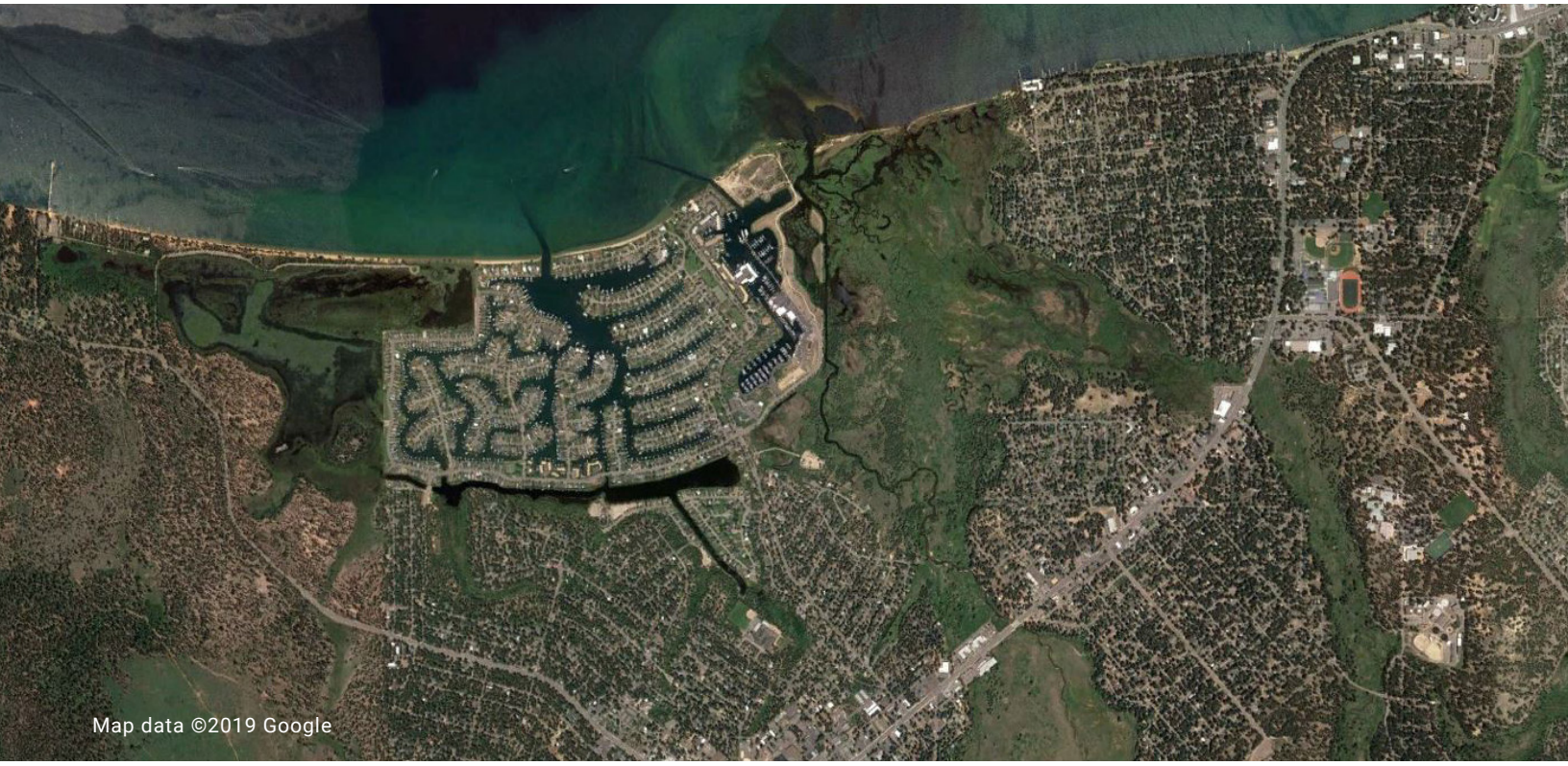
10 May 2020

SOUTH Y PCE FACILITIES FEASIBILITY STUDY

[AGREEMENT D1712508]



Prepared for

South Tahoe Public Utility District

1275 Meadow Crest Drive
South Lake Tahoe, CA 96150
KJ Project No. 1770027*00

Kennedy Jenks

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South Y PCE Facilities Feasibility Study [Agreement D1712508]

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Certification

The following Feasibility Study Report was prepared by:

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Funding Support

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Table of Contents

Table of Contents (cont'd)

Table of Contents (cont'd)

Table of Contents (cont'd)

Table of Contents (cont'd)

List of Tables

Table of Contents (cont'd)

List of Figures

List of Appendices

Glossary

µg/L	micrograms per liter
AACE	Association for the Advancement of Cost Engineering
AC	Asbestos cement
AQMD	Air Quality Management District
ARARs	Applicable or relevant and appropriate requirements
BAT	Best Available Technologies
bgs	Below ground surface
CA	Contaminant Assessment
CAO	Clean up and Abatement Order
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act
CPT/MIP	Cone Penetration Testing//Membrane Interface Probe
CPUC	California Public Utilities Commission
CSLT	City of South Lake Tahoe
CTC	California Tahoe Conservancy
DAC	Disadvantaged Community
DIP	Ductile iron pipe
District	South Tahoe Public Utility District
DRI	Desert Research Institute
DTSC	Department of Toxic Substances Control
DVTEs	Daily Vehicle Trip Ends
EDC	El Dorado County
EPA	United States Environmental Protection Agency
FAAST	Financial Assistance Application Submittal Tool
Fox	Fox Capital Management Corporation
ft/d	Feet per day
ft/ft	Feet per foot
GAC	Granular Activated Carbon
gpm	Gallons per minute
GW	Groundwater

GWMP	2014 Groundwater Management Plan for the Tahoe Valley South Subbasin
HHRA	Human Health Risk Assessment
HVOCs	Halogenated volatile organic compounds
IEC	Initial Environmental Checklist
IRAP	Interim Remedial Action Plan
IS	Initial Study
ISCO	In-Situ Chemical Oxidation
KJ	Kennedy Jenks Consultants
lbs	Pounds
LBWC	Lukins Brothers Water Company
LRWQCB	Lahontan Regional Water Quality Control Board
LTLW	Former Lake Tahoe Laundry Works site (1024 Lake Tahoe Boulevard)
MCL	maximum contaminant level
MG	Million Gallons
mg/L	milligrams per liter
MGD	Million Gallons Per Day
MSBA	Multi-Stage Bubble Aeration
MTBE	Methyl tert-butyl-ether
NPDES	National Pollution Discharge Elimination System
O&M	Operations & Maintenance
PCE	Tetrachloroethylene
PDI	Pre-Design Investigation
PER	Preliminary Engineering Report
PSIG	Pounds per square inch gauge
PTAS	Packed Tower Air Stripper
PVC	Polyvinyl chloride
PWS	Public Water System
R1	Extraction Well 1 (843 Hazel Drive)
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RCI	Resource Concepts Inc.
RI	Remedial Investigation
RW	Replacement Well

SA	Source Assessment
SAG	Stakeholders Advisory Group
SCAP	Site Cleanup Subaccount Program
SDAC	Severely Disadvantaged Community
Seven Springs	Seven Springs Limited Partnerships
STPUD	South Tahoe Public Utility District
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
SWRCB-DDW	State Water Resources Control Board – Division of Drinking Water
SWRCB-DFA	State Water Resources Control Board – Division of Financial Assistance
SWTP	Surface Water Treatment Plant
TAC	Technical Advisory Committee
TKPOA	Tahoe Keys Property Owners Association
TKWC	Tahoe Keys Water Company
TKWZ 4	Tahoe Keys Zone 4
TKWZ 5	Tahoe Keys Zone 5
TRPA	Tahoe Regional Planning Agency
TVS Basin	Tahoe Valley South Subbasin (6-5.01)
URS	URS Corporation
WTP	Water Treatment Plant

Executive Summary

Summary of South Y PCE Contamination History

The South Y Plume occurs within the west central portion of the Tahoe Valley South Sub-basin (6-5.01), herein referred to as the Tahoe Valley South Basin (TVS Basin) located in El Dorado County, California as shown on Figure ES 1. Drinking water service in the South Y is provided by the following water purveyors: South Tahoe Public Utility District (District), Lukins Brothers Water Company (LBWC) and the Tahoe Keys Water Company (TKWC), collectively referred to as water purveyors in this report.

Chlorinated hydrocarbons have been detected in public water system (PWS), monitoring, and private wells north and south of the South "Y" Area since 1989, when these compounds were required to be first tested in regulated drinking water sources. Many of the PWS wells have since ceased operating due to tetrachloroethylene (PCE) concentrations exceeding the drinking water standard of 5 micrograms per liter (µg/L). The majority of these South Y Area wells have been disconnected and many have been taken offline (i.e. ceased operation). A more detailed description of site history is found in Section 1.1.

Project Overview

PCE groundwater contamination has impacted the beneficial use of groundwater in the South Y Area. In order to address these impacts, Kennedy Jenks Consultants (KJ) was retained by the District to complete a Feasibility Study that would identify a cost-effective means of removing PCE from groundwater and manage existing groundwater sources to maintain adequate drinking water supply and quantity. The Feasibility Study evaluates remedial alternatives that will prevent further migration of contaminants and potential future impacts to downgradient water supply wells.

It should be noted that multiple parties have been collecting data related to PCE groundwater contamination in the South Y Area including data collected by Seven Springs/Fox pursuant to the Lahontan Regional Water Quality Control Board's (LRWQCB) Cleanup and Abatement Order (CAO) R6T-201-0022 and data collected by a contractor for the LRWQCB under the Site Cleanup Subaccount Program (SCAP).

Feasibility Study Overview

To inform the Feasibility Study, a Pre-Design Investigation (PDI) was conducted which included a field investigation consisting of: the drilling and construction of two 6-inch diameter wells that could be used for extraction; the performance of an aquifer test to derive aquifer properties; and the collection and analyses of soil and water quality samples to discern the vertical extent of PCE contamination (KJ, 2019). Using information developed during the PDI and information gleaned from fate and transport modeling performed by the Desert Research Institute (DRI, May 2019), KJ completed the Feasibility Study to identify a suite of potential remedial alternatives, in coordination with the Technical Advisory Committee (TAC). Working with the TAC, these remedial alternatives were evaluated for effectiveness, implementability, environmental effects and cost, and a remedial alternative that best met the remedial action objectives (RAOs) and complied with the applicable or relevant and appropriate requirements (ARARs) identified in the Feasibility Study workplan was selected (KJ, December 2018).

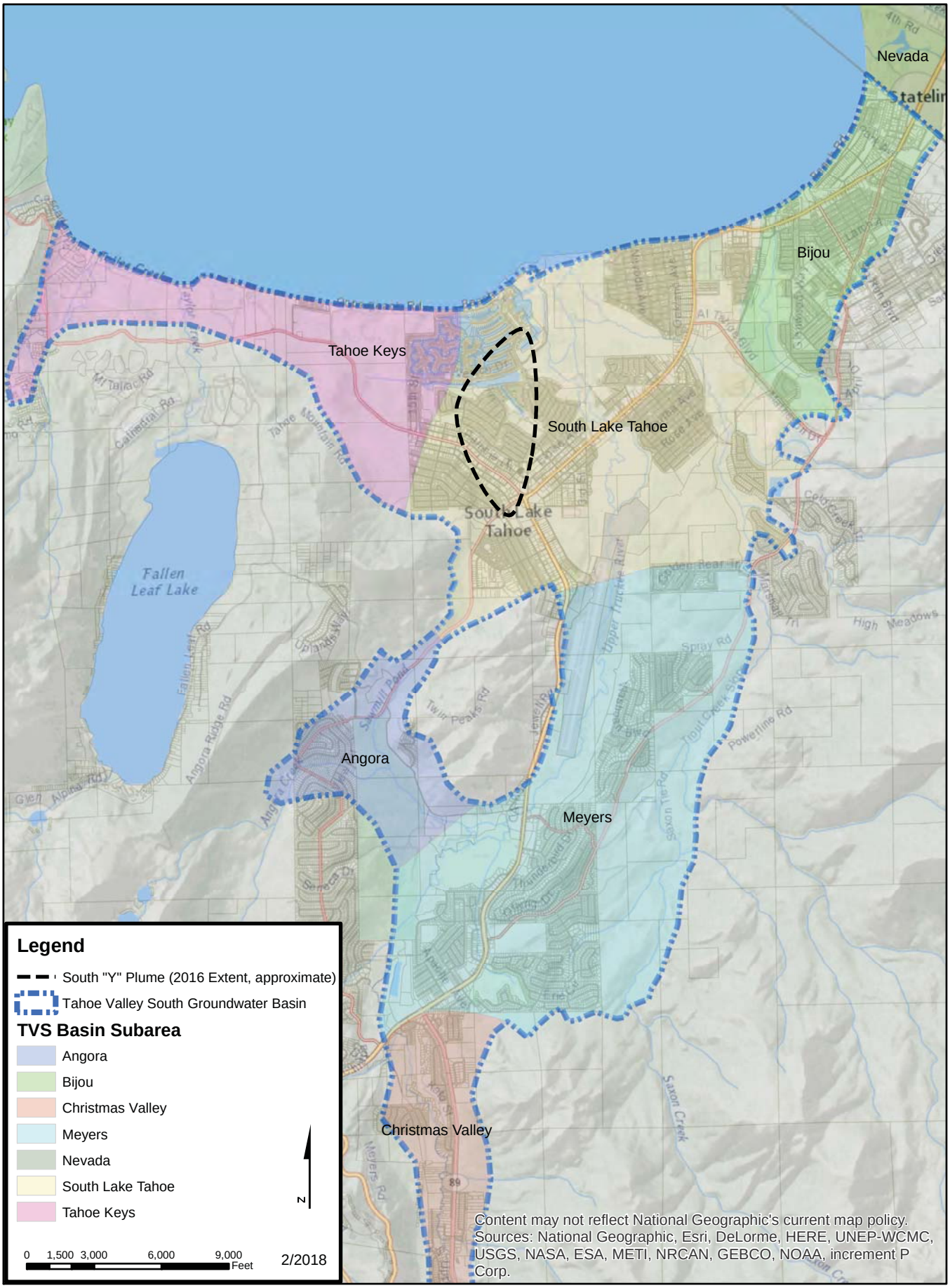

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Figure ES-1: South Y Regional Location

Remedial Alternatives Development

Remedial Alternatives for Initial Screening: Remedial alternatives were developed iteratively by first considering a suite of remedial alternatives for initial screening including:

- No Action: continue the existing operations
- Extraction Wells/Mid-Plume Remediation: pump and treat groundwater from the middle of the plume upgradient of the existing water production wells to intercept the PCE
- Replacement wells: replace existing wells impact by PCE
- In-situ remediation: remove PCE in groundwater (in-situ) by injecting chemical oxidants and enhancing degradation of the PCE

Refinement of Remedial Alternatives: Following fate and transport modeling evaluation by DRI and consultation with the TAC, the initial remedial alternatives were refined as follows:

- Targeted Pumping: a range of targeted pumping options of water supply wells were considered including pumping at 90% of the treatment capacity, 90% of the well capacity, reducing pumping to meet system demands, and pumping using an existing water supply well and a single extraction well to meet demands
- Gradual conversion from groundwater only to surface water as the drinking water source

Remedial Alternatives Selected for Further Consideration: Following additional fate and transport modeling, and discussion and consultation with the TAC, the remedial alternatives that were selected for further consideration were:

- No Action
- Targeted Pumping using an existing water supply well equipped with treatment to remove PCE and construction and operation of a new extraction well to be equipped with PCE treatment that would also replace lost production well capacity
- Conversion to Surface Water

Evaluation Criteria

The criteria used to evaluate the three remedial alternatives were organized in four general categories of effectiveness, implementability, environmental effects and cost. Most categories had several components as follows:

- **Effectiveness**
  - PCE Mass Removal
  - PCE Concentration Trends/Reductions
  - Short-term Effectiveness
  - Long-Term Effectiveness
  - Overall Protection of Human Health and Environment
  - Compliance with ARARS
- **Implementability**
  - Operations and Maintenance
  - Disposal/Reuse Options
- **Environmental Effects**
- **Cost**
  - Capital
  - 20-year Operations and Maintenance

Results of Evaluation of Remedial Alternatives

Tables ES 1 summarizes the alternatives evaluation performed in Section 6 using the Criteria defined in Section 5.

Preferred Remedial Alternative

Based on the Evaluation and Ranking of Alternatives, Targeted Pumping with potable reuse (Alternative 2 Option 1) is the preferred remedial alternative that will best meet the Feasibility Study goals, control or remove PCE from groundwater and prevent further migration of contaminants and potential future impacts to downgradient water supply wells that serves or has served as a source of drinking water; and replace lost drinking water production caused by the impairment of groundwater sources in the South Y Area.

The preferred remedial alternative would change the LBWC current groundwater well operating strategy by using LBWC 5 (equipped with PCE treatment) as the primary LBWC supply and use LBWC 1 as the backup well. R1 would be constructed along with an accompanying groundwater treatment facility at 843 Hazel Drive to replace lost drinking water production in the South Y Area. Drinking water from this facility would be available to the water purveyors through existing water distribution system intertie connections. No capital improvements are needed to implement the new operations strategy at LBWC 5 and LBWC 1.

LBWC 5 and R1 would be operated in a manner that would result in increased contaminant removal and plume containment compared to the No Action Alternative. R1 would be drilled and screened to remove PCE from groundwater above 150 feet below ground surface (ft bgs). Treated water from LBWC 5 would be used to meet LBWC water system demands in conjunction with LBWC 1. Treated water from R1 will be connected to the water purveyors' distribution systems to be available for drinking water use through existing intertie connections between water distribution systems. The greatest total mass of PCE is believed to be removed through implementation of this Alternative. Fate and transport modeling evaluation completed by DRI suggests that about 770 to 3,300 pounds (lbs) of PCE may be expected to be removed from groundwater using this Alternative. Pumping rates and levels of treatment at TKWC wells would be maintained to meet system water demands.

In addition, the preferred remedial alternative was further refined to include activities needed to gather information to complete design of the R1 groundwater treatment facility, as well as to monitor the effectiveness of the project, as described in Section 8. Figure ES 2 and Figure ES 3 show the conceptual site layout of the R1 groundwater treatment facility, including approximate locations, sizes, and quantities of elements. Based on the Conceptual Design and Site Layout, it is estimated that implementation of this Alternative could take 3 to 7 years.

Based on the refined preferred remedial alternative, the estimated implementation costs in 2019$ with an accuracy range of -30% to +50% are:

- Pre-Design Activities = $500,000 to $1,100,000
- Capital = $3,700,000 to $8,000,000
- 20-Year Operations and Maintenance (O&M) = $4,800,000 to $10,000,000

See Section 8.3 for details on the above cost estimates and Section 5.4 for a description of cost factors and assumptions.

Table ES 1: Summary of Detailed Analysis of Refined Alternatives (20-Year Period from 2019-2038)

Criteria	Alternative 1 – No Action	Alternative 2 – Targeted Pumping – LBWC Demands with Extraction Well [a]			Alternative 3 – Conversion to Surface Water Treatment
		Option 1: Potable Reuse	Option 2: Sewer Discharge	Option 3: Sewer/Stormwater System Discharge	
Effectiveness					
PCE Mass Removal	280 to 1,800 lbs	770 to 3,300 lbs	770 to 3,300 lbs	770 to 3,300 lbs	230 to 1,400 lbs
PCE Concentration Trends/ Reduction in Toxicity	• PCE concentrations remain above MCL in LBWC 5 and TKWC 2 • PCE concentration increases to above the MCL in TKWC 1 • PCE concentrations in LBWC 1 and TKWC 3 are not expected to rise above the MCL	• PCE concentrations have the potential to reduce to below the MCL in LBWC 5, TKWC 2, and R1 • PCE concentrations in LBWC 1, TKWC 1, and TKWC 3 are not expected to rise above the MCL	• PCE concentrations have the potential to reduce to below the MCL in LBWC 5, TKWC 2, and R1 • PCE concentrations in LBWC 1, TKWC 1, and TKWC 3 are not expected to rise above the MCL	• PCE concentrations have the potential to reduce to below the MCL in LBWC 5, TKWC 2, and R1 • PCE concentrations in LBWC 1, TKWC 1, and TKWC 3 are not expected to rise above the MCL	• PCE concentrations remain above MCL in LBWC 5 and TKWC 2 • PCE concentration increases to above the MCL in TKWC 1 • PCE concentrations in LBWC 1 and TKWC 3 are not expected to rise above the MCL
Short-Term Effectiveness	0 years to implement	3 to 7 years to implement [b]	3 to 7 years to implement [b]	3 to 7 years to implement [b]	15 years to implement
Long-Term Effectiveness	• 3,800 MG of potable water produced through existing infrastructure and operations • No additional potable supply or improvement in water quality	Additional 2,900 MG of potable water produced through R1 (total 6,700 MG of potable water produced)	No additional potable water supply	No additional potable water supply	• Complete switch of water supply to source not impacted by PCE – 940 MG produced through SWTP to meet demands • No additional PCE treatment; PCE mass removal ceases with conversion to surface water
Overall Protection of Human Health and Environment	• No additional PCE treatment • No reduction in exposure to PCE through drinking water	• New PCE treatment at R1 • Additional PCE removal through LBWC 5 (lead well) and R1 • Reduction in PCE mass removed through TKWC 1 and TKWC 2	• New PCE treatment at R1 • Additional PCE removal through LBWC 5 (lead well) and R1 • Reduction in PCE mass removed through TKWC 1 and TKWC 2	• New PCE treatment at R1 • Additional PCE removal through LBWC 5 (lead well) and R1 • Reduction in PCE mass removed through TKWC 1 and TKWC 2	Complete switch of water supply to source not impacted by PCE
Compliance with ARARs	No additional permitting	Additional Permitting: • Sewer discharge • TRPA and environmental clearances • Temporary permitting related to construction • New drinking water source and potentially Policy Memo 97-005 permitting (SWRCB-DDW)	Additional Permitting: • Sewer discharge • TRPA and environmental clearances • Temporary permitting related to construction	Additional Permitting: • Sewer discharge • TRPA and environmental clearances • Temporary permitting related to construction • NPDES permitting and mitigation for stormwater discharge	Additional Permitting: • Water Rights Permit modification • Sewer discharge • NPDES permitting and mitigation for stormwater discharge • TRPA, Department of Fish and Wildlife, US Army Corps of Engineers, California Air Resources Board and other environmental clearances • CTC access • New drinking water source permitting (SWRCB-DDW) • Temporary permitting related to construction

Notes:

a. Alternative 2 Options:
   Option 1 – Potable reuse of water produced at R1
   Option 2 – Disposal of water produced at R1 via District sewer
   Option 3 – Disposal of water produced at R1 via District sewer in wet months (October through April) and via the City of South Lake Tahoe stormwater system in dry months (May through September)

b. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 Option 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of the 20-year total) is estimated to be 213 lbs to 2,559 lbs.

c. Cost Evaluation conducted over a 20-year period, the first 15 of which assumes No Action operations during design, construction, and start-up of SWTP. Therefore, Total O&M Costs are for the last five years of the Cost Evaluation period.

d. Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4.

Criteria	Alternative 1 – No Action	Alternative 2 – Targeted Pumping – LBWC Demands with Extraction Well [a]			Alternative 3 – Conversion to Surface Water Treatment
		Option 1: Potable Reuse	Option 2: Sewer Discharge	Option 3: Sewer/Stormwater System Discharge	
Implementability					
Operations and Maintenance	No additional O&M	• Increased pumping at LBWC 5 • Increased LBWC 5 GAC backwash and change-out frequency • Maintenance of R1 treatment facility for PCE and drinking water • Disposal of R1 treatment residuals • Monitoring for drinking water standards • No change in TKWC system O&M	• Increased pumping at LBWC 5 • Increased LBWC 5 GAC backwash and change-out frequency • Maintenance of R1 treatment facility for PCE • Disposal of R1 treatment residuals • Monitoring for sewer discharge requirements • No change in TKWC system O&M	• Increased pumping at LBWC 5 • Increased LBWC 5 GAC backwash and change-out frequency • Maintenance of R1 treatment facility for PCE • Disposal of R1 treatment residuals • Monitoring for sewer discharge requirements • Monitoring for NPDES stormwater discharge requirements • No change in TKWC system O&M	• Operation and maintenance of SWTP, intake pump station, distribution pump station o Additional treatment operator certification • No change in TKWC system O&M
Disposal/Reuse Options	No disposal of excess water or additional treatment residuals	Disposal of R1 treatment residuals	Disposal of excess water via District sewer system	Disposal of excess water via District sewer system and/or City stormwater system	• No disposal of excess water • Disposal of treatment residuals
Environmental Effects	No new impacts requiring mitigation	• Air quality • Light and Glare • Noise • Transportation/Circulation • Utilities	• Air quality • Light and Glare • Noise • Transportation/Circulation • Utilities	• Air quality • Light and Glare • Noise • Transportation/Circulation • Utilities	• Aesthetics • Air Quality • Biological Resources • Hydrology and Water Quality • Noise • Recreation • Transportation/Circulation • Utilities
Rounded Cost [d]	No new capital or O&M costs	• Capital: $3.6M to $7.8M • Annual O&M: $200,000 to $2.0M • Total O&M (20 Years): $4.6M to $9.9M	• Capital: $2.8M to $6.0M • Annual O&M: $770,000 to $1.7M • Total O&M (20 Years): $15M to $33M	• Capital: $2.9M to $6.2M • Annual O&M: $470,000 to $1.0M • Total O&M (20 Years): $9.4M to $20M	• Capital: $40M to $86M • Annual O&M: $1.1M to $2.4M • Total O&M (5 Years) [c]: $5.5M to $12M

Notes:

a. Alternative 2 Options:
   Option 1 – Potable reuse of water produced at R1
   Option 2 – Disposal of water produced at R1 via District sewer
   Option 3 – Disposal of water produced at R1 via District sewer in wet months (October through April) and via the City of South Lake Tahoe stormwater system in dry months (May through September)

b. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of the 20-year total) is estimated to be 213 lbs to 2,559 lbs.

c. Cost Evaluation conducted over a 20-year period, the first 15 of which assumes No Action operations during design, construction, and start-up of SWTP. Therefore, Total O&M Costs are for the last five years of the Cost Evaluation period.

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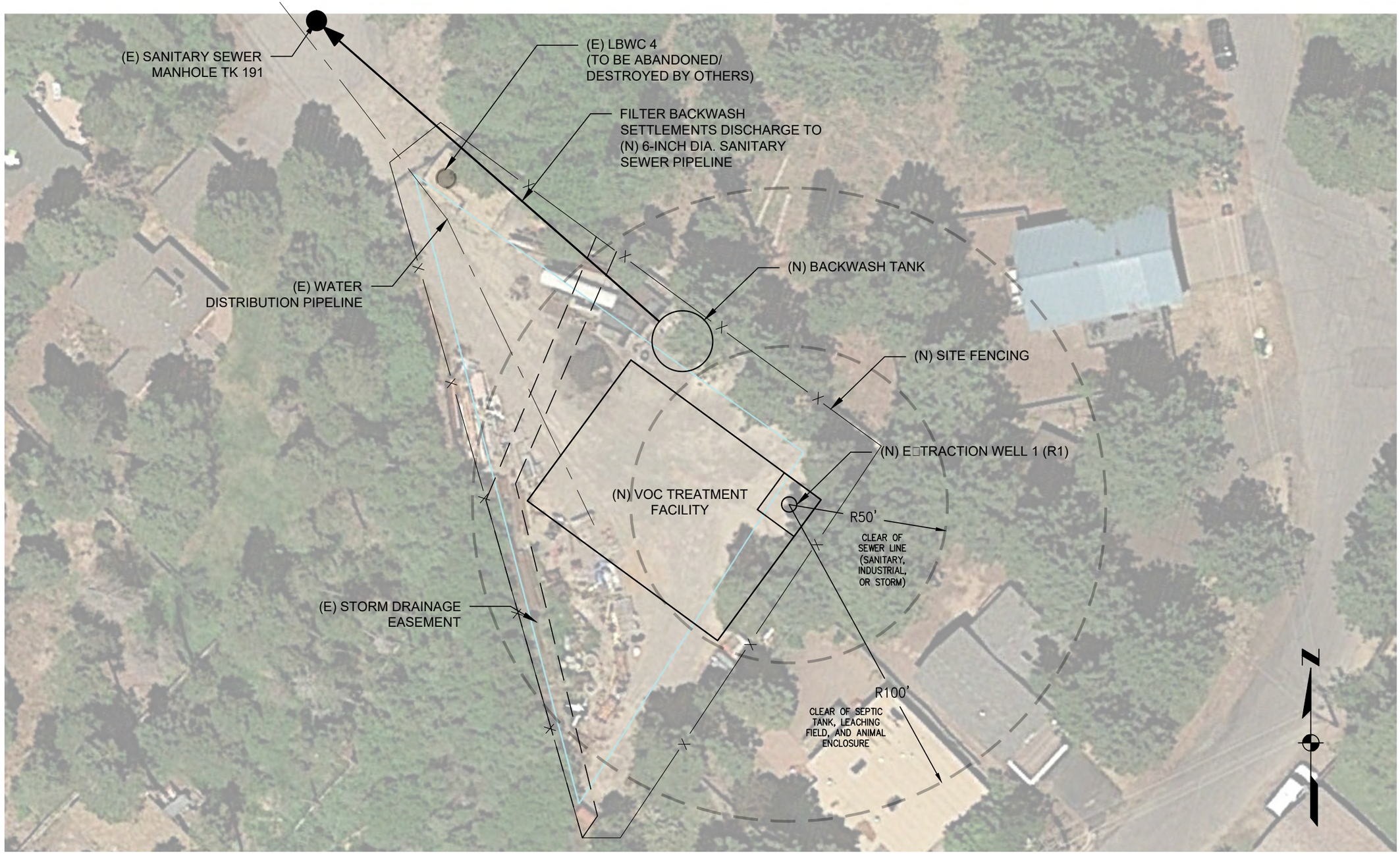

NOTES:
1. LOCATIONS, SIZES AND QUANTITIES ARE APPROXIMATE AND TO BE REFINED DURING DESIGN
2. (E) = EXISTING, (N) = NEW

Kennedy/Jenks Consultants

SOUH TAHOE PUBLIC UTILITY DISTRICT

SOUTH Y FEASIBILITY STUDY

□REFERRED REMEDIAL ALTERNATIVE NEW EXTRACTION WELL □ AND GROUNDWATER TREATMENT FACILIT□ AT □4□ □A□EL DRIVE

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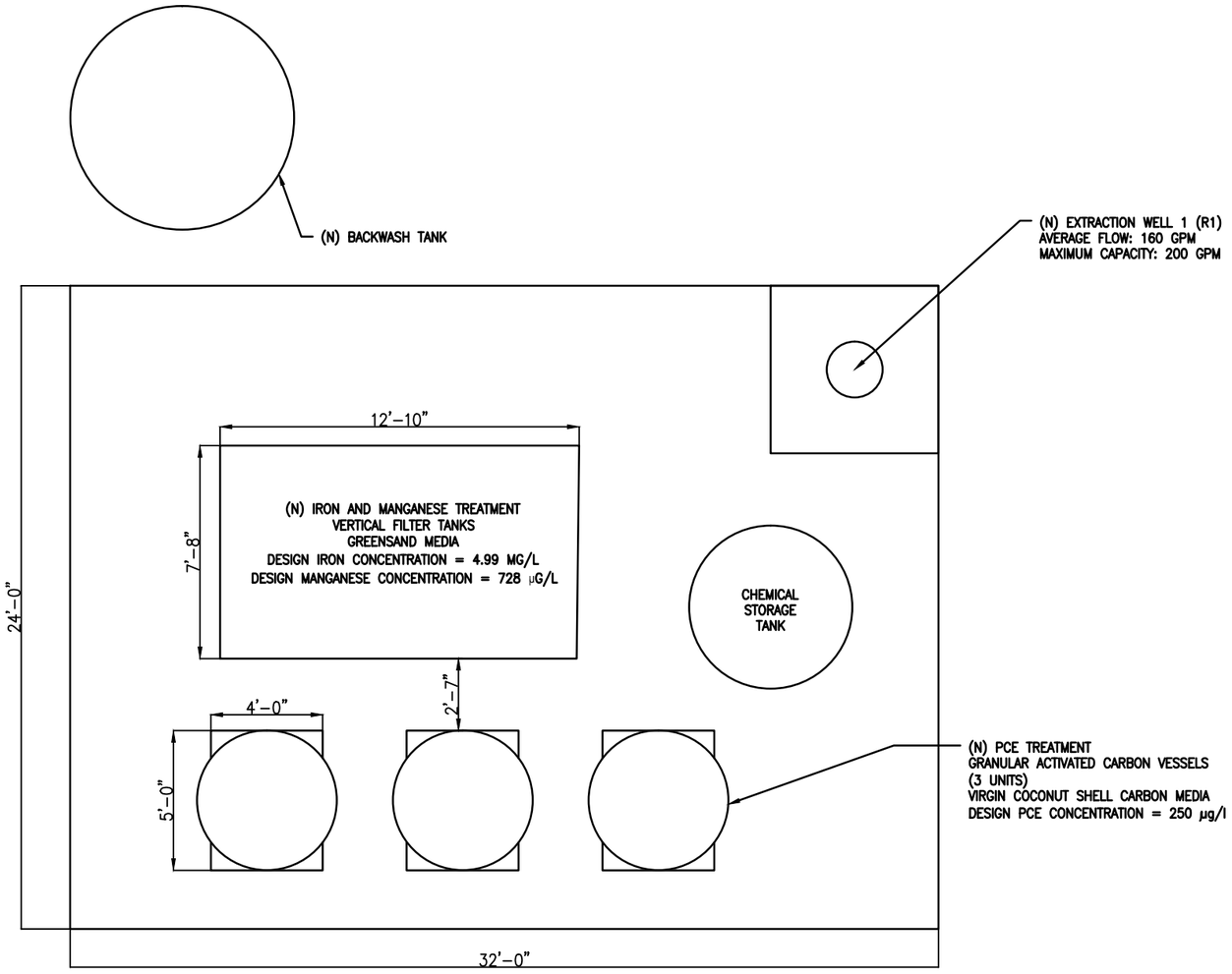
FIGURE ES-2



GROUNDWATER TREATMENT FACILITY FLOOR PLAN

Kennedy/Jenks Consultants

SOUH TAHOE PUBLIC UTILITY DISTRICT

SOUTH Y FEASIBILITY STUDY

REFERRED REMEDIAL ALTERNATIVE GROUNDWATER TREATMENT FACILIT

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FIGURE ES 2

Section 1: Introduction

1.1 Summary of Site History

The South Y Plume occurs within the west central portion of the Tahoe Valley South Sub-basin (6-5.01), herein referred to as the Tahoe Valley South Basin (TVS Basin). The TVS Basin has an area of approximately 23 square miles (14,814 acres) in El Dorado County, California as shown on Figure 1-1. The TVS Basin is roughly triangular in aerial extent and is bounded on the southwest by the Sierra Nevada, on the southeast by the Carson Range, and on the north by the southern shore of Lake Tahoe. The TVS Basin generally conforms to the valleys of the Upper Truckee River and Trout Creek. The City of South Lake Tahoe (CSLT) overlies the northern portion of the TVS Basin. The southern boundary extends about three miles south of the community of Meyers within unincorporated El Dorado County. The northeast boundary of the TVS Basin is defined by the California-Nevada state line. Groundwater is the primary source of drinking water in the TVS Basin. The primary producers of groundwater are the South Tahoe Public Utility District (District), Lukins Brothers Water Company (LBWC) and the Tahoe Keys Water Company (TKWC).

Chlorinated hydrocarbons have been detected in environmental monitoring, private wells and Public Water System (PWS) wells, north and south of the South "Y" Area since 1989, when these compounds were required to be first tested in regulated drinking water sources. Many of the PWS wells have since ceased operating due to PCE concentrations exceeding the drinking water standard of 5 micrograms per liter (µg/L). Such PWS wells have included three District wells (Tata 4 - destroyed, South "Y"-destroyed, and Julie-destroyed), three LBWC wells (LBWC 2- inactive, LBWC 3- destroyed and LBWC 4- inactive), a PWS well (Rockwater Well, offline), a mobile home park well on James Avenue, and private wells on Eloise and Dunlap Avenues (LRWQCB, 2016a).

Multiple parties are engaged in the collection of water quality data related to the occurrence and distribution of PCE within the South Y Plume, including the local water purveyors (District, LBWC, and TKWC), Lahontan Regional Water Quality Control Board (LRWQCB), the entities designated as Identified Discharges for PCE contamination emanating from the LTLW site pursuant to the LRWQCB's Cleanup and Abate Order (CAO) R6T-201-0022, and environmental consultants retained by the Identified Dischargers. Water quality sampling and regional investigations conducted since 2016 have contributed to a greater understanding of the extent, concentrations, and source characteristics of the PCE plume. Consultants retained by the Identified Dischargers are conducting this work to satisfy the provision of the Cleanup and Abatement Order (CAO) R6T-201-0022 to identify potential sources for PCE contamination within the South Y, while the LRWQCB is performing additional work under the Site Cleanup Subaccount Program (SCAP).

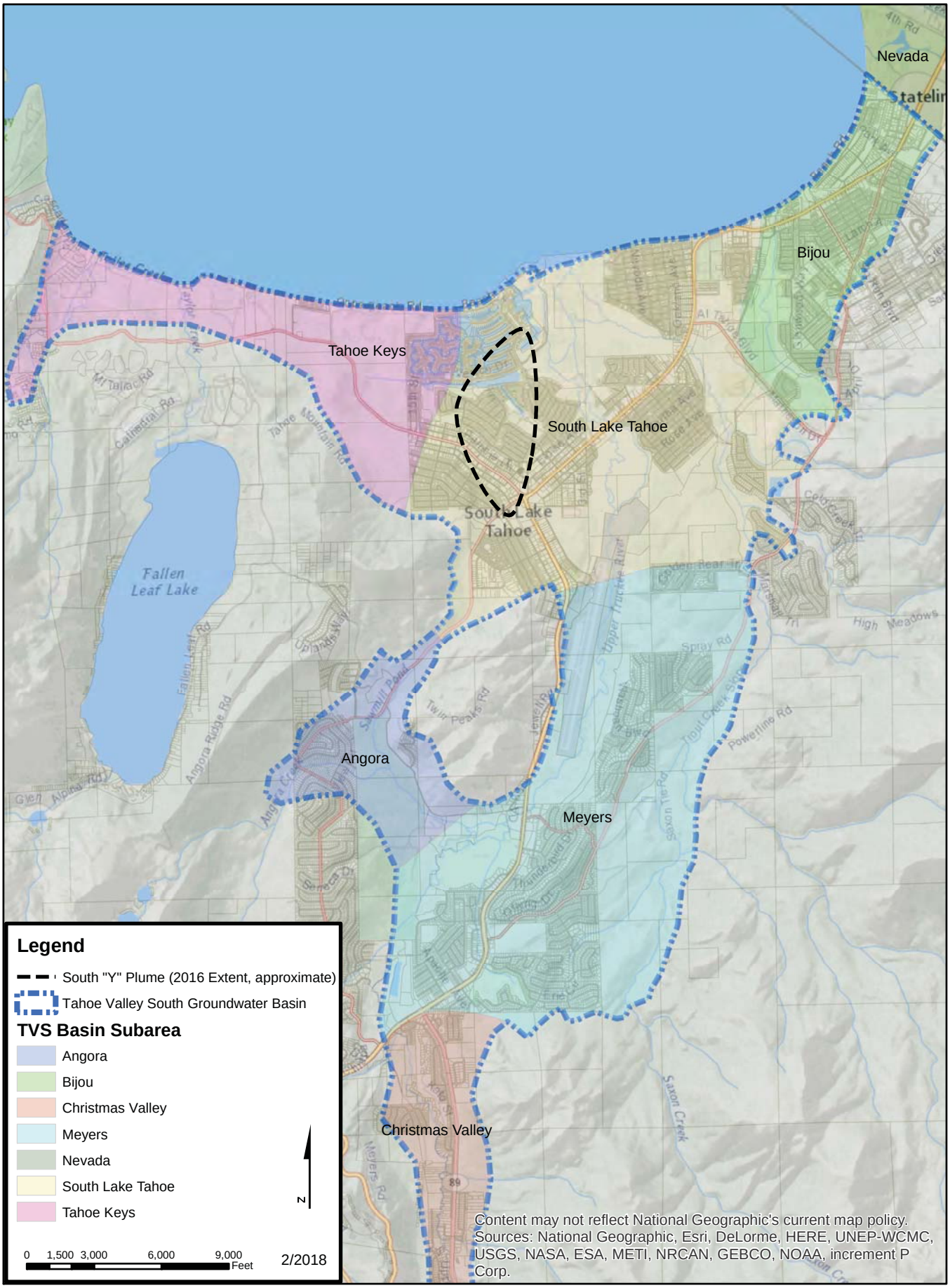

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Figure 1-1: South Y Regional Location

1.2 Feasibility Study Overview

1.2.1 Feasibility Study Objective

PCE groundwater contamination has impacted the beneficial use of groundwater in the South Y Area. In order to address these impacts, Kennedy Jenks Consultants (KJ) was retained by the District to complete a Feasibility Study that would identify a cost-effective means of removing PCE from groundwater and manage existing groundwater sources to maintain adequate drinking water supply and quantity. The Feasibility Study evaluates remedial alternatives that will prevent further migration of contaminants and potential future impacts to downgradient water supply wells.

To inform the Feasibility Study, a Pre-Design Investigation (PDI) was conducted which included a field investigation consisting of: the drilling and construction of two 6-inch diameter wells that could be used for extraction; the performance of an aquifer test to derive aquifer properties; and the collection and analyses of soil and water quality samples to discern the vertical extent of PCE contamination (KJ, 2019). Using information developed during the PDI and information gleaned from fate and transport modeling performed by the Desert Research Institute (DRI, May 2019), KJ, in collaboration with the Technical Advisory Committee, completed the Feasibility Study to select a remedial alternative that best met the remedial action objectives (RAOs) and complied with the applicable or relevant and appropriate requirements (ARARs) identified in the Feasibility Study workplan (KJ, December 2018).

1.2.2 Grant and Grant Task Overview

This Feasibility Study is funded in part by the State Water Resources Control Board (SWRCB) through a Proposition 1 Groundwater Planning Grant Agreement (CALSTARS Agreement No. D1712508) with the District executed by the SWRCB on March 29, 2018. Scope of work items related to the Feasibility Study in the Agreement include Items 10 and 12, summarized below:

> Item 10. Feasibility Study Work Plan: Prepare a Feasibility Study Workplan and submit to the TAC for comment and Grant Manager for approval. The final workplan is provided as Appendix A.
>
> Item 12. Feasibility Study and Reporting: Conduct a Feasibility Study for the Project area and prepare a Feasibility Study Report that summarizes the activities conducted and includes the results of each activity.

1.2.3 Project Partners

1.2.3.1 South Y PCE Technical Advisory Committee

A Technical Advisory Committee (TAC) was formed to advise the Feasibility Study. KJ worked closely with the TAC in different phases and tasks in this Feasibility Study. KJ held discussions and conference calls with TAC as described in Section 2.2.7 and addressed comments and recommendations after TAC reviewed deliverables.

TAC Meeting Dates:

January 25, 2018
June 12, 2018
October 23, 2018
February 27, 2019
June 21, 2019
October 21, 2019
December 17, 2019
March 6, 2020

A list of TAC members is provided in Table 1-1.

Table 1-1: Technical Advisory Committee Roster

AGENCY	Member, Title	Roles/Responsibilities
SWRCB-DFA	Tricia Carter, Water Resource Control Engineer, Grant Manager	Responsible for management and performance of the Agreement.
STPUD	Ivo Bergsohn, PG, CHG, Project Director	Responsible for the overall management of the administrative and technical elements of the Agreement.
SWRCB-DDW	Salvador Turrubiartes, PE, Associate Sanitary Engineer	Responsible for review of Technical Work Plans and Technical Reports. Assist in resolving technical issues associated with project implementation in accordance with the MOU.
LRWQCB	Brian Grey, PG Engineering Geologist	Responsible for review of Technical Work Plans and Technical Reports. Assist in resolving technical issues associated with project implementation in accordance with the MOU.
CSLT	Jason Burke, Stormwater Program Coordinator	Responsible for review of Technical Work Plans and Technical Reports. Assist in resolving technical issues associated with project implementation.
LBWC	Jennifer Lukins, Manager	Responsible for review of Technical Work Plans and Technical Reports. Assist in resolving technical issues associated with project implementation.
TKPOA	Kirk Wooldridge, General Manager	Responsible for review of Technical Work Plans and Technical Reports. Assist in resolving technical issues associated with project implementation.
SWRCB-DFA	Robert Reeves, Program Manager for Grant Program (TAC Alternate)	Assist the Grant Manager and serve as an Alternate for T. Carter on the TAC.
SWRCB-DDW	Ali Rezvani, Sacramento District Engineer (TAC Alternate)	Assist the SWRCB- Division of Drinking Water Sanitary Engineer and serve as an Alternate for S. Turrubiartes on the TAC.
TKPOA	Andy Kopania, Water Quality Committee Chairman (TAC Alternate)	Assist the TKPOA Water Company General Manager and serve as an Alternate for K. Wooldridge on the TAC.

1.2.3.2 Groundwater Management Plan and Groundwater Management Stakeholder Advisory Group

Within the Lake Tahoe area, a Stakeholder Advisory Group (SAG) was formed to provide input for the development of the Groundwater Management Plan (GWMP) and groundwater protection in the TVS Basin. Information regarding the Feasibility Study was presented to the SAG during scheduled SAG meetings and the SAG provided input in various tasks of this

Feasibility Study. A list of SAG members, many of whom are also on the Feasibility Study TAC, is provided below in Table 1-2.

Table 1-2: Stakeholder Advisory Group Members

Category	Name	Affiliation	Position
Agency	Jason Burke	City of South Lake Tahoe	Storm Water Program Coordinator
Agency	Robert Lauritzen	El Dorado County	Geologist
Agency	Brian Grey	Lahontan Regional Water Quality Control Board	Engineering Geologist
Agency	Ken Payne	El Dorado County Water Agency	General Manager
Agency	Paul Nielsen	Tahoe Regional Planning Agency	Planning Manager
Community Rate Payer	Harold Singer	Resident	Retired
Real Property Owner	Scott Carroll	Tahoe Conservancy	Associate Environmental Planner
Water Purveyor	Jennifer Lukins	Lukins Brothers Water Company	Manager
Water Purveyor	Daniel Larson	Tahoe Keys Water Company	Water System Manager (since Nov. 2019)
District	Ivo Bergsohn	STPUD	Hydrogeologist
District	John Thiel	STPUD	General Manager

1.2.4 Pre-Design Investigation

Prior to the Feasibility Study, a Pre-Design Investigation (PDI) was conducted in 2018 to collect specific capacity, aquifer characterization and water quality data that can be used to design strategies for the purpose of hydraulic control and/or removal of PCE contamination from groundwater. The PDI involved the drilling, installation, sampling, and pump testing of a new test well, for lithologic description, aquifer characterization, and vertical delineation of PCE contamination. Two 6-inch diameter wells that could be used for monitoring and extraction were also completed as part of the PDI. The PDI also included sampling and monitoring of existing wells neighboring the test well to evaluate concentrations of chemical constituents in groundwater; estimate horizontal and vertical hydraulic gradients; and groundwater flow directions. These data were integrated and evaluated with the existing hydrologic and chemical constituent distribution data in the Feasibility Study.

A copy of the South Y Pre-Design Investigation Workplan dated 23 March 2018 and Pre-Design Investigation Report for Remedial Alternatives to Mitigate Tetrachloroethylene Contamination dated July 2019 is available at https://stpud.us/groundwater/.

1.2.5 Feasibility Study Workplan

The Feasibility Study as described in the workplan (Appendix A) involves the following steps:

1. Data Review with Feasibility Study Kick-off Meeting
2. Screen Modeled Alternatives for Engineering Evaluation (up to 7 Alternatives)
3. Define Infrastructure Needs (3 Alternatives) (including disposal/reuse options)
4. Develop Life Cycle Cost Estimates (3 Alternatives)
5. Initial Study Checklist for 3 Alternatives and Estimated Cost of Mitigation
6. Select and Develop Recommended Alternative
7. Implementation Plan for Recommended Alternative: Financial and Governance Plan
8. Document findings in Draft and Final Report

1.2.5.1 Remedial Action Objectives

Remedial Action Objectives (RAOs) are specific goals to be achieved by a remedial alternative. RAOs were developed and presented in the Feasibility Study Workplan (Appendix A), presented to the TAC, and finalized at meeting held on 12 June 2018. The RAOs evolved over the course of the Feasibility Study and are used to evaluate the screened remedial alternatives.

This Feasibility Study is an effort to identify cost-effective remedial alternatives that can be taken to remove PCE from groundwater and manage existing groundwater sources to maintain adequate drinking water supply and quantity. The RAOs were developed to assist the water purveyors evaluate the actions that can be taken to promote that goal. These actions may overlap with, but are not necessarily the same as, the actions that the LRWQCB and dischargers of the PCE should take to clean up the PCE contamination impacting the South Y.

With that focus, the RAOs were developed first to consider General EPA RAOs from EPA Document 540/R-96/023 and EPA Document 540/G-88/003 that are relevant to contaminated groundwater. The general EPA RAOs were supplemented with South Y specific RAOs to reflect the needs of the PWS that are above and beyond direct plume remediation (which is also needed), as follows:

1. Control and minimize exposure to contaminated ground water, above acceptable risk levels.
    a. South Y-Specific RAO: Allow additional groundwater production without treatment
2. Control and/or minimize further migration of the contaminant plume (plume containment).
    a. South Y-Specific RAO: Design and implement remedies without increasing existing volume of groundwater impacted by halogenated volatile organic compounds (HVOCs) (plume containment)
3. Control and minimize further migration of contaminants from source materials to ground water (source control).
    a. South Y-Specific RAO: Concentration reduction to less than 50 µg/L at drinking water wells, mass removal for proposed remedial measure. This will avoid State Water Resources Control Board (SWRCB) Division of Drinking Water Policy Memo 97-005 evaluation process requirements for extremely impaired water sources.

4. Return ground waters to their expected beneficial uses wherever practicable (aquifer restoration).
    a. Not applicable for South Y study
5. Cleanup Level
    a. South Y-Specific RAO: Assist in overall objective of supplying water without detectable HVOCs to customers
    b. South Y-Specific RAO: Comply with regulatory agency requirements and directives regarding HVOCs in groundwater
    c. Proposition 1 Metrics of Success: Estimated mass of contaminant removed over the projected life of the project
6. Area of Attainment
    a. South Y-Specific RAO: Address groundwater in mid-plume area including groundwater above 100 feet below ground surface (ft bgs) with high concentrations of PCE in mid-plume and/or replacement wells in deeper aquifer outside of the plume
7. Restoration Time Frame
    a. South Y-Specific RAO: To be consistent with SWRCB grant funding requirements, the anticipated remediation time frame is 20 years or less to remove the majority of PCE mass in groundwater in the mid-plume area cost effectively.

Other RAOs that are important to the water purveyors include:

- Additional RAO 1. Preserve ability to recover future HVOC response costs from responsible parties and/or state grant funding
- Additional RAO 2. Preference for potable reuse of any extracted groundwater resource (i.e., not disposal to sanitary sewer or storm drain)
- Additional RAO 3. Reduce water treatment costs (capital or long-term O&M) for retail customers
- Additional RAO 4. Continue to inform the public of water purveyor activities addressing HVOCs in groundwater

These RAOs were a consideration in the screening and development of remedial alternatives; the remedial alternatives included but did not specifically target wellhead treatment, though that is a typical focus of RAOs.

1.2.5.2 Applicable, Relevant and Appropriate Requirements (ARARs)

Remedial alternatives are required to comply with all applicable or relevant and appropriate requirements (ARARs). Applicable requirements are Federal, state or local requirements that are legally applicable to a hazardous substance, the response action, location or other circumstance at a particular site. Relevant and appropriate requirements that, while not "applicable", address problems or situations sufficiently similar to those encountered that their use is well suited in the particular site. State requirements are ARARs only if they are more stringent than federal requirements.

A summary of ARARs considered in this Feasibility Study are summarized in the Feasibility Study work plan in Appendix A.

1.2.5.3 Summary of Human Health Risk Assessment

A screening level Human Health Risk Assessment (HHRA) was completed to address risks associated with PCE-impacted groundwater in the TVS Basin at PWS wells in the South Y area. The data evaluated were collected from 2016-2018 and were limited to deeper groundwater samples from existing active drinking water wells. This screening level HHRA was conducted consistent with the Risk Assessment Guidance for Superfund (RAGS) procedure established by the United States Environmental Protection Agency (EPA). Groundwater data from the South Y area were compared with screening levels considered protective of human health. Drinking water maximum contaminant levels established by the SWRCB were used as screening levels in this HHRA. Concentrations above the screening levels were assumed to potentially pose an unacceptable risk to human health. The maximum detected concentration of PCE in any water supply well included in the analysis was used as the exposure point concentration.

The maximum detected PCE concentration in the 2016-2018 data was 189 µg/L at the Rockwater Well, which is out of service. No wells with PCE in exceedance of the MCL are delivering drinking water without treatment. In conclusion, the risks to human health from PCE present in water from active wells currently in use as drinking water source with treatment were found to be acceptable. However, returning inactive wells that were taken out of service due to PCE contaminant without implementing treatment to reduce PCE concentrations would pose an unacceptable risk to human health. A complete HHRA report is attached in Appendix B.

1.2.6 Community Relations

As the South Y Plume represents a significant community groundwater concern, the water purveyors in conjunction with the LRWQCB have conducted local public meetings to inform the public of the progress and findings of the Feasibility Study and investigation activities undertaken by LRWQCB. Since February 2018, five *Groundwater at the South Y* public meetings have been convened at the CSLT Council Chambers. These meetings provide opportunities for the public to ask questions and receive answers about the Feasibility Study. A sixth meeting was convened in March 2020 by webcast to receive public input on the draft Feasibility Study and the draft Interim Remedial Action Plan (IRAP).

Public Outreach Meeting Dates:

February 7, 2018
August 8, 2018
November 7, 2018
March 6, 2019
June 26, 2019
March 31, 2020

Recordings of these meetings can be viewed at: http://stpud.us/groundwater/

1.3 Goals of the Feasibility Study

The goal of the Feasibility Study is to evaluate remedial options to select a preferred remedial alternative in accordance with the scope of work in the funding Agreement D1712508. The Feasibility Study was completed to meet this goal in a manner that generally conformed to the

Feasibility Study process outlined in the US Environmental Protection Agency (EPA) Interim Final *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (US EPA, October 1988). This generally involved the use of relevant information sources and site information to develop various remedial options and evaluate those options using prescribed screening criteria to select a preferred remedial alternative. Remedial options described in the Feasibility Study were developed in an iterative manner which is more fully described in Section 4 of this report. Detailed analysis of remedial alternatives was used to identify a cost-effective means of removing PCE from groundwater and the managed use of groundwater sources in order to maintain adequate drinking water supply and quality in the South Y area. The analysis evaluates the remedial alternatives for effectiveness as to treatment and/or remediation process to control and/or remove PCE from groundwater and manage existing groundwater sources to maintain adequate drinking water supply and quantity, prevent further migration of contaminants and potential future impacts to downgradient water supply wells, the site improvements and infrastructure necessary to implement the remedial alternative and uses cost analysis to compare life-cycle costs of the screened remedial alternatives.

Section 2: Review of Background and Related Studies

2.1 Information Sources

KJ reviewed the following sources of information listed below for the Feasibility Study:

A. Recent soils, aquifer and groundwater quality data obtained and documented in the PDI;

B. Data in recent reports such as:
   i. Lukins Brother Water Company (LBWC) Preliminary Engineering Report (PER) Water System Improvements Related to PCE Contamination (RCI, May 2015)
   ii. SWRCB Final PCE Investigation Report (URS, January 2016)
   iii. District South "Y" Extraction Well Suitability Investigation (GEI, June 2016)
   iv. Result of PCE Investigation for Tahoe Keys Property Owners Association (TKPOA), August 2016 (GEI, 2016)
   v. Off-site Groundwater Investigation Data Report (EKI, August 30, 2017)
   vi. Lake Tahoe Laundry Work (LTLW) Preliminary Planning Report (EKI, September 14, 2018)

C. Results of South Y fate and transport modeling reports and work products including confirmation of range of water quality and water supply objectives achieved by identified remedial alternatives prepared for the Feasibility Study by DRI.

D. Recent monitoring results conducted by other entities including
   i. LBWC and TKWC sampling (GEI, 2016)
   ii. LTLW 2018 sampling as documented
   iii. Other monitoring results that became available during the period of this feasibility study

E. Plans and documents provided by the water purveyors that describe the existing extraction, treatment and distribution facilities including cost of operations, historic pumping/ treatment data, etc.

2.2 Water Agency Reports

2.2.1 LBWC Preliminary Engineering Report (PER) Water System Improvements Related to PCE Contamination (May 2015)

Resource Concepts Inc (RCI) finished a Preliminary Engineering Report Water System Improvements related to PCE contamination in the raw water in LBWC's service area in May 2015. LBWC discovered the presence of PCE greater than the PCE MCL of 5 µg/L in LBWC 2 and LBWC 5 from water quality samples collected on June 16, 2014, the results of which were first reported to LBWC on July 7, 2014. More recent data showed levels of PCE at 27 to 53 µg/L at LBWC 2 and LBWC 5. However, at wells located just outside LBWC's boundary, within a mile of LBWC 2 and LBWC 5, PCE concentrations have been reported as high as 280 µg/L. PCE has not been detected in LBWC 1 located in the southwestern corner of the LBWC system. Five remedial alternatives evaluated and considered to address the PCE issue at both LBWC 2 and LBWC 5 in the PER were:

- air stripping treatment,
- granular activated carbon (GAC) treatment,
- development of a new well on USFS property,
- wholesale water purchase with STPUD, and
- UV/Membrane treatment.

Based on this report, LBWC prepared design drawings and construction and O&M cost estimates to apply for construction funding through the Drinking Water State Revolving Fund to equip LBWC 5 with GAC treatment and perform upgrades to the well site. In 2019, LBWC was notified by the SWRCB of approval of funding and it is anticipated that these improvements will be completed in early 2021.

2.2.2 District South "Y" Extraction Well Suitability Investigation (GEI, June 2016)

The District retained GEI to perform an assessment of LBWC 4 and evaluate the suitability of using LBWC 4 as an extraction well for the removal of PCE in groundwater. LBWC 4 has been inactive since 1989 after concentrations of PCE above the primary MCL of 5 µg/L were detected. In 2015, PCE was detected at 34 µg/L in water samples collected from LBWC 4 by the LRWQCB.

The primary flow paths of PCE into LBWC 4 were identified based on depth-discrete water sampling and a vertical flow survey. Aquifer hydraulic properties were estimated by performing a constant rate aquifer test in order to delineate capture zones for the use of LBWC 4 as an extraction well. LBWC 4 is believed to have been a relatively low water production well having a nominal yield of less than 130 gpm. However, during the 24-hour constant rate pump test, the well was pumped at a rate of 100 gpm for 1,184 minutes. During the final 264 minutes, the well was pumped at 170 gpm. The specific capacity of this well at 100 gpm was 22.69 gpm/ft.

The water quality samples during the static zone sampling indicate PCE concentrations in LBWC 4 increased with depth. During the constant rate sampling, the PCE concentrations were greater than those that were measured during the static condition; however, the concentrations did not vary with depth. The PCE concentration in LBWC 4 was expected to exceed 10 times the MCL of 5 µg/L, meeting the definition of an "extremely impaired source" for drinking water as defined by the SWRCB Division of Drinking Water (SWRCB-DDW). GEI developed five remedial alternatives for pumping and treating PCE at the LBWC 4 location based on the field data analysis and recommended drilling a new well with GAC treatment infrastructure at the current well site. A water treatment pilot study was conducted to provide data necessary to develop a pre-design recommendation for the removal of PCE. Results from the pilot study suggested that further testing would be needed to confirm the necessity for iron/manganese treatment prior to GAC filtration.

2.2.3 Results of PCE Investigation for Tahoe Keys Property Owners Association (TKPOA), August 2016 (GEI, 2016).

GEI conducted an investigation for TKPOA to gather historic spatial and temporal groundwater and soil data pertaining to PCE contamination in the South Y area. In this investigation, the source of the PCE contamination was believed to be the former LTLW. The highest PCE concentrations, based on the data review were located near the point of release at the "Y" and

lower concentrations were encountered upgradient and downgradient. The magnitude of the sample results indicated that the PCE was still migrating downgradient towards the Tahoe Keys.

Groundwater quality data compiled during this investigation was provided to DRI during development of the South Y Fate and Transport Model described in Section 2.2.4.

2.2.4 Results of Fate and Transport Modeling of the South Y PCE Groundwater Contamination Plume (DRI, June 2019; DRI, September 2019)

In 2015, the District retained DRI to develop hydrologic modeling tools that could be used to conduct complex hydrologic analysis to address Basin Management Objectives defined in the Tahoe Valley South Subbasin (6-5.01) Groundwater Management Plan. For this work, DRI developed a fully coupled surface water/groundwater model (GSFLOW) and a stand-alone groundwater model (MODFLOW-2005) for the groundwater basin and contributing watersheds. For the South Y Feasibility Study, DRI extracted a sub-section of the groundwater model to develop a higher-resolution flow and transport model (MT3DMS) to simulate PCE migration in the South Y area, referred to as the South Y Fate and Transport Model.

Water quality data from local wells sampled in 2017 and 2018 were incorporated into the model to improve representation of PCE source and transport. The extent of a clay lens, which is expected to impede the downward migration of PCE is the area, was approximated likewise using water quality results, well logs and regional hydrogeological cross-sections provided by the District.

Information from the South Y Fate and Transport Model results was used to develop various Management Scenarios and screen and refine these Scenarios for effectiveness. Five (5) Management Scenarios were modeled originally (Initial Modeling), and based on feedback from stakeholders, two (2) additional Management Scenarios were modeled (Revised Modeling).

For purpose of the South Y Fate and Transport Model, wells were modeled with the following assumed well operations:

- Lead well is the well that serves as the system's primary water supply well to meet most demands.
- Lag well is the well that supplements the lead well to meet additional demands.
- Lag-lag well is the well that supplements the lead and lag wells to meet additional demands not already met.

In addition, simulations assumed that the average annual pumping rates for the last ten years were repeated for up to 50 years into the future through the 2068 water year. Management Scenarios are summarized in Table 2-1.

Table 2-1: Modeled Management Scenarios

Management Scenarios			Description
Initial Modeling	1	No Action	• Maintain current (2018) pumping strategy (lead/lag/lag-lag) for TKWC and LBWC wells • Produced water from LBWC 5 and TKWC 2 is treated via existing GAC
	2	Targeted Pumping	• Use LBWC 5 and TKWC 2 as the lead wells for LBWC and TKWC, respectively, for PCE mass removal and limit potential plume migration towards TKWC 1, TKWC 3, and LBWC 1
	3	Surface Water Conversion	• Switch LBWC and TKWC water supply to Lake Tahoe surface water • Maintain current pumping strategy for time to implement surface water treatment plant (assume 15 years) • Produced water from LBWC 5 and TKWC 2 is treated via existing GAC for the first 15 years • LBWC 1 and TKWC 3 would be used as backup supply wells following implementation of surface water treatment plant
	4	90% GAC Capacity	• Pump both LBWC 5 and TKWC 2 at a rate of 90% of the existing GAC capacity • Maintain current pumping strategy at remaining LBWC and TKWC wells • Reduce STPUD well production rates to use excess treated water beyond the needs of LBWC and TKWC in STPUD service area
	5	90% Well Capacity	• Pump both LBWC 5 and TKWC 2 at a rate of 90% of the existing well pumping capacity • Maintain current pumping strategy at remaining LBWC and TKWC wells • Reduce STPUD well production rates to use excess treated water beyond the needs of LBWC and TKWC in STPUD service area
Revised Modeling	Revised Scenario 2, Option 1	LBWC 5 Lead	• Use LBWC 5 as the lead well for hydraulic control and PCE mass removal for LBWC. Produced water from LBWC 5 is treated via GAC water treatment facility planned to start operating in 2021.
	Revised Scenario 2, Option 2	LBWC 5 Lead/ R1	• Use LBWC 5 as the lead well for LBWC. Produced water from LBWC 5 is treated via existing GAC • Construct a new extraction well (R1) and groundwater treatment facility at 843 Hazel Drive for to replace lost groundwater production and increase PCE mass removal

Other key assumptions in the South Y fate and transport modeling included characterization of the PCE source term. Due to limited data on likely source area locations and source area PCE concentrations, the PCE source term was modeled as point recharge located up-gradient of suspected source areas recognized in the South Y Area. The source term was a fitted parameter used to add PCE contaminant mass as a recharge concentration. The amount of contaminant mass added to the model was fitted to the amount of mass needed to generate a plume of sufficient size to match the observed PCE groundwater concentration trends at selected receptor wells used for model calibration. The time allotted for plume development was constrained and fitted in the model to the time when PCE was known to be used at suspected sources (late 1970s). The modeling included use of a baseline PCE source term with bio degradation of PCE and a conservative PCE source term without biodegradation of PCE which

resulted in a range of PCE mass and concentration model estimates. Results of the modeling including predicted PCE mass removal, PCE concentration trends, and cleanup times, and plume extent are presented in Table 2-2.

It should be noted that while the South Y Fate and Transport Model has been verified, the data used to develop and calibrate the model is relatively sparse geographically and temporally. The 2019 DRI Reports note that data gaps exist for water quality information immediately downgradient of the South Y source area for the period 1988-2014, during which time multiple wells were removed from service and/or abandoned due to PCE contamination. Available water quality data is limited to wells that are in service at the time of development of the South Y Fate and Transport Model, which do not necessarily provide sufficient coverage horizontally (over the geographic area) or vertically (well screen intervals). As more data are collected about the PCE plume and the hydrogeology of the South Y area, the South Y Fate and Transport Model can be updated and recalibrated.

Based on the modeling activities and results described in the previous Sections, the following conclusions were drawn and supported in the 2019 DRI Reports:

- Groundwater within the South Y Fate and Transport Model extent can be expected to maintain concentrations of PCE greater than the MCL over the next 20 years if existing conditions and operations were to continue. TKWC 1 is at risk for PCE concentrations above the MCL.
- In wells located near the heart of the existing PCE plume, increased pumping rates could serve to remove mass at a faster rate than current pumping rates as well as have a protective effect on downgradient wells.
- Within the next 15 years, the majority of PCE mass removal occurs under existing conditions and operations, coinciding with the timing of the highest concentrations of PCE reaching the area of LBWC 5 and TKWC 2.

Table 2-2: Results of the Modeled Management Scenarios

Management Scenarios			Total PCE Mass Removed [a] (lbs)	Peak PCE Concentration [a]					Cleanup Time (Years) [b]
				LBWC 1	LBWC 5	TKWC 1	TKWC 2	TKWC 3	
Original	1	No Action	280 – 1,800	<1	23 to 96	5 to 50	14 to 108	<1	>20
	2	Targeted Pumping	420 – 2,400	<1	22 to 94	4 to 44	13 to 105	<1	20 to >20
	3	Surface Water Conversion [c]	230 – 1,400	<1	23 to 96	5 to 50	14 to 108	<1	>20
	4	90% GAC Capacity	940	<1	23	3	13	<1	17
	5	90% Well Capacity	1,100	<1	25	3	13	<1	14
Revised	Revised Scenario 2, Option 1	LBWC 5 Lead	420 – 2,400	<1	22 to 94	5 to 44	13 to 105	<1	20 to >20
	Revised Scenario 2, Option 2 [d]	LBWC 5 Lead/ R1	770 – 3,300	<1	21 to 89	4 to 38	13 to 103	<1	17 to >20

Notes:

a. Over first 20-year modeling period from 2018 – 2038.

b. Cleanup time is for all 5 wells from start of 20-year modeling period beginning in 2018.

c. Management Scenario 3 assumed No Action groundwater operations for 15 years until change over to surface water treatment. Therefore, Peak PCE Concentrations would resemble Management Scenario 1

d. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of the 20-year total) is estimated to be 213 lbs to 2,559 lbs.

2.3 LTLW/CAO/Other Regional Board Activities

2.3.1 SWRCB Final PCE Investigation Report, (January 2016)

LRWQCB contracted URS Corporation (URS) to conduct a groundwater investigation within the South Y area to evaluate potential properties responsible for PCE discharge. The investigation boundaries were about 9 blocks northwest of the junction of Highway 50 and Highway 89. The investigation was initiated because PCE was detected at levels up to 46 µg/L in LBWC 2 and LBWC 5 in samples taken from the wells on June 16, 2014 and at 52 µg/L and 260 µg/L in 2 out of the 10 private wells in the same service area in July 2014. The investigation report was submitted in January 2016.

Between October 26 and 30, 2015 and November 12 and 13, 2015, URS completed a groundwater investigation comprised of 42 hydropunch samples from 22 geoprobe borings that were advanced to approximately 20 to 40 ft bgs within the City of South Lake Tahoe. PCE was detected in 5 of the 42 samples at concentrations less than the MCL of 5 µg/L; PCE concentrations in the remaining samples were less than the reporting limit of 0.5 µg/L.

URS concluded the sources of PCE detected in LBWC 2 and LBWC 5 could originate from potential sources between the investigation boundary and LBWC 2 and LBWC 5 in addition to a source upgradient to the investigation boundary.

2.3.2 2016-2017 and 2018 Investigations

Sampling during the second half of 2016 through 2017 performed by the water purveyors (District, LBWC and TKWC); LRWQCB staff and environmental consultants retained by Seven Springs Limited Partnership (Seven Springs) and Fox Capital Management Corporation (Fox) detected PCE in groundwater samples collected to a depth of 189 ft bgs, with the highest concentration detected between 147 and 189 µg/Lin the Rockwater Well (with perforations 70-99 ft bgs) located near the intersection of Highway 89 and Tenth Street and detected below the Maximum Contaminant Level (MCL) in samples below 200 ft bgs.

During 2018, the Phase I and Phase II Off-site Groundwater Investigations conducted for the former LTLW site generated additional data showing PCE in groundwater within the South Y Area (EKI, 2019). During the summer of 2019, the LRWQCB initiated an extensive field investigation (Regional Plume Characterization) to delineate the horizontal and vertical extent of the PCE in the region of the South Y. Final results of the Regional Plume Characterization are expected to be available in Spring 2020.

The Phase I and Phase II investigations involved the collection of multi-depth grab groundwater samples using Cone Penetration Testing/Membrane Interface Probe (CPT/MIP) sample points along two transects. The Phase I transect was along Lake Tahoe Boulevard and the Phase II transect was along Tucker Avenue. Both transects were located immediately north of the LTLW site, and neighbor the Tucker Avenue Stormwater Retention Basin. Both transects were used to sample groundwater from depths generally ranging from about 14 to 76 ft bgs. Three monitoring well pairs were also constructed as part of the Phase II investigation down-gradient of the stormwater basin. For each well pair, a shallow zone well was constructed with screened intervals varying from between 8 to 24 ft bgs and a middle zone well was constructed with screened intervals varying from between 33 to 48 ft bgs.

Water quality results from the CPT/MIP sampling show PCE concentrations were generally highest in groundwater samples collected along Tucker Avenue, from between 30 to 50 ft bgs. Groundwater samples from this depth interval had reported PCE concentrations ranging from 145 to 1,680 µg/L. A PCE concentration of 290 µg/L was reported at one CPT/MIP location in a sample collected below this depth interval at 61 ft bgs. PCE was not detected in the deepest CPT/MIP samples collected across this transect suggesting a maximum vertical extent of PCE at approximately 71 to 76 ft bgs.

Water quality results from the monitoring well sampling show PCE concentrations were highest (163 – 1,580 µg/L) in samples collected from the middle zone well for each well pair. Highest concentrations in samples collected from the shallow zone wells was found in the well pair (OS-2S/2M) neighboring the stormwater basin.

2.3.3 Regional Plume Characterization

During 2019, AECOM conducted a Regional Plume Characterization across the South Y Area under direction from the LRWQCB. The objectives for the groundwater investigation were to determine the lateral and vertical extent of PCE contamination; identify potential contaminant pathways and provide a detailed three-dimensional snapshot of the contaminant plume. The groundwater investigation included the drilling and testing of 38 CPT Borings (advanced 82 to 133 feet); and 10 Sonic Borings (advanced to 300 feet). Significant findings from this investigation show that the South Y Plume extends at least 5,300 feet north from the South Y toward Lake Tahoe in a down-gradient direction.

The current PCE distribution in relation to impaired or threatened drinking water sources shows;

- PCE is present at high concentrations (PCE > 20 µg/L) at intermediate depths (63 -113 ft depths; CPT-E10) and at very high concentrations (PCE > 50 µg/L) at deeper depths (138 -150 ft depth; Sonic 5/5A) approximately 700 feet south (up-gradient) of TKWC 2.
- PCE is present at high concentrations (PCE > 20 µg/L) at intermediate depths (71 – 83 ft depths; CPT-G07) and above MCLs (PCE > 5 µg/L) at deeper depths (113-115 ft depth; Sonic 12) within 1,600 feet south (up-gradient) of TKWC 1
- PCE is present at trace levels (PCE < 5 µg/L) at deeper depths (148 -150 ft depth; Sonic 7) approximately 1,320 feet east (cross-gradient) of LBWC 1.
- PCE is not detected in a CPT Boring (CPT-06) located approximately 2,300 feet; and is not detected in a Sonic Boring (Sonic 06) located approximately 1,150 feet, both southeast and up-gradient with respect to TKWC 3.
- PCE is not detected in a CPT Boring (CPT-C05) located approximately 350 feet west southwest and cross-gradient of LBWC 2/LBWC 5 but is present at moderate levels (PCE < 10 µg/L) at deeper depths (148 -150 ft depth; Sonic 4) within 100 feet of LBWC 2/LBWC 5.
- PCE is detected at high concentrations (PCE > 20 µg/L) at intermediate depths (70 – 142 ft; Sonic 3) and above MCLs (PCE > 5 µg/L) at deeper depths (178 – 180 ft; Sonic 3), neighboring 843 Hazel Drive. PCE was not detected in two groundwater samples collected at depths below 200 feet from Sonic 3.

2.4 PDI and Water Quality Sampling

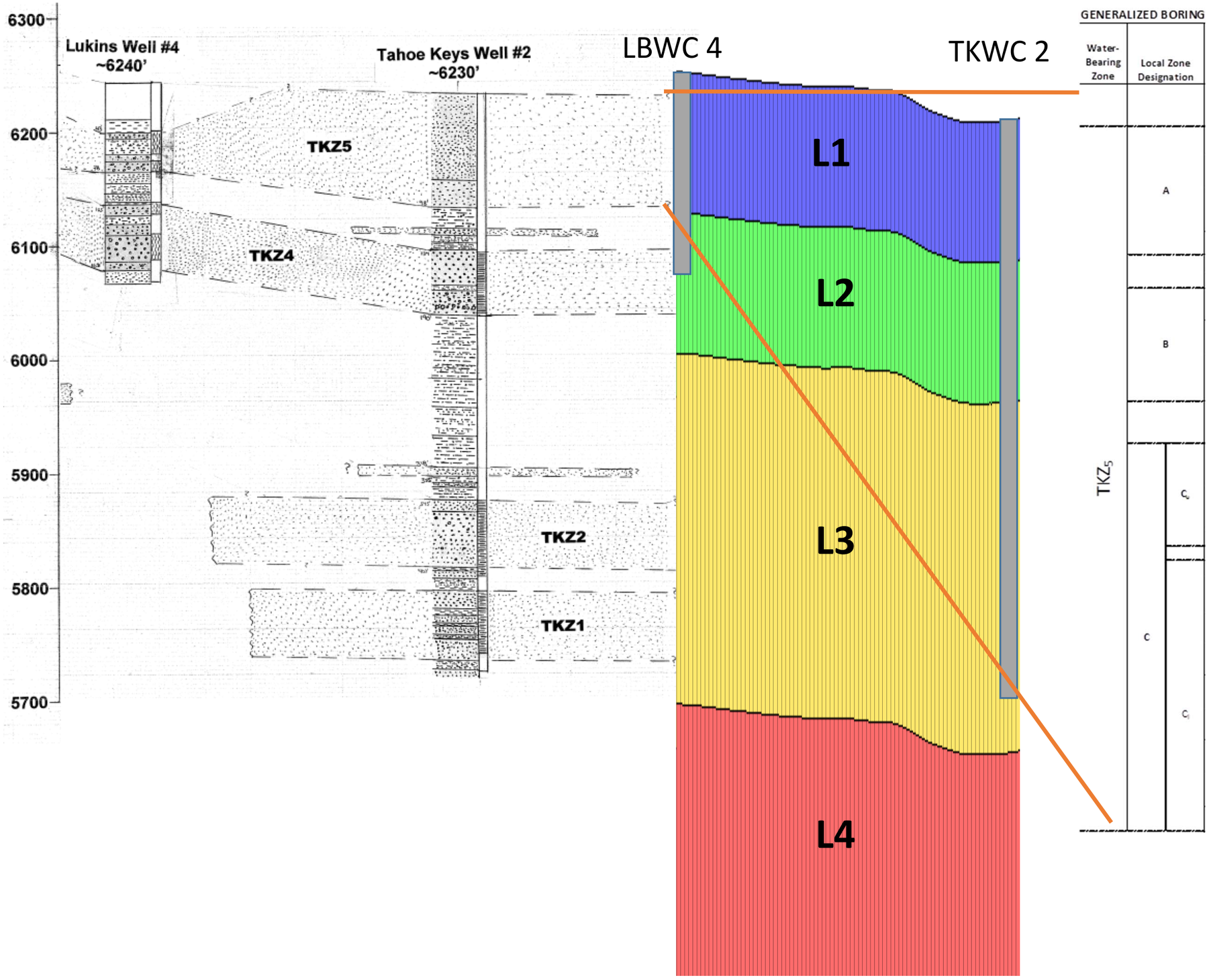
As part of the South Y Feasibility Study, a groundwater investigation was performed at 953 Eloise Avenue, South Lake Tahoe, CA in the summer of 2018. This site is located about 1,200 feet north and hydraulically down-gradient with respect to the Tucker Avenue Stormwater Basin. The site investigation was used to collect water quality information needed to define the vertical extent of groundwater contamination and collect aquifer property information useful for engineering design. Existing wells were also sampled as part of the PDI to establish baseline PCE concentrations, and a representative groundwater sample from LBWC 5 was also obtained. The PDI also confirmed the presence of the clay lens limiting PCE contamination into Tahoe Keys Zone 4 (TKZ4) as shown on Figure 2-1. The flow test conducted as part of the PDI provided a field verified flow rate for use in the South Y Fate and Transport Model to evaluate Management Scenarios.

The groundwater contours and gradients calculated during the PDI using Fall 2018 and Spring 2019 groundwater elevation readings are presented in Figure 2-2 through Figure 2-4. As presented in the PDI, static groundwater level readings collected during the fall of 2018 and the spring of 2019 were used to determine horizontal gradients and flow directions under seasonal low and seasonal high groundwater conditions for two zones in TKZ5 (Zone B and Zone Cu in Figure 2-1) and TK4. Horizontal gradients were relatively low (<0.01 ft/ft) for each zone. Groundwater flow directions varied by depth rotating from northeast in TKZ5 Zone B to northwest in the underlying Zones TKZ5 Cu and TKZ4. Vertical gradients calculated from static groundwater level readings were an order of magnitude greater than horizontal gradients. Relatively high gradients at the Clement Well Cluster show a significant vertical component of downward directed groundwater flow across the clay lens from TKZ5 to TKZ4.

2.5 Summary of Current Conditions and Trends

In addition to the results from the LRWQCB's 2019 Regional Plume Characterization downgradient of LTLW discussed in Section 2.3.3, results of the 2018 groundwater sampling from the on-site monitoring wells at LTLW (source area) as well as other results are presented on Figure 2-5. Review of the 2018 data indicates that PCE concentrations have declined in the middle zone groundwater beneath the LTLW site. The highest groundwater PCE concentration in the middle water-bearing zone beneath LTLW was measured in the monitoring well (designated as FIF) which is constructed at the suspected source area (EKI 2018). Figure 2-6 shows PCE concentration trends in raw water samples collected from LBWC and TKWC drinking water production wells.

Vertical gradients were also calculated in the PDI using a combination of well clusters and indicate that, in general, the vertical gradients are an order of magnitude greater than the average horizontal gradients calculated from the groundwater levels. The plume is believed to extend from the South Y north toward the Tahoe Keys along the south shore of Lake Tahoe. The vertical extent of the South Y Plume is believed to be affected by the lens aquitard occurring between the two uppermost water zones (TKWZ 4 and TKWZ 5).



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South Y Feasibility Study
South Tahoe PUD, CA

South Y Groundwater Schematic Cross-Section

K/J 1770027*00
Figure 2-1

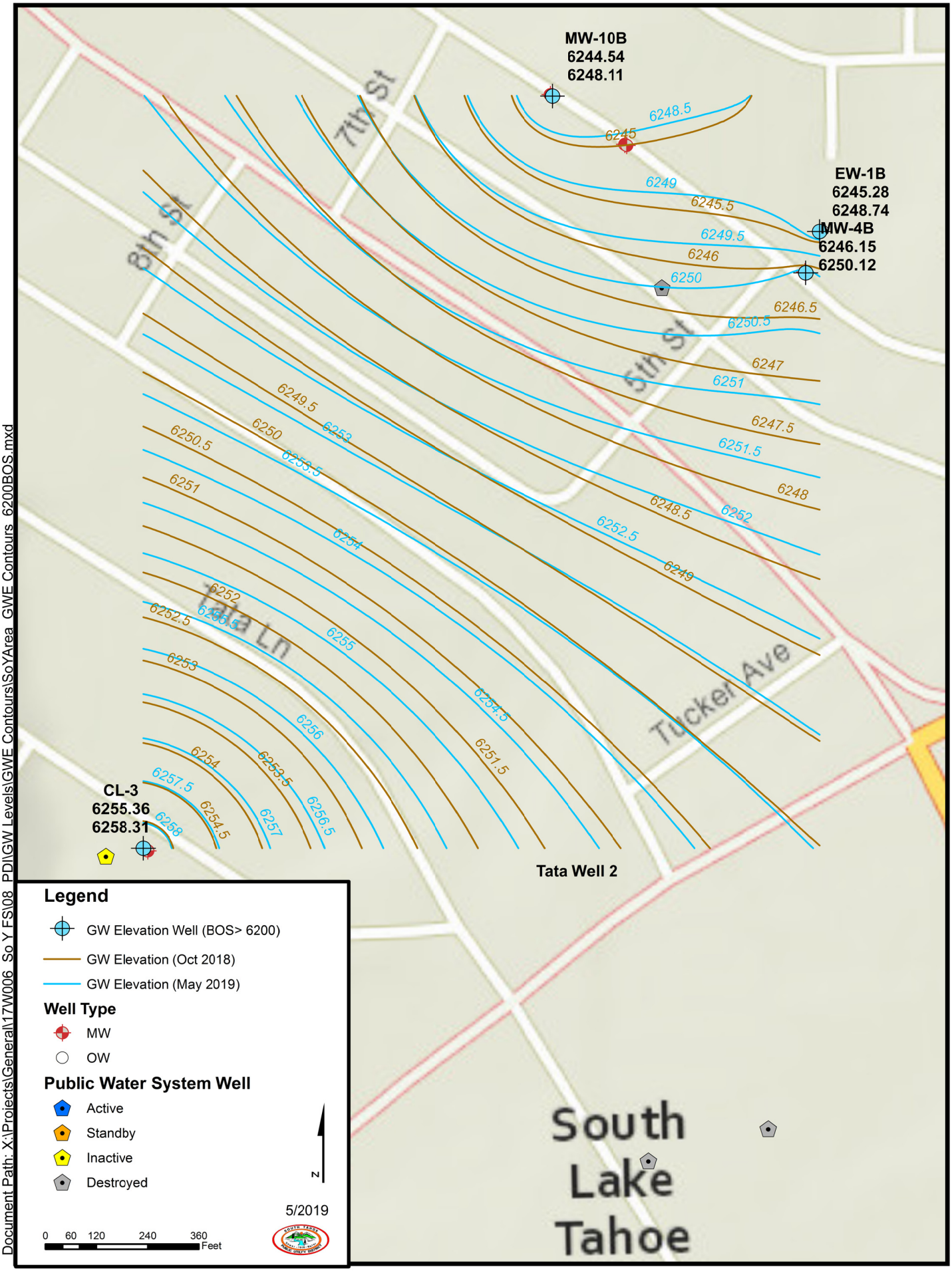

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Figure 2-2: Fall 2018 and Spring 2019 GW Level Elevation Contours for TKZ5 – Zone B

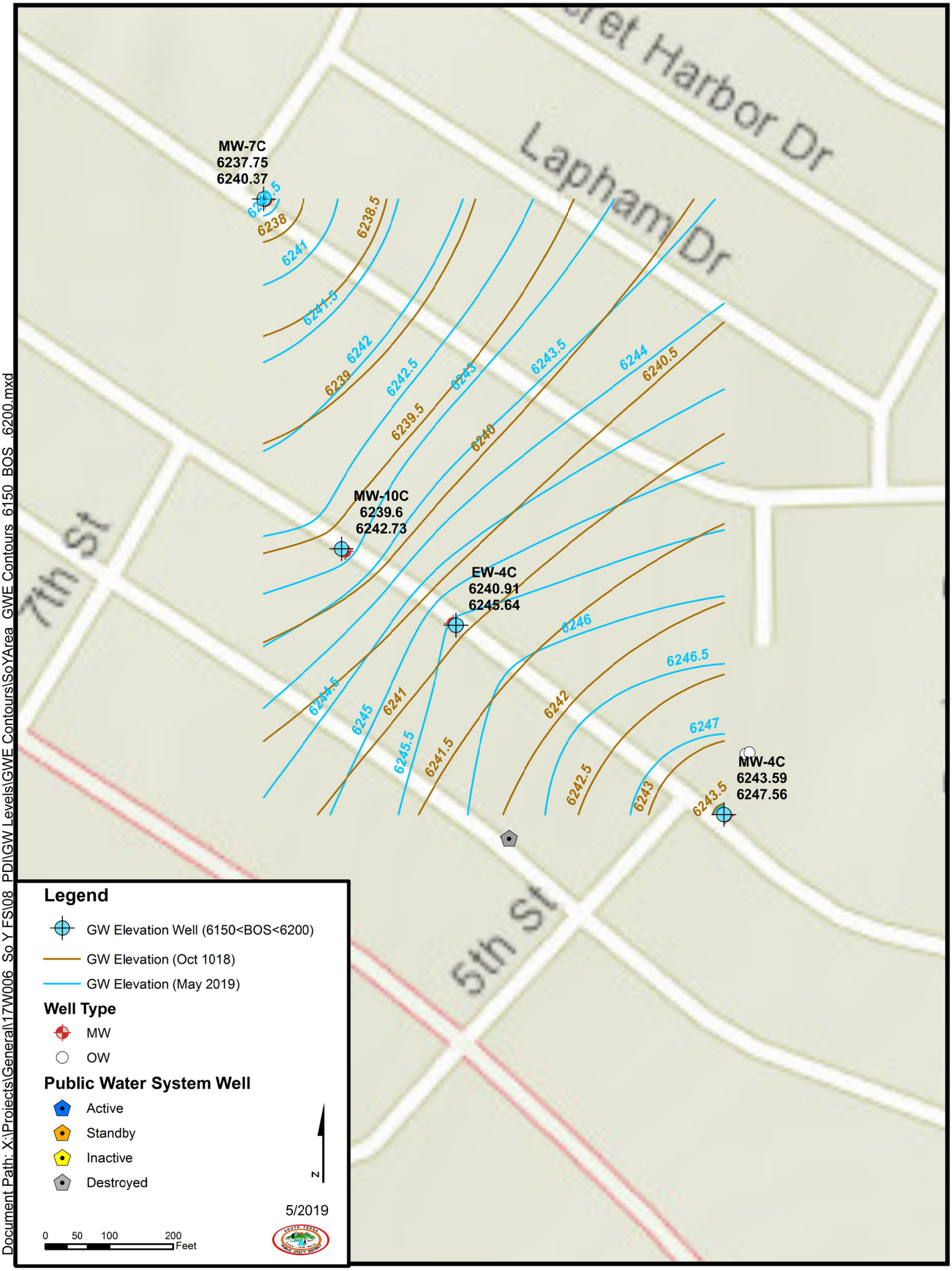


Figure 2-3: Fall 2018 and Spring 2019 GW Level Elevation Contours for TKZ5 – Zone Cu

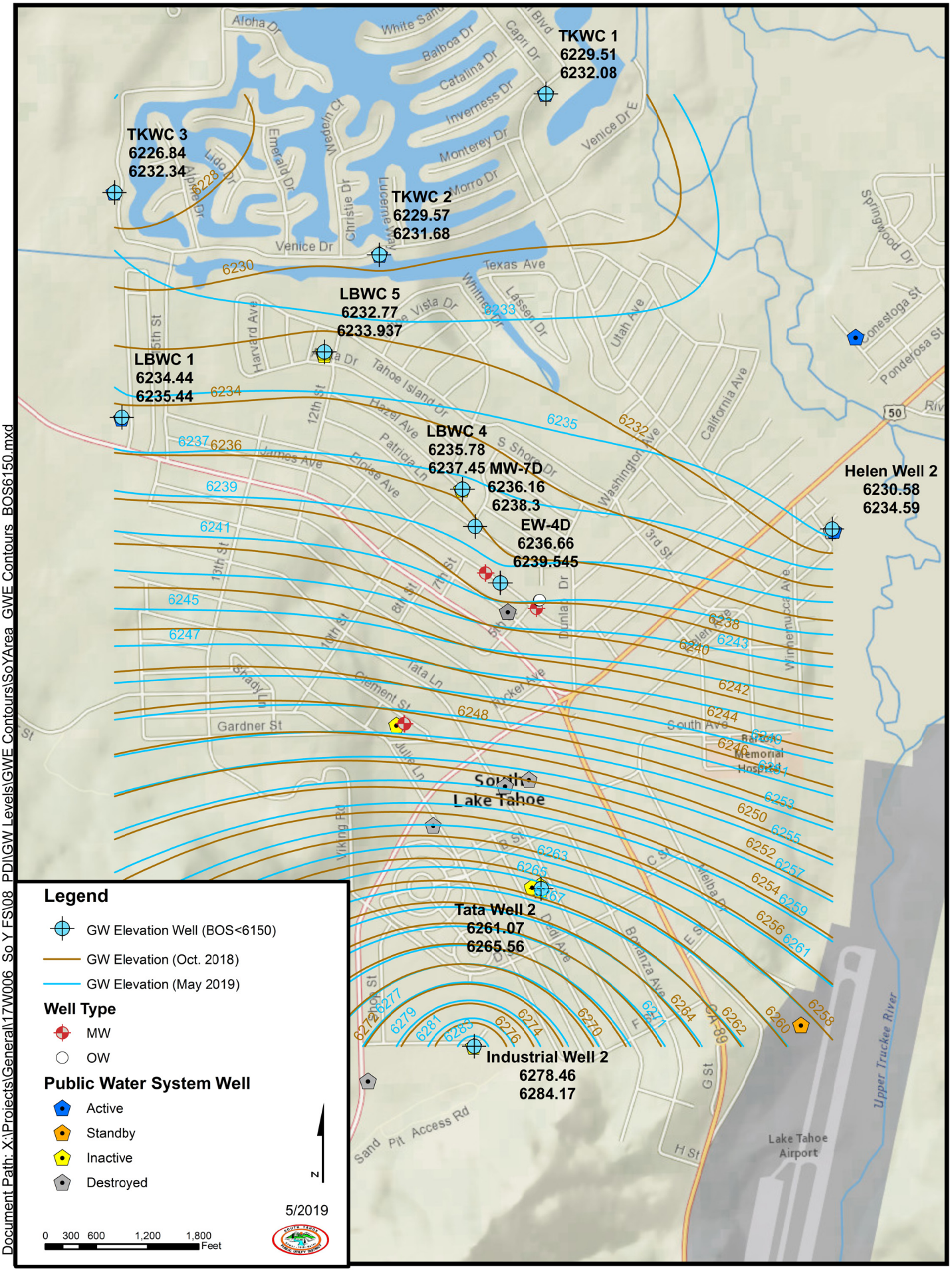


Figure 2-4: Fall 2018 and Spring 2019 GW Level Elevation Contours for TKZ4

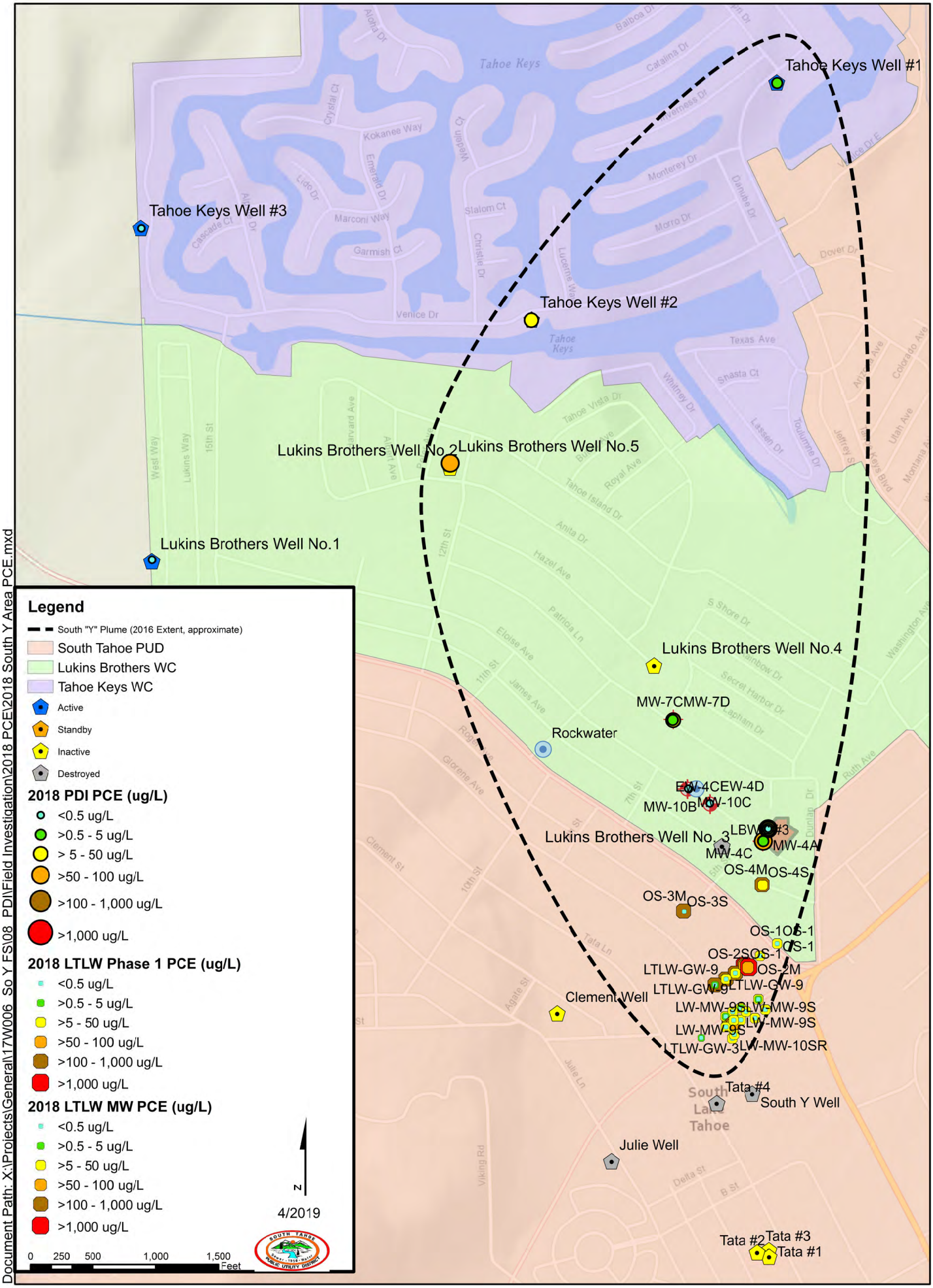


Figure 2-5: PCE Contamination Distribution

Highest PCE concentrations were detected in groundwater samples collected from the shallow wells neighboring the Tucker Avenue Stormwater Retention Basin, which suggests that it receives stormwater run-off from a PCE source at the LTLW site. Considered along with the findings of the 2018 PDI, PCE water quality results from the LRWQCB Regional Plume Characterization Off-Site Groundwater Investigation suggests that the Tucker Avenue Stormwater Basin likely provided a vertical pathway for the infiltration of PCE contamination to depth intervals corresponding to 26 – 38 ft bgs and 40 – 52 ft bgs.

2.5.1 Drinking Water Well Conditions

PCE above MCLs has impaired five PWS wells (LBWC 2, LBWC 3, LBWC 4, LBWC 5 and TKWC 2) with a combined source capacity of 3.25 million gallons per day (MGD). LBWC 5 and TKWC 2 currently have PCE levels higher than the MCL of 5 µg/L. GAC filtration facilities were installed at TKWC 2 and will be installed at LBWC 5 in the near future.

PCE below MCLs is detected in TKWC 1. Potential impairment of TKWC 1 above the MCL would further reduce the total production capacity of area drinking water sources by an additional 1.44 MGD. Two other PWS wells (LBWC 1 and TKWC 3) west of the South Y plume are presently non-detect for PCE. The District has mutual aid and assistance agreements for the emergency provision of drinking water using inter-tie connections from its water distribution system to both the LBWC and TKWC water systems. During the 2018 WY, the District provided 7.54 million gallons through its inter-tie connection to LBWC, which is about 9% of LBWC's total water production for the 2018 WY (STPUD, 2018). Water quality trends in LBWC and TKWC wells are presented in Figure 2-6.

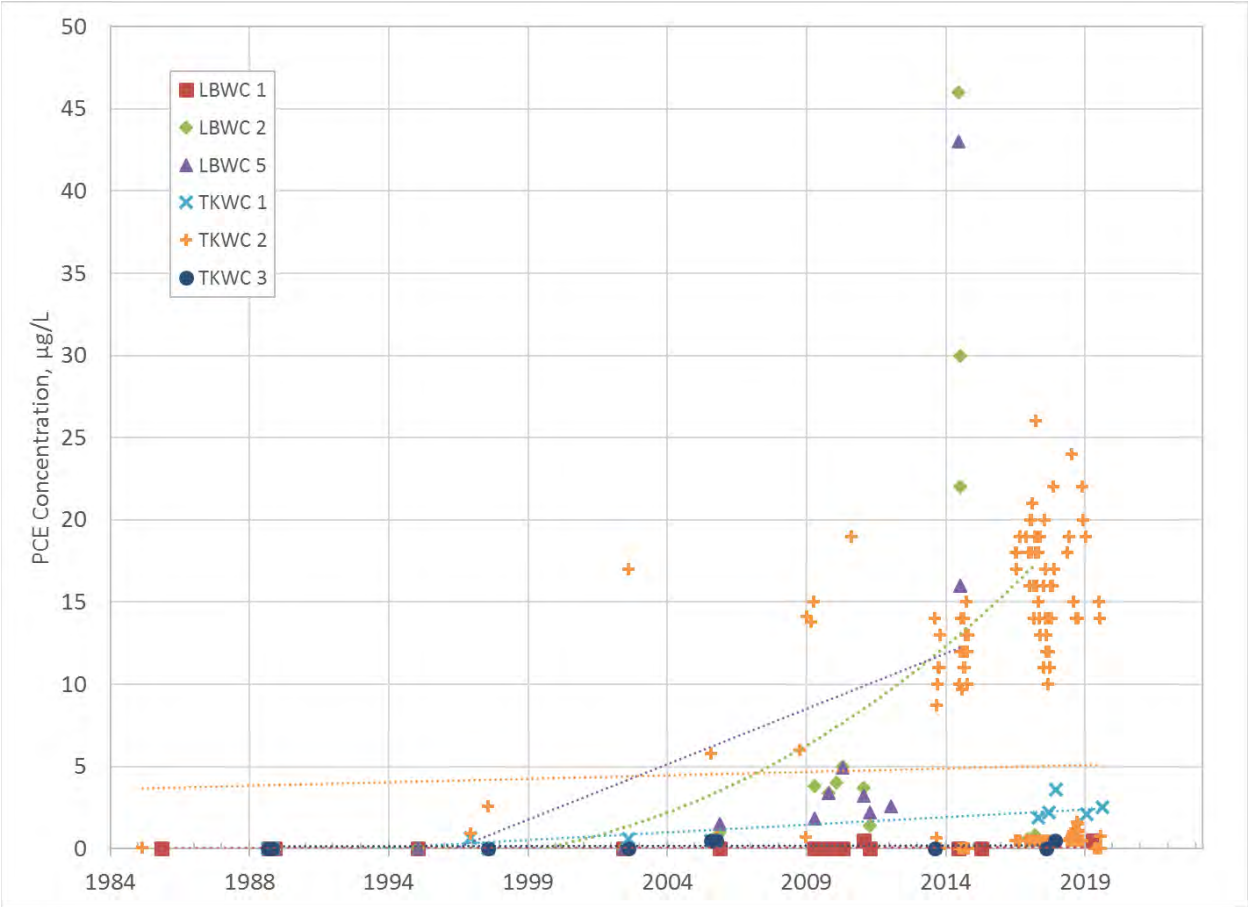


Figure 2-6: LBWC and TKWC GW Quality Trends

Section 3: Existing Infrastructure

Remedial alternatives were developed with a focus on using existing infrastructure as much as possible. This Section discusses existing extraction, treatment and distribution facilities as shown on Figure 3-1 as well as historic pumping and treatment results.

3.1 Existing Extraction and Treatment Facilities

3.1.1 Tahoe Keys Water Company

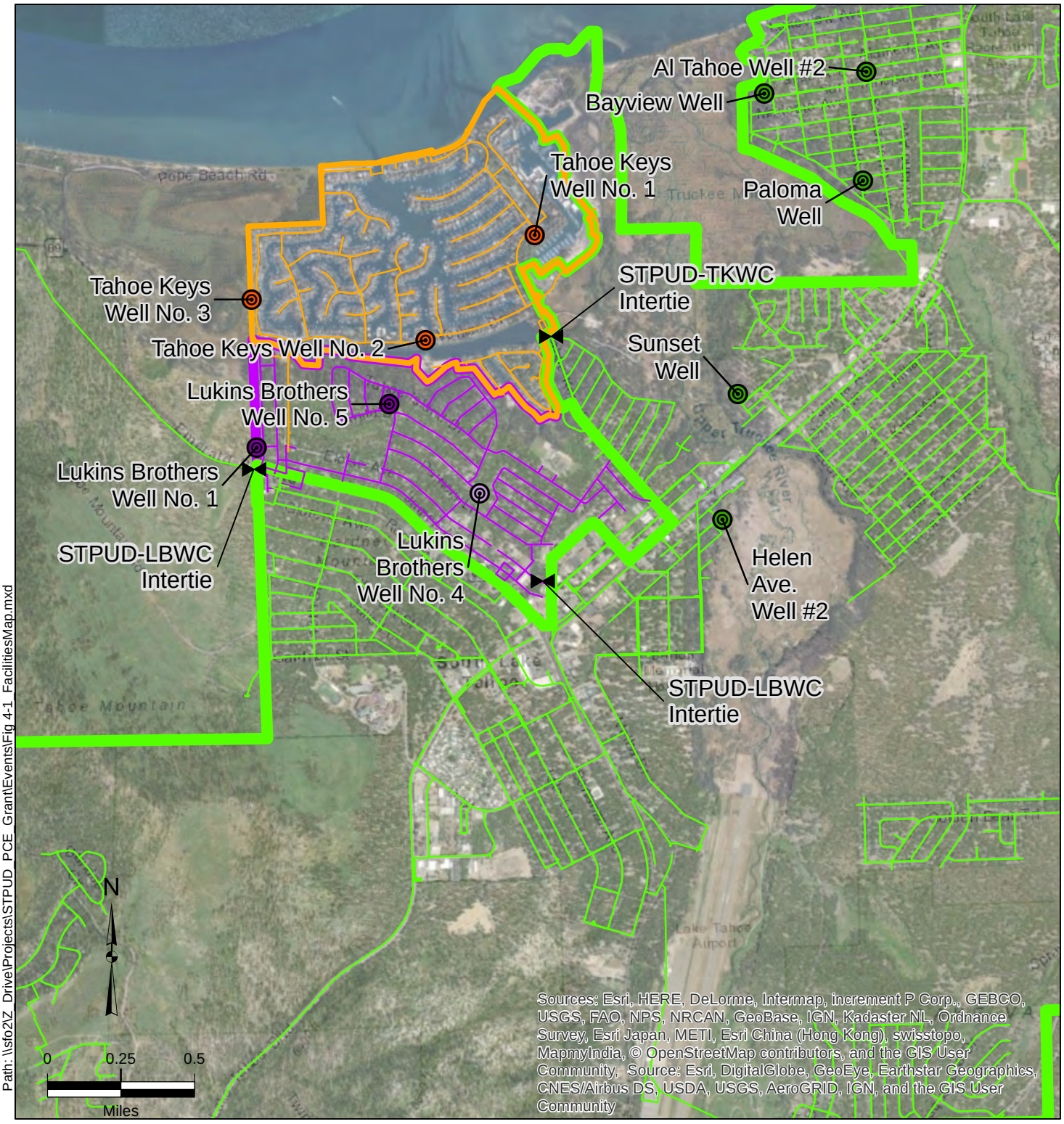
TKWC produces water from three wells with the oldest having been drilled in 1961; two of the three wells have detectable concentrations of PCE with one well requiring GAC treatment because the PCE is at a concentration greater than the MCL. Wellhead treatment facilities using GAC was completed at TKWC 2 in 2012 to address PCE concentrations above the MCL. The GAC pressure filter has a treatment capacity of 550 gpm. Table 3-1 that follows summarizes the TKWC groundwater facilities.

Table 3-1: Summary of TKWC Facilities

Facility Name	Pumping Capacity (gpm)	Average Operational Pumping Rate [(a)] (gpm)	Year Drilled	Screened Interval (ft bgs)
TKWC 1	1,000	242	1961	125 to 312
TKWC 2	550 [(b)]	98	1972	138 to 188, 348-414, 426-480
TKWC 3	2,000	224	1977	175 to 300

Notes:
a. Based on 2009-2018 pumping data provided by the District.
b. Permitted capacity of TKWC 2 is limited to 550 gpm based on installed GAC treatment capacity. Original well was equipped with 2,250 gpm pumping capacity.

The Tahoe Keys development included the construction of a lagoon water quality improvement project (Lagoon Water Treatment Plant, Lagoon WTP) consisting of a large pumping plant to extract surface water from the dead-end lagoons for treatment through a clarifier prior to a pumped discharge back to the lagoon. The Lagoon WTP and water circulation facilities were built for water quality improvements following construction of the Tahoe Keys project. The Lagoon WTP site consists of the operations building, pump building, 117-foot diameter clarifier, influent and effluent pipelines, and drying beds, which are currently used to store and dry aquatic weeds harvested from the lagoon prior to disposal outside the Lake Tahoe Basin. TKWC no longer operates the Lagoon WTP as originally intended, but the property and facilities are still considered useful assets by the TKWC.



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LEGEND

- Production Wells
- STPUD Intertie

Water Service Areas

- Tahoe Keys Water Company
- Lukins Brother Water Company
- South Tahoe Public Utility District

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South Lake Tahoe, CA

Water Facilities within the South Y Region

1770027.00

Figure 3-1

3.1.2 Lukins Brothers Water Company

LBWC currently produces water from one well (LBWC 1) and supplements its demand by purchasing water from the District through interties to meet their demands. LBWC's remaining wells (LBWC 2, LBWC 3, LBWC 4, and LBWC 5) have all been removed from service due to PCE contamination. LBWC received funding to equip LBWC 5 with GAC treatment and is anticipated to be returned to service at a reduced pumping rate by February 2021. Table 3-2 summarizes the LBWC groundwater sources.

Table 3-2: Summary of LBWC Groundwater Sources

Facility Name	Pumping Capacity (gpm)	Average Operational Pumping Rate [a] (gpm)	Year Drilled	Screened Interval (ft bgs)
LBWC 1	720	114	1963	132 to 182
LBWC 2	290	Standby [b]	Pre-1950	132 to 156
LBWC 4 [c]	<130	Inactive	1966	43 to 63 68 to 78 105 to 115 132 to 155
LBWC 5	750	Standby [d]	1983	141 to 180

Notes:
a. Based on 2009-2018 pumping data provided by the District.
b. Due to PCE concentrations above the MCL, LBWC 2 is a standby well.
c. Due to PCE concentrations above the MCL, LBWC 4 has been inactive since 1989 and was removed from service in 1994. See Section 2.2.2 for additional details on the construction of LBWC 4.
d. Due to PCE concentrations above the MCL, LBWC 5 is on standby. LBWC received funding in October 2019 through a State-funded grant to equip this well with GAC treatment in order to place it back into regular service by February 2021.

In addition to the wells, service pressure in LBWC's distribution system is maintained by the use of three (3) hydropneumatic pressure tanks. A 9,000-gallon pressure tank serves LBWC 1 while a 2,000-gallon pressure tank and 7,000-gallon pressure tank serves LBWC 2 and LBWC 5. Under normal daily demand of the community, these tanks maintain an average system pressure between 65 and 85 psi.

3.1.3 South Tahoe Public Utility District

STPUD produces water from 13 wells, none of which are in the South Y area. Historically, STPUD has had wells in the South Y area which have been either destroyed per California Well Standards or disconnected from the main water distribution system because of Methyl tert-butyl-ether (MTBE) a gasoline additive and PCE contamination. Table 3-3 summarizes the active STPUD wells nearest the South Y area.

Table 3-3: Summary of Active STPUD Well Facilities

Facility Name	Pumping Capacity (gpm)	Average Operational Pumping Rate (gpm)	Year Drilled	Screened Interval (ft bgs)
Al Tahoe 2	2,500	270	1992	110 to 140 180 to 240 280 to 290 300 to 400
Bayview	3,600	1,659	2004	180 to 300 340 to 370 410 to 430 510 to 540
Helen Ave. 2	260	132	1966	90 to 150
Paloma	2,500	36	1994	188 to 248 268 to 408
Sunset	600	320	1990	275 to 430

Note:
a. Based on 2009-2018 pumping data provided by the District.

STPUD also has a Packed Tower Air Stripper (PTAS) at the Clement Well (not in service) which has not been used since the early 1990s. The components of the air stripper facility could be reused to treat PCE at another site.

3.2 Water Distribution Systems Infrastructure

The TKWC distribution facilities include approximately 11 miles of water distribution piping which are configured with several loops to improve water circulation and reduce water age with associated water quality benefits. The existing pipelines are approximately 50 to 60 years in service and increasing leak occurrence can be expected. The average pipe depth is five feet and the average operating pressure is 50 to 55 pounds per square inch gauge (psig). Distribution system materials include asbestos cement (AC), polyvinyl chloride (PVC), steel, and ductile iron pipe (DIP). Service laterals are constructed of galvanized steel and copper pipe.

The LBWC distribution system is made up of a network of pipes ranging from 2 to 12 inches in diameter with average operating pressures of between 55 and 75 psi. The 4-inch diameter pipe makes up about 85% of the 57,300 total feet of installed pipe.

The District's storage and distribution system is comprised of 16 booster pump stations, 23 storage tanks, 26 pressure reducing valves and 320 miles of potable water pipe. Due to the topography of the District's service area, the system is separated into 15 pressure zones to control over or under pressurization of the areas served. The Gardner Mt pressure zone, which neighbors the TKWC and LBWC service areas, range from 60 to 80 psi, with some areas near the LBWC water system ranges from 40-80 psi. STPUD also has interties with TKWC and LBWC as described below.

- Tahoe Keys Intertie – The intertie is a manually operated 8-inch connection with a pressure reducing valve and meter. Maximum supply is approximately 783 gpm under

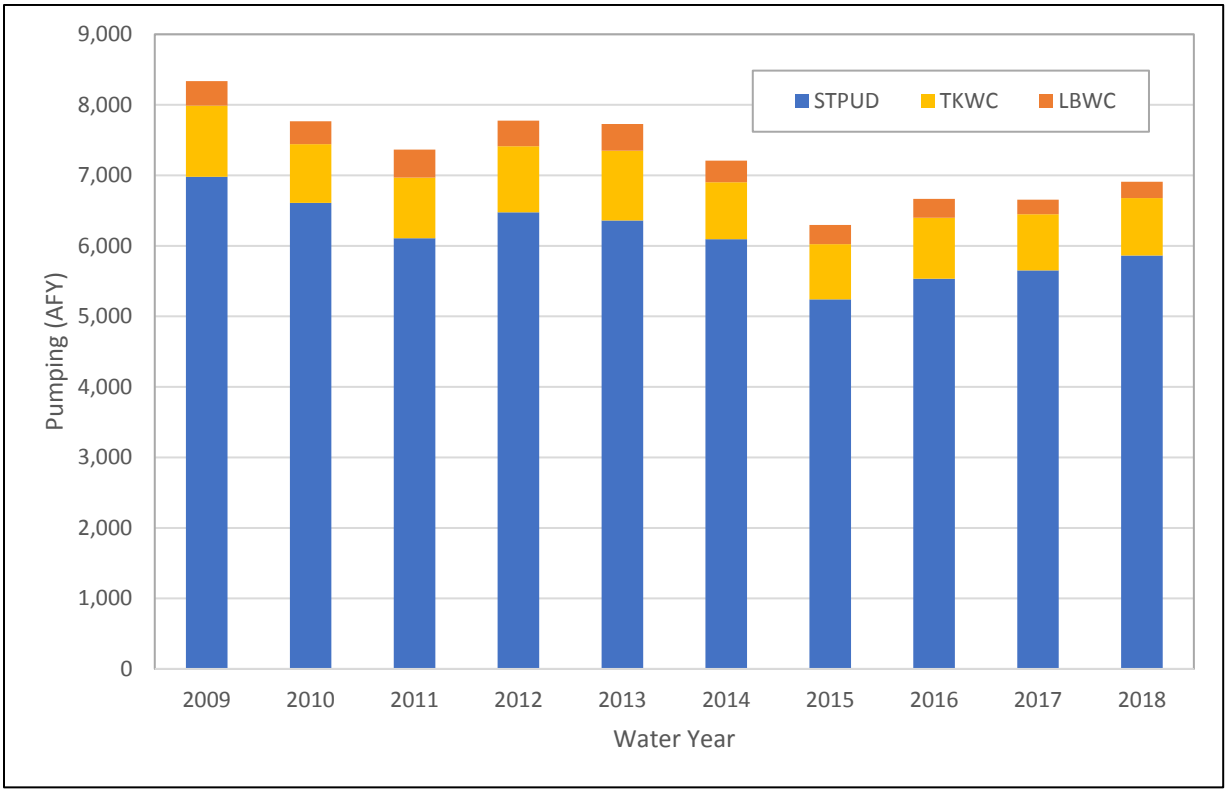
normal operating conditions (maximum velocity less than 5 feet per second through the pipe). The intertie is intended to be operated during emergencies.

- Lukins Brothers Intertie - Lukins and STPUD have constructed two interties which are manually operated. One of the interties is located near the intersection of 15th Street and Hwy 89. The other intertie is located at the intersection of Eloise Avenue and Dunlap Avenue. The interties mutually benefit Lukins and STPUD during periods of extended service disruption or emergencies and have been essential to LBWC's continued ability to provide sufficient water supply to its customers after LBWC 2 and LBWC 5 were placed on standby status in July 2014 due to PCE contamination.

Based on the above information, if the preferred remedial alternative consists of water transfers between water purveyors, specialized pressure control valves may need to be added at interties to maintain acceptable system pressures between water systems.

3.3 Historic Pumping

Each water system is 100% reliant on groundwater sources; groundwater pumping mirrors seasonal variations in drinking water demands. Annual groundwater pumping from STPUD, TKWC and LBWC's well operational records during the 10-year period from 2009 to 2018 is summarized in Figure 3-2. The average annual historic pumping for this period was used as the basis for developing remedial alternatives, further described in Sections 4 through 6.



Note:
AFY = acre-feet per year

Figure 3-2: Historic Pumping

Section 4: Remedial Alternatives Development

Based on the information summarized in Section 1 through Section 3, options to address PCE in the groundwater were developed for evaluation using criteria that would meet the Feasibility Study Objective presented in Section 1.2.1 and the Feasibility Study Goals discussed in Section 1.3. Concepts were reviewed during TAC Meeting 4 held on June 18, 2019, and favorable Concepts were further developed for modeling by the South Y Fate and Transport Model, the results of which are discussed in Section 2.2.4 and evaluated as described in Sections 5 and 6. This Section summarizes those conceptual activities that can be used to protect drinking water supply from the legacy PCE plume in the South Y and also describes approaches that were considered but not pursued further because they were determined to be inconsistent with the RAOs or project objectives or do not align with CERCLA.

4.1 Remedial Alternatives Developed for Initial Screening

Four Remedial Alternative Concepts were developed for initial screening:

1. No Action
2. Extraction Wells
3. Replacement Wells
4. In-Situ Remediation

4.1.1 No Action

The No Action Concept is used to show the potential impacts on the water purveyors if there were no changes in water system operations in response to PCE groundwater contamination. This Concept also provides a baseline against which to compare implementation of other potential actions. The No Action Concept is characterized by maintaining pumping at the wells sufficient to meet TKWC and LBWC demands. This Concept modeled the following well operations:

- Operate TKWC 3 as lead well to meet existing water demands for TKWC System
- Operate TKWC 2 (with GAC treatment) as lag well for TKWC System
- Operate TKWC 1 as lag-lag well for TKWC System
- Operate LBWC 1 as lead well to meet existing water demands for LBWC System
- Operate LBWC 5 (with planned GAC treatment) as a lag well for LBWC System

This Concept assumes that the District will provide emergency water to TKWC/LBWC in accordance with the existing mutual aid and assistance agreements.

4.1.2 Extraction Wells/Mid-Plume Remediation

This Concept is to install a series of mid-plume extraction wells downgradient of the source area, with water to be pumped to a central treatment system. This Concept could include abandonment of existing impacted supply wells, installation of new deeper supply wells at existing locations and/or new supply wells outside the plume to meet water system demands. No individual wellhead treatment at the impacted wells is anticipated in this remedial alternative.

Treated water from the extraction wells could be reused or disposed of to the sanitary or storm sewer systems.

A series of 21 extraction wells were modeled as situated across the mid-plume area for the purposes of cutting off plume migration down-gradient. Pumping at 40 gpm each, the extraction wells were modeled to remove PCE contamination from the upper 100-feet of the aquifer, above the clay lens described in Section 2.2.4. South Y fate and transport modeling results indicate that operation of these extraction wells can remove a greater amount of PCE mass over the No Action Concept, with a majority of the mass removed occurring upgradient of and through the proposed wells located closer to the South Y Fate and Transport Model source area. These wells cannot capture the portion of the PCE plume downgradient of the line of extraction wells.

Implementation of a remedial alternative to achieve the modeled removal would require construction of multiple wells within the mid-plume area; however, the availability of funding and properties on which to construct these wells is limited. In addition to the challenges with constructing these wells, there was concern about the reuse of the excess treated water generated by the extraction wells. Based on these findings, this remedial alternative was not further refined for further screening or analysis.

4.1.2.1 PCE Treatment Methods

For PCE treatment, the EPA, as part of establishing an MCL for PCE, has designated Granular Activated Carbon (GAC) and Packed Tower Aeration as Best Available Technologies (BAT) for removal of PCE from groundwater for public water supplies as described below. The designated BAT process is part of confirming that the proposed MCL can be treated both technically and economically. Other options include low profile air stripping or membrane degassing which are relatively newer and potentially innovative. A high-level feasibility comparison of the four treatment options, especially for applicability in the high altitude, low temperature environment of South Lake Tahoe has been developed in prior studies. For the purposes of this evaluation either packed tower aeration and/or GAC treatment are used in evaluating the final three remedial alternatives.

- **Packed Tower Aeration/Air Stripping (PTA)** – PTA employs a tower containing a packing material, in which water trickles down through the packing while air flows counter-currently upward through the packing, removing the volatile PCE from the water. The treated water is collected in a clearwell and repumped into the distribution system. The District has a decommissioned PTA that was used at the District's Clement well for MTBE treatment. The Clement well has since been removed from service. Relocation and reuse of the existing packed tower aeration treatment system from the District's Clement Well site for use at either the LBWC 5 or a possible replacement well site is evaluated in Section 6.

  The main advantage of packed tower aerators is their high efficiency in removing volatile gases. The disadvantages include the visual impact of a tall tower in a residential neighborhood, the need to pump to distribution pressure, and potential freezing problems if the aerator is located outside in the cold winter Lake Tahoe climate. Unfortunately, the water demand and the resulting flow through the aerator are at its lowest in cold weather, thus increasing the need for an enclosure to remove the potential for freezing.

- **GAC** – PCE is removed from water by adsorption on the GAC media in a pressure vessel. GAC must be periodically replaced as the sorption capacity of the media is consumed. The GAC must be backwashed when a new load of GAC is installed in the contactor. In the limited cases where the groundwater is turbid (which increases headloss through the vessel), contactors are backwashed as needed to fluff the bed and minimize head loss or a pretreatment system (i.e. bag filters or roughing filter) could be used to remove the solids prior to the GAC contactors. Settled backwash water can be recovered and blended with the well water supply prior to treatment. The settled solids can be discharged to a waste solids tank for removal by a vactor truck. When using GAC pressure vessels, it is not necessary to repump the water after treatment.

  TKWC2 GAC Treatment facility consists of two vessels operating in lead/lag configuration. LBWC 5's future GAC treatment facility will also consist of two vessels operating in lead/lag. For this Concept, it is assumed two GAC trains, each with two GAC contactors, would be operated in a lead-lag mode.

  The SWRCB-DDW has accepted GAC for wellhead treatment at LBWC 5. LBWC is planning to start construction of this water treatment facility to remove PCE from groundwater in 2020. Operation of this facility is planned to start in February 2021.

A number of treatment strategies for PCE in groundwater have emerged that were not identified when EPA designated BATs in the 1980s. Several technologies have been evaluated through an initial screening of treatment technologies as follows:

- **Multi-Stage Bubble Aeration (MSBA)** – MSBA is a type of low-profile aeration that employs diffused air bubbles in a series of horizontal flow-through chambers to contact water under turbulent conditions to remove PCE as the bubbles rise through the basins. Although these treatment units employ shallow (3-foot to 4-foot) liquid depths that result in much lower profiles than PTA units, similar to PTA, the water must be repumped after treatment requiring additional energy.
- **ShallowTray™ Aeration** – ShallowTray™ aeration is a type of low-profile aeration that employs a series of stacked perforated trays, in which water flows downward and horizontally through the trays while air flows counter-currently upward through the trays, removing the PCE from the water. Treatment units have a lower profile than PTA units and the water must be repumped after treatment requiring additional energy.
- **Membrane Cell Degassing** – Membrane cell degassing removes PCE across microporous hollow fibers that allow gases to transfer but prevent water from being transferred. The stripped gas can be removed by a vacuum or a carrier gas stream. This technology is still emerging for PCE removal. There is some question as to whether the membrane manufacturer will guarantee the process for low concentrations (e.g., 0.4 µg/L). The membranes are proprietary products that have a limited life span of about 7 years. Advantages of this process are that it has a relatively small footprint and it is not necessary to re-pump the water following treatment.
- **Surface Aeration (inside WTP)** – Surface aeration via mechanical aerators is normally used in wastewater treatment to entrain oxygen from the atmosphere. It has been used infrequently in water treatment. Pumping or agitating of the aerators help keep the aeration basin mixed. This method would increase the concentration of oxygen in the water to volatilize the PCE to the air. This technology would require a large covered water reservoir and re-pumping following treatment.

4.1.2.2 Policy Memo 97-005 Impaired Waters Requirements

If extracted water from wells located within the plume is to be delivered as drinking water, the water purveyor may be required to complete Policy Memo 97-005 documentation and monitoring in order to permit the well as a drinking water supply. State Water Resources Control Board Policy Memo 97-005 applies to source waters with more than 10 times the MCL of a regulated contaminant (also known as an "impaired water") and requires additional study, treatment and monitoring prior to delivery as a potable supply. The estimated level of effort to develop the required documentation could be on the order of $500,000 to $1,000,000 with an additional $50,000 to $100,000 per year for monitoring, not including treatment facility maintenance or waste disposal fees.

4.1.3 Replacement Wells

This Concept consisted of drilling new potable water supply wells (replacement wells) outside of the PCE plume to replace some capacity of contaminated wells. It was assumed that these replacement wells would be outside the PCE plume, within groundwater source water system service area boundaries. The locations of these extraction wells, shown on Figure 4-1, were limited to properties owned or accessible to LBWC, TKWC, or the District or federal, state lands within the water system service area boundaries. In addition, the location of these wells was required to be outside of the inferred extent of PCE groundwater contamination. Replacement wells were modeled to pump groundwater from the water-bearing zones underlying the vertical extent of PCE groundwater contamination.

Seven possible replacement well (RW) sites were considered but based on the hydrogeologic characteristics of the aquifer as included in the South Y Fate and Transport Model, RW-D and RW-F were selected as potential wells locations to replace TKWC 1 and LBWC 5, respectively. The potential well location to replace TKWC 1 is a test hole site shown as RW-D on Colorado Court. The possible LBWC Replacement well site is at RW-F, near 969 Council Rock Drive with the APN number 02368101. The RW-C site is also out of the plume but was not considered since it is closer to the plume and might be impacted by plume movement. RW-A and RW-E were both determined to be too close to existing wells and therefore not selected as replacement well locations. RW-B was not selected as a replacement well because it is located within the plume.

The following replacement well operations were modeled:

- Operate LBWC 1 as lead well to meet existing water demands for LBWC System;
- Operate LBWC 5 (with planned GAC treatment) at half of its capacity for LBWC System;
- Drill, equip and operate RW-F at half of LBWC 5's capacity to meet existing water demands for LBWC System;
- Operate TKWC 3 as lead well to meet existing water demands for TKWC System;
- Operate TKWC 2 (with GAC treatment) as lag well for TKWC System;
- Drill, equip and operate RW-D as lag-lag well for TKWC System;
- Decommission TKWC 1 due to the PCE plume

This Concept assumes the District will provide emergency water to TKWC/LBWC in accordance with the existing mutual aid and assistance agreements.

This Concept was removed from consideration after meeting with the TAC in February 2019 based on results of the South Y Fate and Transport Model which indicated the PCE plume may expand towards the replacement wells. Specifically, it was found that ceasing pumping at LBWC 1 and replacing it with pumping outside the plume had the potential to encourage the PCE plume to move eastward. Furthermore, this Concept could meet the demand of both TKWC and LBWC demand but would not contribute much to overall PCE mass or extent reduction. In addition, the replacement well sites may require additional pipeline infrastructure to connect to the existing water distribution system, and thereby adding cost above using an existing well site. If future replacement wells are planned, additional modeling with wells to the west of the plume and/or at lots that are not limited to those in public ownership is recommended.

4.1.4 In-Situ Remediation

In-situ remediation is a technique used for groundwater remediation to reduce the concentrations of targeted compounds to acceptable levels. In-situ remediation includes the injection or emplacement of vapor, liquid, or solid phase media into the target treatment area to enhance existing or initiate physical, biological or chemical processes that remove or degrade target compounds in the ground.

- **In-Situ Chemical Oxidation (ISCO)** – ISCO is accomplished by injecting or introducing strong chemical oxidizers into the treatment area to destroy target compounds in place. Oxidants are injected in solutions prepared and mixed with water above ground on the surface and injected through a series of wells installed and vertically screened within the target treatment area. The effectiveness of ISCO strategies depends on several variables that describe the oxidant, target compounds, non-target compounds and aquifer matrix. Among these are:
    - Bond-breaking strength of oxidant (thermodynamic potential for the oxidant to oxidize the specific compound)
    - Kinetics of the oxidant-target compound reaction (particularly in relation to non-target compounds that may be present)
    - Non-target chemical oxidant demand, or reductive poise, that may be present in the formation
    - Target compounds sequestered in non-aqueous phase materials, such as natural soil organic matter or residuals associated with releases that are shielded from oxidant reactions.

  These last three variables are highly site-dependent and influence the potential rates of reaction, the mass of oxidant that must be injected to achieve remedial objectives, and the potential amount of target compound that will remain when the oxidation reactions have reached their completion.

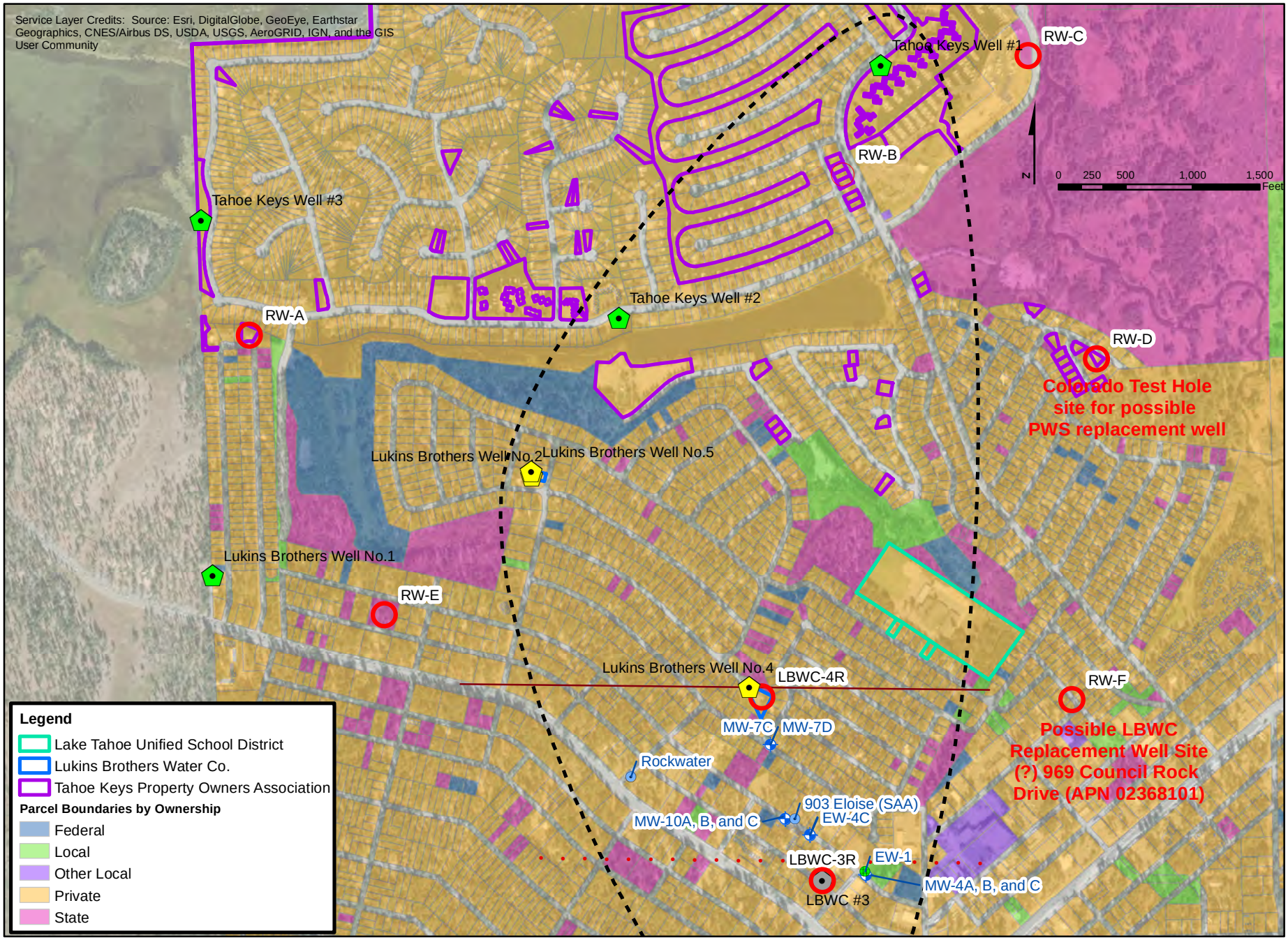


Figure 4-1: Potential Replacement Well Locations

There are four basic oxidants available for in-situ application:

- Hydrogen peroxide
- Ozone
- Permanganate
- Persulfate

Two of these, hydrogen peroxide and ozone, are designed to synthesize hydroxyl radicals in the treatment zone. The hydroxyl radical is a highly reactive, indiscriminate oxidant. Peroxide-based systems have been developed for use in the wastewater treatment industry employing a Fenton's approach, which involves the reduction of the pH of the water to a pH less than 5 via the addition of sulfuric acid and the use of an iron catalyst. This reaction can be controlled in a wastewater treatment plant but has been shown to be difficult to control in a natural environmental setting. The permanganate system is much less reactive, as it does not employ radicals but works via direct oxidation. It has a long half-life in aqueous systems but requires large injection volumes. Persulfate offers a safer slower reaction, but employs a highly reactive sulfate radical, which can effectively oxidize a wide variety of organic compounds. ISCO approaches typically involve intentional and consequential changes to groundwater geochemistry that may not be compatible with nearby concurrent extraction for use as drinking water. Further, secondary water quality effects can include formation or mobilization of undesired compounds or metals such as bromate, arsenic, or hexavalent chromium.

- **Air Sparging** – Air sparging is an in-situ groundwater treatment process in which air is injected into the subsurface via wells screened below or at the bottom of the target depth interval. Injected air moves horizontally and vertically in channels through the soil column, removing volatile compounds by stripping. Injected air flushes volatile compounds into the unsaturated zone, where a soil vapor extraction system is often implemented to remove vapors. Physical removal of target compounds through volatilization is the primary treatment mechanism accomplished via air sparging. Secondary treatment via enhanced biological degradation of target compounds may also occur. Biological degradation requires the presence of microbes, nutrients, and oxygen in sufficient quantities to degrade target compounds. Typically, air sparge is not sufficient as a means of oxygen delivery for accelerating aerobic biological degradation of non-volatile hydrocarbons beyond natural attenuation processes. The primary biological pathway for in-situ degradation of PCE is anaerobic, making air sparging as a means of enhanced biological treatment ineffective for PCE.
- **Bioremediation** – Inject chemical reagents into the aquifer to promote microbial destruction of VOCs. Groundwater TDS increases in the treatment area with potential mobilization of treatment byproducts. Multiple treatments will be necessary.

In-Situ Remediation concepts were considered for the mid-plume area, but later abandoned as the Fate and Transport Model was not of sufficient resolution for individual parcel-scale analysis. Furthermore, in-situ remediation has potentially high cost and high uncertainty of outcome. Based on discussions with the TAC, in-situ remediation was removed from further consideration as a viable remedial alternative.

4.2 Management Scenarios Refined for Further Analysis

Initial screening using the Fate and Transport Model and input from the TAC were used to refine the initial remedial alternative concepts into Management Scenarios that could be further developed for additional analysis. Based on discussions during TAC Meeting 4 held on February 24, 2019 and TAC Meetings 5 held on June 21, 2019, the following Management Scenarios were developed:

1. No Action – Continue existing operations of the TKWC and LBWC systems.
2. Targeted Pumping
    a. Targeted Pumping – 90% of GAC Capacity – Pump TKWC and LBWC wells with existing PCE treatment at 90% of treatment capacity.
    b. Targeted Pumping – 90% Well Capacity – Pump TKWC and LBWC wells with existing PCE treatment at 90% of well pumping capacity.
    c. Targeted Pumping – Change operations of TKWC and LBWC systems so that the wells with existing PCE treatment are in the lead position.
    d. Targeted Pumping – Operate LBWC system with LBWC 5 (equipped with PCE treatment) in the lead position. Continue existing operation of TKWC system.
3. Gradual Conversion to Surface Water – Replace all TKWC and LBWC groundwater supply to surface water supply.

These refined Management Scenarios and the results of the modeling are described in greater detail in the following Sections.

4.2.1 Targeted Pumping

This Scenario is characterized by optimizing groundwater production from existing PWS wells with wellhead treatment (for the removal of PCE from groundwater), situated within the South Y Plume. These wells would be operated as lead wells to enhance PCE removal from groundwater and plume control. Four variations of targeted pumping were evaluated using different sets of existing groundwater sources and water system operation constraints as briefly described below.

4.2.1.1 Targeted Pumping – 90% Treatment Capacity

This Scenario would pump the wells equipped with GAC treatment to 90% of treatment capacity. Therefore, under this Scenario, TKWC 2 and LBWC 5 were modeled as pumping at 90% of treatment capacity as the lead system wells, with the remaining wells operating to meet remaining demand as the lag and lag-lag wells. Pumping from District wells were reduced proportionately assuming that the increased water produced through TKWC 2 and LBWC 5 would be supplied to the District. The objective of this Scenario is to maximize the mass of PCE removed through existing infrastructure.

This Scenario modeled the following well operations:

- Operate LBWC 1 as lag well to meet remaining water demands for LBWC System
- Operate LBWC 5 (with GAC treatment) as lead well pumping at 90% of treatment capacity
- Operate TKWC 3 as lag-lag well to meet remaining water demands for TKWC System
- Operate TKWC 2 (with GAC treatment) as lead well for TKWC System pumping at 90% of treatment capacity
- Operate TKWC 1 as lag well for TKWC System

Modeling of this Scenario showed significantly increased PCE mass removal and a shorter duration for reduction of PCE concentration in local wells to below the MCL as compared to the No Action Scenario. Although the South Y Fate and Transport Model showed great effectiveness in this Scenario to meet project objectives, this Concept was removed from consideration due to water purveyor concerns with managing the increase in GAC media use and excess water generation.

4.2.1.2 Targeted Pumping – 90% Well Capacity

This Scenario would pump the wells equipped with GAC treatment to 90% of pumping capacity. Therefore, under this Scenario, TKWC 2 and LBWC 5 were modeled as pumping at 90% of pumping capacity as the lead system wells, with the remaining wells operating to meet remaining demand as the lag and lag-lag wells. This Scenario requires additional treatment to be installed at TKWC 2. Pumping from District wells were reduced proportionately assuming that the increased water produced through TKWC 2 and LBWC 5 would be supplied to the District. The objective of this Scenario is to maximize the mass of PCE removed through wells already permitted for PCE treatment.

This Scenario modeled the following well operations:

- Operate LBWC 1 as lag well to meet remaining water demands for LBWC System
- Operate LBWC 5 (with GAC treatment) as lead well pumping at 90% of well pumping capacity
- Operate TKWC 3 as lag-lag well to meet remaining water demands for TKWC System
- Operate TKWC 2 (with additional GAC treatment) as lead well for TKWC System pumping at 90% of well pumping capacity
- Operate TKWC 1 as lag well for TKWC System

Modeling of this Scenario showed significantly increased PCE mass removal and a shorter duration for reduction of PCE concentration in local wells to below the MCL as compared to the No Action Scenario. Although the South Y Fate and Transport Model showed great effectiveness in this Scenario to meet project objectives, this Scenario was removed from consideration due to water purveyor concerns with locating additional treatment, managing the increase in GAC media use and excess water generation.

4.2.1.3 Targeted Pumping – System Demands

This Scenario evolved from the previous two Scenarios in an attempt to address the excess water generated. This Scenario would resemble the No Action Scenario in well operations but

swap the wells with GAC treatment with the lead wells to maximize the mass of PCE removed through wells already permitted for PCE treatment, but only extract the volume of water needed to meet system demands.

This Scenario modeled the following well operations:

- Operate LBWC 1 as lag well to meet remaining water demands for LBWC System
- Operate LBWC 5 (with GAC treatment) as lead well to as lead well to meet existing water demands for LBWC System
- Operate TKWC 3 as lag-lag well to meet remaining water demands for TKWC System
- Operate TKWC 2 (with GAC treatment) as lead well to meet existing water demands for TKWC System
- Operate TKWC 1 as lag well for TKWC System

Modeling of this Scenario showed increased PCE mass removal and a shorter duration for reduction of PCE concentration in local wells to below the MCL as compared to the No Action Scenario. Although the South Y Fate and Transport Model showed great effectiveness in this Scenario to meet project objectives, this Scenario was removed from consideration as modeled due to water purveyor concerns with managing the increase in GAC media use and complications with changes in system pressures in the TKWC system. Refinements were made to the Scenario to address water purveyor concerns as discussed in Section 4.2.1.4.

4.2.1.4 Targeted Pumping – LBWC Demands

This Scenario evolved once again from the previous Scenario in an effort to address the complications in changes with TKWC system pressures. This Scenario would resemble the No Action Scenario in well operations, but swap LBWC 5 (equipped with GAC treatment) with LBWC 1 (LBWC lead well) to maximize the mass of PCE removed through wells already permitted for PCE treatment, but only extract the volume of water needed to meet system demands. This Scenario would maintain existing operations for the TKWC system.

This Scenario modeled the following well operations:

- Operate LBWC 1 as lag well to meet remaining water demands for LBWC System
- Operate LBWC 5 (with GAC treatment) as lead well to meet existing water demands for LBWC System
- Operate TKWC 3 as lead well to meet existing water demands for TKWC System
- Operate TKWC 2 (with GAC treatment) as lag well for TKWC System
- Operate TKWC 1 as lag-lag well to meet remaining water demands for TKWC System

Modeling of this Scenario showed increased PCE mass removal and a shorter duration for reduction of PCE concentration in local wells to below the MCL as compared to the No Action Scenario. Furthermore, modeling revealed additional pumping from LBWC 5 resulted in reduced PCE removal from the downgradient wells TKWC 1 and TKWC 2. This Scenario would enable LBWC to provide additional PCE plume containment while also providing a replacement water source.

4.2.1.4.1 LBWC Demands with Extraction Well

Following TAC review, discussion led to the revision of this Scenario to include a new PCE extraction well in the mid-plume area within the LBWC service area at the LBWC-4 location. The new extraction well would be equipped with PCE treatment and was modeled based on the pumping test results of the PDI for the EW-1 extraction well.

This Concept modeled the following well operations:

- Operate LBWC 1 as lag well to meet remaining water demands for LBWC System
- Operate LBWC 5 (with GAC treatment) as lead well to meet existing water demands for LBWC System
- Operate the PCE extraction well at LBWC 4 location at 90% capacity
- Operate TKWC 3 as lead well to meet existing water demands for TKWC System
- Operate TKWC 2 (with GAC treatment) as lag well for TKWC System
- Operate TKWC 1 as lag-lag well to meet remaining water demands for TKWC System

Modeling of this Scenario showed increased magnitude of benefits as compared to the Targeted Pumping – LBWC Demands Scenario.

4.2.2 Gradual Conversion to Surface Water

This Scenario evolved out of the Replacement Well Concept, except that instead of a new groundwater source, demand is met through surface water. To address the challenges related to locating new wells outside of the PCE plume, this Scenario would draw its source from Lake Tahoe, using TKWC lakeshore properties to locate intake facilities, TKWC properties for treatment facilities, and securing surface water rights through the District's surface water right application.

Modeling of this Concept resembled the No Action Concept, as it was assumed that current well operations would continue until the surface water treatment plant was complete and brought online, at which point groundwater pumping by TKWC and LBWC would cease. Therefore, model results do not show a PCE mass removal benefit with the implementation of this Concept.

4.3 Remedial Alternatives Selected for Detailed Analysis

Based on discussion with the TAC on February 26, June 21 and August 2, 2019, three Management Scenarios were further developed as potential remedial alternatives as shown in Table 4-1. Criteria used for evaluation of these remedial alternatives are described in Section 5.

4.3.1 No Action

The No Action Alternative is characterized by maintaining pumping at the wells sufficient to meet LBWC and TKWC existing demands (2009-2018 average annual demands) and current levels of PCE treatment. Emergency water supply will continue to be provided to TKWC and LBWC from STPUD in accordance with the existing mutual aid and assistance agreements. This Alternative is not anticipated to require new permitting and assumes no additional capital or O&M costs above what is currently planned to maintain existing operations and treatment.

Table 4-1: Remedial Alternatives Selected for Detailed Analysis

Remedial Alternative		Description
1	No Action	Maintain existing operation with no new infrastructure changes
2	Targeted Pumping – LBWC Demands with New Extraction Well	Operate LBWC 5 as lead well and LBWC 1 as lag well Operate new Extraction Well 1 as extraction well with connection to the distribution systems for use by water purveyors in the South Y Area. Maintain existing operation with no new infrastructure for the TKWC system
3	Conversion to Surface Water Treatment Plant	Maintain the existing groundwater source operation strategy for 10-15 years with gradual conversion to use of surface water operation strategy.

4.3.2 Targeted Pumping – LBWC Demands with Extraction Well (R1)

This Alternative is characterized by operation of the LBWC system with LBWC 5 (equipped with PCE treatment) in the lead position and LBWC 1 in the lag position. A new extraction well (R1) will be drilled at 843 Hazel Drive, operating at 200 gpm. R1 helps replace lost groundwater production from impaired and destroyed groundwater sources in the South Y Area. An existing well (LBWC 4) at the 843 Hazel Drive site is scheduled to be destroyed in April 2020 under direction of the LRWQCB using SCAP funding and is a separate activity from this Feasibility Study. The additional water produced by R1 would be treated to drinking water quality standards using a groundwater treatment facility. The groundwater treatment facility would be used to remove iron/manganese and PCE from groundwater prior to discharge to the water distribution systems. Excess treated water from the LBWC water system would then be available for consumption by neighboring water distribution systems through existing inter-tie connections.

Emergency water supply will continue to be provided to TKWC and LBWC from STPUD in accordance with the existing mutual aid and assistance agreements.

New infrastructure includes:

- A new 200 gpm extraction well (R1) at LBWC 4 site
- Drinking water treatment facilities for the removal of iron, manganese and PCE from groundwater to meet drinking water standards
- District sewer connection for pump to waste discharge; and
- Water connection for treated drinking water distribution.

Changes in operations and maintenance (O&M) includes:

- LBWC 1: reduced pumping (moved to lag position)
- LBWC 5: Increased monitoring, O&M and filter media replacement, costs for disposal of treatment residuals

- R1: Increased monitoring, O&M and filter media replacement, pumping to waste costs for discharge to sanitary sewer and disposal of treatment residuals

Permits and agreements needed to implement and operate this Alternative include:

- Drinking water permit amendment for R1 and treatment facility
    - Approval of R1 for potable reuse may require SWRCB-DDW Policy Memo 97-005 evaluation (see Section 4.1.2.2)
- District sewer discharge permit
- Required environmental permitting and documentation related to 843 Hazel Drive
- Temporary permitting related to construction

4.3.3 Conversion to Surface Water

This Alternative would require the gradual conversion from groundwater to surface water, using the District's existing surface water rights and Tahoe Keys lake-front property. Full implementation of this Alternative is when the systems no longer use groundwater and use surface water only. The surface water treatment plant capacity would meet Title 22 Source Water Capacity Requirements, but fire flow would be met by District interties. This Alternative assumes that the District would take the lead in obtaining the water rights and funding needed to construct the new surface water intake, pumping and treatment facilities and then enter into water purchase agreements as a wholesale water supplier to both the TKWC and LBWC water systems.

New infrastructure includes:

- Intake pipeline and raw water pump station on TKWC property along the shore of Lake Tahoe
- Raw water pipelines
- Surface water treatment plant (SWTP)
- Treated water pump station and distribution pipelines
- District sewer connection

Changes in operations and maintenance includes:

- TKWC and LBWC cease groundwater pumping following SWTP startup and operation
- Operation and maintenance of new intake pipeline, raw water pump station and pipeline, SWTP, treated water pump station, and distribution pipelines.
- Costs related to discharging to District sewer and treatment residuals

Permits and agreements needed to implement and operate this Alternative include:

- Amendment to District's existing water rights permit for Lake Tahoe
- Drinking water permit for SWTP operation
- District sewer discharge permit
- Required environmental permitting and documentation related to intake and SWTP sites
- Temporary permitting related to construction

Section 5: Criteria for Evaluation of Refined Remedial Alternatives

Based on the initial screening described in the previous Section, initial remedial alternatives were refined and further developed for detailed analysis to select a preferred remedial alternative. Evaluation criteria used for this analysis included effectiveness, implementability and cost. These Criteria are more fully described along with a description of the analysis used to select a preferred remedial alternative below.

The criteria described in this Section were used qualitatively to guide the development of remedial alternatives. Similar to the development of Management Scenarios, the development of the final three remedial alternatives utilized an iterative process based on the results of the criteria evaluation to optimize the benefits of each remedial alternative, as described in Section 6. Where applicable, each criterion is measured over a period of 20 years from the start of implementation, based on the Proposition 1 Groundwater Grant Program Requirement, which commits the funding recipient to operate and maintain the funded activity for 20 years.

5.1 Effectiveness

5.1.1 PCE Mass Removal

The goal of the SWRCB grant program is to remove PCE contamination from groundwater. Therefore, the preferred remedial alternative should demonstrate PCE removal effectiveness. The South Y Fate and Transport Model estimated mass (in pounds, lbs) of PCE removed through pumping groundwater from wells with detectable concentrations of PCE (TKWC 2, TKWC 1, LBWC 5, and R1). The 2019 DRI Model results for PCE mass removal from 2019 to 2038, presented in Section 2.2.4, can be used to compare the effectiveness of each remedial alternative.

5.1.2 PCE Concentration Trends/Reductions in Toxicity

Multiple RAOs presented in Section 1.3 addressed reducing concentrations of PCE and controlling or minimizing further PCE migration. Therefore, the preferred remedial alternative should demonstrate reductions in PCE concentration in groundwater. The South Y Fate and Transport Model estimated PCE concentrations in all wells with detectable levels (TKWC 2, TKWC 1, LBWC 5, and R1) over the period of 2019 to 2038, as presented in Section 2.2.4.

5.1.3 Short-Term Effectiveness

Short-Term Effectiveness addresses the period of time needed to complete the remedial alternative, and any adverse impact on human health and the environment posed during the construction and implementation period. Since the discovery of PCE contamination, the local water suppliers have been reacting to the loss of use of drinking water wells as a result of the loss of acceptable water quality. In order to slow or halt the continued loss of acceptable water quality, the preferred remedial alternative should be able to be implemented quickly. Factors that can reduce the timeline for implementation include use of existing infrastructure and ease of construction.

Reusing existing infrastructure keeps capital costs lower and can also minimize alterations to existing operations. Use of existing sites also reduces the potential of adverse impacts to the environment posed during the construction and implementation periods and the need for property acquisition. This Criterion assesses the use of the existing equipment within the ownership of LBWC, TKWC and STPUD, including agency-owned properties, existing wells, treatment facilities, and conveyance pipelines.

This Criterion also considers the ease of constructability of each remedial alternative. Remedial alternatives that are relatively simple to implement (greater ease of constructability) more easily attain acceptability from the public, permitting agencies, and other stakeholders, in addition to lower implementation costs. Remedial alternatives that are considered to have greater ease of constructability also would have existing site access, sufficient staging/laydown area for construction materials and equipment, and available temporary utilities to minimize impacts to the public or existing operations.

Use of existing treatment, groundwater production, and other infrastructure already owned by the District, TKWC, or LBWC can be used in the implementation of a remedial alternative, potentially reducing Capital and additional O&M Cost.

Prior to design of a remedial alternative, additional information may need to be produced in order to further refine the level or magnitude of actions and predict the outcome of implementation. More complex remedial alternatives will likely require more pre-design activities, which will contribute to the overall cost and length of time needed to see the intended benefit.

5.1.4 Long-Term Effectiveness

Long-Term Effectiveness refers to the ability of a remedial alternative to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. The PCE plume impacts the region's water supply and the local water suppliers have made changes to infrastructure and operations in order to continue providing safe and reliable drinking water that meets all drinking water standards to their customers from local sources. To facilitate the water suppliers' goals of providing water service to their customers, the preferred remedial alternative must be able to provide sufficient high-quality water supply to meet existing demand, including provision of new drinking water to replace lost water production resulting from destruction of an impaired well (LBWC 4). This Criterion is evaluated based on the South Y Fate and Transport Model results for volume of water produced and used for drinking water from all wells with detectable levels (TKWC 2, TKWC 1, LBWC 5, and R1) over the period of 2019 to 2038.

5.1.5 Overall Protection of Human Health and Environment

Overall Protection of Human Health and Environment addresses whether or not a remedial alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls. This Criterion evaluates how well each remedial alternative eliminates, controls, or reduces exposure to PCE in delivered drinking water, meeting multiple RAOs presented in Section 1.3.

5.1.6 Compliance with ARARs

There are many local, regional and state permitting agencies with jurisdiction in the Lake Tahoe Basin including:

- Tahoe Regional Planning Agency (TRPA)
- El Dorado County (EDC)
- City of South Lake Tahoe (CSLT)
- District – Sewer Discharge Permit
- SWRCB-DDW, Water Supply Permit Amendment
- LRWQCB, National Pollutant Discharge Elimination Program (NPDES) Permit and Storm Water Pollution Prevention Plan (SWPPP)
- California Department of Transportation (Caltrans), Encroachment Permit
- California Tahoe Conservancy (CTC)
- California Air Resources Board (CARB), Authority to Construct and Permit to Operate standby power generator.
- California Department of Toxic Substances Control (DTSC)

The preferred remedial alternative will minimize the number of permits and agency coordination required for implementation and operation. Permitting issues relevant to remedial alternative selection include locating implementation on lands already in use by similar operations, treatment technology waste and discharge, building requirements, and environmental impacts/mitigation requirements.

5.2 Implementability

Implementability refers to the technical and administrative feasibility of a remedial alternative, including the availability of materials and services needed to carry out a particular option. Applying this criterion, changes in Operation and Maintenance (O&M) and disposal/reuse options were evaluated.

5.2.1 Operations and Maintenance

The PCE plume has already had impacts to the water suppliers' maintenance O&M, and further significant impacts and changes are not preferred. It is generally easier to operate fewer facilities with less operational complexity than multiple treatment facilities that require frequent visits, additional maintenance, and more operational adjustments. Remedial alternatives should consider maintaining the existing level of operations or implementing changes with minimal impacts to existing operations.

5.2.2 Disposal/Reuse Options

Potential remedial alternatives for implementation can result in the production of "waste", either in the form of water produced above what can be used to meet demand, or as treatment residuals (e.g. spent media, solids removed from water). Disposal of these "waste" products means that the investment put into the extraction of these products cannot be recovered and can also generate further spending through disposal permits or other efforts to mitigate the impacts of these "wastes". Reuse of all water produced is preferred, which can also generate revenue and minimize mitigation costs.

- **Disposal of Produced Water** – Water produced through groundwater treatment above what is needed to meet demand would require storage for later use or disposal. Avenues for disposal of treated water include the District's sewer system and City of South Lake Tahoe's existing stormwater system. According to the District's Special Use permit, waste disposed through the sewer system is charged at a volumetric rate of $6.50 per 1,000 gallons in addition to the annual sewer service charge. The existing stormwater system ultimately drains to Lake Tahoe or the Upper Truckee River watershed, both of which require permitting, monitoring, and mitigation to prevent negative impacts to receiving waters.
- **Disposal of Treatment Residuals** – Treatment residuals (such as spent GAC) contain high concentrations of contaminants that cannot be disposed of through conventional waste management and usually require special materials analysis and handling such as regeneration of GAC and/or disposal. If treatment residuals are such that they are considered hazardous waste, additional cost and handling are required for disposal.
- **Reuse of Produced Water** – Use of all water produced through the implementation of a remedial alternative requires identification of demand for the produced water, sufficient treatment for the intended use (such as potable water, industrial supply, or agricultural irrigation), approval and permitting through SWRCB-DDW or applicable regulatory agency, and acceptance by rate payers/customers. The South Y area does not have a large industrial market, and based on the region's climate, does not have a large demand for agricultural irrigation. Therefore, the largest demand for treated water would be for Single Family; Multi-Family and Commercial water uses.

5.3 Environmental Effects

To evaluate the potential environmental effects from implementation of a remedial alternative, the California Environmental Quality Act (CEQA) Initial Study Checklist and the Tahoe Regional Planning Agency (TRPA) Initial Environmental Checklist (IEC) were completed for each of the three remedial alternatives considered for detailed analyses.

The preferred remedial alternative considers activities that result in less than significant environmental effects and require minimal mitigation measures, which will also reduce costs of implementing mitigation. The results of both checklists helped to identify mitigation measures and potential costs of implementing mitigation. The preliminary checklists for each remedial alternative are provided in Appendix C.

- **CEQA Initial Study Checklist (CEQA-IS Checklist)** – An Initial Study to determine whether there are any potential significant impacts under CEQA is the first step in the environmental review process. Based on the findings of the Initial Study for each remedial alternative, initial mitigation methods with budgetary costs were developed. The CEQA-IS Checklist prepared for the Feasibility Study shall be refined and updated for any remedial alternative that proceeds to design and/or construction.

  The CEQA-IS Checklist requires the review of the following environmental factors: Aesthetics, Biological Resources, Greenhouse Gas Emissions, Land Use/Planning, Population/Housing, Transportation/Traffic, Agriculture and Forestry Resources, Cultural Resources, Hazards & Hazardous Materials, Mineral Resources, Public Services, Tribal

Cultural Resources, Air Quality, Geology/Soils, Hydrology/Water Quality, Noise, Recreation, Utilities/Service Systems, and other Mandatory Findings of Significance.

- **TRPA Initial Environmental Checklist (TRPA-IEC)** – An Initial Environmental Checklist (IEC) is a preliminary environmental analysis prepared under TRPA regulations to determine whether an Environmental Impact Statement, a Mitigated Finding of No Significant Effect, or a Finding of No Significant Effect is required. TRPA-IECs prepared for the Feasibility Study shall be refined and updated for any remedial alternative that proceeds to design and/or construction.

  The TRPA-IEC requires the review of the following environmental impacts: Land, Air Quality, Water Quality, Vegetation, Wildlife, Noise, Light and Glare, Land Use, Natural Resources, Risk of Upset, Population, Housing, Transportation/Circulation, Public Services, Energy, Utilities, Human Health, Scenic Resources/Community Design, Recreation, Archaeological/Historical, and other Findings of Significance.

Based on the completion of the preliminary CEQA-IS Checklist and TRPA-IEC, each remedial alternative is evaluated based on the anticipated activities to mitigate environmental impacts. Specific environmental impacts and mitigation activities will be identified for any remedial alternative that progresses to design.

5.4 Cost

Capital costs and operation and maintenance (O&M) costs have impacts on agency budgets, water rates, and decisions on future system investments. In addition, the type of activities can influence the funding sources available for implementation and/or O&M, which will be discussed in Section 8 for the preferred remedial alternative. For the purposes of evaluating remedial alternatives for implementation, preliminary cost estimates for capital and O&M were developed based on information provided in recent studies (updated to Engineering News and Review Construction Cost Index (ENR CCI) 12354 for July 2019), recent project costs (including bid costs) and engineering judgement. The following assumptions were used to estimate costs for capital and O&M for remedial alternatives:

- The capital and O&M costs were prepared based on the Association for the Advancement of Cost Engineering (AACE) Class 4 Estimate for feasibility evaluations (Table 1 – Cost Estimate Classification Matrix for Process Industries, AACEI 2016). To account for the broad level of detail, a conservative accuracy range of -30% to +50% of the estimated cost is applied and the remedial alternatives are compared based on order of magnitude of dollars (e.g. $100,000, $1 million, $10 million).
- Associated soft costs to complete the project for this planning level analysis consist of the following assumptions:
  - A Location Factor of 25% of capital costs was added to implementation costs to account for delivery of materials to and from the Lake Tahoe region and travel for contractors.
  - Contingency costs were added to implementation costs equal to 25% of capital cost to account for ancillary costs for installation of remedial alternative components. Examples of items that can be considered as contingency include unforeseen permits and site conditions, yard piping, valves, bracing, etc.

    - Construction/engineering management is assumed to be 20% of the cost of construction and includes development of preliminary/final design drawings and construction documents, site and geotechnical surveying, environmental and permitting clearance not identified, and construction management and administration.

- O&M cost estimates consist of energy, labor, chemicals and maintenance costs. O&M cost was developed for an estimate 20-year operational period based on the Proposition 1 Groundwater Grant Program funding terms. O&M cost estimates were developed in consultation with water purveyors to reflect actual, local experience.

Cost estimates were developed for each remedial alternative for the purposes of evaluating each remedial alternative in comparison to the others. Cost estimates for the preferred remedial alternative for implementation were further refined using vendor quotes and presented in Section 10. All costs presented in this Feasibility Study are in 2019 dollars (indicated as 2019$).

Section 6: Results of Evaluation of Refined Remedial Alternatives

Based on the range of remedial alternative concepts presented in Section 4 and criteria presented in Section 5, planning-level infrastructure improvements were developed for three remedial alternatives that were developed in collaboration with the TAC:

- Alternative 1: No Action
- Alternative 2: Targeted pumping
- Alternative 3: Gradual Conversion to Surface Water

The following Sections describe how each remedial alternative will meet the criteria presented in Section 5. It should be noted that at this stage of remedial alternatives development and refinement, neither the District, TKWC, nor LBWC has endorsed or committed to the activities or facilities described for the remedial alternatives, and discussions and decisions have been limited to the feasibility of such activities or facilities.

6.1 Alternative 1: No Action

6.1.1 Effectiveness

6.1.1.1 PCE Mass Removal

This Alternative continues to provide the same water supply and water quality as existing operations. Based on the results of the South Y Fate and Transport Model, the anticipated mass of PCE removed over a period of 20 years ranges from about 280 lbs to 1,800 lbs.

6.1.1.2 PCE Concentration Trends/Reductions in Toxicity

Table 6-1 summarizes the results of the South Y Fate and Transport Model results for predicted PCE concentrations in each of the agency water supply wells impacted by PCE for the No Action Alternative. Based on the results, the No Action Alternative does not reduce PCE concentration to acceptable levels within a 20-year timeframe, and risks PCE concentrations above the MCL in TKWC 1, which would prompt additional action.

Table 6-1: South Y Fate and Transport Model – Alternative 1 Predicted PCE Concentrations [(a)]

	LBWC 1	LBWC 5	TKWC 1	TKWC 2	TKWC 3
Maximum Concentration (µg/L)	<1	23 to 96	5 to 50	14 to 108	<1
Time to Reduce to Below MCL (years)	NA [(b)]	>20	>20	>20	NA [(b)]
Concentration at End of 20-Year Simulation (µg/L)	<1	6 to 30	5 to 50	5 to 53	<1

Note:
a. Over 20-year modeling period from 2018 – 2038.
b. Modeled PCE concentrations in these wells never exceed the MCL.

6.1.1.3 Short-Term Effectiveness

This Alternative continues existing operations without new infrastructure. It is assumed that this Alternative will not require new permitting or administrative activities. Therefore, this Alternative can be considered to have an implementation period of 0 years.

6.1.1.4 Long-Term Effectiveness

This Alternative assumes the average annual pumping rates for each water purveyor to continue. Table 6-2 presents the assumed flow rates for Alternative 1. Over a period of 20 years, it is estimated that about 3,800 MG will be produced through the existing water purveyor wells.

Table 6-2: Assumed Flow Rates for Alternative 1

TKWC	LBWC	STPUD
TKWC 1: 98 gpm TKWC 2: 224 gpm TKWC 3: 242 gpm	LBWC 1: 160 gpm LBWC 2: 0 gpm LBWC 4: 0 gpm LBWC 5: 37 gpm	Sunset Well: 318 gpm Paloma Well: 36 gpm Helen 2 Well: 131 gpm Bayview Well: 1,651 gpm Al Tahoe 2 Well: 268 gpm
Total: 564 gpm	Total: 197 gpm	Total: 2,404 gpm

Because this Alternative does not increase the available water supply or improve the existing water quality, water supply reliability depends on the District, TKWC, and LBWC utilizing the existing mutual aid and assistance agreements.

6.1.1.5 Overall Protection of Human Health and Environment

This Alternative maintains the current levels of PCE treatment and does not implement additional protections nor reduces existing levels of exposure to PCE through delivered drinking water.

6.1.1.6 Compliance with ARARs

This Alternative continues existing operations and maintenance with existing infrastructure and therefore no additional permitting is anticipated.

6.1.2 Implementability

6.1.2.1 Operations and Maintenance

This Alternative continues existing operations and maintenance with existing infrastructure; therefore, no additional O&M is anticipated.

6.1.2.2 Disposal/Reuse Options

This Alternative is not anticipated to produce additional water or treatment residuals; therefore, disposal and reuse options are not considered.

6.1.3 Environmental Effects

This Alternative continues existing operations and maintenance with existing infrastructure and therefore no additional environmental effects are anticipated if PCE levels in the wells do not increase.

Alternative 1 continues existing operation strategy without implementing new water resource and treatment facilities. There are no anticipated new impacts for this Alternative therefore no mitigation is required.

6.1.4 Cost

This Alternative continues existing operations and maintenance with existing infrastructure and therefore no additional costs are anticipated.

6.2 Alternative 2 - Targeted Pumping

6.2.1 Effectiveness

6.2.1.1 PCE Mass Removal

This Alternative increases pumping through LBWC 5 (equipped with PCE treatment) and construction of a new extraction well (R1) to provide new water production lost to the impairment and destruction of LBWC 4. Water treatment for the removal of iron/manganese and PCE from groundwater is proposed at R1 to satisfy drinking water treatment requirements. Water treatment for the removal of PCE from groundwater at well LBWC 5 is planned for construction starting in 2020 with operations planned to begin in 2021, under funding through the State Revolving Fund (SRF). LBWC 5 is planned to be operated as the lead well for the LBWC water system and LBWC 1 will operate as a lag well to meet LBWC water system demands. R1 would be operated at 200 gpm for additional PCE removal and as a supplemental water source for use by the water purveyors. The TKWC wells would operate similar to the No Action Alternative. Based on the results of the South Y Fate and Transport Model, the anticipated mass of PCE removed over a period of 20 years ranges from about 770 lbs to 3,300 lbs.

6.2.1.2 PCE Concentration Trends/Reductions in Toxicity

Table 6-3 summarizes the results of the South Y Fate and Transport Model results for predicted PCE concentrations in each of the agency water supply wells impacted by PCE for this Alternative. Based on the results, this Alternative has the potential to reduce the concentration of PCE within the 20-year timeframe in all water purveyor wells.

Table 6-3: South Y Fate and Transport Model – Alternative 2 Predicted PCE Concentrations [(a)]

	LBWC 1	LBWC 5	TKWC 1	TKWC 2	TKWC 3	R1 [(b)]
Maximum Concentration (µg/L)	<1	21 to 89	4 to 38	13 to 103	<1	131 to 324
Time to Reduce to Below MCL (years)	NA [(c)]	14 to >20	NA [(c)]	17 to >20	NA [(c)]	15 to >20
Concentration at End of 20-Year Simulation (µg/L)	<1	2 to 12	3 to 38	3 to 43	<1	1 to 15

Notes:

a. Over 20-year modeling period from 2018 – 2038.

b. R1 was modeled using aquifer parameters derived from pumping test data collected during the PDI. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of the 20-year total) is estimated to be 213 lbs to 2,559 lbs.

c. Modeled PCE concentrations in these wells never exceed the MCL.

6.2.1.3 Short-Term Effectiveness

Alternative 2 consists of the use of existing treatment and wells to remove PCE and also requires a new well to be drilled and equipped with treatment to replace lost water production from the impairment and destruction of LBWC 4. Activities proposed to design this Alternative includes a treatment pilot test, site survey and geotechnical investigation. Including pre-design activities, permitting, environmental mitigation, financing, and design and engineering, the timeline for implementation of this Alternative could be as long as 3 to 7 years.

6.2.1.4 Long-Term Effectiveness

R1 replaces lost water production due to the impairment and destruction of Well LBWC 4.Table 6-4 presents the assumed flow rates for Alternative 2, which switches the average flow rates for each well from 2009 – 2018 for the lead wells to the wells with GAC treatment and adds new water production from R1. Over a period of 20 years, it is estimated that the R1 groundwater treatment facility will produce about 2,900 MG additional potable water to supplement the 3,800 MG that will be produced through the existing water purveyor wells for a total of about 6,700 MG of potable water.

Table 6-4: Estimate Flow Rates for Alternative 2

TKWC	LBWC	STPUD	New Extraction Well 1
TKWC 1: 98 gpm TKWC 2: 224 gpm TKWC 3: 242 gpm	LBWC 1: 37 gpm LBWC 2: 0 gpm LBWC 4: 0 gpm LBWC 5: 160 gpm	Sunset Well: 318 gpm Paloma Well: 36 gpm Helen 2 Well: 131 gpm Bayview Well: 1,651 gpm Al Tahoe 2 Well: 268 gpm	R1: 200 gpm
Total: 564 gpm	Total: 197 gpm	Total: 2,404 gpm	Total: 200 gpm

This Alternative has the potential to increase the available water supply by over four times over the 20-year timeframe as compared to the No Action Alternative. The addition of R1 equipped to provide treatment for potable water increases the available water supply and thus the reliability of the South Y water supply through intertie connections between water distribution systems. This would also ease reliance of the LBWC water system on the District' water system to provide emergency water supply.

6.2.1.5 Overall Protection of Human Health and Environment

This Alternative adds PCE treatment to a new extraction well within the plume and has the potential to reduce the PCE mass load on downgradient wells, based on South Y Fate and Transport Model results. Review of the predicted PCE concentrations in drinking water wells in Table 6-1 and Table 6-3 reveals that the amount of PCE removed through TKWC 1 and TKWC 2 are reduced with the implementation of Alternative 2 compared to the No Action Alternative.

6.2.1.6 Compliance with ARARs

This Alternative consists of the use of existing treatment and wells to remove PCE and also requires a new extraction well to be drilled and equipped with treatment. Potential permitting consists of sewer discharge, NPDES permitting and mitigation for stormwater discharge, TRPA and environmental clearances, new drinking water source that may be regulated under the extremely impaired source permitting process, and temporary permitting related to construction.

6.2.2 Implementability

6.2.2.1 Operations and Maintenance

Under this Alternative, pumping at LBWC 5 will increase along with GAC backwash and change-out frequency due to the increased flow through the GAC vessels. The treatment system at R1 will require monitoring and maintenance of the treatment systems for PCE, as well as the discharge and facility infrastructure. In addition, to deliver extracted groundwater as drinking water, additional monitoring and maintenance will be required for drinking water standards.

6.2.2.2 Disposal/Reuse Options

Based on the South Y Fate and Transport Model, this Alternative can produce an additional 2,900 MG through R1 in 20 years compared to Alternative 1. This Alternative would also generate additional treatment residuals during operation of the R1 groundwater treatment facility There are three potential disposal and reuse options for Alternative 2:

1. Potable reuse of water produced at R1. This option requires DDW permitting and approval of R1 as a drinking water source, additional treatment to meet drinking water quality requirements, and regular water quality monitoring and reporting.
2. Disposal of water produced at R1 via District sewer. This option requires water quality monitoring and payment to the District for discharges to the sewer system according to the appropriate rate schedule.

3. Disposal of water produced at R1 via District sewer in wet months (October through April) and via the City of South Lake Tahoe stormwater system in dry months (May through September). This option requires water quality monitoring, payment to the District for discharges to the sewer system according to the appropriate rate schedule, and agreement with and payment to the City of South Lake Tahoe for discharges to the City's stormwater system.

6.2.3 Environmental Effects

Alternative 2 consists of drilling a new extraction well and installing groundwater treatment facilities at 843 Hazel Drive. This property is a 1-acre parcel owned by LBWC which was formerly used as the LBWC 4 well site. Operations changes consist of increasing groundwater production at LBWC 5 and adding new groundwater production at R1, which can result in more frequent GAC media changeout and disposal. Under both the CEQA-IS Checklist and the TRPA-IEC, it is expected that potential impacts requiring mitigation are:

1. Air Quality: During construction, it is anticipated that there will be short-term deterioration of air quality due to construction vehicle/equipment operation. Mitigation activities can consist of control of fugitive dust, limiting idling of on-road and off-road diesel-powered equipment, and maintenance and inspection of construction equipment. Quantification of greenhouse gas emissions should be developed in the pre-design stage to be incorporated in the CEQA document for the project, but no permanent deterioration of ambient air quality is anticipated.
2. Light and Glare: Site illumination due to the operation and security of the R1 site can produce light and glare that could negatively impact the neighboring properties. Potential mitigation activities can consist of shielding, restricting height of fixtures, timing illumination for when its needed, matching type of lighting with purpose, and using non-glare materials.
3. Noise: During construction, it is anticipated that there will be short-term increases in noise due to construction vehicle/equipment operation. Mitigation activities during construction can consist of erection and use of sound walls at the construction site, designating haul roads in areas where noise is less of an impact, rerouting traffic to disperse noise caused by congestion, and placing storage areas away from sensitive receptors.

   Noise as a result of the operation and maintenance of LBWC 5, R1, and associated treatment facilities will be mitigated through enclosing noise-producing equipment in buildings or installation of other permanent sound barriers.
4. Transportation/Circulation: During construction, it is anticipated that there will be short-term increases in Daily Vehicle Trip Ends (DVTEs) due to travel to and from the construction site by workers and construction vehicles, as well as a temporary increase in traffic hazards around the construction site and staging areas. Mitigation activities can consist of notifying local residences and businesses, locating vehicle parking and storage and staging areas off roads and providing traffic control.
5. Utilities: The operation of the R1 facility will require upgrades to the site's existing power and communications systems. If Alternative 2 Option 3 is implemented, mitigation will be required to comply with the City of South Lake Tahoe's permit for stormwater discharge, the LRWQCB Water Quality Objectives, and the Tahoe Basin Plan for the Upper

Truckee River. Mitigation activities for Alternative 2 Option 3 can consist of additional treatment and detention of stormwater discharges.

6.2.4 Cost

Planning level cost estimates were developed for the conceptual layout shown in Figure 6-1 and are summarized below for each Disposal/Reuse Option:

Table 6-5: Alternative 2 Preliminary Cost Estimate (2019$, Rounded)

Option	Capital Cost [a]	O&M Cost [a]
1. Potable Reuse	$3.6M to $7.8M [b] (New Well, GAC/Potable Water Treatment, Treatment Facility, Pipeline to Sewer)	$4.6M to $9.9M over 20 years, $200,000 - $2.0M annually (Start-up Demonstration of treatment, Conditional Operation, Normal Operations)
2. Discharge to Sewer	$2.8M to $6.0M (New Well, GAC Treatment, Treatment Facility, Pipeline to Sewer)	$15M to $33M over 20 years, $770,000 - $1.7M annually (Treatment Pilot, Normal Operations)
3. Discharge to Sewer/ Stormwater System	$2.9M to $6.2M (New Well, GAC Treatment, Treatment Facility, Pipeline to Sewer, Pipeline to Stormwater System)	$9.4M to $20M over 20 years, $470,000 - $1.0M annually (Treatment Pilot, Normal Operations)

Note:

a. Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4.

b. Compliance with Policy Memo 97-005 is expected to incur a cost from $400,000 - $900,00 for studies such as Drinking Water Source Assessment, additional monitoring, and coordination with DDW.

Capital and O&M cost details are provided in Appendix D.

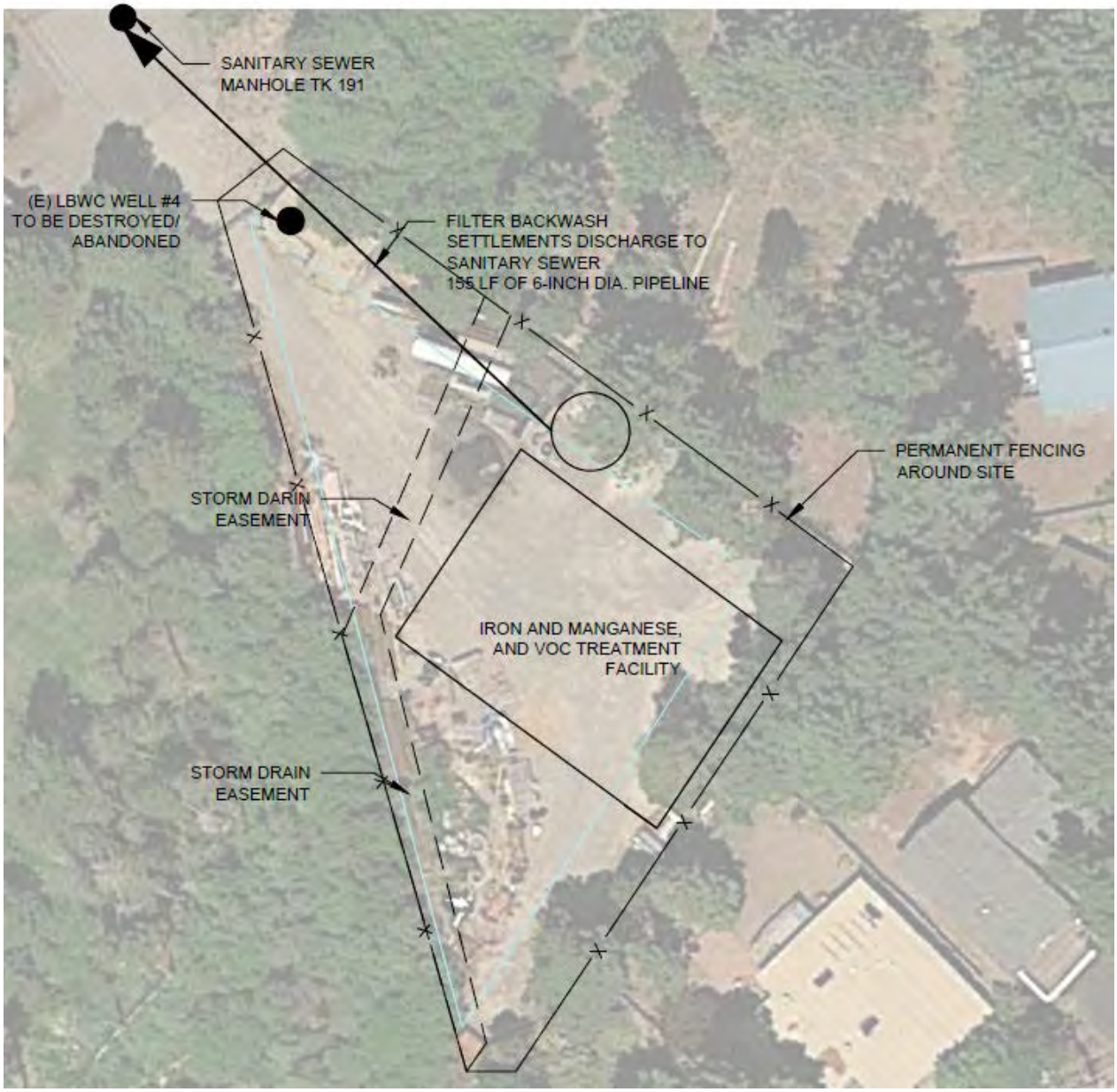


Figure 6-1: Alternative 2 Conceptual Site Layout

Neither the District, TKWC, nor LBWC has endorsed or committed to the activities or facilities described for the remedial alternatives, and discussions and decisions have been limited to the feasibility of such activities or facilities.

6.3 Alternative 3 – Conversion to Surface Water Treatment

6.3.1 Effectiveness

6.3.1.1 PCE Mass Removal

This Alternative continues to provide the same water supply and water quality as existing operations for the time it takes to convert from groundwater to surface water; this was assumed to be 15 years. Based on the results of the South Y Fate and Transport Model, the anticipated mass of PCE removed over a period of 15 years ranges from about 230 lbs to 1,400 lbs.

6.3.1.2 PCE Concentration Trends/Reductions in Toxicity

Table 6-6 summarizes the results of the South Y Fate and Transport Model results for predicted PCE concentrations in each of the agency water supply wells impacted by PCE for Alternative 3. Based on the results, this Alternative does not reduce PCE concentration to acceptable levels within a 20-year timeframe.

Table 6-6: South Y Fate and Transport Model – Alternative 3 Predicted PCE Concentrations [(a)]

	LBWC 1	LBWC 5	TKWC 1	TKWC 2	TKWC 3
Maximum Concentration (µg/L)	<1	23 to 96	5 to 47	14 to 108	<1
Time to Reduce to Below MCL (years)	NA [(b)]	>20	>20	>20	NA [(b)]
Concentration at End of 15-Year Simulation (µg/L)	<1	9 to 44	5 to 47	8 to 72	<1

Notes:
a. Over 15-year modeling period from 2018 – 2033. Simulations for this Alternative end after 15 years based on the estimated interval to convert to surface water supply and cease groundwater pumping.
b. Modeled PCE concentrations in these wells never exceed the MCL.

6.3.1.3 Short-Term Effectiveness

This Alternative consists of the financing, design, construction, and start-up and operation of a surface water treatment plant and associated facilities. Anticipated activities needed to design this Alternative includes site survey and geotechnical investigation. Including financing, pre-design activities, extensive permitting (including water rights), environmental mitigation, and design and engineering, the timeline for implementation of this Alternative could be as long as 15 years.

6.3.1.4 Long-Term Effectiveness

Alternative 3 would only produce groundwater through the existing wells during the time it takes to finance, design, construct, and commission the surface water treatment plant (SWTP), assumed to be 15 years; however it is assumed that the SWTP would provide new supply at the same rate as the existing groundwater wells. Therefore, the amount of water delivered to meet potable demand for this duration is assumed to be the same as Alternative 1, about 3,800 MG. This Alternative improves the water supply reliability for the water purveyors by switching to a water supply not impacted by PCE.

6.3.1.5 Overall Protection of Human Health and Environment

This Alternative reduces exposure to PCE through delivered drinking water by switching the water purveyors' groundwater supply to surface water from Lake Tahoe.

6.3.1.6 Compliance with ARARs

This Alternative requires the construction of a new intake pipeline and pump station, conveyance pipelines, water treatment facility, and distribution connections. This Alternative would have a high permitting requirement. A list of required permits is presented in Table 6-7.

Table 6-7: Permitting Requirements for Alternative 3

Required Permits	Description
SWRCB - DDW	New drinking water permitting for surface water WTP Well abandonment
SWRCB– Division of Water Rights	Water rights permit modification
Lahontan Regional Water Quality Control Board	NPDES Permit Storm Water Pollution Prevention Plan
California Department of Fish and Wildlife	Notification of lake or streambed alteration required for lakebed alteration within Lake Tahoe
US Army Corps of Engineers	Regional Nationwide Permit for construction in an aquatic environment
STPUD	Sewer connection and permit
California Air Resources Board	Authority to construct and permit to operate standby power generator
TRPA, CEQA	Environmental compliance document
CTC	Access agreement
TRPA	Construction permitting for new public facilities
CSLT/El Dorado County	Encroachment permit for work within the right-of-way

6.3.2 Implementability

6.3.2.1 Operations and Maintenance

This Alternative requires the operation and maintenance of a new surface water intake, pipeline and pump station, conveyance pipelines, water treatment facility, and distribution connections. Operation of the SWTP also requires additional operator certification.

The existing well operations and maintenance strategy will continue until the surface water treatment plant is operational. To meet existing demands, the WTP will be sized for minimum plant production at 0.2 to 1.3 MGD with the maximum average plant production to be 4.4 MGD to accommodate seasonal demands. Peak hour demand could be met by 360,000 gallons of clearwell storage.

After the completion of the SWTP, LBWC 1 and TKWC 3 will serve as backup supply for LBWC and TKWC systems, respectively. It is assumed that LBWC 5, TKWC 1, and TKWC 2 will be removed from service and destroyed.

6.3.2.2 Disposal/Reuse Options

This Alternative would only produce the amount of water needed to meet demands; therefore, this Alternative is not anticipated to produce additional water. However, this Alternative would generate treatment residuals through the SWTP. For conventional water treatment plants, the State of California allows backwash water (limited to a portion of the total plant flow) to be recycled to the head of the treatment train. SWTP treatment residuals could also be disposed to STPUD sewer or hauled to a disposal facility.

6.3.3 Environmental Effects

This Alternative requires the construction of a new intake pipeline and pump station, conveyance pipelines, water treatment facility, and distribution connections. This Alternative includes construction methods to mitigate environmental impacts, such as minimizing lakebed disturbance through the use of horizontal directional drilling for intake construction.

Alternative 3 consists of a new 4.4 MGD SWTP at TKWC's existing Lagoon WTP site, a new intake pipeline and pump station from Lake Tahoe, new raw water pipeline from the shore to the SWTP and new treated water pipelines to connect to TKWC and LBWC distribution systems. This Alternative has the most significant construction effort among the three Alternatives and complex permitting is anticipated. Under both the CEQA-IS Checklist and the TRPA-IEC, it is expected that potential impacts requiring mitigation are:

1. Aesthetics: The intake pump station will be located on the Lake Tahoe shoreline attached and/or adjacent to the existing Tahoe Keys Property Owner's Association (POA) Building. The building's exterior will be designed to match those of the surrounding neighborhood and not exceed the building height limitation per Tahoe Keys POAs design code.
2. Air Quality: During construction, it is anticipated that there will be short-term deterioration of air quality due to construction vehicle/equipment operation. Mitigation activities can consist of control of fugitive dust, limiting idling of on-road and off-road diesel-powered equipment, and maintenance and inspection of construction equipment. Quantification of greenhouse gas emissions should be developed in the pre-design stage for incorporation in CEQA documents, but no permanent deterioration of ambient air quality is anticipated.
3. Biological Resources: There are no special-status plant or animal species on the previously disturbed TKWC Lagoon WTP site. However, the implementation of the raw water intake and pump station may require mitigation measures to keep impacts to special status species less than significant near the shoreline and within 2,500 LF radius from the shoreline.
4. Hydrology and Water Quality: During construction, care will be taken to minimize lakebed disturbance, by using horizontal directional drilling to install the intake pipeline on the floor of Lake Tahoe. New buildings and impervious area will be designed to comply with water quality requirements for erosion and sediment control.
5. Noise: During construction, it is anticipated that there will be short-term increases in noise due to construction vehicle/equipment operation. Mitigation activities during construction can consist of erection and use of sound walls at the construction site, designating haul roads in areas where noise is less of an impact, rerouting traffic to

disperse noise caused by congestion, and placing storage areas away from sensitive receptors.

Noise as a result of the operation and maintenance of the intake pump station, SWTP, and associated treatment facilities will be mitigated through enclosing noise-producing equipment in buildings or installation of other permanent sound barriers.

6. Recreation: The intake pipeline will be designed to avoid conflict with the nearby boat channel, including anchorage to the bottom of the lakebed and using horizontal directional drilling to minimize lakebed disturbance and impacts to the clarity of Lake Tahoe within that area.
7. Transportation/Circulation: During construction, it is anticipated that there will be short-term increases in Daily Vehicle Trip Ends (DVTEs) due to travel to and from the construction site by workers and construction vehicles, as well as a temporary increase in traffic hazards around the construction site and staging areas. Mitigation activities can consist of notifying local residences and businesses, locating vehicle parking and storage and staging areas off roads and providing traffic control.
8. Utilities: The operation of the SWTP facility will require upgrades to the site's existing power and communications systems.

While chlorine and other chemicals would be used in the operation and maintenance of the SWTP, these are not anticipated to create a significant hazard if planned and design appropriately. If this Alternative advances to design, a more detailed evaluation should be conducted.

6.3.4 Cost

Planning level cost estimates were developed for the conceptual layout shown on Figure 6-2 and Figure 6-3 and are summarized below:

Table 6-8: Alternative 3 Preliminary Cost Estimate (2019$, Rounded)

Description	Capital Cost [a]	O&M Cost [a]
Intake Pipeline and Pump Station	$9.4M to $20M	$5.5M to $12M (5 years of SWTP) $1.1M to $2.4M annually
Raw Water Conveyance Pipeline	$3.8M to $8.1M	
Surface Water Treatment Plant	$22M to $47M	
Treated Water Pump Station and Pipelines	$5.1M to $11M	
Permitting	$180,000 to $380,000	
Well Abandonment	$110,000 to $230,000	
Total	$40M to $86M	

Note:
a. Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4.

Capital and O&M cost details are provided in Appendix D.

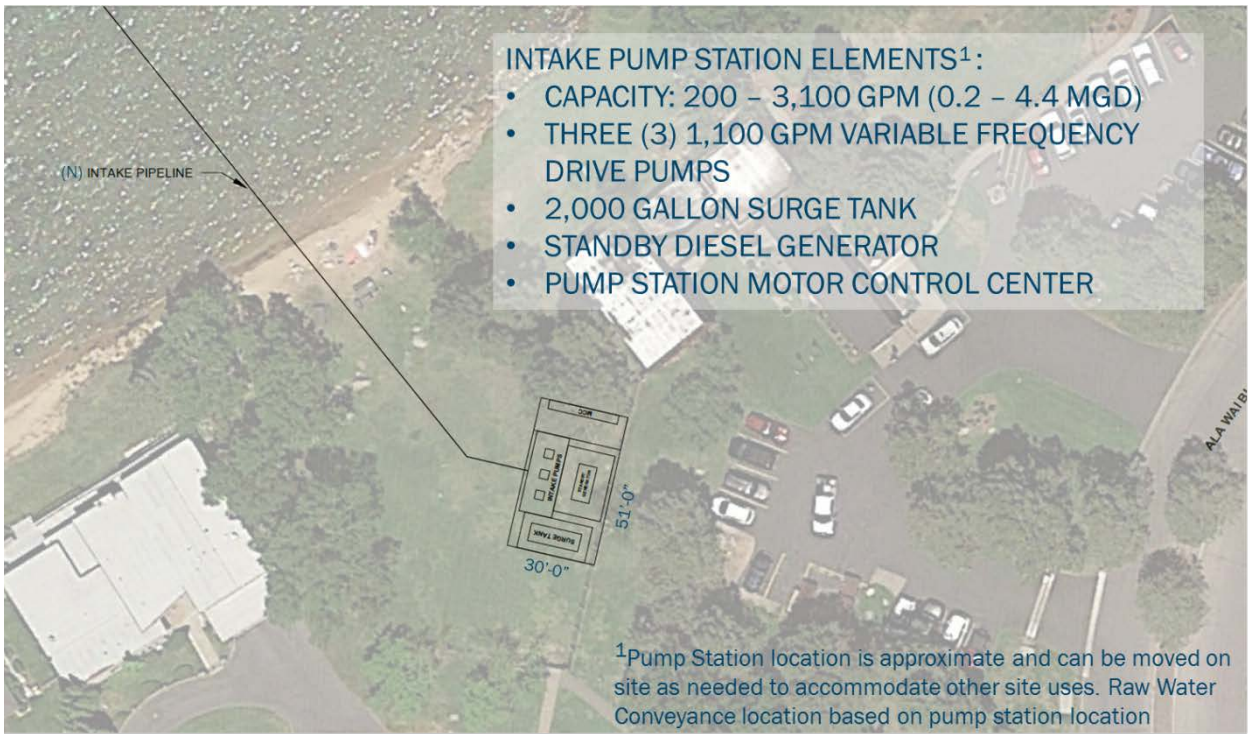


Figure 6-2: Alternative 3 Intake Conceptual Layout

Neither the District, TKWC, nor LBWC has endorsed or committed to the activities or facilities described for the remedial alternatives, and discussions and decisions have been limited to the feasibility of such activities or facilities.

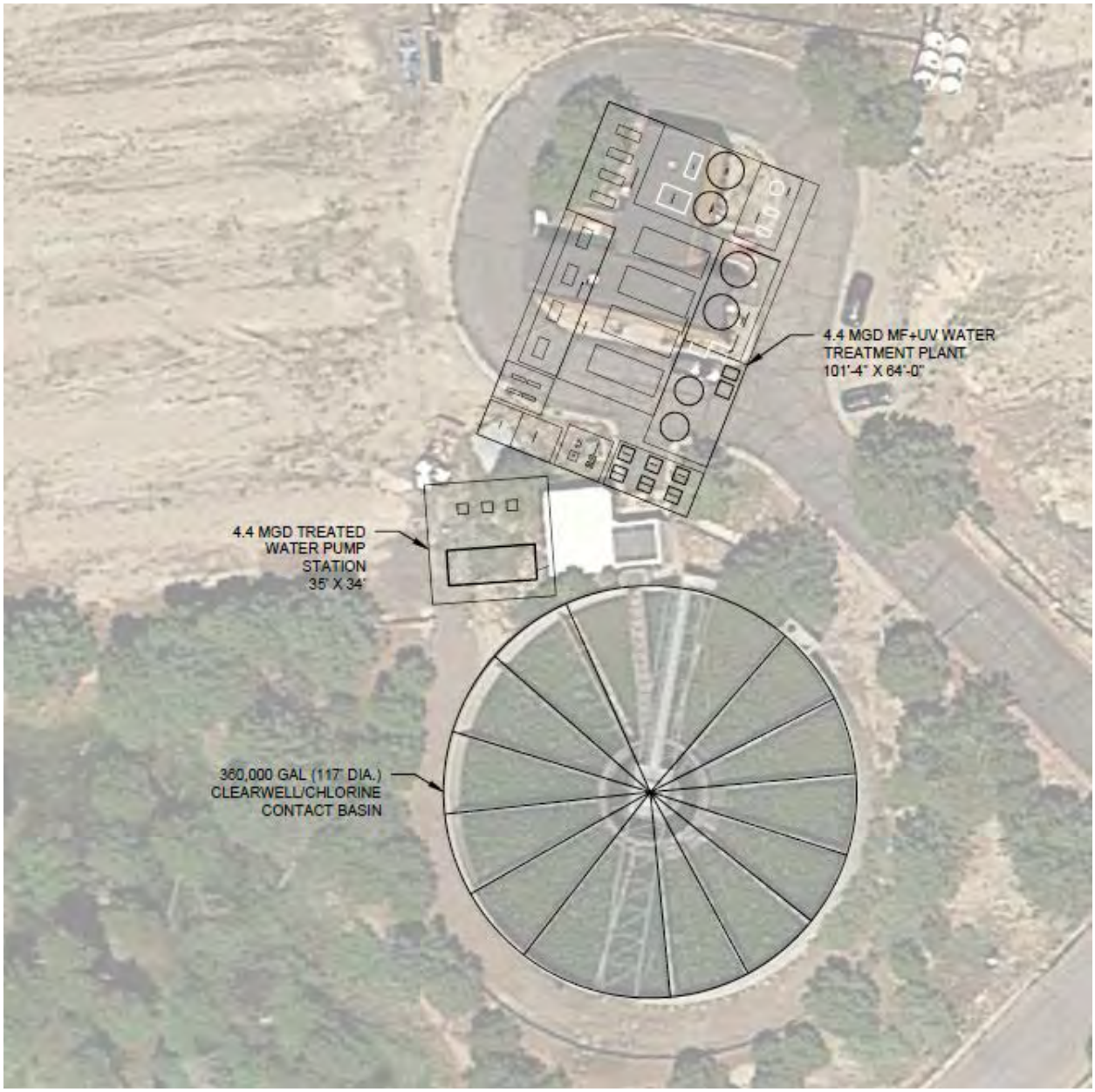


Figure 6-3: Alternative 3 Surface Water Treatment Plant Conceptual Layout

Neither the District, TKWC, nor LBWC has endorsed or committed to the activities or facilities described for the remedial alternatives, and discussions and decisions have been limited to the feasibility of such activities or facilities.

Section 7: Ranking of Remedial Alternatives

As introduced in Section 1.3, the process used to develop and evaluate the remedial alternatives for the Feasibility Study generally conformed to the EPA guidance document for CERCLA, as reflected in the previous Sections. This Section ranks the remedial alternatives in order to select a preferred remedial alternative for further development.

7.1 Ranking of Remedial Alternatives for Consideration

Table 7-1 summarizes the Alternatives Evaluation performed in Section 6 using the Criteria defined in Section 5.

7.1.1 Effectiveness

Alternative 2 (Targeted Pumping – LBWC Demands with New Extraction Well) best meets the Feasibility Study goals when evaluated for Effectiveness:

- PCE Mass Removal: Alternative 2 has the potential to remove over 170% more PCE mass from the groundwater than either Alternative 1 or Alternative 3. Alternative 3 would remove the least amount of PCE mass from the groundwater by discontinuing use of the groundwater wells by replacement with surface water.
- Short-Term and Long-Term Effectiveness: Although Alternative 2 would take longer to implement (Short-Term Effectiveness) than Alternative 1, the Long-Term Effectiveness of Alternative 2 is shown through the additional removal of PCE mass. Additionally, if the water produced through the new extraction well is treated to potable water standards, Alternative 2 increases the volume of available potable water supply. Alternative 3 provides reliable water supply free of PCE, however it can take as much as 15 years to implement, and by which time the amount of PCE mass removed is 75% of the No Action Alternative.
- Overall Protection of Human Health and Environment: Alternative 3 would completely remove exposure of PCE through drinking water by meeting all water demands through surface water from Lake Tahoe. Alternative 2 would reduce the exposure to PCE through drinking water by adding new PCE treatment in the mid-plume area (at the LBWC 4 site), which would reduce the PCE mass load at downgradient wells. Alternative 1 does nothing to reduce the exposure of PCE through drinking water.
- Compliance with ARARs: Alternative 1 requires no new permitting. Alternative 2 will likely require permitting for some TRPA and environmental clearances, and if the water produced through R1 is to be delivered as drinking water, it will also require DDW approvals and permitting, potentially including Policy Memo 97-005 evaluation and monitoring. Alternative 3 requires the most permitting effort to obtain water rights permit modification and multiple environmental clearances. Alternatives 2 and 3 both require temporary permitting related to construction, NPDES permitting (if Alternative 2 discharges to the stormwater system), and sewer discharge permitting.

Table 7-1: Summary of Detailed Analysis of Refined Remedial Alternatives (20-Year Period)

Criteria	Alternative 1 – No Action	Alternative 2 – Targeted Pumping – LBWC Demands with Extraction Well [a]			Alternative 3 – Conversion to Surface Water Treatment
		Option 1: Potable Reuse	Option 2: Sewer Discharge	Option 3: Sewer/Stormwater System Discharge	
Effectiveness					
PCE Mass Removal	280 to 1,800 lbs	770 to 3,300 lbs	770 to 3,300 lbs	770 to 3,300 lbs	230 to 1,400 lbs
PCE Concentration Trends/ Reduction in Toxicity	• PCE concentrations remain above MCL in LBWC 5 and TKWC 2 • PCE concentration increases to above the MCL in TKWC 1 • PCE concentrations in LBWC 1 and TKWC 3 are not expected to rise above the MCL	• PCE concentrations have the potential to reduce to below the MCL in LBWC 5, TKWC 2, and R1 • PCE concentrations in LBWC 1, TKWC 1, and TKWC 3 are not expected to rise above the MCL	• PCE concentrations have the potential to reduce to below the MCL in LBWC 5, TKWC 2, and R1 • PCE concentrations in LBWC 1, TKWC 1, and TKWC 3 are not expected to rise above the MCL	• PCE concentrations have the potential to reduce to below the MCL in LBWC 5, TKWC 2, and R1 • PCE concentrations in LBWC 1, TKWC 1, and TKWC 3 are not expected to rise above the MCL	• PCE concentrations remain above MCL in LBWC 5 and TKWC 2 • PCE concentration increases to above the MCL in TKWC 1 • PCE concentrations in LBWC 1 and TKWC 3 are not expected to rise above the MCL
Short-Term Effectiveness	0 years to implement	3 to 7 years to implement [b]	3 to 7 years to implement [b]	3 to 7 years to implement [b]	15 years to implement
Long-Term Effectiveness	• 3,800 MG of potable water produced through existing infrastructure and operations • No additional potable supply or improvement in water quality	Additional 2,900 MG of potable water produced through R1 (total 6,700 MG of potable water produced)	No additional potable water supply	No additional potable water supply	• Complete switch of water supply to source not impacted by PCE – 940 MG produced through SWTP to meet demands • No additional PCE treatment; PCE mass removal ceases with conversion to surface water
Overall Protection of Human Health and Environment	• No additional PCE treatment • No reduction in exposure to PCE through drinking water	• New PCE treatment at R1 • Additional PCE removal through LBWC 5 (lead well) and R1 • Reduction in PCE mass removed through TKWC 1 and TKWC 2	• New PCE treatment at R1 • Additional PCE removal through LBWC 5 (lead well) and R1 • Reduction in PCE mass removed through TKWC 1 and TKWC 2	• New PCE treatment at R1 • Additional PCE removal through LBWC 5 (lead well) and R1 • Reduction in PCE mass removed through TKWC 1 and TKWC 2	Complete switch of water supply to source not impacted by PCE
Compliance with ARARs	No additional permitting	Additional Permitting: • Sewer discharge • TRPA and environmental clearances • Temporary permitting related to construction • New drinking water source and potentially Policy Memo 97-005 permitting (DDW)	Additional Permitting: • Sewer discharge • TRPA and environmental clearances • Temporary permitting related to construction	Additional Permitting: • Sewer discharge • TRPA and environmental clearances • Temporary permitting related to construction • NPDES permitting and mitigation for stormwater discharge	Additional Permitting: • Water Rights Permit modification • Sewer discharge • NPDES permitting and mitigation for stormwater discharge • TRPA, Department of Fish and Wildlife, US Army Corps of Engineers, California Air Resources Board and other environmental clearances • CTC access • New drinking water source permitting (DDW) • Temporary permitting related to construction

Notes:

a. Alternative 2 Options:
Option 1 – Potable reuse of water produced at R1
Option 2 – Disposal of water produced at R1 via District sewer
Option 3 – Disposal of water produced at R1 via District sewer in wet months (October through April) and via the City of South Lake Tahoe stormwater system in dry months (May through September)

b. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of the 20-year total) is estimated to be 213 lbs to 2,559 lbs.

c. Cost Evaluation conducted over a 20-year period, the first 15 of which assumes No Action operations during design, construction, and start-up of SWTP. Therefore, Total O&M Costs are for the last five years of the Cost Evaluation period.

Criteria	Alternative 1 – No Action	Alternative 2 – Targeted Pumping – LBWC Demands with Extraction Well [a]			Alternative 3 – Conversion to Surface Water Treatment
		Option 1: Potable Reuse	Option 2: Sewer Discharge	Option 3: Sewer/Stormwater System Discharge	
Implementability					
Operations and Maintenance	No additional O&M	• Increased pumping at LBWC 5 • Increased LBWC 5 GAC backwash and change-out frequency • Maintenance of R1 treatment facility for PCE and drinking water • Disposal of R1 treatment residuals • Monitoring for drinking water standards • No change in TKWC system O&M	• Increased pumping at LBWC 5 • Increased LBWC 5 GAC backwash and change-out frequency • Maintenance of R1 treatment facility for PCE • Disposal of R1 treatment residuals • Monitoring for sewer discharge requirements • No change in TKWC system O&M	• Increased pumping at LBWC 5 • Increased LBWC 5 GAC backwash and change-out frequency • Maintenance of R1 treatment facility for PCE • Disposal of R1 treatment residuals • Monitoring for sewer discharge requirements • Monitoring for NPDES stormwater discharge requirements • No change in TKWC system O&M	• Operation and maintenance of SWTP, intake pump station, distribution pump station o Additional treatment operator certification • No change in TKWC system O&M
Disposal/Reuse Options	No disposal of excess water or additional treatment residuals	Disposal of R1 treatment residuals	Disposal of excess water via District sewer system	Disposal of excess water via District sewer system and/or City stormwater system	• No disposal of excess water • Disposal of treatment residuals
Environmental Effects	No new impacts requiring mitigation	• Air quality • Light and Glare • Noise • Transportation/Circulation • Utilities	• Air quality • Light and Glare • Noise • Transportation/Circulation • Utilities	• Air quality • Light and Glare • Noise • Transportation/Circulation • Utilities	• Aesthetics • Air Quality • Biological Resources • Hydrology and Water Quality • Noise • Recreation • Transportation/Circulation • Utilities
Rounded Cost [c]	No new capital or O&M costs	• Capital: $3.6M to $7.8M • Annual O&M: $200,000 to $2.0M • Total O&M (20 Years): $4.6M to $9.9M	• Capital: $2.8M to $6.0M • Annual O&M: $770,000 to $1.7M • Total O&M (20 Years): $15M to $33M	• Capital: $2.9M to $6.2M • Annual O&M: $470,000 to $1.0M • Total O&M (20 Years): $9.4M to $20M	• Capital: $40M to $86M • Annual O&M: $1.1M to $2.4M • Total O&M (5 Years) [b]: $5.5M to $12M

Notes:

a. Alternative 2 Options:
   Option 1 – Potable reuse of water produced at R1
   Option 2 – Disposal of water produced at R1 via District sewer
   Option 3 – Disposal of water produced at R1 via District sewer in wet months (October through April) and via the City of South Lake Tahoe stormwater system in dry months (May through September)

b. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of the 20-year total) is estimated to be 213 lbs to 2,559 lbs

c. Cost Evaluation conducted over a 20-year period, the first 15 of which assumes No Action operations during design, construction, and start-up of SWTP. Therefore, Total O&M Costs are for the last five years of the Cost Evaluation period.

7.1.2 Implementability

Alternative 1 (No Action) best meets the Feasibility Study goals when evaluated for Implementability:

- Operations and Maintenance: Alternative 1 continues existing O&M activities. Alternative 2 continues some of the existing O&M activities but requires additional O&M related to the new PCE and iron and manganese treatment facility and R1 well, in addition to increased use of GAC treatment at LBWC 5. Alternative 3 requires the most changes to existing O&M, including obtaining additional treatment operator certification, and O&M related to two pump stations and a surface water treatment plant. Both Alternative 2 and Alternative 3 require additional monitoring, whether to meet drinking water standards or discharge standards.
- Disposal/Reuse Options: Alternative 1 does not consist of increases in water production or treatment, therefore no disposal or reuse is required. Alternative 2 and Alternative 3 both require disposal for treatment residuals. In addition, Alternative 2 would produce additional water, which could be treated for delivery as drinking water (Option 1) or disposed of through the District sewer system and/or City stormwater system (Options 2 and 3).

7.1.3 Environmental Effects

Because Alternative 1 does not consist of additional activities, it best meets the Feasibility Study goals when evaluated for Environmental Effects. Alternative 3 will likely have the greatest environmental impacts due to the extent of activities to implement a lake intake, raw water pump station and pipelines, SWTP, and treated water pump station and pipelines. Environmental effects due to Alternative 2 are anticipated to be limited to the LBWC 4 site.

7.1.4 Cost

Using the cost estimate assumptions described in Section 5.4, Alternative 1 continues existing operations with existing infrastructure, and therefore has the lowest cost to implement and lowest additional O&M cost. To implement Alternative 2, about $2.8 million to $7.8 million in capital is needed, with an additional $200,000 to $2 million in annual O&M costs. To implement Alternative 3, about $40 million to $86 million in capital is needed, with an additional $5.5 million to $12 million in annual O&M costs.

7.2 Ranking Summary and Preferred Remedial Alternative

As seen in the previous Sections, Alternative 2 best meets the Feasibility Study goals for Effectiveness, but Alternative 1 best meets the Criteria for Implementability, Environmental Effects, and Costs. To rank the remedial alternatives based on all the Evaluation Criteria, the remedial alternatives are compared against one another based on the quantified Criteria, Effectiveness and Cost, shown in Table 7-2.

Table 7-2: Ranking of Remedial Alternatives – Quantifiable Criteria

Quantified Criteria	Alternative 1: No Action	Alternative 2: Targeted Pumping [a]			Alternative 3: Conversion to SWTP
		Option 1: Potable Reuse	Option 2: Sewer Discharge	Option 3: Sewer/ Stormwater System Discharge	
Quantity of PCE Removed (lbs)	280 to 1,800	770 to 3,300	770 to 3,300	770 to 3,300	230 to 1,400
Quantity of Water Produced for Potable Use (MG)	3,800	6,700	3,800	3,800	2,900 (GW) [b] 940 (SWTP) [c]
Additional Capital (Rounded)/ PCE Removed ($/lbs) [d]	No New Costs	1,100 – 10,000	850 - 7,800	880 – 8,100	No New Costs for PCE Removal
Additional Annual O&M Cost (Rounded)/ PCE Removed ($/lbs) [d]	No New Costs	60 – 2,600	230 – 2,200	140 – 1,300	No New Costs for PCE Removal [c]

Notes:

a. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of the 20-year total) is estimated to be 213 lbs to 2,559 lbs.

b. From groundwater produced by wells with detectable levels of PCE (TKWC 2, TKWC 1, and LBWC 5) pumping for the assumed 15 years it would take to design, construct, and start-up the SWTP.

c. Surface water treated and delivered to meet demands for 5 years (following 15-year implementation period of groundwater pumping).

d. Cost based on Preliminary Cost Estimates for Capital and Average Annual O&M (for 20 years) as presented in this Section. Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4.

7.2.1 Preferred Remedial Alternative

Based on the evaluation and ranking of remedial alternatives, Alternative 2 Option 1 is the preferred remedial alternative that will best meet the Feasibility Study goals to control or remove PCE from groundwater and manage existing groundwater sources to maintain adequate drinking water supply and quantity and prevents further migration of contaminants and potential future impacts to downgradient water supply wells. It also allows for the replacement of lost drinking water production resulting from the impairment and/or destruction of groundwater sources in the South Y Area.

Section 8: Development of Preferred Remedial Alternative

The preferred remedial alternative is Alternative 2 Option 1, which consists of a new extraction well, R1, equipped with treatment to allow for potable reuse of treated groundwater and operating the LBWC wells to maximize pumping to remove PCE from groundwater. This Section presents the conceptual design of Alternative 2 Option 1, as well as identifies the next steps in progressing implementation of this Alternative.

The preferred remedial alternative would change the LBWC groundwater well operating strategy to pump LBWC 5 (equipped with PCE treatment) as the primary LBWC supply, with LBWC 1 as the lag well. R1 would be used to replace water production lost to the impairment and destruction of LBWC 4. No capital improvements are needed to implement the new operations strategy at LBWC 5 and LBWC 1. LBWC 4 would be destroyed and R1 would be drilled, which will be equipped with PCE treatment and iron and manganese treatment to meet drinking water quality standards for potable reuse of extracted water.

Alternative 2 is characterized by increased pumping at LBWC 5 with GAC treatment and an extraction well at the LBWC 4 location with GAC treatment to enhance PCE removal. LBWC 5 would be operated to meet water system demands in a manner that would result in increased contaminant removal and plume containment compared to the No Action Alternative. The R1 would be drilled and screened to remove PCE from groundwater above 150 ft bgs. Treated water from R1 will be routed through the LBWC distribution system for potable reuse by the water purveyors through existing water distribution system interties. Pumping rates and levels of treatment at TKWC wells would be maintained as is.

Water agreements would likely be needed in order for the excess treated water produced at the R1 groundwater treatment facility to be available for use as a potable water supply. If water agreements for this excess water cannot be attained, the excess water would likely need to be disposed to the sanitary sewer. Supplemental water supply, if needed, will continue to be provided to TKWC and LBWC from STPUD in accordance with existing mutual aid and assistance agreements.

To evaluate the effectiveness of the preferred remedial alternative in containing the PCE plume and preventing the spread of PCE mass to downgradient wells, a monitoring network should be created. Construction information for existing wells can be used to evaluate their appropriateness to track the PCE plume and monitor water quality upgradient of wells without treatment. If needed, new sentinel wells can be constructed to fill gaps in the monitoring network.

8.1 R1 Conceptual Site Layout

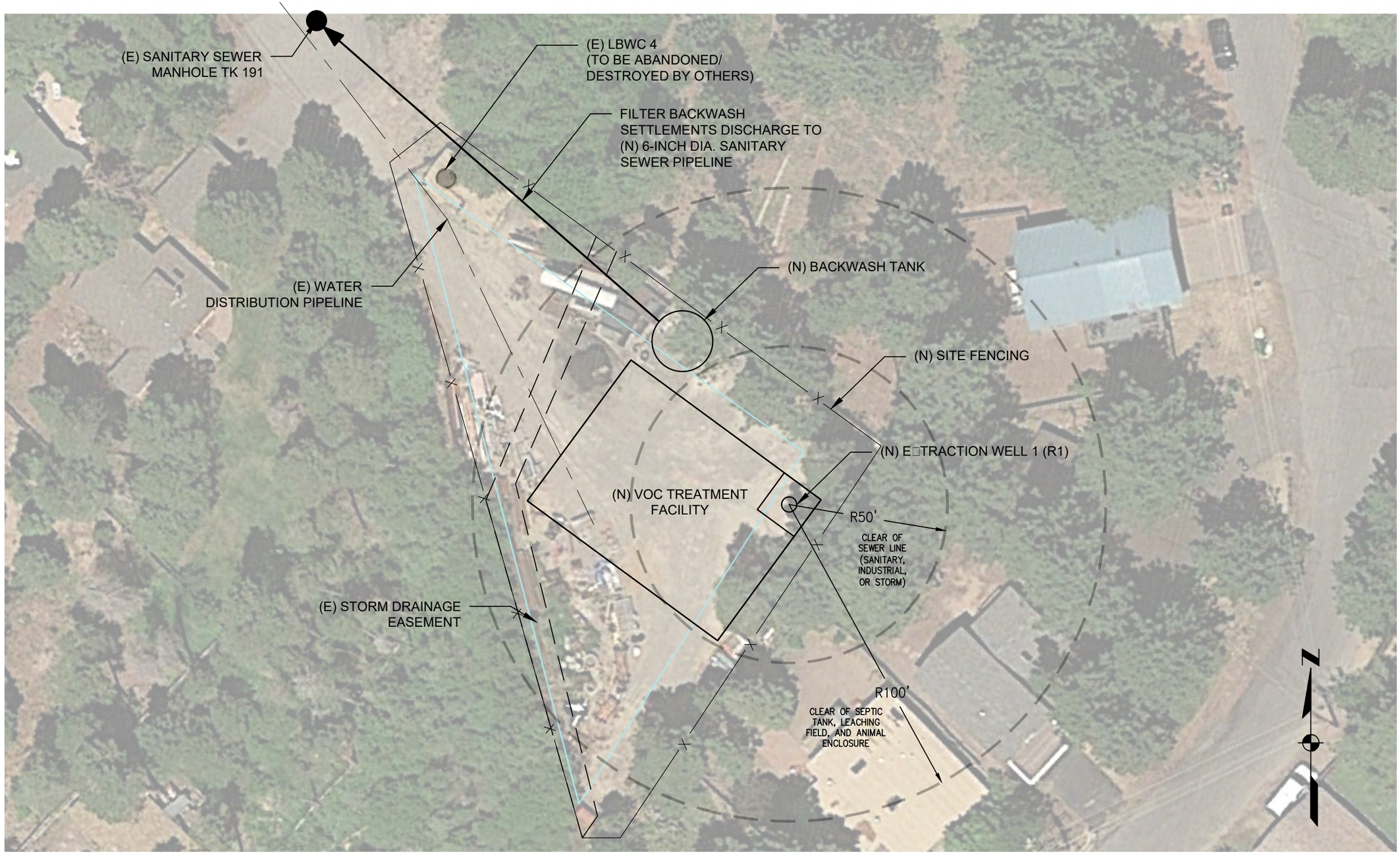
R1 and treatment facilities will be located at 843 Hazel Drive on the same property as the existing LBWC 4. Following destruction of LBWC 4, R1 will be drilled and screened to pump groundwater at a maximum rate of 200 gpm from the two shallow water bearing zones (between 50 and 150 ft bgs). In order to deliver the water produced water from R1, it is anticipated that GAC for PCE removal and pyrolusite/greensand media for iron and manganese removal will be required to achieve drinking water quality.

Prior to PCE treatment, the raw water will be treated to reduce the high concentrations of iron and manganese that is expected at this location. Two treatment trains of pressure vessels containing pyrolusite/greensand media will provide treatment to the raw water to meet drinking water standards for iron and manganese. The pressure vessels will be operated in series to provide buffer when breakthrough of the media is detected. Spent media will be backwashed, and the backwashed water will be recovered through the use of a backwash tank to settle out solids, which will be discharged to the District's sanitary sewer.

At a minimum, two (2) GAC treatment vessels will be required for PCE treatment but depending on the changing levels of PCE in R1, a third GAC treatment vessel may be used to meet water quality goals with greater control. Therefore, the Layout includes space for a future third GAC treatment vessel. The GAC vessels will be operated in series, so that when breakthrough is detected in the leading vessel, there will still be treatment capacity in the remaining vessel(s). Spent GAC media will be taken off site and regenerated when replaced with virgin coconut shell carbon by the GAC vendor.

Sodium hypochlorite will be injected into the treatment train at two points: 1) ahead of the iron/manganese treatment for corrosion control, and 2) following GAC treatment to provide sufficient chlorine residual entering the distribution system.

Figure 8-1 and Figure 8-2 show the conceptual site layout of the R1 groundwater treatment facility, including approximate locations, sizes, and quantities of elements. Based on the Conceptual Design and Site Layout, it is estimated that implementation of this Alternative could take 3 to 7 years.



NOTES:
1. LOCATIONS, SIZES AND QUANTITIES ARE APPROXIMATE AND TO BE REFINED DURING DESIGN
2. (E) = EXISTING, (N) = NEW

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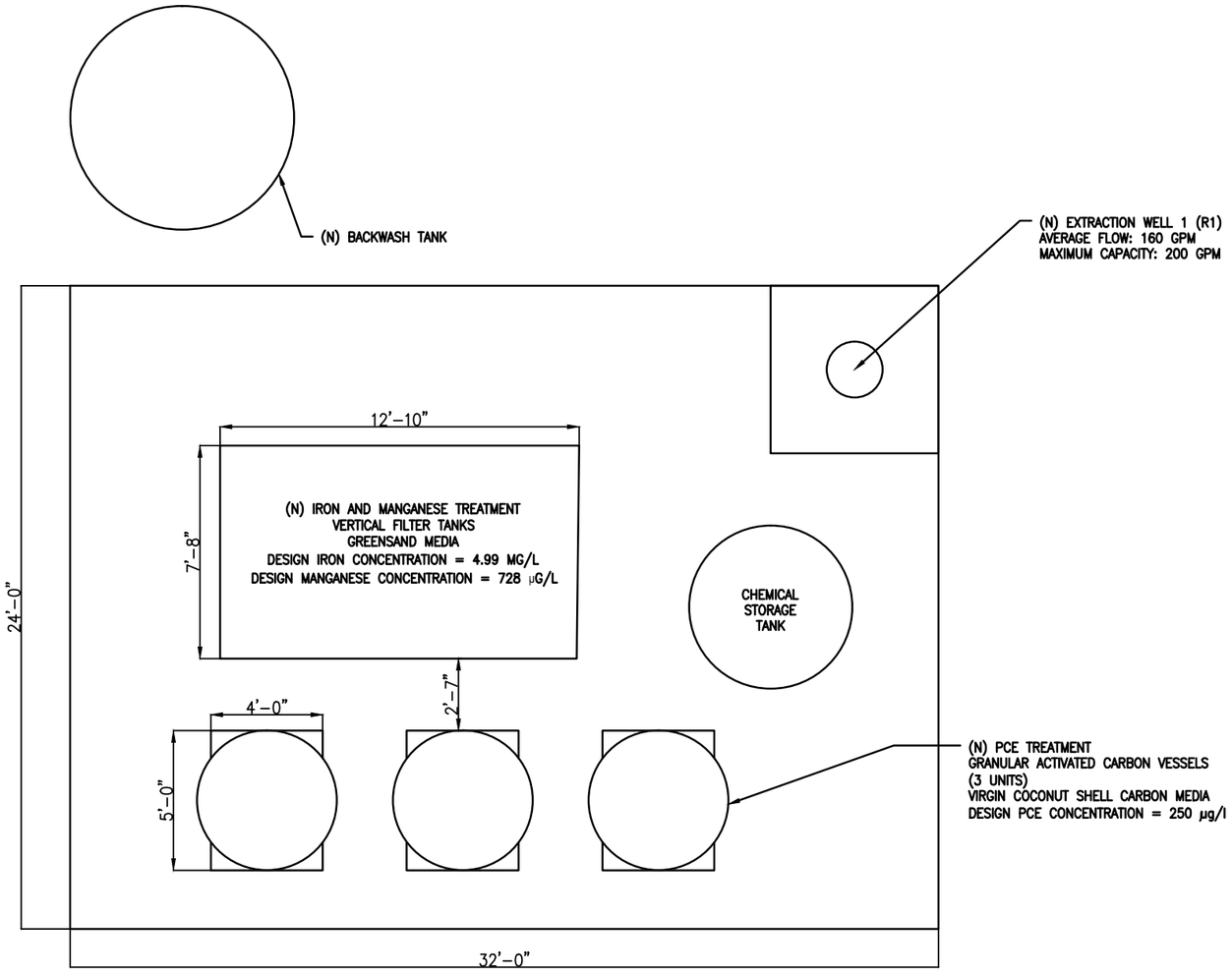
SOUH TAHOE PUBLIC UTILITY DISTRICT

SOUTH Y FEASIBILITY STUDY

□REFERRED REMEDIAL ALTERNATIVE NEW EXTRACTION WELL □ AND GROUNDWATER TREATMENT FACILIT□ AT □4□ □A□EL DRIVE

1770027*00

FIGURE □□□



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SCALE FEET

GROUNDWATER TREATMENT FACILITY FLOOR PLAN

Kennedy/Jenks Consultants

SOUH TAHOE PUBLIC UTILITY DISTRICT

SOUTH Y FEASIBILITY STUDY

□REFERRED REMEDIAL ALTERNATIVE GROUNDWATER TREATMENT FACILIT□

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FIGURE □2

8.2 Pre-Design Activities

To advance the design and implementation of the conceptual site layout at 843 Hazel Drive, additional activities are required, including a treatment pilot, site survey and geotechnical investigation, obtaining permits and environmental documentation, and developing implementation and operating agreements. Costs for these activities were developed to provide a refined life-cycle cost estimate for the preferred remedial alternative.

The following activities have been identified as needed to support the development of the design and implementation of the preferred remedial alternative:

1. Drill a new test well at the 843 Hazel Drive site to confirm water quality by depth and aquifer properties for the extraction well and conduct treatment pilot to estimate the amount of treatment needed to achieve water quality objectives. It is recommended that the treatment pilot be conducted for both PCE treatment and iron and manganese treatment in a treatment train. Based on the water quality in the test well, if results indicate constituent concentrations near 10 times the MCL, develop documentation to satisfy Policy Memo 97-005 evaluation requirements, including but not limited to:
    - Drinking Water Source Assessment (SA) and Contaminant Assessment (CA)
    - Full Characterization of the Raw Water Quality
    - Drinking Water Source Protection
    - Treatment and Monitoring Program Proposal
    - Evaluation of the risks of failure of the proposed treatment system
    - CEQA Review
    - Technical, Managerial, and Financial Assessment Form
    - Operational Plans for water quality monitoring, water system operations, and disaster/emergency response
2. Conduct site survey and geotechnical investigation to locate existing infrastructure, other utilities, and to accurately site new construction. This will also aid in estimating quantities and refining cost estimates. A geotechnical investigation will be required to evaluate foundation and building requirements.
3. Obtain permitting and complete TRPA and CEQA environmental documentation, including:
    - Updated CEQA checklist and preparation of complete CEQA environmental document
    - District Sewer Discharge Permit
    - DDW new drinking water source permit
    - Land Coverage evaluation through TRPA
    - Temporary permitting related to construction
    - Others as identified during design

The recommended Pre-Design Activities will be further developed as part of the IRAP presented in Appendix E.

8.3 Estimated Implementation Cost

This Section describes the activities and associated costs needed to advance the design and implementation of the preferred remedial alternative. Details on the estimated costs presented in this Section are provided in Appendix D.

8.3.1 Pre-Design Activity Costs

The cost to collect the information needed to design the preferred remedial alternative is summarized in Table 8-1, which is incorporated into the IRAP in Appendix E.

Table 8-1: Summary of Preliminary Costs of Pre-Design Activities for the Preferred Remedial Alternative (2019$, Rounded)

Activity	Estimated Cost (2019$) [(a), (b)]
R1 Test Well and Treatment Pilot	$130,000 to $280,000
Policy Memo 97-005 Documentation and Permit Application	$370,000 to $790,000
Site Survey and Geotechnical Investigation	$50,000 to $110,000
TRPA/CEQA Environmental Documentation and Approvals	$44,000 to $94,000
Funding, Maintenance, and Water Service Agreements Discussions	As Needed
Total Preliminary Cost Estimate for Pre-Design Activities	$500,000 to $1,100,000

Notes:

a. The costs listed in this table are for reference only and is not intended to encompass all mitigation requirements that may be encountered during the development of this Alternative should it proceed to design and construction. It is assumed that during the design of this Alternative, specific permits and other requirements will be identified and the cost for mitigation will be updated.

b. Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4.

8.3.2 Environmental Mitigation Costs

The costs of mitigation of the environmental impacts identified in Section 5.3 are summarized in Table 8-2. In addition, a land capability review of the 843 Hazel Drive site will be required by TRPA, the result of which may lead to the need for coverage to be purchased through TRPA to mitigate for additional water quality impacts from erosion of soils. For the conceptual building footprint for this Alternative, it is estimated that the land capability and application and review will be about $5,000 and as much as $19,200 in coverage could be required to be purchased through TRPA.

Table 8-2: Summary of Preliminary Costs of Environmental Impact Mitigation for Preferred Remedial Alternative

Environmental Impact	Preliminary Estimated Cost of Mitigation (2019$)
Air Quality	El Dorado County Air Quality Management District (AQMD) Fees (July 1, 2019 – June 30, 2020) [a]: • Authority to Construct Application = $393 • Filing Fee = $103 • Fugitive Dust Plans = $138 • Processing Fee for 2 hours of AQMD staff time = $290
Light and Glare	To be determined during design
Noise [b]	• Temporary Construction Sound Walls = $6,000 • Facility Building Shell = $250/building square feet
Transportation/Circulation	To be determined during design/construction
Utilities	To be determined during design
TRPA Coverage [c]	• TRPA Land Capability Application/Review = $4,964 • Coverage Purchase = $19,200

Notes:

a. From the AQMD Fee Schedule for July 1, 2019 – June 30, 2020: https://www.edcgov.us/Government/AirQualityManagement/Documents/19-20%20AQMD%20FINAL%20BUDGET%20FOR%20WEBSITE.pdf

b. Based on PDI cost for noise control.

c. The costs listed in this table are for reference only and is not intended to encompass all mitigation requirements that may be encountered during the development of this Alternative should it proceed to design and construction. It is assumed that during the design of this Alternative, specific permits and other requirements will be identified and the cost for mitigation will be updated.

8.3.3 Capital Costs

The cost to implement the preferred remedial alternative is summarized in Table 8-3. These costs include known permitting fees not already included in Pre-Implementation Activities, design/engineering, construction, construction management, and contingency for unforeseen expenses. Capital Costs were developed using the assumptions outlined in Section 5.4.

Table 8-3: Summary of Preliminary Costs of Implementation for Preferred Remedial Alternative (2019$, Rounded)

Description	Estimated Cost (2019$)
R1 Drilling, Construction, and Pump/Motor	$330,000 to $710,000
Groundwater Treatment Facility and GAC Vessels	$1,600,000 to $3,500,000
Iron and Manganese Treatment	$470,000 to $1,000,000
Monitoring Network Plan and New Monitoring Well (1)	$49,000 to $110,000
Contingency (25%)	$620,000 to $1,300,000
Permitting/Engineering/Design/Construction Management (20%)	$620,000 to $1,300,000
Total Preliminary Cost Estimate	$3,700,000 to $8,000,000

Note:
Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4.

8.3.4 Operations and Maintenance Costs

The cost to operate and maintain the preferred remedial alternative is summarized in Table 8-4. These costs include known annual utilities fees, energy costs, chemical cost estimates, monitoring and administration of the treatment systems, and assumed remaining facility maintenance as a percent of total O&M costs. O&M Costs were developed using the assumptions outlined in Section 5.4.

Table 8-4: Summary of Preliminary Costs of O&M for the Preferred Remedial Alternative (2019$, Rounded)

Description	Estimated Annual Cost (2019$) [(a)]	Estimated 20-Year Cost (2019$) [(a)]
Facility O&M	$130,000 to $270,000	$2,500,000 to $5,400,000
Policy Memo 97-005 Monitoring and Administration	$34,000 to $73,000	$680,000 to $1,500,000
Water Quality Operations and Monitoring	$47,000 to $100,000	$930,000 to $2,000,000
Volumetric Sewer Discharge [(b)]	$680,000	As Needed
Total Preliminary Cost Estimate	$891,000 to $1,100,000	$4,100,000 to $8,900,000

Notes:
a. Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4.
b. The District charges $6.50 per 1,000 gallons discharged through the Special Discharge Permit. The estimated initial cost is based on one year of discharge in order to satisfy initial Policy Memo 97-005 monitoring requirements for the first year of operation.

8.4 Financial Plan

If the preferred remedial alternative is intended to be implemented, including all the activities identified in this Feasibility Study, it is anticipated that funding, either in the way of public grants or loans, will be sought. Therefore, the following Sections describe a proposed Financial Plan for the implementation for the preferred remedial alternative using grant funding.

8.4.1 Potential Sources of Financing

Table 8-5 summarizes the potential sources of funding to support the implementation of the preferred remedial alternative and activities in the IRAP.

Table 8-5. Potential Sources of Grant/Loan Funding

Source	Description	Eligibility	Funding Constraints
Groundwater Quality Funding – Proposition 1 Groundwater Grant Program	This program provides funds for planning and implementing groundwater projects that prevent or clean up contamination of groundwater that serves or has served as a source of drinking water. Priorities: threat posed by groundwater contamination to drinking water supply, potential for contaminant to spread, potential to enhance local water supply reliability, recharge vulnerable high-use basins, projects with no viable responsible parties. Contaminants can be natural or human-made. Funding is also available for drinking water treatment and septic-to-sewer projects that benefit Disadvantaged Communities (DACs) or Economically Disadvantaged Areas (EDAs) and prevent or reduce contamination of municipal or domestic wells.	Public Agencies, Tribes, Public Utilities, Non-Profits, Mutual Water Companies Application Deadline: Anticipated future application (late 2020)	Planning grants range from $100,000 to $2 million. Implementation grants range from $500,000 to $50 million. DAC/EDA projects can receive up to $5 million for drinking water treatment. There is a 50% cost share, which can be reduced for projects benefitting DACs/EDAs.
Groundwater Treatment & Remediation (Proposition 68)	Funding for treatment and remediation activities for the reduction or prevention of contamination of groundwater that serves as a source of drinking water. Projects must address contamination resulting from a discharge of waste. The project must be identified as a high priority by the applicable state or federal agencies (e.g., Water Board, DTSC, US EPA, DWR). Project priorities and preferences are outlined in the guidelines. It is expected that proposals will primarily consist of requests to fund O&M at existing facilities. New infrastructure projects will generally be directed to the Proposition 1 Groundwater Grant Program, except for small-scale capital improvements that will reduce long-term O&M costs.	Public agencies, nonprofit organizations, public utilities, state and federally recognized Indian tribes, and mutual water companies. Application Deadline: Applications due January 24, 2020 then rolling application	A total of $74 million is available. Grant amounts range from $500,000 to $5M for O&M activities, and up to $2M for life cycle cost reduction projects. Cost share requirement is 50% and may be reduced for DACs or EDAs
Groundwater Quality Funding – SB 445 Site Cleanup Subaccount Program (SCAP)	This program provides funds for groundwater projects that remediate harm or threat to human health, safety, and the environment from surface- or groundwater contamination; regulatory agency has issued a directive, unless infeasible, responsible party lacks financial resources. Priorities are: significant threat to human health or the environment, DAC or small community impact, cost and environmental benefit of project, lack of alternative funding sources. Contaminants considered are human-made. Projects may include site characterization, source identification, or implementation of cleanup.	All applicants with eligible projects. Application Deadline: Continuous	$19.5 million annual appropriation; approximately $18 million available annually for grants and contracts. No funding request limit.
Drinking Water State Revolving Fund (DWSRF) – Planning and Construction	This program provides low interest loans and, in some instances, grants to assist public water systems in financing projects that (1) address public health risk problems, (2) are needed to comply with the Safe Drinking Water Act (SDWA), and (3) assist those most in need on a per household affordability basis. Projects will be assigned a category based on priority and will be placed on the Comprehensive List in order to be considered for financing. Construction Financing is available for applicants with complete final plans, specifications, and environmental documentation. Planning/Design financing is available for applicants who do not have final documentation required for construction financing. Projects may include the following: treatment systems, distribution systems, interconnections, consolidations, pipeline extensions, water sources, water meters, water storages.	Public and community water systems and non-community water systems operated by not-for-profit entities. Application Deadline: Continuous	A total of $260M has been allocated to the program from Proposition 1. Limited grants are available for DAC projects of up to $5M per project and up to $20M per project with regional benefits, at least one of which is a small DAC. Cost share based on per household affordability criteria. Loans are available with interest rates at 1/2 the General Obligation bond rate and 20-year terms. 2018 interest rate was 1.8%. DACs may be eligible for 0% loans for 30 years, or complete principal forgiveness for severely disadvantaged communities. (All applications are for loans; financial review determines if grant funds apply.) Up to $10M in 0% interest financing is available for a PWS that consolidates with a Severely DAC (SDAC) or extends service to a DAC/SDAC.
Cost Share Grant by the El Dorado County Water Agency	This program provides funds for long- and short-range surveys, regional and purveyor specific water management plans, development of procedures or techniques, exploratory work, permit fees, engineering and geological studies, environmental and mitigation feasibility studies, in the applicant's service areas or jurisdiction. Historically the Agency has contributed 70% of costs for water rights related projects (Priority One) and 50% for other eligible projects. Typically, projects should include at least 50% of matching funds by the applicant.	Application Deadline: Submission deadline is around April of each Fiscal Year	

Based on Table 8-5, disadvantaged communities (DACs) may be able to access separate funding sources or funding sources with reduced match requirements through State funding programs. The South Y area consists of populations that fall into the DAC category. Therefore, applications for Proposition 1 and Proposition 68 should be prioritized in order to take advantage of the funding programs that set aside funding specifically for DAC projects.

Once grant and low interest loan funding is maximized and assuming that capital and/or O&M funding needs still remain, an assessment of the various sources of funding that could be available to fill the unfilled funding needs will be required. These could include other local sources of funding such as:

- Property Taxes: Within California, most counties', cities', schools' and special district's receive revenue through the 1 percent general tax forms. Voter-approved debt rates can also be issued in the form of bonds. The City of South Lake Tahoe or the District could access this revenue stream to help fund the preferred remedial alternative as Project Partner(s).
- Waiver of Local Fees: As presented in Section 8.2.1, anticipated costs to implement and operate the preferred remedial alternative include fees to other utilities, such as the District's volumetric sewer discharge. As a Project Partner, the District could waive this fee, which could also be considered a funding match in many State grant programs.
- Bridge Loans: Local agencies can support the implementation of the preferred remedial alternative be providing a low or zero-interest loan to serve as bridge funding, with repayment from a grant. Typically, state and federal grants are paid to applicants by way of reimbursements for direct costs and work performed. A source of bridge funding would help alleviate the impact to the water purveyors reserves during the implementation of the preferred remedial alternative. The El Dorado County Business Assistance Loan Program can provide up to $100,000 in loans for up to 10 years with interest rates, fees, and other requirements negotiated on a case-by-case basis.
- Cost recovery via the Responsible Parties is also another potential source of Project funding for the water purveyors. Cost recovery action for the construction and operation of a PCE extraction and treatment facility requires close coordination with legal counsel and technical support therefore can be both time consuming and expensive.

8.4.2 Potential Funding Approach

For the purposes of maximizing the use of existing California Proposition funding with the limited timelines for application and implementation, described in Section 8.3.1, the following assumptions are made:

1. Grant applications to the Proposition 1 Groundwater Grant Program will be submitted for the preferred remedial alternative.
2. The lead grant applicant is committed to operate the funded portions of the preferred remedial alternative for the grant term and/or facility life (a minimum of 20 years) as prescribed by the terms of the Proposition 1 Groundwater Grant Program.
3. Cost recovery from responsible parties will not occur prior to the implementation of the preferred remedial alternative.

4. Following approval and acceptance of this Feasibility Study, an Implementation Project grant application will be submitted to the Proposition 1 Groundwater Grant Program for the preferred remedial alternative. The activities that will be included in the Implementation Project grant application will be for the R1 test well and pilot, Policy Memo 97-005 documentation and permitting (if required), design activities including survey and geotechnical investigation, and environmental documentation.

8.5 Additional Stakeholder Outreach Plan

As the water purveyors continue to pursue implementation of the recommended project, additional outreach to stakeholders should periodically continue to inform not only of the results of Feasibility Study implementation, but of other LRWQCB and water purveyor activities.

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Appendix A

Feasibility Study Workplan

South Tahoe Public Utility District

Feasibility Study of Remedial Alternatives to Mitigate Tetrachloroethylene Contamination

Agreement No. D1712508

Feasibility Study Workplan

Feasibility Study Objectives

The objective of the feasibility study is to integrate the information obtained from the pre-design investigation and the alternatives evaluated in the groundwater modeling and conduct an engineering analysis. The analysis will identify the most cost effective means of removing tetrachloroethylene (PCE) from groundwater and the managed use of groundwater sources in order to maintain adequate drinking water supply and quality in the South Y area. As detailed below, the analysis will evaluate the alternatives for engineering considerations as to treatment and/or remediation process to prevent and/or clean up the groundwater contamination, the site improvements and infrastructure necessary to implement the alternative, and life-cycle costs to be used to further evaluate the feasibility of the screened alternatives.

Feasibility Study Steps

The steps to the feasibility study include:

1. Data Review with Feasibility Study Kick-off Meeting
2. Screen Modeled Alternatives for Engineering Evaluation (up to 7 Alternatives)
3. Define Infrastructure Needs (3 Alternatives) (including disposal/reuse options)
4. Develop Life Cycle Cost Estimates (3 Alternatives)
5. Initial Study Checklist for 3 Alternatives and Estimated Cost of Mitigation
6. Select and Develop Recommended Alternative
7. Implementation Plan for Recommended Alternative: Financial and Governance Plan
8. Document findings in Draft and Final Report

The steps are detailed below.

1. <u>Data Review with Feasibility Study Kick-off Meeting</u>

This step will include detailed review of:

A. Preliminary Design Investigation (PDI) conducted to support this effort in order to obtain recent soils, aquifer, and groundwater quality information
B. Recent reports such as:
    i. Lukins Brothers Water Company (LBWC) Preliminary Engineering Report (PER) Water System Improvements Related to PCE Contamination (May 2015)
    ii. Water Board Final PCE Investigation Report, (January 2016)
    iii. District South “Y” Extraction Well Suitability Investigation (GEI, June 2016)
    iv. Results of PCE Investigation for Tahoe Keys Property Owners Association (TKPOA), August 2016 (GEI, 2016).
    v. Off-site Groundwater Investigation Report (August 30, 2017)
    vi. Lake Tahoe Laundry Works (LTLW) Preliminary Planning Report (September 14, 2018)
    vii. TKPOA Well #2 vertical profiling, if available during Feasibility Study investigation

C. Results of Groundwater/Contaminant Transport Modeling and confirmation of range of water quality and water supply objectives achieved by identified alternatives.
D. Results of recent monitoring conducted by other entities including
    i. 2018 PDI sampling
    ii. LBWC and TKWC sampling
    iii. LTLW 2018 sampling as documented in 1.B.6. above
    iv. Other monitoring results that becomes available during the period of this feasibility study
E. Plans and documents provided by the water purveyors that describe the existing extraction, treatment and distribution facilities including cost of operations, historic pumping/treatment data, etc.

A meeting conducted during this task on 12 June 2018 included discussion with Technical Advisory Committee (TAC)/Stakeholder Advisory Group (SAG) regarding:

A. Alternatives from Groundwater/Contaminant Transport Modeling to be analyzed in the Feasibility Study including flow rates, locations, PCE contamination levels and residuals disposal
B. Updates on activities of the responsible parties and water purveyors
C. Current conditions with regard to PCE concentrations, pumping and treatment

A Transport Modeling Analysis/Engineering Evaluation Kick-Off Meeting was convened with the TAC/SAG on July 18, 2018. Topics of discussion for that meeting included:

A. Detailed description of the local PCE Fate and Transport Model
B. Approaches towards developing Remedial Alternative Scenarios for model simulation; and
C. Other source area assumptions and water purveyor considerations to inform the evaluation of alternatives.

This step includes preparation of a draft reference list.

2. <u>Screen Modeled Alternatives for Engineering Evaluation</u>

Groundwater modeling will include analysis of a range of pumping and PCE containment alternatives (both extraction/treatment and in-situ remediation) that will result in the identification of up to seven alternatives that have been modeled and demonstrated to provide a range of PCE removal and water supply benefits. Each of the alternatives will be screened using criteria developed in discussion with TAC/SAG, for engineering and permitting characteristics, to identify the three alternatives that will be carried forward for more detailed analysis. A sample list of screening criteria is provided below:

A. Ease of Construction;
B. Operations and Maintenance;
C. Disposal/Reuse Options;
D. Permitting Requirements;
E. Environmental Effects; and
F. Preliminary Cost

Specific alternatives will be developed during the groundwater modeling analysis of pumping and PCE containment alternatives. Specific detail and validation of findings regarding advantages and disadvantages to meet criteria will be developed for identified alternatives under this task.

It is assumed that at least one alternative will include sufficient treatment for municipal water supply using an impaired water source that will require compliance with State Water Resource Control Board

Policy Memo 97-005 – Policy Guidance for Direct Domestic Use of Extremely Impaired Sources (Policy Memo 97-005).

The results of this screening analysis will be brought to the TAC/SAG for review and comment in a meeting. Other topics that will be brought to the stakeholders at that meeting will include: Approach to infrastructure needs; Basis for life-cycle costs; Assumptions for Initial Study checklist and estimated cost of mitigation; Criteria for selection of recommended alternative; and an implementation plan for the recommended alternative which are detailed below. This step includes preparation of a draft report section for review and comment.

3. Define Infrastructure Needs (3 Alternatives) (including disposal/reuse options)

Conceptual level infrastructure improvements will be developed for the three preferred alternatives and include consideration of the following:

A. Extraction facilities (new or existing) for municipal water supply and/or for PCE removal including depth and range of proposed flow rate(s) (average vs maximum day and seasonal variability) and seasonal/monthly operating assumptions, if any.
B. For PCE treatment in drinking water, packed tower aeration and granular activated carbon (GAC) are considered best available technology (BAT). Other options include low profile air stripping or membrane degassing which are relatively newer and potentially innovative. A high-level feasibility comparison of the four treatment options, especially for applicability in the high altitude, low temperature environment of South Lake Tahoe will be developed. For the purposes of this evaluation either packed tower aeration and/or GAC treatment will be used in evaluating the three alternatives. A decision as to which treatment option will be used in the analysis will be made jointly between the TAC, Kennedy Jenks Consultants and the water purveyors. Relocation and reuse of the existing packed tower aeration treatment system from the South Tahoe Public Utility District's Clement Well site for use at either the LBWC #5 or a possible replacement well site will also be evaluated.

   Conceptual PCE treatment facilities (new or existing) will be developed for the assumed flow rate of the extraction facilities, PCE removal estimates, residuals production rate and concentration. Depending on the alternative, treatment may result in disposal of groundwater and as required by the alternative, the treatment process will be appropriate to domestic reuse sufficient to meet State Water Resources Control Board Policy Memo 97-005 on use of extremely impaired sources including consideration of reliability features and whether multi-barrier treatment is needed will be prepared. Each option that includes potable water delivery will include disinfection to follow PCE removal treatment. Other treatment for constituents to meet secondary maximum contaminant limits (MCLs) such as iron, manganese, and taste and odor are not included in this work plan. Prior to seeking Division of Drinking Water approval for treatment, secondary MCLs, if applicable, will be evaluated in an Engineering Report during the permitting process.
C. Pumping and conveyance facilities including estimated flow rates to deliver water from extraction to treatment facilities and then to disposal and/or to potable water distribution system.
D. Disposal options for treatment residuals including flow rates, concentrations, and estimates of quantities for on-site storage, limitations on quantities and duration of storage based on concentrations of residuals, frequency of removal and/or conveyance of residuals, if any, to

sanitary sewer. Regeneration versus single use of GAC (including vapor phase GAC if required for packed tower aeration discharges) will be evaluated. Air dispersion modeling for packed tower aeration emissions is not included in this scope of work.

In addition to tables and narrative describing the necessary facilities for each alternative, figures will be prepared showing infrastructure for each alternative sufficient to estimate quantities. For those alternatives where existing supply reliability is thought to be impacted by the preferred alternative(s) (i.e. alternatives does not result in additional potable water supply), discussion of replacement water supply will be provided. This step includes preparation of a draft report section for review and comment.

4. Develop Life Cycle Cost Estimates (3 Alternatives)

This task will include development of capital, operating and life cycle costs for the three alternatives.

A. The costs for the alternatives will be developed based on a Class 5 level representing Planning to Feasibility Level information with an estimated accuracy range between -30 percent and +50 percent.
B. Costs will be based on information provided in recent studies (updated to an agreed upon engineering cost index), recent project experience, and engineering judgment.
C. Capital costs will be amortized over the life of the project and divided by the anticipated volume of water produced to provide an estimate of the unit capital cost per million gallons (MG).
D. Operations and maintenance (O&M) costs will be developed for an estimate 50-year operational period based on current annual costs provided by water purveyors for typical energy rates, labor estimates, residuals disposal, and replacement of key components of infrastructure. O&M estimates will be developed in consultation with water purveyors to reflect actual, local experience.
E. Capital, O&M, and life cycle costs will be developed for each of the three alternatives and a unit life cycle cost per MG will be presented in a cost comparison summary. Detailed and summary cost tables will be developed and integrated into the Feasibility Study as appropriate.
F. Estimating cost for design, environmental compliance, permitting and property acquisition costs will be on a high level and assume a percent of construction and/or local land costs for property.

This step includes preparation of a draft report section for review and comment.

5. Initial Study Checklist for 3 Alternatives and Estimated Cost of Mitigation

The 12-page initial study checklist for compliance with CEQA (CEQA-IS) and the Tahoe Regional Planning Agency Initial Environmental Checklist for determination of environmental impact (TRPA-IEC) will be completed for each of the three alternatives. It is expected that potential impacts requiring mitigation for an alternative may occur in six out of seventeen checklist areas included within the CEQA-IS checklist identified below:

A. air quality,
B. greenhouse gas emissions,
C. hazards and hazardous materials,
D. hydrology and water quality,
E. noise, and
F. utilities and service systems.

This step will also include identification of mitigation measures and costs of implementing mitigation. The initial study checklists, mitigation measures and costs of mitigation for the three alternatives will be summarized in the text and provided as an appendix to the draft report.

6. Select and Develop Recommended Alternative

This step will compile the screening evaluation results for the three alternatives, the life cycle costs including mitigation for the three alternatives and include consideration of other factors, which have been previewed with the TAC/SAG in a meeting, such as:

A. Threshold Criteria such as quantity of water produced and/or quantity of PCE removed
B. Balancing Criteria such as time to achieve PCE reduction, use of existing infrastructure
C. Long-Term Effectiveness and Permanence
D. Reduction of Toxicity, Mobility or Volume of PCE plume through Treatment
E. Short-Term Effectiveness
F. Constructability and Cost including permitting considerations such as meeting Policy 95-007

Based on consideration of this broad range of factors, the alternatives will be ranked and selection of a recommended alternative will be made and presented to the TAC/SAG. Once the recommended alternative is identified, more specific site–specific materials will be developed to a conceptual design level, and documented with figures (such as conceptual site layouts) with narrative description, and updated capital costs. This step includes preparation of a draft report section for review and comment.

7. Implementation Plan for Recommended Alternative: Financial and Governance Plan

This step includes development of an implementation plan for the recommended alternative including schedule for implementation, discussion of potential financing options including cost recovery from the responsible parties, a governance plan and stakeholder outreach. This step includes preparation of a draft report section for review and comment.

8. Draft and Final Report

The draft report sections prepared and reviewed under the previous tasks will be compiled into a single draft report document that responds to the comments received on the draft sections. A final report will be prepared based on the comments on the draft report.

Remedial Action Objectives

Draft Remedial Action Objectives (RAO) were developed and presented to the TAC at 12 June 2018 meeting and are attached. It is anticipated that the RAO may evolve over the course of the Feasibility Study.

Line No	General EPA Remedial Action Objectives	South Y Specific Remedial Action Objectives	Comments
Source: Per EPA Document 540/R-96/023: Objectives applicable for all sites with contaminated groundwater include the following:			
1	Prevent exposure to contaminated ground water, above acceptable risk levels.	Allow additional groundwater production without treatment	
2	Prevent or minimize further migration of the contaminant plume (plume containment).	Design and implement remedies without increasing existing volume of groundwater impacted by HVOCs (C) (plume containment)	
3	Prevent or minimize further migration of contaminants from source materials to ground water (source control).	Concentration reduction to < 50 ppb at drinking water wells, mass removal for proposed remedial measure	To avoid 97-005 permitting requirements
4	Return ground waters to their expected beneficial uses wherever practicable (aquifer restoration).	Not applicable for South Y study	
Source: Per EPA Document 540/G-88/003: Remedial Action Objectives for contaminated groundwater sites should address the following:			
5	Cleanup Level	Assist in overall objective of supplying water without detectable HVOCs(C) to customers Comply with regulatory agency requirements and directives regarding HVOCs (C) in groundwater Proposition 1 Metrics of Success: Estimated mass of contaminant removed over the projected life of the project	RAO that aims to reduce contaminant mass to reduce the cleanup burden (e.g., reduce well head treatment duration) for downgradient receptors required to cleanup pumped water to MCLs for distribution and consumption – maybe this amounts to some level of concentration reduction, but still greater than MCLs in in-situ groundwater.
6	Area of Attainment	Address groundwater in mid-plume area including groundwater < 100' below ground surface with high concentrations of PCE in mid-plume and/or replacement wells in deeper aquifer outside of the plume	This is addressed above and likely to include the area of the plume between the source zone and the downgradient extent of the plume
7	Restoration Time Frame	Anticipated remediation time frame is 30 years or less to remove the majority of PCE mass in groundwater in the mid-plume area cost effectively	RAO that acknowledge STPUD's/Water Agency's efforts as interim and will be maintained until such time that source control has been implemented by the RPs and groundwater concentrations have declined to influent levels that are equal to or less than the proposed cleanup level above)
Other South Y Specific Objectives			
		Preserve ability to recover HVOC(C) response costs from responsible parties and/or state grant funding in the future	
		Preference for beneficial use of any extracted groundwater resource (i.e. not disposal to sanitary sewer or storm drain)	
		Reduce costs (capital or long-term O&M) for groundwater remedial wellhead treatment to retail customers	
		Perform community outreach and information activities regarding HVOCs(C) in groundwater	

Notes:

(a) STPUD is responsible for management of the groundwater basin. Other water supply entities are the water retailers.
(b) Other parties have been named as responding parties to a Cleanup and Abatement Order issued by the Water Board.
(c) HVOCs = halogenated volatile organic compounds including tetrachloroethene (PCE) and its degradation products.

Applicable or Relevant and Appropriate Requirements (ARAR) Analysis

Applicable or relevant and appropriate requirements (ARARs) are federal and state environmental statutes, regulations, and standards. Applicable requirements are federal or state laws or regulations that specifically address a hazardous substance, pollutant, contaminant, removal action, or location. Relevant and appropriate requirements that, while not "applicable," address problems or situations sufficiently similar to those encountered that their use is well suited to the particular site. State requirements are ARARs only if they are more stringent than federal requirements.

A summary of likely ARARs to be considered in this Feasibility Study are summarized in the table that follows:

Requirement	Description	Other Information
Clean Water Act (CWA) (33 USCA 125-1-1376 and 40 CFR 100-149.	Federal act that establishes a system of national effluent discharge standards and ocean discharge requirements.	
CWA, Section 304	Establishes water quality criteria based on the designated or potential use of the water and designated use of the receiving waters.	
CWA, Section 404	Prohibits discharge of dredged or fill material into wetlands without a permit. US Army Corps of Engineers regulates activities that may physically alter the waters of the United State.	
Safe Drinking Water Act (SDWA)/ California Code of Regulations, Title 22	Establishes primary and secondary drinking water standards.	California sets drinking water standards based on Federal SDWA
Clean Air Act (42 USC 7401-7642, 40 CFR 50 – 69)	Identifies categories of industrial sources and treatment standards. Establishes primary and secondary ambient air standards. States develop implementation plans for attainment of the standards.	May be applicable or relevant and appropriate depending upon the response action being considered. Impacts to air quality, if any, under local air district jurisdiction may result from the implementation of
Occupational Safety and Health Act (29 CFR 1910.120 et seq.)	Identifies permissible exposure limits (PELs) for inhalation or dermal exposure of workers to chemicals. When PELs are exceeded, OSHA requires the use of personal protective equipment or other methods to block exposure.	Occupational Safety and Health Act (29 CFR 1910.120 et seq.)

Requirement	Description	Other Information
National Historic Preservation Act of 1966 (NHPA) 16 USC 470 and 36 CFR 800	Established to preserve historic properties	National Historic Preservation Act of 1966 (NHPA) 16 USC 470 and 36 CFR 800
Endangered Species Act of 1973	Established to conserve endangered or threatened species	Endangered Species Act of 1973
Hazardous Waste Control Act (HSC, Chapter 6.5, section 25100 et seq., 22 CCR 66260.1 et seq.)	Establishes criteria for determining waste classification for the purposes of transportation and land disposal of wastes in California. Regulates treatment, storage, transportation and disposal of substances identified as hazardous.	
Hazardous Waste Generator Requirements (22 CCR 66262.1 et seq.)	Establishes standards applicable to generators of hazardous waste.	
Land Disposal Restrictions (22 CCR 66268.7 et seq.)	Establishes standards for treatment and land disposal of hazardous waste.	
Stockpiling Requirements for Contaminated Soil (HSC section 25123.3(a)(2)	Establishes standards for stockpiling of non-RCRA contaminated soil	
California Hazardous Substances Account Act (HSC section 25340-25392)	Establishes fees regarding disposal of hazardous substances and outlines process for cleanup of hazardous substance release sites.	

Requirement	Description	Other Information
Porter Cologne Water Quality Act (23 CCR Chapter 3, Subchapter 15, WC section 13000 et seq.)	Establishes the authority of the State Water Resources Control Board and Regional Water Quality Control Boards to protect water quality by identifying beneficial uses of the waters of the State, establishing water quality objectives, and regulating discharges to is	
Regional Water Quality Control Board Basin Plan	Adopts narrative standards and permissible concentrations of organic and inorganic chemicals for surface water, groundwater, point sources and non-point sources. Establishes beneficial uses of surface waters and groundwater.	
NPDES Permit	The State Water Resources Control Board (SWRCB), as part of the National Pollutant Discharge Elimination System (NPDES), has adopted a statewide NPDES General Permit for Stormwater Discharges Associated with Construction Activity (General Permit) to address discharges of storm water runoff from construction projects that encompass one acre or more in total acreage of soil disturbances.	This would be applicable for construction activities, including demolition, clearing, grading, excavation, soil stockpiling, material storing, onsite staging, offsite staging, and other land disturbance activities.
Hazardous Waste Haulers Act (22 CCR Chapter 30)	Governs transportation of hazardous materials in California.	
Safe Drinking Water and Toxic Enforcement Act (Proposition 65) (22 CCR section 12000 et seq.)	Requires public warnings of potential exposure to suspected carcinogens and reproductive toxins.	
California Occupational Health and Safety (8 CCR 5192)	Requires workers involved in hazardous substance operations associated with cleanup of sites perform the cleanup operations in accordance with Cal OSHA health and safety requirements.	Applicable requirement for all workers who can come into contact with contaminated media at the Site

Requirement	Description	Other Information
California Fish and Game Code (sections 1601-1607 and 5650)	Regulates activities that involve construction within stream channels to assure protection of fish and wildlife. Prohibits discharges to waters of the State that may cause adverse effects to fish, plant or bird life.	
Tahoe Regional Planning Agency Ordinances Governing Exterior Lighting, Land Use Coverage, Building Height/Scenic Resources and Noise	Limits exterior lighting, impervious coverage of property, height and aesthetics of buildings, and the amount of noise generated during certain times of day as defined by Community Noise Equivalency Levels (CNEL).	

Appendix B

Baseline Health and Human Risk Assessment

Kennedy/Jenks Consultants

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Human Health Risk Assessment for South Y Groundwater

2 January 2019

Prepared for

South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, CA 96150

K/J Project No. 1770027.00

Table of Contents

List of Tables

Table of Contents (cont'd)

List of Figures

Section 1: Background Information and Purpose

1.1 Background Information

The South "Y" Plume occurs within the west central portion of the Tahoe Valley South Sub-basin (6-5.01), herein referred to as the Tahoe Valley South Basin (TVS Basin). The TVS Basin has an area of approximately 23 square miles (14,814 acres) in El Dorado County, California (Figure 1). The TVS Basin is roughly triangular in aerial extent and is bounded on the southwest by the Sierra Nevada, on the southeast by the Carson Range, and on the north by the southern shore of Lake Tahoe. The Basin generally conforms to the valleys of the Upper Truckee River and Trout Creek. The City of South Lake Tahoe (CSLT) overlies the northern portion of the TVS Basin. The southern boundary extends about 3 miles south of the town of Meyers. The northeast boundary of the TVS Basin is defined by the California-Nevada state line.

Groundwater is the primary source of drinking water for the communities overlying the TVS Basin. Most wells drilled in the TVS Basin are completed in basin-fill deposits that generally consist of unconsolidated glacial, lake and stream sediments. These sedimentary deposits fill the lower reaches of the canyons that drain toward Lake Tahoe and underlie the relatively flat lying valley floors.

The South Tahoe Public Utility District (District) is recognized as the exclusive Groundwater Sustainability Agency (GSA) for the TVS Basin. In 2014, the District, in collaboration with a Stakeholders Advisory Group (SAG) composed of local water purveyors, regulatory agency, municipal and county representatives; and rate payers identified the South "Y" Plume as a significant groundwater concern requiring immediate action (KJC, 2014). The South "Y" Plume has impaired groundwater pumped by public water supply (PWS) wells operating in this area since at least 1989, when tetrachloroethene (also known as perchloroethylene or PCE) was first tested in raw water samples collected from these wells. Since 1989, this contaminant problem has been addressed in PWS wells by either removing the impaired well from service, installing wellhead treatment, or abandoning the well.

In 2016, the District in partnership with Lukins Brothers Water Company (LBWC) and the Tahoe Keys Property Owners Association (TKPOA) undertook renewed investigations to define the extent of PCE contamination and identify remedial measures that could be used to remove this contamination from groundwater to protect existing groundwater sources used for drinking water supply. This included completion of an engineering assessment of an inactive water supply well (LBWC #4) for use as a potential extraction well (GEI, 2016a); compilation of historical data to show the spatial and temporal distribution of PCE contamination in the South Y Area (GEI, 2016b); and initial development of a modular three-dimensional multispecies transport model (MT3DMS) that could be used to evaluate various remedial alternatives designed to mitigate contamination from the South "Y" Plume.

Source(s) of PCE groundwater contamination for the South "Y" Plume are currently being investigated by the Lahontan Regional Water Quality Control Board (LRWQCB). Potential sources include commercial facilities (repair shops and dry cleaners) that operated during the 1970s and where chlorinated solvents were used as part of their normal business activities.

1.2 Purpose of HHRA Report

This report provides a screening level Human Health Risk Assessment (HHRA) addressing risks associated with PCE-impacted groundwater in the TVS Basin at PWS wells in the South Y area. As described in Section 3.1, the data evaluated were collected from 2016-2018 and were limited to deeper groundwater samples from existing active drinking water wells.

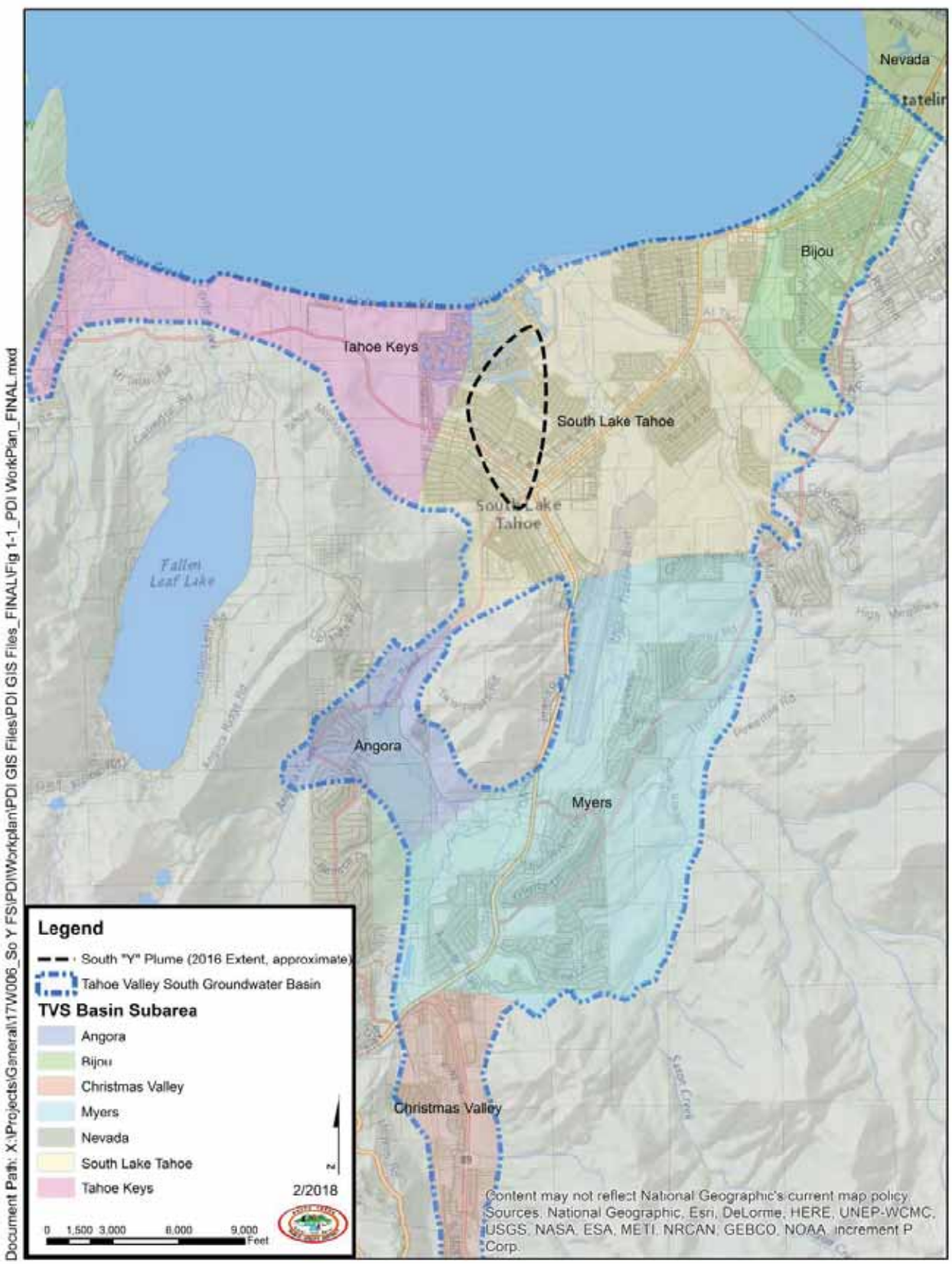


Figure 1: Regional location of the South "Y" Plume within the South Lake Tahoe subarea of the Tahoe Valley South Groundwater Basin.

Section 2: Site Description

The boundaries of the South "Y" Plume have been generally defined using maximum PCE concentrations detected in groundwater samples collected from monitoring wells and PWS wells during 2011 through early 2016 (GEI, 2016b). These data indicate that the South "Y" Plume covers an area of approximately 465 acres extending from the South "Y" in a northerly direction toward Lake Tahoe (Figure 2). The South "Y" is a local term used to describe the intersection of Highway 50 and 89 located in the west side of the CSLT.

The South "Y" Plume has impaired four PWS wells (LBWC #2, LBWC #4, LBWC #5 and TKWC #2) with a combined source capacity of 3.44 million gallons per day (MGD) to levels greater than the maximum contaminant level (MCL) for PCE. Of these wells, only TKWC #2 is in use with a 550 gallon per minute (gpm) granular activated carbon (GAC) treatment system; the other LBWC wells are not used for public water supply. Trace levels of PCE below the MCL are presently detected in one PWS well (TKWC #1). This well is located about ½-mile south of the south shore of Lake Tahoe, near the leading edge of the contaminant plume. Since June 2016, PCE concentrations in raw water samples collected from this well have generally ranged from 1.5 to 4 micrograms per liter (µg/L). Potential further impairment of TKWC #1 at greater than the MCL would further reduce the total production capacity of area drinking water sources by an additional 1.44 MGD.

Two other PWS wells (LBWC #1 and TKWC #3) west of the South "Y" plume are presently nondetect (ND) for PCE. The District has mutual aid and assistance agreements for the emergency provision of drinking water using inter-tie connections from its water distribution system to both the LBWC and TKPOA water systems. During the 2016 water year, the District provided 8.73 million gallons through its inter-tie connection to LBWC, which was about 10% of its total water production.

2.1 Geology/Hydrogeology

In general, the high levels of PCE occur in the shallower layers < 100 feet below ground surface of the multi-layered aquifer system. The drinking water wells are generally screened in the deeper layers of the aquifer. Some drinking water wells are screened over both shallower and deeper layers, which is the likely reason that drinking water wells are impacted by PCE. Regional geology and hydrogeology are described in greater detail in the South Y Pre-Design Investigation Workplan (Kennedy/Jenks, 2018).

2.2 PCE Contamination

Chlorinated hydrocarbons have been detected in PWS, monitoring wells, and private wells north and south of the South "Y" Area since 1989, when these compounds were required to be first tested in regulated drinking water sources. Many of the PWS wells have since ceased operating due to PCE concentrations exceeding the MCL of 5 µg/L. Such PWS wells have included three District wells (Tata #4 - destroyed, South "Y"-destroyed, and Julie-destroyed), two Lukins Brothers Water Company (LBWC) wells (LBWC #3- destroyed and LBWC #4, LBWC #2 and LBWC #5- all currently offline). A PWS well (Rockwater Well, offline), a mobile home park well on James Avenue, and private wells on Eloise and Dunlap Avenues (LRWQCB,

2016a). The majority of these South Y Area wells have been disconnected and many have been abandoned.

The highest concentrations of chlorinated hydrocarbons in the South "Y" area are detected near and downgradient of the location of the former Lake Tahoe Laundry Works, at 1024 Lake Tahoe Boulevard, South Lake Tahoe in the shallow groundwater. Chlorinated hydrocarbons are also detected in soil in this localized area. A soil vapor extraction and air sparging (SVE/AS) system was installed at this location as an interim remedial measure in 2010 and remains in operation. On May 2017, the LRWQCB issued a Cleanup and Abatement Order (CAO) requiring additional investigation and remediation at the former Lake Tahoe Laundry Works site (LRWQCB, 2017). The CAO indicates that concentrations of chlorinated hydrocarbons that could potentially impact human health are present at this site.

A detailed history of PCE contamination in the project area is provided in the South Y Pre-Design Investigation Workplan (Kennedy/Jenks, 2018).

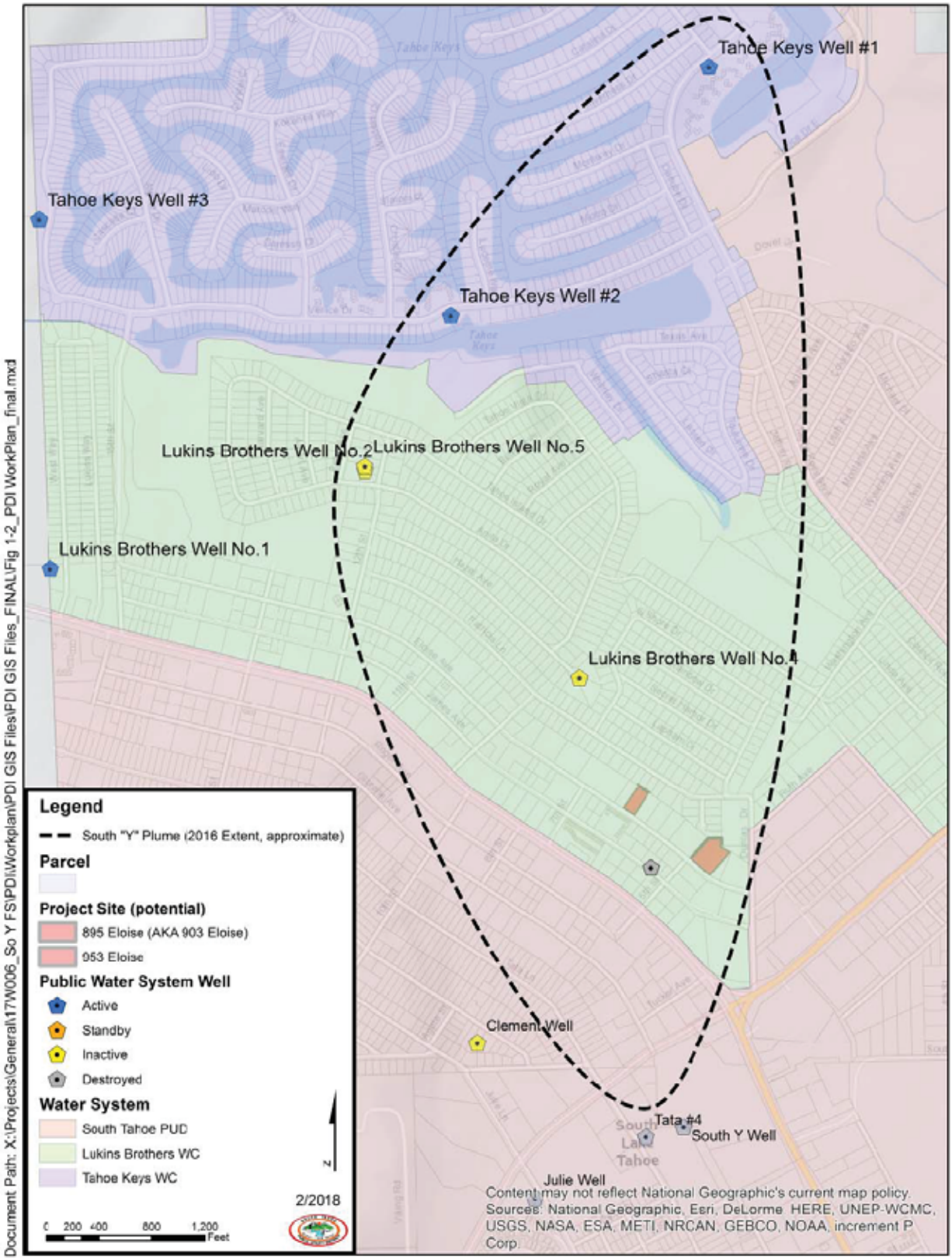


Figure 2: Public Water Supply Wells in the South "Y" Area

Section 3: Screening Level Human Health Risk Assessment

The United States Environmental Protection Agency (EPA) established a process for evaluating risks to human health in Risk Assessment Guidance for Superfund (RAGS). The goal of the procedures outlined in RAGS is to develop the risk information necessary to assist decision-making at remediation sites. As defined in RAGS, a risk assessment includes four steps: data evaluation, exposure assessment, toxicity assessment, and risk characterization.

This screening level HHRA was conducted consistent with the RAGS procedures. In this HHRA, groundwater data from the South "Y" Area were compared with screening levels considered protective of human health. Screening levels used in this HHRA are presented in Table 1 and represented the drinking water maximum contaminant levels. Concentrations above the screening levels were assumed to potentially pose an unacceptable risk to human health.

Table 1: Screening Levels Used in HHRA

Chemical	Maximum Contaminant Level (µg/L)
cis-1,2-Dichloroethene	6
Tetrachloroethene	5
Trichloroethene	5

This risk assessment evaluated human receptors only through contact at PWS wells; ecological receptors were not included in the analysis. However, because contaminants in the South "Y" Area are primarily present in groundwater and impacts to surface water have not been observed, it is unlikely that ecological receptors would be exposed to contaminants in groundwater.

Because this risk assessment was completed for use by the District to evaluate risks associated with the use of South "Y" groundwater as a drinking water source, domestic use of groundwater at PWS wells was the only exposure pathway considered.

3.1 Data Evaluation

The overall groundwater quality dataset for the South "Y" Area includes analytical results for samples collected from PWS wells, as well as analytical results for samples collected from monitoring wells and reconnaissance groundwater samples from 2016 – 2018; the results include both shallow and deeper groundwater samples. To restrict analysis to wells capable of producing drinking water, which is the exposure pathway considered, only existing (i.e., non-abandoned) PWS wells, in deeper groundwater, were included in the assessment. While private wells are known to be present in the South "Y" Area, historical water quality data are limited in availability and therefore were not reviewed for these wells; therefore, they were not included in the assessment.

The water quality dataset for the existing active drinking water wells and wells that are out of service evaluated in this assessment is provided in Table 2. PCE concentrations are provided for wells included in the analysis. The dataset also includes trichloroethene (TCE) and 1,2-

dichloroethene (1,2-DCE) concentrations for a subset of the wells. For some wells, the dataset includes data for “1,2-DCE” without specifying a specific analyte (i.e., cis- vs. trans-1,2-dichloroethene). In those instances, the analyte was assumed to be cis-1,2-DCE, which has the lowest screening level. TCE and 1,2 DCE are degradation products of PCE.

Table 2: Water Quality Data for South "Y" Water Supply Wells

Well Name	Sample Date	Perforated Interval (feet below ground surface)	PCE Concentration (µg/L)	TCE Concentration (µg/L)	cis-1,2-DCE Concentration (µg/L)	1,2-DCE Concentration (species not specified) (µg/L)
Wells Removed From Service						
LBWC #4	10/26/2017	43-78	43	1.1	-	0.6
LBWC #4 - 110'	3/29/2016	-	52	1	0.7	-
LBWC #4 - 68'	3/29/2016	-	52.3	1.1	0.8	-
LBWC #4 - 72'	3/29/2016	-	55.1	1	0.8	-
LBWC #4 - 82'	3/29/2016	-	47	1	0.7	-
LBWC #4 - Well Head	3/30/2016	-	42.3	0.8	0.7	-
LBWC #4 / 125-130	12/7/2016	105-132	39.8	0.8	-	0.5
LBWC #4 / 125-130	3/16/2017	105-132	26.7	0.8	-	0.5
LBWC #4 / 70-75	12/7/2016	43-78	12.9	ND	-	ND
LBWC #4 / 70-75	3/16/2017	43-78	9	ND	-	ND
LBWC #2 / 145-150	3/16/2017	132-156	1	ND	-	ND
LBWC #2 / 145-150	12/7/2016	132-156	1	ND	-	ND
LBWC #2/126	10/26/2017	132-156	4	ND	-	ND
Rockwater / 65-70	7/6/2017	70 - 99	189	3.3	-	3.3
Rockwater / 65-70	10/26/2017	70 - 99	147	4	-	4
Active Wells						
TKWC #1/45	12/13/2016	125-312	2.3	-	-	-
TKWC #1/45	9/24/2017	125-312	2.1	-	-	-
TKWC #1/45	3/28/2017	125-312	1.8	-	-	-
TKWC #3/125	8/15/2017	175-300	<0.5	-	-	-
TKWC #3/125	5/20/2017	175-300	<0.5	-	-	-
TKWC #3	3/1/2018	175 - 300'	<0.5		-	-
LBWC #1	4/11/2017	132 - 182	0.25	ND	-	ND
TKWC #1	5/27/2018	125 - 312'	2.5	<0.5	-	-
TKWC #1	7/13/2018	125 - 312'	2.5	<0.5	-	-
TV School/110-115	4/28/2017	86-146	<0.5	ND	-	ND
TV School/110-115	12/29/2016	86-146	<0.5	ND	-	ND
CL-1 (Clement)	10/25/2017	105-115	<0.5	ND	-	ND
CL-1 (Clement)	5/17/2017	105-115	ND	ND	-	ND
CL-1 (Clement)	12/28/2016	105-115	ND	ND	-	ND

Table 2: Water Quality Data for South "Y" Water Supply Wells

Well Name	Sample Date	Perforated Interval (feet below ground surface)	PCE Concentration (µg/L)	TCE Concentration (µg/L)	cis-1,2-DCE Concentration (µg/L)	1,2-DCE Concentration (species not specified) (µg/L)
Active Wells - Treatment In Place						
TKWC #2/250	12/13/2016	138-188	20	-	-	-
TKWC #2/250	3/28/2017	138-188	18	-	-	-
TKWC #2/250	12/6/2016	138-188	17	-	-	-
TKWC #2/250	10/24/2017	138-188	16	-	-	-
TKWC #2/250	12/20/2016	138-188	16	-	-	-
TKWC #2	7/11/2018	138 - 188'	24	-	-	-
TKWC #2	6/17/2018	138 - 188'	19	-	-	-
TKWC #2	5/27/2018	138 - 188'	18	-	-	-
TKWC #2	8/9/2018	138 - 188'	15	-	-	-
LBWC 5	6/18/2018	141 - 180'	60	1.40	1.6	-
LBWC 5	6/5/2018	141 - 180'	58	1.30	1.3	-
LBWC#5	10/26/2017	141-180	67	2	-	2.5
LBWC#5	6/21/2018	141-180	60	1.40	-	1.6

3.2 Exposure Assessment

The South "Y" Area is developed and consists primarily of industrial and commercial properties. However, residential properties, including a mobile home park, are also present in the area. Groundwater is used for drinking water, most of which is delivered by public water suppliers, and is the primary drinking water source for receptors in the area.

3.2.1 Identification of Exposure Pathways

Ingestion of impacted groundwater is the only exposure pathway for human receptors considered in this risk assessment. This risk assessment considered the current risks to human receptors from consumption of the drinking water supplied by active PWS wells. It also considered the potential future risks to human receptors from consumption of drinking water from inactive water supply wells that are currently out of service in the South "Y" Area in the unlikely event that those wells were returned to service without treatment. Use of contaminated drinking water wells with or without treatment would require consultation with the SWRCB-DDW and amendment of the drinking water permit.

3.2.2 Exposure Point Concentrations

The maximum detected concentration of a chemical in any water supply well included in the analysis was used as the exposure point concentration. For current risks, the maximum concentration of each chemical detected in an active water supply well (i.e. one that is currently used for drinking water supply) was used as the exposure point concentration for that chemical.

For future risks, the maximum concentration of each chemical detected in any existing water supply well (i.e. a well that has not yet been destroyed and may be used for monitoring) was used as the exposure point concentration for that chemical. Wells that are currently used for water production with treatment in place to maintain chemical concentrations below the MCLs, such as at TKWC #2, are included in the existing water supply well analysis, at the pre-treatment concentration.

3.3 Toxicity Assessment

This HHRA used the MCLs established by the California State Water Resources Control Board and adopted as regulatory standards for public water systems as the screening levels. MCLs are health-protective standards that are developed based on a chemical's health impacts, detectability and treatability, and the costs of treatment. MCLs are considered to represent an acceptable level of human health risk. A concentration of any chemical that exceeds the MCL was considered to represent unacceptable human health risk in this HHRA.

3.4 Risk Characterization

3.4.1 Active Water Supply Wells

The screening level risks due to consumption of water from active water supply wells are presented in Table 3. No exceedance of the MCLs was observed for the wells currently used to produce drinking water without treatment. Therefore, the current risks associated with use of groundwater as a drinking water source are considered acceptable.

Table 3: Risk Assessment for Drinking Water from Active Water Supply Wells

Chemical	Maximum Concentration (µg/L)	Maximum Contaminant Level (µg/L)	Exceedance of MCL?
cis-1,2-Dichloroethene	-	6	No
Tetrachloroethene (PCE)	2.5	5	No
Trichloroethene	-	5	No

3.4.2 Existing Water Supply Wells

By comparison, the screening level risks due to consumption of water from existing water supply wells, including those removed from service due to PCE concentrations greater than the MCL, are presented in Table 4. The maximum detected PCE concentration in a water supply well, 189 µg/L, exceeds the MCL of 5 µg/L. The 189 µg/L is a single occurrence at the Rockwater well, which is out of service. This indicates that PCE concentrations would pose an unacceptable risk to human health if the water supply wells were returned to service without treatment in place to reduce PCE concentrations. No wells with PCE in exceedance of the MCL are delivering drinking water without treatment.

Table 4: Risk Assessment for Drinking Water from Active Water Supply Wells and Wells Removed From Service

Chemical	Maximum Concentration (µg/L)	Maximum Contaminant Level (µg/L)	Exceedance of MCL?
cis-1,2-Dichloroethene	4	6	No
Tetrachloroethene (PCE)	189	5	**Yes**
Trichloroethene	4	5	No

3.5 Uncertainties

This risk assessment did not consider concentration trends. The risks posed by contaminants in area groundwater could increase or decrease over time based on fluctuations in contaminant concentration or migration of the plume.

This risk assessment used the maximum concentration detected in a water supply well as the exposure point concentration. This study did not account for blending of water from multiple sources or changes in concentration that may occur during distribution.

As discussed in Section 3.1.1, the dataset used in this HHRA included concentrations of PCE, TCE, and 1,2-DCE in South "Y" Area water supply wells. However, the dataset available for TCE and 1,2-DCE was incomplete. In addition, other chemicals may be present in groundwater that were not included in the available dataset.

Section 4: Conclusion

This screening level risk assessment was conducted to evaluate risks to human receptors from use of South “Y” groundwater as a drinking water source. The analysis was conducted considering both the water supply wells currently used to produce drinking water and for the larger set of existing (i.e., not destroyed) water supply wells present in the South “Y” area, including those removed from service due to elevated PCE concentrations that could be used in the future. The risks to human health from chemicals present in water from active wells currently in use as a drinking water source were found to be acceptable.

However, the risks to human health from chemicals present in the network of existing water supply wells without treatment were found to be unacceptable. Therefore, returning these wells to service without implementing treatment to reduce PCE concentrations would pose an unacceptable risk to human health.

References

Kennedy/Jenks (2018). Pre-Design Investigation Workplan (Agreement D1712508), Prepared for South Tahoe Public Utility District, KJC Project No. 1770027.00. January 23, 2018.

Lahontan Regional Water Quality Control Board (2017). Cleanup and Abatement Order R6T-2017-0022 Requiring Remediation and Additional Investigation of PCE Groundwater Contamination, Lake Tahoe Laundry Works, South Lake Tahoe, California, Site Cleanup Program Case T6S043.

Appendix C

CEQA-IS and TRPA-IEC Checklists

CEQA APPENDIX G:
ENVIRONMENTAL CHECKLIST FORM

NOTE: The following is a sample form and may be tailored to satisfy individual agencies' needs and project circumstances. It may be used to meet the requirements for an initial study when the criteria set forth in CEQA Guidelines have been met. Substantial evidence of potential impacts that are not listed on this form must also be considered. The sample questions in this form are intended to encourage thoughtful assessment of impacts, and do not necessarily represent thresholds of significance.

1. Project title: South Y PCE Facilities Feasibility Study - Alternative 2 Targeted Pumping
2. Lead agency name and address:
   South Tahoe Public Utility District
   1275 Meadow Crest Dr, South Lake Tahoe, CA 96150
3. Contact person and phone number: _____
4. Project location: See attached
5. Project sponsor's name and address:
   South Tahoe Public Utility District
   1275 Meadow Crest Dr, South Lake Tahoe, CA 96150
6. General plan designation: Low Density Residential (LDR) per South Lake Tahoe General Plan adopted on May 17, 2011
7. Zoning: Zoning 6: IND; Zoning 7: DEV; Zoning 8: Light manufacturing
8. Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)
   See attached
9. Surrounding land uses and setting: Briefly describe the project's surroundings:
   843 Hazel Drive is located in a residential neighborhood.
10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)
    See attached
11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun?

    No.

    NOTE: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21083.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California

Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality
☐ Land Use / Planning	☐ Mineral Resources	☐ Noise
☐ Population / Housing	☐ Public Services	☐ Recreation
☐ Transportation/Traffic	☐ Tribal Cultural Resources	☐ Utilities/Service Systems

☐ Mandatory Findings of Significance

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature _____ Date _____

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) the significance criteria or threshold, if any, used to evaluate each question; and

   b) the mitigation measure identified, if any, to reduce the impact to less than significance

SAMPLE QUESTIONS

Issues:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐
II. AGRICULTURE AND FORESTRY RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	X
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	X
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	X
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	X
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	X
III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:	Short term impact could be expected during construction but the Contractor will be required to provide mitigations.			
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	X	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	X	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone	☐	☐	X	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
precursors)?				
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☐	☒
VI. GEOLOGY AND SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
	None of the porject components would be located on or near a known fault.			
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
VII. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒
VIII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒
IX. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒

The estimated pumping rate for thereplacement well is 200 gpm and is negiligible comparing to the whole groundwater basin. The alternative consists of lead pumping by LBWC 5 (equipped with GAC treatment) and lag pumping by LBWC 1 . In total, there is no significant pumping increase.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
	Treated water may be discharged to the storm drain during dry season. The option needs coordination with City of South Lake Tahoe.			
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒
X. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒
XI. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒
XII. NOISE -- Would the project result in:	Noise Level could increase during construction phase especially when the well drilling occurs. Noise mitigation strategies will be incoporated in the design phase.			
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIV. PUBLIC SERVICES.				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☐
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒
XV. RECREATION.				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

The proposed project would not create any long-term change in transportation. During construction, short-term traffic increase could be expected.

XVI. TRANSPORTATION/TRAFFIC.

Would the project:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☒	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. TRIBAL CULTURAL RESOURCES				
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVIII. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

The treated water will be discharged to the sanitary sewer, but the discharge rate would not exceed the 200 gpm pumping rate.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIX. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

Note: Authority cited: Sections 21083 and 21083.05, 21083.09 Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21073, 21074 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21080.3.1, 21080.3.2,21082.3, 21084.2, 21084.3, 21093, 21094, 21095, and 21151, Public Resources Code; *Sundstrom v. County of Mendocino,* (1988) 202 Cal.App.3d 296; *Leonoff v. Monterey Board of Supervisors,* (1990) 222 Cal.App.3d 1337; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

4. Project Location

Alternative 2: Targeted Pumping includes drilling a replacement well and install treatment infrastructure at 843 Hazel Drive, South Lake Tahoe, which is an existing wellsite owned and operated by Lukins Brother Water Company.

8. Description of the Project

Alternative 2 increases pumping through LBWC 5 (equipped with Granular Activated Carbon, GAC for PCE treatment) and construction of a replacement well (R1) to provide new water production lost to the impairment and destruction of LBWC 4. Water treatment for the removal of iron/manganese and PCE from groundwater is proposed at R1 to satisfy drinking water treatment requirements. Water treatment for the removal of PCE from groundwater at well LBWC 5 is planned for construction starting in 2020 with operations planned to begin in 2021, under funding through the State Revolving Fund (SRF). LBWC 5 is planned to be operated as the lead well for the LBWC water system and LBWC 1 will operate as a lag well to meet LBWC water system demands. R1 would be operated at 200 gpm for additional PCE removal and as a supplemental water source for use by the water purveyors. The TKWC wells would operate similar to the No Action Alternative. Based on the results of the South Y Fate and Transport Model, the anticipated mass of PCE removed over a period of 20 years ranges from about 700 lbs to 3,500 lbs.

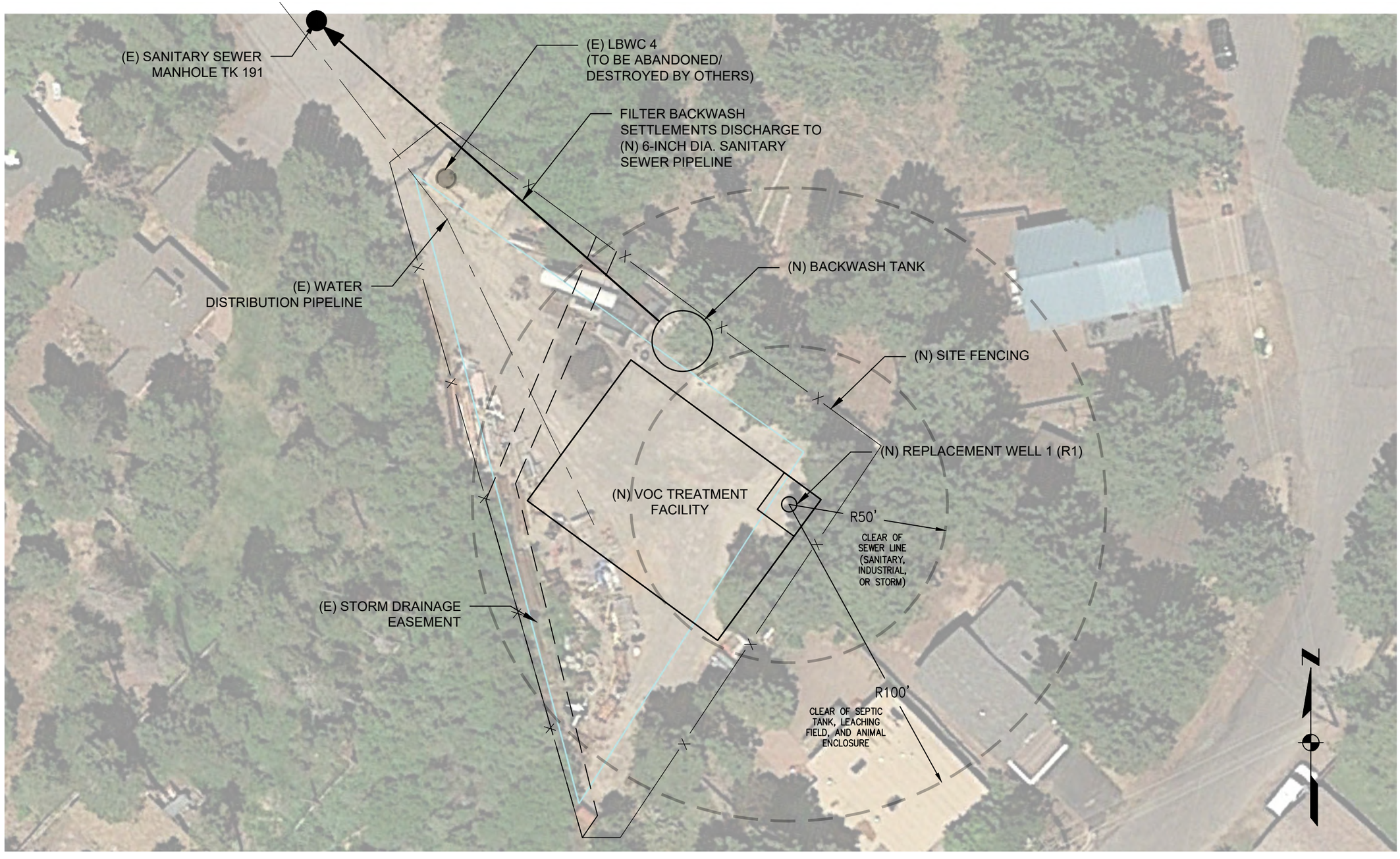
R1 will be drilled and screened to pump groundwater at a maximum rate of 200 gpm from the two shallow water bearing zones (between 50 and 150 feet BGS).A new well house will be constructed to protect the well and mitigate noise. Groundwater from the extraction well will be treated for PCE removal and iron and manganese removal and used for potable drinking water. During startup for up to one year, discharge to sanitary sewer and/or storm drain through a 6-inch sewer line could occur This initial checklist also assumes GAC treatment for PCE removal, pyrolucite/greensand media for iron and manganese removal and 6-inch diameter sewer line for discharge during startup.

A figure showing the extraction well site plan pipeline of this alternative is attached.

10. Other Public Agencies Whose Approval is Required:

The proposed project would require the following approvals:

- Tahoe Regional Planning Authority – Public Service Application requiring a Governing Board approval, Scenic Assessment and Tree Removal Permit
- Lahontan Regional Water Quality Control Board (RWQCB) – Clean Water Act Section 401 Water Quality Certification, Optional NPDES permit for stormwater discharge during start up
- New STPUD sewer connection and permit
- State Water Resource Control Board, Division of Drinking Water – Amendment to LBWC's current Water Supply Permit



NOTES:
1. LOCATIONS, SIZES AND QUANTITIES ARE APPROXIMATE AND TO BE REFINED DURING DESIGN
2. (E) = EXISTING, (N) = NEW

Kennedy/Jenks Consultants

SOUH TAHOE PUBLIC UTILITY DISTRICT

SOUTH Y FEASIBILITY STUDY

ALTERNATIVE 2
REPLACEMENT WELL 1 AND GROUNDWATER TREATMENT FACILITY AT 843 HAZEL DRIVE

1770027*00

MARCH 2020

TAHOE REGIONAL PLANNING AGENCY

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New Applications Until 3:00 pm

Print Form

INITIAL ENVIRONMENTAL CHECKLIST FOR DETERMINATION OF ENVIRONMENTAL IMPACT

I. Assessor's Parcel Number (APN)/Project Location 023-65-518/ 843 Hazel Drive, South Lake Tahoe, El Dorado COunty

Project Name South Y PCE Facilities Feasibility Study - [illegible]

County/City El Dorado

Brief Description of Project:

See attached

The following questionnaire will be completed by the applicant based on evidence submitted with the application. All "Yes" and "No, With Mitigation" answers will require further written comments. Use the blank boxes to add any additional information. If more space is required for additional information, please attach separate sheets and reference the question number and letter.

II. ENVIRONMENTAL IMPACTS:

1. Land

Will the proposal result in:

a. Compaction or covering of the soil beyond the limits allowed in the land capability or Individual Parcel Evaluation System (IPES)?

No determination provided on Parcel Tracker. The replacement well and treatment will be constructed on 843 Hazel Drive, which is already developed.	☐ Yes	☐ No	
	☐ No, With Mitigation	☒ Data Insufficient	

b. A change in the topography or ground surface relief features of site inconsistent with the natural surrounding conditions?

The height of the well building and air stripper will be lower than County and City's standards	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Unstable soil conditions during or after completion of the proposal?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Changes in the undisturbed soil or native geologic substructures or grading in excess of 5 feet?

The construction will happen at previously developed site. Grading plan will be developed at the design phase and the 5 feet grading limitation can be incorporated.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

e. The continuation of or increase in wind or water erosion of soils, either on or off the site?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

f. Changes in deposition or erosion of beach sand, or changes in siltation, deposition or erosion, including natural littoral processes, which may modify the channel of a river or stream or the bed of a lake?

No construction near beach or Lake Tahoe.	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

g. Exposure of people or property to geologic hazards such as earthquakes, landslides, backshore erosion, avalanches, mud slides, ground failure, or similar hazards?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

2. Air Quality

Will the proposal result in:

a. Substantial air pollutant emissions?

Project will need Air Resources Control Board Permit.	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

b. Deterioration of ambient (existing) air quality?

Short term deterioration could be expected during construction but no permanent impact is anticipated.	☐ Yes	☐ No
	☒ No, With Mitigation	☐ Data Insufficient

c. The creation of objectionable odors?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

d. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

e. Increased use of diesel fuel?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

3. Water Quality

Will the proposal result in:

a. Changes in currents, or the course or direction of water movements?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Changes in absorption rates, drainage patterns, or the rate and amount of surface water runoff so that a 20 yr. 1 hr. storm runoff (approximately 1 inch per hour) cannot be contained on the site?

All runoff will be manage on site with new storm drain.	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Alterations to the course or flow of 100-yearflood waters?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Change in the amount of surface water in any water body?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

f. Alteration of the direction or rate of flow of ground water?

The pumping rate at the new extraction well is low enough to not alter the direction or rate of GW flow.

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

g. Change in the quantity of groundwater, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?

The pumping rate at the new extraction well is negligible comparing to the GW volume in the whole GW basin.

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

h. Substantial reduction in the amount of water otherwise available for public water supplies?

This alternative will operate LBWC 5 as lead well and LBWC 1 as lag well to meet the demand for LBWC system.

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

i. Exposure of people or property to water related hazards such as flooding and/or wave action from 100-year storm occurrence or seiches?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

j. The potential discharge of contaminants to the groundwater or any alteration of groundwater quality?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

k. Is the project located within 600 feet of a drinking water source?

The nearest drinking water well (LBWC 5) is more than 2,000 ft away.

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

4. Vegetation

Will the proposal result in:

a. Removal of native vegetation in excess of the area utilized for the actual development permitted by the land capability/IPES system?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

b. Removal of riparian vegetation or other vegetation associated with critical wildlife habitat, either through direct removal or indirect lowering of the groundwater table?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

c. Introduction of new vegetation that will require excessive fertilizer or water, or will provide a barrier to the normal replenishment of existing species?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

d. Change in the diversity or distribution of species, or number of any species of plants (including trees, shrubs, grass, crops, micro flora and aquatic plants)?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

e. Reduction of the numbers of any unique, rare or endangered species of plants?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

f. Removal of stream bank and/or backshore vegetation, including woody vegetation such as willows?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

g. Removal of any native live, dead or dying trees30 inches or greater in diameter at breast height (dbh) within TRPA's Conservation or Recreation land use classifications?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

h. A change in the natural functioning of an old growth ecosystem?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

5. Wildlife

Will the proposal result in:

a. Change in the diversity or distribution of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects, mammals, amphibians or microfauna)?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

b. Reduction of the number of any unique, rare or endangered species of animals?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Deterioration of existing fish or wildlife habitat quantity or quality?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

6. Noise

Will the proposal result in:

a. Increases in existing Community Noise Equivalency Levels (CNEL) beyond those permitted in the applicable Plan Area Statement, Community Plan or Master Plan?

The R1 site will have increased noise once the operating facilities are brought on-line. Noise control strategy will be incorporated in the design phase.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

b. Exposure of people to severe noise levels?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Single event noise levels greater than those set forth in the TRPA Noise Environmental Threshold?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. The placement of residential or tourist accommodation uses in areas where the existing CNEL exceeds 60 dBA or is otherwise incompatible?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

e. The placement of uses that would generate an incompatible noise level in close proximity to existing residential or tourist accommodation uses?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

f. Exposure of existing structures to levels of ground vibration that could result in structural damage?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

7. Light and Glare

Will the proposal:

a. Include new or modified sources of exterior lighting?

Site illumination will be further identified during design phase.	☒ Yes	☐ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Create new illumination which is more substantial than other lighting, if any, within the surrounding area?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Cause light from exterior sources to be cast off -site or onto public lands?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Create new sources of glare through the siting of the improvements or through the use of reflective materials?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

8. Land Use

Will the proposal:

a. Include uses which are not listed as permissible uses in the applicable Plan Area Statement, adopted Community Plan, or Master Plan?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Expand or intensify an existing non-conforming use?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

9. Natural Resources

Will the proposal result in:

a. A substantial increase in the rate of use of any natural resources?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Substantial depletion of any non-renewable natural resource?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

10. Risk of Upset

Will the proposal:

a. Involve a risk of an explosion or the release of hazardous substances including, but not limited to, oil, pesticides, chemicals, or radiation in the event of an accident or upset conditions?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Involve possible interference with an emergency evacuation plan?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

11. Population

Will the proposal:

a. Alter the location, distribution, density, or growth rate of the human population planned for the Region?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Include or result in the temporary or permanent displacement of residents?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

12. Housing

Will the proposal:

a. Affect existing housing, or create a demand for additional housing?

To determine if the proposal will affect existing housing or create a demand for additional housing, please answer the following questions:

(1) Will the proposal decrease the amount of housing in the Tahoe Region?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

(2) Will the proposal decrease the amount of housing in the Tahoe Region historically or currently being rented at rates affordable by lower and very-low-income households?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

Number of Existing Dwelling Units: _____

Number of Proposed Dwelling Units: _____

b. Will the proposal result in the loss of housing for lower-income and very-low-income households?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

13. Transportation/Circulation

Will the proposal result in:

a. Generation of 100 or more new Daily Vehicle Trip Ends (DVTE)?

DVTE might increase during construction but coordination can be made to mitigate the impact.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

b. Changes to existing parking facilities, or demand for new parking?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Substantial impact upon existing transportation systems, including highway, transit, bicycle or pedestrian facilities?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Alterations to present patterns of circulation or movement of people and/or goods?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

e. Alterations to waterborne, rail or air traffic?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

f. Increase in traffic hazards to motor vehicles, bicyclists, or pedestrians?

Traffic hazards could increase during construction. Traffic control plan will be required from the Contractor to mitigate the impact.	☐ Yes	☐ No
	☒ No, With Mitigation	☐ Data Insufficient

14. Public Services

Will the proposal have an unplanned effect upon, or result in a need for new or altered governmental services in any of the following areas?

a. Fire protection?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

b. Police protection?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

c. Schools?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

d. Parks or other recreational facilities?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

e. Maintenance of public facilities, including roads?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

f. Other governmental services?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

15. Energy

Will the proposal result in:

a. Use of substantial amounts of fuel or energy?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

16. Utilities

Except for planned improvements, will the proposal result in a need for new systems, or substantial alterations to the following utilities:

a. Power or natural gas?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Communication systems?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Utilize additional water which amount will exceed the maximum permitted capacity of the service provider?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Utilize additional sewage treatment capacity which amount will exceed the maximum permitted capacity of the sewage treatment provider?

The treated water will be disposed to the sewer but the discharge rate will be capped by the allowed capacity.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

e. Storm water drainage?

Treated water might be discharged to the SD during dry season but it needs coordination and communication with the City of SLT.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

f. Solid waste and disposal?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

17. Human Health

Will the proposal result in:

a. Creation of any health hazard or potential health hazard (excluding mental health)?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Exposure of people to potential health hazards?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

18. Scenic Resources/Community Design

Will the proposal:

a. Be visible from any state or federal highway, Pioneer Trail or from Lake Tahoe?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Be visible from any public recreation area or TRPA designated bicycle trail?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

c. Block or modify an existing view of Lake Tahoe or other scenic vista seen from a public road or other public area?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

d. Be inconsistent with the height and design standards required by the applicable ordinance or Community Plan?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

e. Be inconsistent with the TRPA Scenic Quality Improvement Program (SQIP) or Design Review Guidelines?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

19. Recreation

Does the proposal:

a. Create additional demand for recreation facilities?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Create additional recreation capacity?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

c. Have the potential to create conflicts between recreation uses, either existing or proposed?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

d. Result in a decrease or loss of public access to any lake, waterway, or public lands?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

20. Archaeological/Historical

a. Will the proposal result in an alteration of or adverse physical or aesthetic effect to a significant archaeological or historical site, structure, object or building?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Is the proposed project located on a property with any known cultural, historical, and/or archaeological resources, including resources on TRPA or other regulatory official maps or records?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

c. Is the property associated with any historically significant events and/or sites or persons?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

d. Does the proposal have the potential to cause a physical change which would affect unique ethnic cultural values?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

e. Will the proposal restrict historic or pre-historic religious or sacred uses within the potential impact area?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

21. Findings of Significance.

a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California or Nevada history or prehistory?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time, while long-term impacts will endure well into the future.)

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environmental is significant?)

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

d. Does the project have environmental impacts which will cause substantial adverse effects on human being, either directly or indirectly?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

DECLARATION:

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this initial evaluation to the best ofmy ability, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.

Signature: (Original signature required.)

_____ At _____ Date: _____

Person Preparing Application — County

Applicant Written Comments: (Attach additional sheets if necessary)

Print Form

FOR OFFICE USE ONLY

Date Received: _____ By: _____

Determination:

On the basis of this evaluation:

a. The proposed project could not have a significant effect on the environment and a finding of no significant effect shall be prepared in accordance with TRPA's Rules of Procedure.

☐ Yes ☐ No

b. The proposed project could have a significant effect on the environment, but due to the listed mitigation measures which have been added to the project, could have no significant effect on the environment and a mitigated finding of no significant effect shall be prepared in accordance with TRPA's Rules and Procedures.

☐ Yes ☐ No

c. The proposed project may have a significant effect on the environment and an environmental impact statement shall be prepared in accordance with Chapter 3 of the TRPA Code of Ordinances and the Rules of Procedure.

☐ Yes ☐ No

_____ Date: _____

Signature of Evaluator

Title of Evaluator

The following is to be used as a supplemental checklist for the Tahoe Regional Planning Agency Initial Environmental Checklist (IEC). It is to be used when reviewing any development right transfer pursuant to Chapter 34 of the Code of Ordinances or Conversion of Use pursuant to Chapter 33 of the Code of Ordinances. Any question answered in the affirmative will require written documentation showing that the impacts will be mitigated to a less than significant level. Otherwise, an environmental impact statement will be required.

The asterisk (*) notes threshold subjects.

a) Land*
Does the proposal result in any additional land coverage?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

b) Air Quality*
Does the proposal result in any additional emission?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

c) Water*
Does the proposal result in any additional discharge that is in violation of TRPA discharge standards?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

d) Does the proposal result in an increase in the volume of discharge?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

e) Noise*
Does the proposal result in an increase in Community Noise Equivalency Level (CNEL)?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

f) Aesthetics

Does the proposal result in blockage of significant views to Lake Tahoe or an identified visual resource?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

g) Recreation*

Does the proposal result in a reduction of public access to public recreation areas or public recreation opportunities?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

h) Land Use

Does the converted or transferred use result in a use that is not consistent with the goals and policies of the Community Plan or Plan Area Statement?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

i) Population

Does the proposal result in an increase in the existing or planned population of the Region?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

j) Housing

Does the proposal result in the loss of affordable housing?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

k) Transportation

Does the proposal result in the increase of 100 Daily Vehicle Trip Ends (DVTE)?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

l) Does the proposal result in a project that does not meet the parking standards?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

m) Utilities

Does the proposal result in additional water use?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

n) Does the proposal result in the need for additional sewer treatment?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

o) Historical

Does the proposal result in the modification or elimination of a historic structure or site?

☐ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

DECLARATION:

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this initial evaluation to the best of my ability, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.

Signature: (Original signature required.)

_____ At _____ Date: _____

Person Preparing Application — County

Applicant Written Comments: (Attach additional sheets if necessary)

Print Form

TRPA Initial Environmental Checklist

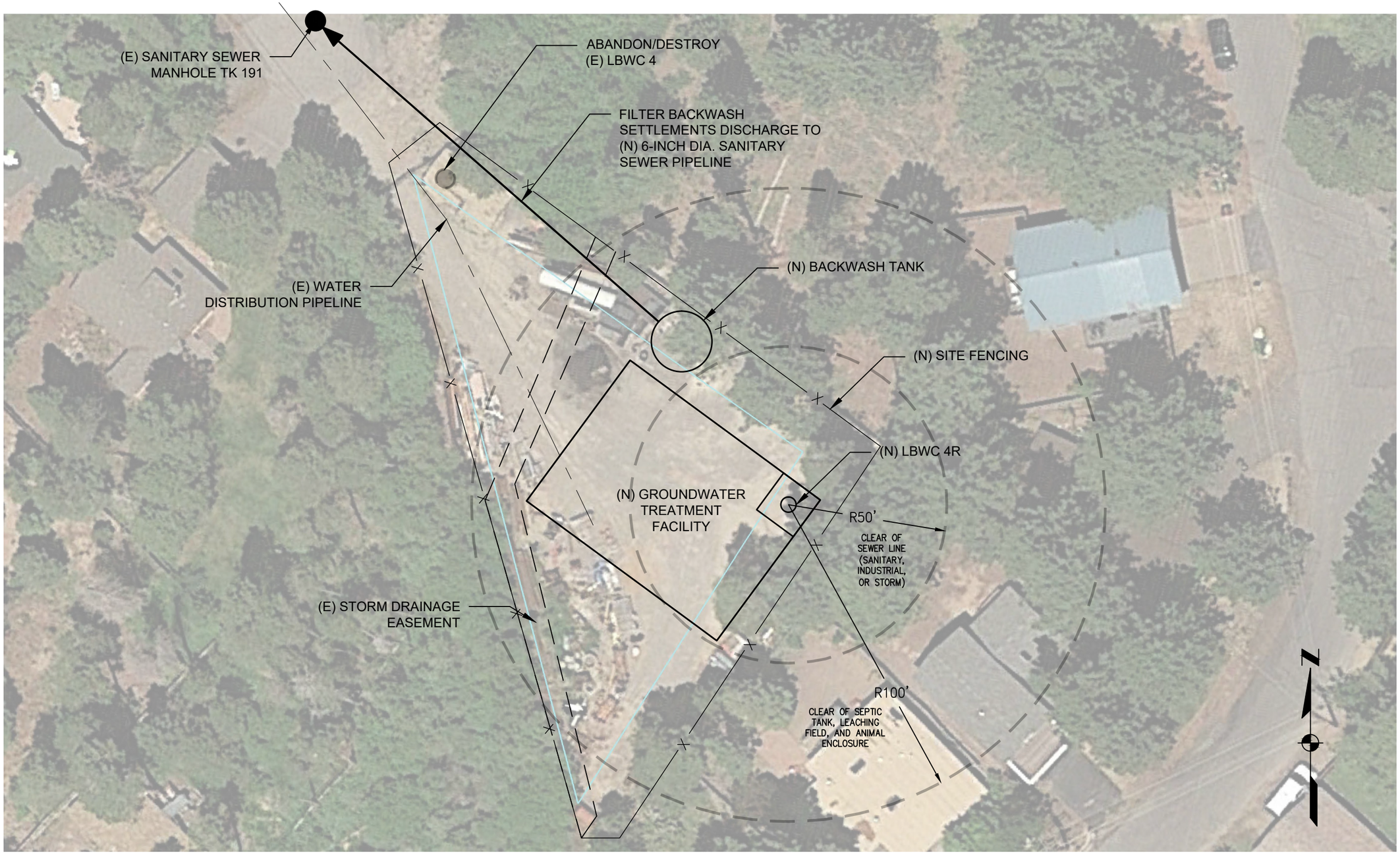
Brief Description of Project

A Feasibility Study of Remedial Alternatives (FS) is underway to address tetrachloroethylene (PCE) contamination found in groundwater within the South "Y" Area of the City of South Lake Tahoe, El Dorado County, California; herein referred to as the South "Y" Plume. The South "Y" plume occurs within the west central portion of the Tahoe Valley South Sub-basin (TVS basin). PCE has been detected in water supply wells in the South Y area since 1989. Many of the supply wells were taken out of service due to PCE concentrations exceeding the drinking water standard of 5 µg/L.

As outlined in the FS workplan, three interim remediation alternatives are developed to mitigate PCE contamination in drinking water wells in the area. Alternative 2 of the FS proposed increased pumping at Lukins Brothers Water Company (LBWC) Well #5, a new extraction well, LBWC 4R,and treatment to remove PCE and naturally occurring iron and manganese. Wells at LBWC would be operated to meet water system demands in a manner that would result in increased contaminant removal and plume containment.

Preliminary analysis for this alternative indicates the need for a new extraction well and related treatment and well building at the existing LBWC 4 site. A new well is proposed to be drilled to depths of up to 150 feet below ground surface. The extraction well will be screened in between 50'-150' and equipped with a 200 gallons per minute (gpm) well pump and motor. A new well house will be constructed to protect the well and mitigate noise. Groundwater from the extraction well will be treated for PCE removal, iron and manganese removal and used for potable drinking water. During startup for up to one year, discharge to sanitary sewer and/or storm drain through a 6-inch sewer line could occur. Further, more detailed development of Alternative 2 will occur to confirm the depth of the well, pumping capacity, groundwater treatment option and discharge pipe size. This initial checklist also assumes to use Granular Activated Carbon (GAC) for PCE removal, pyrolucite/greensand media for iron and manganese removal and 6-inch diameter sewer line for discharge.

A Figure showing the extraction well site plan of this alternative is attached.



NOTES:
1. LOCATIONS, SIZES AND QUANTITIES ARE APPROXIMATE AND TO BE REFINED DURING DESIGN
2. (E) = EXISTING, (N) = NEW

Kennedy/Jenks Consultants

SOUH TAHOE PUBLIC UTILITY DISTRICT
SOUTH Y FEASIBILITY STUDY

ALTERNATIVE 2
EXTRACTION WELL & TREATMENT
AT LBWC WELL 4 SITE

1770027*00
FEBRUARY 2020

Note: This Environmental checklist is being completed for alternatives which are at an early stage of development as part of the South Y Feasibility Study. Responses provided are preliminary.

CEQA APPENDIX G: ENVIRONMENTAL CHECKLIST FORM

NOTE: The following is a sample form and may be tailored to satisfy individual agencies' needs and project circumstances. It may be used to meet the requirements for an initial study when the criteria set forth in CEQA Guidelines have been met. Substantial evidence of potential impacts that are not listed on this form must also be considered. The sample questions in this form are intended to encourage thoughtful assessment of impacts, and do not necessarily represent thresholds of significance.

1. Project title: South Y PCE Facilities Feasibility Study - Alternative 3 Conversion to Surface Water Supply
2. Lead agency name and address:
   South Tahoe Public Utility District
   1275 Meadow Crest Dr, South Lake Tahoe, CA 96150
3. Contact person and phone number: Ivo Bergsohn, (530) 543-6204
4. Project location: See attached
5. Project sponsor's name and address:
   South Tahoe Public Utility District
   1275 Meadow Crest Dr, South Lake Tahoe, CA 96150
6. General plan designation: Low-Density Residential (LDR) per South Lake Tahoe General Plan adopted on May 17, 2011
7. Zoning: Zoning 6: RES; Zoning 7: VAC; Zoning 8: Non-Res.Improvements <=2.5 AC.
8. Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)
   See attached
9. Surrounding land uses and setting: Briefly describe the project's surroundings:
   The proposed WTP site is adjacent to single-family residencies located along Texas Ave at the TKPOA existing Lagoon WTP site.
   The proposed Intake Pump Station (IPS) site is located at the end of Ala Wai Road on the bear near the TKPOA offices and the designated land use is recreation. The raw water pipeline extends 2,500 feet into Lake Tahoe from the IPS.
10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)
    See attached
11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun?
    No since the project is in very early conceptual stages, consultation will occur when additional project development has occurred

    NOTE: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21083.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

[x] Aesthetics	[ ] Agriculture and Forestry Resources	[x] Air Quality
[x] Biological Resources	[ ] Cultural Resources	[x] Geology /Soils
[x] Greenhouse Gas Emissions	[ ] Hazards & Hazardous Materials	[x] Hydrology / Water Quality
[ ] Land Use / Planning	[ ] Mineral Resources	[x] Noise
[ ] Population / Housing	[ ] Public Services	[ ] Recreation
[x] Transportation/Traffic	[ ] Tribal Cultural Resources	[x] Utilities/Service Systems

[ ] Mandatory Findings of Significance

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

[ ] I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

[ ] I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

[ ] I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

[ ] I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

[ ] I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature _____ Date _____

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) the significance criteria or threshold, if any, used to evaluate each question; and

   b) the mitigation measure identified, if any, to reduce the impact to less than significance

SAMPLE QUESTIONS

Issues:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista? Submersible pumps along shoreline in small building, some mitigation required	☐	☐	X	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	X
c) Substantially degrade the existing visual character or quality of the site and its surroundings? Submersibloe pumps along shoreline in small building, some mitigation required	☐	☐	X	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? The lagoon site and the Tahoe Keys beach property both have existing lighting, some additional lighting for new infrastructure may be merited	☐	☐	☐	X
II. AGRICULTURE AND FORESTRY RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒
III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:		Short term impact could be expected during construction but the Contractor will be required to provide mitigations. No permanent deterioration of ambient air quality is anticipated		
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone	☐	☐	☒	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
precursors)?				
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐
IV. BIOLOGICAL RESOURCES: Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☒	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

There are likely no special-status plant or animal species on the previously disturbed lagoon site for the proposed WTP. The implementation of the raw water intake and pump station may need mitigation measures to keep impact to special-status species near the shoreline and within 2,500 LF radius from the shoreline to less than significant.

The proposed sites are previously disturbed sites.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☐	☒
VI. GEOLOGY AND SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒

None of the project components would be located on or near a known fault.

Intake pipeline would be drilled below the bottom of Lake Tahoe. The proposed WTP site has a relatively flat ground elevation.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
VII. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? Additional operational power usage will likely be required, diesel generator may be needed.	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒
VIII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? Chlorine will be used as disinfectant in liquid form and no gaseous chlorine will be used.	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐
IX. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
The proposed project would rely on the extraction of surface water from the lake as opposed to groundwater sources. Stormwater runoff quality will be managed with best management practices				
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☒	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
	Horizontal directional drilling will be used to minimize lakebed disturbance during the installation of the intake pipeline within Lake Tahoe.			
f) Otherwise substantially degrade water quality?	☐	☒	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
	The proposed project does not include construction of housing.			
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒
X. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	X
XI. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	X
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	X
XII. NOISE -- Would the project result in:	Noise level could increase during construction phase. The Lagoon site could have increased noise once the operating facilities are brought online. Noise control strategy would be incoporated in the design phase .			
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	X	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	X
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	X	☐	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	X	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	X

Planning level cost for sound attenuated enclosure for noise mitigation is estimated at $20k each for the intake pump station, treatment plant site for $ 40k in total.

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
XIV. PUBLIC SERVICES.				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☐
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒
XV. RECREATION.				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

XVI. TRANSPORTATION/TRAFFIC.

The proposed project would not create any long-term change in transportation. During construction, short-term traffic increase could be expected.

Would the project:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☒	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. TRIBAL CULTURAL RESOURCES				
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVIII. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIX. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

Note: Authority cited: Sections 21083 and 21083.05, 21083.09 Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21073, 21074 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21080.3.1, 21080.3.2,21082.3, 21084.2, 21084.3, 21093, 21094, 21095, and 21151, Public Resources Code; *Sundstrom v. County of Mendocino,* (1988) 202 Cal.App.3d 296; *Leonoff v. Monterey Board of Supervisors,* (1990) 222 Cal.App.3d 1337; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

4. Project Location

The proposed surface drinking water treatment plant (WTP) would be constructed on the lagoon site (APN No. 022200005), which is currently owned by Tahoe Keys Water Company. The proposed project would require a new lake intake near the Tahoe Keys offices, which is approximately 1.0 mile from the WTP building site. The project would also include the construction of a raw water intake pump station and may require installation of a new water transmission pipeline between the intake station and the treatment plant building. Existing pipelines that are currently unused will be used as much as feasible. An overview map is provided in Figure 1.

8. Description of the Project

A Feasibility Study of Remedial Alternatives (FS) is underway to address tetrachloroethylene (PCE) contamination found in groundwater within the South "Y" Area of the City of South Lake Tahoe, El Dorado County, California; herein referred to as the South "Y" Plume. The South "Y" plume occurs within the west central portion of the Tahoe Valley South Sub-basin (TVS basin). PCE have been detected in water supply wells in the South Y area since 1989. Many of the supply wells were taken out of the services due to PCE concentrations exceeding the drinking water standard of 5 μg/L.

As outlined in the FS workplan, three interim remediation alternatives are developed to mitigate PCE contamination in drinking water wells in the area. Alternative 3 of the FS proposed the conversion from contaminated groundwater to surface water, using the South Tahoe Public Utility District's existing surface water rights from Lake Tahoe. After the full implementation of the surface WTP which could take many years, Lukins Brother Water Company (LBWC) Well#1 and Tahoe Keys Water Company (TKWC) Well #3 will serve as the backup supply, while LBWC Well #5 and TKWC Well #2 will be abandoned due to PCE contamination detected.

This alternative includes building a new drinking water treatment plant (WTP) at the lagoon site on TKWC property as shown on Figure 2. The new drinking WTP will use Lake Tahoe surface water as its source with a treatment capacity of 3,100 gallons per minute (gpm) or 4.4 million gallons per day (MGD). The raw water pipeline is assumed to extend 2,500 linear feet (LF) into the Lake from the shore of Tahoe Key's beach property using trenchless technology to avoid suspending sediments. A raw water intake pump station (IPS) is proposed to be built on Tahoe Key's beach property at the landward end of the raw water pipeline. The IPS would be used to house the raw water intake pumps installed within a below-grade pump sump and the instrumentation and controls necessary to operate the intake pumps(Figure 2). A raw water pipeline from the IPS will follow the alignment of Ala Wai Blvd and Venice Dr and tie into the existing raw water line near TKWC Well #2. The new WTP features would likely include a skid mounted membrane filtration process; ultra-violet (UV) disinfection; post chlorination disinfection for water distribution disinfection residual maintenance and treated water clear well storage facility (Figure 3). Additional infrastructure need for this alternative also include electrical and facility piping. Other assumptions related to the new WTP are described below:

1. The size of the raw water IPS on Tahoe Keys beach property is assumed to have a footprint of 30' x 51'. This assumption is based on the design of a similar facility near Tahoe City, which has a similar intake and treatment condition.
2. New raw water pipelines will be installed from the lake intake facilities to the IPS and from the IPS to the proposed WTP but the distribution of the treated water will rely on existing

distribution systems. There is potential to reuse existing unused pipelines if condition, size, and location are appropriate.

3. Waterborne pathogens will be removed from the raw water through filtration and any that remain following filtration will be inactivated at the WTP using UV disinfection and chlorination using sodium hypochlorite to maintain a disinfection residual.

A Figure showing the infrastructure locations of this alternative is attached.

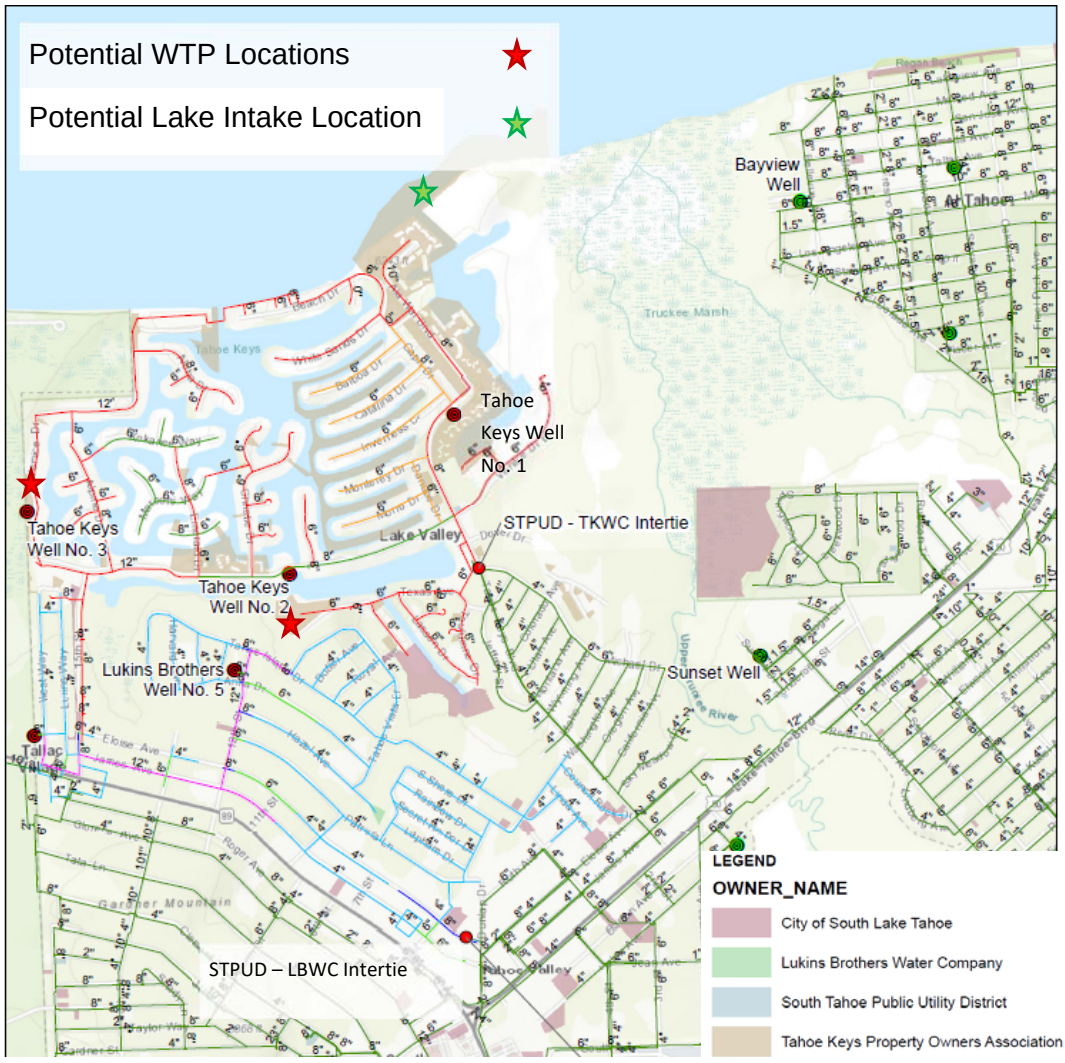
10. Other Public Agencies Whose Approval is Required:

The proposed project would require the following approvals:

- U.S. Army Corps of Engineers – Clean Water Act Section 404 Permit for expansion/construction of the lake intake
- Tahoe Regional Planning Authority – Public Service Application requiring a Governing Board approval, Scenic Assessment, Shorezone Permit, and Tree Removal Permit
- California Department of Fish and Wildlife (CDFW) – Streambed Alteration Agreement for alteration of Lake Tahoe lakebed
- Lahontan Regional Water Quality Control Board (RWQCB) – Clean Water Act Section 401 Water Quality Certification
- State Water Resource Control Board, Division of Drinking Water – Amendment to STPUD's current Water Supply Permit
- State Water Resource Control Board, Division of Water Rights – Amendment to STPUD's existing water rights permits
- City of South Lake Tahoe – Minor Use Permit and Encroachment Permit (for pipe installation)

South Y Feasibility – CEQA Information for Alternative 3 – Surface Water Treatment Plant

Figure 1: Alternative 3 Site Map



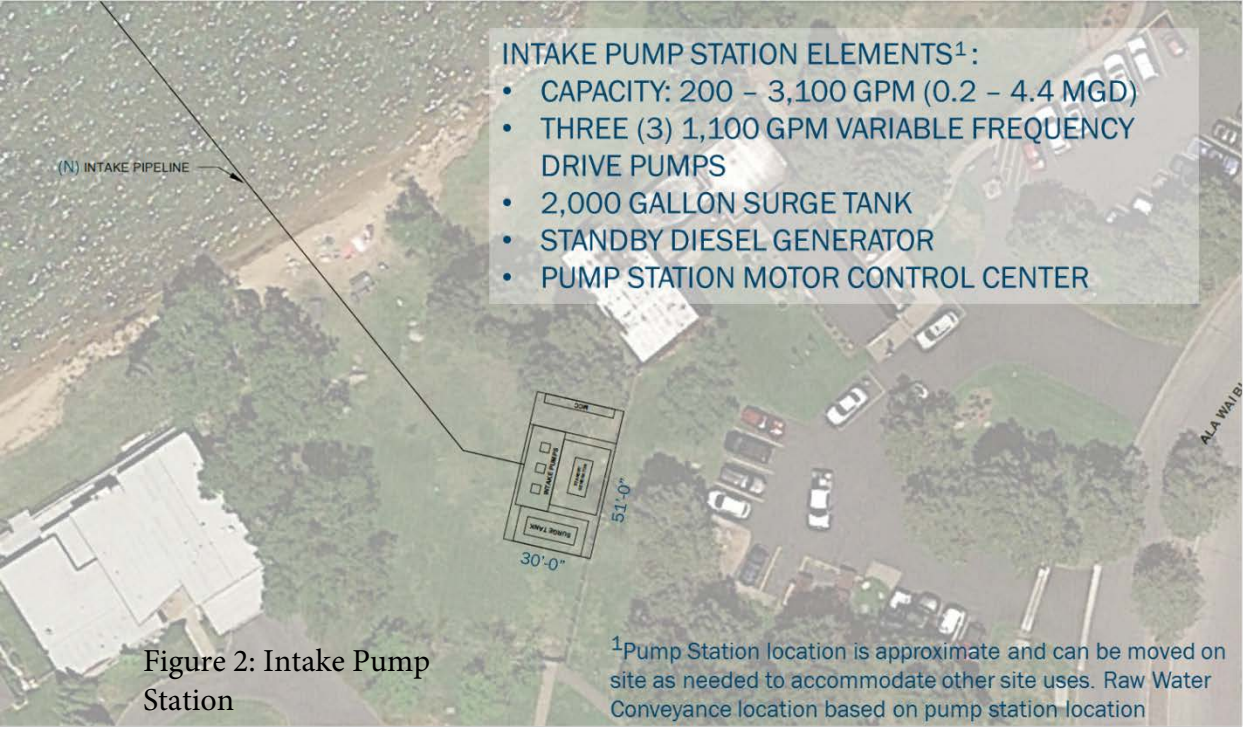


Figure 2: Intake Pump Station

[1]Pump Station location is approximate and can be moved on site as needed to accommodate other site uses. Raw Water Conveyance location based on pump station location

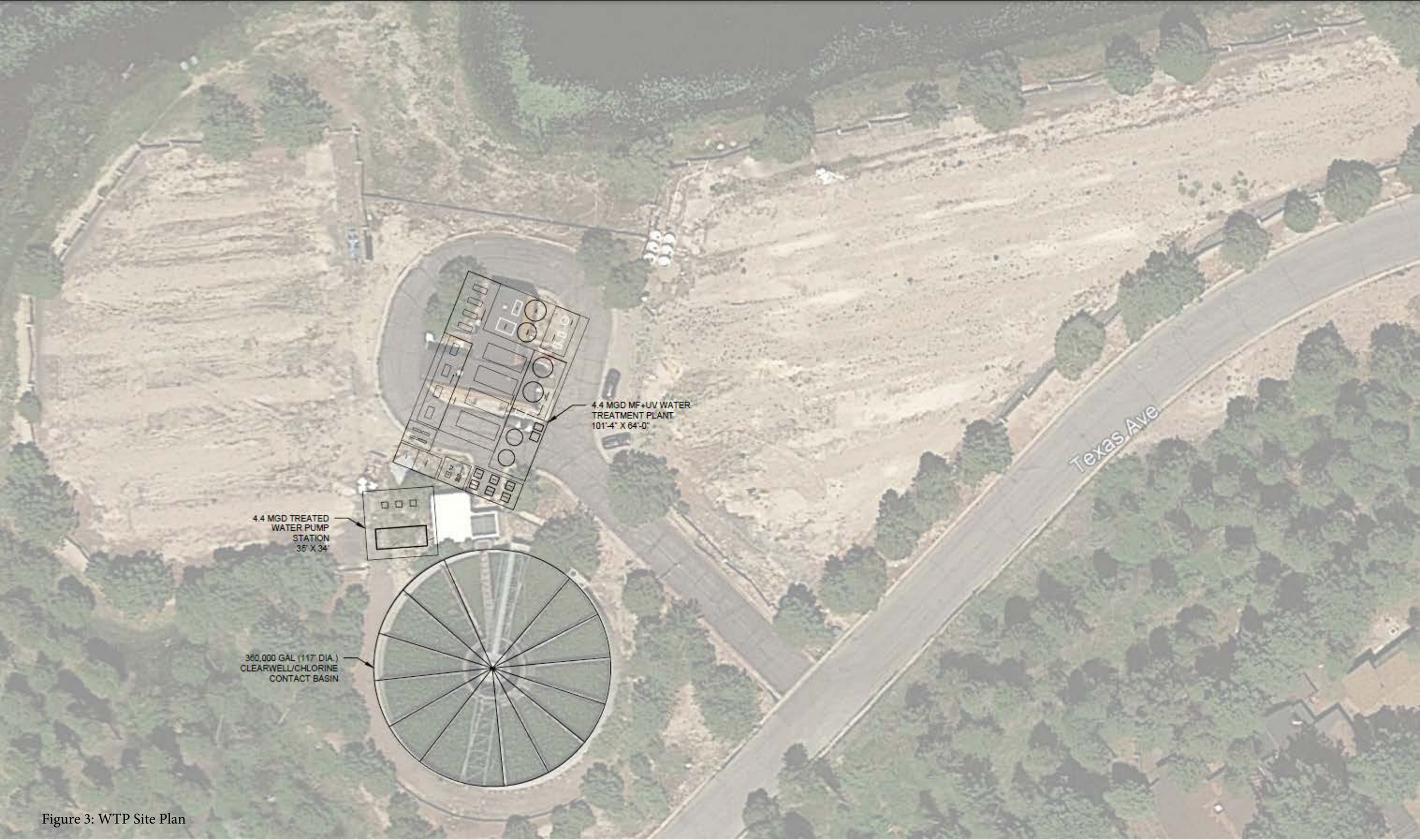


Figure 3: WTP Site Plan

TAHOE REGIONAL PLANNING AGENCY

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INITIAL ENVIRONMENTAL CHECKLIST FOR DETERMINATION OF ENVIRONMENTAL IMPACT

I. Assessor's Parcel Number (APN)/Project Location **022200005/ PO Box 1239, South Lake Tahoe,CA 96156**

Project Name **South Y PCE Facilities Feasibility Study -** County/City **El Dorado**

Brief Description of Project:

See Attached document

Note: This Environmental checklist is being completed for alternatives which are at an early stage of development as part of the South Y Feasibility Study. Responses provided are preliminary.

The following questionnaire will be completed by the applicant based on evidence submitted with the application. All "Yes" and "No, With Mitigation" answers will require further written comments. Use the blank boxes to add any additional information. If more space is required for additional information, please attach separate sheets and reference the question number and letter.

II. ENVIRONMENTAL IMPACTS:

1. Land

Will the proposal result in:

a. Compaction or covering of the soil beyond the limits allowed in the land capability or Individual Parcel Evaluation System (IPES)?

	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

b. A change in the topography or ground surface relief features of site inconsistent with the natural surrounding conditions?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Unstable soil conditions during or after completion of the proposal?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Changes in the undisturbed soil or native geologic substructures or grading in excess of 5 feet?

The installation of the proposed infrastructures will be located at existing disturbed area. The lagoon site had treatment facilities to treat water from the lagoon.	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

e. The continuation of or increase in wind or water erosion of soils, either on or off the site?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

f. Changes in deposition or erosion of beach sand, or changes in siltation, deposition or erosion, including natural littoral processes, which may modify the channel of a river or stream or the bed of a lake?

Construction related disturbance may occur during the installation of intake pipeline into the lake by trenchless technique, no permanent disturbance anticipated	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

g. Exposure of people or property to geologic hazards such as earthquakes, landslides, backshore erosion, avalanches, mud slides, ground failure, or similar hazards?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

2. Air Quality

Will the proposal result in:

a. Substantial air pollutant emissions?

The WTP is assumed to rely on membrane filtration treatment which will be enclosed in a building, potential need for emergency generator to be evaluated.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

b. Deterioration of ambient (existing) air quality?

Short term deterioration could be expected during construction but no permanent impact is anticipated.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

c. The creation of objectionable odors?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

e. Increased use of diesel fuel?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

3. Water Quality

Will the proposal result in:

a. Changes in currents, or the course or direction of water movements?

The volume of water removed from the lake is negligible therefore changes in currents not expected.	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

b. Changes in absorption rates, drainage patterns, or the rate and amount of surface water runoff so that a 20 yr. 1 hr. storm runoff (approximately 1 inch per hour) cannot be contained on the site?

All runoff will be manage on site with new runoff best management practices	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

c. Alterations to the course or flow of 100-yearflood waters?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

d. Change in the amount of surface water in any water body?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

f. Alteration of the direction or rate of flow of ground water?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

g. Change in the quantity of groundwater, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

h. Substantial reduction in the amount of water otherwise available for public water supplies?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

i. Exposure of people or property to water related hazards such as flooding and/or wave action from 100-year storm occurrence or seiches?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

j. The potential discharge of contaminants to the groundwater or any alteration of groundwater quality?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

k. Is the project located within 600 feet of a drinking water source?

The lagoon site proposed for the new surface water treatment plant is within 600 ft of Tahoe Keys Well No.2, which is an active drinking water well.

☒ Yes ☐ No

☐ No, With Mitigation ☐ Data Insufficient

4. Vegetation

Will the proposal result in:

a. Removal of native vegetation in excess of the area utilized for the actual development permitted by the land capability/IPES system?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

b. Removal of riparian vegetation or other vegetation associated with critical wildlife habitat, either through direct removal or indirect lowering of the groundwater table?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

c. Introduction of new vegetation that will require excessive fertilizer or water, or will provide a barrier to the normal replenishment of existing species?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

d. Change in the diversity or distribution of species, or number of any species of plants (including trees, shrubs, grass, crops, micro flora and aquatic plants)?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

e. Reduction of the numbers of any unique, rare or endangered species of plants?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

f. Removal of stream bank and/or backshore vegetation, including woody vegetation such as willows?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

g. Removal of any native live, dead or dying trees30 inches or greater in diameter at breast height (dbh) within TRPA's Conservation or Recreation land use classifications?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

h. A change in the natural functioning of an old growth ecosystem?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

5. Wildlife

Will the proposal result in:

a. Change in the diversity or distribution of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects, mammals, amphibians or microfauna)?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

b. Reduction of the number of any unique, rare or endangered species of animals?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Deterioration of existing fish or wildlife habitat quantity or quality?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

6. Noise

Will the proposal result in:

a. Increases in existing Community Noise Equivalency Levels (CNEL) beyond those permitted in the applicable Plan Area Statement, Community Plan or Master Plan?

The Lagoon site and intake pump station may have increased noise once the operating facilities are brought on-line. Cost for noise mitigation is estimated at $40k.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

b. Exposure of people to severe noise levels?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Single event noise levels greater than those set forth in the TRPA Noise Environmental Threshold?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. The placement of residential or tourist accommodation uses in areas where the existing CNEL exceeds 60 dBA or is otherwise incompatible?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

e. The placement of uses that would generate an incompatible noise level in close proximity to existing residential or tourist accommodation uses?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

f. Exposure of existing structures to levels of ground vibration that could result in structural damage?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

7. Light and Glare

Will the proposal:

a. Include new or modified sources of exterior lighting?

The lagoon site and the intake pump station property both have existing lighting and will need minimal additional lighting for new infrastructure.	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Create new illumination which is more substantial than other lighting, if any, within the surrounding area?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Cause light from exterior sources to be cast off -site or onto public lands?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Create new sources of glare through the siting of the improvements or through the use of reflective materials?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

8. Land Use

Will the proposal:

a. Include uses which are not listed as permissible uses in the applicable Plan Area Statement, adopted Community Plan, or Master Plan?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Expand or intensify an existing non-conforming use?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

9. Natural Resources

Will the proposal result in:

a. A substantial increase in the rate of use of any natural resources?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Substantial depletion of any non-renewable natural resource?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

10. Risk of Upset

Will the proposal:

a. Involve a risk of an explosion or the release of hazardous substances including, but not limited to, oil, pesticides, chemicals, or radiation in the event of an accident or upset conditions?

The new surface water treatment plant will use chlorine for disinfection. Liquid chlorine will be used instead of gas chlorine to minimize hazards.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

b. Involve possible interference with an emergency evacuation plan?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

11. Population

Will the proposal:

a. Alter the location, distribution, density, or growth rate of the human population planned for the Region?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Include or result in the temporary or permanent displacement of residents?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

12. Housing

Will the proposal:

a. Affect existing housing, or create a demand for additional housing?

To determine if the proposal will affect existing housing or create a demand for additional housing, please answer the following questions:

(1) Will the proposal decrease the amount of housing in the Tahoe Region?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

(2) Will the proposal decrease the amount of housing in the Tahoe Region historically or currently being rented at rates affordable by lower and very-low-income households?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

Number of Existing Dwelling Units: _____

Number of Proposed Dwelling Units: _____

b. Will the proposal result in the loss of housing for lower-income and very-low-income households?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

13. Transportation/Circulation

Will the proposal result in:

a. Generation of 100 or more new Daily Vehicle Trip Ends (DVTE)?

DVTE might increase temporarily during construction but measures can be taken, if necessary, to mitigate the impact.	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

b. Changes to existing parking facilities, or demand for new parking?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Substantial impact upon existing transportation systems, including highway, transit, bicycle or pedestrian facilities?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

d. Alterations to present patterns of circulation or movement of people and/or goods?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

e. Alterations to waterborne, rail or air traffic?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

f. Increase in traffic hazards to motor vehicles, bicyclists, or pedestrians?

Traffic hazards could increase during construction because of truck traffic which will be analyzed as the project develops.	☐ Yes	☐ No
	☒ No, With Mitigation	☐ Data Insufficient

14. Public Services

Will the proposal have an unplanned effect upon, or result in a need for new or altered governmental services in any of the following areas?

a. Fire protection?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

b. Police protection?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

c. Schools?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

d. Parks or other recreational facilities?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

e. Maintenance of public facilities, including roads?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

f. Other governmental services?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

15. Energy

Will the proposal result in:

a. Use of substantial amounts of fuel or energy?

WTP and intake pump station will both require energy usage which ultimately replaces groundwater pumping energy usage	☒ Yes	☐ No
	☐ No, With Mitigation	☐ Data Insufficient

b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

16. Utilities

Except for planned improvements, will the proposal result in a need for new systems, or substantial alterations to the following utilities:

a. Power or natural gas?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

b. Communication systems?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

c. Utilize additional water which amount will exceed the maximum permitted capacity of the service provider?

	☐ Yes	☒ No
	☐ No, With Mitigation	☐ Data Insufficient

d. Utilize additional sewage treatment capacity which amount will exceed the maximum permitted capacity of the sewage treatment provider?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

e. Storm water drainage?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

f. Solid waste and disposal?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

17. Human Health

Will the proposal result in:

a. Creation of any health hazard or potential health hazard (excluding mental health)?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

b. Exposure of people to potential health hazards?

☐ Yes ☒ No ☐ No, With Mitigation ☐ Data Insufficient

18. Scenic Resources/Community Design

Will the proposal:

a. Be visible from any state or federal highway, Pioneer Trail or from Lake Tahoe?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

b. Be visible from any public recreation area or TRPA designated bicycle trail?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

c. Block or modify an existing view of Lake Tahoe or other scenic vista seen from a public road or other public area?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

d. Be inconsistent with the height and design standards required by the applicable ordinance or Community Plan?

☐ Yes ☐ No

☒ No, With Mitigation ☐ Data Insufficient

e. Be inconsistent with the TRPA Scenic Quality Improvement Program (SQIP) or Design Review Guidelines?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

19. Recreation

Does the proposal:

a. Create additional demand for recreation facilities?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Create additional recreation capacity?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

c. Have the potential to create conflicts between recreation uses, either existing or proposed?

The intake pipeline will be designed to avoid conflict with the nearby boat channel	☐ Yes	☐ No	
	☒ No, With Mitigation	☐ Data Insufficient	

d. Result in a decrease or loss of public access to any lake, waterway, or public lands?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

20. Archaeological/Historical

a. Will the proposal result in an alteration of or adverse physical or aesthetic effect to a significant archaeological or historical site, structure, object or building?

	☐ Yes	☒ No	
	☐ No, With Mitigation	☐ Data Insufficient	

b. Is the proposed project located on a property with any known cultural, historical, and/or archaeological resources, including resources on TRPA or other regulatory official maps or records?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

c. Is the property associated with any historically significant events and/or sites or persons?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

d. Does the proposal have the potential to cause a physical change which would affect unique ethnic cultural values?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

e. Will the proposal restrict historic or pre-historic religious or sacred uses within the potential impact area?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

21. Findings of Significance.

a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California or Nevada history or prehistory?

☐ Yes ☒ No
☐ No, With Mitigation ☐ Data Insufficient

b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time, while long-term impacts will endure well into the future.)

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environmental is significant?)

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

d. Does the project have environmental impacts which will cause substantial adverse effects on human being, either directly or indirectly?

☐ Yes ☒ No

☐ No, With Mitigation ☐ Data Insufficient

DECLARATION:

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this initial evaluation to the best ofmy ability, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.

Signature: (Original signature required.)

_____ At _____ Date: _____

Person Preparing Application — County

Applicant Written Comments: (Attach additional sheets if necessary)

Print Form

FOR OFFICE USE ONLY

Date Received: _____ By: _____

Determination:

On the basis of this evaluation:

a. The proposed project could not have a significant effect on the environment and a finding of no significant effect shall be prepared in accordance with TRPA's Rules of Procedure.

☐ Yes ☐ No

b. The proposed project could have a significant effect on the environment, but due to the listed mitigation measures which have been added to the project, could have no significant effect on the environment and a mitigated finding of no significant effect shall be prepared in accordance with TRPA's Rules and Procedures.

☐ Yes ☐ No

c. The proposed project may have a significant effect on the environment and an environmental impact statement shall be prepared in accordance with Chapter 3 of the TRPA Code of Ordinances and the Rules of Procedure.

☐ Yes ☐ No

_____ Date: _____

Signature of Evaluator

Title of Evaluator

The following is to be used as a supplemental checklist for the Tahoe Regional Planning Agency Initial Environmental Checklist (IEC). It is to be used when reviewing any development right transfer pursuant to Chapter 34 of the Code of Ordinances or Conversion of Use pursuant to Chapter 33 of the Code of Ordinances. Any question answered in the affirmative will require written documentation showing that the impacts will be mitigated to a less than significant level. Otherwise, an environmental impact statement will be required.

The asterisk (*) notes threshold subjects.

a) Land*
Does the proposal result in any additional land coverage?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

b) Air Quality*
Does the proposal result in any additional emission?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

c) Water*
Does the proposal result in any additional discharge that is in violation of TRPA discharge standards?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

d) Does the proposal result in an increase in the volume of discharge?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

e) Noise*
Does the proposal result in an increase in Community Noise Equivalency Level (CNEL)?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

f) Aesthetics

Does the proposal result in blockage of significant views to Lake Tahoe or an identified visual resource?

☐ Yes ☐ No ☐ No, With Mitigation ☐ Data Insufficient

g) Recreation*

Does the proposal result in a reduction of public access to public recreation areas or public recreation opportunities?

☐ Yes ☐ No ☐ No, With Mitigation ☐ Data Insufficient

h) Land Use

Does the converted or transferred use result in a use that is not consistent with the goals and policies of the Community Plan or Plan Area Statement?

☐ Yes ☐ No ☐ No, With Mitigation ☐ Data Insufficient

i) Population

Does the proposal result in an increase in the existing or planned population of the Region?

☐ Yes ☐ No ☐ No, With Mitigation ☐ Data Insufficient

j) Housing

Does the proposal result in the loss of affordable housing?

☐ Yes ☐ No ☐ No, With Mitigation ☐ Data Insufficient

k) Transportation
Does the proposal result in the increase of 100 Daily Vehicle Trip Ends (DVTE)?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

l) Does the proposal result in a project that does not meet the parking standards?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

m) Utilities
Does the proposal result in additional water use?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

n) Does the proposal result in the need for additional sewer treatment?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

o) Historical
Does the proposal result in the modification or elimination of a historic structure or site?

☐ Yes ☐ No
☐ No, With Mitigation ☐ Data Insufficient

DECLARATION:

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this initial evaluation to the best of my ability, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief.

Signature: (Original signature required.)

_____ At _____ Date: _____

Person Preparing Application — County

Applicant Written Comments: (Attach additional sheets if necessary)

Print Form

TRPA Initial Environmental Checklist

Brief Description of Project

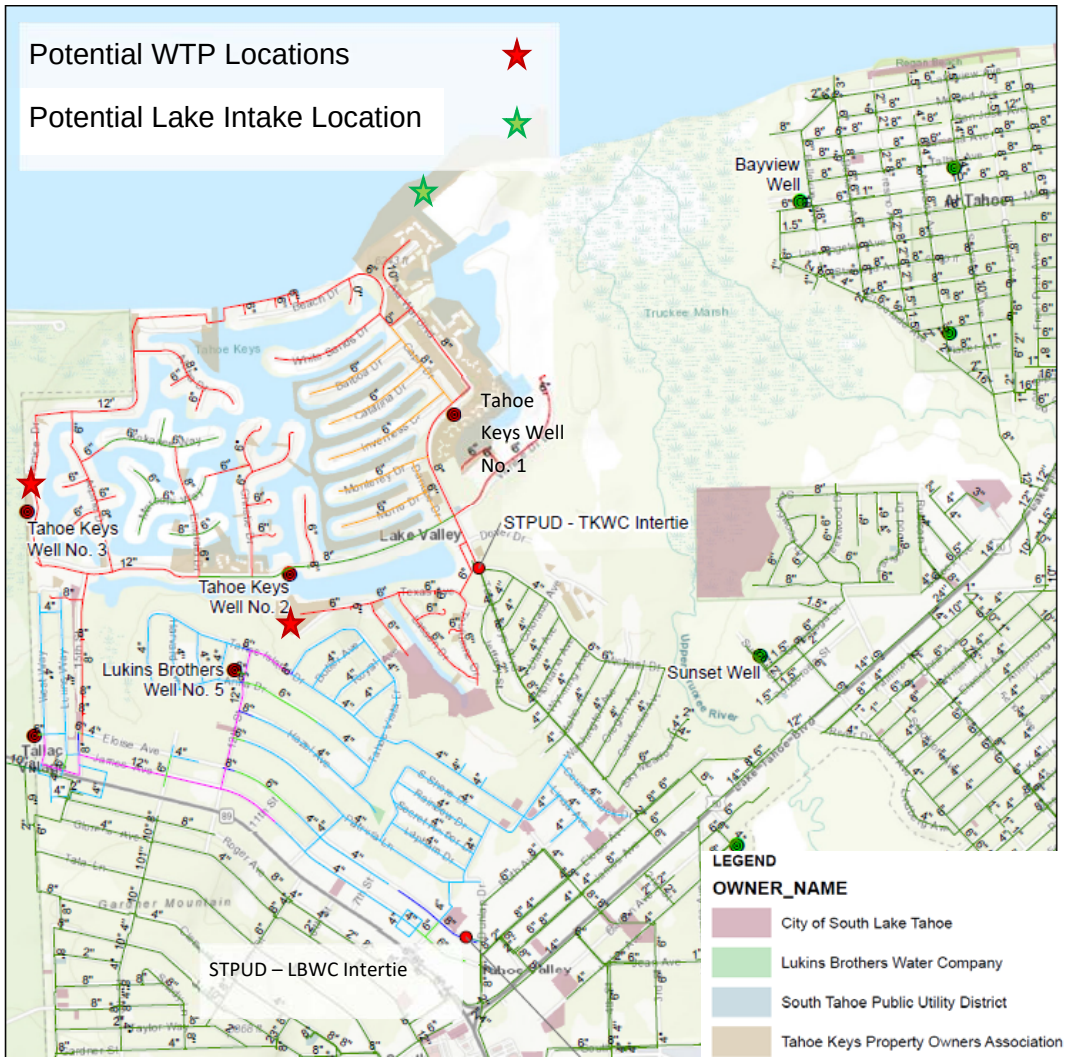
A Feasibility Study of Remedial Alternatives (FS) is underway to address tetrachloroethylene (PCE) contamination found in groundwater within the South "Y" Area of the City of South Lake Tahoe, El Dorado County, California; herein referred to as the South "Y" Plume. The South "Y" plume occurs within the west central portion of the Tahoe Valley South Sub-basin (TVS basin). PCE have been detected in water supply wells in the South Y area since 1989. Many of the supply wells were taken out of the service due to PCE concentrations exceeding the drinking water standard of 5 µg/L from then on.

As outlined in the FS workplan, three interim remediation alternatives are developed to mitigate PCE contamination in drinking water wells in the area. Alternative 3 of the FS proposed the conversion from contaminated groundwater to surface water as shown conceptually on Figure 1, using the South Tahoe Public Utility District's existing surface water rights from Lake Tahoe. After the full implementation of the surface WTP, which could take many years, Lukins Brother Water Company (LBWC) Well#1 and Tahoe Keys Water Company (TKWC) Well #3 will serve as the backup supply, while LBWC Well #5 and TKWC Well #2 will be abandoned due to PCE contamination detected.

This alternative includes building a new drinking water treatment plant (WTP) at the lagoon site on TKWC as shown on Figure 2. The new drinking water WTP will use Lake Tahoe surface water as its source with a treatment capacity of gallons per minute (gpm) or 4.4 million gallons per day (MGD). The raw water pipeline is assumed to extend 2,500 LF into the Lake from the shore of Tahoe Key's beach property using trenchless technology to avoid suspending sediments. A raw water intake pump station (IPS) is proposed to be built on Tahoe Key's beach property at the landward end of the raw water pipeline. The IPS would be used to house the raw water intake pumps installed within a below-grade pump sump and the instrumentation and controls necessary to operate the intake pumps (Figure 2). with two submersible pumps anchored to the bottom of the lake with an intake screen for each pump as shown on Figure 3. A raw water pipeline from the IPS will follow the alignment of Ala Wai Blvd and Venice Dr and tie into the existing raw water line near TKWC Well #2. The new WTP features would likely include a skid mounted membrane filtration process; ultra-violet (UV) disinfection; post chlorination disinfection for water distribution disinfection residual maintenance and possible treated water storage facility (Figure 3). Additional infrastructure for this alternative also include electrical and facility piping and possible storage facility. Other assumptions related to the new WTP are described below:

1. The size of the raw water IPS on Tahoe Keys beach property is assumed to have a footprint of 30' x 51'. This assumption is based on the design of a similar facility near Tahoe City, which has a similar intake and treatment condition.
2. New raw water pipelines will be installed from the lake intake facilities to the IPS and from the IPS to the proposed WTP but the distribution of the treated water will rely on existing distribution systems. There is potential to reuse existing unused pipelines if condition, size, and location are appropriate.
3. Waterborne pathogens will be removed from the raw water through filtration and any that remain following filtration will be inactivated at the WTP using UV disinfection and chlorination using sodium hypochlorite to maintain a disinfection residual..

Figure 1: Alternative 3 Site Map



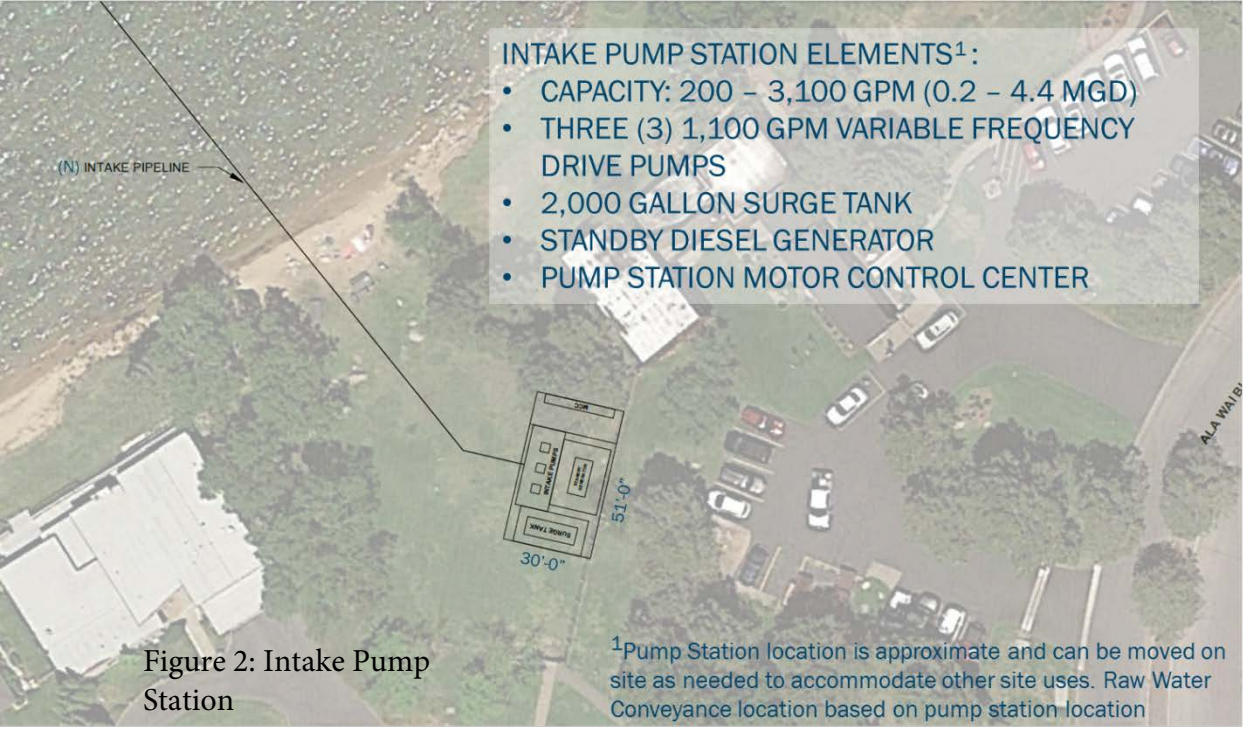


Figure 2: Intake Pump Station

[1]Pump Station location is approximate and can be moved on site as needed to accommodate other site uses. Raw Water Conveyance location based on pump station location

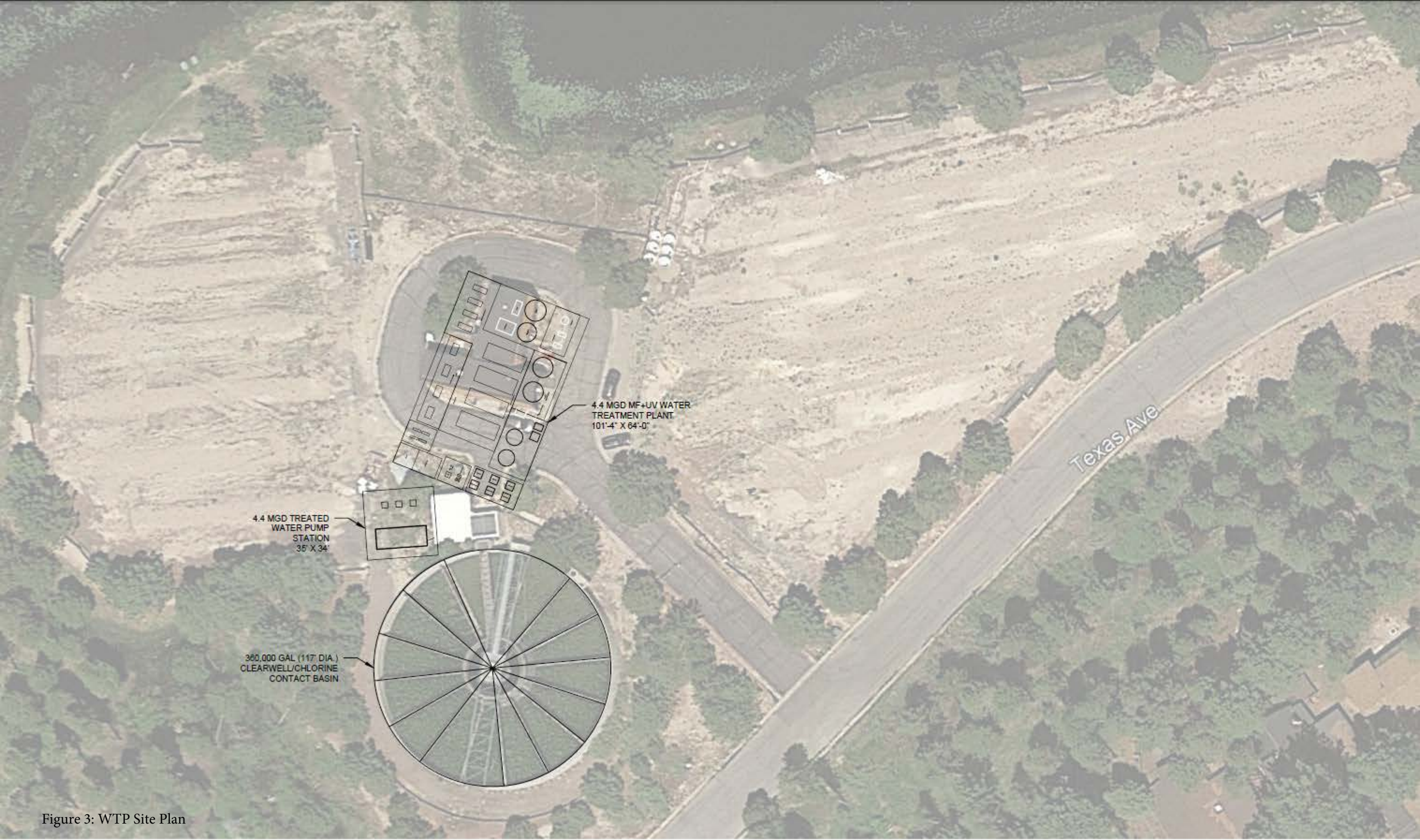


Figure 3: WTP Site Plan

Appendix D

Cost Estimate Details

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 1 Potable Reuse	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC+ Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

DIRECT FACILITY COSTS

Item No.	Description		Cost
1	**Replacement Well 1 (R1)**	**$**	**476,000**
1.1	Drill/Construct New Well to Zone 1 and 2	$	417,000
1.2	Well Pump and Motor (200 gpm)	$	59,000
2	**R1 Groundwater Treatment Facility**	**$**	**3,001,000**
2.1	Building and Site Improvements	$	914,000
2.2	Granular Activated Carbon Treatment System	$	1,309,000
2.3	Iron and Manganese Treatment	$	670,000
2.4	Water Supply Tie In	$	54,000
2.5	Sewer Pipeline	$	54,000
	Subtotal Direct Facility Costs	**$**	**3,477,000**
	Contingency (25%)	**$**	**869,250**
	Subtotal	**$**	**4,346,250**
	Engineering/Construction Management (20%)	**$**	**869,250**
	Total Construction	**$**	**5,215,500**

Total -30% (Rounded)	Total Construction (Rounded)	Total +50% (Rounded)
$3,600,000	**$5,200,000**	**$7,800,000**

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 1 Potable Reuse	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC+ Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Start-Up Demonstration)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	LBWC 5 Pumping	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	**$**	**14,000**
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**Policy Memo 97-005 Requirements**	**$**	**668,000**
	Application Preparation and Submittal		
	Consultant	$	480,000
	Staff	$	70,000
	Reporting and Administration		
	Consultant	$	25,000
	Staff	$	42,000
	Sampling	$	7,000
	Laboratory Analysis	$	34,000
	General Monitoring (25%)	$	10,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**75,000**
6	**Volumetric Sewer Discharge**	**$**	**684,000**
	Subtotal O&M Costs	**$**	**1,571,000**
	Contingency (25%)	**$**	**392,750**
	Subtotal (Rounded)	**$**	**2,000,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 1 Potable Reuse	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC+ Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Conditional Operation)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	$	14,000
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**97-005 Requirements**	**$**	**118,000**
	Reporting and Administration		
	Consultant	$	25,000
	Staff	$	42,000
	Sampling	$	7,000
	Laboratory Analysis	$	34,000
	General Monitoring (25%)	$	10,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**75,000**
	Subtotal O&M Costs	**$**	**337,000**
	Contingency (25%)	**$**	**84,250**
	Subtotal (Rounded)	**$**	**400,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 1 Potable Reuse	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC+ Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Normal Operation - PCE > 50 µg/L)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	$	14,000
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**97-005 Requirements**	**$**	**50,000**
	Reporting and Administration		
	Consultant	$	15,000
	Staff	$	21,000
	Sampling	$	3,000
	Laboratory Analysis	$	8,000
	General Monitoring (25%)	$	3,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**76,000**
	Subtotal O&M Costs	**$**	**270,000**
	Contingency (25%)	**$**	**67,500**
	Subtotal (Rounded)	**$**	**300,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 1 Potable Reuse	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC+ Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Normal Operation - PCE < 50 µg/L)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	$	14,000
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**97-005 Requirements**	**$**	**14,000**
	Reporting and Administration		
	Consultant	$	-
	Staff	$	6,000
	Sampling	$	2,000
	Laboratory Analysis	$	4,000
	General Monitoring (25%)	$	2,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**27,000**
	Subtotal O&M Costs	**$**	**185,000**
	Contingency (25%)	**$**	**46,250**
	Subtotal (Rounded)	**$**	**200,000**

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 1 Potable Reuse	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC+ Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (20-Year Total)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**1,400,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	760,000
1.2	R1 Pumping	$	640,000
2	**Chemicals**	**$**	**280,000**
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**1,200,000**
4	**97-005 Requirements**	**$**	**668,000**
	Application Preparation and Submittal		
	Consultant	$	480,000
	Staff	$	70,000
	Reporting and Administration		
	Consultant	$	170,000
	Staff	$	312,000
	Sampling	$	58,000
	Laboratory Analysis	$	172,000
	General Monitoring (25%)	$	64,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**1,028,000**
6	**Volumetric Sewer Discharge**	**$**	**684,000**
	Subtotal O&M Costs	**$**	**5,260,000**
	Contingency (25%)	**$**	**1,315,000**
	Subtotal (Rounded)	**$**	**6,600,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 2 Sewer Discharge	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC, LBWC 5 w/GAC in lead	**ENR**	12,354

DIRECT FACILITY COSTS

Item No.	Description		Cost
1	**Replacement Well 1 (R1)**	**$**	**476,000**
1.1	Drill/Construct New Well to Zone 1 and 2	$	417,000
1.2	Well Pump and Motor (200 gpm)	$	59,000
2	**R1 Groundwater Treatment Facility**	**$**	**2,187,000**
2.1	Building and Site Improvements	$	824,000
2.2	Granular Activated Carbon Treatment System	$	1,309,000
2.3	Sewer Pipeline	$	54,000
	Subtotal Direct Facility Costs	**$**	**2,663,000**
	Contingency (25%)	**$**	**665,750**
	Subtotal	**$**	**3,328,750**
	Engineering/Construction Management (20%)	**$**	**665,750**
	Total Construction	**$**	**3,994,500**

Total -30% (Rounded)	Total Construction (Rounded)	Total +50% (Rounded)
$2,800,000	**$4,000,000**	**$6,000,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 2 Sewer Discharge	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**50,000**
3	**R1 GAC Treatment Media Changeout/Backwash/Disposal**	**$**	**75,000**
4	**Volumetric Sewer Discharge**	**$**	**684,000**
	Subtotal O&M Costs	**$**	**879,000**
	Contingency (25%)	**$**	**219,750**
	Subtotal (Rounded)	**$**	**1,100,000**

O&M COSTS (20-Year Total)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**1,400,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	760,000
1.2	R1 Pumping	$	640,000
2	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**1,000,000**
3	**R1 GAC Treatment Media Changeout/Backwash/Disposal**	**$**	**1,500,000**
4	**Volumetric Sewer Discharge**	**$**	**13,680,000**
	Subtotal O&M Costs	**$**	**17,580,000**
	Contingency (25%)	**$**	**4,395,000**
	Subtotal (Rounded)	**$**	**22,000,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 3 Sewer/Stormwater Discharge	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC, LBWC 5 w/GAC in lead	**ENR**	12,354

DIRECT FACILITY COSTS

Item No.	Description		Cost
1	**Replacement Well 1 (R1)**	**$**	**476,000**
1.1	Drill/Construct New Well to Zone 1 and 2	$	417,000
1.2	Well Pump and Motor (200 gpm)	$	59,000
2	**R1 Groundwater Treatment Facility**	**$**	**2,231,000**
2.1	Building and Site Improvements	$	821,000
2.2	Granular Activated Carbon Treatment System	$	1,302,000
2.3	Sewer Pipeline	$	54,000
2.4	Stormwater Pipeline	$	54,000
	Subtotal Direct Facility Costs	**$**	**2,707,000**
	Contingency (25%)	**$**	**676,750**
	Subtotal	**$**	**3,383,750**
	Engineering/Construction Management (20%)	**$**	**676,750**
	Total Construction	**$**	**4,060,500**

Total -30% (Rounded)	Total Construction (Rounded)	Total +50% (Rounded)
$2,900,000	**$4,100,000**	**$6,200,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Oct-2019
Project Title:	Alternative 2 Option 3 Sewer/Stormwater Discharge	**K/J Proj. No.**	1770027*00
Description	R1 equip w/GAC, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**50,000**
3	**R1 GAC Treatment Media Changeout/Backwash/Disposal**	**$**	**75,000**
4	**Volumetric Sewer Discharge**	**$**	**342,000**
	Subtotal O&M Costs	**$**	**537,000**
	Contingency (25%)	**$**	**134,250**
	Subtotal (Rounded)	**$**	**700,000**

O&M COSTS (20-Year Total)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**1,400,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	760,000
1.2	R1 Pumping	$	640,000
2	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**1,000,000**
3	**R1 GAC Treatment Media Changeout/Backwash/Disposal**	**$**	**1,500,000**
4	**Volumetric Sewer Discharge**	**$**	**6,840,000**
	Subtotal O&M Costs	**$**	**10,740,000**
	Contingency (25%)	**$**	**2,685,000**
	Subtotal (Rounded)	**$**	**13,400,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	Conversion to Surface Water Supply	**Date Prepared:**	Oct-2019
Project Title:	Alternative 3	**K/J Proj. No.**	1770027*00
Description	Convert from groundwater wells to surface water from Lake Tahoe	**ENR**	12,354

DIRECT FACILITY COSTS

Item No.	Description		Cost
1	**Intake Pipeline and Pump Station**	**$**	**8,582,000**
2	**Raw Water Pipeline**	**$**	**3,664,000**
3	**Surface Water Treatment Plant**	**$**	**21,029,000**
3.1	Membrane Filtration (MF) and Backwash	$	12,318,000
3.2	Ultraviolet Light (UV) Disinfection Process	$	334,000
3.3	Chlorine Contact Chamber	$	730,000
3.4	Chemicals	$	478,000
3.5	Building, Site Improvements, and Appurtenances	$	7,169,000
4	**Treated Water Pump Station**	**$**	**1,361,000**
5	**Connection to TKWC/LBWC Distribution**	**$**	**3,500,000**
6	**TKWC/LBWC Well Abandonment**	**$**	**104,000**
7	**Permitting**	**$**	**170,000**
7.1	DDW Drinking Water Permit	$	10,000
7.2	District Sewer Connection and Permit Fee	$	8,000
7.3	Modification of surface water rights applications and agency approvals	$	2,000
7.4	TRPA/CTC Access Agreements/Easements/Coverage Purchase	$	150,000
	Subtotal Direct Facility Costs	**$**	**38,410,000**
	Contingency (25%)	**$**	**9,602,500**
	Subtotal	**$**	**48,012,500**
	Engineering/Construction Management (20%)	**$**	**9,602,500**
	Total Construction	**$**	**57,615,000**

Total -30% (Rounded)	Total Construction (Rounded)	Total +50% (Rounded)
$40,300,000	**$57,600,000**	**$86,400,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	Conversion to Surface Water Supply	**Date Prepared:**	Oct-2019
Project Title:	Alternative 3	**K/J Proj. No.**	1770027*00
Description	Convert from groundwater wells to surface water from Lake Tahoe	**ENR**	12,354

O&M COSTS

Item No.	Description		Cost
1	**Energy Costs**	**$**	**86,000**
1.1	Raw Water Pumping	$	26,000
1.2	Surface Water Treatment	$	60,000
2	**Labor**	**$**	**208,000**
3	**Chemicals**	**$**	**204,000**
4	**MF/UV Maintenance**	**$**	**507,000**
5	**Facility Maintenance (Intake, WTP, Pipelines, Distribution)**	**$**	**248,000**
6	**Volumetric Sewer Discharge**	**$**	**3,000**
	Subtotal O&M Costs	**$**	**1,256,000**
	Contingency (25%)	**$**	**314,000**
	Subtotal (Rounded)	**$**	**1,600,000**

O&M COSTS (5-Year Total)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**430,000**
1.1	Raw Water Pumping	$	130,000
1.2	Surface Water Treatment	$	300,000
2	**Labor**	**$**	**1,040,000**
3	**Chemicals**	**$**	**1,020,000**
4	**MF/UV Maintenance**	**$**	**2,535,000**
5	**Facility Maintenance (Intake, WTP, Pipelines, Distribution)**	**$**	**1,240,000**
6	**Volumetric Sewer Discharge**	**$**	**15,000**
	Subtotal O&M Costs	**$**	**6,280,000**
	Contingency (25%)	**$**	**1,570,000**
	Subtotal (Rounded)	**$**	**7,900,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Feb-2020
Project Title:	Preferred Remedial Alternative	**K/J Proj. No.**	1770027*00
Description	R1 and equip w/GAC+Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

Pre-Design Activities

Item No.	Description		Cost
1	**R1 Test Well and Treatment Pilot**	**$**	**147,000**
1.1	Test Well (Based on PDI)	$	97,000
1.2	Treatment Pilot	$	50,000
2	**97-005 Documentation and Permit Application**	**$**	**419,000**
2.1	Drinking Water Source Assessment and Contaminant Assessment	$	13,000
2.2	Drinking Water Source Protection	$	16,000
2.3	Effective Treatment and Monitoring	$	19,000
2.4	Human Health Risks Associated with Failure of Proposed Treatment	$	8,000
2.5	California Environmental Quality Act (CEQA) Review of the Project	$	9,000
2.6	Submittal of a Permit Application	$	2,000
2.7	Public Hearing	$	7,000
2.8	TMF Assessment Form	$	263,000
2.9	Technical Report	$	82,000
3	**Site Survey**	**$**	**34,000**
4	**Geotechnical Investigation**	**$**	**23,000**
5	**TRPA/CEQA Environmental Documentation and Approvals**	**$**	**50,000**
	Subtotal Direct Facility Costs	**$**	**566,000**
	Contingency (25%)	**$**	**141,500**
	Subtotal	**$**	**707,500**

Total -30% (Rounded)	Total Pre-Design (Rounded)	Total +50% (Rounded)
$500,000	**$710,000**	**$1,100,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Feb-2020
Project Title:	Preferred Remedial Alternative	**K/J Proj. No.**	1770027*00
Description	R1 and equip w/GAC+Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

DIRECT FACILITY COSTS

Item No.	Description		Cost
1	**Replacement Well 1 (R1)**	**$**	**476,000**
1.1	Drill/Construct New Well to Zone 1 and 2	$	417,000
1.2	Well Pump and Motor (200 gpm)	$	59,000
2	**R1 Groundwater Treatment Facility**	**$**	**3,001,000**
2.1	Building and Site Improvements	$	914,000
2.2	Granular Activated Carbon Treatment System	$	1,309,000
2.3	Pyrolucite/Greensand Filtration System (Fe/Mn Treatment)	$	670,000
2.4	Water Supply Tie In	$	54,000
2.5	Sewer Pipeline	$	54,000
3	**Monitoring Network**	**$**	**70,000**
3.1	Monitoring Network Plan	$	15,000
3.2	Optional Monitoring Well	$	55,000
	Subtotal Direct Facility Costs	**$**	**3,547,000**
	Contingency (25%)	**$**	**886,750**
	Subtotal	**$**	**4,433,750**
	Engineering/Construction Permitting/Construction Management (20%)	**$**	**886,750**
	Total Construction	**$**	**5,320,500**

Total -30% (Rounded)	Total Construction (Rounded)	Total +50% (Rounded)
$3,700,000	**$5,300,000**	**$8,000,000**

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Feb-2020
Project Title:	Preferred Remedial Alternative	**K/J Proj. No.**	1770027*00
Description	R1 and equip w/GAC+Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Start-Up Demonstration)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	**$**	**14,000**
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**Policy Memo 97-005 Requirements**	**$**	**118,000**
	Reporting and Administration		
	Consultant	$	25,000
	Staff	$	42,000
	Sampling	$	7,000
	Laboratory Analysis	$	34,000
	General Monitoring (25%)	$	10,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**75,000**
6	**Volumetric Sewer Discharge**	**$**	**684,000**
7	**Monitoring Well Quarterly Sampling and Analysis (x3)**	**$**	**1,800**
	Subtotal O&M Costs	**$**	**1,022,800**
	Contingency (25%)	**$**	**255,700**
	Subtotal (Rounded)	**$**	**1,300,000**

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Feb-2020
Project Title:	Preferred Remedial Alternative	**K/J Proj. No.**	1770027*00
Description	R1 and equip w/GAC+Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Conditional Operation)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	$	14,000
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**97-005 Requirements**	**$**	**118,000**
	Reporting and Administration		
	Consultant	$	25,000
	Staff	$	42,000
	Sampling	$	7,000
	Laboratory Analysis	$	34,000
	General Monitoring (25%)	$	10,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**75,000**
6	**Monitoring Well Quarterly Sampling and Analysis (x3)**	**$**	**1,800**
	Subtotal O&M Costs	**$**	**338,800**
	Contingency (25%)	**$**	**84,700**
	Subtotal (Rounded)	**$**	**400,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Feb-2020
Project Title:	Preferred Remedial Alternative	**K/J Proj. No.**	1770027*00
Description	R1 and equip w/GAC+Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Normal Operation - PCE > 50 µg/L)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	$	14,000
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**97-005 Requirements**	**$**	**50,000**
	Reporting and Administration		
	Consultant	$	15,000
	Staff	$	21,000
	Sampling	$	3,000
	Laboratory Analysis	$	8,000
	General Monitoring (25%)	$	3,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**76,000**
6	**Monitoring Well Quarterly Sampling and Analysis (x3)**	**$**	**1,800**
	Subtotal O&M Costs	**$**	**271,800**
	Contingency (25%)	**$**	**67,950**
	Subtotal (Rounded)	**$**	**300,000**

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Feb-2020
Project Title:	Preferred Remedial Alternative	**K/J Proj. No.**	1770027*00
Description	R1 and equip w/GAC+Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (Normal Operation - PCE < 50 µg/L)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**70,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	38,000
1.2	R1 Pumping	$	32,000
2	**Chemicals**	$	14,000
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**60,000**
4	**97-005 Requirements**	**$**	**14,000**
	Reporting and Administration		
	Consultant	$	-
	Staff	$	6,000
	Sampling	$	2,000
	Laboratory Analysis	$	4,000
	General Monitoring (25%)	$	2,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**27,000**
6	**Monitoring Well Quarterly Sampling and Analysis (x3)**	**$**	**1,800**
	Subtotal O&M Costs	**$**	**186,800**
	Contingency (25%)	**$**	**46,700**
	Subtotal (Rounded)	**$**	**200,000**

Engineers Opinion of Probable Costs **Construction and O&M Class 4 OPCC**

South Tahoe PUD - South Y Feasibility Study Alternatives Analysis

Agency:	STPUD / TKWC / LBWC	**Prepared By:**	KY, JLL
Project Type:	PCE Extraction plus Meet Demand	**Date Prepared:**	Feb-2020
Project Title:	Preferred Remedial Alternative	**K/J Proj. No.**	1770027*00
Description	R1 and equip w/GAC+Fe/Mn Treatment, LBWC 5 w/GAC in lead	**ENR**	12,354

O&M COSTS (20-Year Total)

Item No.	Description		Cost
1	**Energy Costs**	**$**	**1,400,000**
1.1	Additional LBWC 5 Pumping as Lead Well	$	760,000
1.2	R1 Pumping	$	640,000
2	**Chemicals**	**$**	**280,000**
3	**General R1 Groundwater Treatment Facility** Based on LBWC Operating Expenses (Revised 2014 Annual Report of LBWC, Schedule B-2). Includes labor, contract work, transportation, materials, supplies, and parts.	**$**	**1,200,000**
4	**97-005 Requirements**	**$**	**776,000**
	Reporting and Administration		
	Consultant	$	170,000
	Staff	$	312,000
	Sampling	$	58,000
	Laboratory Analysis	$	172,000
	General Monitoring (25%)	$	64,000
5	**R1 Treatment Media Changeout/Backwash/Disposal**	**$**	**1,028,000**
6	**Volumetric Sewer Discharge**	**$**	**684,000**
7	**Monitoring Well Quarterly Sampling and Analysis (x3)**	**$**	**36,000**
	Subtotal O&M Costs	**$**	**5,404,000**
	Contingency (25%)	**$**	**1,351,000**
	Subtotal (Rounded)	**$**	**6,800,000**

Appendix E

Interim Remedial Action Plan

Kennedy Jenks

10850 Gold Center Drive, Suite 350
Rancho Cordova, CA 95670
916-858-2700

Interim Remedial Action Plan for the South Y PCE Facilities Feasibility Study [Agreement D1712508]

9 May 2020

Prepared for

South Tahoe Public Utility District
1275 Meadow Crest Drive
South Lake Tahoe, CA 96150

KJ Project No. 1770027*00

Table of Contents

List of Tables

List of Figure

Certification

The following Interim Remedial Action Plan was prepared by:

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South Tahoe Public Utility District

Funding Support

Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board using funds from Proposition 1. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Section 1: Introduction

The Interim Remedial Action Plan (IRAP) is intended to describe the activities that will lead to the implementation of the preferred remedial alternative recommended in the South Y PCE Facilities Feasibility Study (Feasibility Study). The objective of the Feasibility Study is to evaluate and select a preferred remedial alternative that would remove tetrachloroethylene (PCE) from groundwater and manage use of groundwater sources to maintain adequate drinking water supply and quality in the South Y Area. The Feasibility Study evaluates remedial alternatives that will prevent further migration of contaminants and potential future impacts to downgradient water supply wells. This IRAP considers the outcomes of the South Y Fate and Transport Model and Feasibility Study and presents recommended activities to advance implementation of the preferred remedial alternative, an implementation schedule, potential financing options, and recommended stakeholder outreach activities.

Drinking water service in the South Y is provided by the following water purveyors: South Tahoe Public Utility District (District), Lukins Brothers Water Company (LBWC) and the Tahoe Keys Water Company (TKWC), collectively referred to as water purveyors in this report.

The preferred remedial alternative is an interim measure that meets the water purveyors' objectives of replacing lost water production in the South Y Area while increasing PCE mass removal and reducing cleanup times needed for PCE concentrations to decline below maximum contaminant levels (MCLs) at down-gradient receptor wells. As an interim measure, the water purveyors understand that implementation of this remedial alternative would be most effective in conjunction with remediation by other parties at source area sites contributing groundwater contamination to the South Y Plume.

1.1 Feasibility Study Results

1.1.1 Description of Preferred Remedial Alternative

Based on an evaluation of Alternatives and Model scenario results, Alternative 2 Targeted Pumping was selected as the preferred remedial alternative that will best meet the Feasibility Study goals to control or clean up PCE in groundwater that serves or has served as a source of drinking water. Once GAC treatment is installed at LBWC 5, it will be operated as lead and LBWC 1 will be operated as lag for the LBWC system. A new extraction well 1 (R1) would be used to replace lost water production resulting from the impairment and planned destruction of well LBWC 4 and equipped to deliver potable water to the distribution systems of the District, TKWC, and LBWC. No capital improvements are needed to implement the new operations strategy at LBWC 5 and LBWC 1. R1 would be located at 843 Hazel Drive and equipped with PCE treatment and optionally iron and manganese treatment to meet drinking water quality standards for potable reuse of produced groundwater (collectively referred to as the R1 groundwater treatment facility or GWTF).

LBWC 5 would be operated to meet water system demands in a manner that would result in increased contaminant removal and plume containment compared to the No Action Alternative. R1 would be drilled and screened to remove PCE from groundwater above 150 feet bgs.

Treated water from R1 will be routed to either the District sewer system, City of South Lake Tahoe stormwater collection system, or to a public water distribution system for potable reuse.

To evaluate the effectiveness of the preferred remedial alternative in containing the PCE plume and preventing the spread of PCE mass to downgradient wells, a monitoring network plan will be created. Construction information for existing wells can be used to evaluate their appropriateness to track the PCE plume and monitor water quality upgradient of wells without treatment. If needed, new sentinel wells can be constructed to fill gaps in the monitoring network.

1.1.2 Anticipated Benefits of Preferred Remedial Alternative

Table 1 presents the Model results of the preferred remedial alternative compared to results of the No Action Alternative (Alternative 1).

Table 1: Model Results for Selected Alternative

Alternative		Total PCE Mass Removed[a] (lbs)	Peak PCE Concentration[a]					Cleanup Time[b] (Years)
			LBWC 1	LBWC 5	TKWC 1	TKWC 2	TKWC 3	
1	No Action	280 – 1,800	<1	23 to 96	5 to 50	14 to 108	<1	>20
2, Option 1	LBWC 5 Lead/ R1	770 – 3,300	<1	21 to 89	4 to 38	13 to 103	<1	17 to >20

Notes:

a. Over 20-year modeling period from 2018 – 2038.

b. Cleanup time is for all 5 wells from start of 20-year modeling period beginning in 2018.

c. Fate and Transport Model results assume PCE removal for Alternative 2 begin immediately for all wells, including new R1. To calculate PCE removal through R1 following the implementation period of 3-7 years, it is assumed that mass will be removed from the R1 site at the same fractional rate over a 20 year period, and mass removal for R1 after 3-7 years can be estimated by scaling the total simulated mass removed at R1 in Alternative 2 to the ratio of [Alternative 1 concentration at R1 after 3-7 years] to [Alternative 2 concentration at R1 at start of simulation]. Using this method, mass extraction at R1 beginning in 3-7 years is estimated to be between 77.7% (beginning in 3 years) and 47.6% (beginning in 7 years) of mass extraction beginning immediately, which was estimated to be 446.6 lbs. Therefore, mass extracted at R1 beginning at 3-7 years (for a pumping period of 13 to 17 years out of 20 year total) is estimated to be 213 lbs to 2,559 lbs.

Based on the Model results, it is anticipated that the implementation of Alternative 2 can remove as much as 170% more PCE than the current infrastructure and operations, shortening the cleanup time by three years, and potentially reducing the peak PCE concentrations in down-gradient wells.

In addition to increased PCE Mass Removal and reduced cleanup times at receptor wells, the preferred remedial alternative provides a new source of drinking water that helps replace lost drinking water production due to the impairment of groundwater sources in the South Y Area. Providing sufficient quantities of drinking water to the South Y Area is a significant challenge for the water purveyors. The addition of the R1 GWTF provides a new source of drinking water where the need for additional drinking water supply is the greatest.

1.1.3 Costs of Preferred Remedial Alternative

Section 8.2.1 of the Feasibility Study summarized the preliminary cost estimates for pre-design activities, environmental mitigation, capital, and operations and maintenance of the preferred remedial alternative. Section 5.4 describes the cost factors and assumptions used to develop cost estimates, which utilize Association for the Advancement of Cost Engineering (AACE) Class 4 Estimate for feasibility evaluations (Table 1 – Cost Estimate Classification Matrix for Process Industries, AACEI 2016). Table 2 summarizes the preliminary cost estimate of implementation by well.

Table 2: Preliminary Cost Estimate for Preferred Remedial Alternative (2019$, Rounded) [(a)]

Activity	LBWC 5	R1
Pre-Design Activities		
R1 Test Well and Treatment Pilot	0	$130,000 to $280,000
Policy Memo 97-005 Documentation and Permit Application	0	$370,000 to $790,000
Site Survey and Geotechnical Investigation	0	$50,000 to $110,000
TRPA/CEQA Environmental Documentation and Approvals	0	$44,000 to $94,000
Direct Facility Costs		
R1 Construction and Equipping	0	$500,000 to $1,100,000
R1 Groundwater Treatment Facility	0	$3,200,000 to $6,800,000
Monitoring Network Plan and New Monitoring Well (1)	0	$74,000 to $160,000
O&M for 20 Years	$670,000 to $1,400,000 [(b)]	$3,500,000 to $7,400,000
Total	$670,000 to $1,400,000	$8,600,000 to $18,000,000

Note:
a. Cost estimates based on 2019 dollars with an accuracy range of -30% to +50%. Cost factors and assumptions are described in Section 5.4 of the Feasibility Study.
b. Energy costs only

A more detailed breakdown of the preliminary cost estimate is provided in Appendix D of the Feasibility Study.

Section 2: Implementation Activities

The anticipated implementation activities for the preferred remedial alternative consists of the following Phases:

- Phase 1 – Project Planning
- Phase 2 – R1 Test Well Installation and Treatment Pilot Study
- Phase 3 – Groundwater Treatment Facility (GWTF) Preliminary Design
- Phase 4 – Final GWTF Design
- Phase 5 – GWTF Construction/Startup

2.1 Phase 1: Project Planning

To further develop the preferred remedial alternative, a number of planning activities are recommended, may occur in parallel, and are detailed in the sections that follow:

- Develop Agreements
- Identify and Secure Funding
- Develop Project Workplans and Protocols
- Conduct Stakeholder Outreach

2.1.1 Develop Agreements

It is recommended that additional discussion be held between the three water agencies regarding the preferred remedial alternative, including:

- Property Access/Easements: The preferred remedial alternative includes use of the 843 Hazel Drive property for construction and operation of the new R1 GWTF. This is a 1-acre parcel situated near the middle section of the South Y Plume and owned by LBWC. Agreements will be needed to either lease the property or obtain access from LBWC to construct and operate the R1 GWTF.

- Water Purchase Agreements: The water produced by the R1 GWTF will supplement drinking water produced by the District, TKWC, and LBWC to meet system demands. In order to optimize operation of the R1 GWTF for PCE removal, the treated water from this facility will need to be consumed in the District, TKWC, or LBWC water systems.

  District drinking water supply to TKWC and LBWC through the existing mutual aid and assistance agreements is on an as-needed and as-available basis. The water agencies should review the existing mutual aid and assistance agreements as well as possible upgrade of District interties with TKWC and LBWC. These discussions should also consider, but not be limited to:

  - Water quality standards and monitoring
  - Water quantity
  - Purchase pricing, considering existing production costs and R1 production costs

- Agreement term
- Water delivery points
- Integration with other existing or future supplies
- Governance (see below)

- Governance Discussions: Depending on the level of participation of the water agencies in the funding, planning, implementation, and operation of the preferred remedial alternative, the water agencies should develop governance agreements that specifically define issues, including but not limited to, the following:

  - Roles and parties of water producers, water recipients, and other beneficiaries of the facilities and operation of the facilities to implement the preferred remedial alternative
  - Lead agency, ownership, and operational responsibility of the preferred remedial alternative and produced water
  - Levels of commitment
  - Operations and administerial/managerial roles
  - Commencement and termination of agreements
  - Payment mechanisms for debt services, capital costs, administration and development costs, and other expenditures incurred
  - Liability (insurance/indemnity)

  If implementation or O&M of the preferred remedial alternative is to include two or more parties, it is recommended that a memorandum of understanding (MOU) or a similar document be developed and reviewed with the parties' legal counsel. A MOU is a type of agreement between two or more parties. It expresses a convergence of will between the parties, indicating an intended common line of action.

- Financing: Discussed further in Section 2.1.2.

- Operations and Maintenance (O&M): Discussed further in Section 2.1.3.4.

2.1.2 Identify and Secure Funding

In parallel to developing agreements, the water agencies should begin to apply for grant/loan funding. This activity should continue through all Phases of implementation of the preferred remedial alternative and can continue after start-up of the preferred remedial alternative to maintain operations and maintenance funding.

The funding strategy used for the preferred remedial alternative should consider the following:

- Grant/loan limitations and schedule of grant solicitations, application deadlines, and funding agreement execution

- Impact of the preferred remedial alternative on the rates and/or reserves of the water agencies and potential partners

- Other financial support either through other agency (i.e., LBWC property access, El Dorado County, City of South Lake Tahoe, or the local Groundwater Sustainability Agency) funding, in-kind services, or waivers of local fees such as District sewer discharge fees.

- Bridge Funding: Local agencies can support the implementation of the preferred remedial alternative by providing a low or zero-interest loan to serve as bridge funding, with repayment from a grant. Typically, state and federal grants are paid to applicants by way of reimbursements for direct costs and work performed. A source of bridge funding would help alleviate the impact to reserves during the implementation of the preferred remedial alternative.

Section 8.3 of the Feasibility Study summarizes the recommended funding strategy:

1. Proposition 1, Round 3 Groundwater Sustainability Funding: As shown in Section 8.2.1 of the Feasibility Study, the total preliminary cost estimate to implement the preferred remedial alternative can be on the order of $10,000,000, including land coverage or easement acquisition, pre-design and permitting, environmental documentation and mitigation, and design and construction activities. The Proposition 1 Groundwater Grant Program has a grant funding limit of $50,000,000.

   It is anticipated that the solicitation for the Round 3 of Proposition 1 funding will occur in late 2020, and based on the Round 2 funding schedule, it can take approximately 18 months for an applicant to receive an executed grant funding agreement. It is assumed that SWRCB will issue a Preliminary Award Letter prior to the completed funding agreement to allow work to commence. SWRCB will issue this correspondence prior to the executed funding agreement. It should be noted that commencing work prior to an executed agreement is a risk management decision for the Grantee to consider and determine. SWRCB-DFA will accept and approve grant fund reimbursements for costs incurred dating back to the Preliminary Award Letter.

2. Drinking Water SRF Loan Funding: If for some reason the Proposition 1 Groundwater Grant Program does not provide sufficient funding to cover implementation of the R1 portion of the preferred remedial alternative, the water agencies can also apply for additional grant or principal forgiveness funding through the Drinking Water State Revolving Fund (DWSRF). These grant and loan applications are accepted on a continuous basis, with a maximum of $20,000,000 available for projects with a regional benefit.

3. El Dorado County Bridge Loan Funding: The water agencies should also apply for bridge loan funding through El Dorado County to minimize the drawdown of reserves and for cash flow.

4. Local Project Sponsorship/Cost Share: If the water agencies would like to accelerate implementation activities prior to receipt of an executed grant or loan funding agreement, local agencies can sponsor the preferred remedial alternative through no interest loans, grants, or in-kind services. Project partners may also contribute to the O&M of the preferred remedial alternative by subsidizing or waiving fees (such as the District sewer discharge fees), sharing resources (such as contract services for water quality laboratory

analysis), or providing in-kind services (for example to complete administration duties). These funds can be secured and used as match funding in most State grant programs, in addition to the stated purpose of accelerating implementation activities prior to receipt of an executed funding agreement.

Cost recovery via the Responsible Parties is also another potential source of funding for the water purveyors for the preferred remedial alternative. Cost recovery actions for the construction and operation of and the R1 GWTF requires close coordination with legal counsel and technical support therefore can be both time consuming and expensive.

2.1.3 Develop Project Workplans and Protocols

Prior to conducting field activities and design, it is recommended that project workplans and protocols be developed. These documents should be refined throughout the Phases of Implementation as needed.

2.1.3.1 Project Guide Manual

To guide the activities over the near-term (next three to five years), a Project Guide Manual can be prepared to address administrative and project management aspects related to the implementation activities of water agencies and other project partners. The guidelines and expectations should be developed to provide smooth and efficient execution of all parties' contracted responsibilities. Specific subtopics that will be developed at the appropriate time are likely to include:

- Project Guide Manual Overview, Organization, and Layout
- Project Description and Objectives
- Project Team Organization Chart
- Project Budget and Status
- Project Schedule
- Project Action Plan
- CAD Design Standards
- Quality Assurance and Control Plan
- Forms and Templates

The Project Guide Manual should be a living document to be reviewed and updated periodically over the course of implementation of the preferred remedial alternative. The Project Guide Manual should document practices and procedures to implement the preferred remedial alternative and will be updated to reflect changes as they are identified.

2.1.3.2 Treatment Pilot Study Protocol

Following drilling of the R1 Test well, it is recommended that a treatment pilot study be conducted to identify all contaminants projected to be detected at the R1 GWTF, develop a basis of design for the best available technologies (BATs) use to remove identified contaminants, and inform potential construction and operations maintenance costs. The pilot study plan will describe the objectives of the pilot, including treatment goals, facilities involved, and schedule. The protocol will cover the monitoring and sampling frequency, pump test and

water quality and media analysis requirements and field parameters to be recorded. The protocol will also include the mobilization and demobilization and sewer discharge permit.

2.1.3.3 Policy Memo 97-005 Documentation

Groundwater produced at R1 GWTF is planned to be used for potable consumption, based on the treatment pilot results. If water quality results indicate contaminant concentrations near 10 times the MCL, the following documentation will also be required to satisfy Policy Memo 97-005 permitting[1] for extremely impaired sources, including but not limited to:

- Drinking Water Source Assessment (SA) and Contaminant Assessment (CA): The objective of these tasks is to determine the aquifer's vulnerability to contaminating activities and should include descriptions of the environmental setting, capture zones, and potential sources of contamination.

- Full Characterization of Raw Water Quality: The proposed R1 test well and pilot study described in Phase 2 is anticipated to provide the data needed to meet this documentation requirement.

- Drinking Water Source Protection: Use of an extremely impaired source requires that the origin of the contamination be controlled. To satisfy this requirement the water purveyors will need to stay informed on the progress of on-going contamination assessment and remediation activities at identified source area sites contributing groundwater contamination to the South Y Plume. The water purveyors should review contamination assessment and remedial action plans to ensure that appropriate BMPs for waste handling and reduction are used during the investigation and clean up of source area sites. The water purveyors should also review technical reports to ensure that groundwater monitoring is conducted between identified source areas and the R1 GWTF; and that ground water monitoring for these sites adequately demonstrates contaminant control.

- Treatment and Monitoring Program Proposal: To obtain approval for use of an "impaired water" under Policy Memo 97-005, it is anticipated that prior to full approval and acceptance of the R1 GWTF, there will be 12 months of start-up demonstration operations and 12 months of conditional operations. During start-up demonstration operations, water produced through the R1 GWTF is required to be monitored for PCE at a higher frequency than normal groundwater quality monitoring with all of the produced water disposed of through non-potable uses, if available, or discharged to the sanitary sewer. During conditional operations, it is expected that the monitoring and reporting frequency for PCE remains the same but produced water can be delivered as drinking water. Monitoring frequency for PCE and other drinking water parameters for normal operations can be negotiated with SWRCB-DDW based on the concentration of PCE and revisited as needed.

[1] State Water Resource Control Board, Division of Drinking Water (SWRCB-DDW) Policy Memo 97-005 applies to source waters with more than 10 times the MCL of a regulated contaminant (also known as an "impaired water") and requires additional study, treatment and monitoring prior to delivery as a potable supply.

- Human Health Risks Associated with Failure of Proposed Treatment: An evaluation of the risks of failure of the proposed treatment system must include probability of failure of the treatment technology and description of failure modes. This evaluation will be used to propose monitoring frequency and use of additional levels of treatment, such as redundant treatment units, in order to safeguard protection of public health.

2.1.3.4 Operational Plans

After completion of the R1 Test Well and treatment pilot study (Section 2.2) and in conjunction with development of the engineering design of the R1 GWTF, the operational plans for water quality monitoring, water system operations, and disaster and emergency response should be developed. These documents can be filled-in as design progresses and specific monitoring and reporting requirements become known.

The following topics should be covered:

- Energy costs due to pumping and operating the R1 GWTF
- Purchase of chemicals used for the treatment of groundwater produced by the R1 GWTF
- Annual fees and permits, such as those needed to discharge to the sewer system
- Treatment and Monitoring Program
- Media changeout of the R1 GWTF
- General facility maintenance, including labor, contract work, transportation, and replacement equipment, materials, and parts
- Monitoring and administration of the R1 GWTF as a drinking water source either as a standard domestic water supply or as an extremely impaired source (which requires Policy Memo 97-005 compliance)
- Other topics needed to satisfy SWRCB-DDW water system permit requirements to add the R1 GWTF to a public water distribution system.

2.1.4 Conduct Stakeholder Outreach

As the water purveyors continue to pursue implementation of the preferred remedial alternative, additional outreach to stakeholders should periodically continue to inform not only of the implementation activities, but of other investigations and remedial activities being conducted at identified source areas contributing groundwater contamination to the South Y Plume. Further work to identify contributing source areas is currently being conducted under the direction of the LRWQCB.

Outreach for the Feasibility Study centered around participation of the Stakeholder Advisory Group (SAG) organized through the Tahoe Valley South Subbasin Groundwater Management

Plan. This group includes a broad range of technical staff of the water purveyors, as the LRWQCB, as well as members of the business community and outreach to Disadvantaged Communities represented by the City of South Lake Tahoe (CSLT) and the water utility customers. It is anticipated that outreach for the preferred remedial alternative would continue to utilize this group.

2.2 Phase 2: R1 Test Well and Treatment Pilot Study

This Phase will include the design and construction of a test well and performance of a treatment pilot study. If pump testing of the R1 test well reveals water quality over 10 times the MCL for drinking water, preparation of Policy Memo 97-005 documentation will be initiated. The major tasks under this Phase are:

- Test Well Design: The test well design will include a detailed set of technical specifications that can be used to obtain competitive bids for well drilling and construction. The design package will also include a well location figure, site plan figure showing required noise mitigation and erosion control measures, and well profile figure.

- Test Well Drilling: A pilot borehole will be drilled to conduct hydrogeological and water quality tests. Based on the pilot borehole test results, the borehole will be reamed, screened, and cased to draw water from the appropriate zones in a test well. Water quality data will be collected in accordance with the pilot study testing protocol and used to further develop the conceptual engineering design presented in the Feasibility Study and a Treatment and Monitoring Program Proposal, if needed.

- Policy Memo 97-005 Evaluation: Groundwater produced from R1 is planned to be treated for drinking water use. Once the water quality data from the test well is available, the data will be reviewed to determine whether the evaluation process outlined in the Division of Drinking Water (SWRCB-DDW) Policy Memo 97-005 is applicable. If contaminant levels in the source water is less than 10 times of the MCL for any identified contaminant, the Policy Memo 97-005 evaluation will not be required. Otherwise, the evaluation process for an extremely impaired drinking water source will be initiated. Work related to Policy Memo 97-005 will extend through Phase 5 and would need to be completed before the treated water produced by the R1 GWTF is allowed to be used for drinking water.

  This IRAP assumes a Policy Memo 97-005 evaluation will be required based on the levels of PCE in groundwater found at and neighboring the 843 Hazel Drive site; and the levels of PCE contamination predicted in groundwater by the fate and transport modeling of the South Y Plume (DRI, 2019).

- Identify a treatment vendor: Contact treatment vendors for quotes, process flow diagrams, and proposals to equip and perform the pilot treatment study. Based on the proposals, select a water treatment vendor that will best meet the objectives laid out in the pilot study plan.

- Conduct the Pilot Study: Install the pilot equipment, operate the pilot, and collect data in accordance with the treatment pilot study protocol . It is assumed that water treated

through the pilot treatment facilities will be discharged to the District sewer collection system. The pilot is anticipated to be online for a month, or for a period as determined through discussion with SWRCB-DDW. Field parameters to be collected include, but are not limited to, flow rate, volume of water treated for each filter run, pumping water level, pH, temperature, electroconductivity, pressure at both inlet and outlet from the filter, chlorine dosage, and free and total chlorine residual in the filter effluent. Water quality analysis will include, but not limited to, VOCs, iron and manganese in both raw and treated water and ammonia, sulfide and silica in the raw water. The test well will be capped following completion of the treatment pilot study until construction of the wellhead and installation of the down-hole equipment for the final production well (Phase 5).

- Treatment and Monitoring Program Proposal: Analyze treatment pilot study data and prepare a Treatment and Monitoring Program Proposal in accordance with the requirements of Policy Memo 97-005. The proposal will be submitted to the SWRCB-DDW for review and approval. If California grant funds are used, the proposal will also be submitted to the Grant Manager of the appropriate funding agency (i.e., SWRCB – DFA) with courtesy copy to the LRWQCB.

- Drinking Water Source Assessment Program (DWSAP): A draft DWSAP report will be developed and submitted for review and approval to SWRCB-DDW. If California grant funds are used, the draft DWSAP will also be submitted to the Grant Manager of the appropriate funding agency (i.e., SWRCB – DFA) with courtesy copy to the LRWQCB

2.3 Phase 3: Preliminary Design Report and Draft Design

A preliminary design report (PDR) will be developed in this Phase based on the groundwater quality, treatment pilot study results, survey data, the geotechnical investigation and existing information provided. The PDR will document the criteria to be used as the basis of the R1 GWTF. The PDR will outline the key components of the R1 GWTF. The PDR will develop:

- Preliminary assumptions and criteria list,
- Completed calculations to size the treatment,
- 50% design of treatment facility floor plan and section view, well equipment, flow schematic, and draft process and instrumentation diagrams, and list of technical specifications,
- Opinion of Probable Construction Cost,
- Estimated schedule for construction of the R1 GWTF, and
- List of agreements and required permitting

Survey and geotechnical investigation of the R1 site should also be conducted during this Phase in order to inform limitations in building or infrastructure location or foundation requirements.

Agreements and permitting to be obtained before the construction phase will be initiated during this Phase of the work. The anticipated agreement and permitting would include, but are not limited to:

- Environmental Documents (CEQA and TRPA)
- Technical, Managerial, Financial (TMF) Assessment and Drinking Water Supply Permit Amendment (SWRCB-DDW)
- Sanitary Sewer Connection Agreement (District)
- Storm Sewer Connection Agreement (CSLT)
- Land Coverage Acquisition (CTC)
- Tahoe Regional Planning Agency (TRPA) Permit

2.4 Phase 4: Final Design

Based on the PDR and draft design documents developed during the Preliminary Design Phase (Phase 3) and acknowledged by the Responsible Parties, final design documents for construction including design drawings, specifications and opinion of probable construction cost will be prepared for construction of the R1 GWTF and accompanying drinking water connection to the public water distribution system; and waste discharge connections to the sanitary sewer and storm sewer collection systems. The Final Design Phase will include:

- Mechanical and structural design engineering for R1 GWTF work inside the building,
- Structural design engineering for the building and R1 GWTF,
- Electrical, instrumentation and controls engineering for well, treatment process, building and site,
- Coordination of electrical power service upgrade,
- Calculation of headloss through the treatment process for the selection of well pump, and
- Preparation of the 60%, 90% and final design and construction documents. Because the preferred remedial alternative will be funded using public resources, construction documents must incorporate the public bidding procedures in accordance with Public Contracting Code.

2.5 Phase 5: Construction/Startup

With the completion of Final Design, the final design package will be distributed and go out to bid. A contractor will be identified after the bid analysis and will be brought on board for the construction. Assuming Policy Memo 97-005 requirements, it is assumed that R1 startup will be phased as:

- Year 1 – Start-up Demonstration: treated water will be routed to the sewer discharge with high-frequency sampling requirement
- Year 2 – Conditional Operation: treated water will be connected to the distribution system with high-frequency sampling

- After 2 years – Normal Operation: treated water will be connected to the distribution system with a sampling schedule approved by DDW

Once the R1 GWTF is tested and brought online, the operations strategy will be:

- Operate LBWC 5 with GAC treatment as lead well to meet existing water demands for LBWC system
- Operate LBWC 1 as lag well to meet existing water demands for LBWC system
- Operate the R1 GWTF at 160 gpm for potable reuse by the water purveyors and PCE mass removal

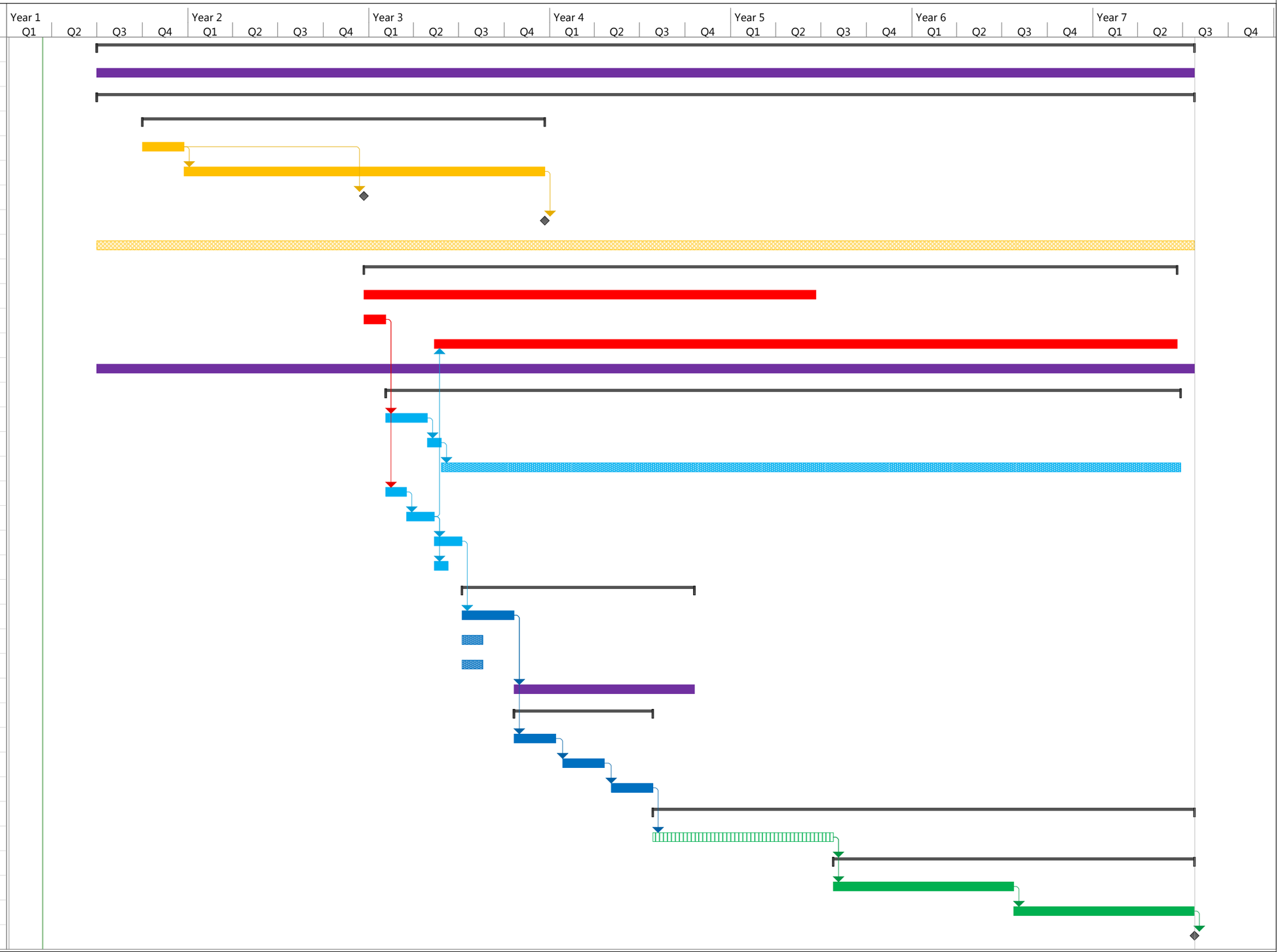
Section 3: Implementation Schedule

Figure 1 shows the proposed project schedule to complete implementation of the preferred remedial alternative. Tasks to complete the preferred remedial alternative are broken into the Phases of the Implementation Activities. Task durations are in months and the schedule is anticipated to start assuming the solicitation period for Round 3 of Proposition 1 Groundwater Sustainability Funding closes in the fourth quarter of 2020.

Phase 2 of the implementation of the preferred remedial alternative is anticipated to begin in the fourth quarter of 2021, assuming that a Letter of Commitment from the SWRCB to fund the preferred remedial alternative is received within one year after submittal of a grant application for Proposition 1 Groundwater Sustainability Funding.

South Y Feasibility Study
Interim Remedial Action Plan
Preferred Remedial Alternative
Project Schedule

ID	Task Name
1	**Phase 1: Project Planning**
2	Develop Agreements
3	**Identify and Secure Funding**
4	**Proposition 1 Groundwater Sustainability Grant**
5	Preparation of Grant Application
6	Application Review by SWRCB
7	Preliminary Award Letter by SWRCB
8	Executed Funding Agreement
9	Additional Funding
10	**Develop Project Workplans and Protocols**
11	Project Guide Manual
12	Treatment Pilot Study Protocol
13	Operational Plans
14	Conduct Stakeholder Outreach
15	**Phase 2: R1 Test Well and Treatment Pilot Study**
16	Test Well Design
17	Test Well Drilling
18	(Optional) Process Memo 97-005 Evaluation
19	Identify Treatment Vendor
20	Conduct Pilot Study
21	Treatment and Monitoring Program Proposal
22	DWSAP
23	**Phase 3: Preliminary Design Report and Draft Design**
24	PDR
25	Geotechnical Investigation
26	Survey
27	Permitting and Environmental
28	**Phase 4: Final Design**
29	60% Design
30	90% Design
31	100% Design
32	**Phase 5: Construction/Startup**
33	Construction
34	**Facility Startup**
35	Start-Up Demonstration
36	Conditional Operation
37	Begin Normal Operations



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