Sierra Park Water Company
Water System Condition Assessment

Report

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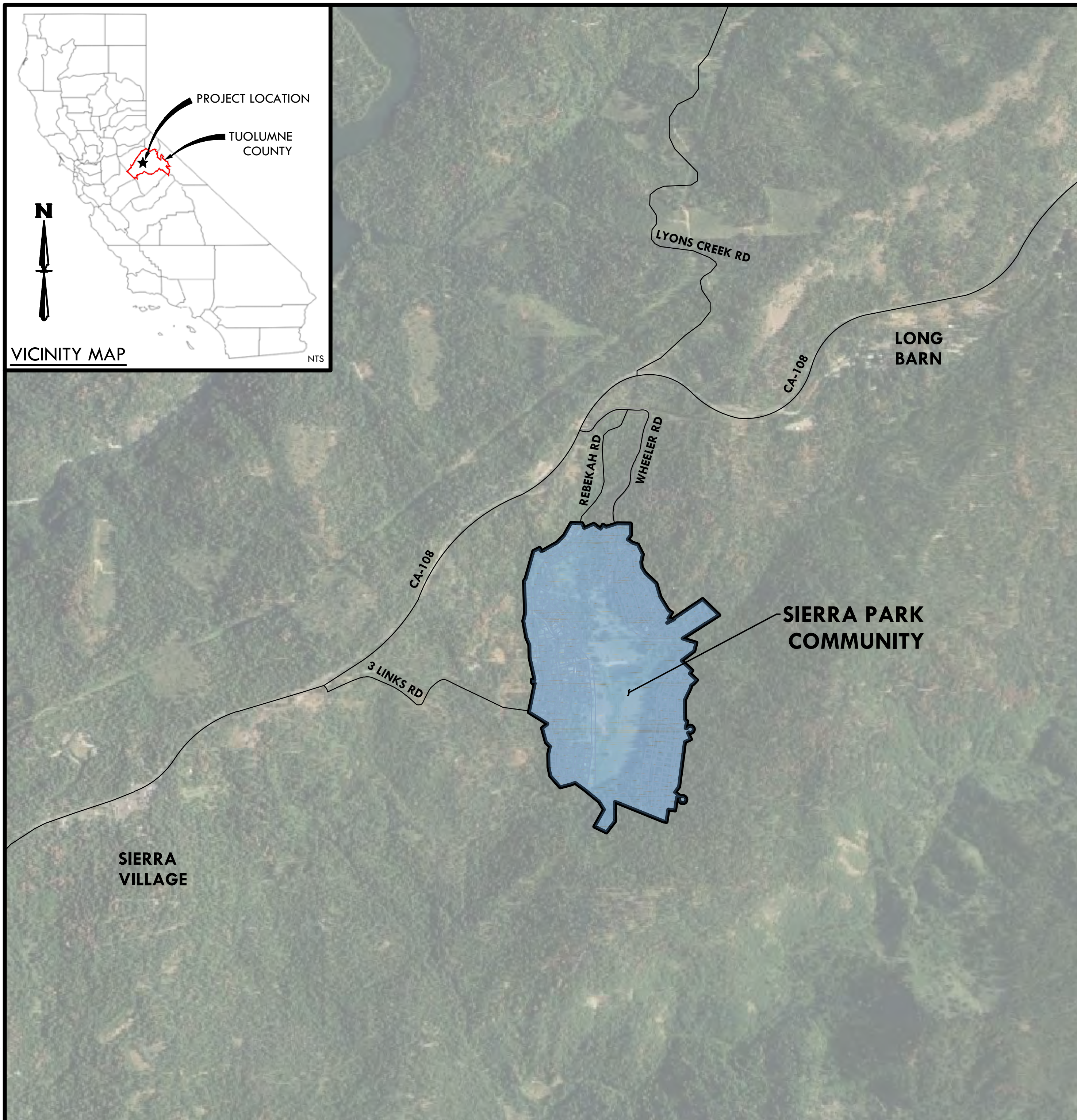
1 Introduction

The Sierra Park Water Company (SPWC) owns and operates the public water system at the Sierra Park community located in Tuolumne County, CA off of State Route 108, refer to Figure 1-1. SPWC provides water service for approximately 300 residents of the Sierra Park community. The community consists mainly of seasonal and intermittent residents, as most of the residences are vacation homes, with some full-time residents, a clubhouse and an irrigated service area.

A Decision Resolving a Complaint and Authorizing a Certificate of Public Convenience and Necessity (CPCN) as Modified (Decision No. D. 16-01-047) was issued by the California Public Utilities Commission (CPUC) on January 29, 2016 conditionally granting a CPCN to SPWC. Compliant with the Orders of the CPUC DWA Final Report recommendation, Black Water Consulting Engineers Inc. (Black Water) has been retained by the SPWC to complete this engineering report in order to: 1) complete an assessment of the existing water system to identify any existing supply, storage, and distribution system deficiencies or compliance issues; 2) recommend capital improvement projects for the existing system including new system upgrades to accommodate existing and future demands; and 3) develop annual revenue requirements and rate design based on the existing rate structure and capital budget estimates.



N

LEGEND

ROADS

SIERRA PARK COMMUNITY

0 1,000' 2,000'

SCALE: 1"=2,000'-0"

LOCATION MAP

SIERRA PARK
WATER COMPANY

WATER SYSTEM
CONDITION ASSESSMENT

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2 Background

Background information regarding the regulatory requirements, existing water system, and water quality are provided in this section for reference.

2.1 Regulatory Requirements

The SPWC community water system operates under State Water Resources Control Board (SWRCB) Division of Drinking Water, Domestic Water Supply Permit Number 03-11-13P-015 (Permit) , Public Water System No. CA 5510016. The Permit was issued on July 19, 2013, when regulatory ownership of the water system was acquired by SPWC from Odd Fellows Sierra Recreation Association. The SPWC community water system was previously permitted under Permit No. 03-11-11P-002, issued February 28, 2011. The Permit establishes the monitoring and reporting requirements for production and safety of the water system supply, as well as monitoring and reporting requirements and standards for water quality. The Permit is included in Appendix A.

SPWC is subject to CPUC jurisdiction and regulation as Class-D small water utility providing water service to the Sierra Park community. The CPUC's Division of Water and Audits (DWA) issues a staff report on April 15, 2015, based on review of a joint Application by Odd Fellows Sierra Recreation Association and SPWC for a CPCN to operate a Public Utility Water System near Long Barn, Tuolumne County, California and to establish rates for service. The staff reviewed revenue requirements and expenses for previous years and provided recommendations to the SPWC for adjustments to revenue requirements. Additional recommendations relevant to this engineering report included hiring an engineering consultant to evaluate the existing water system and prioritize capital improvement projects needed to maintain the system to determine revenue requirements for future years. The CPNC is included in Appendix B.

2.2 Existing Water Facilities and Operations

The existing SPWC water system serves a population of approximately 300 residents through 364 service connections. However, not all service connections are in continuous use throughout the entire year as the Sierra Park community consists of residences that are used for vacation homes with less than 50 residences occupied continuously year-round.

2.2.1 Water Sources, Storage and Distribution System

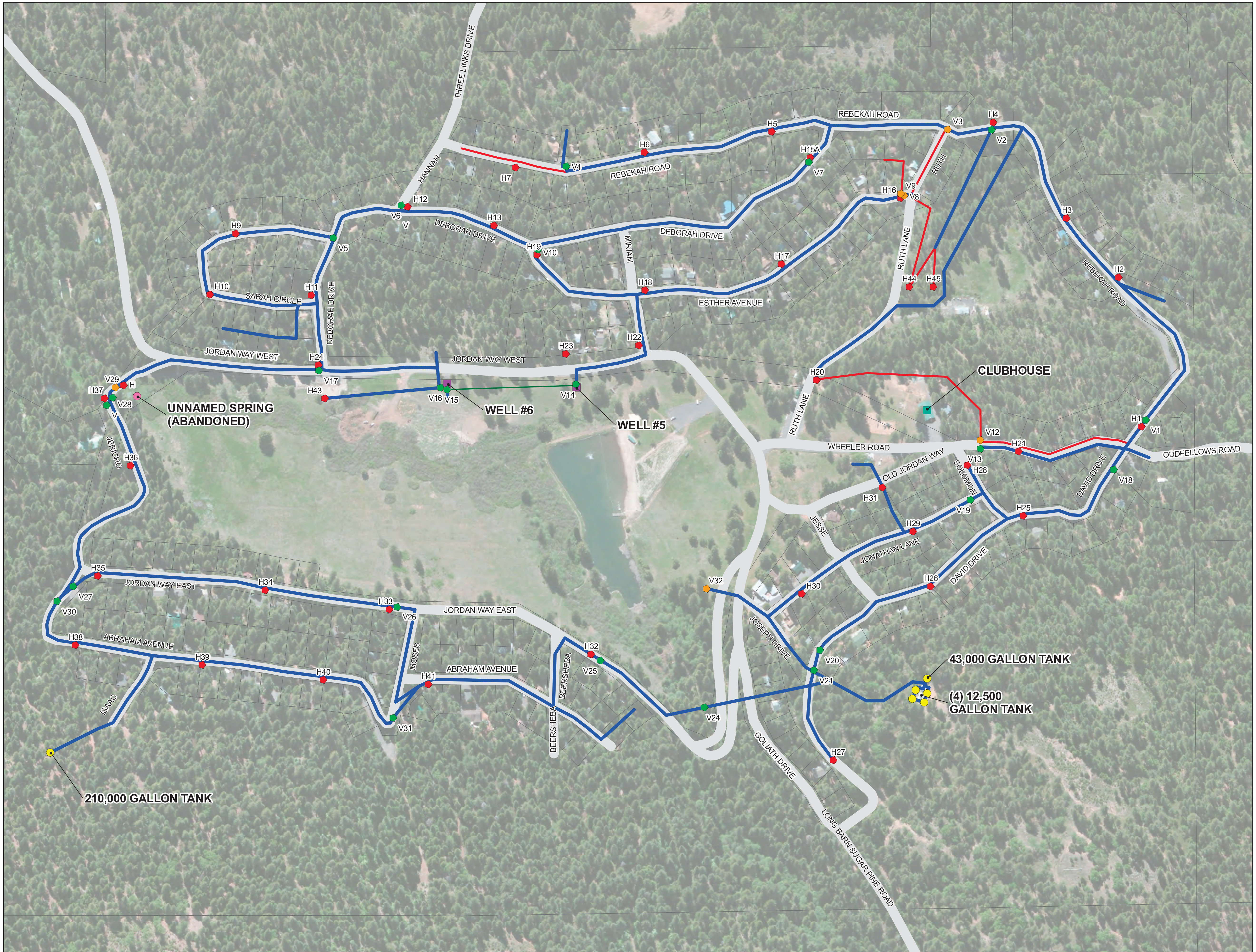
The water supply for domestic and fire flow is supplied from two active groundwater well supply sources (Well No. 5 and Well No. 6) and six storage tanks with a combined capacity of 303,000 gallons. Groundwater is pumped through the distribution system via 4-inch diameter water pipelines to fill the storage tanks. Well pumps are operated manually, in alternating sequence, to maintain the level in the tanks to supply the distribution system demand and maintain system pressures. A 6-inch water main connects the discharge piping between both well sites. Manual operation of valves allows isolation of each well from the system when water supply is alternated between each well.

Previous water sources used by the community included four wells (Well No. 1, Well No. 2, Well No. 3, and Well No. 4) and one unnamed spring. Well No. 1-4 have been abandoned and destroyed. The spring has also been abandoned. Abandonment of other previous well sources and the spring was triggered by high levels of iron and manganese, per SPWC staff. Documentation of water rights for the unnamed spring is included in Appendix C. Figure 2-1 presents a schematic of the water distribution system.

FIGURE 2-1
SIERRA PARK WATER COMPANY

WATER SYSTEM SCHEMATIC MAP

TUOLUMNE COUNTY, CA



Legend

- 2" Valve
- 4" Valve
- Hydrant
- Well Site
- Tank
- 2" Water Main
- 4" Water Main
- 6" Water Main

N

0 125 250 500 Feet

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Table 2-1 summarizes the active groundwater well pump capacities, and site and equipment details.

Table 2-1 - Active Water Sources

Source	Capacity (gpm)	Year Drilled	Pump Type	Year Pump Installed	Pump Motor (HP)
Well No. 5	55	1986	Submersible	1986	10
Well No. 6	100	1996	Submersible	2014	15

2.2.1.1 Well Site No. 5

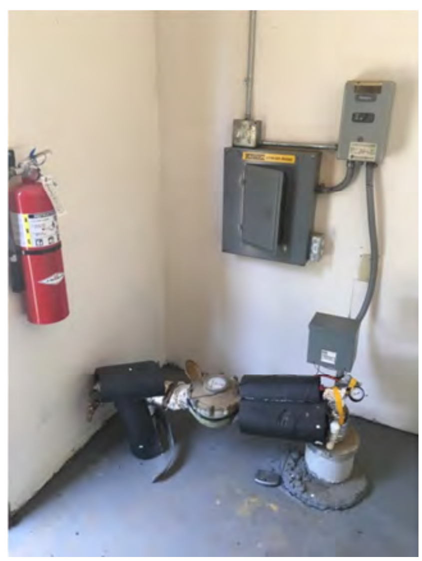
Well site No. 5 is located on Jordan Way West. Well No. 5 was drilled in 1986. The total well depth is 350 feet. The borehole contains a 12-inch diameter, 10-inch diameter, and 7-inch diameter steel casing from 0 to 34 feet, 0 to 86 feet, and 0 to 146 feet, respectively. The 7-inch diameter casing is perforated from 95 feet to 140 feet. The well has a cement and bentonite annular seal to a depth of 90 feet and a gravel pack from 90 to 145 feet.

Figure 2-2 - Well Site No. 5

The well is equipped with a submersible pump and 10-HP constant speed motor capable of pumping approximately 55 gpm. The make and manufacture of the pump is unknown. The well discharge piping includes a check valve and flow meter. The well is also equipped with a 3/4-inch diameter sounding tube and sample tap. Power supply to the site is 230-V, 3-Phase.

The well, discharge piping, and electrical controls are housed in a permanent wood framed building.

Figure 2-3 - Well No. 5



Well No. 5 is operated manually, in alternating sequence with Well No. 6. The well is equipped with a run timer to allow the operator to schedule operation of the well to maintain tank levels, as needed. Water is distributed to the system via a 4-inch diameter water main.

Recent water quality violations for exceedance of secondary maximum contaminant levels (MCL) of 0.05 mg/L for manganese occurred during one reporting quarter in 2014, all reporting quarters in 2015, and one reporting quarter in 2016.

2.2.1.2 Well Site No. 6

Well site No. 6 is located on Jordan Way West, just south of Well Site No. 5. Well No. 6 was drilled in 1996. The total well depth is 403 feet. The borehole contains a 12-inch diameter and an 8-inch diameter steel casing from 0 to 55 feet and 0 to 78 feet, respectively with no perforations. The well has a cement annular seal to a depth of 50 feet and no gravel pack. The well completion report is included in Appendix D.

The well is equipped with a Berkeley Model 6T15-115 submersible pump and 15-HP constant speed motor capable of pumping approximately 100 gpm. The well discharge piping includes a check valve and flow meter. The well is also equipped with a 3/4-inch diameter sounding tube. Power supply to the site is 230-V, 3-Phase. The pump was installed in 2014 when there were mechanical issues with fuses blowing at the site that was attributed to the well pump.

Figure 2-4 - Well No. 6 Site

Well No. 6 is operated manually, in alternating sequence with Well No. 5. The well is equipped with a run timer to allow the operator to schedule operation of the well to maintain tank levels, as needed. Water is distributed to the system via a 6-inch diameter water main.

Recent water quality violations for exceedance of secondary MCL of 0.05 mg/L for manganese occurred during one reporting quarter in 2014, all reporting quarters in 2015, and one reporting quarter in 2016.

Figure 2-5 - Well No. 6

2.2.1.3 Storage

There are a total of six storage tanks at two tank sites with a combined storage volume of 303,000 gallons which provides working pressures for the system based on tank levels. Water supplied from the wells are pumped through the distribution system and stored in the tanks. The 210,000 gallon storage tank is located off Isaac Road at the southeast end of the distribution system. The other tank site is located off David Drive at the northeast end of the distribution system and has five storage tanks, one 43,000 gallon storage tank and four 12,500 gallon storage tanks. Table 2-2 presents a summary of the storage tank data.

Figure 2-7 - 210,000 gal Storage Tank

Figure 2-6 - 12,500 gal (4) and 43,000 gal Storage Tanks

Table 2-2 - Storage Tank Data

Tank	Type	Volume (gal)	Year Constructed	Diameter (ft)	Height (ft)	Tank Base Elevation (ft)[6]	Tank Top Elevation (ft.)
1	Welded Steel, On Grade	12,500	1993	12	16	4768	4784
2	Welded Steel, On Grade	12,500	1993	12	16	4768	4784
3	Welded Steel, On Grade	12,500	1993	12	16	4768	4784
4	Welded Steel, On Grade	12,500	1993	12	16	4768	4784
5	Bolted Steel, On Grade	43,000	1993	21	16	4768	4784
6	Welded Steel, On Grade	210,000	1999	38	24	4762	4786

In 2010, all storage tanks were inspected and the findings were reported in separate reports for each tank and all recommended maintenance improvements were completed in July 2015. The storage tanks were recently inspected in 2016 and no additional maintenance was recommended. Appendix E includes the 2010 tank inspection reports.

2.2.1.4 Distribution System

The water distribution system consists of approximately 25,650 linear feet of 4-inch diameter water pipeline and 500 linear feet of 6-inch diameter water pipeline. Service laterals for up to four residential lots, common areas, and irrigated areas consist of 2-inch diameter water pipelines. The 2-inch and 4-inch diameter water pipelines are Schedule 40 PVC and were installed in 1972. The 6-inch diameter water pipelines are Class 150 C-900 PVC installed in 1996.

The distribution system includes isolation valves and 44 hydrants. The system hydrants are mainly 2-1/2-inch diameter wet standpipe hydrants. In 2014, SPWC replaced isolation valves on the western side of the system. The replaced valves were 4-inch diameter plastic ball valves and were inoperable. When the valves were replaced, nine dry barrel wharf hydrants were also installed in order to improve system reliability and response time, as accessibility to the standpipe hydrants is limited. The standpipe hydrant activation valves are located in valve boxes, most of which are hard to locate due to dirt and debris and snow coverage during winter months. Limited access to water valves increases staff response time to shut off water service in case of emergency or contamination situations. Additionally, during the winter months ice forms in the standpipes affecting operation of the hydrant. The new wharf hydrants are 2-1/4-inch in diameter and were installed to provide a more reliable source for fire flow during an emergency.

Other maintenance repairs included replacement of one 6-inch diameter isolation valve and valves on the 2-inch diameter service laterals.

2.2.2 Existing and Future Water Demand

Water demands for the community are based on water usage data from monthly well production totals. The Sierra Park community, being mostly a seasonal vacation community, experiences the highest demands during the months of July through September. Using the highest monthly production recordings from the last 10 years from January 2006 to December 2015, consistent with CCR Title 22, Chapter 16 § 64554.(b)(2),the average day demand (ADD) for the Sierra Park Community is calculated to be approximately 60,595 gpd. Maximum day demands (MDD) are estimated to be 150 percent of ADD and peak hour demands (PHD) are estimated to be 150 percent of MDD. Table 2-3 summarizes the estimated water demands for the community.

Table 2-3 - Summary of Demands

Average Day Demand[a,b]		Maximum Day Demand[a,c]		Peak Hour Demand[a,d]	
gpd	gpm	gpd	gpm	gpd	gpm
60,595	42.1	90,892	63.1	136,339	94.7

[a]CCR Title 22, Chapter 16 § 64554.b(2).
[b]Highest monthly production – August 2006.
[c]Maximum day demand is 1.5 times the average day demand.
[d]Peak hour demand is 2.25 times the average day demand.

The maximum number of service connections to be served by the water system based on the maximum number of developable lots is 364. Currently, most of the lots are developed, and some lots are shared by a single owner. The estimated MDD was based on the highest production month during August 2006. Since 2006, the highest production months have been 15 to 40 percent lower in more recent years. It is assumed that the calculated MDD for the existing water system, based on the highest production month in August 2006, is the highest demand for the water system for existing and future conditions. With reduced water usage as a result of conservation requirements and low use water fixture requirements for new development, it is not anticipated that development of undeveloped lots within the community will increase water demands in the system.

3 Condition Assessment and System Deficiencies

This section includes a condition assessment of the existing system facilities and identifies system deficiencies related to water quality, capacity, and operation.

3.1 Water Quality

Historically, exceedance of the manganese secondary MCL has been a consistent issue for groundwater sources for the water system. Additionally, exceedance of the iron secondary MCL has also occurred.

Well No. 5 and Well No. 6 have consistently violated secondary MCLs for manganese. High levels of manganese above the secondary MCL may result in poor water quality, specifically black to brown color, black staining, and a bitter metallic taste, although the water is not unsafe for consumption or use. High levels of iron above the secondary MCL may result in poor water quality, specifically rusty color, sediment, metallic taste, and reddish or orange staining, although the water is not unsafe for consumption or use. Table 3-1 summarizes the historical analysis results for iron and manganese MCL exceedances at Well No. 5 and Well No. 6.

Table 3-1 - Iron and Manganese MCL Exceedances

Analyte Name	Sampling Date	Analysis Result, mg/L	MCL, mg/L	Analyte Name	Sampling Date	Analysis Results, mg/L	MCL, mg/L
Well No. 5				Well No. 6			
Iron	11/9/1999	0.726	0.3	Iron	7/23/2012	0.546	0.3
Iron	9/28/2005	0.553	0.3	Manganese	9/28/2005	0.284	0.05
Manganese	12/5/1989	0.117	0.05	Manganese	6/10/2009	0.205	0.05
Manganese	11/9/1999	0.246	0.05	Manganese	7/8/2009	0.252	0.05
Manganese	6/18/2002	0.2	0.05	Manganese	10/26/2010	0.328	0.05
Manganese	9/28/2005	0.165	0.05	Manganese	7/23/2012	0.376	0.05
Manganese	6/10/2009	0.159	0.05	Manganese	5/23/2013	0.297	0.05
Manganese	7/8/2009	0.173	0.05	Manganese	9/25/2013	0.307	0.05
Manganese	10/28/2010	0.192	0.05	Manganese	2/12/2014	0.202	0.05
Manganese	7/23/2012	0.264	0.05	Manganese	9/17/2014	0.348	0.05
Manganese	5/30/2013	0.174	0.05	Manganese	11/24/2014	0.17	0.05
Manganese	9/25/2013	0.186	0.05	Manganese	3/4/2015	0.224	0.05
Manganese	5/21/2014	0.141	0.05	Manganese	6/10/2015	0.463	0.05
Manganese	11/24/2014	0.125	0.05	Manganese	9/29/2015	0.294	0.05
Manganese	3/4/2015	0.129	0.05	Manganese	11/18/2015	0.327	0.05
Manganese	6/10/2015	0.28	0.05	Manganese	2/10/2016	0.252	0.05
Manganese	9/29/2015	0.167	0.05	Manganese	5/18/2016	0.292	0.05
Manganese	11/18/2015	0.201	0.05	Manganese	8/30/2016	0.161	0.05
Manganese	2/10/2016	0.161	0.05				
Manganese	5/18/2016	0.175	0.05				
Manganese	8/30/2016	0.263	0.05				

Table 3-2 lists violations issued for manganese exceedances since 2013. Appendix F includes the March 24, 2015, SWRCB Enforcement Letter citing the violations.

Table 3-2 - Manganese MCL Exceedance Violations

Sample Date	Analysis Result, mg/L	Violation	Analyte Name
Well No. 5			
5/30/2013	0.174	§64449 SECONDARY MCL	Manganese
9/25/2013	0.186	§64449 SECONDARY MCL	Manganese
5/21/2014	0.141	§64449 SECONDARY MCL	Manganese
11/24/2014	0.125	§64449 SECONDARY MCL	Manganese
Well No. 6			
5/30/2013	0.297	§64449 SECONDARY MCL	Manganese
9/25/2013	0.307	§64449 SECONDARY MCL	Manganese
9/14/2014	0.348	§64449 SECONDARY MCL	Manganese
11/24/2014	0.170	§64449 SECONDARY MCL	Manganese

3.2 Source and Storage Capacity

The Sierra Park Community water system shall have the capacity to meet the system maximum day demand (MDD), per California Code of Regulations (CCR) Title 22, Chapter 16 § 64554. Systems with less than 1,000 service connections shall have storage capacity equal to or greater than MDD.

3.2.1 Source Capacity

Community water systems are required to meet the system maximum day demand with the largest water source off-line during a regular 'non-conservation year'. The largest water source in the system is Well No. 6. The reliable capacity of the system with Well No. 6 inactive is reduced to 55 gpm, the capacity of Well No. 5. Table 3-3 presents the maximum day demands for the previous 10 years.

Table 3-3 - Summary of Water Usage

Year	Max. Day Usage (gpm)[a]
2006	63.1
2007	53.8
2008	44.4
2009	42.7
2010	54.1
2011	45.7
2012	46.7
2013	43.7
2014	37.9
2015	40.9

[a]Based on maximum month production.

The maximum day demand for the year 2015 was approximately 40.9 gpm. The current system has sufficient capacity to meet the maximum day demand based on the 2015 usage data. If maximum day demands return to usage rates similar to the 2006 demands, the system will not be compliant with permit requirements. However, a demand of 63.1 gpm is not likely a realistic demand value due to poor record keeping during 2006, per SPWC staff.

The significant reduction in the maximum day demands since 2006 can be attributed to a downturn in the economy, and, in more recent years, State mandated water conservation efforts. Due to the nature of the community being a seasonal vacation community, the population of the community during high demand months may fluctuate as a result of the economy. A declining economy from 2006 likely had an effect on the population of vacationers in the past 10 years, resulting in a decrease in water usage. Further decreased water usage in the past 5 years is likely a result of the State mandated water conservation efforts implemented by SPWC. Considering a 'normal' year, the system capacity would be insufficient to meet maximum day demands with Well No. 6 inactive. Normal years are considered years when the SPWC mandated conservation program is not in place.

Monitoring of water usage and demands is essential to determining the actual MDD for the system in order to evaluate if the existing source capacity is sufficient. Installation of water meters on service laterals would allow SPWC to monitor customer water usage.

3.2.2 Storage Capacity

Typically, storage capacity should be sufficient to meet MDD and fire flow demands in the system, simultaneously. The existing total system storage capacity is 303,000 gallons. With a MDD of 63.1 gpm, the total volume of storage required is 90,864 gallons. The existing system storage is sufficient to meet the MDD.

Per the County of Tuolumne Fire Prevention Department, the required fire flow for the water system is 1,000 gpm for a duration of one hour compliant with Section B105.1 of the California Fire Code for one or two-family dwellings less than 3,600 square feet . The storage volume required to supply the required fire flow is 60,000 gallons. With a MDD storage requirement of 90,864 gallons and a fire storage requirement of 60,000 gallons for a duration of one hour, a total of 150,864 gallons is required to meet MDD and the fire flow demand. The existing storage capacity of 303,000 gallons is sufficient to meet MDD and fire flow demands of 150,864 gallons.

3.3 Distribution System and Operations

Evaluation of the distribution system and operations considers the ability of the system to meet system demands, maintain adequate service pressures, and provide efficient, safe, and reliable water service. Improving system operations is essential in order to reduce maintenance issues, identify potential problems before an emergency occurs, ensure that system demands and pressures are maintained, and provide reasonable emergency response times. The following distribution system deficiencies that affect system operations were identified:

- Undersized distribution system pipelines and hydrants and inoperable valves.
- No remote monitoring for storage tank levels and well operation.

3.3.1 Distribution Pipelines, Valves, and Hydrants

As discussed in Section 1, the water distribution system consists mainly of 4-inch diameter water pipelines water pipelines with 2-1/2-inch diameter hydrants. Typically, a minimum of 6-inch diameter water mains and standard hydrants are required in order to supply the required fire flow of 1,000 gpm out of a single hydrant while maintaining a minimum pressure of 20 psi throughout the system, per the 2013 California Fire Code Section B105.1. In 2014, a fire flow test was conducted by County of Tuolumne Fire Prevention staff. The fire flow test was conducted at two hydrants, one at the highest elevation in the system on Rebekah Road and one at the lowest elevation in the system on Jordan Way West. Results of the fire flow test showed that the maximum flow rate available at Jordan Way West while maintaining 20 psi at the hydrant is 455 gpm. There was insufficient pressure at the Rebekah Road hydrant to determine the maximum flow rate available at 20 psi at the hydrant. Excessive headloss through the 4-inch diameter water pipelines will contribute to reduced flow and pressure at hydrants throughout the system. Insufficient fire flows put the community at risk during the event of a fire emergency. In order to achieve the required fire flow, a minimum of 6-inch diameter pipe and standard fire hydrants are needed.

Per SPWC staff, there are approximately three isolation valves on the eastern side of the system that are inoperable. Additionally, there are three hydrants that need replacement due to limited accessibility.

3.3.2 System Operation Strategy

Storage tank levels and pump operations are monitored and maintained by manual operation. SPWC operation staff visually checks tank levels at each tank site, and manually turns on one of the two well pumps to fill the storage tanks through the distribution system each morning. Well pump run timers are set to run wells at night to maintain the tanks levels at 20 feet. Operation of run timers is alternated between wells. No remote monitoring of tank levels requires staff to be on-site to observe tank levels and determine if well operation is needed to fill the tanks in order to meet system demands. No automation or remote monitoring of tank levels and pump operation could result in tank overflow or tank levels to draw down below normal operating level.

4 Improvement Analysis and Recommendations

Improvement alternatives were developed to determine strategies for future improvements to the existing water system that address system deficiencies identified in Section 3. Each alternative is evaluated based on the proposed improvement's ability to meet system priorities of 1) compliance with regulatory requirements; 2) meeting system demands; and 3) improve system operations and increase efficiency.

4.1 Water Quality Improvement

Improvements to the water system are needed to address the presence of manganese in order to comply with regulatory requirements. Iron has historically exceeded secondary MCL concentrations in the groundwater supply in abandoned wells, the unnamed spring, and existing Well No.5 and Well No.6. Treatment for both iron and manganese is recommended. Three options considered to address the water quality deficiency are treatment utilizing oxidation and filtration technology for removal of iron and manganese, treatment via sequestration, and consolidation with a nearby water system. The following sections briefly describe each option.

4.1.1 Oxidation and Filtration Treatment System

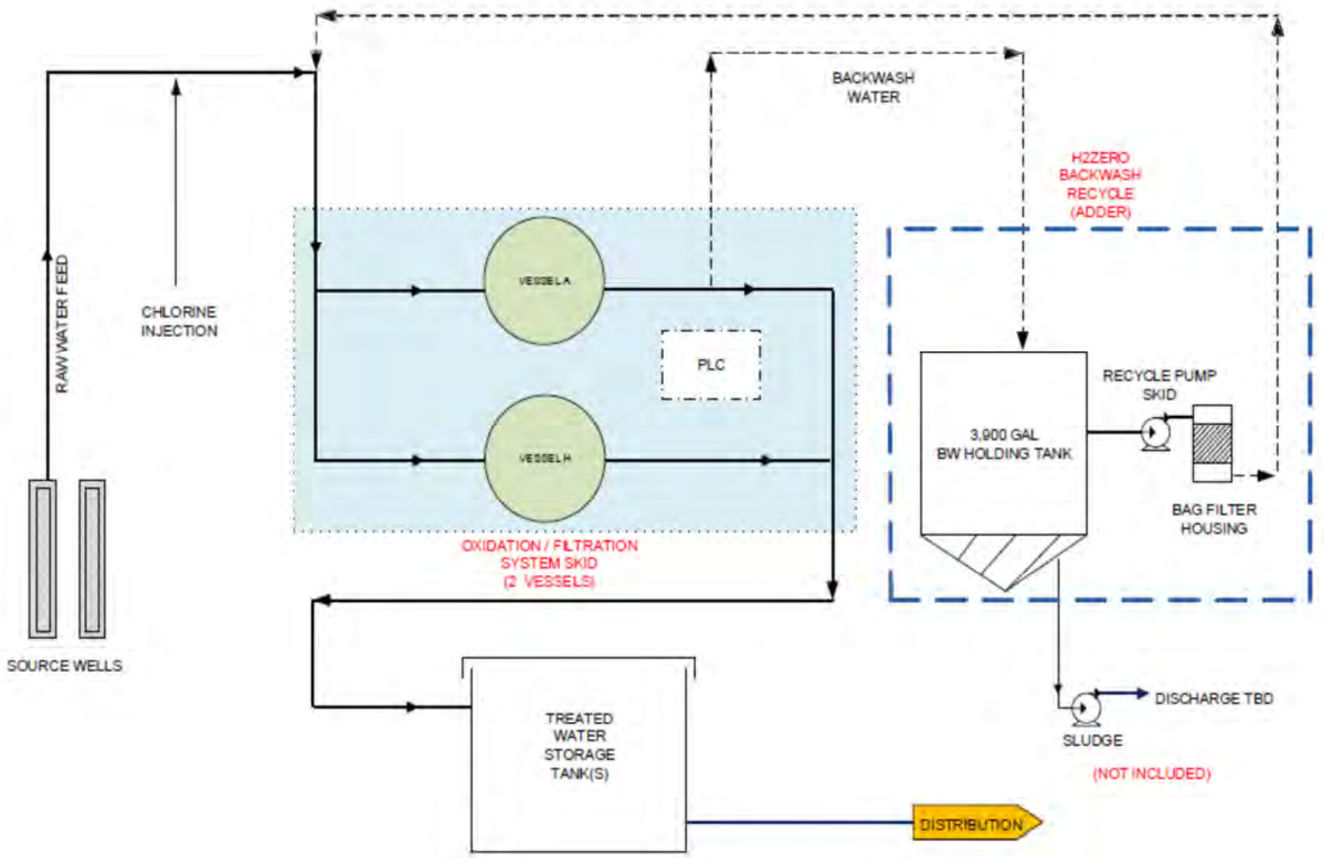
Oxidation/filtration technology utilizes an oxidant and media to oxidize and remove iron and manganese. Packaged treatment systems equipped with chlorine injection and pressure vessels with filtration media to facilitate oxidation and filtration in a single step without long residence times area available. Advantages to packaged treatment plants include small footprint area and a complete treatment system with instrumentation and controls and backwash recycle options. All treatment equipment can be housed in a secure building. Capital costs are considerably higher than other treatment methods, but overall system maintenance costs are low. However, regular disposal of sludge byproduct is required and recommended at least every two to three months. The sludge material is non-hazardous and can be disposed via landfill.

Figure 4-1 - Typical Packaged Oxidation/Filtration Treatment System (AdEdge)

Figure 4-1 shows a typical packaged oxidation/filtration treatment system, and Figure 4-2 shows a process flow schematic for the treatment system.

Figure 4-2 - Iron and Manganese Oxidation Filtration Process Flow Schematic

AdEdge



The packaged treatment system is the recommended option for effective removal of iron and manganese from the groundwater wells in order to comply with regulatory requirements for water quality. Treatment is typically located near the well head. However, if visual aesthetics are a priority to the community, locating a new building near the existing well sites may be undesirable. The final location of the treatment system will be determined during the planning and design phase. The addition of a treatment system will require amendment to the existing Permit. On-site treatment is recommended as the most effective way to reduce iron and manganese if groundwater continues to be the sole water supply source for the water system.

4.1.2 Sequestration

Sequestration treatment method is the addition of an agent or combination of agents, typically phosphates, to slow the formation of particulate metals rather than remove them. The agent temporarily binds with the dissolved manganese to prevent it from oxidizing and causing discoloration and metallic taste in the water. Chemical addition is added at the well head. Sequestration is more suitable for smaller water systems and is usually considered when the high capital cost for treatment is not an option. Sequestration is most successful for iron and manganese concentration levels of less than 0.8 mg/L and 0.1 mg/L, respectively. Determining the most effective sequestering agent and dosage is dependent on the source water quality and a pilot study is typically required.

Due to the higher concentration levels and consistent presence of manganese and iron in the source water, sequestration treatment is not recommended.

4.1.3 Consolidation

Per CPUC directives, the SPWC should start discussions with Tuolumne Utilities District (TUD) for the potential for consolidation with the TUD water system. At a minimum, consolidation would require that the water system comply with TUD standards. However, consolidation with TUD or another nearby water system requires several miles of water infrastructure to extend water service to the Sierra Park community and is not considered a viable option.

4.2 Source Capacity

Sufficient source capacity is critical to comply with regulatory requirements and meet system demands. Current water usage is estimated based on well production rates from the well discharge flow meters. The MDD of 63.1 gpm determined in Section 2 are based on the past 10 years of monthly well production data. Recent MDD are significantly lower than the 2006 MDD, and the existing reliable source capacity of 55 gpm has been sufficient to meet the MDD for the past 9 years. Well production rates should be closely monitored in the coming year to determine if a lower MDD is warranted. Additional water usage monitoring through water metering at service connections is recommended to monitor customer usage and more accurately determine the fluctuating demands in the system and during the peak season when more residences are occupied.

4.2.1 Water Meter Installation

Limited data on actual water use by customers and other service connections also limits the SPWC's ability to identify unaccounted for water loss in the system. Water loss can be attributed to either unaccounted for or unresolved leaks in the system and/or unmetered water use. Water meters on service connections would provide a method for the SPWC to compare well production with customer usage data and identify potential sources of water loss in the system and potentially reduce system demands.

In addition to monitoring customer water usage, water metering also promotes water conservation. Compliant with the State of California Executive Order B-37-16 as a result of drought conditions in California, water conservation efforts are a priority for water systems. The installation of water meters will allow the SPWC to implement a consumption-based billing structure to promote water conservation.

4.2.2 Alternative Water Sources

Alternate water supply sources to consider if the existing supply wells fail or are no longer sufficient to meet system demands include additional wells, the existing and previously used spring, and consolidation with another water system. As discussed in Section 2, previous well supply and the spring source were abandoned due to high levels of iron and manganese. New well sources and use of the existing spring will most likely require treatment for iron and manganese in order to be reliable sources. Prior to the development of future water supply sources, evaluation of actual water usage through the installation of water metering is recommended.

4.3 Distribution System and Operation Improvements

Improvements to the distribution system are recommended to ensure compliance with regulatory requirements for fire flow, ensure reliability and redundancy, and improve system operation and efficiency.

4.3.1 Fire Flow Hydraulic Network Analysis

The current water system does not comply with CFC requirements for fire flow. As discussed in Section 3, reduced fire flows can be attributed to excessive headloss through the 4-inch diameter water pipelines. Increasing water pipeline diameters will improve fire flows to existing hydrants. In order to prioritize water pipeline replacement, upsizing, or the construction of new 6-inch and 8-inch diameter water pipelines, a hydraulic network analysis is recommended. This analysis would evaluate system pressures throughout the system to determine the required upsizing, replacement, or addition of pipelines within the distribution system in order to maintain adequate pressures during a fire event. Because the existing hydrants are 2-1/2-inch diameter standpipes or 2-1/4-inch diameter dry barrel hydrants, fire flows are limited to approximately 500 gpm per hydrant. Standard 4-1/2-inch or 5-1/4-inch diameter hydrants are recommended to be installed on new water pipelines.

4.3.2 Replacement of Isolation Valves and Hydrants

Replacement of approximately three inoperable isolation valves on the eastern side is recommended to improve system reliability and operation. Replacing the existing water valves will allow the SPWC to provide better maintenance and operation of the system and allow for redundancy in case of an emergency. Additionally, there are three hydrants that need replacement due to limited accessibility. Replacement of the existing standpipe hydrants with dry barrel hydrants is recommended to improve emergency response time. Replacement of valves and hydrants is recommended after the hydraulic network analysis is complete to consolidate recommended distribution system improvement efforts.

4.3.3 Remote Monitoring and Automation of Tank/Well Operation

Remote monitoring and automation of the system would improvement system reliability, efficiency, and operations. Automation of well operation based on tank levels would reduce the risk of tank overflow when the wells are operating to fill the tanks and allow for reliability during demand fluctuations. Operation efficiency is improved as operation staff is not required to check tank levels and manually turn on and off well pumps to maintain tank levels.

5 Recommended Improvements Budgetary Costs

The following provides a brief overview for each proposed improvement project recommendation, estimated budget cost for planning and construction, and an estimate of annual revenue and operation and maintenance costs.

5.1 Water Quality Improvement Project

Water quality treatment is the most effective method to reduce manganese concentrations in the groundwater supply. It is recommended that SPWC seek funding to complete the water treatment improvement project as consolidation with another water system is not considered a feasible option due to the long distance to the nearest water system and requirements for the existing system to comply with the service provider's water system standards. Project funding through most state and federal programs will require a planning phase that includes the planning, design, and environmental phase in order to describe the project and obtain approval to secure construction funds.

5.1.1 Iron and Manganese Treatment

A packaged oxidation and filtration treatment system is recommended to provide removal of iron and manganese in the groundwater supply sources. The treatment system will be designed for a maximum capacity of 100 gpm (capacity of the highest producing well, Well No. 6). The proposed packaged treatment system is the AdEdge AD26 Oxidation Filtration System. The proposed packaged system includes the following:

- Two (2) 36-inch diameter (60-inch Ht.) carbon steel media vessels, parallel operation, skid-plate mounting.
- Chemical Feed Module: sodium hypochlorite feed pump and 50 gallon HDPE storage tank.
- Process valving and piping.
- Instrumentation and Controls
- System start-up and commissioning, operator training, training and maintenance manuals.
- Backwash recycle system and 3,900 gallon storage tank.

Other components to be provided by a contractor include inlet and outlet piping from the distribution system, power supply, secure enclosure, and miscellaneous site improvements. The estimated project cost for the iron and manganese treatment system project is $539,438 including planning, engineering design, environmental, permitting, construction, and construction administration and management. The estimated construction cost for the treatment system is $356,250.

Table 5-1 summarizes the budgetary capital costs for the proposed iron and manganese treatment improvement project.

Table 5-1 - Treatment System Improvement Project Estimated Capital Cost

Item	Budgetary Cost
AdEdge AD 26 Packaged Treatment System	$150,000
Site piping, valving, flow meter, and connection to existing distribution system	$55,000
Power Service and Miscellaneous Electrical	$15,000
Site improvements: grading/paving/lighting.	$35,000
Secure Building	$25,000
Disinfection and Testing	$5,000
Subtotal	$285,000
Contingency 25%	$71,250
Construction Total	**$356,250**
Administration and Application Assistance	$25,000
Field Investigations (Survey, Geotechnical)	$35,625
Engineering Design	$71,250
Environmental	$7,000
Water System Permit Modification/Report	$6,500
Bidding and Construction Support	$17,813
Construction Administration and Construction Management	$20,000
TOTAL PROJECT COST	**$539,438**

The estimated annual revenue requirement to cover the project capital cost of $539,438 is $32,747. The estimated cost assumes the project funding source is a low interest loan at a term of 20 years with an interest rate of 2% at monthly repayment of $2,728. With a total customer base of 364 service accounts, the rate impact totals approximately $7.50 per month increase to water rates or $89.96 annually.

Required maintenance for the treatment system includes quarterly removal, hauling, and disposal of sludge to a landfill site. The estimated annual operation and maintenance cost is summarized in Table 5-2.

Table 5-2 - Treatment System Estimated Annual Operation and Maintenance Cost

Item	Budgetary Cost
Sludge Hauling and Disposal at Landfill	$2,500
Treatment System Operation, including media replacement and sodium hypochlorite chemical	$15,960
TOTAL ANNUAL OPERATION AND MAINTENANCE COST	**$18,460**

The estimated annual revenue requirement to cover the operation and maintenance of the iron and manganese treatment system is $18,460 which includes staff operation, media replacement, chemicals, and quarterly sludge hauling and disposal. With a total customer base of 364 service accounts, the rate impact totals approximately $4.23 per month increase to water rates or $50.71 annually.

The estimated annual revenue requirement to cover the capital cost for loan repayment and operation and maintenance cost for the iron and manganese improvement project is $51,207. The project results in an overall increase to the annual water rate from $545 to $686 assuming no annual reserves are available to reduce revenue requirements.

Appendix G includes detailed cost estimates for the iron and manganese treatment improvement project. Appendix H includes the budget cost proposal for the AdEdge AD 26 Oxidation Filtration System, and

5.2 Water Meter Improvement Project

The water meter improvement project includes installation of water meters on service laterals to residences, the existing clubhouse, and irrigated service area pipelines. Major components of the proposed construction project will consist of the installation of new 3/4-inch remote read water meters for residential service connections and the clubhouse and 1-inch diameter remote read water meter for the irrigation service area. Water meters will be installed on approximately 366 existing service laterals (364 residential, 1 clubhouse, and 1 irrigation) within the service area.

Table 5-3 summarizes the budgetary cost of $295,638 for the proposed water meter improvement project.

Table 5-3 - Water Meter Improvement Project Estimated Capital Cost

Item	Budgetary Cost
3/4-inch diameter Remote Read Water Meter (365 @ $400 each)	$146,000
1-inch diameter Remote Read Water Meter (1 @ $400 each)	$400
Miscellaneous Water Meter Piping and Valving	$14,640
Miscellaneous Construction Repairs	$8,157
Subtotal	$169,092
Contingency 25%	$42,273
Construction Total	**$211,365**
Administration	$15,000
Field investigations	$21,137
Engineering Design	$21,137
Environmental	$1,500
Permitting	$3,000
Bidding and Construction Support	$7,500
Construction Administration and Construction Management	$15,000
TOTAL PROJECT COST	**$295,638**

The estimated annual revenue requirement to cover the project capital cost of $295,638 is $17,947. The estimated cost assumes the project funding source is a low interest loan at a term of 20 years with an interest rate of 2% at monthly repayment of $1,496. With a total customer base of 364 service accounts, the rate impact totals approximately $4.11 per month or $49.30 annually.

The estimated annual operation and maintenance cost is summarized in Table 5-4.

Table 5-4 - Water Meter Improvement Project Estimated Annual Operation and Maintenance Cost

Item	Budgetary Cost
Operation and Maintenance, Monitoring and Reporting	$8,480
TOTAL ANNUAL OPERATION AND MAINTENANCE COST	**$8,480**

The estimated annual revenue requirement to cover the operation and maintenance of the remote read water meters is $8,480 including staff operation for monitoring and reporting. With a total customer base of 364 service accounts, the rate impact totals approximately $1.94 per month increase to water rates or $23.30 annually.

The estimated annual revenue requirement to cover the capital cost for loan repayment and operation maintenance cost for the water meter improvement project is $26,427. The project results in an overall increase to the annual water rate from $545 to $618 assuming no annual reserves are available to reduce revenue requirements.

Appendix G includes detailed cost estimates for the water meter improvement project.

5.3 Fire Flow Hydraulic Network Analysis and Pipeline Replacement

A hydraulic network analysis of the distribution system to evaluate available fire flows during MDD is recommended to prioritize improvement to comply with CFC standard for required fire flow at the community. The analysis would include the creation of a network model of the existing distribution system and 44 existing hydrants using software such as Innovyze InfoWater. A water pressure and capacity analysis will be completed to determine critical hydrants where minimum flows and pressures are not met. Fire flow and pressure deficiencies will be identified. The results of the analysis will be summarized in a technical memorandum that summarizes the water system analysis methodology, assumptions, and recommendations for prioritized improvements to mitigate identified system deficiencies will be prioritized. Budget level cost estimates, project phasing, and schedules will be also be provided.

Table 5-5 summarizes the budgetary cost of $42,300 for the fire flow hydraulic network analysis. The project includes engineering consultant fees and field survey to verify hydrant elevations.

Table 5-5 - Fire Flow Hydraulic Network Analysis Estimated Cost

Item	Budgetary Cost
Project Management and Administration	$5,000
Topographic Field Survey	$8,500
Model Development and Calibration	$9,600
Hydraulic Network Analysis: Maximum Day Demand with Fire Flow, Identify System Deficiencies, Capital Improvement Prioritization to Mitigate Deficiencies	$12,800
Technical Memorandum	$6,400
TOTAL PROJECT COST	**$42,300**

The estimated annual revenue requirement to cover the engineering consultant services for hydraulic network analysis cost is $2,568. The estimated cost assumes the project funding source is a low interest program loan at a term of 20 years with an interest rate of 2% results in a monthly repayment of

$213.99. With a total customer base of 364 service accounts, the rate impact totals approximately $0.59 per month or $7 annually.

The project results in an overall increase to the annual water rate from $545 to $552 assuming no annual reserves are available to reduce revenue requirements. There is no operating and maintenance cost associated with this project.

The anticipated outcome of the hydraulic analysis is a recommendation to replace existing undersized water mains to increase flow and pressure to existing hydrants. In 2013, a budget estimate for replacement of all pipelines in the water system was completed. [4] The replacement cost estimated assumed the construction of 10,400 lineal feet of 6-inch diameter pipelines and 16,400 lineal feet of 8-inch diameter pipelines for a total construction cost of $1,826,100. It is assumed that the 2013 estimate is all-inclusive of miscellaneous piping, valving, and road reconstruction/repairs required for the project.

Table 5-6 summarizes the budgetary cost for the pipeline replacement using the Engineering News-Record (ENR) Construction Cost Index (CCI) to estimate the present day budgetary construction cost in addition to other related costs including planning, engineering design, environmental, and construction management and administration totaling $2,870,264, not included in the original estimate. Project costs may increase or decrease depending on the results of the hydraulic network analysis and recommended improvement project description and design or construction phasing,

Table 5-6 - Water System Pipeline Replacement Improvement Project Estimated Cost

Item	Budgetary Cost
Replacement of Existing and Construction of 6-inch and 8-inch diameter water main (February 2013 ENR CCI: 9453)	$1,825,800
2016 Project Cost (August 2016 ENR CCI: 10385)	$2,005,811
25% Contingency	$501,453
Construction Total	**$2,507,264**
Administration	$15,000
Field investigations	$80,000
Engineering Design	$200,000
Environmental	$15,000
Permitting	$3,000
Bidding and Construction Support	$15,000
Construction Administration and Construction Management	$35,000
TOTAL PROJECT COST	**$2,870,264**

The estimated annual revenue requirement to cover the project capital cost of $2,870,264 is $174,242. The estimated cost assumes the project funding source is a low interest loan at a term of 20 years with an interest rate of 2% at monthly repayment of $14,520. With a total customer base of 364 service accounts, the rate impact totals approximately $39.89 per month increase to water rates or $478.69 annually. It is not anticipated that operation and maintenance costs of the system will increase from current operation and maintenance costs as a result of the project. The project results in an overall increase to the annual water rate from $545 to $1024 assuming no annual reserves are available to reduce monthly revenue requirements. Due to the high cost of the pipeline replacement project, replacement of piping may be phased in order to reduce immediate impacts to rate payers.

Appendix G includes the detailed cost estimate for the fire flow hydraulic network analysis and water system pipeline replacement projects.

5.4 Remote Monitoring and Automation of Tank/Well Operations

Remote monitoring of tank levels and automation of well operation to maintain tank levels would improve system reliability to meet demands and operation and maintenance. Major project components include the design of a supervisory control and data acquisition (SCADA) for remote monitoring of Well Site No. 5 and Well Site No. 6 and the existing storage tanks. In 2014, Industrial Control Systems Online, Inc. provided the SPWC with an estimate for a SCADA system with wireless communications between the 210,000 gallon storage tank and both well site. Solar control panels were considered as an option as there is no power supply at the storage tank site. The estimated project cost including engineering design and construction was $52,220.

Table 5-7 summarizes the budgetary cost for the previously quoted remote monitoring SCADA system using the Engineering News-Record (ENR) Construction Cost Index (CCI) to estimate the present day budgetary cost.

Table 5-7 - SCADA System Improvement Project Estimated Cost

Item	Budgetary Cost
Industrial Control Systems Online, Inc. SCADA System Cost Proposal (October 2014 ENR CCI: 9886)	$52,220
2016 Project Cost (August 2016 ENR CCI: 10385)	$54,856
15% Contingency	$8,228
TOTAL PROJECT COST	**$63,084**

The estimated annual revenue requirement to cover the project capital cost of $63,084 for the SCADA improvement project is $3,830. The estimated cost assumes the project funding source will be a low interest loan at a term of 20 years with an interest rate of 2% at monthly repayment of $319.13. With a total customer base of 364 service accounts, the rate impact is approximately $2.96 per month or $36 annually.

The estimated annual operation and maintenance cost is summarized in Table 5-8.

Table 5-8 – SCADA System Improvement Project Estimated Annual Operation and Maintenance Cost

Item	Budgetary Cost
Wireless Communication Services	$1,800
TOTAL ANNUAL OPERATION AND MAINTENANCE COST	**$1,800**

The estimated annual revenue requirement to cover the operation and maintenance of the SCADA system is $1,800 for wireless communication services. With a total customer base of 364 service accounts, the annual rate impact totals approximately $0.41 per month increase to water rates or $4.95

annually. It is assumed that staff cost associated with operation of the system will not exceed current operational costs.

The estimated annual revenue requirement to cover the annual capital cost for loan repayment and operation and maintenance cost for the SCADA system improvement project is $5,630. The project results in an overall increase to the annual water rate from $545 to $560 assuming no annual reserves are available to reduce revenue requirements.

Appendix G includes the detailed cost estimate for the SCADA system improvement project. Appendix I includes the October 2014 Industrial Control Systems Online, Inc. SCADA System Cost Proposal.

5.5 Summary of Costs

If all recommended improvement projects are constructed, water rates are anticipated to increase from the current annual rate of $545 by 131% (including replacement of all system pipelines). Rate impacts may be reduced if annual reserves are available to offset capital costs for improvement project. Additionally, overall project costs may be reduced by consolidating improvement projects. It is recommended that one funding application be completed for several projects in order to maximize the allowed funding SPWC qualifies to receive. Table 5-9 summarizes the recommended improvements, associated project costs, and impacts to water rates.

Table 5-9 –Summary of Improvement Projects, Estimated Costs, and Rate Impact

Improvement Project	Budgetary Capital Cost	Annual Revenue Requirement		Annual Rate Increase Per Customer	Current Rate + Rate Increase Per Customer
		Capital Cost (Loan Repayment)	Operation and Maintenance		
Iron and Manganese Treatment	$539,438	$51,207		$141	$686
		$32,747	$18,460		
Water Meters	$295,638	$26,427		$73	$618
		$17,947	$8,480		
Fire Flow Analysis	$42,300	$2,568		$7	$552
		$2,568	$0		
Pipeline Replacement	$2,870,264	$174,242		$479	$1,024
		$174,242	$0		
SCADA	$63,084	$5,630		$15	$560
		$3,830	$1,800		
TOTALS	**$3,810,724**	**$440,201**	**$28,740**	**$714**	**$1,259**

Depending on the funding source and loan program, repayment is typically not required until the project is constructed or one-year after.

6 Funding Sources

The Drinking Water State Revolving Fund (DWSRF) Program is a potential funding source for the recommended improvements. The U.S. Environmental Protection Agency offers this program. The program is administered through the State of California. This program is a grant or loan based funding source for drinking water systems. The DWSRF provides funding to correct public water system deficiencies based upon a prioritized funding approach that addresses the systems' problems that pose public health risks, and systems with needs for funding to comply with the requirements of the Safe Drinking Water Act.

The Sierra Park community is not considered a disadvantaged community. As such, the SPWC does not qualify for grants funding under the SRF program. Non-disadvantaged systems are eligible for the standard DWSRF/Prop 1 financing terms – specifically, a 20 year loan with an interest rate of 1.60%. [The interest rate changes each January 1st; the 1.60% noted above is current as of this report.]

Water system improvements eligible under this program relevant to the recommendations discussed in this report include treatment system, distribution system, pipeline extension, SCADA system, and water meter projects.

The process to apply for this funding program is to complete a planning application for submittal to the State for the proposed improvements. Engineering design services, environmental services, labor compliance, rate studies, legal fees, land acquisition, and project planning are eligible for loan funding under the program. Once the planning project is complete, a construction application for funding is submitted to the State.

A similar potential funding source is the United States Department of Agriculture (USDA) Rural Development (RD) Program. The main difference between the USDA loan and DWSRF loan is the loan term. The RD program loan term is 40 years.

7 Improvement Prioritization and Schedules

Prioritization of each recommended improvement is done to maximize the benefits to the community while considering the urgency of addressing system deficiencies in order to comply with the system priorities.

7.1 Prioritization of Improvements

The following summarizes the recommended prioritization of improvement projects:

(1) Iron and Manganese Treatment Improvement Project
(2) Fire Flow Hydraulic Network Analysis
(3) Water Meter Improvement Project
(4) SCADA Improvement Project

The estimated scheduled for the duration of each project includes a planning, design, and construction phase and accounts for time to apply for the planning and construction phases. Project durations can be reduced significantly if program funding is not needed. Additionally, applications for funding for each improvement project can be submitted concurrently.

7.1.1 Iron and Manganese Treatment Improvement Project

Treatment to mitigate iron and manganese exceedance levels present in the groundwater supply is ranked the highest priority project as the State has issued several water quality violations to SPWC and levels have been present in the groundwater supply source consistently since 1989 for Well No. 5 and 2005 for Well No. 6. Due to the high capital cost to construct several miles of water infrastructure for extension of water service from another water system, consolidation is not considered a feasible option to mitigate water quality.

Table 7-1 includes the estimated project schedule to complete the project from the date the work is authorized. A feasibility study is included in the planning stage to evaluate treatment compared to consolidation. The total estimated project duration is 36 months.

Table 7-1 - Water Quality Planning Study Improvement Project Schedule

Task	Expected Time of Completion from the Date the Work is Authorized
Submit Planning Funding Application	1 month
Executed Funding Agreement	7-9 months
Preliminary Design and Field Investigation	9-12 months
Environmental Document	12 months
Provide Final Plans and Specifications	13-16 months
Project Approval	16-18 months
Submit Construction Funding Application	19 months
Executed Funding Agreement	25 months
Project Bidding and Award	26-29 months
Construction	30-32 months
Project Inspection and Completion	40 months

7.1.2 Fire Flow Hydraulic Network Analysis

The fire flow hydraulic network analysis improvement project is ranked the second priority improvement project. However, the analysis can be done concurrently with the planning phases for the water quality planning project. It is recommended that replacement of inaccessible stand pipe hydrants be delayed until results of the fire flow analysis is complete.

Table 7-2 includes the estimated project schedule to complete the project from the date the work is authorized.

Table 7-2 - Fire Flow Hydraulic Network Analysis Project Schedule

Task	Expected Time of Completion from the Date the Work is Authorized
Submit Planning Funding Application	1 month
Executed Funding Agreement	7-9 months
Topographic Field Survey	10-11 months
Model Development and Calibration	10-11 months
Hydraulic Network Analysis	11-12 months
Project Approval	13 months

Project phasing for recommended pipeline improvements will be included in the analysis.

7.1.3 Water Meter Improvement Project

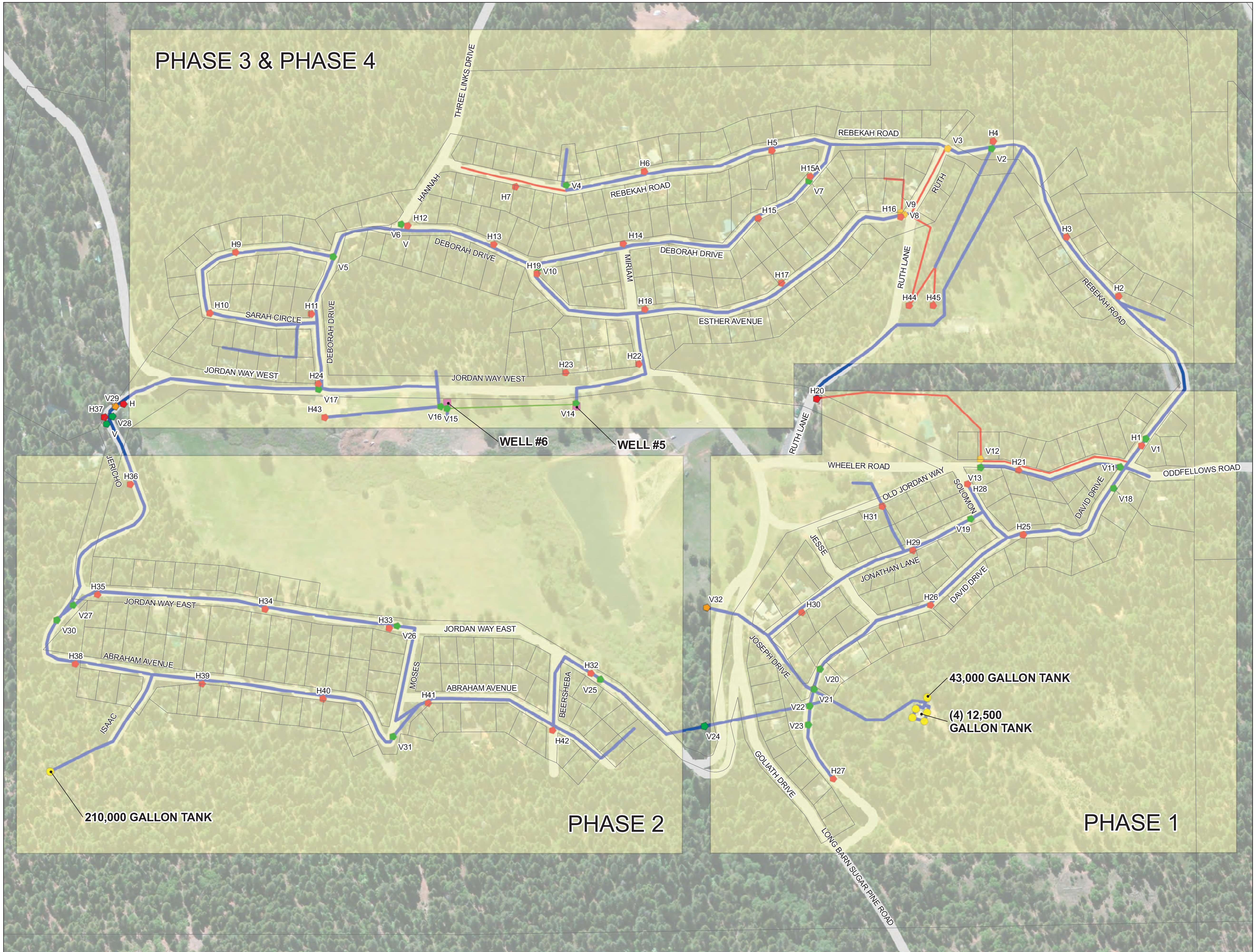
The water meter improvement project is ranked the third priority improvement project, as the CPUC CPNC directed the SPWC to develop a schedule for the installation of water meters. Due to the high number of water meters to be installed, it is recommended that construction be completed in four phases. Figure 7-1 presents a map of the proposed construction phasing, with the first phase of construction starting at the residences on the northeast side of the community. The second phase of construction includes the residences at the southeast side of the community. The last two phases of construction includes the residences at the western side of the community. It is recommended that replacement of inoperable isolation valves be completed with the water meter construction project

Table 7-3 includes the estimated project schedule to complete the project from the date the work is authorized. The estimated duration to complete the engineering phase and award a project for construction is 23 months. Phase construction will be scheduled at two phases per year during the off-peak season for vacation during the spring months and fall months, weather permitting.

FIGURE 7-1
SIERRA PARK WATER COMPANY

WATER METER IMPROVEMENT PROJECT CONSTRUCTION PHASING

TUOLUMNE COUNTY, CA



Legend

- Phase Area
- 2" Valve
- 4" Valve
- Hydrant
- Well Site
- Tank
- 2" Water Main
- 4" Water Main
- 6" Water Main

N

0 125 250 500 Feet

BLACKWATER CONSULTING ENGINEERS, INC.

Table 7-3 - Water Meter Improvement Project Schedule

Task	Expected Time of Completion from the Date the Work is Authorized
Submit Planning Funding Application	1 month
Executed Funding Agreement	7-9 months
Preliminary Design and Field Investigation	9-11 months
Environmental Document	10 months
Provide Final Plans and Specifications	12 months
Project Approval	12-15 months
Submit Construction Funding Application	16 months
Executed Funding Agreement	17-19 months
Project Bidding and Award	20-23 months
Construction Phase 1/2	24-36 months (2 phases per year)
Construction Phase 3/4	36-48 months (2 phases per year)
Project Inspection and Completion	48 months

7.1.4 SCADA Improvement Project

The SCADA improvement project is ranked the fourth priority improvement project. However, the improvements are not considered critical to operation of the system. Depending on the recommended capital improvement determined from the fire flow hydraulic network analysis, the SCADA improvement project may be reprioritized.

Table 7-4 includes the estimated project schedule to complete the project from the date the work is authorized.

Table 7-4 - SCADA Improvement Project Schedule

Task	Expected Time of Completion from the Date the Work is Authorized
Submit Planning Funding Application	1 month
Executed Funding Agreement	7-9 months
Preliminary Design and Field Investigation	9-12 months
Environmental Document	12 months
Provide Final Plans and Specifications	13-16 months
Project Approval	16-18 months
Submit Construction Funding Application	19 months
Executed Funding Agreement	22 months
Project Bidding and Award	23-26 months
Construction	26-28 months
Project Inspection and Completion	36 months

8 References

[1] *Engineering Report for the Consideration of a Permit for the Sierra Park Water Company,* California Department of Public Health, July 2013.

[2] Water Supply Permit No. 3-11-13P-015, California Department of Public Health, July 19, 2013.

[3] *Decision 16-01-047 Resolving a Complaint and Authorizing a Certificate of Public Convenience and Necessity as Modified,* Public Utilities Commission of the State of California, January 28, 2016.

[4] *Odd Fellows Recreation Association Water Facilities Capital Expenditures Report*, Dominichelli & Associates Civil Engineering, February 6, 2013.

[5] Sierra Park Water Company Water Production Data, 2004-2015.

[6] 2012 Survey Data, Golden State Surveying and Engineering, Inc.

[7] Inspection Reports for Odd Fellow Sierra Recreation Association, Long Barn, CA, *Inland Potable Services Inc.*, July 4, 2010.

[8] *An in depth look into iron and manganese treatment.* Greg Gilles. Water Technology. February 2012.