South including Vista Canyon demands, is the recommended project.

Section 4: Phase 2B Design Criteria

The Phase 2B Recycled Water system would require a new pump station, new pipeline facilities and a new storage reservoir. This section discusses the design criteria for the pump station, pipelines, and storage reservoir for the preferred alternative.

4.1 Development of the Recycled Water Design Criteria

The design criteria defined in the following sections are the basis of the assumptions in the hydraulic model (discussed in Section 3.2).

4.2 Pump Station Design Criteria

The following subsections summarize pump station equipment, layout, structure, electrical service requirements, and instrumentation and controls for the recycled water pump station. The pump station is limited in size by the output of the Vista Canyon Water Factory being designed and developed by Vista Canyon. The anticipated recycled water available from the Water Factory is 272 gpm, sized to treat the average daily flow to the plant.

4.2.1 Pump Station Configuration and Layout

The new pump station would include three (3) 136 gpm vertical turbine pumps. Two (2) of the pumps would be capable of delivering the required 272 gpm combined, and one (1) pump would operate as a standby unit. The pump type is similar to those used at several pump stations throughout CLWA's potable and recycled water systems, including the Valencia WRP pump station.

The pump station would be located on top of the proposed Water Factory Effluent Storage Tank and the vertical turbines would be submerged within the tank. Discharge piping would be above ground for a distance of approximately ten feet beyond the limits of the tank and then be buried. The main switch gear and Motor Control Center would also be located on the tank. Coordination with Vista Canyon would be necessary to ensure that the design of the storage can support the pump station structure and appurtenances.

4.2.2 Pump Station Equipment

The pump station would have the following equipment:

- Three (3) vertical turbine, water lubricated pumps, with a design operating capacity of 136 gpm each at a total dynamic head (TDH) of approximately 348 feet for the south system options and 319 feet for the north system. Nominal pump rotation speed would be 1,800 RPM. Pump seals shall be mechanical.
- Bronze impellers and welded parts.
- Epoxy or porcelain-lined column piping and bowls.

- Three (3) 15 horsepower, 480 volt, 3-phase, high efficiency motors; solid shaft, inverter duty, constant speed. The 2 duty pumps combined would operate at 30 horsepower with one standby pump at 15 horsepower.
- A pump control valve for each pump.
- A pressure relief / surge control valve on the discharge header.
- Butterfly valves on the 10-inch discharge piping for isolating the pumps.
- A magnetic type flowmeter installed above grade on the discharge header.
- Air release valves for the pump discharge.
- An emergency power standby generator would be provided.

4.2.3 Electrical System Requirements

The following subsections describe the electrical system requirements for the pump station.

Electrical Service

The electrical service for the pump station would be rated at 277/480 volts 3 phase, 3 wire system derived from the Southern California Edison distribution system near the pump station site. The electrical service would require a pad mounted transformer (2,400 to 480 Vac, 3Ph, 60HZ). The transformer would be installed near the pump station and its 277/480-volt secondary service routed to a main service switchboard located on the effluent tank as indicated above.

The main switchboard would be designed to carry anticipated pump loads. The main switchboard would include a distribution circuit breaker.

Lighting and Miscellaneous loads

Lighting and small electrical loads would be served from a panelboard at 208/120 volts or 240/120 volts. A dry type transformer would be used to step down the 480 volt service to the lower voltage to be utilized by the panelboard. The lighting system would utilize high pressure sodium or metal halide for exterior lighting.

Solid State Starters

These starters allow a "soft" start of pump motors which minimizes inrush on the SCE grid. Solid state starters include a full speed shorting contactor that transfers the motor to across-the-line once it reaches full speed. Solid state starters also include time adjustments for ramp-up and coast-down for smoother transitions and to minimize hydraulic surges. These starters include operator interface pad, motor protection and thermal protection of motor and drive.

4.2.4 Instrumentation and Controls

Various instruments would be used for monitoring the pump station. For pump station discharge pressure, electronic pressure transducers would be used. A magnetic type flow meter for measuring pump station flow and a level transmitter for measuring water levels (in the Effluent Storage Tank) would also be provided.

The control system would be a Programmable Logic Controller (PLC) housed in a control panel for pump station controls. The PLC would be provided with a local operator interface panel, such as Allen Bradley Panelview, to allow the operator the ability to adjust setpoints and monitor pump station status and source water levels. The panel would display alarms, trend level, pressure and flow.

PLCs such as those by Allen Bradley, Modicon, GE or others are commonly used for pump station applications. Remote Telemetry Units (RTUs) are also used. The choice of the appropriate brand and type of PLC/RTU shall be coordinated with CLWA to match their standards and to be compatible with the existing SCADA system.

4.3 Pipeline Design Criteria

Based discussions with CLWA and previously used design criteria from the 2009 Phase 2A PDR, the following design criteria were used to size the proposed transmission pipelines:

- Maximum design velocity: 6 fps.
- Maximum system pressure: 185 psi.
- Minimum delivery pressure: 55 psi.
- Optimum delivery pressure: 55 to 150 psi.
- Pipelines shall be sized to meet the peak hour demand.

In addition to the above, the general design guidelines discussed in the following subsections would be followed.

4.3.1 Pipe Materials

Based on the results of the hydraulic model, the largest pipe size anticipated for Alt 1a - Phase 2B South + Vista Canyon is 10-inch diameter. Therefore, buried piping shall be "purple" high pressure Polyvinyl Chloride (PVC) and any above grade pipe (if needed) shall be steel or ductile iron (DI) pipe. PVC pipe shall conform to the requirements of AWWA C900 and C905; DI pipe shall be in conformance with AWWA C150 and C151 and welded steel shall be in conformance with AWWA C200.

All buried PVC pipes shall be purple in color. All above-grade metal pipes shall be painted purple Pantone 512. Tracer wire shall be installed on all buried PVC lines and shall be located above the

pipe and terminated at access boxes to provide a means to locate the pipe in the future. All buried pipes shall be installed with warning tape with the words "CAUTION: RECYCLED WATER LINE BURIED BELOW" imprinted on the tape and laid in the trench above the pipeline.

4.3.2 Pipe Fittings

For pressure-rated PVC pipe 14-inches in diameter or smaller, ductile iron fittings with restraints shall be used. Ductile iron fittings for buried PVC and above grade ductile iron pipe shall comply with AWWA C110. Fabricated steel fittings for above grade welded steel pipe shall be in conformance with AWWA C208. Buried ductile iron fittings shall be installed with purple polyethylene wrap.

4.3.3 Pipe Appurtenances

Appurtenances shall be installed appropriately to protect the pipeline from water hammer, collapse, and vacuum and to isolate and/or drain the pipe. Appurtenances shall include air and vacuum release valves, blowoff/pumpouts, and valves. All appurtenances shall comply with applicable AWWA standards.

Air and Vacuum Release Valves

Air and vacuum relief valves (AVARs) shall be installed to exhaust air from the pipeline during filling and normal operations and to protect the pipeline from collapse due to vacuum conditions. AVARs would be designed, sized and located to meet current AWWA design recommendations (AWWA M51). Identification for AVAR enclosures varies depending on the type of enclosures preferred. Options of identification include fully painting the enclosure with purple Pantone 512 paint, strips of purple stickers (for plastic enclosures only), and stick on purple labels with the words "RECYCLED WATER" in black markings.

Blowoff/Pumpout Facilities

Blowoff/pumpout facilities shall be installed along the pipeline for relief of pipeline pressure and dewatering when the pipeline is shut down and out of service for maintenance or internal inspection. Blowoffs shall be installed at each low point and on the upstream side of any valve along the pipeline to facilitate and ensure complete dewatering. Covers for the blowoff/pumpout facilities shall have a cast marking with the words "RECYCLED WATER."

Distribution Mains and Laterals

The minimum size distribution main shall be a 6-inch diameter. If a dead-end in the distribution pipeline cannot be avoided, the pipeline shall be sized so that sufficient water is regularly drawn to prevent stagnation.

The pipe material for new customer service lines shall be copper for 1- or 2-inch diameter lines, or PVC or DI for larger sizes. All service lines shall include a valve at the connection to the recycled

water distribution main. Meter capacity shall be determined based upon the recycled water customer demands.

Existing irrigation lines shall be retrofit to connect to a recycled distribution main. For retrofits, meter capacity shall be sized to match existing or sized to accommodate historical water use. Design of irrigation facilities shall include isolation of existing service, cross-connection prevention, and proper tag identification to properly execute a conversion from an irrigation system served by potable water to one served with recycled water.

Valves and Miscellaneous Appurtenances

Butterfly valves shall be installed to facilitate dewatering during emergency or routine maintenance, such as internal pipeline inspections and to isolate the pipeline. Isolation (shut-off) valves shall be installed at all pipe branches and/or every 1,000 feet. Long lasting, chemical resistant nitrile gaskets for fittings and appurtenances are recommended. Sampling stations are recommended to adequately monitor the quality of the recycled water in the distribution system.

Due to the nature of this project, other agencies, such as the City of Santa Clarita, may have requirements that would affect the design of new facilities. These may include traffic control and paving requirements.

4.3.4 Pipe Trenches

Pipelines shall be designed for a minimum cover as shown below, unless otherwise specified. These depths protect the pipeline from live loads while minimizing dewatering costs.

- 6-inch diameter and smaller: 3.5 foot minimum cover
- 8- to 12-inch diameter: 3.5 foot minimum cover
- 14- to 24-inch diameter: 4 foot minimum cover

When the minimum cover requirements cannot be met, the pipe trench loading shall be further analyzed. In such cases, the use of concrete or slurry encasement may be necessary.

As established by the California Department of Drinking Water (DDW), the minimum separation for existing water mains and new pipelines carrying tertiary-treated recycled water shall be in conformance with Section 64572 of Title 22 California Code of Regulation. There shall be at least a 4-foot horizontal separation where lines are running parallel and a 1-foot vertical separation (water line above recycled water line) where the lines cross each other. When these criteria cannot be met, special permission must be obtained from DPH.

A minimum clearance of at least 12 inches (when paralleling) and 6 inches (when crossing) electric lines is required by the Southern California Edison Underground Structures (UGS-100) and the California Public Utilities Commission General Order (GO-128).

4.4 Storage Reservoir Design Criteria

This subsection discusses reservoir storage requirements, codes and standards applicable to the welded steel storage reservoirs and reservoir piping, structural requirements, geotechnical considerations, earthwork and cathodic protection considerations, reservoir piping, valves and accessories, control and monitoring features, and electrical considerations.

4.4.1 Storage Requirements

The hydraulic model identified the need for a reservoir for the Phase 2B Preferred Alternative. Reservoir size is based on 1.5 times the maximum day demand. The storage required for the preferred alternatives and sub-alternatives is as follows:

- Alt 1 - Phase 2B South = 500,000 gallons
- Alt 1a - Phase 2B South + Vista Canyon = 1,000,000 gallons
- Alt 1b - Phase 2B South + Vista Canyon + Nearby Customers = 1,700,000 gallons. However, it is unclear if the site is large enough to accommodate this storage.

4.4.2 Codes and Standards

Applicable codes and standards for the welded steel reservoir(s) are summarized below. Additional standards applicable to the reservoir piping are discussed in Subsection 5.3.

- California Code of Regulations, Title 8, Industrial Safety (CAL-OSHA) for safe employment conditions
- American Water Works Association (AWWA) standards for welded steel tanks used for water storage (AWWA D100)
- Uniform Building Code (UBC)
- International Building Code (IBC)
- National Electrical Code (NIC)

4.4.3 Structural Requirements

The reservoirs shall be above-ground welded steel structures. Based on the hydraulic requirements, the reservoirs should be located and dimensioned to maintain a pressure of 55 psi at the highest service elevation and to maintain a pressure less than 185 psi at the lowest service elevation. Sufficient freeboard shall be provided between the HWL and the underside of the roof girders for sloshing waves in a seismic event. It is recommended that the tank(s) have a HWL of 30 feet and a shell height of 32 feet with the following diameters:

- Alt 1 - Phase 2B South = 54 feet
- Alt 1a - Phase 2B South + Vista Canyon = 76 feet
- Alt 1b - Phase 2B South + Vista Canyon + Nearby Customers = 99 feet

The following structural criteria shall be used in final design:

- Reservoir shall be designed based on a minimum 25 psf live load in areas outside of platforms and guardrails and 50 psf live load in platform areas within guardrails near the roof access hatch.
- Reservoir design shall be based on a wind velocity of 100 mph, the minimum in accordance with AWWA D100, with a reduction of 60 percent for the cylindrical surface of the tank (unless noted otherwise by the local building official).
- Reservoir shall have a knuckled roof connection between the top of the wall shell plates and the roof plates. Roof design shall be in accordance with the AISC (ASD).
- The roof rafters shall not project below the HWL of the reservoir.
- Reservoir shall be designed for water load, wind, and seismic loads.
- Reservoir drain shall be sized to drain the reservoir volume in two (2) days.
- Minimum roof slope of 3/4 in 12 and a maximum slope not exceeding 2 in 12.
- Minimum roof plate thickness shall be 3/16-inch.

4.4.4 Geotechnical Considerations

Phase 2B is located in a seismically active portion of southern California. The 1994 Northridge earthquake (Richter Magnitude 6.7) occurred in the vicinity of the site and caused significant damage to infrastructure within the Santa Clarita area. Potential for strong ground motion to occur within the lifetime of the project is considered high. Site specific geotechnical investigations in the vicinity of the proposed reservoirs are required.

Structural criteria based on the available geotechnical information for the area are as follows:

- The welded steel reservoir shall be supported on perimeter concrete ringwall foundation.
- The footing shall be a minimum of 2'-6" wide and embedded at least 2'-0" below the lowest adjacent finished grade.
    - Footings shall be dimensioned and sized in order to equalize the unit soil bearing pressure beneath the center of the tank and perimeter ringwall footing so that differential settlement is minimized.
    - The ringwall footing shall be dimensioned based on the allowable soil bearing pressure of 2,000 psf for dead load plus live load.
    - The top of ringwall foundations shall be a minimum of 6 inches above the adjacent finished grade and site grading and paving shall be sloped away from reservoir at 1 to 2 percent for positive drainage.
- The reservoir shall be anchored to the foundation with steel straps or minimum 1¼-inchw diameter anchor bolts and chairs spaced 10-feet on center (maximum) designed by the tank fabricator to minimize damage to the tank shell plates during seismic events.
- The reservoir floor plates shall be placed on an asphaltic concrete road mix and sloped uniformly upward to the center of the reservoir.

- If two (2) reservoirs are chosen instead of one (1), the reservoirs shall be separated by a minimum of 20-feet in order to reduce impacts for overlapping stress bulbs and increased settlement.
- Seismic design forces in AWWA D100 shall be increased in accordance with the International Building Code requirements to account for near source effects. Determination of seismic forces for the welded steel tank construction shall include evaluation of both the AWWA D100-11 and 2015 IBC criteria and be compared with site specific design response spectra developed using the computer program FRISKSP by Blake (2000b).

4.4.5 Earthwork Considerations

The reservoir site and surrounding access areas would require grading. Construction of the reservoir shall require overexcavation and recompaction a minimum of two (2) feet beneath the reservoir pad elevation to remove any existing artificial fill beneath the proposed structures and help provide a more uniform condition beneath the reservoir and ringwall. Overexcavation shall extend 5 feet laterally beyond the structure or the depth of the overexcavation, whichever is greater. Loose, soft, or unsuitable materials encountered at the base of the overexcavation shall be removed. Onsite soils may be suitable to be used as general fill beneath the proposed structures. At least one foot of compacted select fill (silty sand, sand with silt, or sand) with less than 20 percent passing the number 200 sieve shall be placed at the top of the reservoir's pad excavation.

4.4.6 Protective Coatings and Cathodic Protection Recommendations

It is recommended that protective coatings shall be applied to the tank in accordance with ANSI/AWWA D-102 standards. The reservoir's exterior shall be coated with a three-coat zinc-epoxy-polyurethane coating system with a total system dry film thickness (DFT) equal to 10 to 13 mils (primer, intermediate, and finish coats). Reservoir exteriors should be painted with low-reflective paint in a camouflaging color that blends with the surrounding environment. The reservoir's interior shall be coated with NSF-epoxy coating system with DFT equal to 10 to 12 mils.

A sacrificial anode cathodic protection system is recommended for the reservoir's interior to mitigate imperfections in the tank coating system and to extend the life of the interior painting system. Design of the cathodic protection system for the reservoirs' interior and exterior bottom shall be based on following assumptions:

- One percent of the tank interior would eventually be susceptible to corrosion.
- Five percent of the tank bottom exterior would be susceptible to corrosion (this would require the bottom plates to be coated similar to the tank interior).
- Cathodic protection would apply a current density of 3.7 milliamps per square foot (mA/ft^2) to the interior (based on NACE).

4.4.7 Reservoir Piping, Valves, and Accessories

The following American Water Works Association (AWWA) Standards are applicable to the reservoir piping:

- AWWA C207: Steel Pipe Flanges for Waterworks Service - Sizes 4 in. Through 144 in. (100 MM Through 3,600 mm)
- AWWA C208: Dimensions For Fabricated Steel Water Pipe Fittings
- AWWA C213: Fusion-Bonded Epoxy Coating For the Interior and Exterior of Steel Water Pipelines

Piping and Valves

Exposed (above grade) and buried reservoir piping shall meet the following requirements:

- Exposed: fusion-bonded, epoxy-lined and coated steel pipe with flanged fittings.
- Buried: Cement mortar lined and coated welded steel pipe with fabricated steel pipe fittings. Transition to PVC shall be made at the reservoir site boundary.
- Overflow and drain piping shall be fusion-bonded epoxy lined and coated steel pipe with welded steel fittings.
- Inlet/outlet piping shall be equipped with insulated flange kits.

The following valves shall be provided for the reservoir:

- Inlet/outlet isolation valves (2 per reservoir): Butterfly valves, 150 pounds per square inch (psi) pressure rating.
- Inlet/outlet check valves (2 per reservoir): slanted disc style check valves with flanged ends, 200 psi pressure rating, and fusion epoxy lining and coating.
- Drain valve (each reservoir): Resilient seated gate valves with 150 psi pressure rating.

The reservoir shall be equipped with the following accessories:

- Flexible expansion joint connections for inlet/outlet piping (2 per reservoir): Flanged double ball type with up to 30 degree of deflection and 8 inches of expansion with 350 psi pressure rating.
- Flanged coupling adapters (FCA's): Fabricated steel, fusion epoxy lined and coated FCA's shall be provided to facilitate valve removal.
- Flush type cleanout with gate valve.
- Combination air vacuum/air release valves shall be provided on the reservoir inlet/outlet piping.
- Potable Water makeup connection piping shall extend to the reservoir roof and include an air gap and splash guard.

The reservoirs shall be equipped with a 1-way altitude valve with delayed opening to control the high water level in the reservoir and keep the reservoir from overflowing. The valve shall be hydraulically operated and pilot controlled. The valve shall close at a high water level and shall delay its opening for until the pressure at the valve inlet is lower than a pre-set adjustable pressure.

A ¾-inch minimum (inside diameter) pressure sensing line shall be installed between the altitude valve and reservoir. Isolation valves shall be provided on each side of the altitude valve to facilitate valve maintenance. Valve shall have a 150 psi pressure rating and be fusion epoxy lined and coated.

The reservoir shall be equipped with a Seismic Shutoff System for protection during an earthquake or seismic event. The system shall include a 14-inch motor operated valve.

Access Hatch, Vent and Manways

Unless otherwise requested by CLWA, reservoir shall be provided with a minimum of two shell manholes at least 48 inches in diameter. The roof of the reservoir shall be provided with a 3-foot by 3-foot aluminum access hatch. The access hatch shall be provided with a minimum curb at least 4-inches high and the hinged access cover shall have a downward overlap of at least 2 inches. The access hatch shall be located at the edge of each reservoir and shall be placed over an interior vertical stainless steel ladder. The stainless steel ladder shall have a retracting cable-type ladder fall prevention safety device mounted to the reservoir wall under the access latch. The access latch shall be equipped with a removable extension for the ladder safety device.

A 36-inch diameter vent with a stainless steel screen shall be provided on the roof of the reservoir and located in the center of the reservoir. The vent would exhaust or admit air during the filling or emptying of the reservoir. It would also aid in cross ventilation whenever the reservoir is entered for maintenance. The vent shall be designed to prevent the entrance of birds or animals and a stainless steel screen shall be provided to guard against insects.

Vertical Ladders

A galvanized vertical exterior ladder shall be provided for exterior access to the reservoir roof. The ladder shall have an intermediate landing platform and shall be equipped with a steel cage. The bottom 10' of the cage shall be solid, covered by light gage metal with lockable access prevention for security. Interior and exterior ladders shall be provided with SAF-T-Climbs. Vertical exterior ladders, interior ladders, landings and guardrails shall be designed in accordance with the State of California Title 8, General Industry Safety Orders, and Federal Occupational Safety and Health Standards (OSHA).

4.4.8 Reservoir Monitoring and Control Features

The following sensors and piping shall be provided for monitoring tank operations:

- Sample piping shall be located 1/2 reservoir height, two (2) per reservoir on opposite sides of the reservoir. Samples shall be taken manually by the operators to determine if chemical stratification has occurred due to poor mixing.
- A level transmitter shall be provided for the reservoir to monitor tank levels and altitude valve performance. It shall be located on the side of the reservoir, at the same elevation as the top of discharge pipe (reference zero level). Should the altitude valve malfunction, the

PLC would generate high and low warnings and alarms. Typically, warnings are set at 90 percent and 10 percent levels and alarms are set at 95 percent and 5 percent levels based on zero level.

- Transmitter for monitoring the altitude valve position shall be supplied with the valve.
- An alarm switch shall be provided to signal access to the reservoir via its access hatch.

The following equipment shall be provided for controlling reservoir operations:

- Remote Telemetry Panel: This panel would contain a Programmable Logic Controller (PLC), Input/Output (I/O) modules and Human Machine Interface (HMI) for controlling operations. The panel shall either be installed in a location to avoid direct sunlight or be provided with a sunscreen.
- Seismic Valve Controller: This motor operated valve (MOV) shall be battery-operated and open-closed by a contact closure from the PLC or closed automatically during a seismic event. This valve requires 120 VAC for the battery charger only. The valve is monitored for remote status (valve in automatic), open and closed position, and alarm (failure or seismic operation).

4.4.9 Electrical Considerations

Utility, 120/240 volts, single phase, 3 wire electrical power would be required at the reservoir site for the seismic controller, remote telemetry panel, lighting and receptacles.

Section 5: Implementation Considerations

This section provides implementation considerations that should be investigated during the design and environmental review phases of the Recommended Project.

5.1 Permitting Recycled Water

The production, discharge, distribution, and use of recycled water are subject to federal, state, and local regulations, the primary objectives of which are to protect public health. In the State of California, recycled water requirements are administered by the State Water Resource Control Board (SWRCB)-Division of Water Quality (DWQ) and Division of Drinking Water (DDW, formerly under California Department of Public Health (CDPH)) and individual Regional Water Quality Control Boards (RWQCBs). The regulatory requirements for recycled water projects in California are contained in the following sources:

- California Code of Regulations (CCR), which includes Title 22 and Title 17
- California Health and Safety Code
- California Water Code.

The SWRCB issues loans in accordance with the Water Code and approves petitions for the change in place and purpose of use of treated wastewater in accordance with the Water Code.

Local requirements focus on the distribution and use of recycled water and, primarily, the onsite (user) systems, with emphasis on cross-connection control.

The Los Angeles County Department of Public Health (LACDPH) Cross-Connection and Water Pollution Control Program establishes more specific requirements for the separation and construction of potable and recycled water lines, guidelines for on-site (user) systems, and identification of recycled water facilities.

The local requirements are also administered by LACDPH as follows:

1. Review as-built drawings of user's potable water system.
2. Perform an onsite survey of the user's water system.
3. Guide users in methods of identifying potable and recycled water systems.
4. Review and approve design drawings of user's recycled water systems.
5. Inspect user's potable and recycled water systems following construction.

The Phase 2B project would also have to adhere to the requirements set forth in the Vista Canyon Water Factory permit for production and use of recycled water. Vista Canyon is currently in discussions with the RWQCB and DDW for this permit. A Title 22 Report will be prepared by the developer, Vista Canyon Ranch LLC.

Additional detail about recycled water regulatory requirements is provided in Appendix D.

5.2 Other Permits

Other permitting requirements associated with general construction practices may include but not be limited to the following:

- **Stormwater Permit:** The requirements of the General Construction Storm Water Permit, including preparation of a Storm Water Pollution Prevention Plan (SWPPP), apply to projects that disturb more than one acre. Recently, the SWRCB developed a Statewide General Permit for storm water discharges associated with construction activity from Small Linear Underground/Overhead Project that applies to pipeline projects that disturb between one and five acres. If the proposed project disturbs at least one acre but less than five acres (including trenching and staging areas) then this permit would apply. If the proposed project disturbs more than five acres, then the requirements of the General Construction Storm Water Permit would apply.

- **Trenchless Crossings:** For crossings that require a trenchless method, an Underground Classification would be required from the California Division of Occupational Safety and Health prior to construction. Other permits that would be required but could be under the Contractor's responsibility are General Construction Storm Water Permit from Regional Water Quality Control Board and Trenching and Excavation Permit from California Occupation Safety and Health.

- **River Activities:** Activities in the Santa Clara River would require Nationwide Permits from the U.S. Army Corps of Engineers (USACE) for activities such as temporary construction, access and dewatering, or alternation of the contours of the riverbed or its banks. U.S. Fish and Wildlife Service (USFWS), as part of the Department of the Interior (DOI), also reviews proposals for work and activities in or affecting navigable waters that are licensed, assisted, or conducted by the federal government. Additional information about USACE and USFWS requirements are described in Appendix D.

Table 5-1 provides a summary of jurisdictional permits, permitting agencies and contact information.

Table 5-1: Summary of Agency Contacts

Agency	Permit	Contact
US Army Corp of Engineers	Section 404	Dan Swenson 213.452.3414
US Fish and Wildlife Service	Biological Approval	Chris Delith 805.644.1766
State Water Resource Control Board	Notice of Intent of Storm Water Discharge and General Construction Stormwater Permit	Harumi Zoya 213.620.2283
Regional Water Quality Control Board	401 Certification	Valerie Carillo 213.576.6759
California Department of Fish and Game	Notification of Lake or Streambed Alteration	Betty Courtney 661.263.8306
California Division of Occupational Safety and Health	Underground Classification	James Wittry 818.901.5420
Los Angeles County Department of Public Heath	Approval of Design and Inspection of Facilities	General (626) 430-5350
City of Santa Clarita	Encroachment Permit	Linda Newman 661.286.4060
Los Angeles County Flood Control District	Encroachment Permit	Juan Sorda 626.458.4962

5.3 Utilities and Separation Requirements

The pipelines that serve customers near the recommended alignments are primarily located within the roadways. Most of the streets are smaller, residential roadways, but laterals from the 8-inch transmission pipeline may need to cross under Lost Canyon Road to connect to customer meters. There are specific separation requirements between potable water and recycled water that would have to be considered in accordance with the Department of Drinking Water's pipeline separation requirements. Recycled water pipelines generally require ten feet of horizontal separation from potable water pipelines.

5.4 Encroachment Permits and Easements

The majority of the proposed pipeline alignment would be in the public right-of-way. An encroachment permit from the City of Santa Clarita would be required prior to construction of the pipelines. In addition, design drawings would need to be submitted to the California Department of Drinking Water for approval. Other permits and/or approvals for crossing specific facilities are discussed below. Encroachment permits may also be required from the City of Santa Clarita and the Los Angeles County Flood Control District (LACFCD) for work performed within public right-of-way.

The Los Angeles County Flood Control District (LACFCD) owns and maintains the storm drains which would be crossed at various locations. LACFCD reviews, approves, and issues encroachment

permits in cases where their utilities are being crossed (over and/or under). Application for encroachment permits should include the following documents:

1) property rights' of LACFCD to show if easement or fee-owned,
2) structural calculation to prove that the integrity of the existing facility is not being jeopardized,
3) As-Built drawings of the existing facility, and
4) construction plans.

Charged fees as well as insurance coverage policy, naming LACFCD (and the U.S. Army Corps of Engineers, when applicable) as co-insured, are also required to be provided prior to issuance of the encroachment permits.

5.5 Construction Considerations

There are several construction considerations for the project including the recycled water transmission crossing the railroad at Lost Canyon Road, construction of the pump station on top of the Water Factory Effluent Storage Tank, potential dewatering and dewatering disposal along the pipeline alignments and traffic control; particularly near the Fair Oaks Ranch Community School.

The Vista Canyon development would bring the recycled water pipeline to the bridge over the railroad at Lost Canyon Road. It is uncertain whether the pipeline would be attached to the bridge at this location or located in a trench and installed beneath the tracks utilizing trenchless construction techniques. Vista Canyon would also develop the design for the Water Factory and the Effluent Storage Tanks, CLWA and SCWD should work closely with Vista Canyon for both of these conditions to 1) design a point of connection that is least costly and avoids permits that could be difficult and time consuming to obtain, and 2) establish design criteria for the pump station and storage tank that would allow constructing the pump station on the storage tank roof.

Dewatering and dewatering disposal should be analyzed closely during design. If dewatering is required, a dewatering discharge permit, which could include water treatment, from the RWQCB may be required unless an alternative disposal method, such as spray irrigation, is developed.

CLWA should work closely with the Fair Oaks Ranch Community School to avoid traffic regulation issues during the school year and most importantly during early morning student drop off and afternoon pickup times.

5.6 Community/Customer Outreach

Community and customer support are essential to the success of any recycled water project. Divisiveness and opposition could result in project delays, higher costs and more complex implementation strategies. SCWD should initiate and/or continue to communicate with key potential customers and implement a more formalized outreach campaign as soon as possible to garner community involvement and to provide customers and community members with the opportunity to contribute feedback, voice opinions and address concerns. A collaborative outreach

campaign would allow SCWD to understand and address community concerns early in the project and is more likely to foster a sense of support and cooperation during project implementation.

Section 6: Recommendation and Next Steps

This section provides a summary of the recommended project alternative and includes discussion of next steps for project implementation.

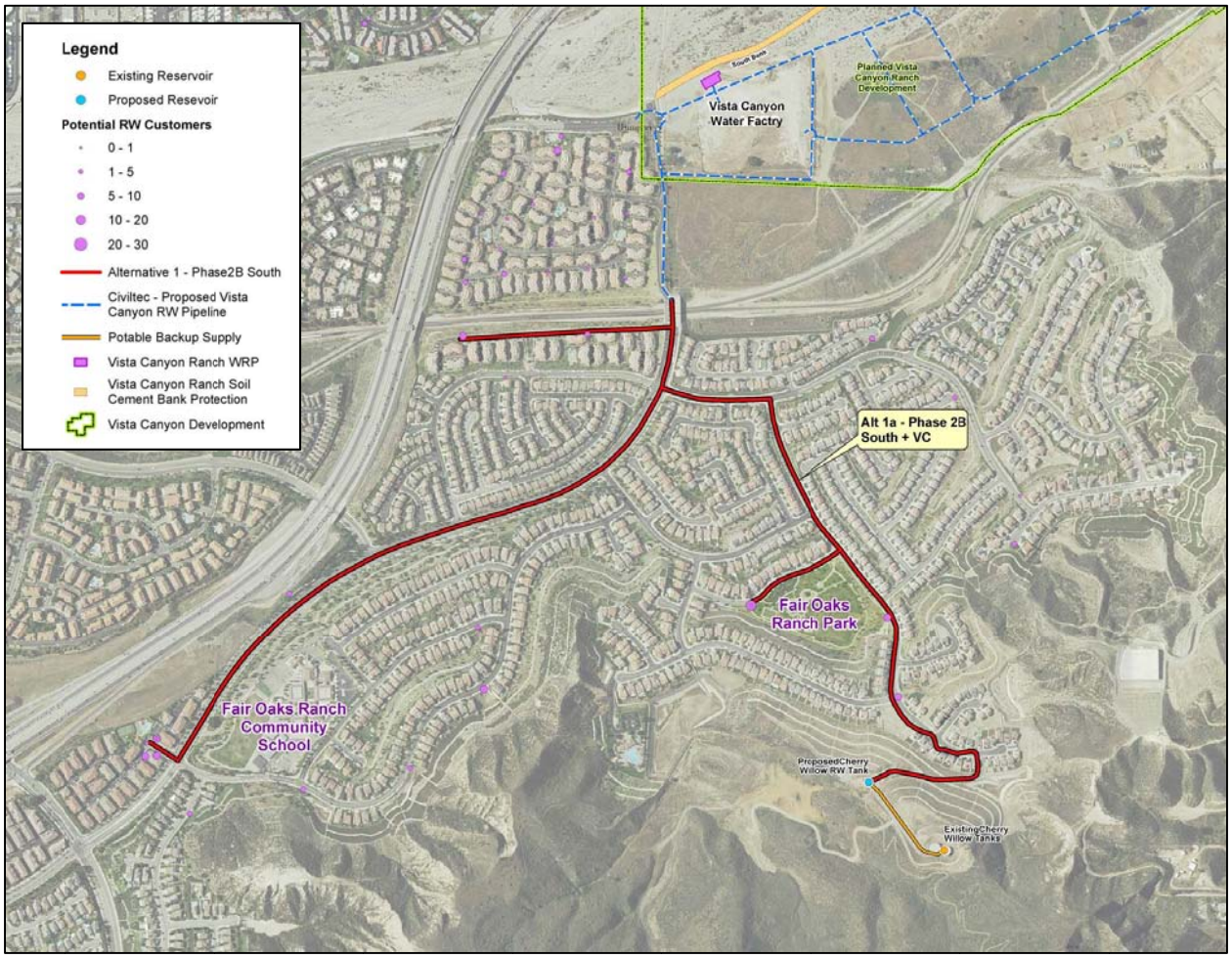
6.1 Recommended Project

The recommended project, Alternative 1a – Phase 2B South + Vista Canyon, is summarized in Table 6-1 and illustrated in Figure 6-1.

Table 6-1: Summary of Recommended Project - Phase 2B South + Vista Canyon

Facility Component	Alt 1 A Phase 2B South	Description
Pipelines	$2,650,000	10"dia backbone (5,000 ft) 6"dia distribution (6,100 ft)
Storage Tank	$2,470,000	1.0 MG new tank at Cherry Willows site with potable backup connection
Pump Station	$720,000	2duty+1standby - 272 gpm, 30 HP Sufficient to convey the peak Vista Canyon flow to storage
Total Probable Construction Cost ($)	**$5,840,000**	Potential cost-sharing with Vista Canyon to be negotiated
Probable Construction Cost ($mil)	**$5.8**	
Annualized Construction Cost ($mil/yr)	**$0.3**	
Average Annual Demand (AFY)	**300**	Includes major customers near alignments plus Vista Canyon indoor/irrigation uses
Annual Unit Cost ($/AF)**	**$1,100**	The least costly annual unit cost of all alternatives evaluated

Figure 6-1: Recommended Project - Phase 2B South + Vista Canyon



6.2 Next Steps

The following section describes the next steps for implementing the Phase2B recycled water project. These are in addition to those implementation considerations discussed in Section 5.

6.2.1 Grant Application

CLWA and SCWD have expressed interest in pursuing grants and loans through the Clean Water State Revolving Fund (SRF) Recycled Water Funding Program (RWFP). The first step in pursuing this funding would be to initiate the RWFP application for the recommended project and have an initial meeting with the State Water Resources Control Board.

The grant application consists of four main attachments/deliverables described below:

1. **General information package.** Information package form (3 pages) including applicant information, project type, assistance requested, project information, project schedules,

capital costs and funding summary, mapping and other attachments. Completion of this package would allow for the assignment of a State Board staff member for the project, and to gain their recommendations for when completion of the rest of the application is most efficient

2. **Technical information package**. Information package includes water conservation statements, proof of UWMP compliance, proof of water rights and other forms as well as a project scope or engineering report, general plan compliance, and water metering compliance certification.
3. **Environmental information package.** Information package includes an information form and certified California Environmental Quality Act (CEQA) document (if available) and a general description of the potential for sensitive resources to be affected by the project.
4. **Financial Security package.** Information includes audited financial statements, tax questionnaire, reimbursement resolution, authorizing resolution, rate adoption resolution, pledged revenues and funds resolution, existing related debt statement, and other forms as applicable. Much of the information in this part of the application would have to come from the CLWA.

6.2.2 Environmental Documentation (MND)

Construction of a new pipeline and storage tank would require the preparation of the appropriate environmental documentation for compliance. CEQA documentation for the Phase 2B project may take the form of a statement of exemption (for a project that is categorically exempt), a Negative Declaration, a Mitigated Negative Declaration, or an EIR since the majority of impacts associated with underground pipelines are temporary and construction-related.

Existing environmental studies that may support the project include the following:

1. The Draft Program Environmental Impact Report (EIR) prepared for the 2002 Recycled Water Master Plan with the CLWA as the Lead Agency

2. The Vista Canyon EIR that covers all facilities and recycled water pipelines associated with the development site.

3. The Cherry Willows Development EIR that constructed the existing Cherry Willow tanks and included site grading for the available tank pad.

Areas of controversy that may be associated with the proposed project would be identified in the Notice of Preparation as well as through an understanding of the issues in the Santa Clarita Valley (CLWA, 2007). These may include but are not limited to:

- Concerns over decrease in effluent discharge to the Santa Clara River, and subsequent decreased flows to Ventura County as a result of sewer scalping.

- Potential impacts to flora and fauna, with emphasis on sensitive habitats that support endangered, threatened, and locally unique species.
- Potential direct, indirect and cumulative impacts to biological resources, including wetland, riparian and aquatic habitats.
- Potential impact to water quality due to chloride in the recycled water
- Potential direct and indirect impacts to recreational facilities.
- Potential adverse impacts to air quality from construction and operation of recycled water facilities.
- Potential impacts to impaired water bodies and associated TMDLs, increases in surface water runoff and decreases in percolation

It is recommended CLWA prepare an Environmental Checklist for the recommended Phase 2B project alternative in accordance with CEQA guidelines. Additional information about CEQA requirements are described in Appendix D.

6.2.3 Institutional Agreements

CLWA is in the process of developing wholesaler-retailer agreements. These agreements may include, but not be limited to the following considerations:

- Producer, wholesaler and retailer roles, for which a potable water rate study will need to be provided
- Delivery criteria (pressure, flow rate and delivery window)
- Responsibility for pumping and storage and delivery to customer sites
- Infrastructure maintenance oversight
- Site retrofit responsibilities and customer oversight

6.2.4 Design and Construction

Similar to any infrastructure project, recycled water projects typically require the following steps for design and construction:

- Conceptual Engineering Report / Preliminary Distribution Design
- Final Distribution Design
- Retrofit Design
- Distribution/Retrofit Bid Packages
- Engineering Support During Construction
- Construction Management

6.2.5 Customer Site Retrofits

Getting customers ready to receive recycled water is typically referred to as Customer site retrofits and may include some if not all of the following activities:

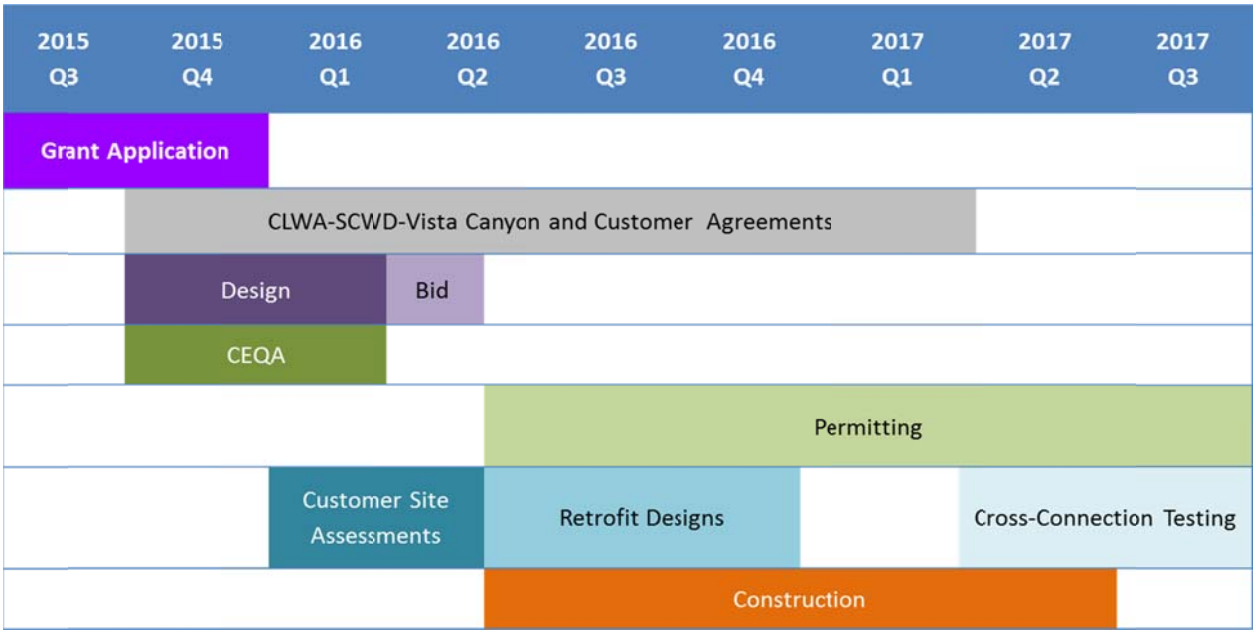
- Data Collection and Site Visits
- Service Lateral Coordination
- Detailed Customer Site Assessment
- Site Retrofit Plans
- DDW Approval Coordination

Customer site retrofits for landscape irrigation customers with separately metered systems may be relatively straightforward. A reduced pressure backflow preventer is recommended for each recycled water service connection. Conducting retrofits as schools can have schedule implications due to allowable construction windows when classes are not in session.

6.3 Potential Schedule

Figure 6-2 illustrates a potential schedule for implementing the Phase2B recycled water project with the goal of having an operational system by July 2017 to align with completion of construction of the Vista Canyon Water Factory.

Figure 6-2 Potential Schedule for Implementation



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Appendix A: Recycled Water Demand Information

This appendix includes supporting information for the recycled water market assessment.

- Figure A-1 shows the Phase 2B Scenario Alignments by pipeline segment, with identified SCWD irrigation meters included in the demand evaluation.
- Table A-1 lists demand information provided by the SCWD database for meters that would be served by each pipeline segment.
- Table A-2 lists monthly demand scenario distributions used to assess the available recycled water throughout the irrigation season and potable backup requirements when the Vista Canyon Water Factory supply is unavailable.
- Table A-3 lists the monthly alternative distributions used to refine the customers served to minimize potable backup requirements.

Figure A-1 Phase 2B Scenario Alignments by Pipeline Segment

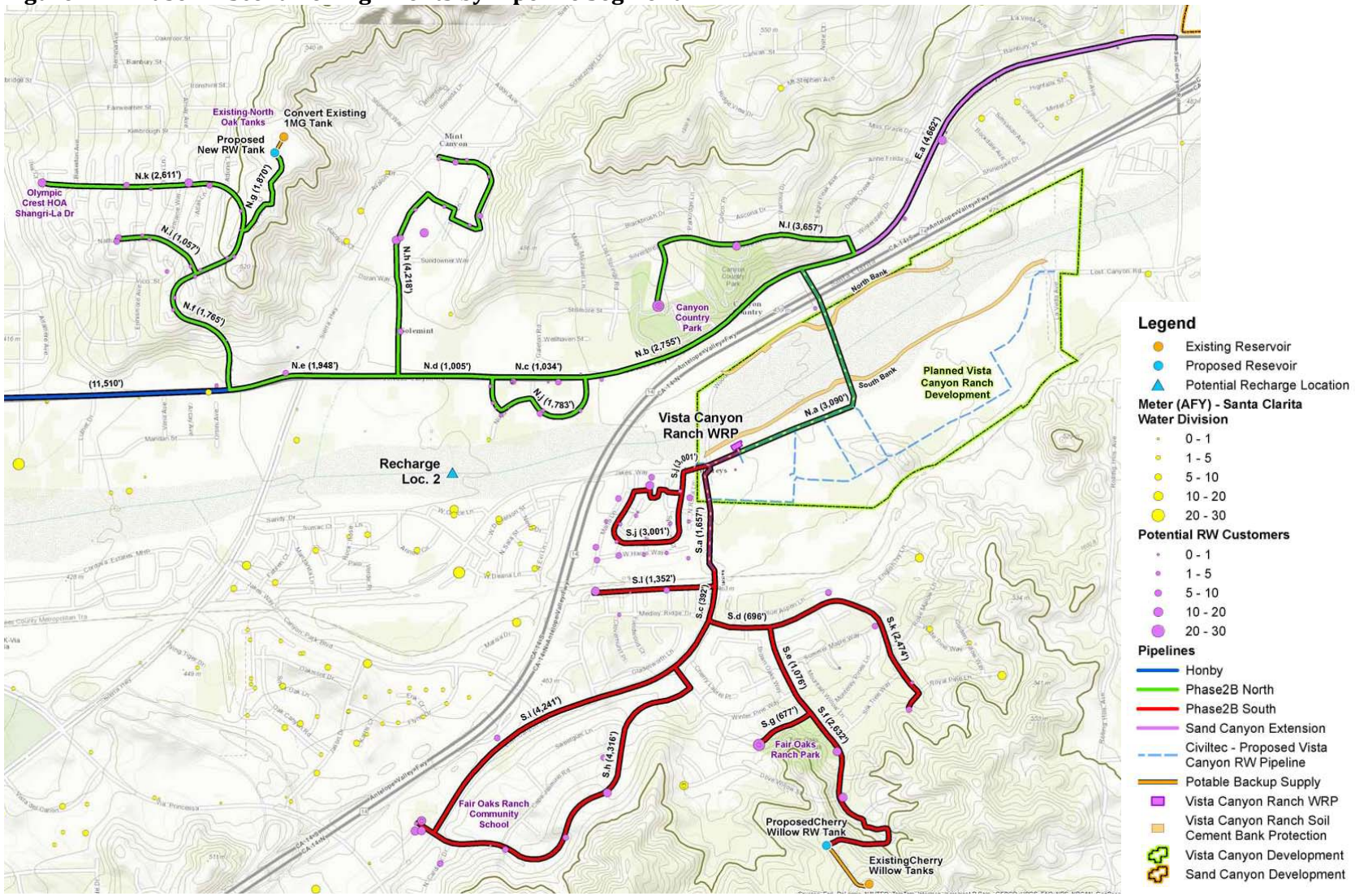

Table A-1 SCWD Database Meter Demand

Pipe Segment	Object ID	Account Number	Name	Serv_Str_1	Meter Number	USAGE (CCF)	USAGE (AFY)
E.a	468	13909	PROPERTY DEVELOPMENT CTRS LLC	IRRIG SOLEDAD CYN RD	65652891	418	0.96
E.a	477	14518	SAND CANYON CONDO ASSOC	IRRIG MISS GRACE DR	68529570	5209	11.96
E.a	479	14661	SANTA CLARITA WATER	IRRIG MISS GRACE DR	98466883	0	0.00
E.a	858	31032	LA IGLESIA CELULAR DEL VALLE D	SOLEDAD CYN RD	71569213	745	1.71
N.a	835	30786	CITY OF SANTA CLARITA	IRRIG NWC LOST CYN &	68291042	770	1.77
N.b	412	12254	TRES ROBLES CONDOS 2	RIVER CIR	68489956	1069	2.45
N.c	395	11903	FACEY MEDICAL FOUNDATION	SOLEDAD CANYON RD	70066806	283	0.65
N.c	397	12147	TRES ROBLES HOA #4	IRRIG IRONSTONE DR	56922970	768	1.76
N.c	398	12157	TRES ROBLES HOA #4	IRRIG IRONSTONE DR	64244341	2163	4.97
N.c	399	12160	TRES ROBLES HOA #4	IRONSTONE DR	56922987	282	0.65
N.c	401	12181	TRES ROBLES HOA #3	IRRIG NUGGET DR	61130883	2105	4.83
N.c	402	12184	TRES ROBLES HOA #3	NUGGET DR	57078808	391	0.90
N.c	403	12193	TRES ROBLES HOA #3	IRRIG RIVER CIR	65704731	3276	7.52
N.c	404	12211	TRES ROBLES CONDOS 2	IRRIG RIVER CIR	65652886	1775	4.07
N.c	405	12239	TRES ROBLES HOA #1	IRRIG RIVER CIR	62720495	965	2.22
N.c	406	12243	TRES ROBLES HOA #1	IRRIG SOLEDAD CYN RD	2140792	204	0.47
N.c	407	12244	TRES ROBLES HOA #1	NUGGET DR	2140793	344	0.79
N.c	408	12245	TRES ROBLES HOA #1	IRONSTONE DR	2140795	471	1.08
N.c	409	12246	TRES ROBLES HOA #1	IRRIG SOLEDAD CYN RD	65447355	2725	6.26
N.c	410	12250	TRES ROBLES HOA #1	RIVER CIR	2140749	329	0.76
N.c	411	12251	TRES ROBLES HOA #1	IRRIG SOLEDAD CYN RD	65447380	3323	7.63
N.e	444	12849	KIMCO REALTY CORPORATION	IRRIG SOLEDAD CYN RD	66514581	2219	5.09
N.e	500	15906	CITY OF SANTA CLARITA	IRRIG CANYON CREST D	68165253	79	0.18
N.f	423	12675	PAN PACIFIC RETAIL PROP	IRRIG SHANGRI-LA DR	65704735	0	0.00
N.f	424	12676	CITY OF SANTA CLARITA	IRRIG SHANGRI-LA DR	65023104	1583	3.63
N.f	425	12677	CITY OF SANTA CLARITA	IRRIG SHANGRI-LA DR	65068834	1264	2.90
N.f	432	12685	CITY OF SANTA CLARITA	IRRIG SHANGRI-LA DR	65023099	1021	2.34
N.f	445	12956	CITY OF SANTA CLARITA	IRRIG SOLEDAD CYN RD	68529673	719	1.65
N.g	426	12678	CITY OF SANTA CLARITA	IRRIG SHANGRI-LA DR	65023098	574	1.32
N.g	427	12679	SANTA CLARITA WATER	IRRIG SHANGRI-LA DR	1831615	0	0.00
N.g	428	12680	CITY OF SANTA CLARITA	IRRIG SHANGRI-LA DR	65023111	512	1.18
N.g	429	12681	CITY OF SANTA CLARITA	IRRIG SHANGRI-LA DR	65023094	1078	2.47

Pipe Segment	Object ID	Account Number	Name	Serv_Str_1	Meter Number	USAGE (CCF)	USAGE (AFY)
N.h	20	3388	CITY OF SANTA CLARITA	IRRIG LOST CYN RD	71324758	5897	13.54
N.h	413	12263	HERMAN SHAMALTA	IRRIG SOLAMINT RD	65023095	2872	6.59
N.h	434	12728	AMERICAN BEAUTY HOA	IRRIG SARABANDE LN	65447359	1592	3.65
N.h	435	12729	AMERICAN BEAUTY HOA	IRRIG SARABANDE LN	72050868	2014	4.62
N.h	436	12734	AMERICAN BEAUTY HOA	IRRIG SARABANDE LN	72030180	3170	7.28
N.h	437	12753	AMERICAN BEAUTY HOA	SARABANDE LN	64244320	1528	3.51
N.h	438	12772	AMERICAN BEAUTY HOA	IRRIG SARABANDE LN	65447393	3400	7.81
N.h	439	12787	AMERICAN BEAUTY HOA	IRRIG SUNDOWNER WY	65652912	2594	5.96
N.h	440	12794	AMERICAN BEAUTY HOA	IRRIG SUNDOWNER WY	65447365	1272	2.92
N.h	441	12797	AMERICAN BEAUTY HOA	IRRIG TYLER LN	65652908	1327	3.05
N.h	442	12808	AMERICAN BEAUTY HOA	IRRIG SARATOGA WY	64244318	1093	2.51
N.h	443	12836	AMERICAN BEAUTY HOA	IRRIG SUNDOWNER WY	65068846	6396	14.68
N.i	430	12682	CITY OF SANTA CLARITA	IRRIG VICCI ST	65023086	1379	3.17
N.i	431	12683	CITY OF SANTA CLARITA	IRRIG NATHAN HILL DR	65068844	706	1.62
N.i	481	15600	SIENNA RIDGE HOA	IRRIG NATHAN HILL DR	71170099	4202	9.65
N.i	482	15601	CITY OF SANTA CLARITA	IRRIG NATHAN HILL DR	71154667	884	2.03
N.i	486	15612	OLYMPIC CREST HOA	IRRIG NATHAN HILL DR	71170064	3145	7.22
N.i	488	15615	CITY OF SANTA CLARITA	IRRIG NATHAN HILL DR	71170097	1245	2.86
N.k	480	15597	OLYMPIC CREST HOA	IRRIG SHANGRI-LA DR	68529696	2413	5.54
N.k	483	15605	SIENNA RIDGE HOA	IRRIG SHANGRI-LA DR	67862403	4143	9.51
N.k	484	15606	THE MANAGEMENT CO	IRRIG SHANGRI-LA DR	71170072	479	1.10
N.k	485	15610	SIENNA RIDGE HOA	IRRIG SHANGRI-LA DR	59125678	1695	3.89
N.k	487	15613	OLYMPIC CREST HOA	IRRIG SHANGRI-LA DR	67862401	5952	13.66
N.k	489	15616	OLYMPIC CREST HOA	IRRIG SHANGRI-LA DR	71904542	7287	16.73
N.l	472	14257	CITY OF SANTA CLARITA	IRRIG PARK MEADOW DR	69568548	4323	9.92
N.l	473	14258	CITY OF SANTA CLARITA	PARK MEADOW DR	69568546	273	0.63
N.l	474	14259	CITY OF SANTA CLARITA	IRRIG SARITA AVE	70066802	7882	18.09
N.l	476	14347	CITY OF SANTA CLARITA	IRRIG PARK MEADOW DR	67351455	8973	20.60
S.a	337	10532	ROBINSON RANCH	IRRIG OAK SPRINGS CY	59248293	27	0.06
S.f	71	4793	THE RANCH AT FAIR OAKS	IRRIG CHERRY WILLOW	67298992	5510	12.65
S.f	882	31099	PARDEE - OPENED FAIR OAKS RCH IN 12/2014	1/2 W.CHERRY WILLOW	71134886	4632	10.63
S.g	70	4792	CITY OF SANTA CLARITA	IRRIG HONEY MAPLE ST	65652278	8797	20.20
S.g	72	4837	CITY OF SANTA CLARITA	IRRIG HONEY MAPLE ST	67250431	657	1.51

Pipe Segment	Object ID	Account Number	Name	Serv_Str_1	Meter Number	USAGE (CCF)	USAGE (AFY)
S.h	45	3912	FAIR OAKS RANCH HOA	IRRIG CARDINAL DR	71446990	2718	6.24
S.h	54	4152	SANTA CLARITA WATER	IRRIG WREN DR	56147205	0	0.00
S.h	55	4246	THE RANCH AT FAIR OAKS	IRRIG WREN DR	61676854	3499	8.03
S.h	56	4247	THE RANCH AT FAIR OAKS	IRRIG WREN DR	61676850	5656	12.98
S.h	57	4248	THE RANCH AT FAIR OAKS	IRRIG CAPE JASMINE R	60919571	3998	9.18
S.h	58	4340	CITY OF SANTA CLARITA	IRRIG WREN DR	60919568	3433	7.88
S.h	18	3386	THE RANCH AT FAIR OAKS	IRRIG LOST CYN RD	74152095	5851	13.43
S.h	19	3387	THE RANCH AT FAIR OAKS	IRRIG LOST CYN RD	74152092	7981	18.32
S.h	21	3389	HEATHER RIDGE COMM ASSN	LOST CYN RD	62124826	659	1.51
S.h	40	3906	THE RANCH AT FAIR OAKS	IRRIG LOST CYN RD	74152097	5676	13.03
S.h	61	4422	THE RANCH AT FAIR OAKS	IRRIG WINTER PINE WY	74152094	8369	19.21
S.h	62	4458	HEATHER RIDGE COMM ASSN	IRRIG LOST CYN RD	61676863	5763	13.23
S.h	881	14832	PARDEE - OPENED FAIR OAKS RCH IN 12/2014 7 months ccf	IRRIG CHERRY WILLOW	65447356	1085	2.49
S.i			Fair Oaks Community School				7
S.i	18	3386	THE RANCH AT FAIR OAKS	IRRIG LOST CYN RD	74152095	5851	13
S.i	19	3387	THE RANCH AT FAIR OAKS	IRRIG LOST CYN RD	74152092	7981	18
S.i	21	3389	HEATHER RIDGE COMM ASSN	LOST CYN RD	62124826	659	2
S.i	40	3906	THE RANCH AT FAIR OAKS	IRRIG LOST CYN RD	74152097	5676	13
S.i	61	4422	THE RANCH AT FAIR OAKS	IRRIG WINTER PINE WY	74152094	8369	19
S.i	62	4458	HEATHER RIDGE COMM ASSN	IRRIG LOST CYN RD	61676863	5763	13
S.i	881	14832	PARDEE - OPENED FAIR OAKS RCH IN 12/2014 7 months ccf	IRRIG CHERRY WILLOW	65447356	1085	2
S.i	17	3385	CITY OF SANTA CLARITA	IRRIG LOST CYN RD	74152096	3120	7
S.j	291	9095	GH PALMER-THE COLONY	DAGMAR WY	71170101	103	0.24
S.j	292	9118	GH PALMER-THE COLONY	IRRIG MARTA LN	71170104	1361	3.12
S.j	293	9175	GH PALMER-THE COLONY	IRRIG PAULINE CT	72050865	5809	13.34
S.j	294	9188	GH PALMER-THE COLONY	IRRIG DAGMAR WY	70066830	994	2.28
S.j	295	9195	GH PALMER-THE COLONY	IRRIG MARTA LN	71170096	3802	8.73
S.j	296	9204	GH PALMER-THE COLONY	IRRIG LYNNE CT	71170102	1172	2.69
S.j	297	9221	GH PALMER-THE COLONY	IRRIG ELEANOR CIRCLE	71170105	3166	7.27
S.j	298	9231	GH PALMER-THE COLONY	IRRIG HARRIS WY	61046424	1952	4.48
S.j	299	9232	GH PALMER-THE COLONY	IRRIG ELEANOR CIRCLE	71170098	565	1.30
S.j	300	9233	GH PALMER-THE COLONY	IRRIG MARTA LN	71170100	3679	8.45

Pipe Segment	Object ID	Account Number	Name	Serv_Str_1	Meter Number	USAGE (CCF)	USAGE (AFY)
S.j	301	9234	GH PALMER-THE COLONY	IRRIG MARTA LN	71154668	2255	5.18
S.j	302	9243	GH PALMER-THE COLONY	IRRIG SHIRLEY PL	63096470	1866	4.28
S.j	303	9251	GH PALMER-THE COLONY	IRRIG HARRIS WY	61676870	924	2.12
S.j	304	9252	GH PALMER-THE COLONY	IRRIG SPENCER CT	61676865	766	1.76
S.j	305	9253	GH PALMER-THE COLONY	IRRIG SPENCER CT	61676869	1597	3.67
S.j	306	9254	GH PALMER-THE COLONY	IRRIG ROSA LN	61676868	4172	9.58
S.j	307	9257	GH PALMER-THE COLONY	IRRIG ROSA LN	61676866	1605	3.68
S.j	308	9258	GH PALMER-THE COLONY	IRRIG ELEANOR CIRCLE	61676864	1981	4.55
S.j	420	12454	CITY OF SANTA CLARITA	IRRIG SHANGRI-LA DR	65023092	3116	7.15
S.k	65	4543	THE RANCH AT FAIR OAKS	IRRIG SUMMER MAPLE W	65652272	3526	8.09
S.k	67	4709	THE RANCH AT FAIR OAKS	IRRIG MEDLEY RIDGE D	65652287	1726	3.96
S.k	68	4773	THE RANCH AT FAIR OAKS	IRRIG BLUE ASPEN LN	65652268	4177	9.59
S.k	69	4774	THE RANCH AT FAIR OAKS	IRRIG BLUE ASPEN LN	65652264	4132	9.49
S.k	76	5086	CITY OF SANTA CLARITA	IRRIG ROYAL PINES LN	67298989	2357	5.41
S.k	851	30879	THE RANCH AT FAIR OAKS	1/2 RED MAPLE COURT	70507096	397	0.91
S.l	22	3391	THE RANCH AT FAIR OAKS	IRRIG MEDLEY RIDGE D	60919566	583	1.34
S.l	309	9274	GH PALMER-THE COLONY	IRRIG SCOTT LN	63416964	6409	14.71
S.l	310	9277	GH PALMER-THE COLONY	IRRIG EVAN LN	65403696	2460	5.65
S.l	311	9282	GH PALMER-THE COLONY	IRRIG SCOTT LN	63843027	425	0.98

Table A-2 Phase 2B Monthly Demand Scenarios

Month	Vista Canyon Water Factory Supply (AFM)	Vista Canyon Demands			Phase 2B Demand Scenarios				Phase 2B Potable Backup Required			
		Landscape (AFM)	Dual Plumbing (AFM)	Total Vista Canyon Demands (AFM)	Scenario 1 North (Max Demand)	Scenario 2 South (Max Demand)	Scenario 3 – North (Max Demand) w/ Sand Canyon	Scenario 4 South (Max Demand) w/ Sand Canyon	Scenario 1 North (Max Demand)	Scenario 2 South (Max Demand)	Scenario 3 North (Max Demand) w/ Sand Canyon	Scenario 4 South (Max Demand) w/ Sand Canyon
Jan	36.1	2.4	4.1	**6.5**	7.4	11.5	10.4	14.5	0.0	0.0	0.0	0.0
Feb	34.3	2.2	3.9	**6.1**	6.9	10.6	9.6	13.4	0.0	0.0	0.0	0.0
Mar	37.3	4.9	4.2	**9.1**	15.2	23.5	21.3	29.5	0.0	0.0	0.0	1.3
Apr	36.1	7.3	4.1	**11.4**	22.9	35.4	32.1	44.6	0.0	10.7	7.4	19.9
May	37.3	10.4	4.2	**14.6**	32.6	50.3	45.6	63.3	9.9	27.6	23.0	40.7
Jun	36.1	11.8	4.1	**15.9**	37.0	57.2	51.8	72.0	16.8	37.0	31.7	51.8
Jul	37.3	12.5	4.2	**16.7**	39.1	60.4	54.8	76.1	18.5	39.8	34.2	55.5
Aug	37.3	12.4	4.2	**16.7**	38.9	60.1	54.5	75.8	18.3	39.5	33.9	55.1
Sept	37.3	10.6	4.2	**14.8**	33.1	51.2	46.4	64.5	10.7	28.7	24.0	42.0
Oct	37.3	7.7	4.2	**12.0**	24.2	37.3	33.8	47.0	0.0	12.0	8.5	21.7
Nov	36.1	2.9	4.1	**7.0**	9.1	14.1	12.8	17.7	0.0	0.0	0.0	0.0
Dec	37.3	1.7	4.2	**6.0**	5.5	8.4	7.7	10.6	0.0	0.0	0.0	0.0
Annual Total, (AFY)	**440**	**87**	**50**	**137**	**272**	**350**	**381**	**529**	**74**	**195**	**163**	**288**
Annual Total, (MGD)	**0.39**	**0.08**	**0.04**	**0.12**	**0.24**	**0.31**	**0.34**	**0.47**	**0.07**	**0.17**	**0.15**	**0.26**

Table A-3 Phase 2B Monthly Alternative

Month	Vista Canyon Water Factory Supply (AFM)	Vista Canyon Demands			Phase 2B Alternatives		Total Recycled Water Demands		Phase 2B Potable Backup Required		Unused VCWF Supply	
		Landscape (AFM)	Dual Plumbing (AFM)	Total Vista Canyon Demands	Alternative 1 South	Alternative 2 North	Alternative 1 South + Vista Canyon Demands	Alternative 2 North + Vista Canyon Demands	Alternative 1 South + Vista Canyon Demands	Alternative 2 North + Vista Canyon Demands	Alternative 1 South + Vista Canyon Demands	Alternative 2 North + Vista Canyon Demands
Jan	36.1	2.4	4.1	6.5	4.5	5.3	10.9	11.8	0.0	0.0	25.2	24.3
Feb	34.3	2.2	3.9	6.1	4.1	5.0	10.2	11.1	0.0	0.0	24.1	23.2
Mar	37.3	4.9	4.2	9.1	9.1	10.9	18.2	20.0	0.0	0.0	19.1	17.3
Apr	36.1	7.3	4.1	11.4	13.7	16.5	25.2	27.9	0.0	0.0	10.9	8.2
May	37.3	10.4	4.2	14.6	19.5	23.4	34.2	38.1	0.0	0.8	3.1	0.0
Jun	36.1	11.8	4.1	15.9	22.2	26.6	38.1	42.6	2.0	6.5	0.0	0.0
Jul	37.3	12.5	4.2	16.7	23.5	28.2	40.2	44.9	2.9	7.6	0.0	0.0
Aug	37.3	12.4	4.2	16.7	23.4	28.0	40.1	44.7	2.7	7.4	0.0	0.0
Sept	37.3	10.6	4.2	14.8	19.9	23.9	34.7	38.7	0.0	1.4	2.6	0.0
Oct	37.3	7.7	4.2	12.0	14.5	17.4	26.5	29.4	0.0	0.0	10.8	7.9
Nov	36.1	2.9	4.1	7.0	5.5	6.6	12.5	13.6	0.0	0.0	23.6	22.5
Dec	37.3	1.7	4.2	6.0	3.3	3.9	9.3	9.9	0.0	0.0	28.0	27.4
Annual Total, (AFY)	**440**	**87**	**50**	**137**	**163**	**350**	**300**	**333**	**8**	**24**	**147**	**131**
Annual Total, (MGD)	**0.39**	**0.08**	**0.04**	**0.12**	**0.15**	**0.31**	**0.27**	**0.30**	**0.01**	**0.02**	**0.13**	**0.12**

Appendix B: Hydraulic Model Information

This appendix includes supporting information for the hydraulic modeling

- Figure B-1 shows the stead-state hydraulic model results with identified pressures and velocities in each pipeline segment for Alternative 1 and 2.
- Table B-1 lists model results for the Alternative 1 and 2 steady-state system without Vista Canyon Demands, including flow and pipeline characteristics for each segment.
- Figures B-2 and B-3 illustrate the hydraulic grade line for Alternative 1 and 2.
- Figures B-4 and B-5 illustrate tank storage volumes and corresponding demands by hourly time step during average day demand condition for Alternative 1 and 2.
- Figures B-6 and B-7 illustrate tank storage volumes and corresponding demands by hourly time step during maximum day demand condition for Alternative 1 and 2.
- Figure B-8 shows the stead-state hydraulic model results with identified pressures and velocities in each pipeline segment for Alternative 1a.
- Table B-2 lists model results for the Alternative 1a steady-state system without Vista Canyon Demands, including flow and pipeline characteristics for each segment..

Figure B-1: Steady-State Hydraulic Model Results

Table B-1 Model Results for Steady-State System without Vista Canyon Demands

Alt 1 - South Pipeline Segment	Pipeline Length (ft)	Design Flow (gpm)	Velocity (ft/s)	Pressure (psi)	Design Diameter (in.)
S.a	1,657	0	0.4	142	8
S.b	176	0	0.4	142	8
S.c	392	95	1.0	121	8
S.d	696	500	3.6	122	8
S.e	1,076	500	3.6	119	8
S.f	2,632	691	4.8	100	8
S.g	677	92	1.1	91	6
S.i	4,279	405	4.6	111	6
S.l	4,070	96	1.1	129	6
Total	**23,137**				
Max		692	5	142	8

Alt 2 - North Pipeline Segment	Pipeline Length (ft)	Design Flow (gpm)	Velocity (ft/s)	Pressure (psi)	Design Diameter (in.)
N.a	3,090	0	0.4	115	8
N.b	2,755	216	1.8	131	8
N.c	1,034	226	1.9	135	8
N.d	1,005	415	3.1	138	8
N.e	1,948	415	3.1	148	8
N.f	1,765	437	3.2	60	8
N.g	1,870	830	5.7	26	8
N.i	4,218	113	1.3	107	6
N.k	1,057	214	2.4	139	6
N.l	1,783	209	2.4	112	6
Total	**23,137**				
Max		830	6	148	8

Figure B-2 Hydraulic Grade Line for Alt 1 - Phase 2B South Alternative

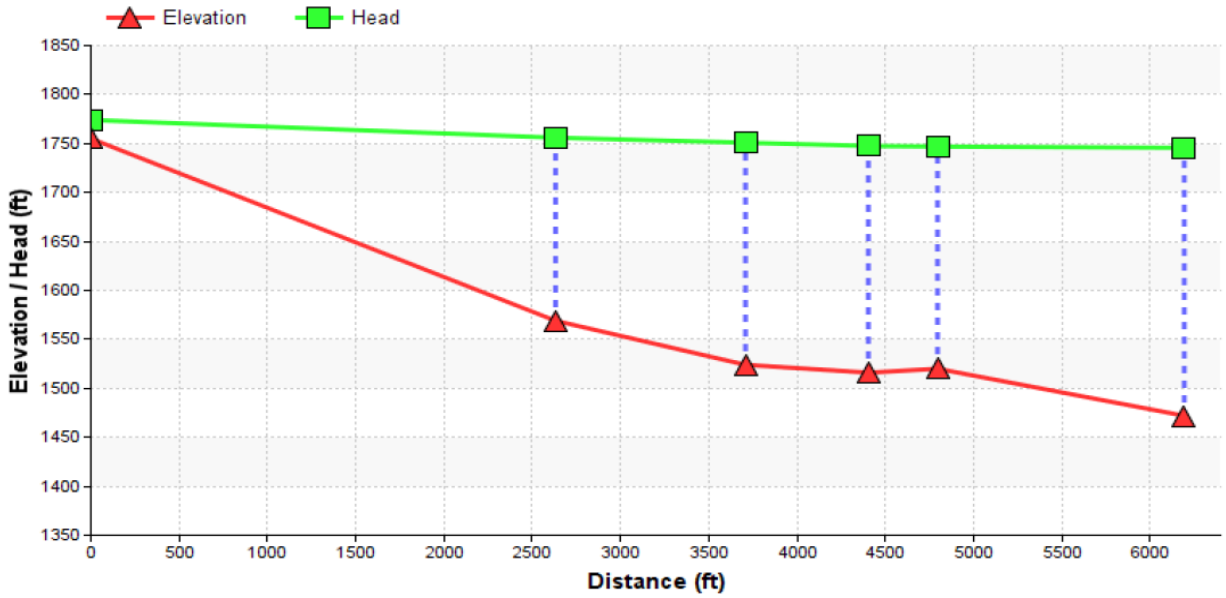

Figure B-3: Hydraulic Grade Line for Alt 2 - Phase 2B North Alternative

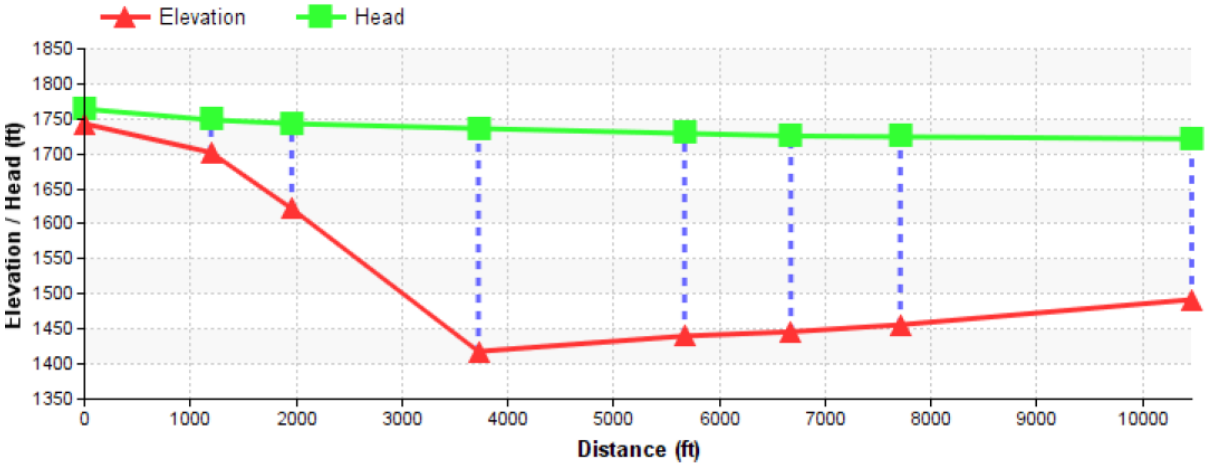

Figure B-4: Alt 1 - Phase 2B South Tank Storage and Corresponding Demands for During Average Day Demand Conditions.

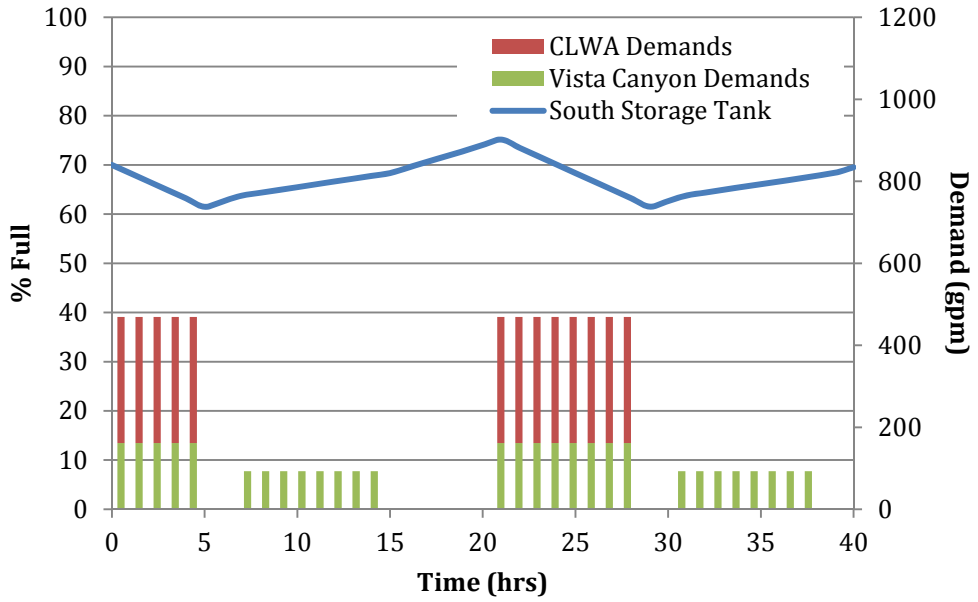

Figure B-5: Alt 2 - Phase 2B North Tank Storage and Corresponding Demands During Average Day Demand Conditions.

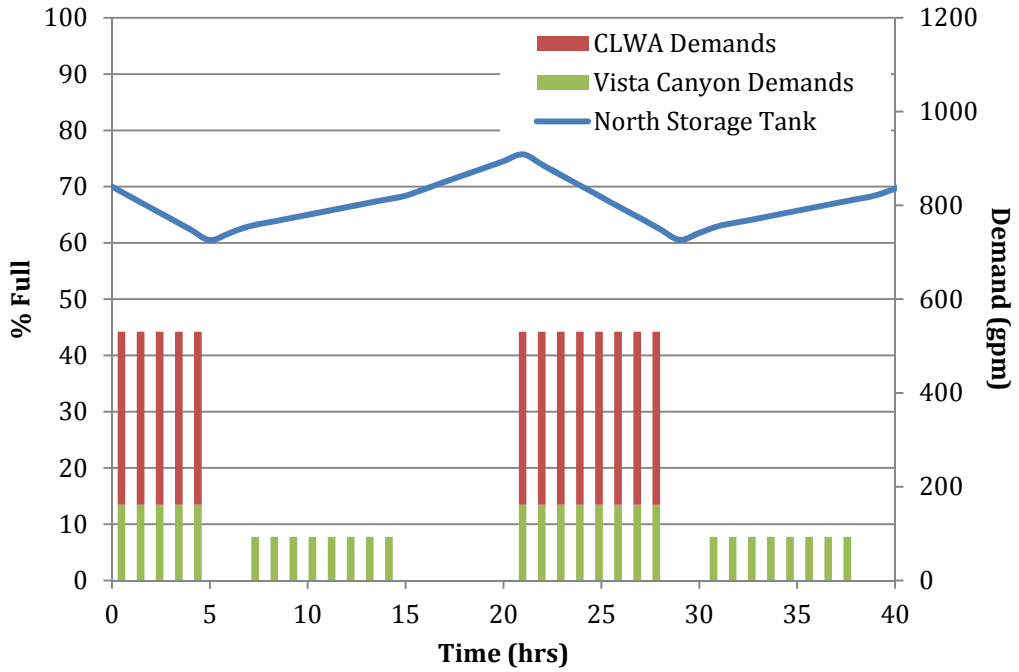

Figure B-6: Alt 1 - Phase 2B South Tank Storage and Corresponding Demands During Maximum Day Demand Conditions.

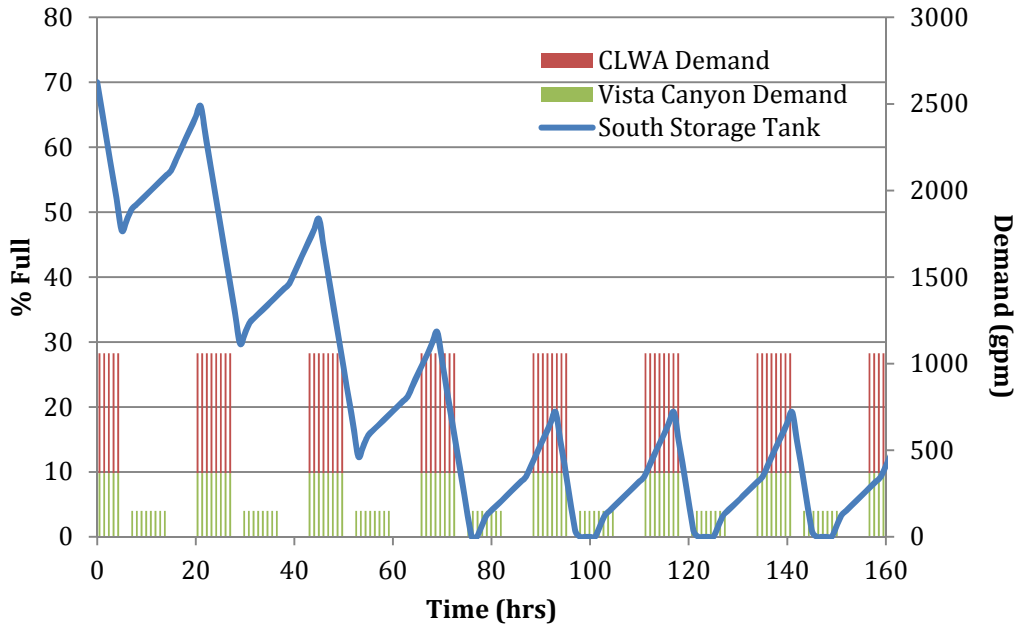

Figure B-7: Alt 2 - Phase 2B North Tank Storage and Corresponding Demands During Maximum Day Demand Conditions.

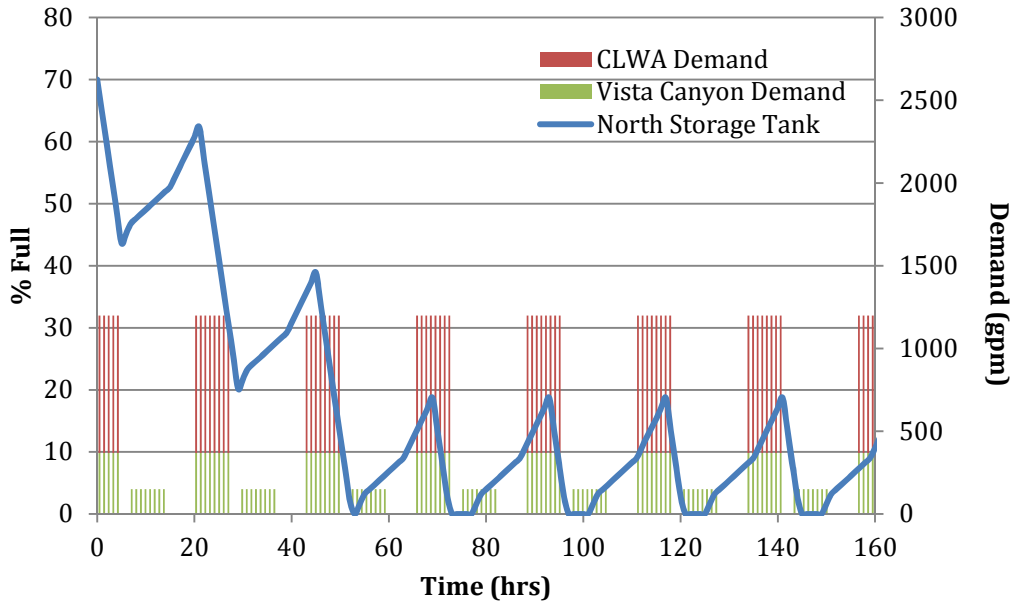

Figure B-8: Alt 1a - Phase 2B South with Vista Canyon Pressure/Velocity Map of Steady-State Scenario

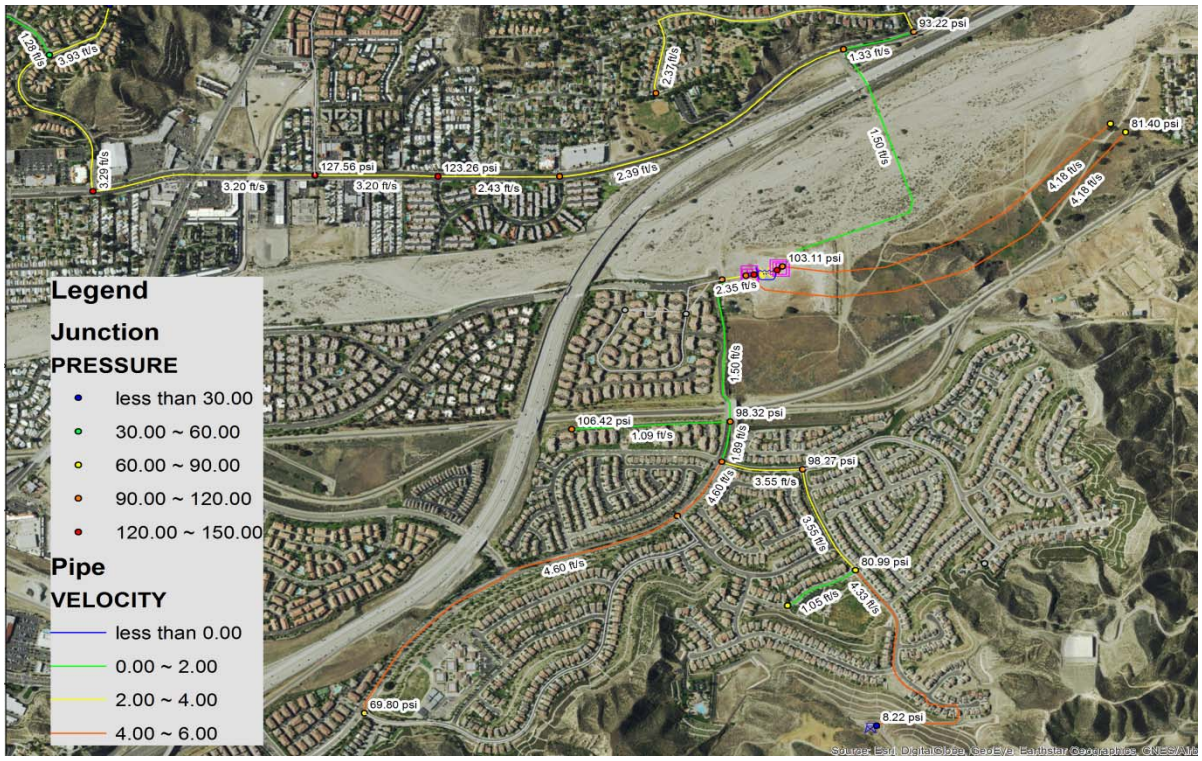

Table B-2 Alt 1a – Phase 2B South with Vista Canyon Model Results for Steady-State System

Alt 1A - South Pipeline Segment	Pipeline Length (ft)	Design Flow (gpm)	Velocity (ft/s)	Pressure (psi)	Design Diameter (in.)
S.a	1,657	368	0.4	119	10
S.b	176	368	0.4	119	10
S.c	392	464	1.0	98	10
S.d	696	869	3.6	100	10
S.e	1,076	869	3.6	98	10
S.f	2,632	1,060	4.8	81	10
S.g	677	92	1.1	72	6
S.i	4,279	405	4.6	70	6
S.l	4,070	96	1.1	106	6
Total	**23,137**				
Max		1,060	5	119	10

Appendix C: Alternative Cost Detail

Table C-1 Alternative 1 – Phase 2B South
Engineer's Opinion of Probable Construction Costs

OPINION OF PROBABLE CONSTRUCTION COST — **KENNEDY/JENKS CONSULTANTS**

Project: CLWA Recycled Water System Phase 2B

Building, Area: South Alternative

Prepared By: ZC/WCY
Date Prepared: 15-Sep-15
K/J Proj. No. 1544236*00

Estimate Type: [x] Conceptual [ ] Preliminary (w/o plans) [ ] Design Development @ _____ % Complete [ ] Construction [ ] Change Order

Current at ENR _____
Escalated to ENR _____
Months to Midpoint of Construct 24

Spec. No.	Item No.	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total	Source
DIVISION ___ - _____												
		Site Development	1	LS	55,000.00	55,000	20,000.00	20,000			75,000	Site Prep and Landscape
		Site Pavement	500	SY	48.00	24,000	15.00	7,500			31,500	
		500,000 Gallon Tank	1	LS					575,000	575,000	575,000	
	Storage	Tank Ring Wall	82	CY	400.00	32,800	200.00	16,400			49,200	
		Tank Underlayment	275	SY	38.00	10,450	12.00	3,300			13,750	
		Tank Piping & Drainage	1	LS	75,000.00	75,000	35,000.00	35,000			110,000	Drainage to site Boundary (~100')
		Potable Water Connection	1	LS	40,000.00	40,000	20,000.00	20,000			60,000	from potable pipe to top of RW tank
		6" PVC Pipe Mainline	6,100	LF	51.00	311,100	60.00	366,000			677,100	
		8" PVC Pipe	5,000	LF	53.00	265,000	64.00	320,000			585,000	S.a not included
		Pipeline Appurt. and Connections	1	LS	100,000.00	100,000	50,000.00	50,000			150,000	
	Pipeline	Bore & Jack Construction		LF	300.00				700			NA
		Bore Shafts		EA			50,000.00					NA
		Receiving Shafts		EA			25,000.00					NA
		Pipeline W/I major intersection		LF			700.00					NA
		Pump Station Pipe and Fittings	1	LS	55,000.00	55,000	28,500.00	28,500			83,500	
		Pump Station Misc. Structural/Civil	1	LS	20,000.00	20,000	10,000.00	10,000			30,000	
	Pump	15 Hp Pump/Motor (2 Duty,1 Standby)	3	EA	20,000.00	60,000	4,000.00	12,000			72,000	
	Station	Electircal Improvements	1	LS	50,000.00	50,000	30,000.00	30,000			80,000	
		Instrumentation/controls/SCADA	1	LS	50,000.00	50,000	20,000.00	20,000			70,000	
		Standby Generator	1	LS	48,000.00	48,000	10,000.00	10,000			58,000	60 kW
		Subtotals				1,196,350		948,700		575,000	2,720,050	
		Division 1 Costs	@	10%		119,635		94,870		57,500	272,005	
		Subtotals				1,315,985		1,043,570		632,500	2,992,055	
		Taxes - Materials Costs	@	9.00%		118,439					118,439	
		Subtotals				1,434,424		1,043,570		632,500	3,110,494	
		Taxes - Labor Costs	@									
		Subtotals				1,434,424		1,043,570		632,500	3,110,494	
		Contractor Markup for Sub	@	12%						75,900	75,900	
		Subtotals				1,434,424		1,043,570		708,400	3,186,394	
		Contractor OH&P	@	15%		215,164		156,536			371,699	
		Subtotals				1,649,587		1,200,106		708,400	3,558,093	
		Estimate Contingency	@	30%							1,067,428	
		Subtotals									4,625,521	
		Escalate to Midpoint of Construct	@	2%							185,021	
		Estimated Bid Cost									**4,810,541**	

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$7,215,812	**$4,810,541**	**$3,367,379**

Table C-2 Alternative 2 – Phase 2B North
Engineer's Opinion of Probable Construction Costs

OPINION OF PROBABLE CONSTRUCTION COST

KENNEDY/JENKS CONSULTANTS

Project: CLWA Recycled Water System Phase 2B

Building, Area: North Alternative

Prepared By: ZC/WCY
Date Prepared: 15-Sep-15
K/J Proj. No. 1544236*00

Current at ENR
Escalated to ENR
Months to Midpoint of Construct 24

Estimate Type: [x] **Conceptual** [ ] **Construction**
[ ] **Preliminary (w/o plans)** [ ] **Change Order**
[ ] **Design Development @** _____ **% Complete**

Spec. No.	Item No.	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total	Source
DIVISION ___ - _____												
		Site Development	1	LS	65,000.00	65,000	25,000.00	25,000			90,000	Site Prep and Landscape
		Site Pavement	550	SY	48.00	26,400	15.00	8,250			34,650	
		600,000 Gallon Tank	1	LS					690,000	690,000	690,000	
	Storage	Tank Ring Wall	90	CY	400.00	36,000	200.00	18,000			54,000	
		Tank Underlayment	330	SY	38.00	12,540	12.00	3,960			16,500	
		Tank Piping & Drainage	1	LS	75,000.00	75,000	35,000.00	35,000			110,000	Drainage to site Boundary (~100')
		Potable Water Connection	1	LS	40,000.00	40,000	20,000.00	20,000			60,000	from potable pipe to top of RW tank
		6" PVC Pipe	7,350	LF	51.00	374,850	60.00	441,000			815,850	
		8" PVC Pipe	10,400	LF	53.00	551,200	64.00	665,600			1,216,800	N.a not included
		Pipeline Appurt. and Connections	1	LS	150,000.00	150,000	75,000.00	75,000			225,000	
	Pipeline	Bore & Jack Construction	150	LF	300.00	45,000			700	105,000	150,000	
		Bore Shafts	1	EA			50,000.00	50,000			50,000	
		Receiving Shafts	1	EA			25,000.00	25,000			25,000	
		Pipeline W/I major intersection	350	LF			700.00	245,000			245,000	
		Pump Station Pipe and Fittings	1	LS	55,000.00	55,000	28,500.00	28,500			83,500	
		Pump Station Misc. Structural/Civil	1	LS	20,000.00	20,000	10,000.00	10,000			30,000	
	Pump Station	15 Hp Pump/Motor (2 Duty,1 Standby)	3	EA	20,000.00	60,000	4,000.00	12,000			72,000	
		Electircal Improvements	1	LS	50,000.00	50,000	30,000.00	30,000			80,000	
		Instrumentation/controls/SCADA	1	LS	50,000.00	50,000	20,000.00	20,000			70,000	
		Standby Generator	1	LS	48,000.00	48,000	10,000.00	10,000			58,000	60 kW
		Subtotals				1,658,990		1,722,310		795,000	4,176,300	
		Division 1 Costs	@	10%		165,899		172,231		79,500	417,630	
		Subtotals				1,824,889		1,894,541		874,500	4,593,930	
		Taxes - Materials Costs	@	9.00%		164,240					164,240	
		Subtotals				1,989,129		1,894,541		874,500	4,758,170	
		Taxes - Labor Costs	@									
		Subtotals				1,989,129		1,894,541		874,500	4,758,170	
		Contractor Markup for Sub	@	12%						104,940	104,940	
		Subtotals				1,989,129		1,894,541		979,440	4,863,110	
		Contractor OH&P	@	15%		298,369		284,181			582,551	
		Subtotals				2,287,498		2,178,722		979,440	5,445,661	
		Estimate Contingency	@	30%							1,633,698	
		Subtotals									7,079,359	
		Escalate to Midpoint of Construct	@	2%							283,174	
		Estimated Bid Cost									**7,362,533**	

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$11,043,800	**$7,362,533**	**$5,153,773**

Table C-3 Alternative 1a – Phase 2B South + Vista Canyon
Engineer's Opinion of Probable Construction Costs

OPINION OF PROBABLE CONSTRUCTION COST — **KENNEDY/JENKS CONSULTANTS**

Project: CLWA Recycled Water System Phase 2B — **Prepared By:** ZC/WCY

Date Prepared: 17-Sep-15

Building, Area: South Alternative 1A — **K/J Proj. No.** 1544236*00

Current at ENR

Estimate Type: [X] Conceptual [ ] Construction — **Escalated to ENR**

[ ] Preliminary (w/o plans) [ ] Change Order — **Months to Midpoint of Construct** 24

[ ] Design Development @ _____ % Complete

Spec. No.	Item No.	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total	Source
DIVISION ___ - _____												
		Site Development	1	LS	75,000.00	75,000	30,000.00	30,000			105,000	Site Prep and Landscape
		Site Pavement	700	SY	48.00	33,600	15.00	10,500			44,100	
		1 MG Tank	1	LS					990,000	990,000	990,000	
	Storage	Tank Ring Wall	120	CY	400.00	48,000	200.00	24,000			72,000	
		Tank Underlayment	550	SY	38.00	20,900	12.00	6,600			27,500	
		Tank Piping & Drainage	1	LS	100,000.00	100,000	40,000.00	40,000			140,000	Drainage to site Boundary (~100')
		Potable Water Connection	1	LS	40,000.00	40,000	20,000.00	20,000			60,000	from potable pipe to top of RW tank
		6" PVC Pipe Mainline	6,100	LF	51.00	311,100	60.00	366,000			677,100	
		8" PVC Pipe		LF	53.00		64.00				0	
		10" PVC Pipe	5,000	LF	55.00	275,000	68.00	340,000			615,000	S.a not included - Const. by others
		Pipeline Appurt. and Connections	1	LS	125,000.00	125,000	70,000.00	70,000			195,000	
	Pipeline	Bore & Jack Construction		LF	300.00				700		0	NA
		Bore Shafts		EA			50,000.00				0	NA
		Receiving Shafts		EA			25,000.00				0	NA
		Pipeline W/I major intersection		LF			700.00				0	NA
		Pump Station Pipe and Fittings	1	LS	55,000.00	55,000	28,500.00	28,500			83,500	
		Pump Station Misc. Structural/Civil	1	LS	20,000.00	20,000	10,000.00	10,000			30,000	
	Pump	15 Hp Pump/Motor (2 Duty,1 Standby)	3	EA	20,000.00	60,000	4,000.00	12,000			72,000	
	Station	Electircal Improvements	1	LS	50,000.00	50,000	30,000.00	30,000			80,000	
		Instrumentation/controls/SCADA	1	LS	50,000.00	50,000	20,000.00	20,000			70,000	
		Standby Generator	1	LS	48,000.00	48,000	10,000.00	10,000			58,000	60 kW
		Subtotals				1,311,600		1,017,600		990,000	3,319,200	
		Division 1 Costs	@	10%		131,160		101,760		99,000	331,920	
		Subtotals				1,442,760		1,119,360		1,089,000	3,651,120	
		Taxes - Materials Costs	@	9.00%		129,848					129,848	
		Subtotals				1,572,608		1,119,360		1,089,000	3,780,968	
		Taxes - Labor Costs	@					0			0	
		Subtotals				1,572,608		1,119,360		1,089,000	3,780,968	
		Contractor Markup for Sub	@	12%						130,680	130,680	
		Subtotals				1,572,608		1,119,360		1,219,680	3,911,648	
		Contractor OH&P	@	15%		235,891		167,904			403,795	
		Subtotals				1,808,500		1,287,264		1,219,680	4,315,444	
		Estimate Contingency	@	30%							1,294,633	
		Subtotals									5,610,077	
		Escalate to Midpoint of Construct	@	2%							224,403	
		Estimated Bid Cost									**5,834,480**	

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$8,751,720	**$5,834,480**	**$4,084,136**

Appendix D: Regulatory Requirements

The production, discharge, distribution, and use of recycled water are subject to federal, state, and local regulations; the primary objectives of which are to protect public health. Regulatory requirements apply for non-potable and potable uses of recycled water. **Non-potable reuse** refers to the use of treated municipal wastewater for specific purposes 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. In California, non-potable reuse has been occurring for the last century and regulations for non-potable reuse have been in place since the 1970s.

Meeting regulatory requirements is an integral part of implementing any non-potable recycled water project. This appendix summarizes the regulatory requirements and their administration, with an emphasis on regulations relating distribution and use of recycled water in California.

D.1. Federal Requirements

Federal requirements relevant to the discharge of recycled water, or wastewater, and any other liquid wastes to "navigable waters" are contained in the 1972 amendments to the Federal Water Pollution Control Act of 1956, commonly known as the federal Clean Water Act (CWA) (Public Law 92-500). The CWA created the U.S. Environmental Protection Agency (USEPA) and established the National Pollutant Discharge Elimination System (NPDES), a permit system for discharge of contaminants to navigable waters. NPDES requires that all municipal and industrial dischargers of liquid wastes apply for and obtain a permit prior to initiating discharge.

There are no federal regulations governing water reuse in the United States, thus regulations (or guidelines) for recycled water are developed and implemented at the state government level. The lack of federal regulations has resulted in differing standards among states that have developed recycled water regulations (WateReuse 2009). This appendix focuses on recycled water regulations in the State of California.

U.S. Environmental Protection Agency (USEPA)

Recognizing the need to provide national guidance on water reuse regulations and program planning, the U.S. Environmental Protection Agency (USEPA) has developed comprehensive, up-to-date water reuse guidelines in support of regulations and guidelines developed by states, tribes, and other authorities (USEPA 2012). The 2012 USEPA Guidelines for Water Reuse provides support for both project planners and state regulatory officials by providing a national overview of the status of reuse regulations and clarifying some of the variations in the regulatory frameworks that support reuse in different states and regions of the United States.

Army Corps of Engineers (USACE)

The United States Army Corps of Engineers (USACE) permit authority derives from the Rivers and Harbors Act of 1899 (Section 10), Clean Water Act (Section 404), and Marine Protection, Research, and Sanctuaries Act (Section 103). These regulations give USACE jurisdiction over all navigable waters within the United States. Approval by USACE is required for construction of structures or work affecting navigable waters of the U.S. Navigable waters include ocean and fresh waters, bays, streams, wetlands, marshes, swamps, and diked lands. USACE has jurisdiction over all of the above even though selected areas may not be navigable.

The USACE issues Nationwide Permits (NWP), which authorize discharges of dredge and fill material to waters of the U.S. for activities with minimal environmental impacts, which have "minimal adverse effects on the aquatic environment." While the Vista Canyon Developer would be responsible for crossing the Santa Clara River and therefore responsible for obtaining permits from the USACE, if any Phase 2B facilities enters USACE jurisdiction, the following would be required:

1. Section 12 of the NWP from the USACE covers Utility Line Discharges. Section 33 covers Temporary Construction, Access and Dewatering.

2. A Section 404 permit would be required for the pipeline itself and the associated construction activities. Generally, USACE requires the area disturbed be restored to its pre-construction condition.

U.S. Fish and Wildlife Service (USFWS)

Similarly, the U.S. Fish and Wildlife Service (USFWS), as part of the Department of the Interior (DOI), reviews proposals for work and activities in or affecting navigable waters that are licensed, assisted, or conducted by the federal government, pursuant to the following acts:

- National Environmental Policy Act (NEPA)
- Estuary Protection Act
- Department of Transportation Act, Airport and Airway Development Act of 1970
- Watershed Protection and Flood Protection Act
- Endangered Species Act (ESA)
- Fish and Wildlife Coordination Act
- Federal Legislation and Regulations

In addition, USFWS reviews permit applications pursuant to Section 10 of the Rivers and Harbors Act, and Sections 208, 402, and 404 of the Clean Water Act, and other Federal legislation for enhancement of fish and wildlife resources. USFWS staff would identify potential adverse impacts and would propose compensation for irretrievable losses. Since no Phase 2B facilities are entering navigable waters, permit reviews by USFWS is not required.

D.2. State Requirements

In the State of California, recycled water requirements are administered by the State Water Resource Control Board (SWRCB) - Division of Drinking Water (DDW), formerly under California Department of Public Health (CDPH), and individual Regional Water Quality Control Boards (RWQCBs). The regulatory requirements for recycled water projects in California are contained in the following sources[1,2] :

- California Code of Regulations (CCR) -Title 22 and Title 17
- California Health and Safety Code
- California Water Code.

Title 22 State Clean Water Act (CWA)

In 1975, Title 22 was prepared by the California Department of Public Health (now DDW[3]) in accordance with the requirements of Division 7, Chapter 7 of the Water Code. In 1978, Title 22 was revised to conform with the 1977 amendment to the federal CWA. The requirements of Title 22, as revised in 1978, 1990, and 2001, regulate production and use of recycled water in California.

The DDW regulates the treatment, quality, and use of recycled water, as well as the proper separation of recycled water and drinking water systems. Title 22 stipulates the levels of treatment for different uses of recycled water, permissible types of reuse, and minimum recycled water quality requirements. Water meeting these standards is considered safe for non-drinking purposes. Routine monitoring is required to ensure that the intended quality is consistently being produced.

Figure D-1 illustrates the allowable uses of recycled water for each level of treatment. Most recycled water used in California meets the Title 22 standards for "disinfected tertiary recycled water", which has the most stringent requirements for non-potable reuse. "Disinfected tertiary recycled water" means a filtered and subsequently disinfected wastewater that meets certain total coliform concentration, turbidity, and disinfection requirements. A lower degree of treatment, "disinfected secondary recycled water", is allowed for specified irrigation, non-irrigation and environmental uses, and is less frequently used. In some cases, a higher degree of treatment beyond Title 22

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[1] State requirements for production, discharge, distribution, and use of recycled water are contained in the California Water Code, Division 7-Water Quality, Sections 1300 through 13999.16 (Water Code); the California Administrative Code, Title 22-Social Security, Division 4 Environmental Health, Chapter 3-Reclamation Criteria, Sections 60301 through 60475 (Title 22); and the California Administrative Code, Title 17-Public Health, Chapter 5, Subchapter 1, Group 4-Drinking Water Supplies, Sections 7583 through 7630 (Title 17).

[2] Applicable excerpts from Title 22, Title 17, and the Health and Safety Code are documented in "The Purple Book", which provides a single source of guidelines and requirements for recycled water use in California (CDPH 2001).

[3] The Drinking Water Program for CDPH moved to the SWRCB and was renamed the Division of Drinking Water (DDW) as of July 1, 2014.

requirements is performed to meet more stringent requirements for salt and nutrient-sensitive uses.

Figure D-1 Non-Potable Recycled Water Uses Allowed[1] in California

This summary is prepared by WateReuse Association of California, from the December 2, 2000, Title 22 adopted **Water Recycling Criteria**, and supersedes all earlier versions.

Recycled Water Use	Treatment Level: Disinfected Tertiary Recycled Water	Disinfected Secondary 2.2 Recycled Water	Disinfected Secondary 23 Recycled Water	Undisinfected Secondary Recycled Water
Irrigation for:				
Food crops where recycled water contacts the edible portion of the crop, including all root crops	ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
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***				
Food crops, surface-irrigated, above-ground edible portion, not contacted by recycled water		ALLOWED		
Cemetaries			ALLOWED	
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				
Orchards with no contact between edible portion and recycled water				ALLOWED
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				
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		
Landscape impoundments without decorative fountains			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	

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:				
Groundwater Recharge	ALLOWED under special case-by-case permits by RWQCB[4]			
Flushing toilets and urinals	ALLOWED	NOT ALLOWED	NOT ALLOWED	NOT ALLOWED
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				
Industrial process water that will not come into contact with workers		ALLOWED	ALLOWED	
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				
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 1, 2009. 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: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/RWregulations_20150625.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.

4 Refer to the June 18, 2014 final Groundwater Recharge Guidelines, available from the DDW website at: http://www.cdph.ca.gov/services/DPOPP/regs/Pages/DPH14-003EGroundwaterReplenishmentUsingRecycledWater.aspx

In addition to recycled water uses and treatment requirements, Title 22 addresses sampling and analysis requirements at the treatment plant, preparation of an engineering report prior to production or use of recycled water, general treatment design requirements, reliability requirements, and alternative methods of treatment.

Title 17 State Drinking Water Code

The focus of Title 17 is protection of drinking (potable) water supplies through control of cross-connections[4] with potential contaminants, including non-potable water supplies such as recycled water. Title 17, Group 4, Article 2 - Protection of Water System, Table 1, specifies the minimum backflow protection required on the potable water system for situations in which there is potential for contamination to the potable water supply. Recycled water is addressed in Title 17 as follows:

- An **air-gap separation** is required on "Premises where the public water system is used to supplement the recycled water supply."
- A **reduced pressure principle backflow prevention device** is required on "Premises where recycled water is used…and there is no interconnection with the potable water system."
- A **double-check valve assembly** may be used for "Residences using recycled water for landscape irrigation as part of an approved dual plumbed use area established pursuant to Sections 60313 through 60316 unless the recycled water supplier obtains approval for the local public water supplier, or (DDW) if the water supplier is also the supplier of the recycled water, to utilize an alternative backflow prevention plan that includes an annual inspection and annual shutdown test of the recycled water and potable water systems pursuant to subsection 60316(a)."

Title 17 specifies the minimum backflow protection on the potable water system for situations in which there is potential for contamination to the potable water supply. In conjunction with local health agencies, DDW reviews and approves final onsite (customer) system plans for cross-connection control in accordance with Title 17, and inspects each system prior to operation. Backflow prevention and cross-connection testing would be performed for each site in accordance with DDW requirements before the recycled water supply is connected to that site.

California Environmental Quality Act (CEQA)

While the California Environmental Quality Act (CEQA) does not require a permit, construction of a new pipeline would require the preparation of the appropriate documentation for compliance. A Draft Program Environmental Impact Report (EIR) has been prepared for the Recycled Water Master Plan with the CLWA as the Lead Agency.

CLWA serves as the Lead Agency for CLWA projects. CEQA documentation may take the form of a statement of exemption (for a project that is categorically exempt), a Negative Declaration, a

[4] A cross-connection is an unprotected actual or potential connection between a potable water system used to supply water for drinking purposes and any source or system containing unapproved water or a substance that is not or cannot be approved as safe, wholesome, and potable, which in this case will be recycled water. By-pass arrangements, jumper connections, removable sections, swivel or changeover devices, or other devices through which backflow could occur, shall be considered to be cross-connections

Mitigated Negative Declaration, or an EIR. Typically, the majority of impacts associated with underground pipelines are temporary and construction-related. Mitigated Negative Declarations are often required for pipeline projects, which incorporate mitigation measures that reduce the impacts to a level that is less than significant. Typical mitigation measures for pipeline construction projects include restoration of the site to its previous condition, and noise, dust, and storm water control during construction.

Review of the Draft EIR for the Recycled Water Master Plan identified potentially significant impacts for the following topical issues: aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use, noise, transportation and traffic, and utilities and service systems. However, the Draft EIR noted that after implementation of the mitigation program, the following direct impacts to air quality and noise (temporary, construction-related noise) would remain significant (CLWA, 2007).

Areas of controversy that may be associated with the proposed project would be identified in the Notice of Preparation as well as through an understanding of the issues in the Santa Clarita Valley (CLWA, 2007). These may include but are not limited to:

- Concerns over decrease in effluent discharge to the Santa Clara River, and subsequent decreased flows to Ventura County.
- Potential impacts to flora and fauna, with emphasis on sensitive habitats that support endangered, threatened, and locally unique species.
- Potential direct, indirect and cumulative impacts to biological resources, including wetland, riparian and aquatic habitats.
- Potential impact to water quality due to chloride in the recycled water
- Potential direct and indirect impacts to recreational facilities.
- Potential adverse impacts to air quality from construction and operation of recycled water facilities.
- Potential impacts to impaired water bodies and associated TMDLs, increases in surface water runoff and decreases in percolation

It is recommended CLWA prepare an Environmental Checklist for the recommended Phase 2B project alternative in accordance with CEQA guidelines.

D.3. State Guidelines for Recycled Water

To assist in compliance with Title 22, DDW has prepared a number of guidelines for production, distribution, and use of recycled water. Additionally, DDW recommends use of guidelines prepared by the California-Nevada Section of the American Water Works Association (AWWA). These guidelines are summarized below.

Guideline for the Preparation of an Engineering Report on the Production, Distribution, and Use of Recycled Water. According to Title 22, prior to implementation of a water reclamation project (production, distribution, or use) an engineering report must be prepared and submitted to DDW. This guideline, prepared by DDW and dated March 2001, specifies the contents of an engineering report. The report should describe the production process, including the treated (effluent) water quality, the raw water quality, the treatment process; the plant reliability features the supplemental water supply, the monitoring program, and a contingency plan to prevent distribution of inadequately treated water. The report should include maps of the distribution system and describe how the system would comply with DDW and AWWA guidelines and Title 17. The report should include maps of proposed use areas and should describe the use areas, the types of uses proposed, the people responsible for supervising the uses, the design of the user systems, and the proposed user inspection and monitoring programs.

Manual of Cross Connection Control/Procedures and Practices. This manual, dated July 1981, focuses on establishing a cross-connection control program to protect the public against backflow and back-siphonage of contamination. Main elements of the manual include areas where protection is required; causes of backflow; approved backflow preventers; procedures, installation, and certification of backflow preventers; and water shutoff procedures (for conditions which pose a hazard to the potable water supply).

Guidelines for the Distribution of Non-potable Water. These guidelines were prepared by the California-Nevada Section of AWWA in 1992. The purpose of these guidelines is to provide guidance for planning, designing, constructing, and operating non-potable water systems, including recycled water systems. Distribution lines, storage and supply, pumping, on-site (user) applications, and system management are discussed. DDW guidelines reference these guidelines.

Guidelines for the On-Site Retrofit of Facilities Using Disinfected Tertiary Recycled Water. The California-Nevada Section of AWWA prepared these guidelines in 1997 to provide guidance on modifying existing on-site facilities for conversion to use of recycled water, including recommendations for signage, backflow prevention, and separation standards, for landscape irrigation, agricultural irrigation, industrial uses, and impoundments.

D.4. State Recycled Water Policy

The SWRCB adopted a Recycled Water Policy (RW Policy) in 2009 to establish more uniform requirements for water recycling throughout the State and to streamline the permit application process in most instances. The RW Policy includes a mandate that the State increase the use of recycled water over 2002 levels by at least 200,000 AFY by 2030. Also included are goals for stormwater reuse, conservation, and potable water offsets by recycled water. The onus for achieving these mandates and goals is placed both on recycled water purveyors and potential users. Absent unusual circumstances, the RW Policy puts forth that recycled water irrigation projects that meet DDW requirements and other State or Local regulations be adopted by Regional Boards

within 120 days. These streamlined projects would not be required to include a monitoring component.

For users with separate irrigation and potable water systems, the primary requirement would be to disconnect the irrigation system from the potable water service and connect it to the recycled water service. Reduced pressure principle backflow prevention devices would need to be installed on the potable service immediately downstream of the meter. For those users with irrigation systems that tie to their potable water systems at several locations, the systems would have to be separated. Additionally, hose bibbs would need to be eliminated from the irrigation systems. Public areas, such as golf courses, parks, and schools, would need to post signs informing the public that recycled water is being used for irrigation. Parks, schools, and other users with exposed drinking fountains near landscaped areas would have to provide shields to prevent recycled water from coming into contact with the drinking fountains.

The cost of these conversion requirements is assumed to be incurred by the users; however, CLWA may adopt a policy to assist with onsite conversion costs. In general, the costs are anticipated to be relatively low. Costs would vary from user to user because the cost would depend on meter size and complexity of the irrigation system.

To develop the recommended recycled water system, key service policies must be considered. Because specific service policies have not yet been established by CLWA, policies necessary for the development of a recycled water system are recommended. Among the recommended service policies upon which the recommended recycled water system is based are:

1. Although retail service by CLWA is limited to areas prescribed by statute, CLWA would provide the facilities to deliver recycled water to individual existing and future users identified as each implementation phase is developed.

2. For new development tracts which plan to or are conditioned to utilize recycled water, CLWA would provide the facilities to deliver recycled water to the boundary of the tract or to a location reasonably near the tract.

3. Facilities located within planned public right-of-way of new development tracts must be dedicated to CLWA or the retail service provider.

4. At CLWA's convenience and discretion, CLWA may construct transmission facilities through new development tracts.

Onsite facilities for new or existing users would be provided by the user. However, CLWA may develop an incentive program to assist in funding the onsite retrofits.

Appendix D References

DDW. 2001. California Health Laws Related to Recycled Water "The Purple Book" Excerpts from the Health and Safety Code, Water Code, and Titles 22 and 17 of the California Code of Regulations. California Department of Public Health [Available at: http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/Purplebookupdate6-01.PDF, accessed June 30, 2014].

DDW. 2014. California Department of Public Health Regulations Related to Recycled Water – June 18, 2014 (Revisions effective on 6/18/14) [Available at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/RWregulations_20140618.pdf, accessed October 9, 2014].

USEPA. 2012. Guidelines for Water Reuse. EPA/600/R-12/618. United States Environmental Protection Agency and National Risk Management Research Laboratory. http://nepis.epa.gov/Adobe/PDF/P100FS7K.pdf

WateReuse Association. 2009. Manual of Practice – How to Develop a Water Reuse Program. Principal authors: Thomas Holliman, Richard Atwater, Dr. James Crook and Lois Humphreys.