TECHNICAL MEMORANDUM

To: Randy Marx, PE | Office of Water Programs
Sheri Braden | San Lucas County Water District

From: Stefanos Word, PE, ENV SP | MKN & Associates
Chris Martin, PE | MKN & Associates
Brian McCauley, PE | MKN & Associates

Date: July 12, 2024

Re: San Lucas County Water District – Feasibility Study Peer Review - Nitrate Work Plan

Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board. 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.

1.0 Background and Objectives

San Lucas County Water District (San Lucas CWD/District) has historically experienced challenges with water quality from their groundwater wells, namely elevated nitrate, salinity, iron, and manganese levels. Furthermore, there are concerns of elevated disinfection byproduct formation in the distribution system, as well as production of radionuclides (uranium), coloration, and odor. Three of the District's wells currently produce non-potable water and an interim well (Well No. 3) that supplies potable water to San Lucas CWD (co-owned by the Naraghi Family and Mission Ranches Company, operated by a contract operator working for the District) has begun to experience intermittent nitrate spikes above the maximum contaminant level (MCL) of 10 mg/L (as Nitrogen). Wallace Group prepared a Feasibility Study for the Mission Ranches Company that evaluated previous work completed by North Coast Engineering that focused on mitigating nitrates through two alternatives:

- Alternative 1: Transmission Line

This alternative analyzes the technical feasibility and associated costs of using the District's existing water storage tank as a modified dilution tank to buffer nitrate spikes in the water supply. When a nitrate exceedance is detected at the well discharge, raw water would bypass the existing distribution system and be conveyed to the existing storage tank to be diluted by the water contained within the tank. If nitrate concentrations in the storage tank exceed the nitrate concentration alarm set point, high nitrate water would be prevented from being served to the customers and a "Do Not Drink" notice would be served.

- Alternative 2: Wellhead Treatment Using Ion Exchange (IX)

This alternative analyzes the technical feasibility and associated costs of implementing a modified ion exchange treatment system to remove nitrate from the source water (Well 3) before it is pumped to the District's distribution system. The modified IX system would only be used when nitrate levels in Well 3 exceed a threshold of 8 mg/L (as Nitrogen) through a continuous online nitrate analyzer connected to the well discharge line. In the event that the raw water nitrate concentration exceeds the threshold, the nitrate analyzer would send a signal to a controller that would isolate the complete well flow to be treated through the IX system. The IX system would run until the analyzed nitrate concentration falls below the set threshold or for the minimum IX equipment run-time, whichever is longer.

Based on MKN's initial review of the historical reports and available water quality data, MKN has developed comments and critiques of the San Lucas Water System Feasibility Study and the Feasibility Study Addendum 1 prepared by Wallace Group in August 2022 and February 2023 (hereafter collectively referred to as the Feasibility Study).

MKN & Associates, Inc. (MKN) has developed the following Feasibility Study Peer Review Technical Memorandum (TM) that will address the following objectives:

- Summarize water quality information from Well No. 3.
- Perform a peer review of the Wallace Group's response to comments received on the Feasibility Study.
- Review and assess the feasibility and viability of the long-term solutions (Alternatives 1 and 2) proposed by the Wallace Group for the District and San Lucas community.
- Provide a long-term operation and maintenance cost assessment of the proposed solutions.
- Provide conclusions and recommendations.

2.0 Historical Water Quality for Well No. 3

Historical nitrate concentrations from 2016 to 2023 are depicted on **Figure 2-1**. It is generally observed that between the Spring and late Fall/early Winter months of each year, nitrate concentrations typically spike, often lasting several months before decreasing to non-detect levels during winter months. Between 2016 and 2021, nitrate concentrations exhibited significant deviation, ranging from non-detect to 20 mg/L (as Nitrogen). The upper and lower concentrations of the aforementioned deviation range exceed the primary MCL concentration of 10 mg/L (as Nitrogen) mandated by the State Water Resources Control Board Division of Drinking Water (DDW). Given the significant deviations previously observed in the raw water nitrate concentrations, it is anticipated that nitrate concentrations will continue to fluctuate in the future.

Historical salinity (Total Dissolved Solids/Solutes [TDS]) concentrations from 2014 to 2023 are depicted on **Figure 2-2**. While the quantity of TDS sampling data from Well No. 3 is much more limited than the nitrate sampling data, it is observed that between the Spring and Winter months of 2016, TDS concentrations spiked, lasting several months before slightly decreasing during the start of 2017. In comparison with spikes in nitrate concentrations that occurred roughly during this time frame, it is suspected that spikes in salinity can also be loosely correlated with the cause(s) of the nitrate spikes. Between 2016 and 2017, TDS concentrations exhibit significant deviation, ranging from 890 to 2,200 mg/L. The upper and lower concentrations of the aforementioned deviation range exceed both the recommended and upper secondary MCL concentrations (500- and 1,000 mg/l, respectively) mandated by the DDW. Given the deviations previously observed in the raw water TDS concentrations, it is anticipated that TDS concentrations will also continue to fluctuate in the future.

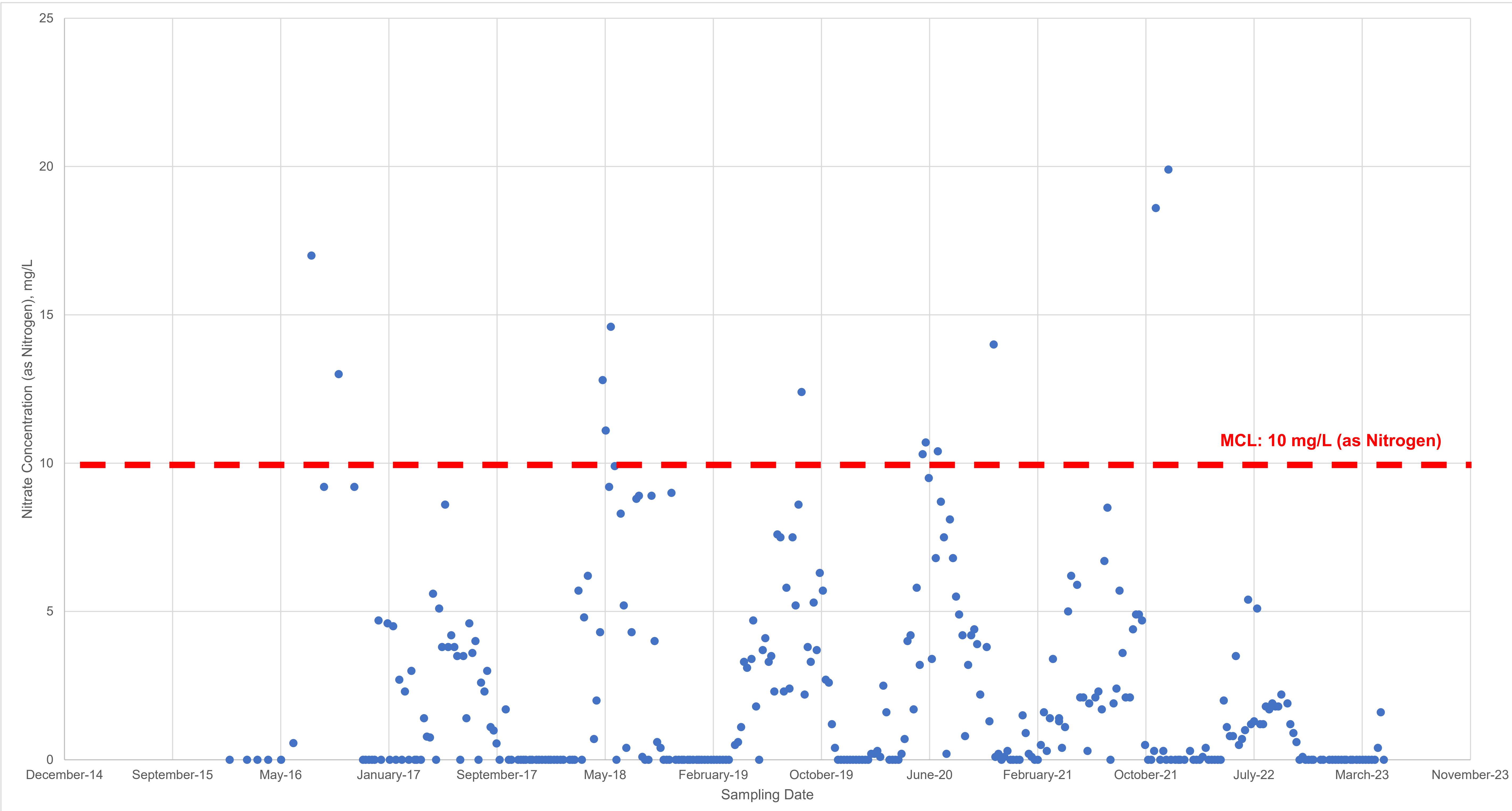

Figure 2-1. Historical Nitrate Concentrations - Well No. 3 (2016 - 2023)

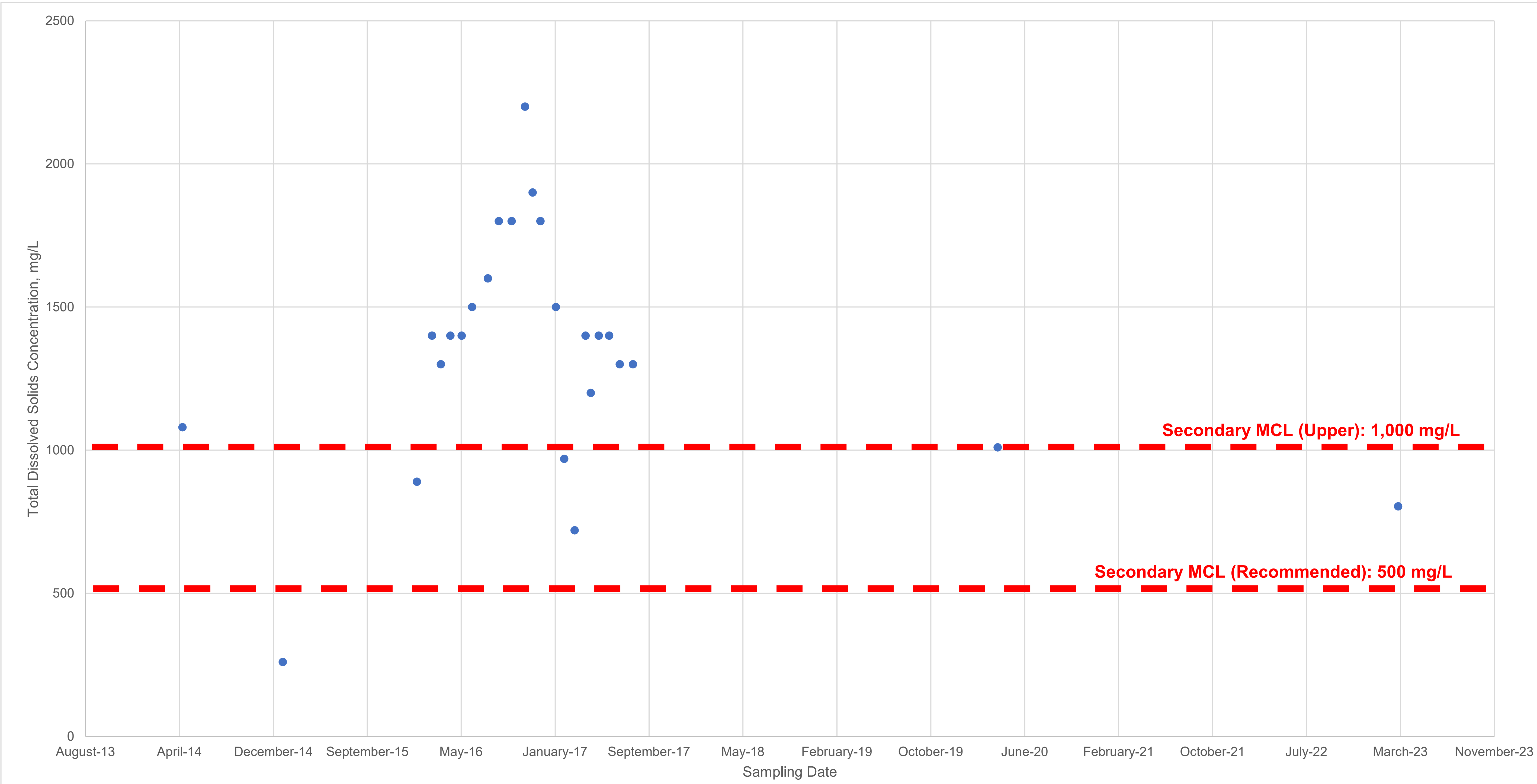

Figure 2-2. Historical TDS Concentrations - Well No. 3 (2014 - 2023)

With respect to both nitrates and TDS concentrations, it is understood that San Lucas CWD will continue to routinely monitor Well No. 3 to better understand trends in raw water quality.

Iron concentrations have historically ranged from 44 to 1040 µg/L, while manganese concentrations have historically ranged from 39 to 860 µg/L. The average of iron and manganese concentrations from 2014 to 2023 are quite high, calculated to be approximately 318 and 494 µg/L, respectively. The majority of the sampling values for both constituents indicate them to be above their respective secondary MCLs of 300 µg/L (iron) and 50 µg/L (manganese) during nearly all sampling events.

Uranium concentrations have historically ranged from 2 to 39 PCI/L. Only one exceedance of the MCL occurred in the second quarter of 2017. While the calculated average of uranium concentration is approximately 8 PCI/L, the uranium samples since 2017 have remained below the MCL. Given that sampling events have remained below 10 PCI/L since the first quarter of 2022, it is expected that uranium concentrations will continue to remain below the MCL in the future.

Color concentrations have historically ranged from 4 to 5 color units. The average of color units from 2014 to 2023 is approximately 4.5 color units. While the range of historically sampled color units remains below the secondary MCL of 15 color units, the presence of color measured at or above 5 color units can often be attributed to discoloration of water obtained from household appliances. It is suspected that oxidation of higher concentrations of iron and manganese can be attributed to the slight discoloration of the raw water.

Odor measurements have historically ranged from 1 to 3 threshold odor numbers (TON). The average of odor measurements from 2014 to 2023 is approximately 2 TON. While the range of historically sampled odor measurements remains at- or below the secondary MCL of 3 TON, the presence of odor measured above 1 TON can easily be smelled in water obtained from household appliances. It is suspected that the presence of odor can potentially be attributed to the reduction of sulfurous elements in the aquifer (i.e., sulfates, sulfides) into hydrogen sulfide gas (typically resulting in a “rotten egg” smell).

General, organic, and inorganic water quality for Well No. 3 is summarized in **Table 2-1**. Brief summaries of pertinent water quality concerns related to the long-term solutions that address both nitrate and non-nitrate water quality issues are discussed in Sections 3.0 and 5.0.

Given that total trihalomethane sampling exceedances pertain to the distribution system sampling (rather than Well No. 3), water quality concerns will be discussed in Section 3.0.

Table 2-1 Historical Water Quality - Well No. 3 (2014 - 2023)						
Parameter	**Average**	**Minimum**	**Maximum**	**Units**	**MCL**	**Number of Values?**
General, Inorganic, and Organic						
1,1,1,2-TETRACHLOROETHANE	--	--	--	UG/L	--	2
1,1,1-TRICHLOROETHANE	--	--	--	UG/L	200	3
1,1,2,2-TETRACHLOROETHANE	--	--	--	UG/L	1	3
1,1,2-TRICHLOROETHANE	--	--	--	UG/L	5	3
1,1-DICHLOROETHANE	--	--	--	UG/L	5	3
1,1-DICHLOROETHYLENE	--	--	--	UG/L	6	3
1,1-DICHLOROPROPENE	--	--	--	UG/L	--	2
1,2,3-TRICHLOROBENZENE	--	--	--	UG/L	--	2
1,2,3-TRICHLOROPROPANE	--	--	--	UG/L	0.005	5
1,2,4-TRICHLOROBENZENE	--	--	--	UG/L	5	3
1,2,4-TRIMETHYLBENZENE	--	--	--	UG/L	--	2
1,2-DIBROMO-3-CHLOROPROPANE	--	--	--	UG/L	.2	1
1,2-DICHLOROETHANE	--	--	--	UG/L	.5	3
1,2-DICHLOROPROPANE	--	--	--	UG/L	5	3
1,3,5-TRIMETHYLBENZENE	--	--	--	UG/L	--	2
1,3-DICHLOROPROPANE	--	--	--	UG/L	--	2
1,3-DICHLOROPROPENE	--	--	--	UG/L	.5	3
2,2-DICHLOROPROPANE	--	--	--	UG/L	--	2
2,4,5-T	--	--	--	UG/L	--	2
2,4,5-TP	--	--	--	UG/L	50	4
2,4-D	--	--	--	UG/L	70	4
3-HYDROXYCARBOFURAN	--	--	--	UG/L	--	3
4-METHYL-2-PENTANONE	--	--	--	UG/L	--	2
ACETONE	--	--	--	UG/L	--	2
AGGRESSIVE INDEX	12.1	11.7	12.3	AGGR	--	3
ALDICARB	--	--	--	UG/L	--	3
ALDICARB SULFONE	--	--	--	UG/L	--	3
ALDICARB SULFOXIDE	--	--	--	UG/L	--	3
ALDRIN	--	--	--	UG/L	--	1
ALKALINITY, BICARBONATE	217.8	177.0	257.0	MG/L	--	4
ALKALINITY, CARBONATE	--	--	--	MG/L	--	4
ALKALINITY, TOTAL	176.5	145.0	211.0	MG/L	--	4
ALUMINUM	--	--	--	UG/L	1000	4
ANTIMONY, TOTAL	--	--	--	UG/L	6	4
ARSENIC	3.2	1.1	7.0	UG/L	10	4
ATRAZINE	--	--	--	UG/L	1	4
BARIUM	64.8	44.1	104.0	UG/L	1000	4
BENTAZON	--	--	--	UG/L	18	4
BENZENE	--	--	--	UG/L	1	3
BENZO(A)PYRENE	--	--	--	UG/L	.2	3
BERYLLIUM, TOTAL	--	--	--	UG/L	4	4
BHC-GAMMA	--	--	--	UG/L	.2	1
BROMACIL	--	--	--	UG/L	--	3
BROMIDE	0.3	0.2	0.3	MG/L	--	3
BROMOBENZENE	--	--	--	UG/L	--	2
BROMOCHLOROMETHANE	--	--	--	UG/L	--	2
BROMODICHLOROMETHANE	--	--	--	UG/L	--	3
BROMOFORM	--	--	--	UG/L	--	3
BROMOMETHANE	--	--	--	UG/L	--	2
BUTACHLOR	--	--	--	UG/L	--	3
CADMIUM	--	--	--	UG/L	5	4
CALCIUM	151.5	111.0	180.0	MG/L	--	4
CARBARYL	--	--	--	UG/L	--	3
CARBOFURAN	--	--	--	UG/L	18	4
CARBON TETRACHLORIDE	0.7	0.7	0.7	UG/L	.5	3
CHLORDANE	--	--	--	UG/L	.1	1
CHLORIDE	103.8	82.1	120.0	MG/L	500	4
CHLOROBENZENE	--	--	--	UG/L	70	3
CHLOROETHANE	--	--	--	UG/L	--	2
CHLOROFORM	--	--	--	UG/L	--	3
CHLOROMETHANE	--	--	--	UG/L	--	2
CHLOROTHALONIL	--	--	--	UG/L	--	1

Table 2-1 Historical Water Quality - Well No. 3 (2014 - 2023)						
Parameter	**Average**	**Minimum**	**Maximum**	**Units**	**MCL**	**Number of Values?**
General, Inorganic, and Organic						
CHROMIUM	3.5	1.0	6.0	UG/L	50	4
CHROMIUM, HEX	--	--	--	UG/L	10	1
CIS-1,2-DICHLOROETHYLENE	--	--	--	UG/L	6	3
CIS-1,3-DICHLOROPROPENE	--	--	--	UG/L	.5	1
COLOR	4.5	4.0	5.0	UNITS	15	4
COMBINED URANIUM	8.4	2.0	39.9	PCI/L	20	24
CONDUCTIVITY @ 25 C UMHOS/CM	1410.6	1129.0	1600.0	UMHO/CM	1600	5
COPPER, FREE	--	--	--	UG/L	1000	4
CYANIDE	--	--	--	UG/L	150	4
DALAPON	--	--	--	UG/L	200	4
DI(2-ETHYLHEXYL) ADIPATE	--	--	--	UG/L	400	3
DI(2-ETHYLHEXYL) PHTHALATE	--	--	--	UG/L	4	3
DIBROMOACETIC ACID	--	--	--	UG/L	--	1
DIBROMOCHLOROMETHANE	--	--	--	UG/L	--	3
DIBROMOMETHANE	--	--	--	UG/L	--	2
DICAMBA	--	--	--	UG/L	--	3
DICHLOROACETIC ACID	--	--	--	UG/L	--	1
DICHLORODIFLUOROMETHANE	--	--	--	UG/L	--	2
DICHLOROMETHANE	--	--	--	UG/L	5	3
DIELDRIN	--	--	--	UG/L	--	1
DIMETHOATE	--	--	--	UG/L	--	3
DINOSEB	--	--	--	UG/L	7	4
DIQUAT	--	--	--	UG/L	20	4
DIURON	--	--	--	UG/L	--	1
ENDOTHALL	--	--	--	UG/L	100	1
ENDRIN	--	--	--	UG/L	2	1
ETHYLBENZENE	--	--	--	UG/L	300	3
ETHYLENE DIBROMIDE	--	--	--	UG/L	.05	1
ETHYL-TERT-BUTYL ETHER	--	--	--	UG/L	--	2
FLUORIDE	0.2	0.1	0.3	MG/L	2	4
FOAMING AGENTS (SURFACTANTS)	0.1	0.1	0.1	MG/L	.5	4
GLYPHOSATE	--	--	--	UG/L	700	1
GROSS ALPHA PARTICLE ACTIVITY	15.8	4.1	63.4	PCI/L	15	26
HARDNESS, TOTAL (AS CACO3)	611.5	441.0	730.0	MG/L	--	4
HEPTACHLOR	--	--	--	UG/L	.01	1
HEPTACHLOR EPOXIDE	--	--	--	UG/L	.01	1
HEXACHLOROBENZENE	--	--	--	UG/L	1	1
HEXACHLOROBUTADIENE	--	--	--	UG/L	--	2
HEXACHLOROCYCLOPENTADIENE	--	--	--	UG/L	50	1
HYDROXIDE AS CALCIUM CARBONATE	--	--	--	MG/L	--	4
IRON	317.7	44.0	1040.0	UG/L	300	30
ISOPROPYL ETHER	--	--	--	UG/L	--	2
ISOPROPYLBENZENE	--	--	--	UG/L	--	4
LANGELIER INDEX (PH(S))	0.5	0.4	0.7	LANG	--	2
LANGELIER INDEX AT SOURCE TEMP.	-0.3	-0.5	-0.1	LANG	--	2
LASSO	--	--	--	UG/L	2	4
LEAD	--	--	--	UG/L	--	4
MAGNESIUM	56.7	40.0	69.0	MG/L	--	4
MANGANESE	494.3	39.0	860.0	UG/L	50	32
M-DICHLOROBENZENE	--	--	--	UG/L	--	2
MERCURY	--	--	--	UG/L	2	4
METHOMYL	--	--	--	UG/L	--	3
METHOXYCHLOR	--	--	--	UG/L	30	1
METHYL ETHYL KETONE	--	--	--	UG/L	--	2
METHYL TERT-BUTYL ETHER	--	--	--	UG/L	13	3
METOLACHLOR	--	--	--	UG/L	--	3
METRIBUZIN	--	--	--	UG/L	--	3
MOLINATE	--	--	--	UG/L	20	4
MONOBROMOACETIC ACID	--	--	--	UG/L	--	1
MONOCHLOROACETIC ACID	--	--	--	UG/L	--	1
NAPHTHALENE	--	--	--	UG/L	--	2
N-BUTYLBENZENE	--	--	--	UG/L	--	2

Table 2-1 Historical Water Quality - Well No. 3 (2014 - 2023)						
Parameter	**Average**	**Minimum**	**Maximum**	**Units**	**MCL**	**Number of Values?**
General, Inorganic, and Organic						
NICKEL	10.7	6.8	17.0	UG/L	100	4
NITRATE	3.8	0.1	19.9	MG/L	10	334
NITRATE (AS NO3)	11.3	8.5	14.0	MG/L	45	9
NITRATE-NITRITE	150.4	0.8	300.0	MG/L	10	5
NITRITE	200.0	200.0	200.0	MG/L	1	4
N-PROPYLBENZENE	--	--	--	UG/L	--	2
O-CHLOROTOLUENE	--	--	--	UG/L	--	2
O-DICHLOROBENZENE	--	--	--	UG/L	600	3
ODOR	2.0	1.0	3.0	TON	3	4
ORTHOPHOSPHATE	--	--	--	MG/L	--	1
OXAMYL	--	--	--	UG/L	50	4
O-XYLENE	--	--	--	UG/L	--	2
P-CHLOROTOLUENE	--	--	--	UG/L	--	2
P-DICHLOROBENZENE	--	--	--	UG/L	5	3
PENTACHLOROPHENOL	--	--	--	UG/L	1	4
PERCHLORATE	--	--	--	UG/L	6	4
PH	7.2	7.1	7.3	pH	--	4
PICLORAM	--	--	--	UG/L	500	4
P-ISOPROPYLTOLUENE	--	--	--	UG/L	--	2
POTASSIUM	2.8	2.4	3.4	MG/L	--	4
PROPACHLOR	--	--	--	UG/L	--	3
RADIUM-226	0.6	0.1	1.6	PCI/L	--	19
RADIUM-228	0.5	0.1	1.0	PCI/L	--	19
SEC-BUTYLBENZENE	--	--	--	UG/L	--	2
SELENIUM	1.3	1.3	1.3	UG/L	50	4
SILVER	--	--	--	UG/L	100	4
SIMAZINE	--	--	--	UG/L	4	4
SODIUM	73.3	63.0	84.0	MG/L	--	4
SPECTRACIDE	--	--	--	UG/L	--	3
STYRENE	--	--	--	UG/L	100	3
SULFATE	453.8	327.0	550.0	MG/L	500	4
TDS	1333.4	260.0	2200.0	MG/L	1000	25
TERT-AMYL-METHYL ETHER	--	--	--	UG/L	--	2
TERT-BUTYLBENZENE	--	--	--	UG/L	--	2
TERTIARY BUTYL ALCOHOL (TBA)	--	--	--	UG/L	--	2
TETRACHLOROETHYLENE	--	--	--	UG/L	5	3
THALLIUM, TOTAL	--	--	--	UG/L	2	4
THIOBENCARB (BOLERO)	--	--	--	UG/L	70	4
TOLUENE	--	--	--	UG/L	150	3
TOTAL HALOACETIC ACIDS (HAA5)	--	--	--	UG/L	60	1
TOTAL POLYCHLORINATED BIPHENYLS (F	--	--	--	UG/L	.5	1
TOTAL RADIUM FOR NTNC PER §64442(B)	--	--	--	PCI/L	5	1
TOXAPHENE	--	--	--	UG/L	3	1
TRANS-1,2-DICHLOROETHYLENE	--	--	--	UG/L	10	3
TRANS-1,3-DICHLOROPROPENE	--	--	--	UG/L	.5	1
TRICHLOROACETIC ACID	--	--	--	UG/L	--	1
TRICHLOROETHYLENE	--	--	--	UG/L	5	3
TRICHLOROFLUOROMETHANE	--	--	--	UG/L	150	3
TRICHLOROTRIFLUOROETHANE	--	--	--	UG/L	1200	3
TRIFLURALIN	--	--	--	UG/L	--	1
TTHM	--	--	--	UG/L	80	3
TURBIDITY	0.6	0.1	1.2	NTU	5	4
VINYL CHLORIDE	--	--	--	UG/L	.5	3
XYLENE, META AND PARA	--	--	--	UG/L	--	2
XYLENES, TOTAL	--	--	--	UG/L	1750	3
ZINC	36.7	14.0	64.0	UG/L	5000	4

Note: "--" indicates "Non-Detct" or "No MCL" Sampling Values.

3.0 Peer Review Comments

Peer review comments were generated from review of the following documents:

- *San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022)*
- *AUGUST 2022 NITRATE FEASIBILITY STUDY COMMENTS SAN LUCAS COUNTY WATER DISTRICT (System No. 2701676) (Division of Drinking Water, January 12th, 2023)*
- *San Lucas Water System Feasibility Study Addendum 1 (Wallace Group, August 16th, 2022)*

The aforementioned documents are located in Appendices A through C of this TM.

1. **Document and Subject:** *San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022),* Pages 2 and 3.

Alternative 1 - Transmission Line.

Comment: This approach depends on the duration of nitrate spikes being very short, having sufficient water stored in the tank to blend down the nitrate, and sufficient tank mixing. Before it is implemented, a long-term study should be performed to evaluate the length (and water volume) of nitrate spikes to verify they can be blended down. Even with this study, there is no guarantee that nitrate spikes will not increase in volume over time given the uncertainty of the nitrate spikes frequency.

The Feasibility Study indicates that a nitrate analyzer should be installed on the tank outlet and “Do Not Drink” notices should be distributed in the event of an exceedance from the blending tank. This consideration, while thoughtful and necessary, implies that exceedances from the tank outlet are anticipated and will be handled in a reactionary way. MKN agrees that exceedances can be expected due to the fact that the blending system is fully reliant on groundwater conditions naturally improving. Blending systems typically obtain clean water from a separate source such that the ratio of clean water to contaminated water may be controlled. In this system, the blending system is at the will of the aquifer with little control over how much clean water is added to blend down the nitrate concentration.

Further, the Feasibility Study does not address what is to occur with a full tank of high-nitrate water if blending is not sufficient. Should nitrate spikes increase over time and in volume, this solution may result in a full tank of high-nitrate water. No contingency plan has been addressed to handle this situation and discharge high-nitrate water from the tank for disposal.

This does not appear to be a technically feasible solution that alleviates long-term concerns regarding exceedances of nitrate and TDS concentrations in the water supply.

2. **Document and Subject:** *San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022),* Page 8.

The frequency of these spikes above the MCL appears to remain fairly consistent with an average of 2 samples per year above the MCL, with the exception of 2017, 2019, 2020 which measured 0, 1, and 3 respectively. The duration of these spikes is not fully defined since sampling intervals are weekly, however it appears that the longest spikes lasted approximately two weeks with elevated nitrate levels (½ the MCL) lasting as long as four weeks.

Comment: As depicted in **Figure 2-1**, nitrate spikes appear to last a period of months making blending through the previously-described transmission main blending concept infeasible.

3. **Document and Subject:** *San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022),* Pages 6 and 7.

See the following sections on Pages 6 and 7: *System Description, Process Flow Path Description, System Sizing, and System Installation*

Comment: The fixed time control operating scheme appears that it will work from a functional standpoint, but it is less efficient than a bypass/blending system since the entire well flow is treated when a spike is detected. Bypass and blending allows only a fraction of the raw water to be treated, while the bypassed fraction is blended with the remainder of the water treated through the ion exchange system. The control scheme proposed by the Wallace Group is expected to provide lower-nitrate water to the distribution system than a bypass/blend system. The fixed time control operating strategy (i.e., the ion exchange system runs for a specified interval [typically one (1) week]) has several challenges since the entire raw water supply is being treated (requiring more salt for regeneration, increasing relative treatment costs), rather than a continuous fraction of the raw water supply (which would require less salt for regeneration, decreasing relative treatment costs).

4. **Document and Subject:** *San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022),* Page 7.

Well No. 3 is estimated to produce 150 gpm based on operator observations. An average day demand (ADD) of 133.7gpm for the water system was calculated using the following:

- *Average Annual Demand: 17,569,640 gallons per year was calculated using the assumptions below.*
- *Per Capita Demand: 88-gallon per capita day (gpcd) was used from previous reports (AMEC, 2015). This value was based on source water production records from 2006 through 2010. Current metered well data was not available at the time of this report.*
- *Population: 547 people. This includes 415 people from the 2020 census plus an additional 132 people is anticipated from a 33 Unit CHISPA project.*
- *Design Average Day Demand (ADD): 48,136 gpd.*

A Design Max Day Demand (MDD) of 96,272 gpd was calculated based on ADD of 48,136 and a peaking factor of 2. The existing 300,000-gallon water storage tank has adequate capacity to handle 3.1 days of MDD. Therefore, the treatment system will be sized to handle ADD or in this case the well production rate since it is higher than ADD.

Comment: A well capacity of 150 gpm coupled with an ADD of 134 gpm is concerning from a volumetric water supply standpoint with reference to Alternative 2. Treated well water would be required for each resin regeneration cycle to provide backwash water, make-down of brine solution, and rinse water. These net “losses” of the total production resulting from regeneration of the ion exchange system are expected to be relatively significant due to competing sulfate concentrations, requiring frequent regeneration cycles to maintain adequate sorptive capacity for nitrate removal.

Projections from two different calculation programs, *Nitrate Ion Exchange Plant Design and Simulation (Boyle Engineering Corporation*) and *PRSM Ion Exchange System Design (Purolite)* indicate overall net production water losses ranging from approximately 8.3 to 8.6 percent of the treatment system product water.

Treated water projections and brine production characteristics from both programs are detailed below. It should be noted that treated water quality projections are only available from the *Nitrate Ion Exchange Plant Design and Simulation (Boyle Engineering Corporation*) program and not the *PRSM Ion Exchange System Design (Purolite*) program. However, it is expected that the water quality of the treated water and brine waste from both software projections are similar.

Water quality characteristics from the ion exchange effluent and the blended water supply are indicated in **Table 3-1**. Usage characteristics of salt (the regenerant used to remove sorbed nitrate from the resin) and waste production (the spent regenerant) are also detailed in the following pages.

Table 3-1
Treated Water Projections – Nitrate Plant Design and Simulation Program
(Boyle Engineering Corporation)

Parameter	Sulfate	Nitrate (as Nitrogen)	Chloride	Bicarbonate
Treated (Ion Exchange Effluent)	**0.6**	**3.5**	**772**	**187**
Blended (IX Effluent and Raw Water Blend)	**207**	**8**	**599**	**204**

Salt Usage

- Concurrent (downflow) regeneration with a Type 1 Strong Base Anion Exchange resin was selected
- Basis is 2.30 Bed Volumes of 1,000 meq/L brine per regeneration
- Brine contains 0.49 pounds NaCl per gallon
- Gallons brine per MG treated: 33,333 gallons
- Pounds salt per MG treated: 16,240 pounds
- Pounds salt per MG product: 14,993 pounds
- Pounds salt per MG blend: 10,299 pounds
- BUF (Brine Use Factor): 34.97

Waste Production

The treatment process produces approximately 5.3 bed volumes of waste per regeneration. This is 7.7 percent of the treated water, or 8.3 percent of the total plant product water.

Table 3-2 Brine Waste Projections – Nitrate Plant Design and Simulation Program (Boyle Engineering Corporation)						
Parameter	**Sodium**	**Sulfate**	**Nitrate (as Nitogen)**	**Chloride**	**Bicarbonate**	**TDS**
Concentration, mg/L	11,472	8,642	178	8,600	799	30,401
Pounds per MG of Product Water (IX Effluent)	7,957	5,994	124	5,965	554	21,082
Pounds per MG of Blended Water (IX Effluent)	5,466	4,118	85	4,098	381	14,482

***PRSM Ion Exchange System Design (Purolite*)**

Salt Usage

- Concurrent (downflow) regeneration with a Type 1 Strong Base Anion Exchange resin was selected
- Basis is 2.30 bed volumes of 1,000 meq/L brine per regeneration
- Brine contains 0.49 pounds NaCl per gallon
- Gallons brine per MG treated: 33,333 gallons
- Pounds salt per MG treated: 16,505 pounds
- Pounds salt per MG product: 13,163 pounds
- Pounds salt per MG blend: 10,100 pounds

Waste Production

The treatment process produces approximately 5.5 bed volumes of waste per regeneration equating to approximately 7.9 percent of the treated water, or 8.6 percent of the total plant product water.

Analysis of Waste Projections

The waste production characteristics projected by both ion exchange design programs indicate high degree of similarity between the two projection models. The high sulfate concentration of the raw water supply inhibits the selectivity of nitrate-selective, Type 1 strong base anion exchange resins, subsequently increasing the regeneration frequency and volume of waste produced by each regeneration cycle. Rather than the 99 percent plant recovery rate assumed in the *San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022),* both industry-accepted programs indicate that the plant recovery rate would likely be approximately 7.3 to 7.6 percent lower in actuality (91.4% to 91.7% plant recovery).

It is expected that disposal of brine waste will be more difficult than that described in the Feasibility Study. Disposal of the increased waste volumes at high salinities (greater than 15,000 mg/L TDS) would potentially require a larger evaporation sump than what is described in the Feasibility Study. Alternatively, irrigation may still be a viable disposal alternative, but further calculation would be necessary to confirm the suitability of the water for irrigation. A greater volume of irrigation water than originally anticipated would be required to sufficiently blend down the salinity, nitrate, and chloride content of the brine waste to concentrations tolerable by the irrigated crops.

When considering limited brine waste disposal options and potentially high costs of sodium chloride or potassium chloride (preferred for land- or alternative brine waste disposal methods) regenerant salts for frequent, high-volume regeneration/waste cycles, strong base anion exchange does not appear to be an economically feasible alternative for San Lucas CWD. Other alternatives that address both nitrate and non-nitrate issues that are both technically- and economically feasible will be discussed briefly in Section 5.0.

5. **Document and Subject:** San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022), Page 9**.**

A monthly brine production rate of 1,134 gallons per month was calculated for this system. This assumes 210 hours per year of runtime per year and a 99% resin recovery rate. This is a conservative brine estimate, and it is likely this value will be lower since these calculations assumed that a threshold exceedance would last 7 days in the absence of more frequent sampling data. With an online nitrate analyzer, nitrate can be measured in real time allowing for shorter IX runtimes and less brine production.

Comment: The Feasibility study states a “99% resin recovery rate”. MKN assumes that the Feasibility Study is referring to an overall net production water loss of one percent to provide for adequate regeneration cycles. With sulfate concentrations ranging from 327 to 550 mg/L which inhibits the sorptive capacity of the resin, MKN does not believe that this is an adequate assumption that can be made. Projections previously presented from two different calculation programs indicate overall production water losses ranging from approximately 8.3 to 8.6 percent of the treatment system product water.

6. **Document and Subject:** *San Lucas Water System Feasibility Study (Wallace Group, August 16th, 2022),* Page 9.

Blend with Mission Ranches Irrigation water and apply to crops. This would need to be further analyzed and updated in the Mission Ranches Irrigation and Nutrient Management plan and approved by the RWQCB. However, based on the conservative estimate for annual brine production in comparison to overall water usage for irrigation within the vicinity of the treatment system, it is safe to assume the increase in TDS and nitrate in the irrigation water would be negligible.

Comment: Blending with irrigation water will require installation of a brine holding tank and pump station. As indicated in Comments 4 and 5, brine waste volumes produced will likely be 7.3 to 7.6 percent higher than assumed in the Feasibility Study. This would ultimately require a higher volume of irrigation water to reduce the overall salinity (TDS), sulfate-, and nitrate concentrations associated with brine waste to mitigate adverse impacts to crops and groundwater.

7. **Document and Subject:** *AUGUST 2022 NITRATE FEASIBILITY STUDY COMMENTS SAN LUCAS COUNTY WATER DISTRICT (System No. 2701676) (Division of Drinking Water, January 12th, 2023),* Page 2.

The treatment system proposal mentions the plant is only run when a raw water nitrate threshold is met. The Division is not aware of a similar ion exchange treatment system proposal already permitted statewide. In general, nitrate ion exchange treatment systems are run continuously to avoid fouling. There isn't enough supporting information provided to demonstrate this proposal will work and adequately protect public health.

Comment: While more information will be required before DDW can permit the proposed treatment scheme, it is possible that the proposed scheme will work. However, it is not the most efficient method of reducing nitrates in the water supply. The DDW's comment on running the ion exchange system continuously to avoid fouling is a fair assertion. If an ion exchange system were to be implemented, some method of regular flushing for the treatment system would be required. Even if regular flushing was implemented, given the considerable amount of organics in the raw water supply, it is our opinion that some form of biological fouling should be anticipated to occur across the treatment system.

8. **Document and Subject:** *AUGUST 2022 NITRATE FEASIBILITY STUDY COMMENTS SAN LUCAS COUNTY WATER DISTRICT (System No. 2701676) (Division of Drinking Water, January 12th, 2023),* Pages 2 and 3.

   a. *The cost estimates provided in Tables 3 and 4 do not provide enough of an estimated cost breakdown. The cost estimations might underestimate the costs of ion exchange. Costs related to the nitrate analyzer, brine storage tank(s), waste tank(s), SCADA / alarms / remote viewing, and operation and CEQA costs are missing.*

   Operations and maintenance costs might be underestimated; missing from the estimate are costs for the regenerant (sodium chloride or potassium chloride), nitrate analyzer operation and maintenance, and the frequency of site visits from the certified operator.

   b. *The cost estimation for Alternative 1 does not include a nitrate analyzer at the tank effluent, which is a requirement for this proposal. California Environmental Quality Act (CEQA) costs are also missing.*

   c. *With the proposal to land dispose spent brine, potassium chloride is the preferred ion exchange regenerant. Potassium chloride is much more costly than sodium chloride, so this cost should be reflected in cost estimates.*

Comment: MKN strongly agrees with these comments. Estimated construction and operating costs for the proposed ion exchange system as described in the Feasibility Study are significantly lower than MKN's initial cost estimates from prior experience. Based on MKN's experience with design of ion exchange facilities of similar capacity, it is estimated that the construction cost could potentially range from $750,000 to $880,000, which is approximately $350,000 to $480,000 higher than the capital cost estimate for an ion exchange treatment system in the Feasibility Study. Total annual operations and maintenance costs are estimated to be approximately $60,000 and $360,000 higher for evaporation and brine hauling, respectively, than the estimated annual ion exchange system operating cost estimated in the Feasibility Study (see Section 4.0).

9. **Document and Subject:** *San Lucas Water System Feasibility Study Addendum 1 (Wallace Group, August 16th, 2022),* Pages 1 and 2.

Disinfectant byproducts (DBP) such as trihalomethane are formed when disinfectants like chlorine interact with natural organic materials in water. The District's water treatment system uses chlorine as an oxidant for the Iron/Manganese removal system and they also maintain a chlorine residual in the distribution system for disinfection. DBPs can be reduced by treating the source water to remove organic carbon, changing the disinfectant and oxidant, or removing DPBs after they are formed. Because the total organic carbon (TOC) in the source water is less than 2.0 mg/l, alternate compliance criteria may be used in lieu of TOC removal per EPA guidance criteria. For water quality data, see Attachment 3.

For this water system we recommend starting with an analysis of the District's chlorine residual to determine if it is in compliance with the EPA's established maximum residual disinfectant limits (MRDL). Once this analysis is completed it can be determined if chlorine is being overdosed to the system. These limits are established by the EPA and are listed below for reference only:

Regulated Disinfectants	MRDL (mg/L)	MRDLG (mg/L)
Chlorine	4.0 as Cl_2	4 as Cl_2
Chloramines	4.0 as Cl_2	4 as Cl_2
Chlorine Dioxide	0.8 as ClO_2	0.8 as ClO_2

Feasibility Study Table 1. Regulated Disinfectants

DBP formation is also directly correlated to chlorine contact time with the DBP precursor, in this case TOC. With the proposed Transmission Line alternative, the tank volume would be exchanged more frequently, and water would be introduced to the tank using a nozzle acting as a mixer/aerator. Both of these changes would reduce water age through increased circulation and create better homogenization of the water, minimizing thermal and chemical stratification that promotes DBP formation. If DBP formation continues to persist after the above solutions are implemented an active mixing system could be installed in the water storage tank to further remove DBPs.

Comment: Wallace Group states that disinfection byproducts are formed when chlorine reacts with natural organics in the water. In the case of San Lucas CWD, this is not entirely correct. The calculated value for total trihalomethanes (TTHMs) is comprised of chloroform, dibromochloromethane, bromodichloromethane, and bromoform. As indicated in **Table 3-3**, sampling data from 2017 to 2023 indicates that the predominant trihalomethane was bromoform, which consists of a reaction between naturally occurring bromide and naturally occurring organic matter in the raw water. Chlorinated trihalomethanes (chloroform, and to a lesser extent, dibromochloromethane and bromodichloromethane) remain very low from 2017 to 2023 (typically less than 10 percent of the TTHM

Sampling Measurement). This potentially indicates that modifications to the existing disinfection system/chlorine dosing scheme will produce little- to no-change in TTHM formation.

Furthermore, the Feasibility Study mentions that active tank mixing could be implemented. Brominated trihalomethanes are difficult to remove using tank mixing/water surface aeration technologies, given that brominated trihalomethanes have a higher molecular weight than chlorinated trihalomethanes. Brominated compounds are difficult to strip from the water matrix using conventional forms of aeration and air stripping.

Since bromide is an anion, bromide would also be removed using the same anion exchange system implemented for nitrate removal. This would likely reduce the formation of brominated trihalomethanes in the distribution system, lowering the total trihalomethane concentration below the locational running annual average of 80 µg/L. However, another solution could include broad spectrum membrane-based treatment solutions, such as reverse osmosis or electrodialysis reversal, which would reduce both naturally occurring organics and bromide in the source water. Reduction of organics could potentially reduce free chlorine consumption, potentially minimizing the amount of initial chlorine dosed to achieve for 4-log virus reduction and a detectable disinfection residual at service connections. Coupled with broad-spectrum treatment, if water age within the distribution system is minimized to the greatest extent possible (while still being able to meet potable- and fire flow demands), it is suspected that the TTHM concentrations sampled within the distribution system would remain under the locational running annual average of 80 µg/L.

Table 3-3 Historical Disinfection Byproduct Concentrations (Distribution System Sampling), 2014 to 2023										
Parameter	**Sampling Date**									**Units**
	4/29/2014	**10/25/2017**	**4/7/2020**	**8/11/2020**	**10/8/2021**	**8/26/2022**	**10/7/2022**	**1/19/2023**	**4/13/2023**	
Bromoform	22.75	0	0	33	3	71	73	51	18	µg/L
Total Trihalomethanes	27	0	0	58	4	111	94	74	38	µg/L
Bromoform Percentage of TTHM Concentration	83%	--	--	57%	75%	64%	78%	69%	47%	--

10. **Document and Subject:** *AUGUST 2022 NITRATE FEASIBILITY STUDY COMMENTS SAN LUCAS COUNTY WATER DISTRICT (System No. 2701676) (Division of Drinking Water, January 12th, 2023),* Page 2.

Alternative 2 – Ion exchange treatment plant

a. *San Lucas CWD uses chlorine as an oxidant for the iron and manganese water treatment plant; chlorinated water is known to damage ion exchange resin. The study does not mention how this is addressed.*

Comment: MKN agrees with the DDW's comment on oxidants damaging ion exchange resin. The Feasibility Study fails to address reduction of free chlorine in the treated effluent in the existing iron and manganese greensand treatment. Free chlorine in excess of 0.5 to 1 mg/L can destroy microporous ion exchange resins. While macroporous variants of nitrate selective resins can tolerate up to 1 mg/L of free chlorine, it is still recommended that complete dechlorination of the treated greensand effluent be implemented upstream of any ion exchange or desalination equipment minimize the risk of destroying downstream filter media. This typically requires injection of sodium bisulfite in the treated effluent through either a pipeline contactor or small "break" tank between the filtration- and ion exchange or desalination systems. The pipeline contactor or break tank is typically designed to retain the maximum instantaneous design flowrate for 15 – 30 seconds of contact time for complete dechlorination.

Operating data indicates that the existing treatment system is not properly removing iron and manganese from the raw water at times. Failure to remove iron and/or manganese from the raw water can result in severe fouling of the cartridge filter(s) equipped on downstream ion exchange or desalination systems. Based on MKN's current understanding of the treatment system, it is possible that improvements could include (but are not limited to) the following:

- replacement of existing media (suspected to be nearly twenty years old) for optimal removal of iron and manganese;
- adjustment of upstream oxidant dosages to achieve proper oxidation of select constituents and continuous regeneration of the filtration media;
- optimizing backwashing to minimize "channeling" of flow through the filtration media beds;
- analysis of potential variances in raw water iron and manganese concentrations that may be contributing to pre-mature breakthrough in the filter effluent.

4.0 <u>Long-Term Operations and Maintenance Cost Assessment</u>

In response to the comments generated by MKN and the DDW, and construction and operating cost information contained within the original- and amended Feasibility Studies, MKN prepared revised life-cycle cost assessments to better understand long-term operations and maintenance costs for Alternative 2, ion exchange. To better illustrate cost impacts of different brine waste disposal alternatives, opinions of probable operating and 20-year net present value costs were prepared for both evaporation/land disposal and off-site hauling of brine waste.

Table 4-1 Opinion of Annual O&M Cost – Ion Exchange with Evaporation and/or Irrigation Land Disposal of Brine Waste			
Item	**Annual Cost**	**Cost per Service Connection**	**Cost per 1,000 Gallons**
Chemicals (1)	$2,208	$25.98	$0.13
Power (2)	$9,443	$111.10	$0.54
Labor and Maintenance (3)	$54,750	$644.12	$3.16
Analytical (4)	$1,800	$21.18	$0.10
Resin Replacement (5)	$1,832	$21.55	$0.11
Additional Consumables (6)	$10,250	$120.59	$0.59
Total	**$80,283**	**$945**	$4.63

Notes:

(1) Assumes a 22% production utilization factor for injection of 12.5% Sodium Hypochlorite and 40% Sodium Bisulfite delivered in 55-Gallon Drums.

(2) Well Pump assumed to be operating at flow rate of 150 gallons per minute @ 25 HP, assumes 1 kW for ion exchange system treatment power/controls at a production utilization factor of approximately 22% and $0.15 per kWH.

(3) Assumes 730 hours of labor and maintenance per year (two hours per day) at a burdened labor cost of approximately $75 per hour.

(4) Consists of monthly sampling for post-treatment nitrate, iron, and manganese, and quarterly sampling of general water quality analytes.

(5) Consists of replacing 99 cubic feet of ion exchange resin once every ten (10) years, assumes approximately $185 per cubic foot.

(6) Assumes delivery of $125 per metric ton of potassium chloride salt and approximately 82 metric annual tons of salt required for resin regeneration.

Table 4-2 Opinion of 20-Year Net Present Value Life Cycle Cost - Ion Exchange with Evaporation and/or Irrigation Land Disposal of Brine Waste	
Net-Present Value of 20-Year O&M Costs (1)	$1,540,156
Total Project Capital Cost (2)	$1,100,000
Present 20-Year Life Cycle Cost	**$2,640,156**

Notes:
(1) Assumes 0.4% discount rate for 20-year Life Cycle costs, accounts for inflation per recent economic projections. Rounded up to nearest thousand.
(2) Updated Project Capital Cost estimated to be approximately $750,000 to $880,000 (construction, engineering, and administration) with a 25 percent project contingency.

Table 4-3 Opinion of Annual O&M Cost – Ion Exchange with Off-Site Hauling of Brine Waste			
Item	**Annual Cost**	**Cost per Service Connection**	**Cost per 1,000 Gallons**
Chemicals (1)	$2,208	$25.98	$0.13
Power (2)	$9,443	$111.10	$0.54
Labor and Maintenance (3)	$54,750	$644.12	$3.16
Analytical (4)	$1,800	$21.18	$0.10
Resin Replacement (5)	$1,832	$21.55	$0.11
Additional Consumables (6)	$10,250	$120.59	$0.59
Brine Waste Disposal (7)	$371,179	$4,366.81	$21.40
Total	**$451,462**	**$5,311**	**$26.03**

Notes:
(1) Assumes a 22% production utilization factor for injection of 12.5% Sodium Hypochlorite and 40% Sodium Bisulfite delivered in 55-Gallon Drums.
(2) Well Pump assumed to be operating at flow rate of 150 gallons per minute @ 25 HP, assumes 1 kW for ion exchange system treatment power/controls at a production utilization factor of approximately 22% and $0.15 per kWH.
(3) Assumes 730 hours of labor and maintenance per year (two hours per day) at a burdened labor cost of approximately $75 per hour.
(4) Consists of monthly sampling for post-treatment nitrate, iron, and manganese, and quarterly sampling of general water quality analytes.
(5) Consists of replace 99 cubic feet of ion exchange resin once every ten (10) years, assumes approximately $185 per cubic foot.
(6) Assumes delivery of $125 per metric ton of potassium chloride salt and approximately 82 metric annual tons of salt required for resin regeneration.
(7) Assume hauling of brine waste generated at approximately 8.6% production loss at an assumed $0.25 per gallon to Monterey Regional WWTP.

Table 4-4 Opinion of 20-Year Net Present Value Life Cycle Cost – Ion Exchange with Off-Site Hauling of Brine Waste	
Net-Present Value of 20-Year O&M Costs (1)	$8,660,880
Total Project Capital Cost	$1,100,000
Present 20-Year Life Cycle Cost	**$9,760,880**

Notes:
(1) Assumes 0.4% discount rate for 20-year Life Cycle costs, accounts for inflation per recent economic projections. Rounded up to nearest thousand.
(2) Updated Project Capital Cost estimated to be approximately $750,000 to $880,000 (construction, engineering, and administration) with a 25 percent project contingency.

MKN does not believe Alternative 1 is a technically feasible alternative and therefore, cost estimates were not prepared for Alternative 1.

5.0 Conclusions and Recommendations

5.1 Peer Review Conclusions

Both the original and modified iterations of the Transmission Main Alternative (Alternative 1) described in the Feasibility Study are not technically feasible approaches for short- or long-term mitigation of nitrates. Nitrates spikes appear to last for weeks (in some cases, months), making blending through a new transmission main technically infeasible. Furthermore, the original and revised concepts of this alternative fail to address mitigation of exceedances in salinity, iron, manganese, color, odor, uranium, and total trihalomethanes. While there might be some benefit to recirculating water in the storage tank to mitigate stagnation of "old" and/or temperature-stratified water (both factors that exacerbate trihalomethane formation), blending/recirculation of water already contaminated with elevated salinity, iron, manganese, color, and/or uranium does contribute to mitigation of these issues. While the project is attractive from simplistic maintenance and operating cost perspectives, it is recommended that implementation of this alternative should not be investigated any further.

Between the two alternatives (the transmission main alternative and wellhead treatment using ion exchange) evaluated in the Feasibility Study, wellhead treatment using ion exchange (Alternative 2) appears to be the only technically feasible alternative. Considering the high sulfate content and significant variability of nitrates in the raw water supply, the method of operation proposed by Wallace Group is not recommended. The suggested operation method is not anticipated to be efficient in reducing nitrates nor permitted by the DDW. Furthermore, additional evaluation of a strong base anion exchange system indicates that a significant amount of sodium- or potassium chloride would be required to regenerate the resin, potentially making ion exchange an economically infeasible alternative. Even considering the typical dynamic trends in raw water nitrate variability, the raw water chemistry limits the overall system recovery to be quite poor (between 8.3- and 8.6-percent, yielding 91.7- and 91.4 overall system recovery) for a strong base anion exchange system. While this alternative should be investigated further, it is anticipated that this alternative will likely not be the most effective method of addressing all the water quality challenges experienced by the District.

5.2 Recommendations

The following investigative measures and next steps are recommended to address the District's water quality issues. It is recommended that the District implement each of these recommendations concurrently.

5.2.1 Evaluate Feasibility of Biological Denitrification Treatment

Biological denitrification (i.e., removal of nitrates) treatment also represents a potential solution to address the nitrates exceedances detailed previously. Several configurations of biological denitrification treatment are currently installed in California and permitted by the DDW. While there may be other permitted, full-scale biological denitrification treatment plants in California, MKN is aware of the following installations:

- Well 35 Nitrate Removal Plant located in the City of Delano (technology supplied by AdEdge [now Chart Water] Technologies, capacity of 500 to 600 gpm)

- Microvi MNE Water Treatment Plant in Pasadena, CA (technology supplied by Microvi, capacity unknown)
- Well 2 AroNite Nitrate Removal Plant in La Crescenta, CA (technology supplied by APTWater, capacity of 130 to 150 gpm)

While each variant of biological denitrification technology operates in a slightly different configuration, each system aims to remove nitrates through biological activity within an atmospheric- or pressurized reactor vessel. Prior to being pumped in the distribution system, the water is further purified using conventional filtration (i.e., sand or mixed media)- or low-pressure membrane-based filtration technologies to provide a positive pathogen barrier between the biology contained in the upstream reactor and the distribution system. Biological nitrate systems do not generate any brine waste or hazardous secondary waste streams and typically have lower O&M costs than ion exchange systems. Furthermore, some biological treatment systems have been observed to achieve up to 99.5 percent overall system recovery, which is higher than the projected strong-base anion exchange system recoveries of 91.7- to 91.4-percent. However, considering SLCWD's constrained operating resources and the inherent operational complexity of similar existing, permitted biological denitrification treatment system, implementation of a full-scale denitrification system is anticipated to be an infeasible project alternative.

5.2.2 Evaluate Feasibility of Reverse Osmosis Treatment

Membrane-based technologies (such as reverse osmosis) are potential, broad-spectrum treatment solutions that could potentially address both nitrate- and non-nitrate issues detailed previously. Preliminary projections of brackish water desalination technologies (i.e. two-stage brackish water reverse osmosis and electrodialysis [both with partial bypass]) pose the potential for greater overall system recovery than 91 percent (resulting in less concentrate ["brine"] waste) while mitigating the full spectrum of the District's primary- and secondary MCL exceedances and improving the overall quality of the water. Adding a third (brine concentration/recovery) stage could further increase the overall system recovery to greater than 95 percent, minimizing the amount of concentrate that would need to be evaporated, blended with irrigation water, and/or disposed of in alternative ways.

The projections also indicate that the salinity of the concentrate would be about 50 to 75 percent lower than the brine waste generated by an ion exchange system. Given the lower waste volume and salinity associated with membrane technologies, concentrate disposal could be much more feasible than ion exchange brine disposal using evaporation and/or blending with the existing Misson Ranches irrigation water. It is anticipated that membrane-based technologies will likely be the most effective, treated-based method of addressing all the water quality concerns pertaining to both the nitrate- and non-nitrate water quality issues.

5.2.3 Monitor Total Dissolved Solids

Further development of alternatives should include data analysis from the recently installed nitrate analyzer to better understand how trends in nitrate concentrations will potentially influence different treatment and non-treatment alternatives. MKN recommends that an online total dissolved solids (electrical conductivity/salinity) analyzer be installed at the same site as the online nitrate analyzer to better understand how seasonal trends in salinity would impact conceptual membrane-based treatment systems.

5.2.4 Optimize Existing Iron and Manganese Treatment System

It is also recommended that San Lucas CWD continue to monitor performance of the existing iron and manganese treatment system. It is recommended that the District or an authorized representative work with the iron and manganese treatment system manufacturer (ATEC Systems) to evaluate optimization and/or rehabilitation alternatives (previously described in Section 3.0) to bring the treated iron and manganese concentrations back into compliance with State-mandated secondary MCLs. Further discussions with the DDW have indicated that if the existing iron and manganese system is to be temporarily optimized until it is completely replaced, the following issues will need to be addressed (at a minimum):

- Replacement of the existing media;
- Installation of a new control system to facilitate reliable backwashing of the media;
- Installation of a new flow meter for monitoring the total- and instantons flowrate of backwash supply water;
- Installation of an online chlorine analyzer (sampling downstream of the combined filtered effluent piping) to monitor upstream chlorine dosing to ensure optimal oxidation of the raw water has occurred and verifying that an adequate disinfection residual is maintained in the filtered effluent.

MEMORANDUM

Mission Ranches Company, LLC
San Lucas Water System Improvements – 1678-0001

Date: August 16, 2022

To: Pamela Silkwood, Mission Ranches Company, LLC

From: Bryan Childress, Wallace Group

Subject: San Lucas Water System Feasibility Study

REGISTERED PROFESSIONAL ENGINEER
BRYAN D. CHILDRESS
No. C88775
CIVIL
STATE OF CALIFORNIA

Background & System Information
San Lucas County Water District ("District") is a community water system that currently serves approximately 415 residents with 85 service connections. The District's water system infrastructure consists of one active well (Well 3) and three abandoned or inactive wells (District Well, Well 1 & 2), five filter vessels (greensand) for iron and manganese removal, a backwash pond, chlorine injection system, 300,000-gallon steel potable water tank, and a mix of PVC and galvanized steel supply and distribution piping. The District's current water supply is from a groundwater well (Well 3) located approximately 1.2 miles south of the town on the Las Colinas Ranch property. The well is co-owned by the Naraghi family and Mission Ranches Company, LLC ("Mission Ranches") and is operated by the District as an interim potable water supply.

Regulatory and Compliance History
The District has a history of poor water quality from their groundwater wells, mainly high TDS and Nitrate. Three of their wells currently produce non-potable water (District Well, Wells 1 & 2) and the interim well (Well 3) has begun to experience intermittent nitrate spikes above the maximum contaminant limit (MCL).

In 1986, EMCON conducted a study of the District's original water supply well (District Well) and determined it was heavily polluted due to "high septic system density and large percentages of system failures in the San Lucas community". This study resulted in the Central Coast RWQCB adopting a local moratorium prohibiting the use of District water as drinking water. During the same time the District was pursuing two additional groundwater sources (Wells 1 & 2). Well 1 had poor water quality and was not connected to the water system. Well 2, located on the Las Colinas Ranch property, had better water quality at the time and was used as the primary water source for a number of years. Well 2 was drilled in 1981 and operated using an easement.

In 2005 the District acquired an expanded easement area for Well 2 using eminent domain and constructed a potable water filtration system and backwash pond. Well 2 was used for a number of years as the primary water supply for the District but water quality began to degrade over time (TDS and Nitrate) due to poor well construction, well age, and other factors. An attempt to rehabilitate the well was conducted in 2012-

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612 CLARION CT
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T 805 544-4011
F 805 544-4294

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2013 but failed, ending with effluent nitrate as nitrogen results in excess of 85 mg/l after the rehabilitation attempt.

In 2013 the Central Coast RWQCB issued Cleanup and Abatement Order R3-2013-0031 (CAO) to Mission Ranches and the Naraghi family requiring them to supply an interim and long-term uninterrupted replacement water supply for San Lucas. At this point Well 2 no longer produced potable water. Well 3 was drilled in 2014 by Mission Ranches Company LLC and the Naraghi family on the Las Colinas Ranch property and was operated by the District to supply interim water to the community. Well 3 met the intent of the CAO and served as the community's primary water source for a number of years.

In 2016 Well 3 began to show periodic spikes in nitrates above the MCL. Mission Ranches and the Naraghi family requested that the Wallace Group conduct a feasibility study to compare two alternatives for a long-term uninterrupted water supply for San Lucas. Such as study was referenced in a RWQCB letter to the "parties" dated June 2, 2022. The purpose of this report is to satisfy the requirements of that letter.

Alternatives for Comparison
This feasibility study compares the following two alternatives:

1. Transmission Line Alternative Project (District tank and distribution system modifications previously proposed by North Coast Engineering)
2. Wellhead Treatment using Ion Exchange

The following sections discuss each alternative in detail comparing capital costs, operational and maintenance costs, and the impact on customer water rates.

Alternative 1: Transmission Line

Background
In 2021 North Coast Engineering (NCE) proposed a nitrate dilution system, which they called a Storage Tank Nitrate Water Treatment System (STNWTS). The STNWTS is a relatively straightforward approach to mitigate nitrate spikes from Well 3. The proposed system bypasses the existing distribution system so elevated nitrate concentrations would not be directly served to the customers. Instead, raw water would be sent to the existing storage tank first to allow the nitrate spike to be buffered and diluted by the large tank volume. If nitrate concentrations in the storage tank exceeded the nitrate concentration alarm set point, high nitrate water would be prevented from being served to the users.

In January 2022 the RWQCB responded to the proposal saying that "it was premature to establish where the Transmission Line Alternative Project will provide a reliable long-term solution for nitrate exceedances" and requested additional technical details. These following sections provide additional technical details and capital costs associated with the STNWTS system.

NCE Design Description
The existing water distribution system bottom feeds the storage tank and supplies water to customers using a 6" distribution line that is connected to Well 3. With the current system design, in the event of a nitrate exceedance at the well head, both the

customers and the tank would be fed water with nitrates above the MCL. With the proposed alternative pipeline design, the District's existing water distribution system would be modified by disconnecting the 6" Well 3 supply line from the existing distribution system and installing a new 8" supply line plumbed directly to the water storage tank. With the proposed design, the 8" supply line would enter the existing water storage tank from the top and then reduce down to a 4" diameter pipe to increase the velocity flowing into the tank. This would aid in creating a mixing effect in the water storage tank and help dilute the nitrate spikes.

Based on weekly water quality data from the existing tank, nitrates have consistently and historically been below the MCL (NCE, 2021). From a regulatory perspective, in-order to verify nitrates are below the MCL, an online nitrate monitoring analyzer would need to be installed at a sample port on the tank to provide continuous nitrate measurement and to notify the water system operator in the event nitrates exceed the MCL. If an MCL exceedance were to occur, the water supply would be shut off until a "Do Not Drink" posting was enacted in the community.

Additional water system improvements would be required for this alternative, including extending larger water distribution piping under the Union Pacific Railroad (UPRR) and installing new distribution piping along Cattleman Road to service existing users. In this report we are recommending an alternative that is similar in concept to the NCE design with the exception of a few modifications in pipe sizes and connection details. These changes are discussed in the next section.

Modifications to NCE's Design

In the design proposed by NCE, water was supplied to the fire hydrants along Cattleman Road directly from Well 3 using the existing 6" supply line. This design would require the well pump to provide fire flow solely without support from the water tank. Flows from the well pump would be in the range of 150 gpm based on the duty point of the pump (Attachment 1) and would likely not meet required fire flow requirements for Cattleman Road. We recommend changing the pipeline design to supply Cattleman Road hydrants from the existing water tank and a new 8" water main along Cattleman Road. Fire flow and line sizes will need to be calculated using a detailed water system model which is beyond the scope of this report. However, for the purposes of this report we have conservatively assumed a 8" water main will be required. Attachment 2 shows the proposed improvements by NCE with recommended modifications by Wallace Group (Fire service from Tank, and 8" waterline extension on Cattleman Road).

Another recommended modification to NCE's design is to the proposed tank feed line connection detail. Fire water storage volume may be affected by the STNWTS concept. First, the concept proposes to insert a minimum of 3 ft of 4" pipe into the storage tank through the top of the tank. This may reduce the operating volume of the storage tank as an air gap must be maintained between the bottom of the inlet pipe and the maximum water surface elevation of the tank. The height of the air gap must be at least twice the diameter of the pipe (4") entering the tank. This gap is typically set by tank design using an overflow pipe to set the maximum water surface of the tank and the elevation of the inlet pipe. By lowering the inlet pipe elevation this design may be removing 3'-8" (3 ft + 2x4") of operating height (volume) from the tank. These assumptions would need to be confirmed based on the height of the installed tank overflow line and fire storage requirements.

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System Costs

The following tables provide a breakdown of capital costs for this alternative. O&M costs are not expected to increase based on this alternative.

Table 1. Capital Cost Estimate for Transmission Pipeline (STNWTS)

Line #	Item	Qty	$/Unit	Cost ($)
1	8" Tank Supply Line (C900 PVC CL200)	3,600 LF	180	$648,000
2	8" Cattleman Rd Water Main Extension	1,450 LF	180	$261,000
3	Jack and Bore (Union Pacific Railroad)	-	LS	$150,000
	Subtotal			$1,059,000
4	Construction Contingency (20% of subtotal)			$211,800
5	Soft Costs: Engineering, administration, construction management, inspections & permitting, excludes environmental (15% of Subtotal)			$158,850
	Total Project Cost			**$1,429,650**

It should be noted that construction of the new 8" water main along Cattleman Road will require one bore beneath Union Pacific Rail Road (UPRR). There is no alternative to boring beneath UPRR except building a pipe bridge over the railroad – this analysis does not contemplate the pipe bridge alternative.

Conclusion and Recommendations

The STNWTS concept is a relatively straightforward means for mitigating intermittent high nitrate levels (i.e. above 10 mg/L for nitrate as nitrogen) in the water produced by Well 3. Assuming intermittent bottled water service is unacceptable, the efficacy and long-term reliability of the concept to provide potable water to the District system hinges on three parameters

1. The concentration of nitrate during the intermittent event
2. The amount of time the intermittent event lasts
3. The frequency of the intermittent event. If the concentrations increase during the event or the events last longer or become more frequent the concept efficacy and reliability are jeopardized.

The following are recommended as a part of moving forward if this alternative is chosen:

1. Implement online monitoring and electronic recording of Well 3 nitrate concentrations
    a. This will aid in determining nitrate concentrations during intermittent events as well as the frequency and duration of the intermittent events
    b. This will aid in determining if other relationships exist to the intermittent event (e.g. Salinas River flow rates/stages, Nacimiento and San Antonio reservoir releases, precipitation, drought, etc)
2. Determine to what extent, if any, fire water storage volume and fire flow rate along Cattleman is affected by the concept.
    a. This will likely require constructing a water system model using computer software (e.g. WaterCAD).

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b. Rather than shutting off all flow from the tank in event of nitrate exceedance, a “Do not drink” order is issued, thus fire protection for the community is maintained.
c. It is recommended that rather than maintaining the existing 6” connection and constructing a new 2” water line to provide fire flow and water service along Cattleman Road respectively, instead abandon the existing 6” connection and provide an 8” water line (along same alignment as NCE 2” line) to provide both water and fire service along Cattleman Rd.
d. It is recommended that rather than installing 3 ft of 4” pipe into the storage tank, an elbow is installed on the discharge into the tank such that flow pours into the tank tangential to the tank wall, inducing mixing. This will minimize or eliminate the loss of fire water storage volume in the tank.

Alternative 2: Wellhead Treatment Using Ion Exchange
This alternative analyzes the cost of installing an ion exchange treatment system to remove nitrate from the source water (Well 3) before it is pumped to the District distribution system and water facilities.

Background
Based on available records, Well 3 was drilled in 2014 by Mission Ranches and originally produced acceptable water quality with no detectable nitrates. In 2016 nitrate concentrations above the MCL were observed with the highest level measured at 17 mg/L. The nitrate sampling frequency was increased to weekly, and it was observed that these concentration “spikes” were erratic, varying by month and year. Table 2 provides a summary of these samples showing the number of samples per year above the MCL and ½ the MCL for nitrate. For a more detailed analysis by month and tabulated water quality data from 2016-2021 see Attachment 3.

Table 2: Well #3 Number of Nitrate Samples Above the MCL by Year

Description	2016	2017	2018	2019	2020	2021
Number of Nitrate Samples Measured above the MCL	2	0	2	1	3	2
Number of Nitrate Samples Measured above ½ MCL	4	3	13	10	12	8

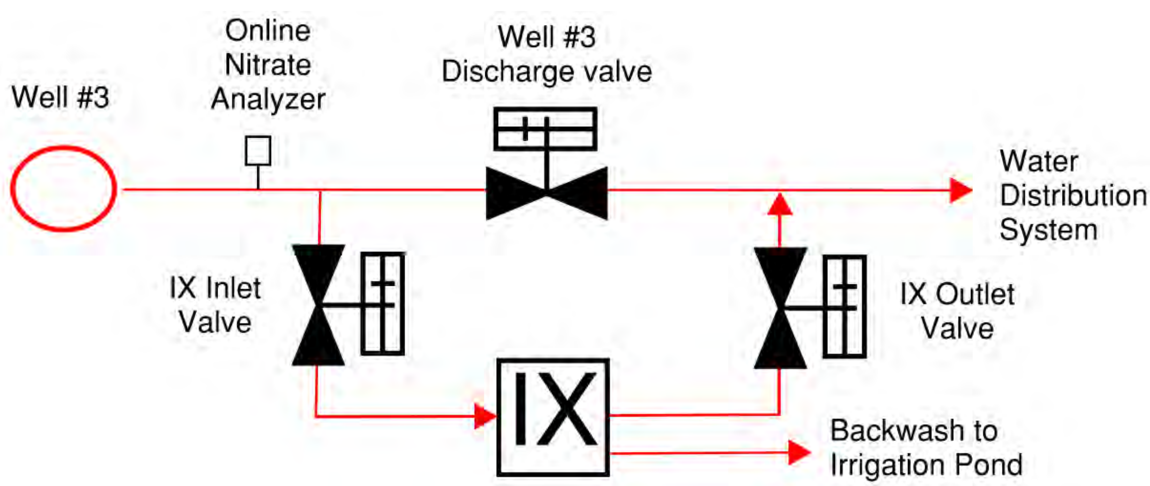
An analysis of the weekly nitrate samples shows that nitrate spikes above the MCL appear multiple times a year, with the highest frequencies typically in May – August, and the highest spike measured at 19.9 mg/L in 2021. It should be noted that there has not been a spike above the MCL in 2022 as of the date of this letter.

The frequency of these spikes above the MCL appears to remain fairly consistent with an average of 2 samples per year above the MCL, with the exception of 2017, 2019, 2020 which measured 0, 1, and 3 respectively. The duration of these spikes is not fully defined since sampling intervals are weekly, however it appears that longest spikes lasted approximately two weeks with elevated nitrate levels (½ the MCL) lasting as long as four weeks.

The cause of these spikes is still unknown, however data provided in previous correspondence to the RWQCB (Letter dated April 6, 2021 to Thea Tryon, Exhibit C), showed increased nitrate concentrations in Well 3 during months where water was flowing in the Salinas river due to Nacimiento Dam releases. Past groundwater studies conducted in the area (Pueblo Water Resources, Gus Yates et. all 2011) concluded that high level of nitrates in Well 2 were likely due to fertilizer application, however the study was inconclusive due to limited data provided on nitrogen application rates by the farm, and variable well data of the surrounding wells (depth screened interval etc.). However, the report did conclude that Well 2 experienced a nitrate increase of 13 mg/l year, 25 times the normal rate. The high rate of nitrate increases in Well 2 has not been observed in Well 3. Instead nitrate spikes seem to be correlated to dam releases rather than fertilizer application as previously discussed. Without further groundwater studies for Well 3, it is difficult to determine the cause of nitrate spikes. For this reason, and due to the intermittent nature of the nitrate spikes, we recommend a nitrate removal system that can selectively remove nitrate ions at the well head during these periods. This strategy will minimize any byproduct production and maximize filter media life, which in turn minimizes incremental operational costs. This can be accomplished using a nitrate selective ion exchange (IX) resin, an online nitrate sensor, and automated bypass valve connected to Well 3 discharge piping. The proposed system details are discussed in the next section.

System Description

The proposed IX system would only be used when nitrate levels in Well 3 reach a certain threshold such as 8 mg/l for nitrate as N, measured continuously, using an online nitrate analyzer connected to the well discharge line. The nitrate threshold would be lower than the MCL to account for calibration error and instrument accuracy for the specific equipment manufacturer. In the event nitrates exceed the threshold, the nitrate analyzer would send a signal to a controller that would open the supply valve to the IX and shut the valve for Well 3 discharge pipe. The system would run until nitrates fall below the set threshold or for the minimum IX equipment run-time, whichever is longer. A process flow path for the proposed system is shown below:



Process Flow Path Description

- Nitrate analyzer detects nitrate concentration above set threshold (8 mg/L assumed for this report)
- IX supply valve opens, well discharge valve shuts
- IX runs for specified interval (typically 1 week)
- After one week, If Nitrate analyzer detects a concentration of less than 8 mg/L,
    - Well discharge valve opens
    - IX supply valve shuts
    - Other water treatment process continues with IX bypassed
- IX backwashes to irrigation pond (as needed)

System Sizing

Well 3 is estimated to produce 150 gpm based on operator observations. An average day demand (ADD) of 133.7gpm for the water system was calculated using the following:

- Average Annual Demand: 17,569,640 gallons per year was calculated using the assumptions below
- Per Capita Demand: 88-gallon per capita day (gpcd) was used from previous reports (AMEC, 2015). This value was based on source water production records from 2006 through 2010. Current metered well data was not available at the time of this report.
- Population: 547 people. This includes 415 people from the 2020 census plus an additional 132 people is anticipated from a 33 Unit CHISPA project
- Design Average Day Demand (ADD): 48,136 gpd.

A Design Max Day Demand (MDD) of 96,272 gpd was calculated based on ADD of 48,136 and a peaking factor of 2. The existing 300,000-gallon water storage tank has adequate capacity to handle 3.1 days of MDD. Therefore, the treatment system will be sized to handle ADD or in this case the well production rate since it is higher than ADD.

System Installation

The IX system should be installed after the existing iron and manganese removal system and before the chlorination system. This will allow for the removal of iron and manganese before the IX system to prevent fouling of the media. Disinfection with chlorine should be done after the IX process to minimize media exposure to chlorine which can cause it to break down over time.

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System Costs
The following tables provide a breakdown of capital and O&M costs for this alternative.

Table 3. Capital Cost Estimate for Ion Exchange

Line #	Item	Cost ($)
1	AdEdge 150 gpm Nitrate Removal IX System	$250,000
2	Nitrate Analyzer	$20,000
3	Electrical and Controls	$10,000
4	Piping & Valves	$5,000
5	Site Work (Grading, concrete etc.)	$10,000
	Subtotal	$295,000
6	Construction Contingency (20% of subtotal)	$59,000
7	Soft Costs: Engineering, administration, construction management, inspections & permitting, excludes environmental (15% of Subtotal)	$44,250
	Total	**$398,250**

Table 4. Annual O&M Cost Estimate for Ion Exchange

Line #	Item	Cost ($)
1	O&M Charges (Materials & Chemicals)	$500
2	IX Resin Replacement (Annualized)[1]	$2,000
3	Brine Disposal (worst case, haul for disposal)	$3,500
4	Utilities (Electricity[$]	$1,200
5	Operator Labor[2]	$5,000
6	Lab Sampling	$5,000
	Subtotal	$17,200
6	Water System Administration (10% of subtotal)	$1,720
	Total	$18,920
	Current Monthly Fee Per Connection	**$71**
	Estimated Increase to Monthly Fee Per Connection	**$18**
	Projected New Monthly Fee Per Connection	**$89**

[1] Assumes a one-time $20,000 resin replacement cost every 10 years
[2] Estimated costs based on anticipated runtime and assumed level of operator training. To be fined tuned

Operational costs were calculated assuming 210 hours per year of runtime. Runtime hours were calculated using a nitrate threshold of 8 mg/L, and average of 5 threshold exceedances per year based on historical data. For each exceedance, the ion exchange would run for one week during Well 3 daily pump time. It was assumed for these calculations that Well 3 runs for approximately 6 hours per day.

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Brine Disposal
A monthly brine production rate of 1,134 gallons per month was calculated for this system. This assumes 210 hours per year of runtime per year and a 99% resin recovery rate. This is a conservative brine estimate, and it is likely this value will be lower since these calculations assumed that a threshold exceedance would last 7 days in the absence of more frequent sampling data. With an online nitrate analyzer, nitrate can be measured in real time allowing for shorter IX runtimes and less brine production.

Brine produced on site could be disposed of in one of three ways:

1. Blend with Mission Ranches Irrigation water and apply to crops. This would need to be further analyzed and updated in the Mission Ranches Irrigation and Nutrient Management plan and approved by the RWQCB. However, based on the conservative estimate for annual brine production in comparison to overall water usage for irrigation within the vicinity of the treatment system, it is safe to assume the increase in TDS and nitrate in the irrigation water would be negligible.
2. Evaporate in a lined pond. A preliminary estimate using conservative numbers indicates that a lined pond could potentially fit in the existing water treatment area near Well #2. Likely the existing pond would have to be expanded to create one larger pond for both IX and Iron and Manganese filter backwash. In order to accurately calculate pond sizing a water balance would have to be conduct looking at the design storm, local precipitation, and evaporation values.
3. Off-site disposal. Typical brine hauling costs range from $0.20 -$0.30/gal. Assuming $0.25/gal this would equate to $10,206 per year. This cost was used in the above O&M costs summary in Table 4 as a worst-case scenario to show that cost per connection would increase approximately $20 if brine was hauled for disposal.

The brine disposal options listed above are listed in the order of most cost effective to least cost effective. For the purpose of comparison with Alternative 1, brine disposal option 3 was selected because it is the highest cost solution. If Alternative 2 is pursued, we recommend a more detailed analysis of brine disposal options be conducted to compare the potential O&M savings of building a brine evaporation pond or blending brine in the existing irrigation ponds. Option 1 is likely the lowest cost option but will require additional time and permitting costs to complete.

Conclusions and Recommendations
Based on the analysis provided in previous sections, Alternative 2 has the lowest capital costs and Alternative 1 has the lowest O&M cost for this project. However, in our view, comparing these two alternatives in terms of costs alone does not accurately represent the best solution for the parties involved for the following reasons:

1. The two alternatives fulfill different requirements. Alternative 1 is an interim solution that is dependent on nitrate concentrations remaining low enough to dilute throughout the year. In our opinion this alternative carries too much risk

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for a variety of reasons discussed earlier in this report. Additionally, Alternative 1 does not provide any nitrate removal and is closer to a water system distribution improvement plan than a treatment system. Alternative 2 is a long-term solution that removes nitrate from the groundwater and better addresses the intent of the CAO.

2. The two alternatives will likely have different sources of funding depending on the responsible party completing them. Alternative 1 would likely qualify for the State Drinking Water System Revolving Funds (SDWSRF) if completed by the District but does may not qualify for SDWSRF if completed by Mission Ranches and the Naraghi family as a requirement of the CAO (See RWQCB Letter, June 2, 2022).

Alternative #2 is recommended for the following reasons:

1. Alternative 2 is the only alternative analyzed in this report that provides a long-term uninterrupted water source at a reasonable cost.
2. Alternative 2 directly address the nitrate issue by removing nitrates from the groundwater instead of diluting them. Alternative 2 is also less dependent on concentration and duration of nitrate spikes as the system would be designed to the highest nitrate concentration observed to date in Well 3. The system could be expanded in the case that Well 3 nitrates increase over time, whereas Alternative 1 would not have that flexibility.
3. Alternative 1 involves upgrading an existing water distribution system owned by the District. While we agree this is a good idea to improve system reliability and simplify sampling, it does not provide a long-term solution for nitrates in the groundwater. The scope of this alternative blurs the lines between responsible parties when it would be more appropriately completed by the District. As previously stated, if Alternative 1 is an improvement plan for the water distribution system and if implemented by the District, it will likely qualify for the SDWSRF. Based on previous correspondence with the RWQCB, Alternative 1 would not be eligible for SDWSRF if implemented by Mission Ranches or the Naraghi family because it would be part the cleanup and enforcement action.

AQUA ENGINEERING
Contractors License #896064
950 Mission Street P.O. Box 398
San Miguel, Ca. 93451
PH 805-238-1315 FX 805-467-9520

Date: June 11, 2014

Customer: Mission Ranches
Billing Address: 117 N First Street
King City, CA 93930
Telephone: (831) 970-6313
Job Location: 8" Public Well

We thank you for your inquiry and are pleased to submit the following estimate for your consideration.

DESCRIPTION

Pump: Model: 6CHC HP: 25 PH: 3 Voltage: 460 Capacity 250 GPM @ 270 T.D.H.	Included
Cable: Size: #6-4 Flat Jacketed Sub Cable Length: 300	Included
Drop Pipe: Type: Galv Size 3" Length: 84'	Included
Sanitary Seal: Size: 8X3	Included
Tank: Type: Size:	N/A
Fitting Package (pressure switch, gauge etc.) Well Head	Included
Meter Loop:	N/A
Safety Switch: Pumping Plant Panel	Included
Float Switch or other: None	N/A

Special Features:

Sounding Tube with Stainless Steel strapping	Included
3" Ductile Iron Check Valve	Included

Note: No Backflow Prevention device included

Notes: No underground water, electrical or trenching included in this estimate.
Note:

Awalt & Son Aqua Engineering hereby offers to the person(s) whose name(s) are written above to provide and install at the location written above, and for the amounts set forth herein the above pump accessories and materials.

Total Price **$14,733.18**

Owner's Signature: ______________________________

THIS OFFER EXPIRES UNLESS ACCEPTED WITHIN 30 DAYS

This job will not be scheduled until this bid is signed and original copy returned with a check for ___$0.00_______. Balance to paid upon completion.

Finance Charges: The purchase/owner agrees to pay interest at the maximum rate allowed by law on all accounts past due.
Customer is responsible for insulating all pipes, pumps etc. against frost damage.
I accept the above offer and agree to its terms:______________________________

ATTACHMENT 1

SEE SHEET 1
FOR CONTINUATION AND
LOCATION OF WELL

MAP IMAGE: COPYRIGHT © LUIS SÁ 2007–2017

LEGEND

(hydrant symbol)	EXISTING FIRE HYDRANT
— — —(W)— — —	EXISTING TRANSMISSION LINE
— — —(F)— — —	EXISTING FILL LINE
———W———	PROPOSED WATERLINE
———F———	PROPOSED FILL LINE

NOTES:

1. 8" CATTLEMAN ROAD WATER MAIN EXTENSION
2. 8" FILL LINE
3. DISCONNECT EXISTING FILL LINE AND CAP
4. CONNECT EXISTING SERVICE TO PROPOSED 8" WATER MAIN EXTENSION

0 75' 150' 300'

SCALE: 1"=150'

MODIFIED BY WALLACE GROUP
7/20/2022.

NOT FOR CONSTRUCTION

SAN LUCAS WATER DISTRICT
NITRATE WATER TREATMENT

ATTACHMENT 2

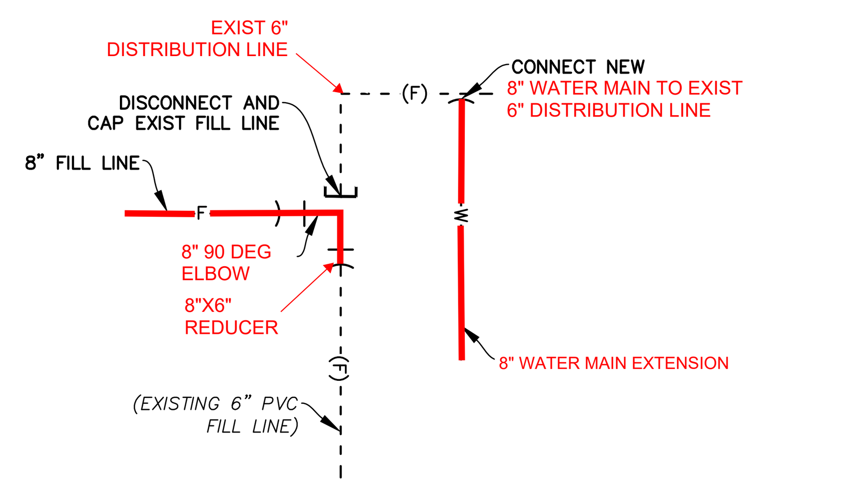
8/30/2021

725 CRESTON ROAD, SUITE C
PASO ROBLES, CA
805.239.3127
NCE
NORTH COAST
ENGINEERING

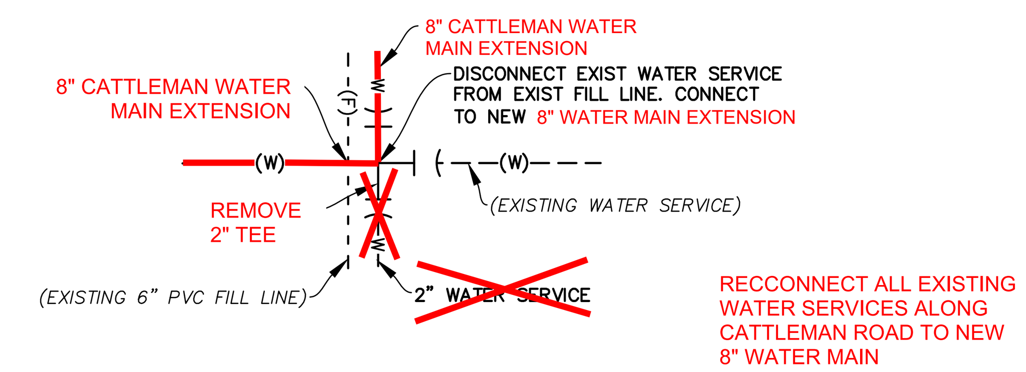
R:\PROJ\21142\Design\Exhibits\21142 Existing Waterline Exhibit.dwg, OVERALL TOWN (2), 9/8/2021 8:04:17 AM, S3J, 1:1

LEGEND

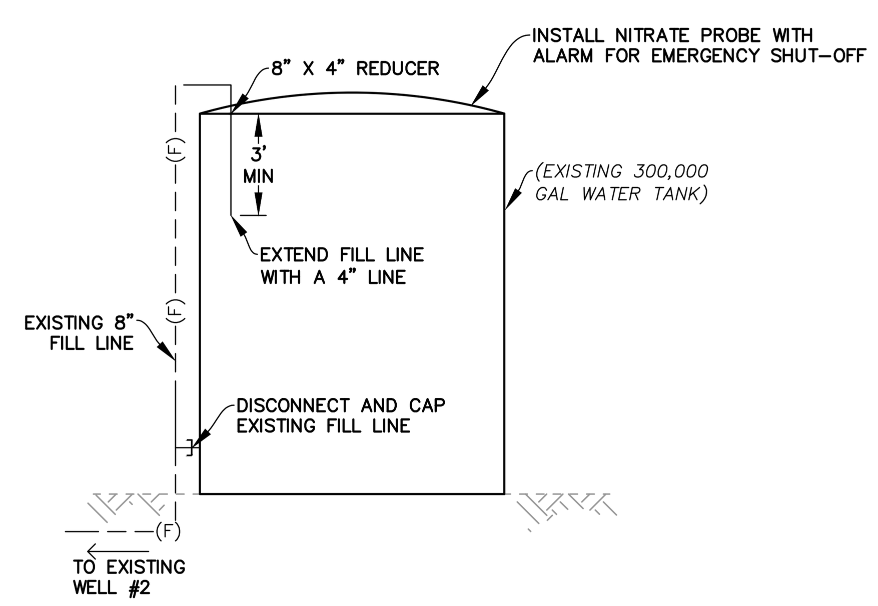
Ω	EXISTING FIRE HYDRANT
— — —(W)— — —	EXISTING TRANSMISSION LINE
— — —(F)— — —	EXISTING FILL LINE
———W———	PROPOSED WATERLINE
———F———	PROPOSED FILL LINE



A DETAIL A
NTS



B DETAIL B
NTS



C DETAIL C
NTS

MODIFIED BY WALLACE GROUP
7/20/2022.

NOT FOR CONSTRUCTION

SAN LUCAS WATER DISTRICT
NITRATE WATER TREATMENT
ATTACHMENT 2
8/30/2021

725 CRESTON ROAD, SUITE C
PASO ROBLES, CA
805.239.3127
NCE NORTH COAST ENGINEERING

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San Lucas Well #3: Nitrate Concentration by Month (2016-2021)

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021 (Nitrate as N)					5, 5.9, 6.2		6.7	5.7, 8.5			18.6	19.9
2020 (Nitrate as N)					5	9.5, 10.3, 10.7	6.8, 7.5, 8.7, 10.4	5.5, 6.8, 8.1			14	
2019 (Nitrate as N)							5.8, 7.5, 7.6	5.2, 7.5, 8.6, 12.4	5.3	5.7, 6.3		
2018 (Nitrate as N)			5.7	6.2	11.1, 12.8	9.2, 9.9, 14.6	5.2, 8.3	8.8, 8.9	8.9	9		
2017 (Nitrate as N)				5.6	5.1, 8.6							
2016 (Nitrate as N)							17	9.2	13	9.2		

ATTACHMENT 3

Water Quality Sampling Results

Analyte Number	Analyte Name	Sampling Date	Detected Level	MCL	Unit	Lab Sample ID	Lab
1040	NITRATE	12-31-2019		10	mg/L	92110061912310920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-28-2021		10	mg/L	211228_16-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-28-2020		10	mg/L	92110062012280900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-28-2018		10	mg/L	92110061812281330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-28-2017		10	mg/L	92110061712281100N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-28-2016		10	mg/L	92110061612281400N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	12-24-2019		10	mg/L	92110061912240915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-22-2021	19.9	10	mg/L	211222_12-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-22-2020		10	mg/L	92110062012220855N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-22-2017		10	mg/L	92110061712221430N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-22-2016	4.7	10	mg/L	92110061612220915N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	12-19-2018		10	mg/L	92110061812191030N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-17-2021		10	mg/L	211217_39-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-17-2019		10	mg/L	92110061912170900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-15-2020	0.3	10	mg/L	92110062012150905N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-13-2016		10	mg/L	92110061612131345N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	12-12-2018		10	mg/L	92110061812121130N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-12-2017		10	mg/L	92110061712121300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-10-2021	0.3	10	mg/L	211210_28-02	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-10-2019		10	mg/L	92110061912100830N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-08-2020	0.1	10	mg/L	92110062012080900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-07-2018		10	mg/L	92110061812071400N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-07-2017		10	mg/L	92110061712071600N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-07-2016		10	mg/L	92110061612070825N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	12-03-2021		10	mg/L	211203_24-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-03-2019		10	mg/L	92110061912030900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	12-01-2020		10	mg/L	92110062012010840N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-30-2016		10	mg/L	92110061611301400N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	11-28-2018		10	mg/L	92110061811281030N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-27-2017		10	mg/L	92110061711271230N	MONTEREY BAY ANALYTICAL SERVICES

ATTACHMENT 3

1040	NITRATE	11-26-2019		10 mg/L	92110061911260900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-24-2020	0.2	10 mg/L	92110062011240830N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-23-2021	18.6	10 mg/L	211123_86-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-23-2018		10 mg/L	92110061811231300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-22-2017		10 mg/L	92110061711221000N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-22-2016		10 mg/L	92110061611220840N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	11-19-2021	0.3	10 mg/L	211119_17-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-19-2019		10 mg/L	92110061911190840N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-17-2020	0.1	10 mg/L	92110062011170900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-16-2018		10 mg/L	92110061811161230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-16-2017		10 mg/L	92110061711161230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-16-2016		10 mg/L	92110061611161300N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	11-13-2020	14	10 mg/L	92110062011131300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-12-2021		10 mg/L	211112_14-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-12-2019	0.4	10 mg/L	92110061911120915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-10-2017		10 mg/L	92110061711101430N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-09-2018		10 mg/L	92110061811091300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-05-2021		10 mg/L	211105_24-02	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-05-2019	1.2	10 mg/L	92110061911050920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	11-03-2020	1.3	10 mg/L	92110062011030840N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-30-2018	9	10 mg/L	92110061810301330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-29-2021	0.5	10 mg/L	211029_46-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-29-2019	2.6	10 mg/L	92110061910290915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-28-2020	3.8	10 mg/L	92110062010280900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-27-2016	9.2	10 mg/L	92110061610270900N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	10-25-2018		10 mg/L	92110061810251315N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-25-2017		10 mg/L	92110061710250910N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	10-22-2021	4.7	10 mg/L	211022_38-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-22-2019	2.7	10 mg/L	92110061910220920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-19-2018		10 mg/L	92110061810191330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-19-2017		10 mg/L	92110061710190840N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	10-15-2021	4.9	10 mg/L	211015_19-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-15-2019	5.7	10 mg/L	92110061910151000N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-13-2020	2.2	10 mg/L	92110062010130845N	MONTEREY BAY ANALYTICAL SERVICES

ATTACHMENT 3

1040	NITRATE	10-12-2018		10	mg/L	92110061810121400N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-12-2017	1.7	10	mg/L	92110061710120810N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	10-08-2021	4.9	10	mg/L	211008_26-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-08-2019	6.3	10	mg/L	92110061910080930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-06-2020	3.9	10	mg/L	92110062010060855N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-05-2018	0.4	10	mg/L	92110061810051315N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-01-2021	4.4	10	mg/L	211001_16-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	10-01-2019	3.7	10	mg/L	92110061910010930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-29-2020	4.4	10	mg/L	92110062009290910N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-28-2017		10	mg/L	92110061709280830N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	09-27-2018	0.6	10	mg/L	92110061809271300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-24-2021	2.1	10	mg/L	210924_28-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-24-2019	5.3	10	mg/L	92110061909240940N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-22-2020	4.2	10	mg/L	92110062009220850N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-21-2018	4	10	mg/L	92110061809211200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-21-2017	0.55	10	mg/L	92110061709210805N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	09-21-2016	13	10	mg/L	92110061609211245N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	09-17-2019	3.3	10	mg/L	92110061909171000N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-15-2020	3.2	10	mg/L	92110062009150845N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-14-2021	2.1	10	mg/L	210914_36-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-14-2018	8.9	10	mg/L	92110061809141330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-14-2017	0.99	10	mg/L	92110061709140815N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	09-10-2019	3.8	10	mg/L	92110061909100920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-08-2020	0.8	10	mg/L	92110062009080845N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-07-2021	3.6	10	mg/L	210907_36-02	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-07-2018		10	mg/L	92110061809071330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-07-2017	1.1	10	mg/L	92110061709070845N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	09-03-2019	2.2	10	mg/L	92110061909030915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	09-02-2020	4.2	10	mg/L	92110062009020825N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-31-2021	5.7	10	mg/L	210831_16-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-30-2018		10	mg/L	92110061808301400N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-30-2017	3	10	mg/L	92110061708300845N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	08-27-2019	12.4	10	mg/L	92110061908270910N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-25-2020	4.9	10	mg/L	92110062008250845N	MONTEREY BAY ANALYTICAL SERVICES

ATTACHMENT 3

1040	NITRATE	08-24-2021	2.4	10 mg/L	210824_35-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-24-2018	0.1	10 mg/L	92110061808241230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-24-2017	2.3	10 mg/L	92110061708240900N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	08-20-2019	8.6	10 mg/L	92110061908200920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-18-2020	5.5	10 mg/L	92110062008180845N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-18-2016	9.2	10 mg/L	92110061608180920N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	08-17-2021	1.9	10 mg/L	210817_56-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-16-2018	8.9	10 mg/L	92110061808161200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-16-2017	2.6	10 mg/L	92110061708161330N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	08-13-2019	5.2	10 mg/L	92110061908130900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-11-2020	6.8	10 mg/L	92110062008110840N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-10-2021		10 mg/L	210810_32-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-10-2018	8.8	10 mg/L	92110061808101400N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-10-2017		10 mg/L	92110061708100850N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	08-06-2019	7.5	10 mg/L	92110061908060910N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-04-2020	8.1	10 mg/L	92110062008040845N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-03-2021	8.5	10 mg/L	210803_54-02	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	08-03-2017	4	10 mg/L	92110061708030855N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	07-30-2019	2.4	10 mg/L	92110061907300915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-30-2018	4.3	10 mg/L	92110061807301300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-27-2021	6.7	10 mg/L	92110062107270955N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-27-2020	0.2	10 mg/L	92110062007270830N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-27-2017	3.6	10 mg/L	92110061707270900N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	07-23-2019	5.8	10 mg/L	92110061907231000N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-21-2021	1.7	10 mg/L	92110062107211200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-21-2020	7.5	10 mg/L	92110062007210900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-20-2017	4.6	10 mg/L	92110061707200820N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	07-20-2016	17	10 mg/L	92110061607201210N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	07-18-2018	0.4	10 mg/L	92110061807181400N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-17-2019	2.3	10 mg/L	92110061907171130N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-14-2020	8.7	10 mg/L	92110062007140825N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-13-2021	2.3	10 mg/L	92110062107131330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-13-2017	1.4	10 mg/L	92110061707130820N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	07-12-2018	5.2	10 mg/L	92110061807121145N	MONTEREY BAY ANALYTICAL SERVICES

ATTACHMENT 3

1040	NITRATE	07-09-2019	7.5	10	mg/L	92110061907091015N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-07-2020	10.4	10	mg/L	92110062007070840N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-06-2021	2.1	10	mg/L	92110062107061330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-06-2017	3.5	10	mg/L	92110061707060850N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	07-05-2018	8.3	10	mg/L	92110061807051200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-02-2020	6.8	10	mg/L	92110062007020845N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	07-02-2019	7.6	10	mg/L	92110061907020925N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-29-2017		10	mg/L	92110061706290810N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	06-25-2019	2.3	10	mg/L	92110061906250910N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-25-2018		10	mg/L	92110061806251215N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-23-2020	3.4	10	mg/L	92110062006230840N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-22-2021	1.9	10	mg/L	92110062106221020N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-22-2017	3.5	10	mg/L	92110061706220830N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	06-21-2018	9.9	10	mg/L	92110061806211230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-18-2021	0.3	10	mg/L	92110062106181200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-18-2019	3.5	10	mg/L	92110061906180915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-16-2020	9.5	10	mg/L	92110062006160855N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-15-2017	3.8	10	mg/L	92110061706150825N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	06-12-2019	3.3	10	mg/L	92110061906120940N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-12-2018	14.6	10	mg/L	92110061806121000N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-09-2020	10.7	10	mg/L	92110062006090850N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-08-2021	2.1	10	mg/L	92110062106081120N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-08-2018	9.2	10	mg/L	92110061806081330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-08-2017	4.2	10	mg/L	92110061706080810N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	06-08-2016	0.56	10	mg/L	92110061606081300N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	06-04-2019	4.1	10	mg/L	92110061906040945N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-02-2020	10.3	10	mg/L	92110062006020915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-01-2021	2.1	10	mg/L	92110062106011110N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	06-01-2017	3.8	10	mg/L	92110061706010830N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	05-31-2018	11.1	10	mg/L	92110061805311200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-29-2019	3.7	10	mg/L	92110061905290920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-26-2020	3.2	10	mg/L	92110062005260900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-25-2021	5.9	10	mg/L	92110062105251230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-25-2017	8.6	10	mg/L	92110061705250840N	ALPHA ANALYTICAL LABORATORIES UKIAH

ATTACHMENT 3

1040	NITRATE	05-24-2018	12.8	10	mg/L	92110061805241515N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-21-2019		10	mg/L	92110061905210925N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-19-2020	5.8	10	mg/L	92110062005190900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-18-2018	4.3	10	mg/L	92110061805181400N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-18-2017	3.8	10	mg/L	92110061705180900N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	05-14-2019	1.8	10	mg/L	92110061905140925N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-12-2020	1.7	10	mg/L	92110062005120905N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-11-2021	6.2	10	mg/L	92110062105111215N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-11-2017	5.1	10	mg/L	92110061705110810N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	05-11-2016		10	mg/L	92110061605111300N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	05-10-2018	2	10	mg/L	92110061805101300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-07-2019	4.7	10	mg/L	92110061905070930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-05-2020	4.2	10	mg/L	92110062005050840N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-04-2021	5	10	mg/L	92110062105041200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-04-2018	0.7	10	mg/L	92110061805041100N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	05-04-2017		10	mg/L	92110061705040830N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	05-03-2019	3.4	10	mg/L	92110061905031230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-28-2020	4	10	mg/L	92110062004280900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-27-2021	1.1	10	mg/L	92110062104271240N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-27-2017	5.6	10	mg/L	92110061704270840N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	04-23-2019	3.1	10	mg/L	92110061904230920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-21-2020	0.7	10	mg/L	92110062004210935N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-20-2021	0.4	10	mg/L	92110062104201115N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-20-2018	6.2	10	mg/L	92110061804201230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-20-2017	0.75	10	mg/L	92110061704200910N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	04-16-2019	3.3	10	mg/L	92110061904160915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-14-2020	0.2	10	mg/L	92110062004140900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-13-2021	1.4	10	mg/L	92110062104131330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-13-2021	1.3	10	mg/L	92110062104131335N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-13-2017	0.78	10	mg/L	92110061704130820N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	04-11-2018	4.8	10	mg/L	92110061804111030N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-11-2016		10	mg/L	92110061604111300N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	04-09-2019	1.1	10	mg/L	92110061904090930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-07-2020		10	mg/L	92110062004070910N	MONTEREY BAY ANALYTICAL SERVICES

ATTACHMENT 3

1040	NITRATE	04-06-2018		10	mg/L	92110061804061200N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	04-06-2017	1.4	10	mg/L	92110061704060825N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	04-02-2019	0.6	10	mg/L	92110061904020900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-31-2020		10	mg/L	92110062003310920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-30-2021	3.4	10	mg/L	92110062103301100N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-30-2017		10	mg/L	92110061703300830N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	03-29-2018	5.7	10	mg/L	92110061803291230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-26-2019	0.5	10	mg/L	92110061903260930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-24-2020		10	mg/L	92110062003240910N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-23-2021	1.4	10	mg/L	92110062103231115N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-20-2018		10	mg/L	92110061803201100N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-20-2017		10	mg/L	92110061703201430N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	03-17-2020		10	mg/L	92110062003170920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-17-2016		10	mg/L	92110061603170840N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	03-16-2021	0.3	10	mg/L	92110062103161130N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-16-2017		10	mg/L	92110061703160820N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	03-15-2018		10	mg/L	92110061803151300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-12-2019		10	mg/L	92110061903120845N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-10-2020	1.6	10	mg/L	92110062003100920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-09-2021	1.6	10	mg/L	92110062103090930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-09-2018		10	mg/L	92110061803091400N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-08-2017	3	10	mg/L	92110061703080910N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	03-05-2019		10	mg/L	92110061903050800N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-04-2022		10	mg/L	220304_33-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-03-2020	2.5	10	mg/L	92110062003030900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-02-2021	0.5	10	mg/L	92110062103021000N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	03-02-2017		10	mg/L	92110061703020850N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	02-26-2019		10	mg/L	92110061902260900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-25-2022		10	mg/L	220225_26-04	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-25-2020	0.1	10	mg/L	92110062002250900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-23-2021		10	mg/L	92110062102230940N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-22-2018		10	mg/L	92110061802221230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-22-2016		10	mg/L	92110061602221425N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	02-21-2017	2.3	10	mg/L	92110061702211510N	ALPHA ANALYTICAL LABORATORIES UKIAH

1040	NITRATE	02-19-2019		10	mg/L	92110061902190910N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-18-2022		10	mg/L	220218_07-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-18-2020	0.3	10	mg/L	92110062002180915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-16-2021		10	mg/L	92110062102160830N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-16-2018		10	mg/L	92110061802161100N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-14-2017		10	mg/L	92110061702141430N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	02-12-2019		10	mg/L	92110061902120900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-11-2020	0.2	10	mg/L	92110062002110915N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-10-2022	0.3	10	mg/L	220210_42-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-09-2021	0.1	10	mg/L	92110062102090900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-08-2018		10	mg/L	92110061802081300N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-08-2017	2.7	10	mg/L	92110061702081250N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	02-05-2019		10	mg/L	92110061902050930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-04-2020	0.2	10	mg/L	92110062002040920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-02-2021	0.2	10	mg/L	92110062102020900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	02-01-2018		10	mg/L	92110061802011130N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-31-2017		10	mg/L	92110061701310900N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	01-30-2019		10	mg/L	92110061901300930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-28-2022		10	mg/L	220128_20-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-28-2020		10	mg/L	92110062001280930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-26-2021	0.9	10	mg/L	92110062101261015N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-25-2017	4.5	10	mg/L	92110061701250830N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	01-24-2018		10	mg/L	92110061801241330N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-22-2019		10	mg/L	92110061901220900N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-21-2020		10	mg/L	92110062001210830N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-19-2021	1.5	10	mg/L	92110062101190920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-19-2018		10	mg/L	92110061801191230N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-18-2022		10	mg/L	220118_61-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-17-2017		10	mg/L	92110061701171330N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	01-15-2019		10	mg/L	92110061901150845N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-14-2022		10	mg/L	220114_10-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-14-2020		10	mg/L	92110062001140920N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-13-2016		10	mg/L	92110061601130920N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	01-12-2021		10	mg/L	92110062101120855N	MONTEREY BAY ANALYTICAL SERVICES

1040	NITRATE	01-12-2018		10	mg/L	92110061801121145N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-12-2017	4.6	10	mg/L	92110061701120840N	ALPHA ANALYTICAL LABORATORIES UKIAH
1040	NITRATE	01-08-2019		10	mg/L	92110061901080830N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-07-2022		10	mg/L	220107_23-01	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-07-2020		10	mg/L	92110062001070850N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-05-2021		10	mg/L	92110062101050930N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-04-2018		10	mg/L	92110061801041045N	MONTEREY BAY ANALYTICAL SERVICES
1040	NITRATE	01-02-2019		10	mg/L	92110061901021215N	MONTEREY BAY ANALYTICAL SERVICES

ATTACHMENT 3

Appendix B: AUGUST 2022 NITRATE FEASIBILITY STUDY COMMENTS SAN LUCAS COUNTY WATER DISTRICT (System No. 2701676)

State Water Resources Control Board
Division of Drinking Water

January 12, 2023

Susan Madson, General Manager
San Lucas County Water District
PO Box 166
San Lucas, CA 93954
sanlucaswater@gmail.com

Dear Susan Madson,

AUGUST 2022 NITRATE FEASIBILITY STUDY COMMENTS
SAN LUCAS COUNTY WATER DISTRICT (System No. 2701676)

The State Water Resources Control Board – Division of Drinking Water (Division) received an August 2022 nitrate feasibility study (study) for the San Lucas County Water District (San Lucas CWD) water system, prepared by the Wallace Group for Mission Ranches LLC. The study compares the following two alternatives for long term nitrate compliance:

- Alternative 1. transmission line alternative project (previously proposed by North Coast Engineering)
- Alternative 2. wellhead treatment using ion exchange, only operated when certain raw water nitrate thresholds are met.

The Division has the following comments on the August 2022 feasibility study (attached). The Division requests a response to these questions and comments by February 10, 2023.

1. **Online nitrate analyzer**
   The Division agrees with page 4 of the proposal, which calls for immediate installation of an online nitrate analyzer with data recording capabilities at Well 3. Both nitrate treatment proposals are contingent upon a complete understanding of the nitrate profile at Well 3. Proposal 1, the tank blending approach does not include treatment, so without understanding the nitrate profile, the Division cannot permit this approach.

   The weekly nitrate grab samples mentioned in this report do not provide a complete Well 3 nitrate profile. In the study, there is a mention of a few spikes per year, as captured from weekly samples, but there isn’t a definitive understanding of the source or reasons for these spikes After the nitrate analyzer is installed, San Lucas

CWD will have a more complete understanding of the well's nitrate profile, which can support the basis of design for a long-term solution. Due to the acute health concerns associated with nitrate, the Division will not consider permitting either approach without the installation of online nitrate analyzer(s).

2. **Alternative 2 - Ion exchange treatment plant**
   The treatment plant proposal mentions the plant is only run when a raw water nitrate threshold is met. The Division is not aware of a similar ion exchange treatment plant proposal already permitted statewide. In general, nitrate ion exchange treatment plants are run continuously to avoid fouling. There isn't enough supporting information provided to demonstrate this proposal will work and adequately protect public health. Additional comments are provided below.

   a. The study does not include details about the proposed ion exchange system including California installations, resin, NSF 61 compliance, etc.

   b. Page 7 states that the ion exchange plant is installed after the iron and manganese treatment plant. The Division is aware that there have been recent issues with the iron and manganese treatment plant that caused customer complaints. Was the consultant aware of these issues during the preparation of this study?

   c. The study must evaluate the useful life of the iron and manganese treatment plant and how that impacts the ion exchange treatment plant design due to the impacts of iron and manganese spikes.

   d. San Lucas CWD uses chlorine as an oxidant for the iron and manganese water treatment plant; chlorinated water is known to damage ion exchange resin. The study does not mention how this is addressed.

   e. San Lucas CWD needs to provide a detailed operations plan that addresses concerns about stagnant water, bacteriological issues, and run time before a regeneration.

3. Due to the presence of elevated distribution system total trihalomethanes, both alternatives must consider disinfection byproduct formation and mitigation. The third and fourth quarter 2022 total trihalomethane results exceed the MCL of 80 ug/L, although compliance is based on a four-quarter running annual average.

4. Fire flow requirements are mentioned in Alternative 1, but not Alternative 2. San Lucas CWD must show that fire flow requirements are met with Alternative 2.

5. **Cost estimation comments**
   a. The cost estimates provided in Tables 3 and 4 do not provide enough of an estimated cost breakdown. The cost estimations might underestimate the costs of ion exchange. Costs related to the nitrate analyzer, brine storage

tank(s), waste tank(s), SCADA / alarms / remote viewing, and operation and CEQA costs are missing.

Operations and maintenance costs might be underestimated; missing from the estimate are costs for the regenerant (sodium chloride or potassium chloride), nitrate analyzer operation and maintenance, and the frequency of site visits from the certified operator.

b. The cost estimation for Alternative 1 does not include a nitrate analyzer at the tank effluent, which is a requirement for this proposal. California Environmental Quality Act (CEQA) costs are also missing.

c. With the proposal to land dispose spent brine, potassium chloride is the preferred ion exchange regenerant. Potassium chloride is much more costly than sodium chloride, so this cost should be reflected in cost estimates.

6. The calculations provided on Page 7 are not completed in accordance with 10 year maximum day demand calculations from California Code of Regulations, title 22, Section 64554.

7. Please provide documentation to demonstrate San Lucas Water District's ownership or easement of Well 3 and access road.

If you have any questions, please contact Querube Moltrup at Querube.Moltrup@waterboards.ca.gov or (831) 655-6936, or me at Jonathan.weininger@waterboards.ca.gov or (831) 655-6932.

Sincerely,

Jonathan Weininger, PE
District Engineer, Monterey District
Division of Drinking Water

Enclosure

cc: Monterey County Environmental Health Department

Sheri Braden, San Lucas County Water District, 88braden@gmail.com

Cypress Water Services
Cypress Water Services, Service@CypressWaterServices.com
Miles Farmer, miles@cypresswaterservices.com

Central Coast Regional Board
Thea Tyron, thea.tryon@waterboards.ca.gov
Tamara Anderson, tamara.anderson@waterboards.ca.gov

Pamela Silkwood, psilkwood@taylorfarms.com
Bryan Childress, bryanc@wallacegroup.us
Louis Lefebvre, louisl@wallacegroup.us

Appendix C: San Lucas Water System Feasibility Study Addendum 1

MEMORANDUM

Mission Ranches Company, LLC
San Lucas Water System Improvements – 1678-0001

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Date: February 15, 2023

To: Pamela Silkwood, Mission Ranches Company, LLC

From: Bryan Childress, Wallace Group

Subject: San Lucas Water System Feasibility Study Addendum 1

REGISTERED PROFESSIONAL ENGINEER
BRYAN D. CHILDRESS
No. C88775
CIVIL
STATE OF CALIFORNIA

Background
The purpose of this memorandum is to serve as an addendum to the San Lucas Water System Feasibility Study by Wallace Group dated August 16, 2022 (Attachment 1). Based on further discussion between the San Lucas County Water District (District) and Mission Ranches, Alternative 1: Transmission Line is the preferred alternative. The following sections of this memorandum provide additional information addressing the Division of Drinking Water (DDW) comment letter dated January 12, 2023 (Attachment 2). Only comments relating to Alternative 1 are addressed in this addendum.

Online Nitrate Analyzer (Comment 1)
In pursuance to Alternative 1, Mission Ranches has approved the purchase of one (1) online nitrate analyzer and in the process of negotiating an installation date with the District's contract operator, Cypress Water Services. Once installed, one (1) year of nitrate data will be collected by Mission Ranches to better understand the well's nitrate profile.

Trihalomethanes (Comment 3)
Disinfectant byproducts (DBP) such as trihalomethane are formed when disinfectants like chlorine interact with natural organic materials in water. The District's water treatment system uses chlorine as an oxidant for the Iron/Manganese removal system and they also maintain a chlorine residual in the distribution system for disinfection. DBPs can be reduced by treating the source water to remove organic carbon, changing the disinfectant and oxidant, or removing DPBs after they are formed. Because the total organic carbon (TOC) in the source water is less than 2.0 mg/l, alternate compliance criteria may be used in lieu of TOC removal per EPA guidance criteria. For water quality data, see Attachment 3.

For this water system we recommend starting with an analysis of the District's chlorine residual to determine if it is in compliance with the EPA's established maximum residual disinfectant limits (MRDL). Once this analysis is completed it can

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be determined if chlorine is being overdosed to the system. These limits are established by the EPA and are listed below for reference only:

Table 1. Regulated Disinfectants

Regulated Disinfectants	MRDL (mg/L)	MRDLG (mg/L)
Chlorine	4.0 as Cl_2	4 as Cl_2
Chloramines	4.0 as Cl_2	4 as Cl_2
Chlorine Dioxide	0.8 as ClO_2	0.8 as ClO_2

DBP formation is also directly correlated to chlorine contact time with the DBP precursor, in this case TOC. With the proposed Transmission Line alternative, the tank volume would be exchanged more frequently, and water would be introduced to the tank using a nozzle acting as a mixer/aerator. Both of these changes would reduce water age through increased circulation and create better homogenization of the water, minimizing thermal and chemical stratification that promotes DBP formation. If DBP formation continues to persist after the above solutions are implemented an active mixing system could be installed in the water storage tank to further remove DBPs.

Updated Cost Estimate for Alternative 1 (Comment 5b)
The previous cost estimate for Alternative 1 did not include a nitrate analyzer at the tank effluent which is being required by DDW. Updated costs are provided in Table 1 below:

Table 1. Capital Cost Estimate for Transmission Pipeline

Line #	Item	Qty	$/Unit	Cost ($)
1	8" Tank Supply Line (C900 PVC CL200)	3,600 LF	180	$648,000
2	8" Cattleman Rd Water Main Extension	1,450 LF	180	$261,000
3	Jack and Bore (Union Pacific Railroad)	-	LS	$150,000
4	Nitrate Analyzer	-	LS	$20,000
Subtotal				$1,079,000
5	Construction Contingency (20% of subtotal)			$215,800
6	Soft Costs: Engineering, administration, construction management, inspections & permitting, excludes environmental (15% of Subtotal)			$161,850
Total Project Cost				**$1,456,650**

Environmental/CEQA costs were not included in the cost estimate because these are improvements to an existing facility and fall under a categorical exemption due to the nature of the improvements per 14 CCR 15301 Existing Facilities, Class 1 (f).

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Maximum Day Demand Calculations (Comment 6)
An updated Maximum Day Demand (MDD) calculation using method 4 per CCR Title 22 64554 with a peaking factor of 2.25**.** Items in **bold** have been updated from the previous feasibility study:

- Per Capita Demand: 88-gallon per capita day (gpcd) was used from previous reports (AMEC, 2015). This value was based on source water production records from 2006 through 2010. Current metered well data was not available at the time of this report.
- Population: 547 people. This includes 415 people from the 2020 census plus an additional 132 people as anticipated from a planned 33 Unit CHISPA project
- Design Average Day Demand (ADD): 48,136 gpd.
- **Design Max Day Demand (MDD):108,306 gpd**. Calculated based on ADD of 48,136 and a **peaking factor of 2.25.**
- **Water Storage Tank Capacity: 2.8 days of MDD**. The existing 300,000-gallon water storage tank has adequate capacity for the current population and the future CHISPA project per CCR Title 22 Section 64554 storage requirements.

Method 4 was used to calculate MDD for this water system because of the lack of recent water quantity data due to bottled water being supplied to the community for over 10 years. Annual bottled water quantities records were not available at the time of this report.

Well 3 and Access Road Easement (Comment 7)
See Attachment 4

List of Attachments

Attachment 1 - San Lucas Water System Feasibility Study. Wallace Group. August 16, 2022
Attachment 2 - August 2022 Nitrate Feasibility Study Comments San Lucas County Water district (System No. 2701676)
Attachment 3 – Well #3 Water Quality Data
Attachment 4 – Well 3 and Access Road Easement