SCV WATER

June 2021

2020 Urban Water Management Plan for Santa Clarita Valley Water Agency

(Los Angeles County Waterworks District No. 36/Cooperating Agency)

VOLUME 2 FINAL

APPENDICES K - M

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Appendix K: Consistency with Delta Plan Policy WR P1

Appendix K:
Data to Document Consistency with Delta Plan Policy WR P1

As stated in the 2020 UWMP Guidebook Appendix C (Final version dated April 2021):

> "An urban water supplier (Supplier) that anticipates participating in or receiving water supply benefits from a proposed project (covered action[1)] such as a multi-year water transfer, conveyance facility, or new diversion that involves transferring water through, exporting water from, or using water in the Sacramento-San Joaquin Delta (Delta) should provide information in their 2015 and 2020 Urban Water Management Plans (UWMP's) that can then be used in the covered action process to demonstrate consistency with Delta Plan Policy WR P1, *Reduce Reliance on the Delta Through Improved Regional Water Self-Reliance* (California Code Reg., tit. 23, § 5003)."

WR P1 subsection (c)(1) further defines what adequately contributing to reduced reliance on the Delta means in terms of (a)(1) above.

> "(c)(1) Water suppliers that have done all the following are contributing to reduced reliance on the Delta and improved regional self-reliance and are therefore consistent with this policy:
>
> > (A) Completed a current Urban or Agricultural Water Management Plan (Plan) which has been reviewed by the California Department of Water Resources for compliance with the applicable requirements of Water Code Division 6, Parts 2.55, 2.6, and 2.8;
> >
> > (B) Identified, evaluated, and commenced implementation, consistent with the implementation schedule set forth in the Plan, of all programs and projects included in the Plan that are locally cost effective and technically feasible which reduce reliance on the Delta; and
> >
> > (C) Included in the Plan, commencing in 2015, the expected outcome for measurable reduction in Delta reliance and improvement in regional self-reliance. The expected outcome for measurable reduction in Delta reliance and improvement in regional self-reliance shall be reported in the Plan as the reduction in the amount of water used, or in the percentage of water used, from the Delta watershed. For the purposes of reporting, water efficiency is considered a new source of water supply, consistent with Water Code section 1011(a)."

[1] Cal. Code Regs., tit. 23, § 5001, subd. (j): A "Covered action" is defined as "an activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, or a reasonably foreseeable indirect physical change in the environment … "directly undertaken by any public agency""(Pub. Resources Code, § 21065) that (i) will occur, in whole or in part, within the boundaries of the Delta or Suisun Marsh, (ii) will be carried out, approved, or funded by the state or a local public agency, (iii) is covered by one or more provisions of the Delta Plan, and (iv) will have a significant impact on achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs to reduce risks to people, property, and state interest in the Delta."

Preparation of UWMPs and Implementation of Projects from the UWMP

SCV Water completed and submitted to DWR, 2005, 2010, and 2015 Urban Water Management Plans, in addition to this 2020 UWMP. SCV Water has identified, evaluated and implemented projects that are locally cost effective and technically feasible which improve local reliability and reduce reliance on the Delta.

Expected Outcomes for Measurable Reduction in Delta Reliance

The expected outcomes for SCV Water's Delta reliance and regional self-reliance were developed based on the approach and guidance described in Appendix C of DWR's Urban Water Management Plan Guidebook 2020 and are summarized in Tables K-1 to K-4 below. This involves setting a baseline and evaluating normal year water demands (potable and non-potable), estimating service area population and water use in gallons per capita per day, evaluating and projecting water supply sources to meet estimated normal year demands including supplies from the Delta, local groundwater, conjunctive use projects, surface water, transfers and exchanges, and non-potable supplies. Inputs to Table K-1, K-2, and K-3 include:

- **Baseline**. In order to calculate the expected outcomes for measurable reduction in Delta reliance and improved regional self-reliance, a baseline is needed to compare against. For consistency with conversations had with DWR, SCV Water is using year 2010 as the baseline year. This analysis uses a normal water year representation of 2010 as the baseline. Data for the 2010 baseline were taken from SCV Water's 2005 UWMP as the UWMPs generally do not provide normal water year data for the year that they are adopted (i.e., 2005 UWMP forecasts normal year 2010, 2010 UWMP forecasts normal year 2015, and so on).

- **Service Area Demands**. Service area demands, including demands for non-potable water, for 2010, 2015, and 2020 were taken from projections from the previous (2005, 2010, and 2015) UWMPs. Service area demands 2025 to 2045 were taken from projections developed as part of the 2020 UWMP.

- **Service Area Population**. Consistent with the methodology for service area demands (using normal year projections from the previous UWMP), service area population for 2010 were taken from the previous (2005) UWMP. Consideration was given to using 2010 UWMP service area population projections for 2015 but because the 2015 UWMP had the benefit of complete Census data, year 2015 population data was taken from the 2015 UWMP. 2020 service area population projections were taken from the 2015 UWMP. Year 2025-2045 service area demands were taken from the 2020 UWMP.

The outcome of Table K-1 is a calculation of water use efficiency since the baseline year (2010). The calculation uses the change in gallons per capita per day and service area population to estimate water use efficiency in years 2015 through 2045 compared to the baseline year of 2010.

Supplies Contributing to Regional Self-Reliance. In Table K-2, the estimate of water use efficiency is taken from Table K-1. Other water supplies, such as groundwater, a non-Delta tributary transfer and recycled water were taken from previous UWMPs (2005 projections were used for 2010 etc.) For years 2025-2045 supplies were taken from projections prepared for the

2020 UWMP.(Note that a correction was made to 2010 value for Local and Regional Water Supply and Storage Projects. The 2005 UWMP incorrectly reported the entire Alluvial Aquifer basin yield as being available for water municipal purveyor use instead of reducing that quantity used by non-purveyors such as agriculture and other private well owners. Accordingly, the 35,000 AF basin yield amount was reduced by 15,000 AF to account for non-Agency use by agriculture and other users leaving 20,000 AFY for municipal purveyor use. That modified value along with Saugus Formation groundwater and Buena Vista/Rosedale-Rio Bravo Transfer resulted in the reported supply)

The outcome of Table K-2 is an estimate of the supplies contributing to regional self-reliance.

- **SWP Contract Supplies**. SWP contract supplies were estimated based on the percentage of Delta supplies provided as a percent of overall imported supplies from the State Water Project. Given that all of SCV Water's imported supplies come directly from DWR, data provided in the 2019 Delivery and Capability Report was utilized to estimate the percentages of supplies from the Delta watershed.

The outcome of Table K-3 is a calculation of the percent change in supplies from the Delta watershed relative to the 2010 Baseline.

Table K-3 illustrates that from 2010 to 2015, SCV Water reduced reliance on the Delta and is projected to have a net reduction in reliance on the Delta from the baseline, through year 2050.

Reduced Reliance Calculation - Data Template

Table K-1: Optional Calculation of Water Use Efficiency -To be completed if Water Supplier does not specifically estimate Water Use Efficiency as a supply

Service Area Water Use Efficiency Demands (Acre-Feet)	Baseline (2010)[b]	2015[b]	2020[b]	2025	2030	2035	2040	2045 (Optional)
Service Area Water Demands with Water Use Efficiency Accounted For[a]	91,450	72,343	68,900	76,400	81,700	88,700	93,600	97,500
Non-Potable Water Demands	500	1,250	565	1,850	3,670	5,540	6,950	7,950
Potable Service Area Demands with Water Use Efficiency Accounted For[a]	90,950	71,093	68,335	74,550	78,030	83,160	86,650	89,550

Total Service Area Population	Baseline (2010)[b]	2015[b]	2020[b]	2025	2030	2035	2040	2045 (Optional)
Service Area Population	301,774	272,500	289,100	332,100	362,100	392,500	411,900	422,100

Water Use Efficiency Since Baseline (Acre-Feet)	Baseline (2010)[b]	2015[b]	2020[b]	2025	2030	2035	2040	2045 (Optional)
Per Capita Water Use (GPCD)	269	233	211	200	192	189	188	189
Change in Per Capita Water Use from Baseline (GPCD)		(36)	(58)	(69)	(77)	(80)	(81)	(80)
Estimated Water Use Efficiency Since Baseline		11,034	18,795	25,540	31,101	35,133	37,490	37,664

[a]Demands with water use efficiency is equivalent to demands with active and passive conservation.
[b]Data for 2010, 2015, and 2020 were taken from projections from the previous (2005, 2010, and 2015) UWMPs. See additional details in text.

Table K-2: Calculation of Service Area Water Demands Without Water Use Efficiency

Total Service Area Water Demands (Acre-Feet)	Baseline (2010)[c]	2015[c]	2020[c]	2025	2030	2035	2040	2045 (Optional)
Service Area Water Demands with Water Use Efficiency Accounted For[a]	91,450	72,343	68,900	76,400	81,700	88,700	93,600	97,500
Reported Water Use Efficiency or Estimated Water Use Efficiency Since Baseline		11,034	18,795	25,540	31,101	35,133	37,490	37,664
Service Area Water Demands without Water Use Efficiency Accounted For[b]	91,450	83,377	87,695	101,940	112,801	123,833	131,090	135,164

[a]Demands with water use efficiency is equivalent to demands with active and passive conservation.
[b]Demands without water use efficiency is equivalent to demands with no (active or passive) conservation.
[c]Data for 2010, 2015, and 2020 were taken from projections from the previous (2005, 2010, and 2015) UWMPs. See additional details in text.

Table K-3: Calculation of Supplies Contributing to Regional Self-Reliance

Water Supplies Contributing to Regional Self-Reliance (Acre-Feet)	Baseline (2010)[a]	2015[a]	2020[a]	2025	2030	2035	2040	2045 (Optional)
Water Use Efficiency		11,034	18,795	25,540	31,101	35,133	37,490	37,664
Water Recycling	500	1,250	565	1,850	3,670	5,540	6,950	7,950
Stormwater Capture and Use								
Advanced Water Technologies								
Conjunctive Use Projects								
Local and Regional Water Supply and Storage Projects[b]	42,000	44,600	47,755	48,880	49,450	52,190	52,190	52,190
Other Programs and Projects the Contribute to Regional Self-Reliance								
Water Supplies Contributing to Regional Self-Reliance	42,500	56,884	67,115	76,270	84,221	92,863	96,630	97,804

Table K-3: Calculation of Supplies Contributing to Regional Self-Reliance (Continued)

Service Area Water Demands without Water Use Efficiency[c] (Acre-Feet)	Baseline (2010)[a]	2015[a]	2020[a]	2025	2030	2035	2040	2045 (Optional)
Service Area Water Demands without Water Use Efficiency Accounted For	91,450	83,377	87,695	101,940	112,801	123,833	131,090	135,164

Change in Regional Self Reliance (Acre-Feet)	Baseline (2010)[a]	2015[a]	2020[a]	2025	2030	2035	2040	2045 (Optional)
Water Supplies Contributing to Regional Self-Reliance	42,500	56,884	67,115	76,270	84,221	92,863	96,630	97,804
Change in Water Supplies Contributing to Regional Self-Reliance		14,384	24,615	33,770	41,721	50,363	54,130	55,304

Percent Change in Regional Self Reliance (As Percent of Demand w/out WUE)	Baseline (2010)[a]	2015[a]	2020[a]	2025	2030	2035	2040	2045 (Optional)
Percent of Water Supplies Contributing to Regional Self-Reliance	46.5%	68.2%	76.5%	74.8%	74.7%	75.0%	73.7%	72.4%
Change in Percent of Water Supplies Contributing to Regional Self-Reliance		21.8%	30.1%	28.3%	28.2%	28.5%	27.2%	25.9%

[a]Data for 2010, 2015, and 2020 were taken from projections from the previous (2005, 2010, and 2015) UWMPs. See additional details in text.
[b]Water supplies include normal year Purveyor Alluvial and Saugus groundwater totals and BVRRB supply.
[c]Demands without water use efficiency is equivalent to demands with no (active or passive) conservation.

Table K-4: Calculation of Reliance on Water Supplies from the Delta Watershed

Water Supplies from the Delta Watershed (Acre-Feet)	Baseline (2010)[b]	2015[b]	2020[b]	2025	2030	2035	2040	2045 (Optional)
CVP/SWP Contract Supplies	67,600	58,100	58,800	55,220	53,310	51,410	49,500	49,500
Delta/Delta Tributary Diversions								
Transfers and Exchanges								
Other Water Supplies from the Delta Watershed								
Total Water Supplies from the Delta Watershed	67,600	58,100	58,800	55,220	53,310	51,410	49,500	49,500

Service Area Water Demands without Water Use Efficiency (Acre-Feet)	Baseline (2010)[b]	2015[b]	2020[b]	2025	2030	2035	2040	2045 (Optional)
Service Area Water Demands without Water Use Efficiency Accounted For[a]	91,450	83,377	87,695	101,940	112,801	123,833	131,090	135,164

Change in Supplies from the Delta Watershed (Acre-Feet)	Baseline (2010)[b]	2015[b]	2020[b]	2025	2030	2035	2040	2045 (Optional)
Water Supplies from the Delta Watershed	67,600	58,100	58,800	55,220	53,310	51,410	49,500	49,500
Change in Water Supplies from the Delta Watershed		(9,500)	(8,800)	(12,380)	(14,290)	(16,190)	(18,100)	(18,100)

Percent Change in Supplies from the Delta Watershed (As a Percent of Demand w/out WUE)	Baseline (2010)[b]	2015[b]	2020[b]	2025	2030	2035	2040	2045 (Optional)
Percent of Water Supplies from the Delta Watershed	73.9%	69.7%	67.1%	54.2%	47.3%	41.5%	37.8%	36.6%
Change in Percent of Water Supplies from the Delta Watershed		-4.2%	-6.9%	-19.8%	-26.7%	-32.4%	-36.2%	-37.3%

[a]Demands without water use efficiency is equivalent to demands with no (active or passive) conservation.

[b]Data for 2010, 2015, and 2020 were taken from projections from the previous (2005, 2010, and 2015) UWMPs. See additional details in text.

Appendix L: Reporting of Energy Intensity of Water

Urban Water Supplier: *Santa Clarita Valley Water Agency*

Table O-1C: Recommended Energy Reporting - Multiple Water Delivery Products

Enter Start Date for Reporting Period: 1/1/2020

End Date: 12/31/2020

☐ Is upstream embedded in the values reported?

			Urban Water Supplier Operational Control							
			Water Management Process						Non-Consequential Hydropower (if applicable)	
			Extract and Divert	Place into Storage	Conveyance	Treatment	Distribution	Total Utility	Hydropower	Net Utility
Water Volume Units	*Total Volume of Water Entering Process (volume units)*						*65996.04*	*N/A*		*N/A*
AF		*Retail Potable Deliveries (%)*					*97%*			
		Retail Non-Potable Deliveries (%)					*1%*			
		Wholesale Potable Deliveries(%)					*2%*			
		Wholesale Non-Potable Deliveries (%)					*0%*			
		Agricultural Deliveries (%)					*0%*			
		Environmental Deliveries (%)					*0%*			
		Other (%)					*0%*			
		Total Percentage [must equal 100%]	*0%*	*0%*	*0%*	*0%*	*100%*	*N/A*	*0%*	*N/A*
		Energy Consumed (kWh)					*56403587*	*56403587*		*56403587*
		Energy Intensity (kWh/vol. converted to MG)	*0.0*	*0.0*	*0.0*	*0.0*	*2622.8*	*N/A*	*0.0*	*N/A*

Water Delivery Type			*Production Volume (volume units defined above)*	*Total Utility (kWh/volume)*	*Net Utility (kWh/volume)*
		Retail Potable Deliveries	*64266.14*	*854.7*	*854.7*
		Retail Non-Potable Deliveries	*468*	*854.7*	*854.7*
		Wholesale Potable Deliveries	*1261.9*	*854.7*	*854.7*
		Wholesale Non-Potable Deliveries	*0*	*0.0*	*0.0*
		Agricultural Deliveries	*0*	*0.0*	*0.0*
		Environmental Deliveries	*0*	*0.0*	*0.0*
		Other	*0*	*0.0*	*0.0*
		All Water Delivery Types	*65996.04*	*854.7*	*854.7*

Quantity of Self-Generated Renewable Energy

0 kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

Combination of Estimates and Metered Data

Data Quality Narrative:

The energy data provided herein is based on metered data for the 2020 year for the SCV Water facilities, including pump stations, reservoirs/tanks, wells, and treatment plants (inluding water reclamation). Efforts were made to differentiate between recycled water a potable energy use, as well as to exclude energy consumption related to administration buildings. For that reason, the data quality is cosidered to be a combination of estimates and metered data. In addition, data was not readily available to distinguish the distribution of water volumes and energy use by water management process. As such, the total 2020 energy use data was reported as a total under "Distribution" along with the total water use volumes

Narrative:

Water volumes reported herein were only broken down by delivery types, however data was not readily available to further breakdown water supplies by management process. However, both water supply volumes and energy consumption data captures a range of management processes, including well production, pumping, treatment, storage and distribution processes.

Appendix M: Groundwater Treatment Plan

19 April 2021

Final Technical Memorandum

To: Dirk Marks, Ernesto Velazquez - SCV Water

From: Ganesh Rajagopalan, Ph.D., P.E., BCEE; Alan Bracewell, EIT – Kennedy Jenks Consultants

Subject: Santa Clarita Valley Water Agency, Groundwater Treatment Implementation Plan KJ 2044401*00

1. Purpose

The objective of this project is to perform a feasibility evaluation for compliance of perchlorate, and PFAS impacted SCV Water wells, develop planning level treatment costs, and update Tables in Chapter 3 of 2015 Urban Water Master Plan (UWMP). Further, the data thus developed will support development of relevant Tables in 2020 UWMP.

2. Background

Santa Clarita Valley Water Agency (SCV Water) provides municipal water for approximately 273,000 residents with a combination of imported water, local groundwater and recycled water supplies. Nearly half of SCV Water's demands are met with groundwater from Alluvial and Saugus formations in the Santa Clara Valley East Sub-basin. In 2018, SCV Water provided 65,200 acre feet (AF) to municipal customers within its 195 square mile service area.

In the 2015 Urban Water Management Plan (UWMP), SCV Water evaluated the long-term water needs (water demand) within its service area based on applicable population projections and county and city land use plans and has compared these needs against existing and potential water supplies. Based on the evaluation, the population in SCV Water service area is expected to expand to 421,400 by 2050 with water demand increasing to 93,900 acre feet per year (AFY), which is nearly a 42% increase from the 2018 demand level.

In addition to the UWMP, in the interim years between UWMP cycles, SCV Water assesses the long-term reliability of its supplies through its water supply reliability plans and annual water reports. The primary objectives of the UWMPs are to identify water supply opportunities, evaluate opportunities using uniform economic criteria, evaluate reliability risks under multiple supply and demand conditions, and to ultimately recommend a water supply reliability strategy that focuses SCV Water's efforts on the most cost effective and beneficial opportunities.

Perchlorate has been a water quality concern in the Santa Clarita Valley since 1997 when it was originally detected in four wells operated by the purveyors in the eastern part of the Saugus Formation. Since then, perchlorate has been detected at elevated levels in eight wells, six of which are in Saugus formation and two in Alluvial formation. Some wells are subjected to impaired water (97-005) compliance requirements, while others are currently in operation with a California Division of Drinking Water (DDW) approved monitoring program. SCV Water has sealed and replaced the capacity of some perchlorate impacted wells with new wells, and it has treated some of the wells and brought them online. Some of the perchlorate measured wells are

currently in operation due to relatively lower levels of perchlorate, while others are currently offline awaiting installation (or permit) of treatment process.

SCV Water's water supply permit for the Saugus Perchlorate Treatment Facility, sets an operational goal of no volatile organic compounds (VOCs) above the detection limit for reporting (DLR) in its distribution system. VOCs have been measured in trace levels in some of the SCV Water wells. Trichloroethylene (TCE) represents the major VOC constituent measured in SCV Water wells. Tetrachloroethylene (PCE) has also been detected in a few samples. However, the measured levels of these constituents in SCV Wells are below their respective MCLs.

Recently, the United States Environmental Protection Agency (USEPA) implemented a new lifetime health advisory level of 70 parts per trillion (or 70 nanogram per liter (ng/L)) for the combined concentrations of two long chained per- and polyfluoroalkyl substances (PFAS), perfluorooctonoic acid (PFOA) and perflurooctane sulfonate (PFOS) in drinking water. In August 2019, the DDW set a notification level (NL) of 5.1 and 6.5 ng/L for PFOA and PFOS, respectively. Subsequently, in February 2020, the DDW set a response level (RL) of 10 ng/L for PFOA and 40 ng/L for PFOS, based on a running annual average (RAA). RL is the concentration at which DDW recommends that a well is taken out of service, pending treatment. If a chemical concentration is greater than its notification level in drinking water (but below the response level) that is provided to consumers, DDW recommends that the utility inform its customers and consumers about the presence of the chemical, and about health concerns associated with exposure to it. Finally, potential regulatory limits for several short chain PFAS compounds are currently undecided.

SCV Water sampled several wells for PFAS levels in accordance with an Order issued by DDW in March 2019. PFOA and/or PFOSs were present above their respective detection levels in over 35 wells. Initial samples collected from one well (Valley Center), exceeded the EPA RL of 70 ng/L for combined levels of PFOA and PFOS and the well was immediately taken out of service. PFOA and/or PFOS levels higher than NL and RLs were observed in over 60% of the wells. Subsequent public notifications were provided to SCV Water customers and wells were taken out of service in response to the DDW revised RL. After the RL for PFOA and PFOS were lowered in February 2020, SCV Water proactively shutdown numerous wells that were anticipated to exceed the RAA for either PFOA or PFOS. Hence, several SCV Water groundwater wells may require compliance action to reliably meet the future water supply demands as identified in the UWMP.

Recognizing the existing water quality issues that affect the local groundwater, from perchlorate and VOCs, and now the addition of PFAS, SCV Water needs to re-evaluate and update the technical, environmental, and economic issues associated with its groundwater supply in order to develop a groundwater treatment and implementation plan to bring impacted water back to potable water quality standards suitable for delivery to its customers. This plan must be consistent with the updated demand projections in the 2015 UWMP, provide flexibility to meet demands in the upcoming 2020 UWMP, and be sufficient to support the necessary groundwater sustainability requirements provided in SB610/221 analyses.

Further, groundwater treatment and implementation must be developed consistent with SCV Water's Groundwater Sustainability Plan (GSP), such that any relevant information pertaining to the adequacy, availability, and sustainability of supplies be consistent with the GSP and GSP implementation plan.

The objective of this project is to perform a feasibility evaluation for compliance of perchlorate, and PFAS impacted SCV Water wells, develop planning level treatment costs, and update Tables in Chapter 3 of 2015 UWMP. While VOCs are measured in trace levels in some of SCV Water's wells, this study will not include compliance of VOCs since the measured levels of the

constituents are below the MCLs. However, SCV Water does intend to address VOCs as part of the drinking water permitting process.

The specific tasks of this study include identifying representative perchlorate, and PFAS concentrations for SCV Water's wells, set treatment thresholds, identify impacted wells, identify compliance options, develop planning level treatment costs, identify prioritization of wells requiring compliance, develop a phasing plan and update Chapter 3 Tables in 2015 UWMP accordingly.

3. SCV Water Groundwater Treatment Thresholds, Quality and Flow Rates

3.1 Identification of Constituents of Concern (COCs) Concentrations in SCV Water Wells

The key constituents of concern for this study are perfluorooctonoic acid (PFOA), perflurooctane sulfonate (PFOS), and perchlorate. Water quality data from 2014 to 2019 (except that for 2017) were used to develop representative concentrations of various parameters. The 2017 groundwater supply data was not included since in this year SCV Water purposely reduced groundwater production in order to allow the basin to recover and take full advantage of the large SWP allocation. For PFOA and PFOS, the running average for the last four quarters was used to develop representative concentrations for SCV Water's wells. For wells that did not have four quarters worth of PFAS data, the average of available PFAS data was used to develop representative concentrations. For perchlorate, maximum measured concentrations were used as representative concentrations.

3.2 Treatment Threshold

To determine whether or not treatment would be required, a Treatment Threshold was established. Wells whose PFAS or perchlorate levels exceeded their respective threshold levels were identified for compliance cost estimation in this study. For PFOA and PFOS, 80% of the California Division of Drinking Water (DDW) RL was set as the treatment threshold. Accordingly, a treatment threshold of 8 and 32 ng/L was set for PFOA and PFOS. For perchlorate, the treatment threshold is set as 80% of the MCL. The MCL for perchlorate is 6 µg/L, and a treatment threshold of 4.8 µg/L was set. Further, SCV Water's preliminary operations budget estimates were used to guide the development of operation and maintenance (O&M) cost estimates for perchlorate compliance. Table 1 shows the regulatory levels and the treatment thresholds for the key constituents for the COCs for this study.

Table 1: Regulatory Levels and Treatment Thresholds for PFAS and Perchlorate

Compound	Regulatory Type	Regulatory Level	Treatment Threshold
Perfluorooctonoic acid (PFOA)	DDW Response Level (RL)	10 ng/L	8 ng/L
Perflurooctane sulfonate (PFOS)	DDW Response Level (RL)	40 ng/L	32 ng/L
Perchlorate	Maximum Contaminant Level (MCL)	6 ppb	4.8 ppb

3.3 Impacted SCV Water Wells

3.3.1 Wells Impacted for PFAS

The wells where the representative concentration exceeded the treatment thresholds were identified as the impacted wells for this study. Table 2 shows the representative COC levels for PFAS and perchlorate in various wells, and the list of impacted wells requiring compliance. The maximum measured PFAS (PFOA and/or PFOS) levels exceeded treatment thresholds in 26 of SCV Water's wells. In addition, the proposed well S9 and existing wells E-14 and E-16 are located in proximity of PFAS impacted wells, and are included for cost evaluation in this study since it is suspected that the PFAS levels may potentially exceed the treatment threshold in the future. Hence, these well are also included for compliance cost evaluation in this study. Figure 1 shows SCV Water's wells impacted by PFAS.

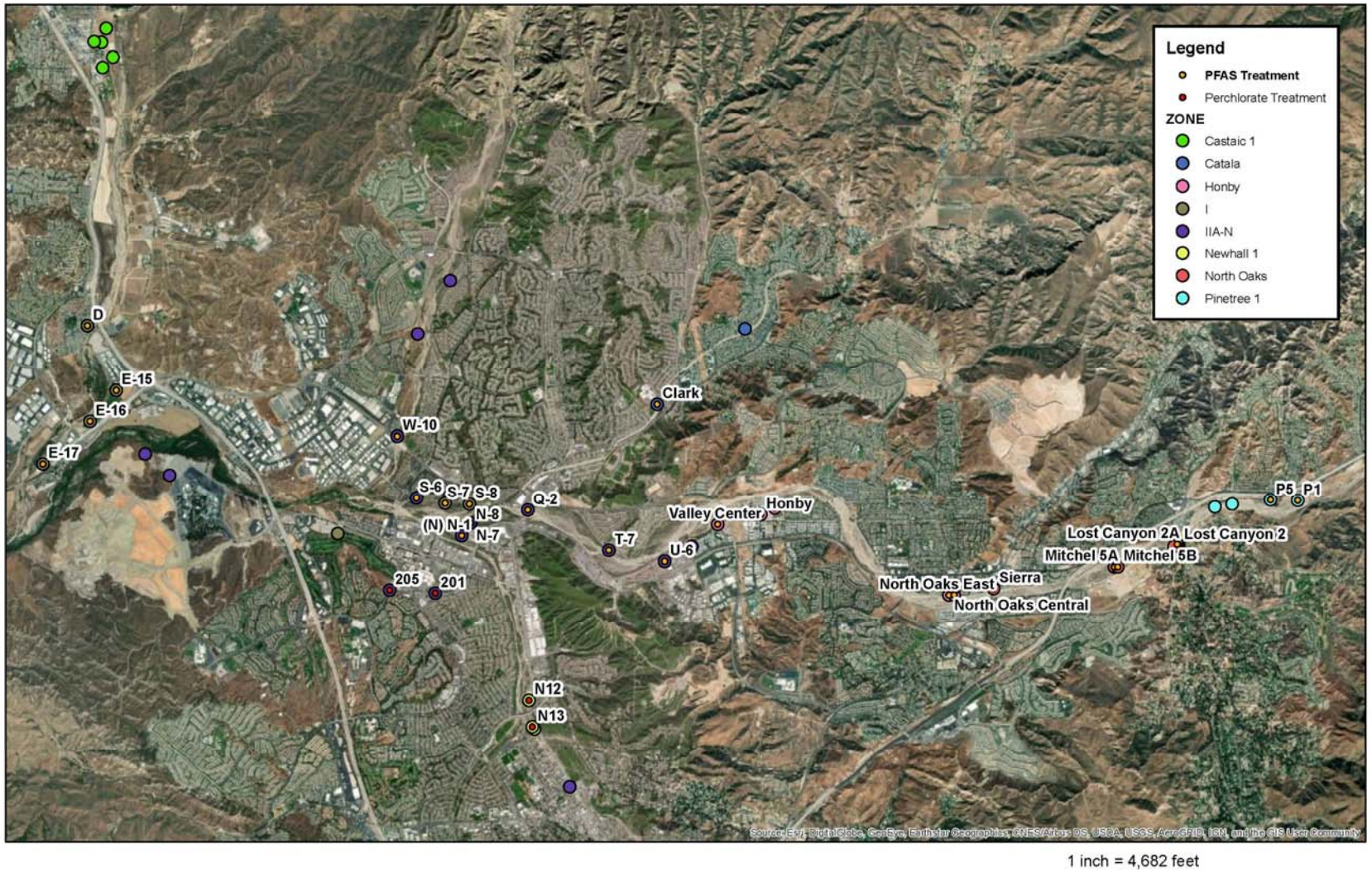


Figure 1. PFAS and perchlorate impacted wells at SCV Water

3.3.2 Wells Impacted for Perchlorate

The water quality data from 2014 to 2019 (except 2017) is summarized in Table 2 and was used in association with SCV Water's past efforts to identify perchlorate impacted wells for compliance evaluation in this study. The 2015 UWMP and 2019 Santa Clarita Valley Water report identified eight wells that contained perchlorate. Of these, Wells 157 and Stadium wells were sealed and replaced by new wells. Additionally, treatment systems have been installed for Saugus wells 1 and 2, and these wells are currently in operation. Well NC-11 has remained out of service with a portion of its capacity replaced by a combination of imported water supplies and treated water from CLWA's Saugus Perchlorate Treatment Facility. Hence, these wells are not included for evaluation in this study.

A perchlorate treatment system is currently installed for Well V-201 and SCV Water is currently awaiting a permit from DDW for operation of the treatment system. Planning and CEQA for Well V205 is currently in progress. Well Q2 is currently not in operation due to higher levels of perchlorate and was therefore included in this study. Wells V201, V205 and Q2 are subjected to impaired water (97-005) compliance requirements.

Perchlorate levels in Newhall Wells 12 and 13 are currently below the detection limit for reporting (DLR). However, DDW is in the process of lowering the current DLR of 4ug/L to 2 ug/L and subsequently to 1ug/L by 2024. In addition, it is expected that DDW may lower the MCL for perchlorate which may impact Newhall Wells 12 and 13. While it is currently unclear if perchlorate MCL will be lowered, Newhall Wells 12 and 13 were also included for perchlorate compliance in this study. In this study, the compliance costs for these wells were estimated assuming these wells may be subjected to 97-005 (i.e. similar sampling and operating conditions similar to other wells subjected to 97-005), however, it is likely that these wells may not be subjected to 97-005 requirements. SCV Water wells impacted by perchlorate are shown in Figure 1 and Table 2.

3.4 Well Flow Rates

A review of SCV Water documents indicated that the design capacity for some of the groundwater wells differed from their maximum permitted flow rates. For this study, the design flow rates for SCV Water's wells were identified as the lower of the design capacity and the maximum permitted capacity for each well. The flows will serve as a basis for developing treatment requirements for each impacted well and the associated cost estimates for implementing treatment. Table 2 summarizes the flow rates for the SCV Water's impacted wells.

Table 2: PFAS and Perchlorate Impacted Wells and Flow Rates

Division	Well	Zone	Flow (GPM)	PERFLUOROOCTANE SULFONIC ACID (PFOS) (ng/L) RL: 40, TAL: 32			PERFLUOROOCTANOIC ACID (PFOA) (ng/L) RL: 10, TAL: 8			PERCHLORATE (UG/L) MCL: 6 TAL: 4.8		
				Min	Max	Average	Min	Max	Average	Min	Max	Average
Wells Primarily Impacted for PFAS												
PINETREE	WELL 01	Pinetree 1	300	5.7	37.0	21.1	0.0	14.0	10.2	ND	ND	ND
PINETREE	WELL 05	Pinetree 1	500	8.0	10.0	9.0	5.9	13.0	10.4	ND	ND	ND
SANTA CLARITA	CLARK WELL - 15	Catala	550	12.0	13.0	12.5	26.0	27.0	26.5	ND	ND	ND
SANTA CLARITA	HONBY WELL 12	Honby	950	9.8	16.0	13.3	13.0	22.0	17.0	ND	ND	ND
SANTA CLARITA	LOST CANYON 02	North Oaks	800	8.6	11.0	9.7	5.9	11.0	8.6	ND	ND	ND
SANTA CLARITA	LOST CANYON WELL 02A	North Oaks	825	7.4	8.4	7.9	5.5	9.3	7.3	ND	ND	ND
SANTA CLARITA	MITCHELL 05B	North Oaks	1,000	18.0	19.0	18.7	9.8	11.0	10.6	ND	ND	ND
SANTA CLARITA	NORTH OAKS CENTRAL WELL 08	Honby	1,200	13.0	13.0	13.0	20.0	20.0	20.0	ND	ND	ND
SANTA CLARITA	NORTH OAKS EAST WELL 07	Honby	950	16.0	17.0	16.5	15.0	30.0	22.5	ND	ND	ND
SANTA CLARITA	SANTA CLARA WELL	Honby	1,500	13.0	20.0	16.8	9.4	31.0	21.4	ND	ND	ND
SANTA CLARITA	SIERRA WELL 06	North Oaks	1,000	12.0	13.0	12.7	10.0	13.0	11.3	ND	ND	ND
SANTA CLARITA	VALLEY CENTER WELL	Honby	1,200	32.0	41.0	35.8	28.0	44.0	38.8	ND	ND	ND
VALENCIA	WELL 207	IIA-N	2,500	3.2	4.0	3.6	6.8	8.5	7.6	ND	ND	ND
VALENCIA	WELL D	I	1,050	0.0	4.0	2.4	6.7	13.0	9.5	ND	ND	ND
VALENCIA	WELL E-15	I	1,400	4.5	5.0	4.8	7.3	8.6	7.9	ND	ND	ND
VALENCIA	WELL E-17	I	1,000	4.2	4.2	4.2	8.7	8.7	8.7	ND	ND	ND
VALENCIA	WELL E-14	I	1,200							NA	NA	NA
VALENCIA	WELL E-16	I	1,200							NA	NA	NA
VALENCIA	WELL N	IIA-N	1,250	11.0	14.0	12.7	18.0	27.0	23.3	ND	ND	ND
VALENCIA	WELL N-7	IIA-N	2,500	11.0	20.0	14.3	17.0	22.0	19.7	ND	ND	ND
VALENCIA	WELL N-8	IIA-N	2,500	14.0	21.0	16.3	16.0	23.0	20.3	ND	ND	ND
VALENCIA	WELL S-6	IIA-N	2,000	11.0	11.0	11.0	26.0	26.0	26.0	ND	ND	ND
VALENCIA	WELL S-7	I	2,000	18.0	20.0	19.0	22.0	29.0	24.3	ND	ND	ND
VALENCIA	WELL S-8	I	2,000	20.0	28.0	23.5	18.0	29.0	22.3	ND	ND	ND
VALENCIA[1]	WELL S-9	I								NA	NA	NA
VALENCIA	WELL T7	IIA-N	1,200	17.0	28.0	21.3	10.0	23.0	16.3	ND	ND	ND
VALENCIA	WELL U-4	IIA-N	1,000	11.0	14.0	12.3	14.0	20.0	15.5	ND	ND	ND
VALENCIA	WELL U-6	IIA-N	1,250	11.0	14.0	12.3	12.0	18.0	14.7	ND	ND	ND
VALENCIA	WELL W10	IIA-N	1,500	3.4	6.1	4.8	6.8	17.0	12.0	ND	ND	ND
Wells Primarily Impacted for Perchlorate[2]												
VALENCIA[3,4]	WELL 201	IIA-N	2,400	0.0	0.0	0.0	0.0	0.0	0.0	ND	14	6
VALENCIA[3]	WELL 205	IIA-N	2,700	0.0	0.0	0.0	0.0	0.0	0.0	ND	8	1
VALENCIA[3,5]	WELL Q-2	IIA-N	1,200	11.0	15.0	13.2	13.0	23.0	18.0	ND	17	3

Division	Well	Zone	Flow (GPM)	PERFLUOROOCTANE SULFONIC ACID (PFOS) (ng/L)			PERFLUOROOCTANOIC ACID (PFOA) (ng/L)			PERCHLORATE (UG/L)		
				RL: 40, TAL: 32			RL: 10, TAL: 8			MCL: 6 TAL: 4.8		
				Min	Max	Average	Min	Max	Average	Min	Max	Average
NEWHALL[6]	WELL 12	Newhall 1	2,000	0.0	3.3	0.8	0.0	4.0	1.0	NA	NA	NA
NEWHALL[6]	WELL 13	Newhall 1	2,250	0.0	4.3	3.2	0.0	4.7	3.4	NA	NA	NA

ND – Non-detect data
NA – Data not available
MCL = Maximum Contaminant Level
TAL = Treatment Action Level
1 – Future well to be drilled in the vicinity of PFAS impacted wells S7 and S8. Hence, considered as potentially impacted for PFAS
2 – In addition to the wells listed, Saugus Wells 1 and 2 are currently treated for perchlorate and VOCs. Hence, these wells are not included for compliance cost evaluation in this study. Perchlorate concentrations shown are for years 2014 through 2019 (2017 excluded). However, determination of impairment for wells with perchlorate was made by DDW using several years of data prior to this period.
3 – Wells subject to impaired water (97-005) treatment requirements
4 – Treatment system is already installed for V201. SCV Water is currently awaiting DDW permit for operation of this well and treatment system.
5 –PFAS (PFOA) was measured above the RL.
6 – DDW is considering lowering the MCL for perchlorate in the future. Wells may be subject to treatment if the perchlorate MCL is lowered. Hence these wells are also included for compliance cost estimation. These wells may not be subject to 97-005 requirements. However, sampling and other O&M requirements are conservatively assumed similar to the wells subjected to 97-005.

4. Compliance Alternatives for PFAS

The next step in compliance evaluation is the identification of compliance options for the impacted wells. Selection of treatment options for compliance is dictated by overall water quality characteristics, cost of treatment and other site- specific factors. Granular Activated Carbon (GAC) and Single-Use ion exchange (IX) are widely considered the treatments of choice for PFAS. They both pose less operational issues, less waste disposal concerns and are modular in nature.

In addition, membrane technologies such as nanofiltration (NF) and Reverse Osmosis (RO) can also remove PFAS. However, these technologies are often expensive, energy intensive and generate brine containing PFASs that need disposal. Generation of a brine stream also lowers the water yield and may put a strain on meeting SCV Water's demands. Hence, NF and RO are not considered as viable options for SCV Water's Wells.

Blending with unimpacted water is another potential compliance option. However, for successful implementation of blending as a compliance option for SCV Water's wells, there needs to be sufficient unimpacted water available in proximity of the impacted wells. If the water has to be pumped directly into a water main, sufficient flow of unimpacted water to achieve compliance through blending must be available at all times in the transmission main during the operation of the impacted SCV Water's wells. Also, an appropriately sized blending station and pumps must be installed to deliver the blended water to the main transmission. Steps must be undertaken to avoid short-circuiting of the impacted well water while blending. Due to these challenges, blending is not considered as an alternative for SCV Water' wells at this time.

The following sections discuss benefits and limitations of GAC and IX processes and their viability for treating SCV Water for PFAS compliance.

4.1 PFAS Treatment by Granular Activated Carbon

GAC removes organic contaminants by adsorption processes. Surface characteristics of GAC play a significant role in the efficiency of contaminant removal. GAC particles consist of numerous pores which provide a large surface area for adsorption of contaminants. The surface area and the distribution of pore size dictate the type and extent of contaminant removal. The treatment unit configuration often consists of a fixed-bed lead-lag configuration. The feed water to GAC may require pre-filtration and other pre-treatment, depending on the water quality. The water is applied in a down flow mode. The vessels are periodically backwashed to remove the clogging of the column by suspended particles. Upon breakthrough in a lead-lag configuration, the changed out GAC is either disposed of, or regenerated by the service company for re-use.

Different types of GACs (e.g. reagglomerated coal-based carbon, direct activated coal-based carbon, surface modified coconut carbon) by different vendors are used for PFAS treatment. In general, reagglomerated carbon media have been shown to perform better than coconut shell carbon for PFAS removal. However, surface modified coconut shell carbon has also been found effective for PFAS removal in some cases. Selection of carbon for PFAS removal is influenced by concentrations of various water quality constituents including organic materials, sulfate, nitrate, and total dissolved solids.

4.2 PFAS Treatment by Ion Exchange

Ion exchange treatment involves reversible exchange of ions of the same charge between a solution and an insoluble solid in contact with it. An ion exchange resin or ion exchange polymer

is the insoluble matrix (or support structure) normally in the form of small (1–2 mm diameter) beads. The material has a highly developed structure of pores on the surface of which are sites that easily trap and release ions. The trapping of ions takes place only with simultaneous releasing of like charged ions; thus, the process is called ion-exchange.

After saturation of the resin with the contaminant, the resin can be regenerated using a solution containing a high concentration of chloride ions (e.g. common salt). In this case, the salt solution used for regeneration, upon saturation, needs to be disposed. This type of ion exchange operation is called regenerative ion exchange process. Alternatively, the resin can be disposed offsite after saturation, and replaced with a new batch of resin. Such an ion exchange treatment process is termed Single-Use ion exchange process. The resins used in Single-Use ion exchange process are often very selective for the contaminant of concern and have a higher capacity for its removal compared to a regenerative ion exchange resin. Single-Use ion exchange resins have been found to be more effective for PFAS removal. On many instances, the same type of resin used for perchlorate removal is effective for removal of PFAS as well.

4.3 Comparison of GAC and Ion Exchange for PFAS Treatment at SCV Water

While GAC and IX are recognized as the treatments of choice for PFAS, a good understanding of water quality impacts on PFAS treatment by these technologies is still evolving. Site specific water quality characteristics can affect performance of each of them differently (e.g., change out frequency) and hence, affect the cost of treatment differently. A comparison of water quality and operational issues for GAC and IX for PFAS treatment are provided in **Table 3**. The empty bed contact time (EBCT) required for effective removal of PFAS by GAC is approximately 10 minutes. The EBCT required for PFAS treatment by IX is about two to three minutes. Hence, the footprint for IX treatment is smaller than that required for GAC for PFAS treatment, likely making IX the preferred option if available land is limited. Additionally, IX can remove smaller chain PFASs better than GAC, and it is less impacted by TOC.

GAC and ion exchange treatment have been permitted for treatment in California. GAC exerts a smaller head loss during operation. Currently, there are more GAC treatment systems installed for PFAS treatment than IX. While IX requires smaller vessels and the breakthrough occurs at a much higher bed volumes than GAC, the resins are more expensive than GAC media. Some of the cost savings obtained from higher breakthrough bed volumes for IX may be offset by lower cost of media and lower head loss (pumping cost) during treatment by GAC.

Table 3: Comparison of Factors Impacting GAC and IX Treatment for PFAS Removal

Item	GAC	Ion Exchange
Experience and Installation	Several full-scale GAC installations are in operation	Used for full scale drinking water systems in United States and Canada.
Ease of O&M	Easy to operate	Easy to operate
Head Loss	Lower than ion exchange due to lower surface loading rate.	Typically, about two folds of the head loss than GAC due to higher surface loading rate and media packing.
Footprint	Larger, due to high EBCT (~10 minutes)	Smaller due to low EBCT (~ 2 minutes)
Permitting	Recognized by EPA. Easier to obtain permit. Potential permitting issues for disposal of backwash water in the future.	Ion Exchange has recently been permitted for PFAS treatment by DDW.
Water Quality Issues	Impacted by TOC (at ~> 1 mg/L). Potential for nitrate sloughing in high nitrate water.	Less impacted by TOC. Expected to be less impacted by nitrate.
Removal of lower chain PFAS	Less effective in removing lower chain PFASs.	More effective than GAC for removing lower chain PFAS.
Breakthrough bed volume	Typically around 50,000 to 60,000 BVs. Can be lower due to water quality issues.	Typically vary from 100,000 to 250,000 BVs based on water quality.
Media/Resin Cost	Less expensive (~$1.25/lb, approximately $40 to $45/cu.ft)[1].	More expensive ($400 to $460/cu.ft) for resin including disposal costs.
Waste Disposal	Spent media is hauled offsite. Disposal option required for waste generated during periodic backwash of GAC media.	Spent resin is hauled offsite. Backwash water may need to be disposed.
Expandability	Modular.	Modular

1. The cost per cu.ft. values is based on bulk density estimates of 32 to 36 lb/cu.ft. Bulk density varies with the carbon type. The costs provided for GAC and ion exchange resins are estimated costs for general comparison only. The site-specific costs may vary.

SCV Water recently performed a side-by-side Rapid Small Scale Column Test (RSSCT) to compare the performance of four carbon media (Filtrasorb 400, Hydrodarco 4000, Ultracarb 1240 LD and AV1240) for the treatment of their N Well water. In addition, isotherm tests were also performed to compare performance of four GAC media and two IX resins (PFA694E and PSR2 Plus). The PFOA and PFOS levels in this well are approximately 25 and 40 ng/L, respectively. The water also contained some smaller chain PFASs. The sulfate and TOC levels were 140 and 1.1 mg/L, respectively, both of which are generally high and can negatively impact GAC and IX performance for PFAS. The bench scale data indicated that Ultrasorb 1240 LD GAC (activated bituminous coal carbon) outperformed the other carbons for this water. In the RSSCT tests, the treated water PFOA level reached the NL for PFOA at 25,400 bed volumes for Ultrasorb 1240 LD while the PFOA level reached NL at around 17,000 to 19,000 for the other carbons. The bench scale isotherm tests indicated that the breakthrough volume to reach 50%

of influent concentration of PFOA for the GAC media was approximately 34,500 bed volumes and that for the IX resins was about 154,000 bed volumes.

5. Selection of Compliance Option for PFAS SCVWA Wells

While our understanding of the water quality impacts on removal of PFAS by GAC and IX treatment is still evolving, IX has been selected as the treatment of choice for PFAS removal in SCV Water wells for the following reasons:

- Land available for installation of treatment system is extremely limited for SCV Water
- Potential challenges may arise with discharge of GAC backwash water. Sewer lines for disposal of backwash water are not readily available near PFAS impacted wells. Future regulations might restrict disposal of PFAS containing backwash water in storm drains.
- While DDW or EPA does not currently regulate short chain PFAS constituents, some of these constituents could potentially be regulated in the future. IX can more effectively remove short chain PFAS constituents than GAC.

6. Compliance Alternatives and Compliance Option for Perchlorate

In addition to blending, compliance alternatives for perchlorate include Ion exchange (Single-Use or regenerative resins) as well as biological treatment such as fluidized bed reactor. SCV Water evaluated these alternatives for the Saugus wells and well V201 and selected Single-Use ion exchange treatment for perchlorate compliance. Hence, Single-Use ion exchange is selected for compliance evaluation of all perchlorate impacted SCV Water wells.

7. Ion Exchange Treatment Process Configuration

For treatment of PFAS and perchlorate with ion exchange (IX), an EBCT of approximately 2 minutes is required for removal in a lead-lag configuration, resulting in a total EBCT of approximately 4 minutes. Typically, 10-foot diameter vessels contain approximately 373 ft^3 of IX resin while 12-foot diameter vessels contain approximately 535 ft^3 of IX resin. A maximum surface loading rate of 18 gpm/ft2 was used for both vessel sizes. The number and size of IX vessels needed to meet various flow ranges and the site space required for the vessels are shown in Table 4. In all cases, 12 ft diameter vessels were selected for compliance cost estimation. For PFAS treatment, quantity of resin required in each vessel was estimated based on the EBCT and surface loading requirements for the 12 ft diameter vessels. However, each vessel was assumed to contain a minimum of 350 ft^3 of resin to provide sufficient media depth (~ 3 ft). For perchlorate treatment the vessels were assumed to contain 350 ft^3 resin.

Treatment trains for IX treatment typically include cartridge or bag filters upstream of IX vessels for particle removal. After IX treatment, sodium hypochlorite and liquid ammonium sulfate will be injected to create chloramines to maintain a disinfectant residual before discharge of the treated water to the distribution system. During the initial resin fill and subsequent resin exchanges, media rinsed water shall be stored and disposed of by a semi-trailer truck. An example process flow diagram is presented as Figure 2 and a conceptual layout is depicted in Figure 3.

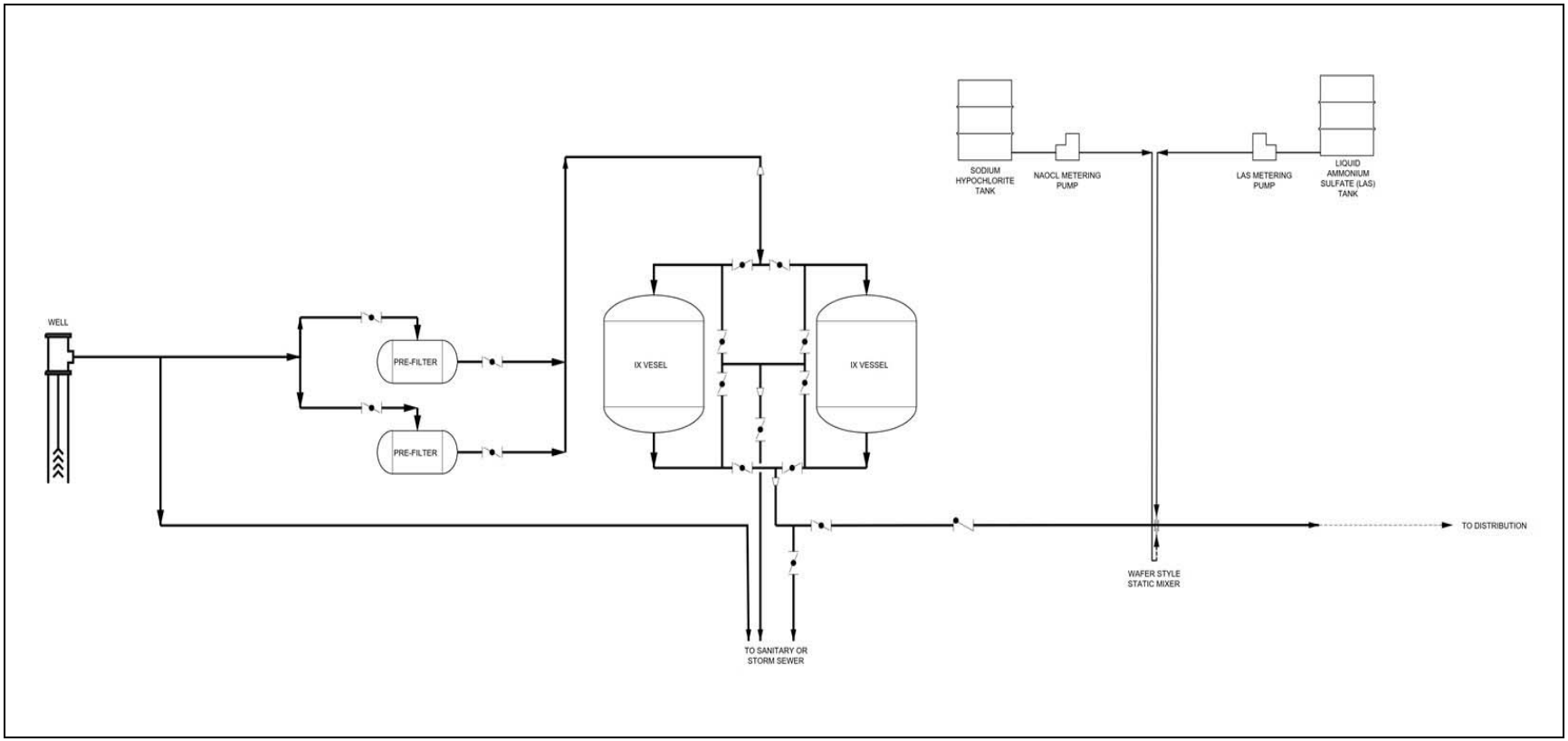


Figure 2: IX Treatment train process flow diagram

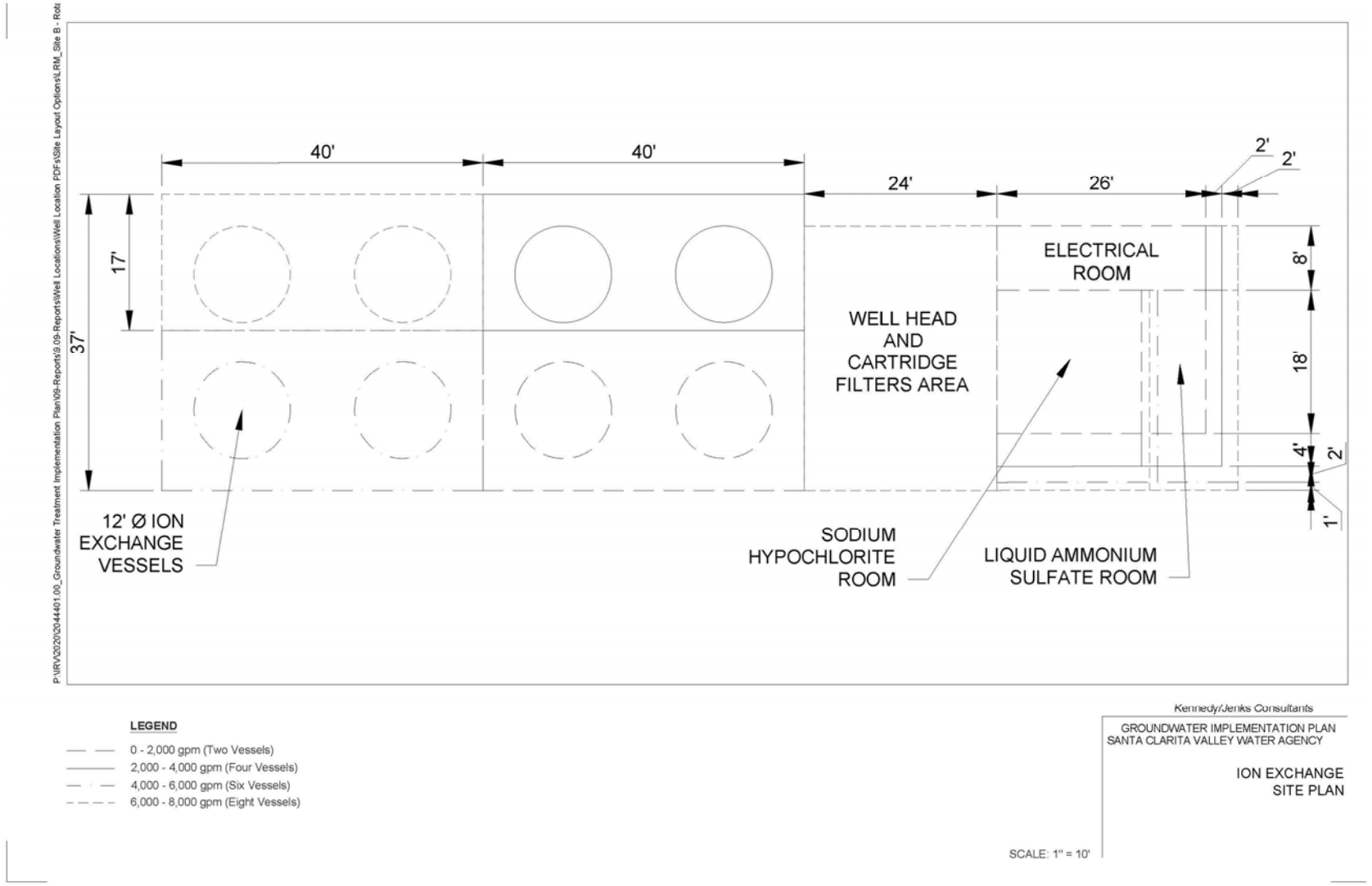


Figure 3. Site layout for IX treatment process

Land available for treatment is very limited at most of the SCV Water well sites. To evaluate and ensure that each site had adequate land available, space requirements were estimated for the pre-filters, vessels, and chemical system/building based on the well flowrates. The space required for each piece of equipment is shown in Table 4. To accommodate truck access for periodic well rehabilitation as well as GAC changeouts, a turnout style access was investigated. For a typical carbon carrying semi-trailer with a 22-foot swept path, or a 41-foot full turn radius, to perform a full turn on site would require approximately 7,000 square feet of dedicated space. For most sites, space was not available for a full turnaround. Instead, an area of 2,000 ft2 was reserved for onsite access which includes space for a truck with stabilizers to work on the well and to allow for access between equipment.

Table 4: Number of 12-ft Diameter Ion Exchange Vessels and Site Area Required for PFAS Treatment

Flow (gpm)	# Trains Required	# Vessels Required	Total Volume of Resin (ft3)	Vessel Area (ft2)	Prefilter (ft2)	Chemical Area (ft2)	Turnaround (ft2)	Total Area (ft2)
0 - 500	1	2	1070	800	195	170	2000	3,165
500 - 1000	1	2	1070	800	195	240	2000	3,235
1000 - 1500	1	2	1070	800	195	192	2000	3,187
1500 - 2000	1	2	1070	800	195	192	2000	3,187
2000 - 2500	2	4	2140	1,480	195	221	2000	3,896
2500 - 3000	2	4	2140	1,480	195	252	2000	3,927
3000 - 3500	2	4	2140	1,480	195	307	2000	3,982
3500 - 4000	2	4	2140	1,480	195	362	2000	4,037
4000 - 4500	3	6	3210	2,160	195	417	2000	4,772
4500 - 6000	3	6	3210	2,160	195	472	2000	4,827

8. Prioritization of Wells for PFAS Compliance

For prioritization of wells requiring PFAS compliance, the following assumptions/approach was used:

- Various pressure zones in SCVWA area are hydraulically isolated (i.e. the groundwater demand in each zone is met only by the groundwater wells located within the zone)
- The groundwater demand for each zone was identified as the maximum monthly groundwater extracted by wells in each zone since 2014
- Water supply deficit due to PFAS impacts in each zone was then estimated by subtracting the water supply that can be obtained from the unimpacted wells from the groundwater demand estimated from the above step
- The wells requiring treatment are prioritized based on the estimated water supply deficit due to PFAS impact (i.e. wells in the zones with the highest deficit have the highest priority for treatment)
- The prioritization was further refined based on the input from SCVWA staff regarding operational and other challenges related to groundwater production and supply

Table 5 and Table 6 shows the estimated groundwater demand for each zone, water supply that can be provided by the unimpacted wells, water deficit due to PFAS impact. Priority ranking for wells/well groups for compliance, and anticipated restoration dates are shown in Table 7.

Table 5: Non-Impacted Wells Grouped by Zone

Zone/Well	Flow from Unimpacted Wells (gpm)	# of Impacted Wells Offline	Historical Peak Month Max Flow (gpm)	Historical Peak Month Average Flow (gpm)	Zone Capacity Differential: Peak Month Max Flow (gpm)[1]	Zone Capacity Differential: Peak Month Average Flow (gpm)[1]
IIA-N	**6800**	**11**	**9306**	**7202**	**-2506**	**-402**
WELL 206	2500					
WELL 207	2500					
WELL W11	1000					
WELL W-9	800					
Honby	**0**	**5**	**6678**	**2698**	**-6678**	**-2698**
I	**2000**	**8**	**3298**	**2198**	**-1298**	**-198**
WELL 160	2000					
North Oaks	**1050**	**4**	**1869**	**1347**	**-819**	**-297**
SAND CANYON WELL 03	1050					
Catala	**1000**	**1**	**1110**	**759**	**-110**	**241**
GUIDA WELL 14	1000					
Pinetree 1	**550**	**2**	**665**	**133**	**-115**	**417**
WELL 03	550					
Newhall 1	**4250**		**3445**	**2093**	**1205**	**2557**
WELL 12	2000					
WELL 13	2250					
Castaic 1	**2540**		**1042**	**746**	**1498**	**1794**
WELL 01	640					
WELL 02	450					
WELL 07	1450					

1. A negative differential means the zone will not be able to meet historical flows without treatment of additional wells. A positive differential means the zone can meet historical flows without additional treatment - future capacity requirements are not considered.

Table 6: PFAS and Perchlorate Impacted Wells Grouped by Zone

Impacted Wells Grouped by Zone		
Zone/Well	**Flow (gpm)**	**Zone Capacity Differential: Peak Month Max Flow (gpm)**
IIA-N	**19500**	**-2506**
WELL 201	2400	
WELL 205	2700	
WELL N	1250	
WELL N-7	2500	
WELL N-8	2500	
WELL Q-2	1200	
WELL S-6	2000	
WELL T7	1200	
WELL U-4	1000	
WELL U-6	1250	
WELL W10	1500	
Honby	**5800**	**-6678**
HONBY WELL 12	950	
NORTH OAKS CENTRAL WELL 08	1200	
NORTH OAKS EAST WELL 07	950	
SANTA CLARA WELL	1500	
VALLEY CENTER WELL	1200	
I	**7450**	**-1298**
WELL D	1050	
WELL S-7	2000	
WELL S-8	2000	
WELL S-9	1000	
Well E-14	1200	
Well E-15	1400	
Well E-16	1200	
Well E-17	1000	
North Oaks	**3625**	**-819**
LOST CANYON 02	800	
LOST CANYON WELL 02A	825	
MITCHELL 05B	1000	
SIERRA WELL 06	1000	
Catala	**550**	**-110**
CLARK WELL - 15	550	
Pinetree 1	**800**	**-115**
WELL 01	300	
WELL 05	500	

9. Grouping of Wells and Treatment Location for PFAS Compliance

Potential sites for treatment in the areas near PFAS impacted wells were obtained from SCV Water. Next, treatment location for each of the wells was assigned based on the area required for treatment, piping and pumping requirements and pressure zone considerations. Table 7 shows the treatment location identified for each of the wells. Out of the 28 wells requiring compliance, five wells will have wellhead treatment system. Groundwater from the remaining wells will be treated among the eight centralized treatment locations. The largest treatment facility will treat 7,000 gpm of groundwater from the S wells. Table 7 also shows the tentative restoration dates for each of the treatment systems. Appendix A shows the site map and piping alignment for each treatment location.

10. Grouping of Wells and Treatment Location for Perchlorate Compliance

Construction of Well V201 is complete. DDW permit for operation of this well is expected in 2021. Wellhead treatment will be installed for Wells V205 and Q2. The anticipated completion date for the treatment system for Well Q2 is July, 2021 and that for Well V205 is February, 2024. It is currently assumed that a centralized treatment system will be installed for Newhall Wells 12 and 13 at Well 13 site, if required due to changes in future regulations.

Table 7: Priority Ranking, Treatment Volume and Location for PFAS Impacted Wells.

Treatment Priority Group	Well Group/Well	Well Flow	Area Required (ft2)	Area Available (ft2)	Treatment Site Location	Site Location Hyperlink	Estimated Restoration Date
1	N Wells	6250	4,827	21,000	Near Well N-1	N Site	October, 2020
	N-1	1250	3,187				
	N-7	2500	3,896				
	N-8	2500	3,896				
2	Valley Center	1200	3,187	4,500	Valley Center Well	Valley Center Site	March, 2022
3	**Santa Clara**	2,450	3,896	6,000	Sand Canyon Pump Station	Honby-Santa Clara Site **(need to fix hyperlink)**	July, 2022
	Honby	950	3,187				
	Santa Clara	1500	3,187	5,000			
4	T-7	3450	4,037	15,000	25401 Bouquet Canyon Rd (Rio Vista Intake Pump Station)	T&U Site	September, 2023
	T-7	1200	3,187				
	U-4	1000	3,187				
	U-6	1250	3,187				
5	S Wells	7000	4,827	20,000	West of S-8	S Site **(need to fix hyperlink)**	January, 2024
	S-6	2000	3,187				
	S-7	2000	3,187				
	S-8	2000	3,187				
	S-9	1000					
6	**E-Wells**	4800	4,827	12,000	Henry Mayo Dr and Commerce Center Dr	E-Site	February 2024
	E-14	1200	3,187				
	E-15	1400	3,187				
	E-16	1200	3,187				
	E-17	1000	3,187				
7	W-10	1500	3,187	6,500	24631 Ave Rockefeller	W-10 Site	2027
8	Well D	1050	3,187	12,000	Well D	W-D Site	2028
9	Oaks	2150	3,896	17,000	27077 Hidaway Ave	Oaks Site	2030
	North Oaks Central	1200	3,187				
	North Oaks East	950	3,187				
10	Sierra	1000	3,187			Sierra Site	2030
11	Lost Canyon/Mitchel	2625	3,896	21,000	Between Sand Canyon and Lost Canyon 2A.	Lost Canyon & Mitchel Site	2030
	Lost Canyon 2	800	3,187				
	Lost Canyon 2A	825	3,187				
	Mitchel 5B	1000	3,187				
12	Clark	550	3,187		Clark Well	Clark Site	2030
13	P Wells	800	3,187	21,000	On Soledad Canyon Dr between Flowerpark Dr and Poppy Meadow St.	Pinetree Site	2030
	P1	300	3,165				
	P5	500	3,165				

Table 8: Priority Ranking, Treatment Volume and Location for Perchlorate Impacted Wells.

Priority	Well(s)	Flow (gpm)	Treatment Site Location	Site Location Hyperlink	Estimated Restoration Date
1	Well 201	2,400	Well 201	Well 201	December, 2021
2	Q2 Well	1,200	Q2 Well	Well Q2	July, 2021
3	Well 205	2,700	Well 205	Well 205	February, 2024
4	Newhall Wells 12 and 13	4,250	Newhall Well 13	Newhall	NA

NA – Not available. Will depend on DDW future regulatory levels.

11. Preliminary Planning Level Cost Estimates for the Treatment Options

Preliminary planning level capital and operations & maintenance (O&M) cost estimates were developed for treatment of PFAS impacted SCV Water wells. The sources used for cost estimation include Kennedy/Jenks' past project experience, costs from the recently designed SCV Water N and Valley Center well treatment systems, preliminary discussions with vendors, and discussions with the District staff. Table 8 shows the assumptions used in estimation of preliminary capital cost and Table 9 summarizes the capital cost estimates for compliance of PFAS impacted wells. Table 10 summarizes the capital cost for perchlorate compliance. Appendix B shows the detailed cost estimates for PFAS and perchlorate compliance.

Table 8: Capital Cost Assumptions

Division #	Division	Assumption
2	Site Work	Percentage of site area.
3	Concrete	Percentage of concrete volume.
4	Masonry	$165,000 for chemical building.
5	Metals	$30,000 for chemical building.
6	Wood & Plastics	NA
7	Thermal & Moisture Protect.	NA
8	Doors & Windows	NA
9	Finishes	$15,000.
10	Specialties	$10,000
11	Equipment	Based on # of vessels and chemical system sizing.
12	Furnishings	NA
13	Special Construction	$50,000 for chemical building.
14	Conveying Systems	NA
15	Mechanical	Based on site flowrate.
16/17	Electrical & Instrumentation	25% of total cost.
Misc.	Well Pump Replacement	Based on site flowrate.
	Div. 1 Cost	10% of Treatment sub-total
	Taxes	9.5% of Materials
	Sub-contractor	12% (of sum of piping costs and 40% of marked up materials cost)
	Bonds and Insurance	2.5%
	Contingency	15%
	Mid-point of construction	4%
	Implementation Multiplier (Engineering, permit, Const Management, etc.	35%

The total capital cost estimate for PFAS treatment is approximately $104 Million (Table 9). Out of this approximately $95.6 Million is for installation of treatment system and about $8.6 Million is estimated for installation of pipelines to deliver water from the wells to the centralized treatment facilities.

The total capital cost estimate for perchlorate treatment is approximately $ 32 Million (Table 10). Approximately $31.1 Million is estimated for installation of treatment system and $820,000 is estimated for pipeline installation from the well to the centralized treatment facility.

Table 9: Summary of Capital Cost Estimates for PFAS Treatment

Treatment Priority	Pressure Zone	Well Group	Flow (gpm_	Rounded Flow (gpm)	# of Wells	# of Prefilters	# of Vessels	Conveyance Pipeline Diameter (in)	Conveyance Pipeline Length (ft)	Piping to Centralized Treatment Facility	Treatment Cost	Total Cost
1	IIA-N	N Wells	6250	6000	3	3	6	-	-	-	$ 9,125,000	$ 9,125,000
2	Honby	Valley Center	1200	1500	1	2	2	-	-	-	$ 5,120,000	$ 5,120,000
3	Honby	Honby-Santa Clara	2450	2500	2	2	4	10"	1300	$ 508,000	$ 7,565,000	$ 8,073,000
4	IIA-N	T&U Wells	3650	4000	3	2	4	-	-	-	$ 8,447,000	$ 8,447,000
5	I	E Wells	4800	5000	4	3	6	10"/16"/24"	5400/1100/600	$ 3,429,000	$ 11,175,000	$ 14,604,000
6	IIA-N	S Wells	6000	6000	4	3	6	12"/18"/22"	1300/1600/1000	$ 2,770,000	$ 13,969,000	$ 16,739,000
7	IIA-N	W-10	1500	1500	1	2	2	-	-	-	$ 5,120,000	$ 5,120,000
8	I	Well D	1050	1500		2	2	-	-	-	$ 5,120,000	$ 5,120,000
9	Honby	North Oaks Central & East	2150	2500		2	4	-	-	-	$ 7,504,000	$ 7,504,000
10	Honby	Sierra	1000	1500		1	2	-	-	-	$ 4,778,000	$ 4,778,000
11	North Oaks	Lost Canyon & Mitchel	2625	3000		2	4	8"	3300	$ 1,298,000	$ 7,989,000	$ 9,287,000
12	Catala	Clark	550	1000		2	2	-	-	-	$ 4,778,000	$ 4,778,000
13	Pinetree 1	Pinetree	800	1000		2	2	6"/8"	500/800	$ 666,000	$ 4,849,000	$ 5,515,000
	Total PFAS Compliance Capital Cost									**$ 8,670,000**	**$ 95,629,000**	**$104,300,000**

Table 10: Summary of Capital Cost Estimates for Perchlorate Treatment

Pressure Zone	Well Group	Flow (gpm)	Rounded Flow (gpm)	# of Prefilters	# of Vessels	Conveyance Pipeline Diameter (in)	Conveyance Pipeline Length (ft)	Piping to Centralized Treatment Facility	Treatment Cost	Total Cost
IIA-N	Well 201	2,400	2500	2	4				7,504,000	7,504,000
IIA-N	Q2 Well	1,200	1500	1	2	-	-	-	$ 5,120,000	$ 5,120,000[1]
IIA-N	Well 205	2,700	3000	2	4				$ 7,852,000	$ 7,852,000
Newhall 1	Newhall Wells 12 & 13	4,250	4500	3	6	14	1500	$ 821,000	$ 10,653,000	$ 11,475,000
Total Perchlorate Compliance Cost								**$ 939,000**	**$ 31,129,000**	**$ 31,951,000**

1. Treatment system for Well 201 is installed and paid for through the Whittaker Settlement.

Table 11 provides the O&M cost assumptions used in this study. Currently, SCV Water sends water samples for PFAS analyses to a certified external laboratory. By the year 2022, the agency plans to test for PFAS through its in-house laboratory. Hence, O&M cost estimates for PFAS compliance were developed for the two timelines. Summary of O&M costs for PFAS and perchlorate compliance are provided in Table 12 and Table 13, respectively.

Table 11: O&M Cost Assumptions

Item	Value
Well Operation Time (%)	93
Well Pump TDH (ft)	30 psi head loss in vessel + piping + elevation
Chemical Pumps & Onsite Generation (hp)	2
Electricity ($/KWh)	$0.15
Salt ($/lb)	$ 0.15
Salt Usage (lb/d-gpm)	0.108
Liquid Ammonium Sulfate ($/gal)	$3.57
Liquid Ammonium Sulfate Usage (gal/d-gpm)	0.007
Media per Vessel for PFAS (cf)	Variable[1]
Media per Vessel for perchlorate (cf)	350[2]
Media Cost ($/cf)	$460
Media Replacement Frequency for PFAS	Extrapolated from N Wells Bench Study data
Media Replacement for Perchlorate (per year)	4[3]
Cost per Filter Element ($)	$350
Filter Replacement Interval (yr)	0.2500
# of Filter Elements per Vessel (#)	7
Maintenance Cost (% of Capital)	1%
Supervisor ($/yr)	$ 175,000
Production Operator ($/yr)	$ 113,000
Supervisor Labor (FTE)	0.05
Production Operator Labor (FTE)	0.2
Water Quality Technician ($/yr)	$88645
Water Quality Specialist ($/yr)	$113114
WQ Technician Labor for N Wells (FTE)	0.05
WQ Technician Labor for Single Wells (FTE)	0.0625
WQ Technician Labor Multiple Wells (FTE)	0.1
WQ Specialist N Wells (FTE)	0.00625
WQ Specialist Other Wells (FTE)	0.05
Sample Analyses Cost Prior to 2022 ($/sample)	$300
Sample Analyses Cost from 2022 Onwards ($/sample)	$9

1. Volume selected to provide a minimum EBCT of 2 minutes, minimum depth of 3 ft (~350 cu.ft.),
2. Based on design for Well 201
3. Based on assumptions in SCV Water annual Operations Budget estimate for Well 201

Table 12 shows the estimated annual O&M cost for PFAS compliance by SCV Water. The total annual O&M cost estimate for PFAS compliance is approximately $12,736,000. The unit O&M cost estimates varied from approximately $180/AF to $350/AF. The wide variation in the estimated unit cost is due to a combination of the size of the treatment system (lower unit cost for larger plants) and the concentration of PFAS which impacts the frequency of resin replacement. The resin replacement frequencies were estimated based on the data from bench scale testing for N wells. However, our understanding of the water quality impacts on PFAS removal (and breakthrough volumes) are still evolving. Hence, the estimated resin replacement rates may need to be verified through field data, and the O&M costs must be updated accordingly.

Table 12: Summary of O&M Cost Estimates for PFAS Compliance

Treatment Group: PFAS	Treatment Group Flow (gpm)	# Wells	Total O&M Cost Pre 2022 ($/yr)	Total O&M Cost ($/yr)	Cost Pre 2022 ($/AF-YR)[1]	Cost ($/AF-YR)[1]
N Wells	6250	3	$ 2,299,000	$ 2,209,000	$ 228	$ 219
Valley Center	1200	1	$ 594,000	$ 568,000	$ 307	$ 293
Honby-Santa Clara	2450	2	$ 976,000	$ 947,000	$ 247	$ 240
T&U Wells	3450	3	NA	$ 1,202,000	NA	$ 216
E Wells	4800	4	NA	$ 1,396,000	NA	$ 180
S Wells	7000	4	NA	$ 2,696,000	NA	$ 239
W-10	1500	1	NA	$ 540,000	NA	$ 223
Well D	1050	1	NA	$ 391,000	NA	$ 231
Oaks Wells	2150	2	NA	$ 858,000	NA	$ 247
Sierra	1000	1	NA	$ 393,000	NA	$ 244
Lost Canyon & Mitchel	2625	3	NA	$ 863,000	NA	$ 204
Clark	550	1	NA	$ 310,000	NA	$ 349
Pinetree	800	2	NA	$ 363,000	NA	$ 281
Total annual O&M Cost Estimate for PFAS Compliance				**$12,736,000[1]**		**$ 227**

NA – Not applicable.
1. Costs include chemical costs for disinfection (~$8 to $10/AF) also. The total estimated O&M Cost without including disinfection cost is approximately $12,220,000/year.

Table 13 shows the annual O&M cost estimate for perchlorate compliance. The estimated annual O&M compliance cost for perchlorate is approximately $6,053,000. The unit treatment cost varied from approximately $325/AF to $430/AF. The differences are largely due to the size of the treatment systems. The resin replacement costs constitute the major cost component of the O&M cost estimate. Hence, the estimated resin replacement fr equencies must be verified using the field data, and the O&M cost must be updated accordingly.

Table 13: Summary of O&M Cost Estimates for Perchlorate Compliance

Treatment Group: PFAS	Treatment Group Flow (gpm)	# Wells	Total O&M Cost ($/yr)	Cost ($/AF-YR)
Well 201	2,400	1	$ 1,488,000	$ 384
Q2 Well[1]	1,200	1	$ 832,000	$ 430
Well 205	2,700	1	$ 1,502,000	$ 345
Newhall	4,250	2	$ 2,231,000	$325
Total annual O&M Cost Estimate for Perchlorate Compliance			$6,053,000	**$ 356**

1. O&M cost for Q2 well includes sampling cost for PFAS, and 25% additional labor cost related PFAS sampling. The sampling cost for PFAS represents the cost of post-2022.

12. Updating Water Resources and Water Quality Information in 2020 Urban Water Management Plan

The information developed in this Groundwater Treatment Implementation Study, including the wells impacted by PFAS and perchlorate contamination and a schedule for returning those wells safely online pending the proposed treatment discussed, are used to update Section 4 (Water Resources) in the 2020 Urban Water Management Plan. Refer to the Santa Clarita Valley Water Agency 2020 Urban Water Management Plan Section 4, Water Resources, for detailed tables (Tables 4-5 through4-12). In addition, Section 6 of the 2020 UWMP provides additional information on the water quality impacts related to PFAS and perchlorate impairments.

13. Potential Funding Opportunities for Implementation of Groundwater Treatment

A high-level evaluation of a comprehensive list of funding opportunities was performed for treatment of PFAS and perchlorate to identify potentially viable grant opportunities. Table 14 identifies current potentially viable grant opportunities and provides a brief description of each, including a program description, summary of available funding, and implementation requirements.

Table 14: Summary of Potential Funding Opportunities for SCV Water Groundwater Treatment

Potential Funding Program	Grant/ Loan	Funding Agency	Program Summary	Application Timelines	Funding Amounts	Pros/Cons
Infrastructure State Revolving Fund (ISRF)	Loan	California Infrastructure and Economic Development Bank (I-Bank)	Funding for infrastructure projects serving a variety of public purposes, including Water Supply; Sewage Collection and Treatment; Water Treatment and Distribution; and others. Applicant must demonstrate project readiness and feasibility to complete construction within 2 years after loan approval.	Applications accepted on an ongoing basis. Average 4 months between application and executed agreement.	Loans of up to $25 million. Current interest rates are around 3%. For loans equal or greater to $250,000, a one-time origination fee of $10,000 or 1% of the original loan amount, whichever is greater, is due at closing. In addition, a servicing fee of 0.3% of the outstanding principal balance is due annually.	Pros/Cons: Interest rates are slightly higher than DWSRF financing, but a large loan can be secured fairly quickly without competitive process. CEQA review is streamlined.
Water Infrastructure Finance and Innovation Act (WIFIA)	Loan	EPA	Funding for water and wastewater infrastructure of national and regional significance, including wastewater conveyance and treatment, drinking water treatment, drought mitigation and resiliency, energy efficiency in water and wastewater facilities, brackish and seawater desalination. A combination of eligible projects is also eligible if all projects serve a common purpose and have a similar timeframe. Priorities vary by solicitation.	Solicitation for Letters of Intent is expected in fall 2021 with full applications due within 1 year of invitation to apply.	Loan funding of up to 49% of total project costs. (Total federal assistance may not exceed 80% of a project's eligible costs.) There are various fees: $100,000 due at time of full application, credit processing fee up to $700,000, and annual servicing fee of approximately $15,000 annually. Interest rate right now at 2-3%.	Pros/Cons: This program can provide large loans, but requires payment of various fees, has an interest rate higher than SRF, and is highly competitive.

			Good for projects greater than $20M.			
Proposition 1 IRWM	Grant	DWR	Funding for multi-benefit projects and programs that support integrated water management.	Next solicitation (Round 2) anticipated in 2021/2022	Funding max depends on allocation by funding region and USCR IRWM Region decisions. In the USCR Round 1 application, per project requests ranged from ~$1-$3 million. 50% cost share required.	Pros/Cons: Grant funding with 50% cost share, but relatively small funding amounts and generally highly competitive.
Drinking Water SRF	Loan	California Water Boards	Funding for planning, design and construction of drinking water infrastructure projects.	Applications accepted on an ongoing basis. Can take 1-2 years for final agreement.	Up to 100% of total project costs with loans at ½ general obligation bond rate and 30 year term or project's useful life.	Pros/Cons: Can provide 100% funding, but overall administrative effort is high, particularly for the application which can be a lengthy process.

SCV Water's groundwater treatment implementation is scheduled to occur over the next ten years or longer. Funding opportunities from other agencies/programs that are currently not available may become available in the coming years. Further, with the incoming of the new administration more funding opportunities may become available, particularly for water quality and water infrastructure projects. The agency must routinely monitor for release of new funding opportunities for groundwater treatment and environmental protection to support its groundwater implementation plan.

14. Summary and Findings

This Technical Memorandum evaluated and identified the following:

- Water quality characteristics and design criteria for SCV Water were identified for PFAS and perchlorate compliance. Impacted wells were identified as those with representative values of PFOA and PFOS above 80% of the DDW Response Levels. For perchlorate, impacted wells were identified as those with representative perchlorate level above 80% of the MCL.

- Twenty eight SCV Water wells were identified for PFAS compliance and five wells were identified for perchlorate compliance. The cumulative flow rates of the PFAS and perchlorate impacted wells are approximately 34,825 gpm and 10,550 gpm, respectively. Approximately 25,150 gpm of PFAS impacted groundwater and 6,300 gpm of perchlorate impacted groundwater are prioritized for treatment and is expected to return to production by 2025. Another 1,500 and 1,050 gpm of PFAS impacted groundwater wells are identified for treatment and estimated to return to service by 2027 and 2028, respectively. The remaining 6,800 gpm of PFAS impacted groundwater and 4,250 gpm groundwater impacted by perchlorate are estimated to return to service by 2030.

- Following evaluation of various compliance options, ion exchange was identified as the treatment option for PFAS as well as perchlorate.

- Based on sub-area demand and other considerations, priority rankings were developed for wells requiring compliance.

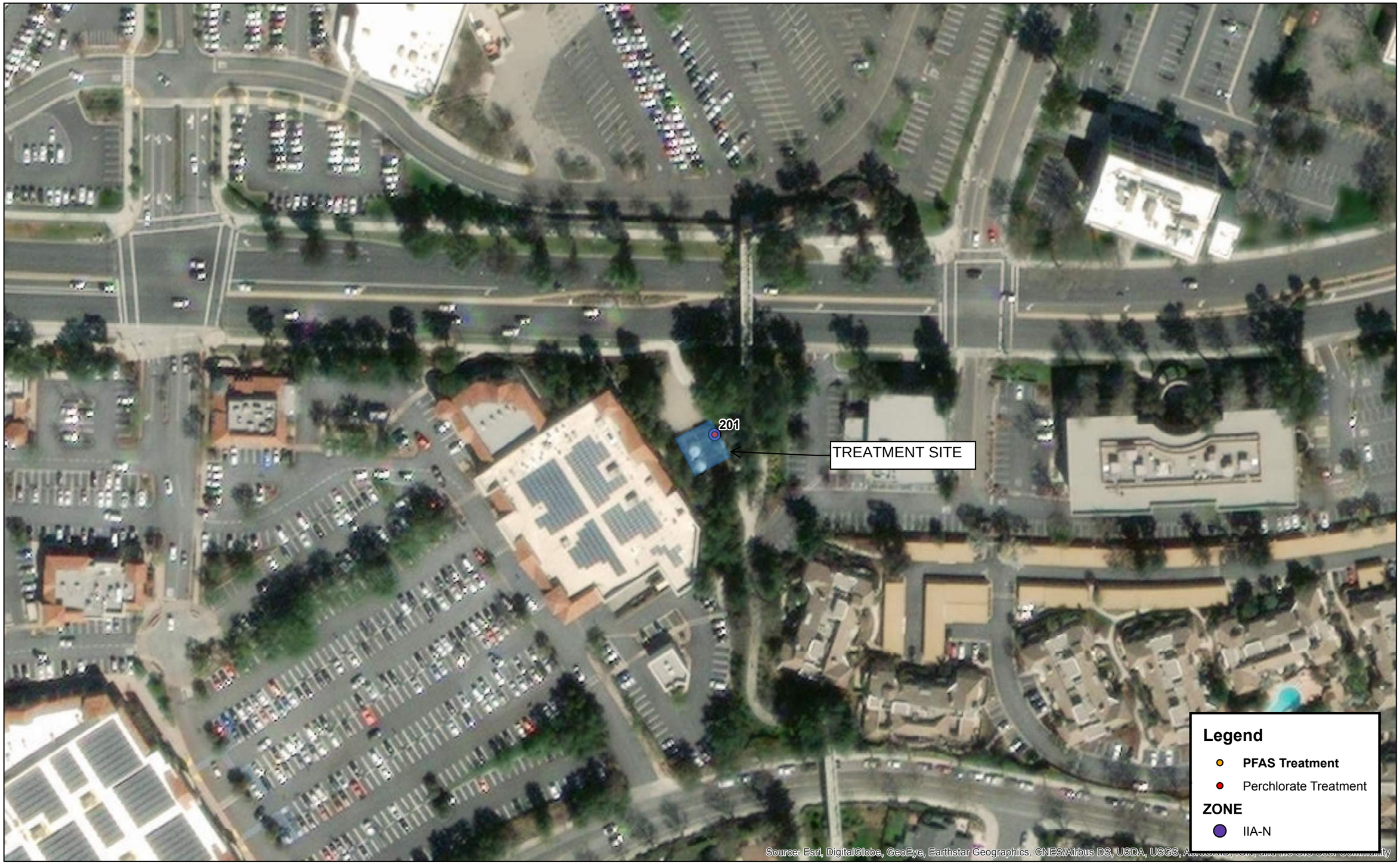
- Wellhead treatment was identified for five PFAS impacted wells. Groundwater from the remaining wells will be treated among the eight centralized treatment locations.

- Wellhead treatment systems were selected for three perchlorate impacted wells. Groundwater from the remaining two wells were selected for treatment at one centralized treatment system.

- Subsequently, capital and annual O&M costs were developed for PFAS and perchlorate impacted wells. The preliminary capital cost estimate for PFAS compliance is approximately $104.3 Million. The capital cost estimate for perchlorate compliance is approximately $ 31.9 Million. The annual O&M cost estimates for PFAS and perchlorate compliance are $12.7 Million and $6.05 Million, respectively.

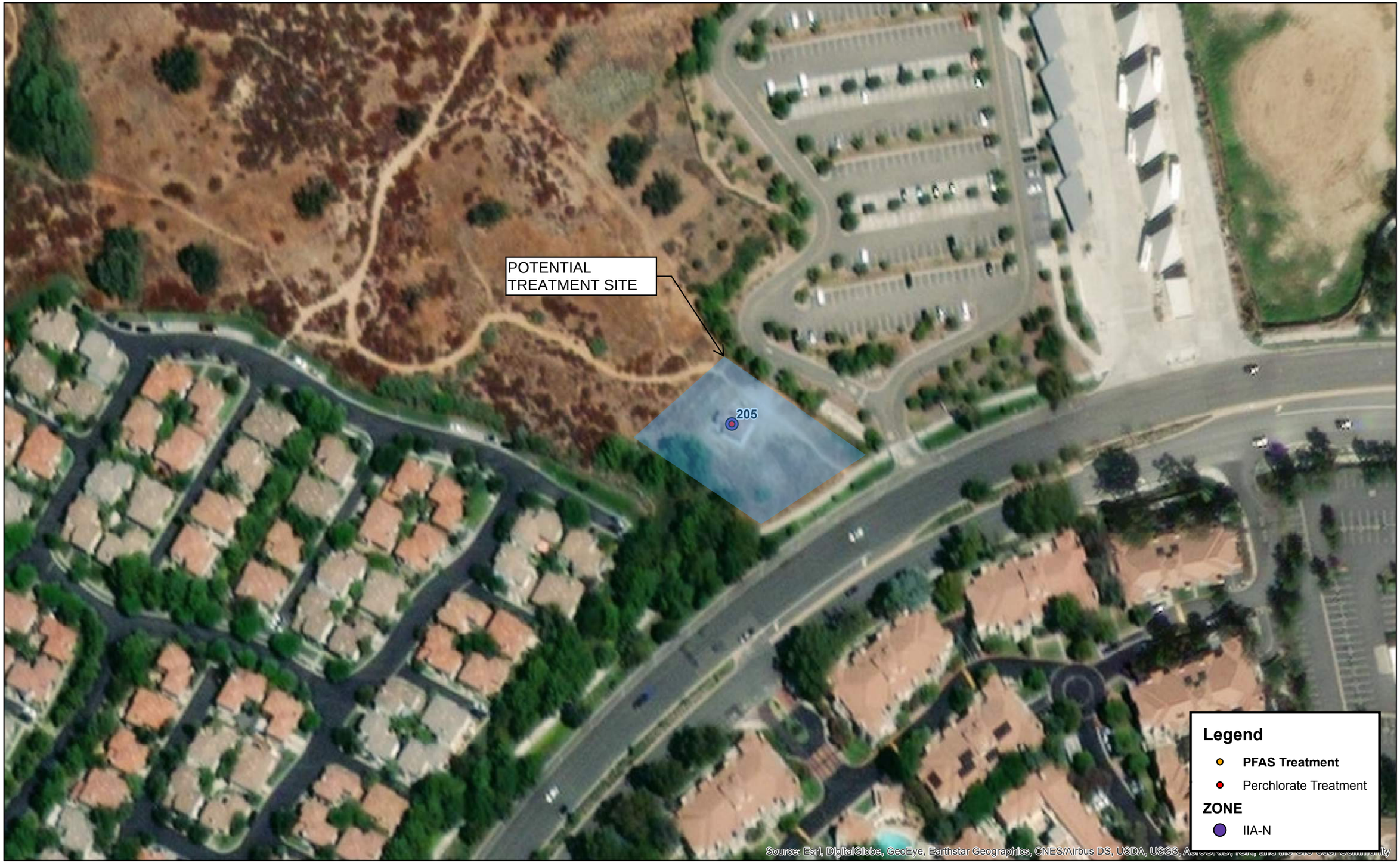
APPENDIX A. TREATMENT SITE LOCATIONS

WELL 201 TREATMENT SITE



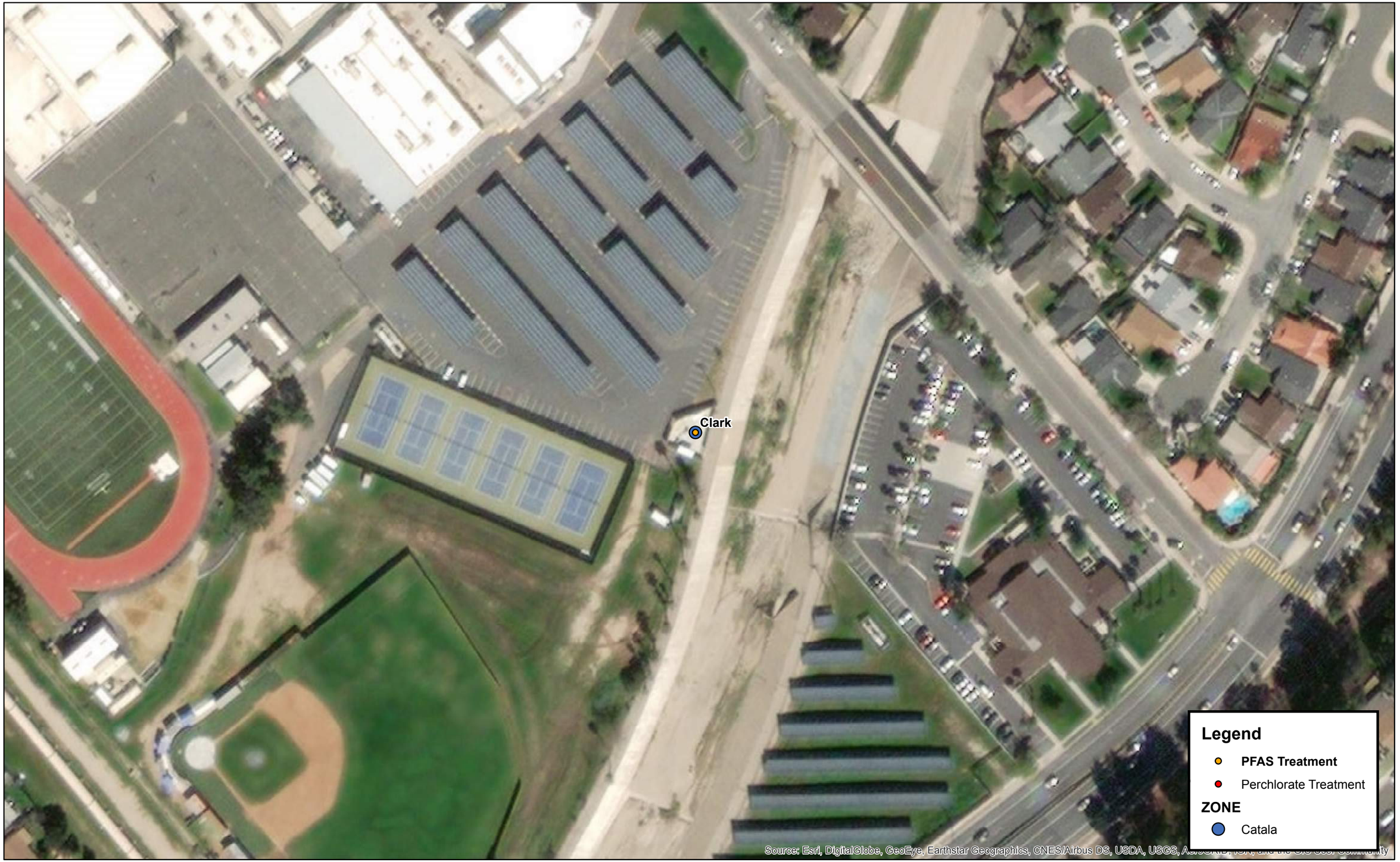
1 inch = 100 feet

WELL 205 TREATMENT SITE



1 inch = 100 feet

CLARK TREATMENT SITE



1 inch = 100 feet

1 inch = 500 feet

HONBY-SANTA CLARA TREATMENT SITE

1 inch = 100 feet

N WELLS TREATMENT SITE

1 inch = 100 feet

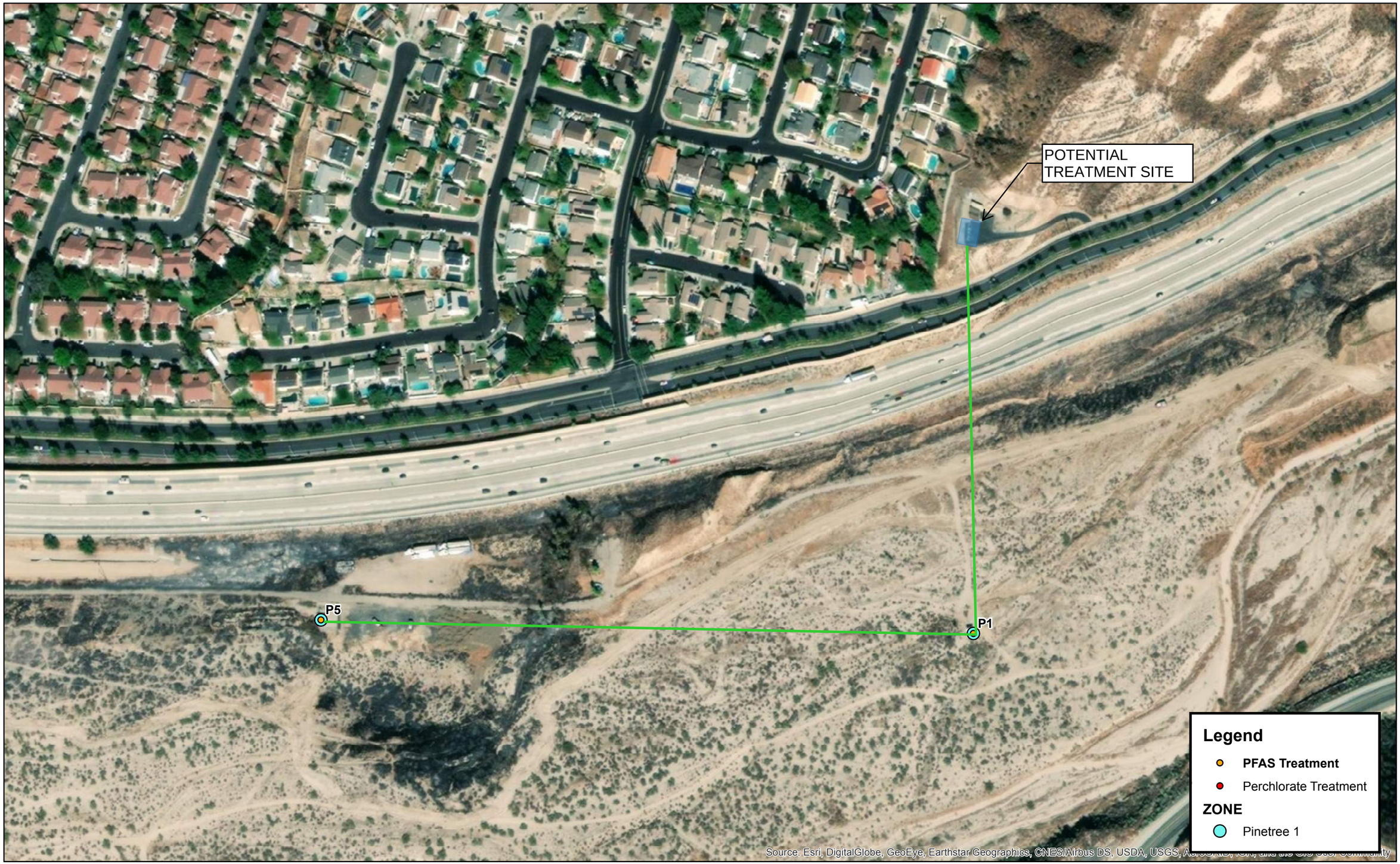
NEWHALL TREATMENT SITE

1 inch = 200 feet

OAKS WELLS TREATMENT SITE

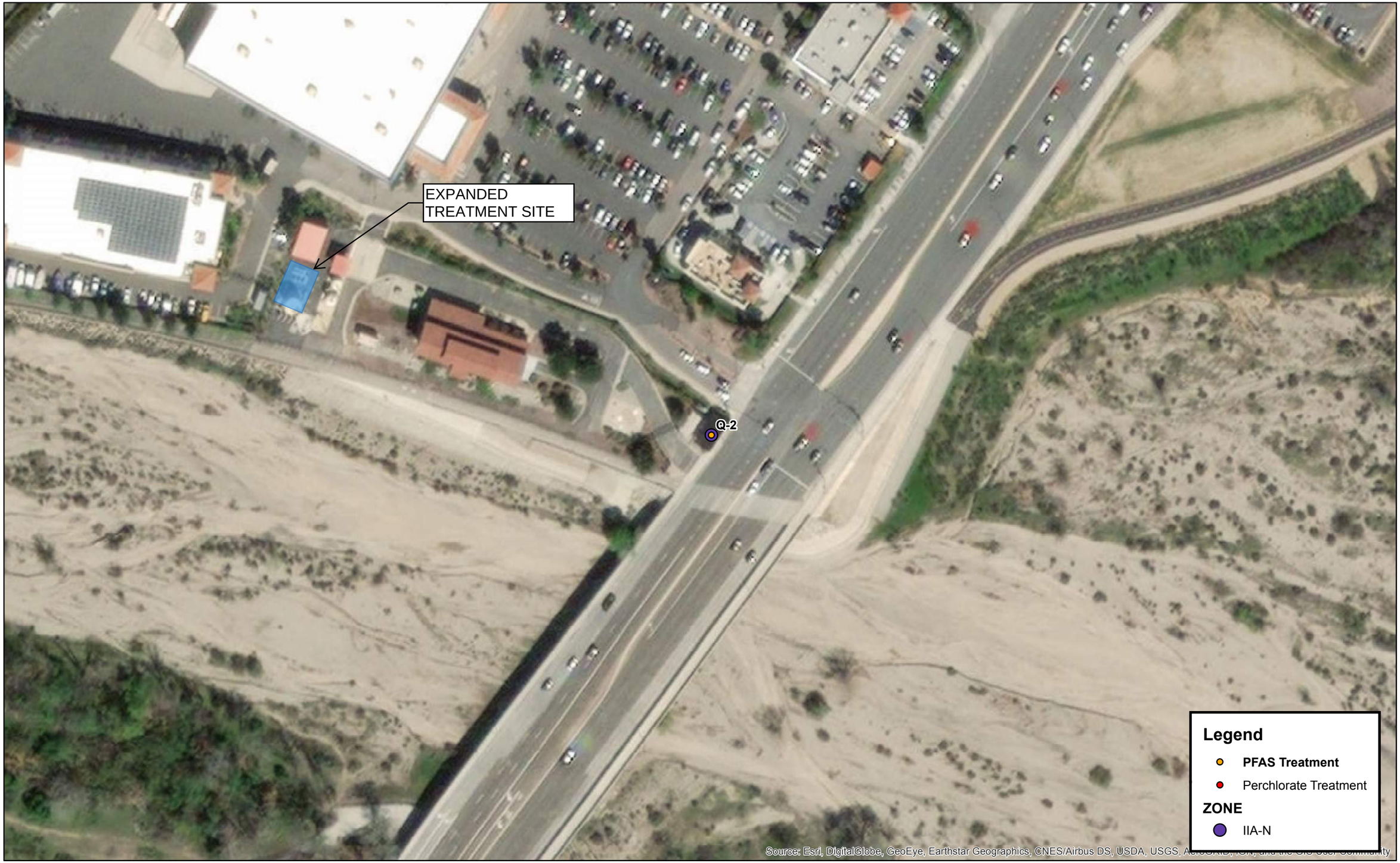
1 inch = 200 feet

PINETREE TREATMENT SITE

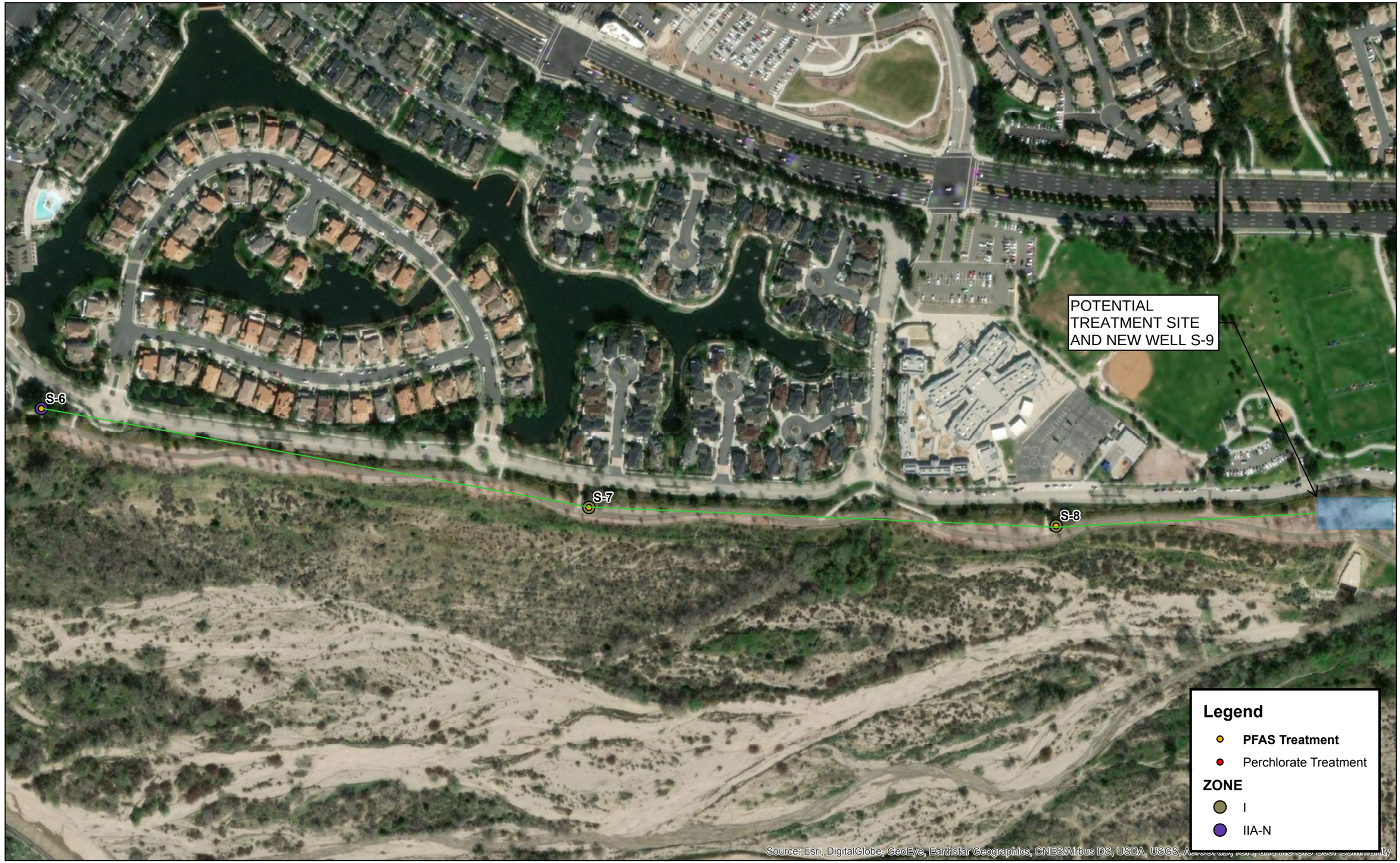


1 inch = 200 feet

WELL Q2 TREATMENT SITE



1 inch = 100 feet



1 inch = 250 feet

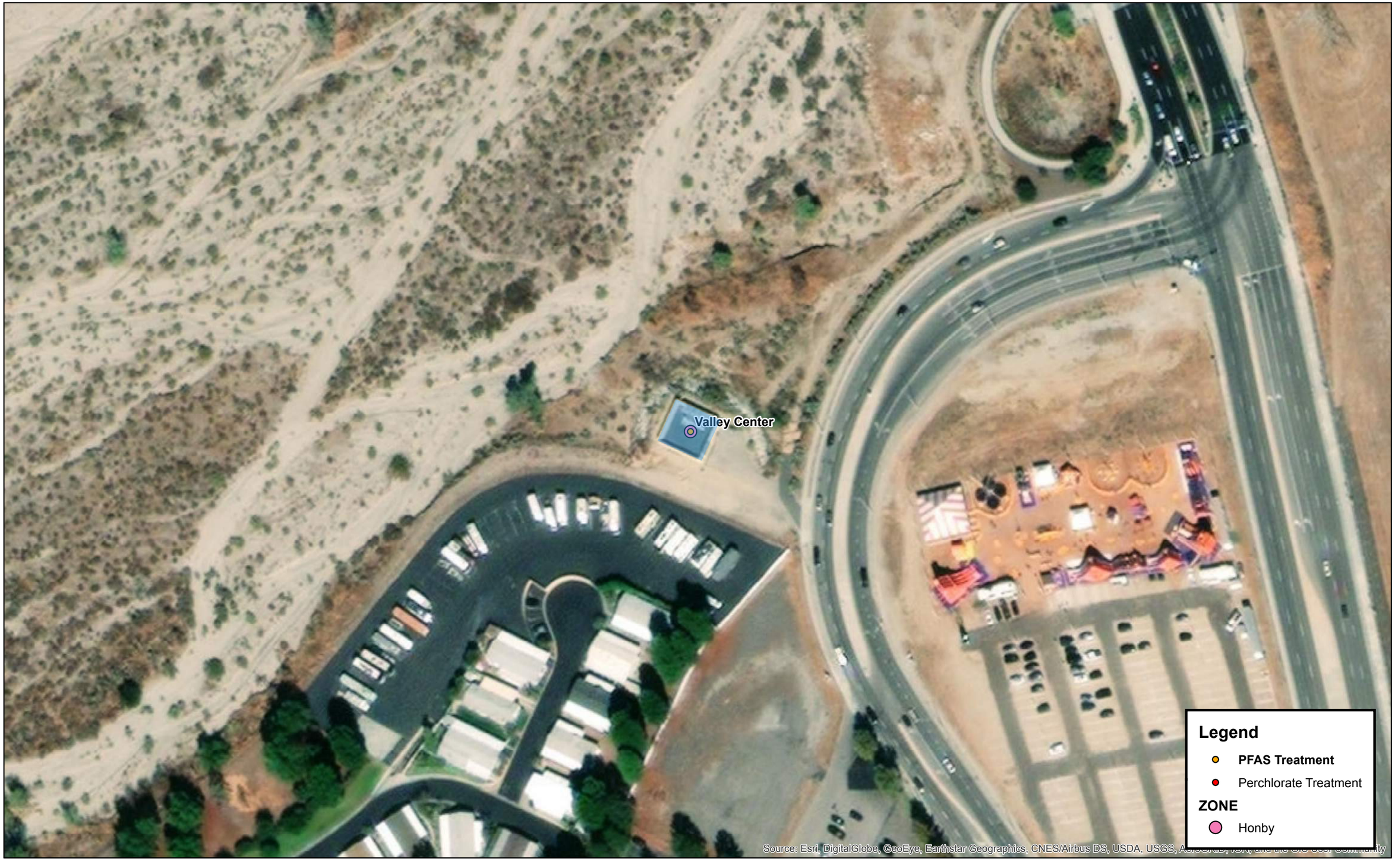
SIERRA TREATMENT SITE

1 inch = 100 feet

T&U WWELLS TREATMENT SITE

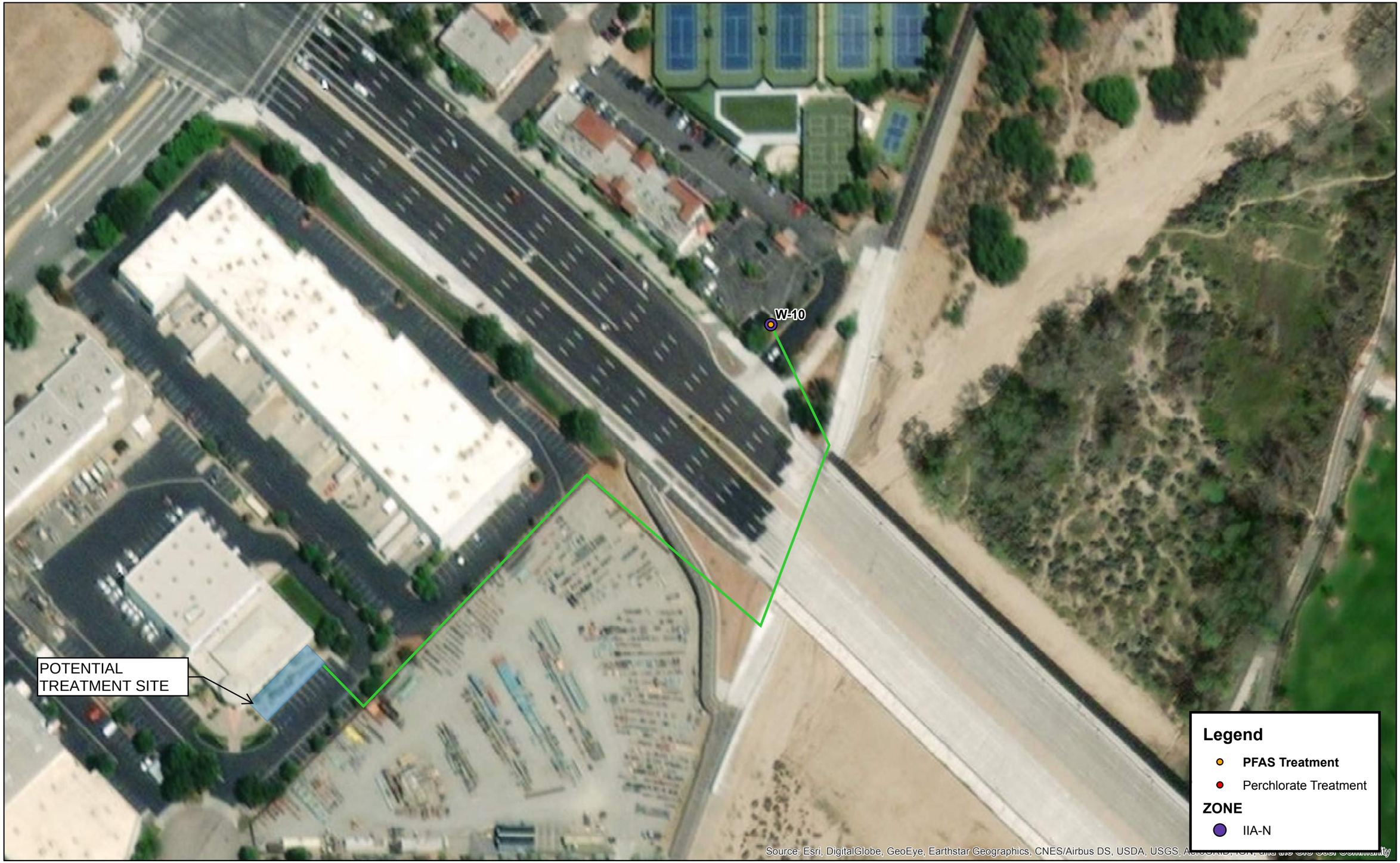
1 inch = 800 feet

VALLEY CENTER TREATMENT SITE



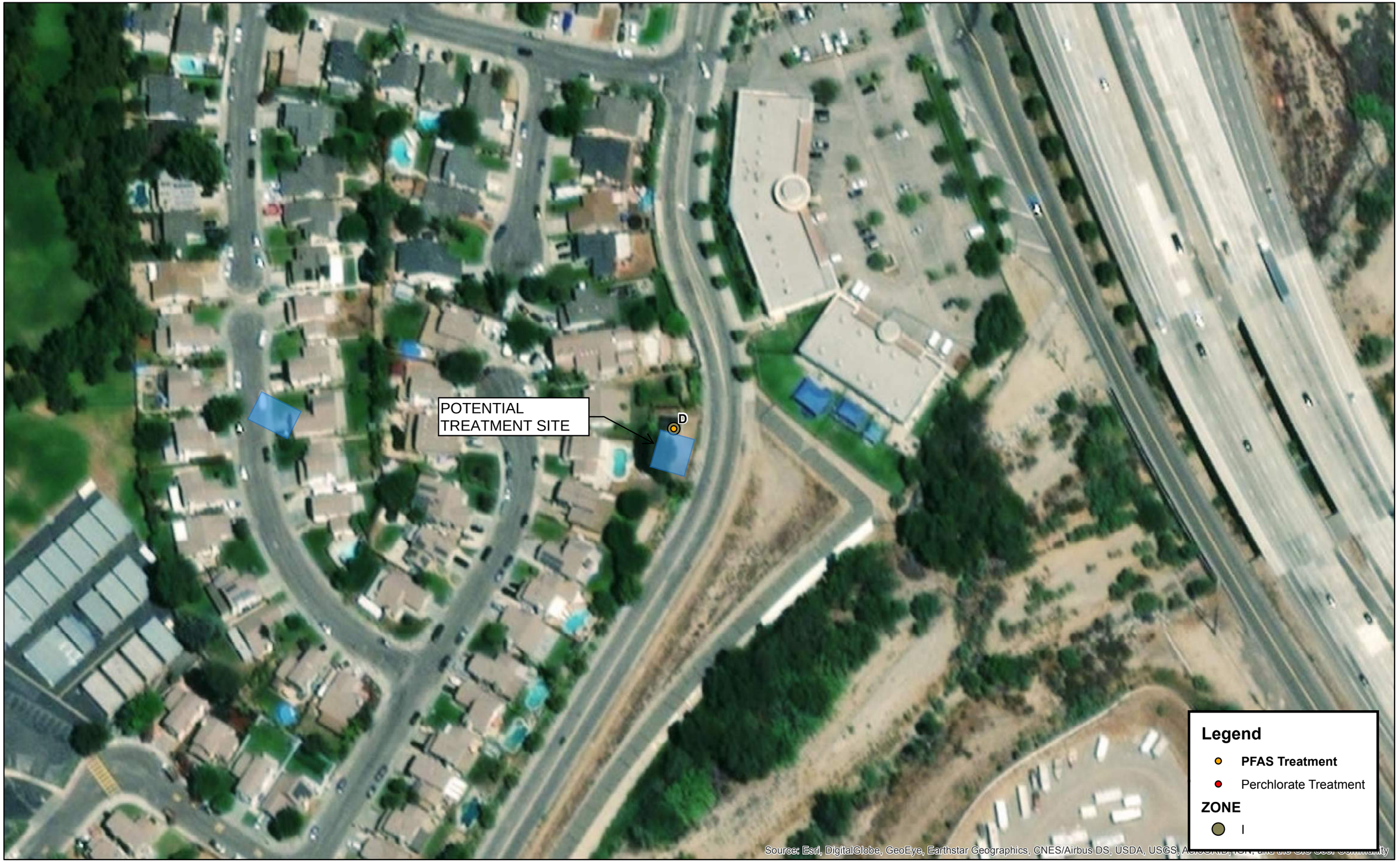
1 inch = 100 feet

W-10 TREATMENT SITE



1 inch = 100 feet

WELL D TREATMENT SITE



1 inch = 100 feet

APPENDIX B. PLANNING LEVEL COST ESTIMATES

Well Site	Flows	Rounded Flows	Site Area
Clark	550	1000	4,839

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs		
Division	**Item Description**	**Total**
Div 2	Site Work	$ 154,004
Div 3	Concrete	$ 55,384
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,156,695
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 190,667
	Well Pump Replacement	$ 152,500
Div 16/17	EI&C	$ 494,812
	Treatment Subtotal	$ 2,474,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 2,474,000
	Div 1 Costs @ 10%	$ 247,400
	Taxes - Materials @ 9.5%	$ 110,000
	Subcontractor - 40% of Materials @ 12%	$ 56,000
	Bonds & Insurance @ 2.5%	$ 72,000
	Estimate Contingency @ 15%	$ 444,000
	Escalate to Midpoint of Construction @ 4%	$ 136,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,239,000
	Total Cost	**$ 4,778,000**

	Treatment Cost + Markups	$ 4,778,000
	Piping Cost + Markups	$ -
	Total Cost	$ 4,778,000

Well Site	Flows	Rounded Flows	Site Area
Centralized Treatment	4800	5000	4,827
E-14	1200	1500	3,187
E-15	1400	1500	3,187
E-16	1200	1500	3,187
E-17	1000	1000	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
E-17 to Collector	3200	1000	10	$ 640,000
E-15 to E-14	1100	1400	10	$ 220,000
E-14 to E-16	1100	2600	16	$ 352,000
E-16 to Collector	1100	1200	10	$ 220,000
Collector to Site	600	6200	24	$ 288,000
			Total Cost	$ 1,720,000.00

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 237,333
Div 3	Concrete	$ 100,000
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 2,761,435
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 353,333
	Well Pump Replacement	$ 762,500
Div 16/17	El&C	$ 1,121,150
	Treatment Subtotal	$ 5,606,000
	Piping to Centralized Treatment Facility	$ 1,720,000
	Subtotal	$ 7,326,000
	Div 1 Costs @ 10%	$ 732,600
	Taxes - Materials @ 9.5%	$ 426,000
	Subcontractor - 40% of Materials @ 12%	$ 339,000
	Bonds & Insurance @ 2.5%	$ 221,000
	Estimate Contingency @ 15%	$ 1,357,000
	Escalate to Midpoint of Construction @ 4%	$ 416,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 3,786,000
	Total Cost	**$ 14,604,000**

	Treatment Cost + Markups	$ 11,175,269
	Piping Cost + Markups	$ 3,428,731
	Total Cost	$ 14,604,000

Well Site	Flows	Rounded Flows	Site Area
Lost Canyon/Mitchel	2625	3000	8,795
Lost Canyon 2	800	1000	3,187
Lost Canyon 2A	825	1000	3,187
Mitchel 5B	1000	1000	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
Mitchel 5B to Canyo	3300	1000	10	660000
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	660000

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 221,710
Div 3	Concrete	$ 93,359
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,934,365
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 272,000
	Well Pump Replacement	$ 457,500
Div 16/17	EI&C	$ 812,233
	Treatment Subtotal	$ 4,061,000
	Piping to Centralized Treatment Facility	$ 660,000
	Subtotal	$ 4,721,000
	Div 1 Costs @ 10%	$ 472,100
	Taxes - Materials @ 9.5%	$ 246,000
	Subcontractor - 40% of Materials @ 12%	$ 172,000
	Bonds & Insurance @ 2.5%	$ 140,000
	Estimate Contingency @ 15%	$ 863,000
	Escalate to Midpoint of Construction @ 4%	$ 265,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 2,408,000
	Total Cost	**$ 9,287,000**

	Treatment Cost + Markups	$ 7,988,669
	Piping Cost + Markups	$ 1,298,331
	Total Cost	$ 9,287,000

Well Site	Flows	Rounded Flows	Site Area
N Wells	6250	6000	4,827
N-1	1250	1500	3,187
N-7	2500	2500	3,896
N-8	2500	2500	3,896

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Actual Cost from SCV Water (Used in TM)		
Item Description	**Total**	
Mobilization	$	190,000.0
Trench Shoring, Scaffolding & Safety	$	1,800.0
Site Clearing & Grubbing	$	15,300.0
Site Grading, Paving and Fencing	$	320,700.0
Concrete Pad for Vessels & Cartridge	$	225,000.0
Installation	$	375,000.0
Yard Piping, Valves and Appurtenances	$	885,300.0
Chemical Building Foundation	$	169,700.0
Chemical Building Wall, Roof, Exterior & interior	$	365,800.0
Chemical Building Piping, Plumbing & HVAC	$	70,700.0
Furnish and Install Chemical Systems	$	742,700.0
Install Other Owner Furnished Equi & Materials	$	500.0
Electrical & Instrumentation	$	628,700.0
Lanscaping & Irrigation	$	20,000.0
Startup & Testing	$	13,600.0
Demobilization	$	10,000.0
Insurance Premium	$	20,000.0
Change Orders	$	245,200.0
Total Site Construction		**$4,300,000**
Evoqua (Vessels)	$	1,400,000
Evoqua (Resin)	$	287,000
Purolite (Resin)	$	600,000
TRC (Construction Management)	$	615,000
Kennedy/Jenks (Engineering During)	$	215,000
Kennedy/Jenks (Prelim Design)	$	100,000
Kennedy/Jenks (Final Design)	$	260,000
Pump/motor upgrades*** (Future)	$	915,000
Power Upgrades*** (Future)	$	523,000
Total Cost		**$9,215,000**

Well Site	Flows	Rounded Flows	Site Area
Newhall	4250	4500	9,640
Newhall 12	2000	2000	3,187
Newhall 13	2250	2500	3,896

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
N12 to N13	1500	2000	14	420000
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	420000

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 236,378
Div 3	Concrete	$ 100,000
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 2,731,435
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 333,000
	Well Pump Replacement	$ 686,250
Div 16/17	EI&C	$ 1,089,266
	Treatment Subtotal	$ 5,446,000
	Piping to Centralized Treatment Facility	$ 420,000
	Subtotal	$ 5,866,000
	Div 1 Costs @ 10%	$ 586,600
	Taxes - Materials @ 9.5%	$ 299,000
	Subcontractor - 40% of Materials @ 12%	$ 182,000
	Bonds & Insurance @ 2.5%	$ 173,000
	Estimate Contingency @ 15%	$ 1,066,000
	Escalate to Midpoint of Construction @ 4%	$ 327,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 2,975,000
	Total Cost	**$ 11,475,000**

	Treatment Cost + Markups	$ 10,653,401
	Piping Cost + Markups	$ 821,599
	Total Cost	$ 11,475,000

Well Site	Flows	Rounded Flows	Site Area
Oaks	2150	2500	3,896
North Oaks Central	1200	1500	3,187
North Oaks East	950	1000	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 207,248
Div 3	Concrete	$ 85,526
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,904,365
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 251,667
	Well Pump Replacement	$ 381,250
Div 16/17	EI&C	$ 775,014
	Treatment Subtotal	$ 3,875,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 3,875,000
	Div 1 Costs @ 10%	$ 387,500
	Taxes - Materials @ 9.5%	$ 181,000
	Subcontractor - 40% of Materials @ 12%	$ 91,000
	Bonds & Insurance @ 2.5%	$ 113,000
	Estimate Contingency @ 15%	$ 697,000
	Escalate to Midpoint of Construction @ 4%	$ 214,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,945,000
	Total Cost	**$ 7,504,000**

	Treatment Cost + Markups	$ 7,504,000
	Piping Cost + Markups	$ -
	Total Cost	$ 7,504,000

Well Site	Flows	Rounded Flows	Site Area
P Wells	800	1000	4,839
P1	300	500	3,165
P5	500	500	3,165

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
P5 to P1	1500	500	6	180000
P1 to Treat	1000	800	8	160000
NA	0	0	0	0
			Total Cost	340000

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 154,004
Div 3	Concrete	$ 55,384
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,156,695
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 190,667
	Well Pump Replacement	$ 152,500
Div 16/17	EI&C	$ 494,812
	Treatment Subtotal	$ 2,474,000
	Piping to Centralized Treatment Facility	$ 340,000
	Subtotal	$ 2,814,000
	Div 1 Costs @ 10%	$ 281,400
	Taxes - Materials @ 9.5%	$ 142,000
	Subcontractor - 40% of Materials @ 12%	$ 96,000
	Bonds & Insurance @ 2.5%	$ 83,000
	Estimate Contingency @ 15%	$ 512,000
	Escalate to Midpoint of Construction @ 4%	$ 157,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,430,000
	Total Cost	**$ 5,515,000**

	Treatment Cost + Markups	$ 4,848,653
	Piping Cost + Markups	$ 666,347
	Total Cost	$ 5,515,000

Well Site	Flows	Rounded Flows	Site Area
S Wells	7000	7000	5,562
S-6	2000	2000	3,187
S-7	2000	2000	3,187
S-8	2000	2000	3,187
S-9	1000	1000	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
One Site: S-6 to S-7	1600	2000	14	448000
One Site: S-7 to S-8	1300	4000	20	520000
One Site: S-8 to S-9 (Treatment Site)	900	6000	24	432000
			Total Cost	1400000

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 237,333
Div 3	Concrete	$ 100,000
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 3,539,105
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 434,667
	Well Pump Replacement	$ 1,067,500
Div 16/17	EI&C	$ 1,412,151
	Treatment Subtotal	$ 7,061,000
	Piping to Centralized Treatment Facility	$ 1,400,000
	Subtotal	$ 8,461,000
	Div 1 Costs @ 10%	$ 846,100
	Taxes - Materials @ 9.5%	$ 469,000
	Subcontractor - 40% of Materials @ 12%	$ 338,000
	Bonds & Insurance @ 2.5%	$ 253,000
	Estimate Contingency @ 15%	$ 1,555,000
	Escalate to Midpoint of Construction @ 4%	$ 477,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 4,340,000
	Total Cost	**$ 16,739,000**

	Treatment Cost + Markups	$ 13,969,280
	Piping Cost + Markups	$ 2,769,720
	Total Cost	$ 16,739,000

Well Site	Flows	Rounded Flows	Site Area
Santa Clara	2,450	2,500	3,896
Honby	950	1000	3,187
Santa Clara	1500	1500	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
Honby to Santa Clara	1300	950	10	260000
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	260000

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 207,248
Div 3	Concrete	$ 85,526
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,904,365
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 251,667
	Well Pump Replacement	$ 381,250
Div 16/17	EI&C	$ 775,014
	Treatment Subtotal	$ 3,875,000
	Piping to Centralized Treatment Facility	$ 260,000
	Subtotal	$ 4,135,000
	Div 1 Costs @ 10%	$ 413,500
	Taxes - Materials @ 9.5%	$ 206,000
	Subcontractor - 40% of Materials @ 12%	$ 123,000
	Bonds & Insurance @ 2.5%	$ 122,000
	Estimate Contingency @ 15%	$ 750,000
	Escalate to Midpoint of Construction @ 4%	$ 230,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 2,093,000
	Total Cost	**$ 8,073,000**

	Treatment Cost + Markups	$ 7,565,387
	Piping Cost + Markups	$ 507,613
	Total Cost	$ 8,073,000

Well Site	Flows	Rounded Flows	Site Area
Sierra	1000	1000	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 154,004
Div 3	Concrete	$ 55,384
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,156,695
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 190,667
	Well Pump Replacement	$ 152,500
Div 16/17	EI&C	$ 494,812
	Treatment Subtotal	$ 2,474,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 2,474,000
	Div 1 Costs @ 10%	$ 247,400
	Taxes - Materials @ 9.5%	$ 110,000
	Subcontractor - 40% of Materials @ 12%	$ 56,000
	Bonds & Insurance @ 2.5%	$ 72,000
	Estimate Contingency @ 15%	$ 444,000
	Escalate to Midpoint of Construction @ 4%	$ 136,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,239,000
	Total Cost	**$ 4,778,000**

	Treatment Cost + Markups	$ 4,778,000
	Piping Cost + Markups	$ -
	Total Cost	$ 4,778,000

Well Site	Flows	Rounded Flows	Site Area
T-7	3450	4000	4.037
T-7	1200	1500	3,187
U-4	1000	1000	3,187
U-6	1250	1500	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs

Division	Item Description	Total	
Div 2	Site Work	$	223,619
Div 3	Concrete	$	93,359
Div 4	Masonry	$	165,000
Div 5	Metals	$	30,000
Div 6	Wood & Plastics	-	
Div 7	Thermal & Moisture Protect.	-	
Div 8	Doors & Windows	-	
Div 9	Finishes	$	15,000
Div 10	Specialties	$	10,000
Div 11	Equipment (Includes Contractor Markups)	$	1,994,365
Div 12	Furnishings	-	
Div 13	Building Special Construction	$	50,000
Div 14	Conveying Systems	-	
Div 15	Mechanical	$	312,667
	Well Pump Replacement	$	610,000
Div 16/17	EI&C	$	876,002
	Treatment Subtotal	$	4,380,000
	Piping to Centralized Treatment Facility	$	-
	Subtotal	$	4,380,000
	Div 1 Costs @ 10%	$	438,000
	Taxes - Materials @ 9.5%	$	189,000
	Subcontractor - 40% of Materials @ 12%	$	96,000
	Bonds & Insurance @ 2.5%	$	128,000
	Estimate Contingency @ 15%	$	785,000
	Escalate to Midpoint of Construction @ 4%	$	241,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$	2,190,000
	Total Cost	**$**	**8,447,000**

	Treatment Cost + Markups	$	8,447,000
	Piping Cost + Markups	$	-
	Total Cost	$	8,447,000

Well Site	Flows	Rounded Flows	Site Area
Valley Center	1200	1500	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 167,094
Div 3	Concrete	$ 63,218
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,186,695
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 211,000
	Well Pump Replacement	$ 228,750
Div 16/17	EI&C	$ 531,689
	Treatment Subtotal	$ 2,658,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 2,658,000
	Div 1 Costs @ 10%	$ 265,800
	Taxes - Materials @ 9.5%	$ 113,000
	Subcontractor - 40% of Materials @ 12%	$ 57,000
	Bonds & Insurance @ 2.5%	$ 77,000
	Estimate Contingency @ 15%	$ 476,000
	Escalate to Midpoint of Construction @ 4%	$ 146,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,327,000
	Total Cost	**$ 5,120,000**

	Treatment Cost + Markups	$ 5,120,000
	Piping Cost + Markups	$ -
	Total Cost	$ 5,120,000

Well Site	Flows	Rounded Flows	Site Area
Well 201	2400	2500	3,896

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs		
Division	**Item Description**	**Total**
Div 2	Site Work	$ 207,248
Div 3	Concrete	$ 85,526
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,904,365
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 251,667
	Well Pump Replacement	$ 381,250
Div 16/17	EI&C	$ 775,014
	Treatment Subtotal	$ 3,875,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 3,875,000
	Div 1 Costs @ 10%	$ 387,500
	Taxes - Materials @ 9.5%	$ 181,000
	Subcontractor - 40% of Materials @ 12%	$ 91,000
	Bonds & Insurance @ 2.5%	$ 113,000
	Estimate Contingency @ 15%	$ 697,000
	Escalate to Midpoint of Construction @ 4%	$ 214,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,945,000
	Total Cost	**$ 7,504,000**

	Treatment Cost + Markups	$ 7,504,000
	Piping Cost + Markups	$ -
	Total Cost	$ 7,504,000

Well Site	Flows	Rounded Flows	Site Area
Well 205	2700	3000	3,927

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs

Division	Item Description	Total	
Div 2	Site Work	$	221,710
Div 3	Concrete	$	93,359
Div 4	Masonry	$	165,000
Div 5	Metals	$	30,000
Div 6	Wood & Plastics	-	
Div 7	Thermal & Moisture Protect.	-	
Div 8	Doors & Windows	-	
Div 9	Finishes	$	15,000
Div 10	Specialties	$	10,000
Div 11	Equipment (Includes Contractor Markups)	$	1,934,365
Div 12	Furnishings	-	
Div 13	Building Special Construction	$	50,000
Div 14	Conveying Systems	-	
Div 15	Mechanical	$	272,000
	Well Pump Replacement	$	457,500
Div 16/17	EI&C	$	812,233
	Treatment Subtotal	$	4,061,000
	Piping to Centralized Treatment Facility	$	-
	Subtotal	$	4,061,000
	Div 1 Costs @ 10%	$	406,100
	Taxes - Materials @ 9.5%	$	184,000
	Subcontractor - 40% of Materials @ 12%	$	93,000
	Bonds & Insurance @ 2.5%	$	119,000
	Estimate Contingency @ 15%	$	729,000
	Escalate to Midpoint of Construction @ 4%	$	224,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$	2,036,000
	Total Cost	**$**	**7,852,000**

	Treatment Cost + Markups	$	7,852,000
	Piping Cost + Markups	$	-
	Total Cost	$	7,852,000

Well Site	Flows	Rounded Flows	Site Area
Well D	1050	1500	5,593

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs		
Division	**Item Description**	**Total**
Div 2	Site Work	$ 167,094
Div 3	Concrete	$ 63,218
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,186,695
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 211,000
	Well Pump Replacement	$ 228,750
Div 16/17	EI&C	$ 531,689
	Treatment Subtotal	$ 2,658,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 2,658,000
	Div 1 Costs @ 10%	$ 265,800
	Taxes - Materials @ 9.5%	$ 113,000
	Subcontractor - 40% of Materials @ 12%	$ 57,000
	Bonds & Insurance @ 2.5%	$ 77,000
	Estimate Contingency @ 15%	$ 476,000
	Escalate to Midpoint of Construction @ 4%	$ 146,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,327,000
	Total Cost	**$ 5,120,000**

	Treatment Cost + Markups	$ 5,120,000
	Piping Cost + Markups	$ -
	Total Cost	$ 5,120,000

Well Site	Flows	Rounded Flows	Site Area
Well Q2	1200	1500	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs

Division	Item Description	Total
Div 2	Site Work	$ 167,094
Div 3	Concrete	$ 63,218
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,186,695
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 211,000
	Well Pump Replacement	$ 228,750
Div 16/17	EI&C	$ 531,689
	Treatment Subtotal	$ 2,658,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 2,658,000
	Div 1 Costs @ 10%	$ 265,800
	Taxes - Materials @ 9.5%	$ 113,000
	Subcontractor - 40% of Materials @ 12%	$ 57,000
	Bonds & Insurance @ 2.5%	$ 77,000
	Estimate Contingency @ 15%	$ 476,000
	Escalate to Midpoint of Construction @ 4%	$ 146,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,327,000
	Total Cost	**$ 5,120,000**

	Treatment Cost + Markups	$ 5,120,000
	Piping Cost + Markups	$ -
	Total Cost	$ 5,120,000

Well Site	Flows	Rounded Flows	Site Area
W-10	1500	1500	3,187

Piping to Centralized Treatment Facility

Piping Site	Distance	Flow	Diameter	Construction Cost
NA	0	0	0	0
NA	0	0	0	0
NA	0	0	0	0
			Total Cost	0

Treatment Costs		
Division	**Item Description**	**Total**
Div 2	Site Work	$ 167,094
Div 3	Concrete	$ 63,218
Div 4	Masonry	$ 165,000
Div 5	Metals	$ 30,000
Div 6	Wood & Plastics	-
Div 7	Thermal & Moisture Protect.	-
Div 8	Doors & Windows	-
Div 9	Finishes	$ 15,000
Div 10	Specialties	$ 10,000
Div 11	Equipment (Includes Contractor Markups)	$ 1,186,695
Div 12	Furnishings	-
Div 13	Building Special Construction	$ 50,000
Div 14	Conveying Systems	-
Div 15	Mechanical	$ 211,000
	Well Pump Replacement	$ 228,750
Div 16/17	EI&C	$ 531,689
	Treatment Subtotal	$ 2,658,000
	Piping to Centralized Treatment Facility	$ -
	Subtotal	$ 2,658,000
	Div 1 Costs @ 10%	$ 265,800
	Taxes - Materials @ 9.5%	$ 113,000
	Subcontractor - 40% of Materials @ 12%	$ 57,000
	Bonds & Insurance @ 2.5%	$ 77,000
	Estimate Contingency @ 15%	$ 476,000
	Escalate to Midpoint of Construction @ 4%	$ 146,000
	Total Implementation Multiplier (Engineering, Construction Management, Permitting, etc.) @35%	$ 1,327,000
	Total Cost	**$ 5,120,000**

	Treatment Cost + Markups	$ 5,120,000
	Piping Cost + Markups	$ -
	Total Cost	$ 5,120,000