NCWA
Northern California Water Association

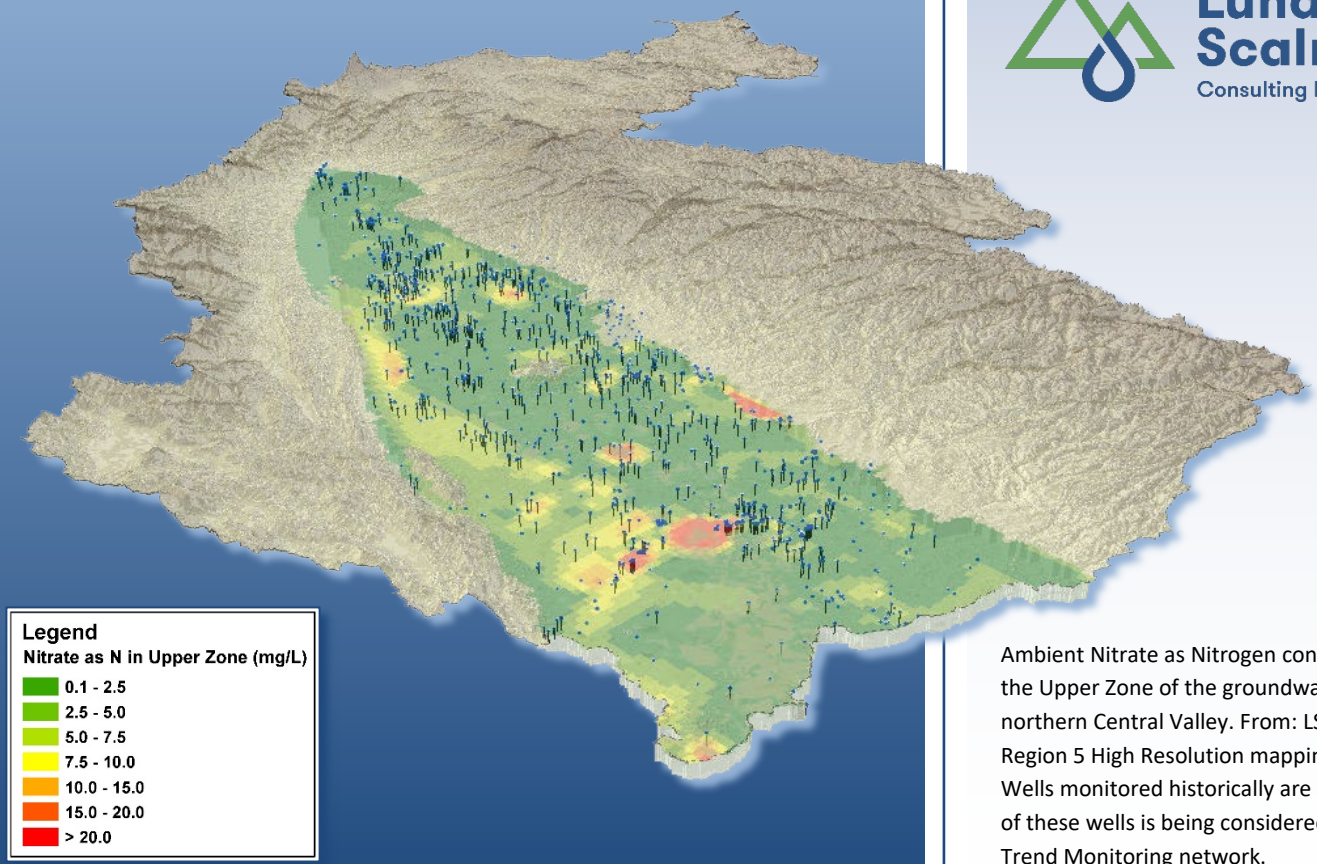
2020 ANNUAL GROUNDWATER QUALITY TREND MONITORING REPORT

for the Sacramento Valley Water Quality Coalition

May 1, 2021

Submitted by

Luhdorff & Scalmanini
Consulting Engineers



Ambient Nitrate as Nitrogen concentrations in the Upper Zone of the groundwater system in the northern Central Valley. From: LSCE et al. (2016), Region 5 High Resolution mapping for CV-SALTS. Wells monitored historically are shown. A subset of these wells is being considered for the ongoing Trend Monitoring network.

Signature Page

Vicki Kretsinger Grabert
Senior Principal Hydrologist

Nick Watterson, PG, CHG
Supervising Hydrogeologist
May 1, 2021

Aaron King
Project Engineer

Chris Curtis
Project Hydrogeologist

Suggested Citation: Luhdorff and Scalmanini, Consulting Engineers. 2021. Sacramento Valley Water Quality Coalition 2020 Annual Groundwater Quality Trend Monitoring Report. May 1, 2021.

LSCE File Number: 20-1-089

Table of Contents

List of Tables

List of Figures

Appendices

1 EXECUTIVE SUMMARY

As part of compliance with the Central Valley Regional Water Quality Control Board's (Regional Board or CVRWQCB) *Order No. R5-2014-0030-R1 Waste Discharge Requirements General Order for Growers in the Sacramento River Watershed that are Members of the Third-Party Group*, hereafter referred to as the WDRs (CVRWQCB, 2014), the Sacramento Valley Water Quality Coalition (Coalition or SVWQC) must develop and implement a Groundwater Quality Trend Monitoring (GQTM) Program. This report presents results and discussion related to the SVWQC GQTM sampling activities conducted during 2020. The Coalition GQTM well network 2020 sampling event occurred during late July and early August 2020 and included sampling of a total of 30 wells. The sampling plan include a total of 31 wells as indicated in the 2020 GQTM Workplan Update submitted in July 2020 (LSCE, 2020); however, one well could not be sampled because of withdrawal of the well owner's permission.

In accordance with the annual and five-year GQTM sampling schedule, four wells sampled for the first time as part of the GQTM were tested for nitrate, total dissolved solids (TDS), and major cations and anions as required every five years, meanwhile 26 wells previously sampled for the GQTM and were only tested for nitrate, as required by the annual monitoring schedule. All wells sampled for the GQTM were also tested for field parameters, including specific conductance, pH, temperature, dissolved oxygen, oxidation-reduction potential, and turbidity. The results from 2020 GQTM sampling, a discussion of GQTM trends and patterns, and a summary of the data quality assurance assessment are presented in this report.

The groundwater quality results from the 2020 sampling included nitrate concentrations above the primary drinking water maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) in three network wells and one well had nitrate concentrations very close to, but below, the MCL. Additionally, one of the four wells sampled for total dissolved solids (TDS) had concentrations above the recommended secondary drinking water MCLs of 500 mg/L and also above the upper MCL of 1,000 mg/L, but the three other wells had TDS concentrations below 300 mg/L. In accordance with the SVWQC GQTM Workplan documents (LSCE, 2017, 2018a, 2018b, 2019, 2020), evaluation of patterns and trends in groundwater quality and any relationships with agricultural practices will be conducted at five-year intervals commencing after sufficient GQTM data have been developed for evaluating temporal trends in groundwater quality.

2 BACKGROUND AND GQTM OBJECTIVES

The Central Valley Regional Water Quality Control Board's (Regional Board or CVRWQCB) *Order No. R5-2014-0030-R1 Waste Discharge Requirements General Order for Growers in the Sacramento River Watershed that are Members of the Third-Party Group*, hereafter referred to as the WDRs (CVRWQCB, 2014), requires the Sacramento Valley Water Quality Coalition (Coalition or SVWQC) to develop and implement a Groundwater Quality Trend Monitoring (GQTM) Program. The WDRs Attachment B, Section IV.C. (p. 1-2) states:

> "*1. Objectives.* The objectives of Groundwater Quality Trend Monitoring are (1) to determine current water quality conditions of groundwater relevant to irrigated agriculture, and (2) to develop long-term groundwater

quality information that can be used to evaluate the regional effects (i.e., not site-specific effects) of irrigated agriculture and its practices.

2. Implementation. To reach the stated objectives for the Groundwater Quality Trend Monitoring program, the third-party shall develop a groundwater quality monitoring network that will (1) be implemented over both high and low vulnerability areas in the third-party area; and will (2) employ shallow wells, but not necessarily wells completed in the uppermost zone of first encountered groundwater. The use of existing wells is less costly than installing wells specifically designed for groundwater quality monitoring, while still yielding data which can be compared with historical and future data to evaluate long-term groundwater quality trends. The third party may also consider using existing monitoring networks such as those used by AB 3030 and SB 1938 plans.

3. Reporting. The results of trend monitoring are to be included in the third-party's Monitoring Report and shall include a map of the sampled wells, tabulation of the analytical data, and time concentration charts. Groundwater quality monitoring data are to be submitted electronically to the State Water Board's GeoTracker Database and to the Central Valley Water Board.

Following collection of sufficient data (sufficiency to be determined by the method of analysis proposed by the third-party or Trend Monitoring Group) from each well, the third-party is to evaluate the data for trends. The methods to be used to evaluate trends shall be proposed by the third-party or Trend Monitoring Group in the Groundwater Quality Trend Monitoring Workplan described in section IV.E below."

Between September 2017 and May 2018, the Coalition submitted two phases of the *Sacramento Valley Water Quality Coalition Groundwater Quality Trend Monitoring Workplan* (LSCE, 2017 and 2018a) to address the requirements for the GQTM Program as outlined in the WDRs Attachment B, Sections III.C and III.E. A subsequent Addendum to the Workplan was also submitted in July 2018 (LSCE, 2018b) to address comments on the Workplan provided by the Regional Board and presented an initial proposed GQTM well network. The Regional Board issued a Conditional Approval of the Addendum (CVRWQCB, 2018) and noted several additional requirements to be completed by May 1, 2019 including the submittal of a revised Workplan addressing a number of elements noted in the accompanying Regional Board staff review memorandum. Subsequently, GQTM Workplan Updates were submitted in 2019 and 2020 (LSCE, 2019, 2020) to address comments and required revisions as noted in the May 2019 Regional Board Conditional Approval letter (including the accompanying staff memorandum) and additional Regional Board staff review letter from November 9, 2019. The GQTM Workplan Updates included an increased number of wells in the GQTM network, recognizing that the GQTM well network continues to be considered an evolving network, not a static product.

In a August 6, 2020 letter, the Regional Board recommended proceeding with the Coalition's GQTM efforts as described in the 2020 Workplan Update (LSCE, 2020). This report presents the results from 2020 GQTM sampling, a discussion of GQTM trends and patterns, and a summary of the data quality assurance assessment are presented in this report.

The Coalition's boundary coincides with the boundary of the Sacramento River watershed and encompasses more than 18.2 million acres, including about 1.3 million acres of irrigated agricultural land. The Groundwater Quality Assessment Report (CH2M, 2016) prepared for the Coalition region provides an overview of hydrogeologic and groundwater quality conditions in the Coalition region.

3 GROUNDWATER QUALITY TREND MONITORING

The 2020 GQTM sampling event occurred in Summer 2020 and the results from this sampling event are presented in this report. The GQTM program involves groundwater quality sampling utilizing a network of wells selected to accomplish the GQTM Program objectives of monitoring regional and long-term trends in groundwater quality in relation to agricultural practices as outlined in Coalition GQTM Workplan submittals. These workplans discuss the dynamic nature of the GQTM network design, including the expectation that the network would evolve and be expanded or otherwise modified in future years, as needed to achieve the program objectives. The GQTM network proposed for the 2020 sampling event consisted of network wells identified in the 2020 GQTM Workplan Update (LSCE, 2020) submitted in July 2020. In accordance with the annual and five-year GQTM sampling schedule, wells being sampled for the first time as part of the GQTM were tested for nitrate, total dissolved solids (TDS), and major cations and anions as required every five years, meanwhile wells previously sampled for the GQTM were only tested for nitrate, as required for annual monitoring. All wells sampled for the GQTM were also tested for field parameters, including specific conductance, pH, temperature, dissolved oxygen, oxidation-reduction potential, and turbidity.

3.1 2020 GQTM Network Sampling Activities

Information related to the GQTM network wells sampled in 2020 are summarized in **Table 1** and their locations are displayed on **Figure 1**. The 2020 groundwater quality sampling for the SVWQC GQTM Program took place between August 21 and August 29, 2020. A total of 31 wells were previously identified for the 2020 GQTM network in the 2020 GQTM Workplan Update. The well owner for one well (SVWQC00030), who is not a Coalition member, elected to withdraw from participation in the program. As a result, a total of 30 GQTM network wells were sampled in 2020.

The 2020 GQTM network well sampling event was conducted without notable issues. Wells were measured for depth to water (if access to water level measurements was available) upon arrival at each site and prior to conducting any well purging. All wells were purged and sampled in accordance with the standard operation procedures (SOP) for sampling activities using existing pumping equipment or installed sampling pumping equipment. All sampled wells were monitored for field parameters including pH, temperature, electrical conductivity (EC), dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity during the well purging and sampling event. In all wells sampled, the pumped water had achieved stabilization of field parameters prior to sample collection and no remarkable occurrences during the sampling process were noted. All water samples were stored on ice after collection and delivered to California Laboratory Services in Sacramento for analysis of nitrate and major cations and anions, in accordance with the GQTM requirements. Field forms from the sampling activities are provided as part of the electronic data submittal package submitted together with this document.

Table 1: 2020 GQTM Network Wells

GQTM Well ID	State Well Number	WCR Number	Well Use	Well Construction Information					Latitude (NAD83)	Longitude (NAD83)	Depth Bottom of Upper Zone (feet)[3]	Percent Screen in Upper Zone	Explanation of Monitored Depth
				Seal Depth (feet)	Seal Mat.	Total Well Depth (feet)[1,2]	Depth Top of Screen (feet)[2]	Depth Bottom of Screen (feet)[1]					
SVWQC00001	17N/03E-18		PWS		Cem				39.32262	-121.67860	113	N/A	The well depth is not known. WCRs suggest that all wells in vicinity are of similar depths, generally less than the bottom of the Upper Zone. Therefore, well is likely screened in the Upper Zone.
SVWQC00003	18N/02E-35		Irrig		Bent	**105**		**105**	39.36562	-121.70920	136	100%	Screens entirely in Upper Zone
SVWQC00004	18N/01W-16		PWS	50	Cem	**120**		**120**	39.41960	-121.96697	137	100%	Screens entirely in Upper Zone
SVWQC00005	22N/02W-32	369971	PWS	80	Bent	225	145	225	39.71070	-122.10609	139	0%	Older very shallow domestic wells skew delineated Upper Zone depth; recent wells are typically deeper. The well is screened at typical depth (from 145 to 225 feet) for domestic wells in the nearby sections (32 to 330 feet).
SVWQC00006	13N/01W-19	702875	PWS	60	Cem	260	180	260	38.96060	-122.01811	234	68%	Mostly in Upper Zone; well depth is less than the average domestic well depth in area (264 feet).
SVWQC00007	13N/09W-10	916600	PWS	50	Cem	121	55	105	38.98349	-122.84658	Not Mapped	N/A	Screens entirely above average domestic well depth in area (100 feet).
SVWQC00008	13N/05E-13		Dom		Cem	**111**		**111**	38.97403	-121.36062	98	N/A	Upper Zone is very shallow. Well screens are likely mostly in Upper Zone and entirely above average domestic well depth in area (127 feet).
SVWQC00009	42N/09E-25	138832	PWS	120	Cem	400	120	400	41.44681	-120.87935	Not Mapped	N/A	Outside Central Valley - Upper Zone not defined. Well intake depth is partially above average domestic well depth in area (215 feet). Well depths range from 75 to 640 feet in the area.
SVWQC00010	21N/15E-12		Dom			**159**		**159**	39.69027	-120.25014	Not Mapped	100%	Relatively shallow well; outside Central Valley Floor area - Upper Zone not defined. Likely screened mostly or entirely above average depth of nearby domestic wells (145 feet).

GQTM Well ID	State Well Number	WCR Number	Well Use	Well Construction Information					Latitude (NAD83)	Longitude (NAD83)	Depth Bottom of Upper Zone (feet)[3]	Percent Screen in Upper Zone	Explanation of Monitored Depth
				Seal Depth (feet)	Seal Mat.	Total Well Depth (feet)[1,2]	Depth Top of Screen (feet)[2]	Depth Bottom of Screen (feet)[1]					
SVWQC00011	06N/01E-17	116111	Other	20	Cem	120	70	80	38.36561	-121.89659	207	100%	Screens entirely in Upper Zone
SVWQC00012	07N/02E-17	51591	Dom		Cem	165	115	165	38.45108	-121.77325	260	100%	Screens entirely in Upper Zone
SVWQC00013	23N/15E-30	1089364	Stock	23	Cem	203	23	203	39.80460	-120.34511	Not Mapped	N/A	Relatively shallow well; outside Central Valley - Upper Zone not defined. Screened mostly above average depth of nearby domestic wells (152 feet).
SVWQC00015	10N/02E-08		PWS		Cem	226	203	226	38.72674	-121.76936	226	100%	Screens entirely in Upper Zone
SVWQC00016	09N/02E-09	72206	PWS	80	Cem	157	134	157	38.64049	-121.76376	273	100%	Screens entirely in Upper Zone
SVWQC00017	10N/01W-18	428830	Irrig	60	Cem	210	80	210	38.70895	-122.01271	185	80%	Screens mostly in Upper Zone
SVWQC00018	20N/02E-26	141495	Dom	20		80	60	80	39.56190	-121.70782	142	100%	Screens entirely in Upper Zone
SVWQC00019	13N/02W-03	2734	Dom		Cem	**140**		**140**	39.01184	-122.06906	228	100%	Screens entirely in Upper Zone
SVWQC00020	24N/03W-08	77262	Dom		Cem	152	144	152	39.94890	-122.22980	163	100%	Screens entirely in Upper Zone
SVWQC00021	18N/01W-30	E0113243	Dom	28	Bent	120	90	120	39.37719	-122.01334	142	100%	Screens entirely in Upper Zone
SVWQC00022	12N/01E-13	E067697	Dom	80	Bent	160	110	150	38.88302	-121.81911	247	100%	Screens entirely in Upper Zone
SVWQC00023	21N/02E-29		Dom			**121**		**121**	39.64656	-121.77023	141	100%	Screens entirely in Upper Zone
SVWQC00024	26N/02W-17		PWS		Cem	**120**		**120**	40.10719	-122.10759	131	100%	Screens entirely in Upper Zone
SVWQC00026	15N/09W-07		PWS	40	Cem	130	80	130	39.16774	-122.91139	Not Mapped	N/A	Shallow well; outside Central Valley - Upper Zone not defined. Screens sampling primarily above the local average domestic well depth (106 ft).
SVWQC00027	22N/01W-11	70806	PWS	50	Bent	200	140	200	39.78040	-121.95486	134	0%	Relatively shallow well; represents water quality within the depth range for typical local domestic wells, which range from 35 to 520 feet deep. Zone of wells screens not hydraulically distinct from delineated Upper Zone.

GQTM Well ID	State Well Number	WCR Number	Well Use	Well Construction Information					Latitude (NAD83)	Longitude (NAD83)	Depth Bottom of Upper Zone (feet)[3]	Percent Screen in Upper Zone	Explanation of Monitored Depth
				Seal Depth (feet)	Seal Mat.	Total Well Depth (feet)[1,2]	Depth Top of Screen (feet)[2]	Depth Bottom of Screen (feet)[1]					
SVWQC00028	11N/03W-10	555247	Dom	20	Cem	110	90	110	38.81890	-122.18366	136	100%	Screens entirely in Upper Zone
~~SVWQC00030~~	~~05N/07E-12~~	~~176623~~	~~Dom~~		~~Cem~~				~~38.29532~~	~~-121.16222~~	~~242~~	~~N/A~~	~~Likely has similar construction as other nearby domestic wells, which was the primary metric used by CV-SALTS in defining the Upper Zone. Suggests well is likely representative of the Upper Zone.~~
SVWQC00031	37N/04E-04		Dom			**98**		**98**	41.07892	-121.51902	Not Mapped	N/A	Very shallow well; outside Central Valley Floor area - Upper Zone not defined. Much shallower than average depth of nearby domestic wells (230 feet).
SVWQC00032	14N/03E-22	053306	Dom			139	100	120	39.04675	-121.62959	114	68%	Screens mostly in Upper Zone, depth typical for local domestic wells.
SVWQC00033	06N/05E-24	583117	Dom	50	Cem	220	169	220	38.35233	-121.37830	200	62%	Screens mostly in Upper Zone, entirely above average local domestic well depth.
SVWQC00034	29N/03W-04	091561	Dom	20	Bent	100	75	100	40.39615	-122.20709	156	100%	Screens entirely in Upper Zone
SVWQC00035	11N/02E-13		Dom			**100**		**100**	38.80289	-121.69580	198	100%	Screens entirely in Upper Zone

Note: Table includes all GQTM network wells included in 2020 Workplan Update. Strikeout of SVWQC00030 indicates the well was removed from the network because the well owner withdrew permission.

[1] **Bold** values for total depth and bottom of screens are based on a tag of the well bottom conducted in the field; in such cases the total well depth is assumed to also be the bottom of the screen.

[2] In open-completion wells (open hole) the depth to top of screens is represented as the bottom of the casing and the total depth is the depth of the well borehole.

[3] The Upper Zone is defined by CV-SALTS (LSCE and LWA, 2016) based on typical domestic well depths and other hydrogeologic characteristics. The depth of bottom of Upper Zone from CV-SALTS ranges from less than 100 feet to about 300 feet in the Coalition region. Average domestic well depth in the vicinity is presented where Upper Zone depth was not determined by CV-SALTS.

PWS = public water supply; Dom = domestic; Irrig = irrigation; Bent = bentonite; Cem = cement

3.2 2020 GQTM Network Sampling Results

The results from the 2020 GQTM sampling event are presented in **Table 2**. Water quality results exceeding applicable drinking water standards are highlighted in bold in **Table 2**. For the purpose of comparing results with water quality objectives, the results are discussed below relative to drinking water standards. Some of the more notable water quality results from the sampling are discussed below.

In the 2020 sampling, analytical water quality results for three of the sampled wells, SVWQC00016, SVWQC00018, and SVWQC00020, exceeded the primary drinking water MCL of 10 mg/L for nitrate (as nitrogen) and one well (SVWQC00012) had a nitrate concentration just below the MCL. The three wells with nitrate exceedances had also previously tested high in nitrate concentrations in 2019 and SVWQC 00012 had a nitrate result above the MCL in 2019. Four wells had nitrate concentrations between 5.0 and 7.5 mg/L in 2020 and nearly half (14) of the sampled wells had undetectable nitrate concentrations or concentrations below 2.5 mg/L. Only four wells were sampled for the broader suite of analytes required for the GQTM at five-year intervals. Of the four GQTM network wells sampled for total dissolved solids (TDS), one well exceeded the secondary recommended drinking water MCLs of 500 mg/L for TDS and also exceeded the upper MCL of 1,000, but all others were below the recommended MCL with concentrations less than 300 mg/L. The one well exceeding the recommended MCL for TDS was SVWQC00032. This well also had specific conductance readings and chloride and sulfate concentrations above the respective MCLs.

Of the wells with nitrate concentrations detected above the MCL in 2020, two are domestic wells used for drinking water. In accordance with requirements of the GQTM program, the owner of one of these domestic wells (SVWQC00020) had previously been notified in September 2019 about the high nitrate concentrations detected in 2019 and at that time was provided a Drinking Water Notification Template to complete and return. The owner of the other domestic well with a nitrate MCL exceedance (SVWQC00018), which had not previously experienced a nitrate exceedance, was notified in September 2020 of the exceedance that occurred during the 2020 sampling event and provided a Drinking Water Notification Template form to complete and return. Letters summarizing the 2020 sampling results for individual wells and noting any identified water quality exceedances have been transmitted to all GQTM network well owners. Additional communication with owners of network wells exhibiting nitrate exceedances who are Coalition members is also in process to make well owners aware of management practices contained in the Coalition's Groundwater Quality Management Plan or other management practices intended to protect groundwater quality. These practices may include actions related to wellhead protection as well as agricultural management practices.

A spreadsheet with tabulated results for the 2020 sampling is included with the accompanying electronic data submittal package. All laboratory analytical report files and chain of custody forms associated the sampling and analytical testing are also provided in the electronic data submittal package.

Table 2: 2020 GQTM Sampling Results

Site ID	Sample Date		Nitrate + nitrite (as nitrogen)	Total Dissolved Solids (TDS)	Boron	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulfate	Bicarbonate (as HCO3)	Carbonate (as CO3)	Hydroxide (as CaCO3)	Total Alkalinity (as CaCO3)	pH	Specific Conductance (EC)	Temperature	Dissolved Oxygen (DO)	Oxidation-Reduction Potential (ORP)	Turbidity	Depth to Water
		UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH units	uS/cm	°C	mg/L	mV	NTU	ft, bgs
		MCL:	10 [1]	500/ 1,000 [2]	1.0 [4]					250/ 500[2]	250/ 500[2]					6.5/ 8.5 [3]	900/ 1,600 [2]					
SVWQC00001	8/26/20		3.6													7.63	469	22.4	3.47	112	4.4	
SVWQC00003	8/26/20		0.79													7.72	326	17.6	6.7	108	0	20
SVWQC00004	8/26/20		2.7													7.76	865	18.0	5.26	117	0	20
SVWQC00005	8/28/20		5.6													7.44	666	18.1	7.55	91	0	50
SVWQC00006	8/21/20		3.4													7.53	495	19.9	10.8	116	0.4	
SVWQC00007	8/21/20		2													7.31	301	15.6	6.1	76	0	
SVWQC00008	8/25/20		2													7.55	379	19.1	5.65	86	0	64.98
SVWQC00009	8/29/20		ND													7.88	446	25.4	2.09	-136	0	
SVWQC00010	8/29/20		ND													7.82	236	14.1	9.82	-98	0	
SVWQC00011	8/24/20		5.6													7.46	1390	17.5	10.48	145	1.2	10.05
SVWQC00012	8/24/20		9.8													7.82	1.07	17.3	7.05	88	0	43.5
SVWQC00013	8/29/20		ND													7.72	1,180	11.2	3.63	-161	4.3	22
SVWQC00015	8/25/20		7.7													7.78	977	16.5	6.38	85	8.2	
SVWQC00016	8/25/20		**15**													7.68	1430	17.4	5.95	100	1.1	
SVWQC00017	8/25/20		0.52													7.75	626	17.7	6.4	62	0	
SVWQC00018	8/28/20		**11**													7.49	547	17.6	7.8	77	0	
SVWQC00019	8/21/20		8.3													7.16	650	18.5	10.49	89	3.9	78.3
SVWQC00020	8/28/20		**11**													7.49	409	18.4	10.24	113	0	
SVWQC00021	8/26/20		ND													8.03	530	18.0	6.55	-76	0.5	20
SVWQC00022	8/25/20		ND													7.92	653	15.9	11.45	-2	0	63.25
SVWQC00023	8/28/20		6.3													7.39	643	16.5	9.92	91	7.8	48.45

Site ID	Sample Date		Nitrate + nitrite (as nitrogen)	Total Dissolved Solids (TDS)	Boron	Calcium	Magnesium	Potassium	Sodium	Chloride	Sulfate	Bicarbonate (as HCO3)	Carbonate (as CO3)	Hydroxide (as CaCO3)	Total Alkalinity (as CaCO3)	pH	Specific Conductance (EC)	Temperature	Dissolved Oxygen (DO)	Oxidation-Reduction Potential (ORP)	Turbidity	Depth to Water
		UNITS:	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pH units	uS/cm	°C	mg/L	mV	NTU	ft, bgs
		MCL:	10 [1]	500/ 1,000 [2]	1.0 [4]					250/ 500[2]	250/ 500[2]					6.5/ 8.5 [3]	900/ 1,600 [2]					
SVWQC00024	8/28/20		3.9													7.23	570	16.7	3.94	121	0	
SVWQC00026	8/21/20		ND													6.49	245	15.4	24.3	70	0.1	
SVWQC00027	8/28/20		7.7													7.74	553	17.7	10.26	98	0	
SVWQC00028	8/21/20		5.2													6.95	1180	19.4	10.56	119	1.1	82.05
SVWQC00031	8/29/20		ND													7.51	211	11.1	5.79	-21	0	
SVWQC00032	8/26/20		ND	**1200**	0.085	200	130	4.5	67	**380**	**260**	390	ND	ND	390	7.77	**2000**	18.1	5.85	-111	1.6	30
SVWQC00032*	8/26/20		ND	**1300**	0.088	240	160	4.9	64	**390**	**270**	400	ND	ND	400	7.77	**2000**	18.1	5.85	-111	1.6	30
SVWQC00033	8/24/20		3.5	240	0.025	28	17	2.4	15	7	16	140	ND	ND	140	7.73	329	17.5	7.71	66	0	67.55
SVWQC00033*	8/24/20		2.5	240	0.022	26	15	2.3	14	7.1	16	130	ND	ND	130	7.73	329	17.5	7.71	66	0	67.55
SVWQC00034	8/28/20		1.1	170	ND	22	17	2.5	13	2.8	4.2	140	ND	ND	140	7.43	273	16.3	10.71	163	0	45.93
SVWQC00034*	8/28/20		1	200	ND	23	17	2.5	13	2.8	4.2	150	ND	ND	150	7.43	273	16.3	10.71	163	0	45.93
SVWQC00035	8/27/20		ND	290	0.73	22	14	3.3	46	14	9.1	240	ND	ND	240	7.98	453	16.0	4.21	-101	0	
SVWQC0035*	8/27/20		ND	280	0.7	22	13	3.2	46	14	9.1	240	ND	ND	240	7.98	453	16.0	4.21	-101	0	

[1] Primary Maximum Contaminant Level (MCL) for drinking water[1] Primary Maximum Contaminant Level (MCL) for drinking water.

[2] Secondary MCL (recommended/upper range) for drinking water[2] Secondary MCL (recommended/upper range) for drinking water.

[3] Suggested lower/upper acceptable range for drinking water.

[4] State Notification (Action) level - A health-based notification level established by the State of California for some constituents lacking MCLs; if a public water system detects a constituent at concentrations above the action level, local governing bodies must be notified.

ND = Not detected above laboratory minimum detection level or reporting limit (MDL) shown; N/A = no access to water level reading; * = duplicate sample.

Bold values indicate results above an MCL or action level.

3.3 Groundwater Quality Trends and Patterns

A map of locations and concentrations of nitrate in GQTM network wells in 2020 is presented as **Figure 2**. Land uses mapped in 2016 based on Department of Water Resources (DWR)[1] data are also shown in **Figure 2** in relation to the GQTM network wells and 2020 nitrate concentrations. As discussed above and illustrated in **Figure 2**, nitrate concentrations in wells sampled in 2020 were generally, low although three nitrate MCL exceedances (>10 mg/L) did occur and one additional well had a concentration very close to the MCL. The wells exceeding the nitrate MCL are symbolized in red in **Figure 2**; wells with nitrate concentrations between 7.5 and 10 mg/L are displayed in orange in **Figure 2**. All three nitrate exceedances occurred in wells located within the Central Valley Floor area of the Coalition region. One of the nitrate exceedance wells was in the more southern part of the Coalition in the Yolo Subwatershed area and two wells were farther north in the Butte-Yuba-Sutter Subwatershed area and Shasta-Tehama Subwatershed area. Of the four wells with nitrate concentrations between 7.5 and 10 mg/L, two are located in the Yolo Subwatershed area, one is in the Butte-Yuba-Sutter Subwatershed area and one is located in the Colusa-Glenn Subwatershed area. Nearly half of the wells sampled in 2020 had nitrate concentrations of less than 2.5 mg/L, including less than detectable nitrate concentrations in samples collected from wells located in the groundwater basins outside of the Central Valley. Otherwise, no notable spatial patterns in nitrate concentrations are apparent from the 2020 GQTM sampling results.

The primary objective of the GQTM Program is to evaluate regional temporal trends in groundwater quality as they relate to agricultural practices. As discussed in the GQTM Workplan, more extensive evaluation of groundwater quality data and identification of any trends and associated relationships with agricultural practices will be conducted and summarized at five-year intervals and once a sufficient period of record of groundwater quality data has been developed for assessing such trends.

The groundwater quality results from the 2020 sampling event represent the first, second, or third groundwater quality datapoint for the Sacramento Valley Water Quality Coalition GQTM network wells. Charts of time-series nitrate concentration data for all network wells are presented in **Appendix A.** Most of the charts with sufficient historical data show relatively stable to decreasing trends in nitrate concentrations based on available historical groundwater quality data for GQTM network wells. One well (SVWQC00016) appears to exhibit a trend of increased nitrate concentrations since the mid-2000s based on historical data records, but no data on nitrate concentrations in the well exist between about 2009 and the commencement of GQTM monitoring in 2018. Three samples collected from the well since 2018 suggest a shorter-term trend of decreasing concentrations. A longer-term record of recent nitrate concentrations will be important in understanding current trends in groundwater quality. The period of available data record for most wells remains limited. As network wells develop a longer-term time-series record of datapoints, more in-depth analysis and evaluation of groundwater quality trends in GQTM network wells will be conducted as part of the broader GQTM program summary and analysis completed every five years.

[1] https://data.cnra.ca.gov/dataset/statewide-crop-mapping

3.4 Summary of Quality Assurance Evaluation for 2019 Sampling Event

Consistent with the QAPP, field measurements of electrical conductivity (EC) at 25°C, pH, dissolved oxygen (DO) and temperature (T) were obtained during the sample retrieval and the laboratory performed analysis for nitrate as nitrogen (NO3 as N), boron (B), sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), chloride (Cl), sulfate (SO4), carbonate and bicarbonate alkalinity, and total dissolved solids (TDS), in accordance with the annual and five-year sampling schedule in the GQTM Workplan and QAPP. Additional field parameters of turbidity and oxidation-reduction potential (ORP) were also recorded during sampling.

3.4.1 Purging, sample handling, and custody

Wells were purged according to the SOP. Samples were retrieved upon stabilization of indicator parameters (i.e., EC and pH) and after the turbidity of the discharging water dropped below 10 NTUs. Purging and sampling activities were documented on field sheets provided in the QAPP. Samples were collected in laboratory-supplied bottles and transported under prescribed chain of custody to the laboratory according to the QAPP.

3.4.2 Field and analytical completeness

A total of 31 wells were planned for sampling, and 30 wells were able to be sampled in 2020 resulting in an overall 97 percent completeness for well sampling and field parameters (**Table 3**). One well originally planned for sampling in 2020 could not be sampled because the well owner notified the sampler that the well could no longer be used for the GQTM network. All well samples collected were analyzed at the laboratory resulting in 100 percent analytical completeness (**Table 3**). For the purpose of field quality control (QC), the QAPP prescribes the collection of one duplicate sample and one blank sample for every 20 samples retrieved (each must be at least 5 percent of total samples). In accordance with the QAPP, four duplicate samples were retrieved representing twelve percent of the wells sampled for nitrate and 50 percent of the wells sampled for all other constituents. No field blank samples were submitted to the laboratory because of a miscommunication about collection of field duplicates instead of field blanks. One of the primary reasons for analyzing field blanks is to detect contamination (usually of trace constituents) that may occur during sampling activities and transport. Although no field blanks were collected and analyzed, the collection and analysis of two additional field duplicates is believed to provide sufficient QA/QC of the sampling and analysis process. The QAPP only requires one field duplicate and one field blank for every 20 samples (each at a count of 5 percent of total samples); a total of four field duplicates were collected in 2020 equal to about 12 percent of the total samples. The assessment of completeness for field QC sampling is summarized in **Table 4.** A summary of the hold times specified in the QAPP for the laboratory analyses is presented in **Table 5**. All analyses were conducted within the specified hold time.

3.4.3 Analytical precision and accuracy

The laboratory performed all QA/QC for laboratory precision and accuracy in accordance with the QAPP including lab blanks, lab duplicates, matrix spikes, and lab control spikes. Results of the assessment of precision and accuracy are summarized in **Tables 6 and 7** and include evaluation of chemistry QC with field and laboratory blank samples; laboratory control and matrix spikes to evaluate accuracy; and field,

laboratory, and matrix spike duplicates to evaluate precision. Analytical precision and accuracy met all acceptability requirements for most analytes tested. As noted above and shown in **Table 6**, the analysis of additional field duplicates instead of field blanks was inadvertent but is believed to achieve the objective of evaluating QA/QC of the sampling procedures. One of the four field duplicates was outside of the range of acceptability. The percent recovery for matrix spike testing for a number of analytes was outside acceptability limits of 90 percent including for nitrate + nitrite (67% acceptable), sulfate (50% acceptable), calcium (75% acceptable), magnesium (75% acceptable), and sodium (75% acceptable). The analytical precision and accuracy were deemed acceptable for all constituents based on the combined results from laboratory controls, including laboratory blanks.

3.4.4 Quality assurance evaluation conclusions

All groundwater quality data are considered acceptable based on the review of QA/QC procedures and results in accordance with the requirements in the QAPP. The inclusion of two additional field duplicates is sufficient to address the objectives of the two field blanks which were inadvertently not collected and analyzed. The recovery percentages outside of acceptability range for some matrix spikes were reviewed and are not believed to be caused by issues related to laboratory accuracy and precision based on combined evaluation of all other laboratory controls. A narrative of the laboratory quality control related to these results was included on the analytical reports. None of these issues have been determined to significantly affect the reliability or usability of the data obtained as part of the 2020 sampling event; therefore, all data were accepted and are considered useable.

Table 3: Completeness of Field and Analytical Testing

Constituent	Test Type	Analytical Method	Matrix	Wells Planned for Sampling	Wells Sampled	Field and Transport Completeness	Total Samples Analyzed	Analytical Completeness
Dissolved Oxygen (DO)	Field parameter	SM4500-O G-2001	Groundwater	31	30	97%	30	100%
Electrical Conductivity (EC) at 25 °C	Field parameter	SM2510-B 1997	Groundwater	31	30	97%	30	100%
pH	Field parameter	SM4500-H+ B-2000	Groundwater	31	30	97%	30	100%
Temperature	Field parameter	SM2550-B 2000	Groundwater	31	30	97%	30	100%
*Oxidation-reduction potential (ORP)	Field parameter	-	Groundwater	31	30	97%	30	100%
*Turbidity	Field parameter	EPA180.1	Groundwater	31	30	97%	30	100%
Nitrate + Nitrite as N	Laboratory	SM4500-NO3 E	Groundwater	31	30	97%	30	100%
Total Dissolved Solids (TDS)	Laboratory	SM2540C	Groundwater	4	4	100%	4	100%
Carbonate	Laboratory	SM 2330B	Groundwater	4	4	100%	4	100%
Bicarbonate	Laboratory	SM 2330B	Groundwater	4	4	100%	4	100%
Alkalinity as CaCO3	Laboratory	SM 2320B	Groundwater	4	4	100%	4	100%
Chloride	Laboratory	EPA 300.0	Groundwater	4	4	100%	4	100%
Sulfate	Laboratory	EPA 300.0	Groundwater	4	4	100%	4	100%
Boron	Laboratory	EPA 200.7	Groundwater	4	4	100%	4	100%
Calcium	Laboratory	EPA 200.7	Groundwater	4	4	100%	4	100%
Magnesium	Laboratory	EPA 200.7	Groundwater	4	4	100%	4	100%
Potassium	Laboratory	EPA 200.7	Groundwater	4	4	100%	4	100%
Sodium	Laboratory	EPA 200.7	Groundwater	4	4	100%	4	100%
			Total	261	254	97%	254	100%

* ORP and turbidity are optional field parameters.

Table 4: Completeness of Field QC

Constituent	Analytical Method	Matrix	Total Well Samples Analyzed	Field Duplicate Samples Analyzed	Field Blank Samples Analyzed	Total Samples Analyzed (well and duplicates)	Field Duplicate Completeness	Field Blank Completeness
Nitrate + Nitrite as N	SM4500-NO3 E	Groundwater	30	4	0	34	11.8%	**0%**
Total Dissolved Solids (TDS)	SM2540C	Groundwater	4	4	0	8	50.0%	**0%**
Carbonate	SM 2330B	Groundwater	4	4	0	8	50.0%	**0%**
Bicarbonate	SM 2330B	Groundwater	4	4	0	8	50.0%	**0%**
Alkalinity as CaCO3	SM 2320B	Groundwater	4	4	0	8	50.0%	**0%**
Chloride	EPA 300.0	Groundwater	4	4	0	8	50.0%	**0%**
Sulfate	EPA 300.0	Groundwater	4	4	0	8	50.0%	**0%**
Boron	EPA 200.7	Groundwater	4	4	0	8	50.0%	**0%**
Calcium	EPA 200.7	Groundwater	4	4	0	8	50.0%	**0%**
Magnesium	EPA 200.7	Groundwater	4	4	0	8	50.0%	**0%**
Potassium	EPA 200.7	Groundwater	4	4	0	8	50.0%	**0%**
Sodium	EPA 200.7	Groundwater	4	4	0	8	50.0%	**0%**
		Total	74	48	0	122	39.3%	**0%**

Completeness values below the acceptability requirement of 5 percent are presented in **bold**.
Note: Field blanks were not analyzed in 2020 due to a miscommunication regarding use of field duplicates in lieu of field blanks. Additional field duplicates were collected instead of field blanks.

Table 5: Evaluation of Sample Hold Times

Constituent	Analytical Method	Matrix	Hold Time	Total Samples Analyzed (well and duplicates)	Samples Analyzed within Hold Time	Acceptability
Nitrate + Nitrite as N	SM4500-NO3 E	Groundwater	7 days	34	34	100%
Total Dissolved Solids (TDS)	SM2540C	Groundwater	7 days	8	8	100%
Carbonate	SM 2330B	Groundwater	14 days	8	8	100%
Bicarbonate	SM 2330B	Groundwater	14 days	8	8	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	14 days	8	8	100%
Chloride	EPA 300.0	Groundwater	28 days	8	8	100%
Sulfate	EPA 300.0	Groundwater	28 days	8	8	100%
Boron	EPA 200.7	Groundwater	6 months	8	8	100%
Calcium	EPA 200.7	Groundwater	6 months	8	8	100%
Magnesium	EPA 200.7	Groundwater	6 months	8	8	100%
Potassium	EPA 200.7	Groundwater	6 months	8	8	100%
Sodium	EPA 200.7	Groundwater	6 months	8	8	100%
			Total	122	122	100%

Acceptability values below 90 percent are presented in **bold**.

Table 6: Evaluation of Field Duplicates and Blanks

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Nitrate + Nitrite as N	SM4500-NO3 E	Groundwater	Field duplicate	RPD≤25%	4	3	**75%**
Total Dissolved Solids (TDS)	SM2540C	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Carbonate	SM 2330B	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Bicarbonate	SM 2330B	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Alkalinity as CaCO3	SM 2320B	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Chloride	EPA 300.0	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Sulfate	EPA 300.0	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Boron	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Calcium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Magnesium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Potassium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	4	4	100%
Sodium	EPA 200.7	Groundwater	Field duplicate	RPD≤25%	4	4	100%
				Field Duplicate Total	48	47	98%

Acceptability values below 90 percent are presented in **bold**.

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Nitrate + Nitrite as N	EPA 300.0	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Total Dissolved Solids (TDS)	SM 2320B	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Carbonate	SM 2330B	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Bicarbonate	EPA 300.0	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Alkalinity as CaCO3	SM 2330B	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Chloride	EPA 300.0	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Sulfate	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Boron	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Calcium	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Magnesium	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Potassium	EPA 200.7	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
Sodium	SM2540C	Groundwater	Field blank	<RL or < sample/5	0	0	**0%**
				Field Blank Total	0	0	**0%**

Acceptability values below 90 percent are presented in **bold**.
Note: Field blanks were not analyzed in 2020 due to a miscommunication regarding use of field duplicates in lieu of field blanks. Additional field duplicates were collected instead of field blanks.

Table 7: Evaluation of Lab Controls and Spikes

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Lab Blanks							
Nitrate + Nitrite as N	SM4500-NO3 E	Water	Blank	< RL	3	3	100%
Total Dissolved Solids	SM2540C	Water	Blank	< RL	2	2	100%
Total Alkalinity	SM2320B	Water	Blank	< RL	2	2	100%
Bicarbonate as CaCO3	SM2320B	Water	Blank	< RL	2	2	100%
Carbonate as CaCO3	SM2320B	Water	Blank	< RL	2	2	100%
Hydroxide as CaCO3	SM2320B	Water	Blank	< RL	2	2	100%
Chloride	EPA 300.0	Water	Blank	< RL	2	2	100%
Sulfate	EPA 300.0	Water	Blank	< RL	2	2	100%
Boron	EPA 200.7	Water	Blank	< RL	2	2	100%
Calcium	EPA 200.7	Water	Blank	< RL	2	2	100%
Magnesium	EPA 200.7	Water	Blank	< RL	2	2	100%
Potassium	EPA 200.7	Water	Blank	< RL	2	2	100%
Sodium	EPA 200.7	Water	Blank	< RL	2	2	100%
				Lab Blank Total	27	27	100%
Lab Control Spikes							
Nitrate + Nitrite as N	SM4500-NO3 E	Water	LCS	PR 90-110	6	6	100%
Chloride	EPA 300.0	Water	LCS	PR 75-125	4	4	100%
Sulfate	EPA 300.0	Water	LCS	PR 75-125	4	4	100%
Boron	EPA 200.7	Water	LCS	PR 75-125	2	2	100%
Calcium	EPA 200.7	Water	LCS	PR 75-125	2	2	100%
Magnesium	EPA 200.7	Water	LCS	PR 75-125	2	2	100%
Potassium	EPA 200.7	Water	LCS	PR 75-125	2	2	100%
Sodium	EPA 200.7	Water	LCS	PR 75-125	2	2	100%
				Lab Control Total	24	24	100%
Matrix Spikes							
Nitrate + Nitrite as N	SM4500-NO3 E	Water	Matrix Spike	PR 80-120	6	4	**67%**
Chloride	EPA 300.0	Water	Matrix Spike	PR 75-125	4	4	100%
Sulfate as SO4	EPA 300.0	Water	Matrix Spike	PR 75-125	4	2	**50%**
Boron	EPA 200.7	Water	Matrix Spike	PR 75-125	4	4	100%
Calcium	EPA 200.7	Water	Matrix Spike	PR 75-125	4	3	**75%**
Magnesium	EPA 200.7	Water	Matrix Spike	PR 75-125	4	3	**75%**
Potassium	EPA 200.7	Water	Matrix Spike	PR 75-125	4	4	100%
Sodium	EPA 200.7	Water	Matrix Spike	PR 75-125	4	3	**75%**
				Matrix Spike Total	49	41	**84%**

Constituent	Analytical Method	Matrix	Sample Type	Acceptability Requirement	Total Samples	Samples within Acceptability	Acceptability
Analytical Duplicates							
Total Dissolved Solids	SM2540C	Water	MSD/LCSD	RPD ≤ 25%	2	2	100%
Total Alkalinity	SM2320B	Water	MSD/LCSD	RPD ≤ 25%	2	2	100%
Bicarbonate as CaCO3	SM2320B	Water	MSD/LCSD	RPD ≤ 25%	2	2	100%
Carbonate as CaCO3	SM2320B	Water	MSD/LCSD	RPD ≤ 25%	2	2	100%
Hydroxide as CaCO3	SM2320B	Water	MSD/LCSD	RPD ≤ 25%	2	2	100%
				Analytical Duplicate Total	10	10	100%

Acceptability values below 90 percent are presented in **bold**.
LCS=lab control spike; MS=matrix spike; MSD=matrix spike duplicate; LCSD=lab control spike duplicate

3.5 GQTM Network Discussion

An initial network of wells was selected for the GQTM and presented in the Workplan (LSCE, 2017, 2018a, 2018b) based on evaluation of candidate wells and their individual well characteristics in combination with locational considerations identified in the Workplan and Addendum. The Workplan presented the prioritization of areas for monitoring derived through a quantitative evaluation using factors based on required GQTM considerations indicated in the WDRs, including historical water quality, high vulnerability areas delineated in the GAR, proximity and flow direction relative to any communities, and land use and agricultural areas. Identified Monitoring Areas (MAs) delineate general areas of higher monitoring priority. Unlike a random design approach, this focuses monitoring efforts in areas where impacts from agricultural activities are more likely to manifest in the groundwater. As described in the Workplan, the target depth zone for the GQTM network is the Upper Zone as delineated by CV-SALTS (LSCE and LWA, 2016). The depth of the Upper Zone is defined based on hydrogeologic considerations and the typical depth of domestic wells. The bottom of the Upper Zone within the SVWQC is typically not defined by any distinct hydrogeologic feature(s).

The Workplan discusses the dynamic nature of the GQTM network design, including the expectation that the network would evolve and be expanded or otherwise modified in future years, as needed to achieve the program objectives. The Coalition submitted GQTM Workplan Updates in 2019 and 2020 (LSCE, 2019, 2020) in May 2019 and July 2020, including discussion of modifications and additions to the GQTM network and additional rationale for the network design. The Regional Board provided a review of the 2020 GQTM Workplan Update in a August 6, 2020 letter (CVRWQCB, 2020) including recommending proceeding with the GQTM efforts as described in the 2020 Workplan Update. In future years, if any changes to the GQTM network occur, an updated Workplan is to be submitted 60 days prior to sampling. No changes to the GQTM network are proposed at this time.

4 OTHER ANNUAL REPORTING REQUIREMENTS

In accordance with the WDRs, this Annual Groundwater Quality Trend Monitoring Report provides information on the Coalition monitoring activities and results related to the GQTM program. Additional required annual reporting elements identified in the Monitoring and Reporting Program (MRP) are addressed in the Annual Monitoring Report, or other submittal documents, as appropriate.

4.1 Electronic Data Submittal and Data Uploaded to GeoTracker

In accordance with the requirements for reporting of annual groundwater monitoring results, an electronic data submittal with information related to the Coalition's GQTM activities is being provided to accompany this report (**Appendix B**). Included in the electronic data submittal are the following items:

- Excel worksheet containing export of data uploaded to GeoTracker
- Excel worksheet containing:
    - Summary table of information on 2020 GQTM network wells, including latitude and longitude information
    - Summary table of results from 2020 GQTM sampling event in tabular form
    - Summary sheet of laboratory analytical methods
- GIS shapefile dataset with locations of 2020 GQTM network wells
- Field forms for 2020 GQTM sampling event
- Laboratory analytical report files including chain of custody forms and laboratory narrative of QC failures and identification of any analytical problems and anomalies

All other electronic data and information relating to the Coalition's other monitoring activities is addressed in the Annual Monitoring Report submittal, or other associated submittals, as appropriate.

5 SUMMARY AND CONCLUSIONS

The 2020 GQTM sampling event was successfully completed with 30 GQTM wells being sampled. Water quality results from the 2020 sampling indicate three wells with nitrate concentrations above the MCL and one additional well with nitrate concentrations very close to, but below, the MCL. About half of the wells sampled had nitrate concentrations below 2.5 mg/L. Of the four wells sampled for TDS, one well had a concentration over the recommended MCL, although all others had TDS concentrations of less than 300 mg/L. The well with high TDS concentrations also had concentrations of chloride and sulfate above the secondary MCL. Insufficient data are available for evaluating long-term trends and patterns in groundwater quality at this point in the GQTM program implementation; however, review of time-series charts of nitrate concentrations in GQTM wells suggests that most or all wells have stable or declining trends in nitrate concentrations. In accordance with the GQTM Workplan, an evaluation of trends will be conducted at five-year intervals starting in reporting on the first five years of GQTM data.

In September 2020, the owner of GQTM network well SVWQC00018, which is a domestic well used for drinking water, was notified that the well had concentrations of nitrate above the drinking water MCL and was provided a Drinking Water Notification Template form to complete and return. The owner of GQTM network well SVWQC00020, which also had a nitrate exceedance and is a domestic well, had

previously been notified and provided a Drinking Water Notification Template in 2019. Letters summarizing the 2020 sampling results for individual wells and noting any identified water quality exceedances were prepared and transmitted to all GQTM network well owners. Additional communication by the Coalition with owners of network wells exhibiting nitrate exceedances will continue to make well owners aware of management practices contained in the Coalition's Groundwater Quality Management Plan or other management practices intended to protect groundwater quality.

6 REFERENCES

Central Valley Regional Water Quality Control Board (CVRWQCB). 2020. Review of the 2020 Groundwater Quality Trend Monitoring Workplan: Sacramento Valley Water Quality Coalition. August 6, 2020.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2019. Review of the 2019 Groundwater Quality Trend Monitoring Workplan: Sacramento Valley Water Quality Coalition. November 5, 2019.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2018. Conditional Approval of the Sacramento Valley Water Quality Coalition Groundwater Quality Trend Monitoring Workplan with Addendum. September 24, 2018.

Central Valley Regional Water Quality Control Board (CVRWQCB). 2015. Order R5-2014-0030-R1, Waste Discharge Requirements General Order for Growers within the Sacramento River Watershed that are Members of the Third-Party Group. Adopted March 12, 2014; revised June 5, 2015 (including all applicable revisions).

CH2M. 2016. Groundwater Quality Assessment Report, Prepared for Central Valley Regional Water Quality Control Board On Behalf Of Northern California Water Association & Sacramento Valley Water Quality Coalition. Final. January 2016.

Luhdorff & Scalmanini (LSCE). 2020. Sacramento Valley Water Quality Coalition Groundwater Quality Trend Monitoring Workplan: 2019 Update. July 14, 2020.

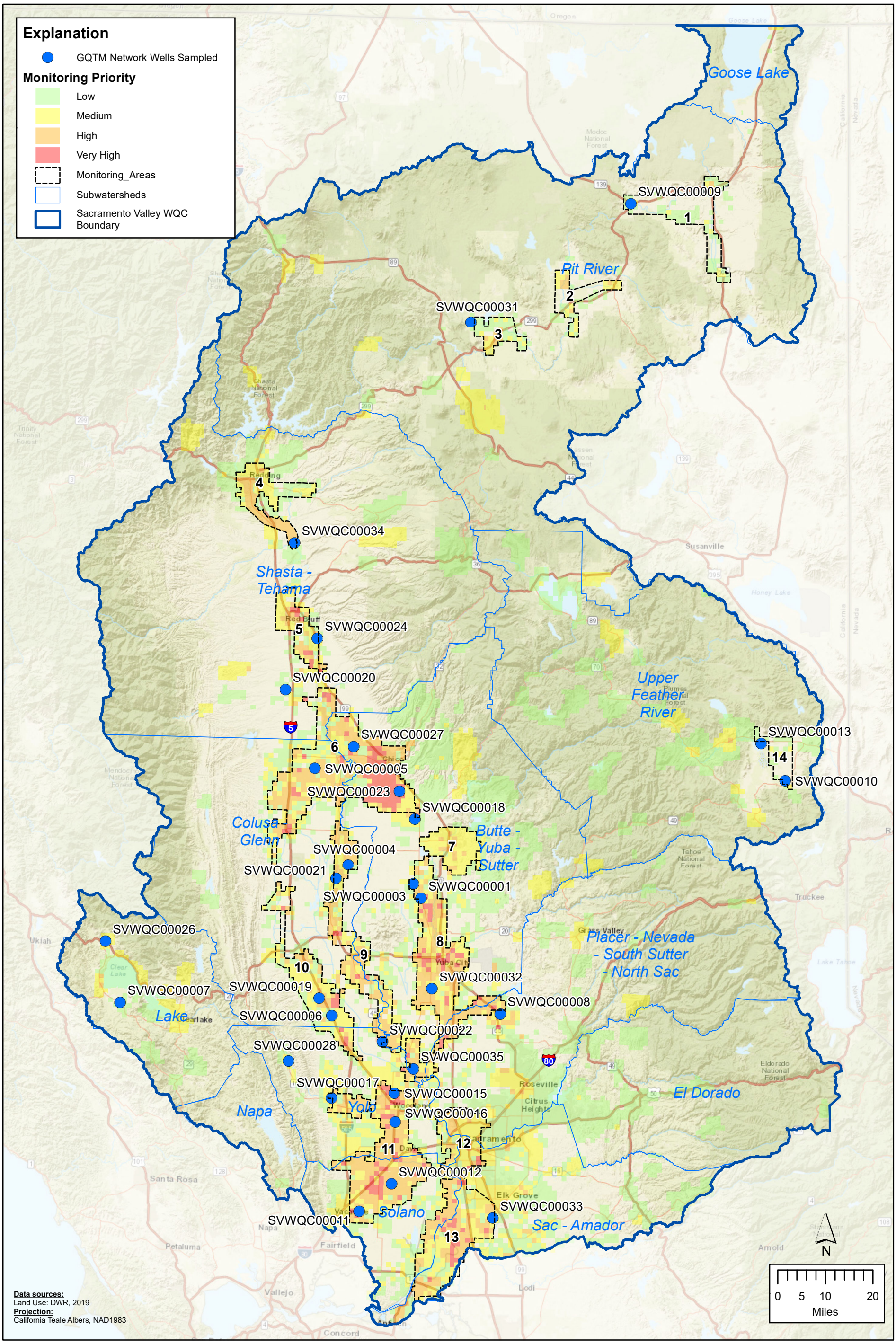
Luhdorff & Scalmanini (LSCE). 2019. Sacramento Valley Water Quality Coalition Groundwater Quality Trend Monitoring Workplan: 2019 Revisions and Update. May 1, 2019.

Luhdorff & Scalmanini (LSCE). 2018a. Groundwater Quality Trend Monitoring Workplan, Phase 2 – Determination of Network Wells, for the Sacramento Valley Water Quality Coalition. May 16, 2018.

Luhdorff and Scalmanini (LSCE). 2018b. Sacramento Valley Water Quality Coalition Groundwater Quality Trend Monitoring Workplan: Addendum. July 31, 2018.

Luhdorff & Scalmanini (LSCE). 2017. Groundwater Quality Trend Monitoring Workplan, Phase 1 – Monitoring Design Approach, for the Sacramento Valley Water Quality Coalition. September 18, 2017.

Map Figures



X:\2020\20-089 NCWA - Sacramento Valley Water Quality Coalition 2021 Groundwater Services\GIS\Figure 1 2020 GW Report Network.mxd

Luhdorff & Scalmanini
Consulting Engineers

FIGURE 1
2020 GQTM Network Wells

Groundwater Quaity Trend Monitoring
Sacramento Valley Water Quality Coalition

Explanation

Nitrate Concentration in 2020 GQTM Samples

(mg/L as N)

- <2.5
- 2.5 - 5.0
- 5.0 - 7.5
- 7.5 - 10.0
- >10.0

2016 Land Use

- Citrus/Subtropical
- Deciduous Fruit/Nuts
- Field Crops
- Grain/Hay
- Pasture
- Vegetable/Seed/Fruit Crops
- Vineyard
- Young Perennial
- Rice
- Idle
- Native
- Urban
- Monitoring_Areas
- Subwatersheds
- Sacramento Valley WQC Boundary

Goose Lake

Pit River

Shasta - Tehama

Colusa - Glenn

Butte - Yuba - Sutter

Upper Feather River

Placer - Nevada - South Sutter - North Sac

Lake

Napa

Yolo

El Dorado

Sac - Amador

Solano

SVWQC00009
SVWQC00031
SVWQC00034
SVWQC00024
SVWQC00020
SVWQC00027
SVWQC00005
SVWQC00023
SVWQC00018
SVWQC00004
SVWQC00021
SVWQC00003
SVWQC00001
SVWQC00026
SVWQC00007
SVWQC00019
SVWQC00006
SVWQC00022
SVWQC00028
SVWQC00035
SVWQC00017
SVWQC00015
SVWQC00016
SVWQC00012
SVWQC00011
SVWQC00033
SVWQC00032
SVWQC00008
SVWQC00013
SVWQC00010

1 2 3 4 5 6 7 8 9 10 11 12 13 14

N

0 5 10 20
Miles

Data sources:
Land Use: DWR, 2019
Projection:
California Teale Albers, NAD1983

X:\2020\20-089 NCWA - Sacramento Valley Water Quality Coalition 2021 Groundwater Services\GIS\Figure 2 2020 GQTM Sampling Results Nitrate.mxd

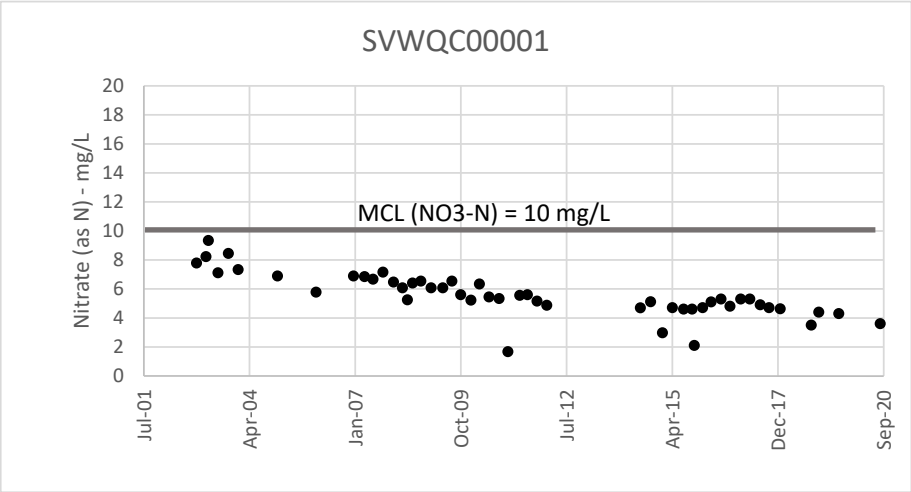
Luhdorff & Scalmanini
Consulting Engineers

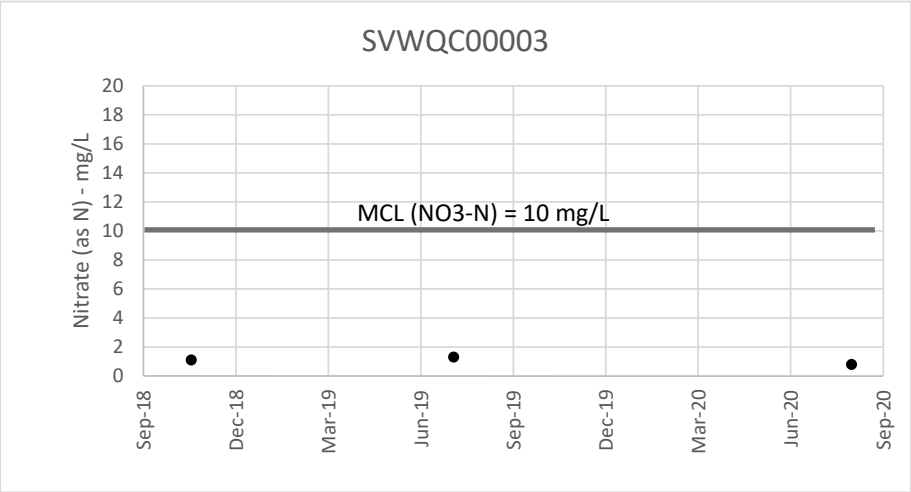
FIGURE 2
2020 GQTM Sampling Results: Nitrate Concentrations

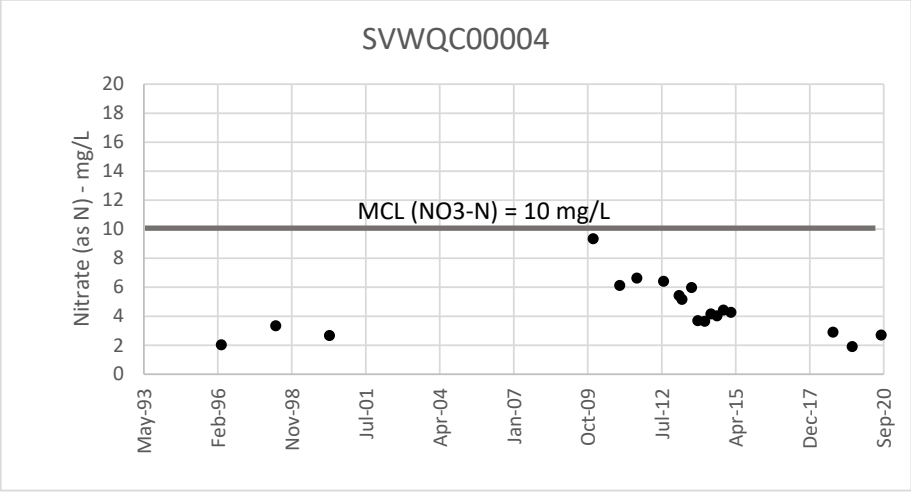
Groundwater Quaity Trend Monitoring
Sacramento Valley Water Quality Coalition

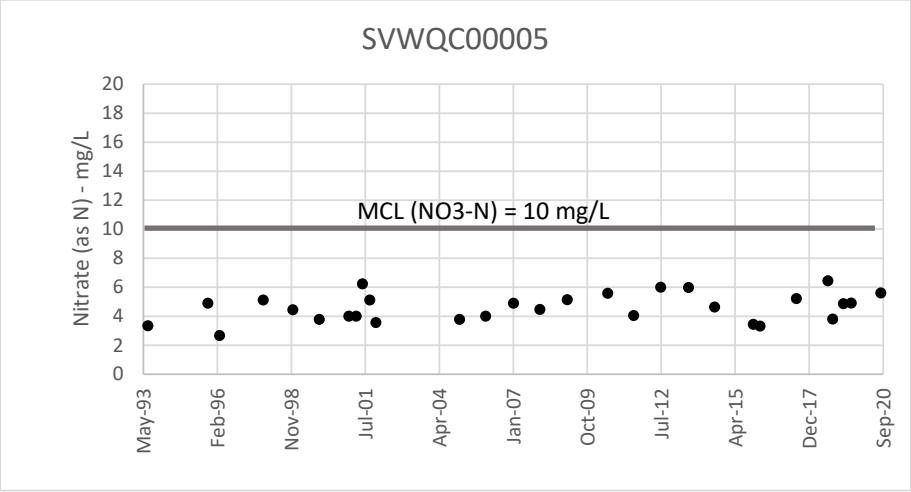
Appendix A:
GQTM Network Well Nitrate Concentration Time-Series Plots

This appendix presents time-series nitrate concentration plots for GQTM network wells for which sufficient data are available. Concentrations relative to the primary drinking water MCL of 10 mg/L are presented on the plots.







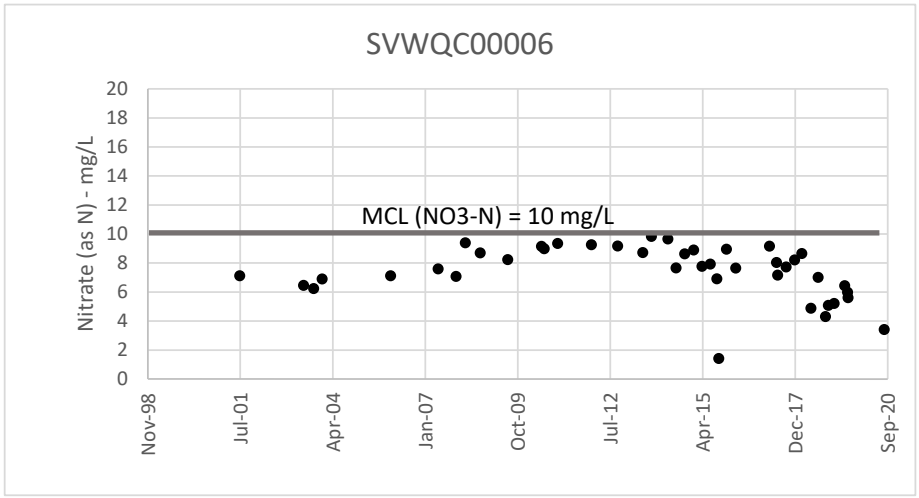


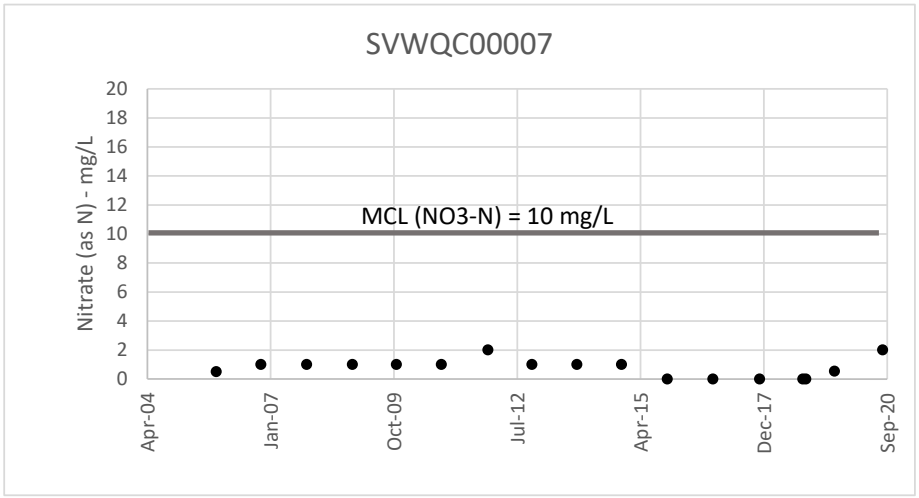
Luhdorff & Scalmanini
Consulting Engineers

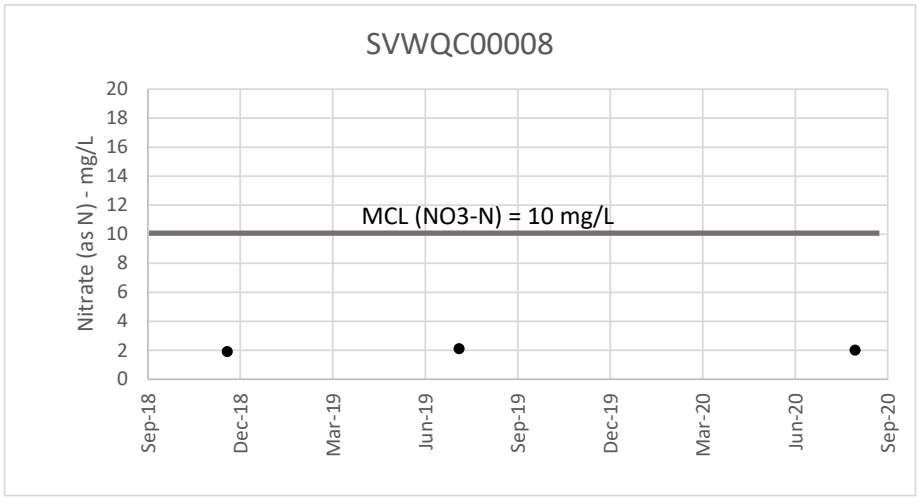
GQTM Network Well Nitrate Concentration Time-Series Plots

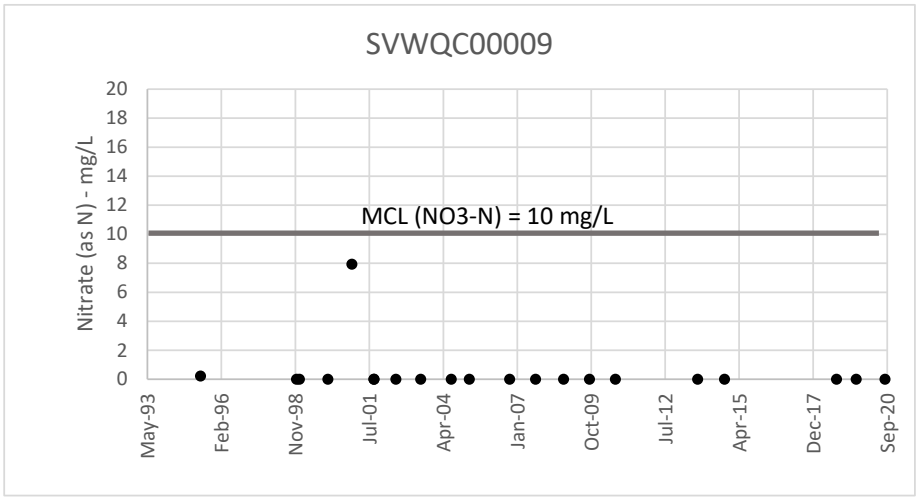
Groundwater Quality Trend Monitoring
Sacramento Valley Water Quality Coalition

Appendix A







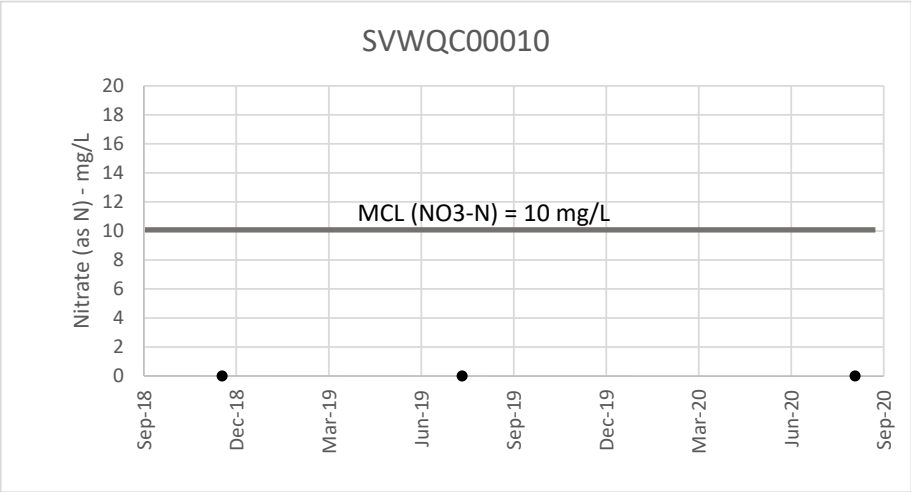


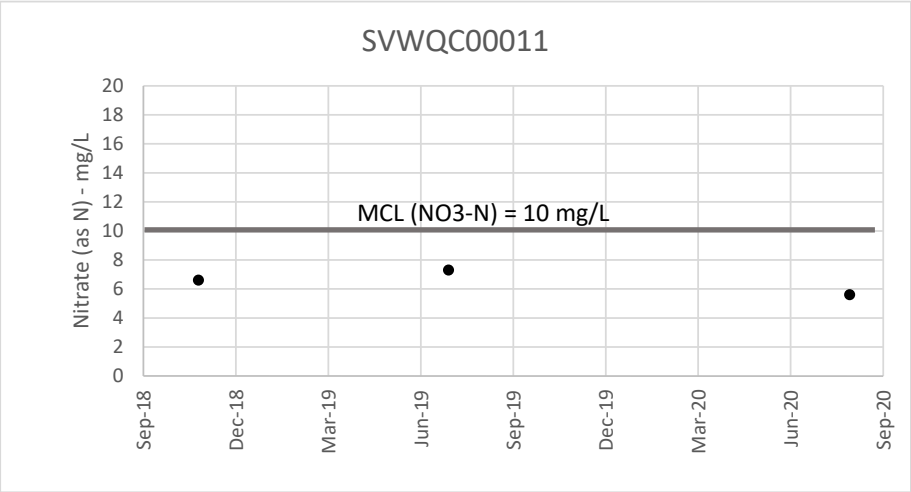
Luhdorff & Scalmanini
Consulting Engineers

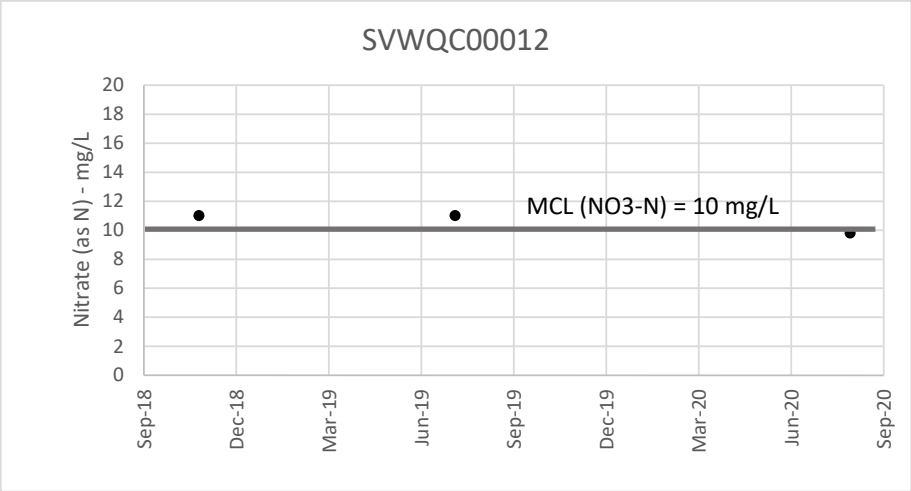
GQTM Network Well Nitrate Concentration Time-Series Plots

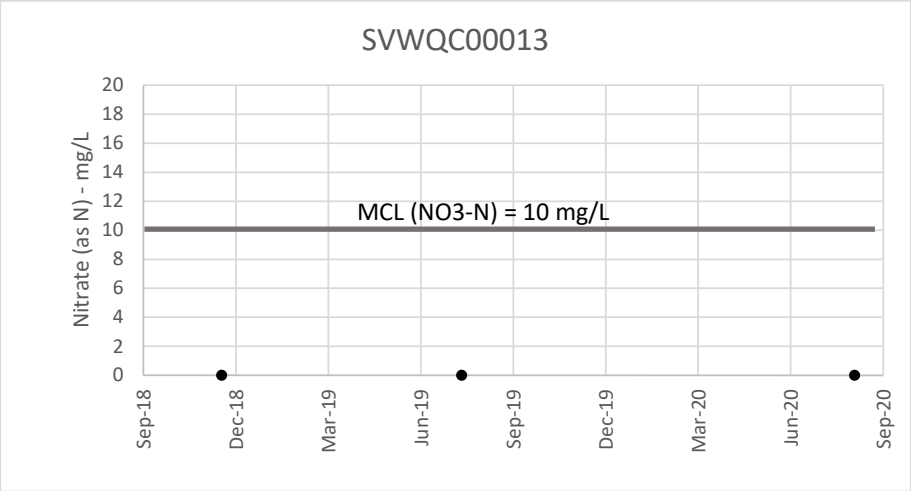
Groundwater Quality Trend Monitoring
Sacramento Valley Water Quality Coalition

Appendix A







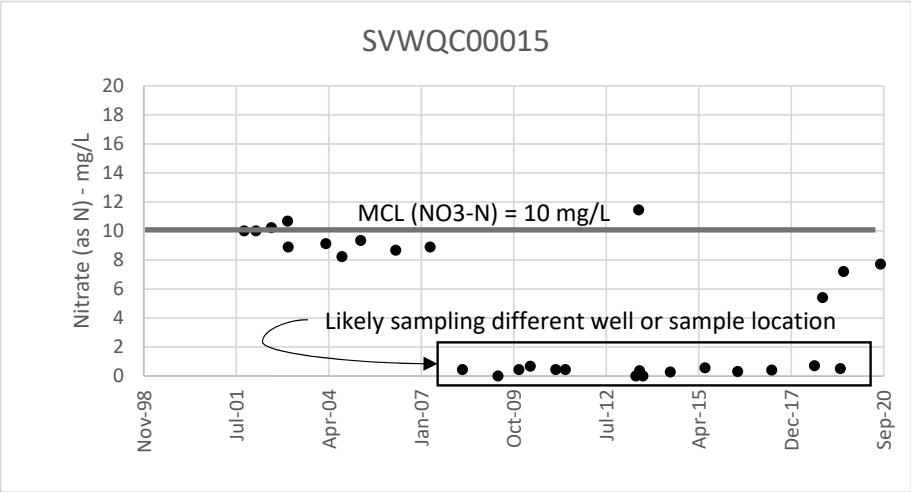


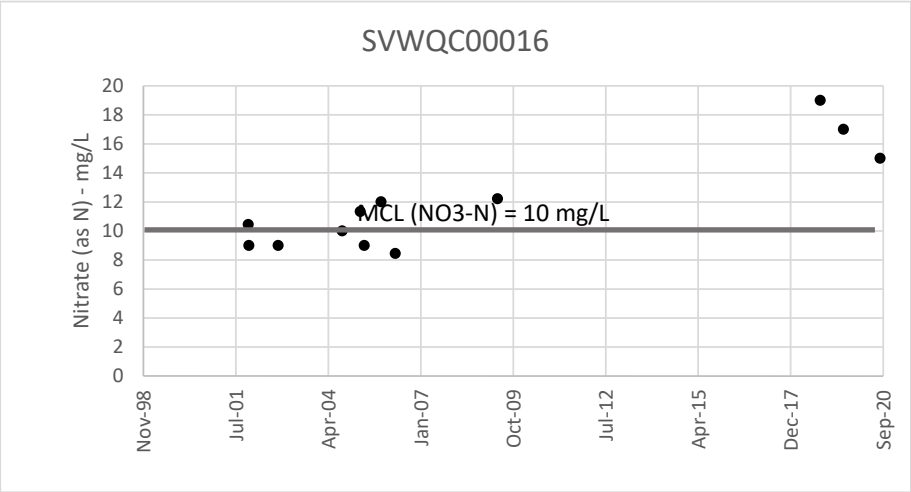
Luhdorff & Scalmanini
Consulting Engineers

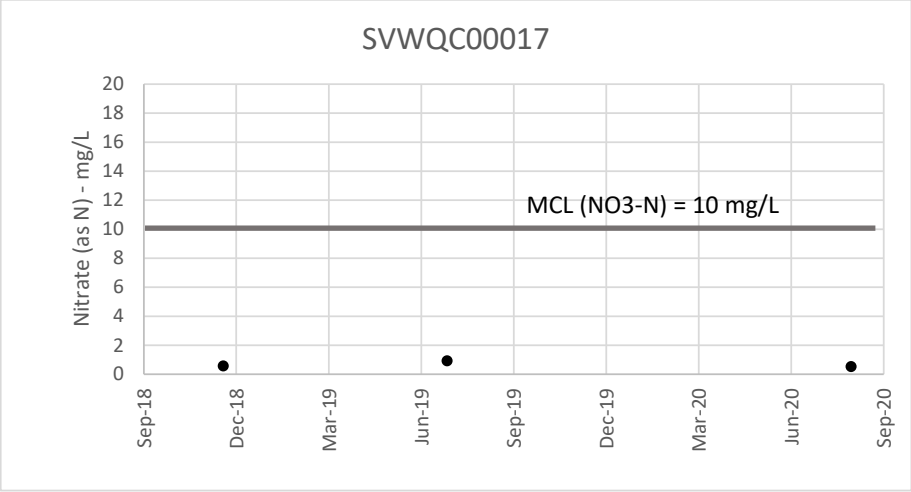
GQTM Network Well Nitrate Concentration Time-Series Plots

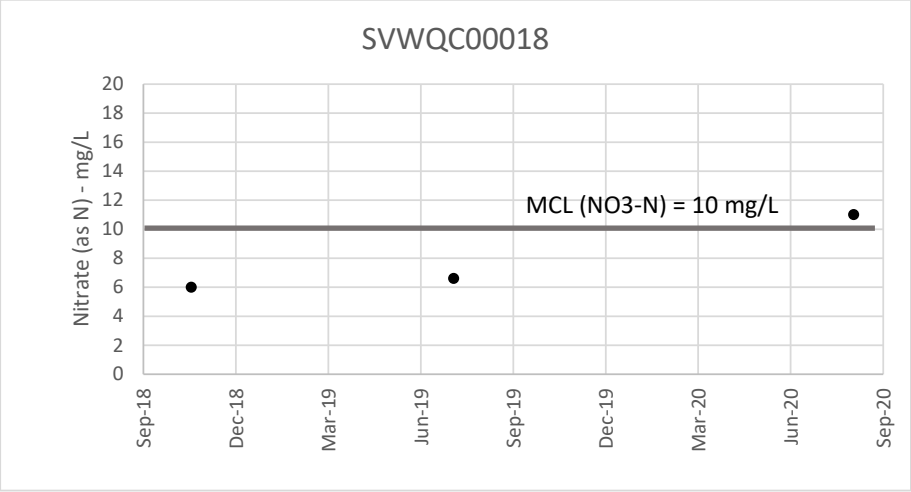
Groundwater Quality Trend Monitoring
Sacramento Valley Water Quality Coalition

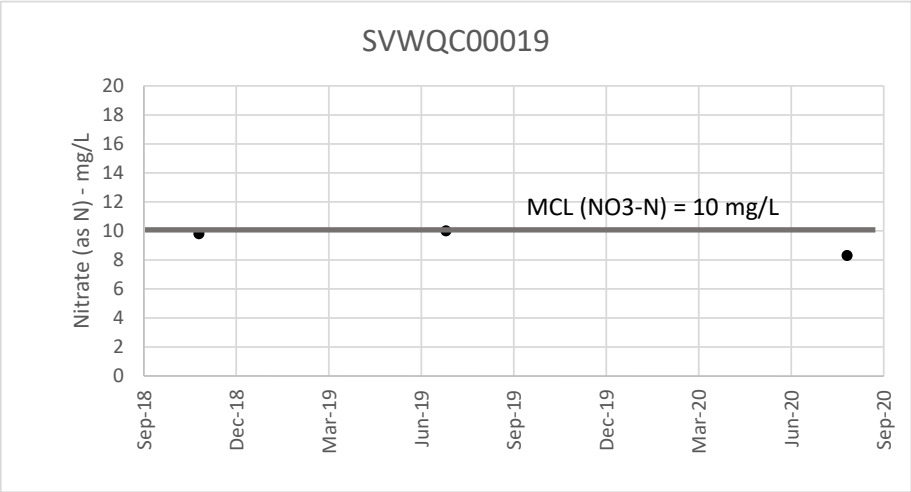
Appendix A

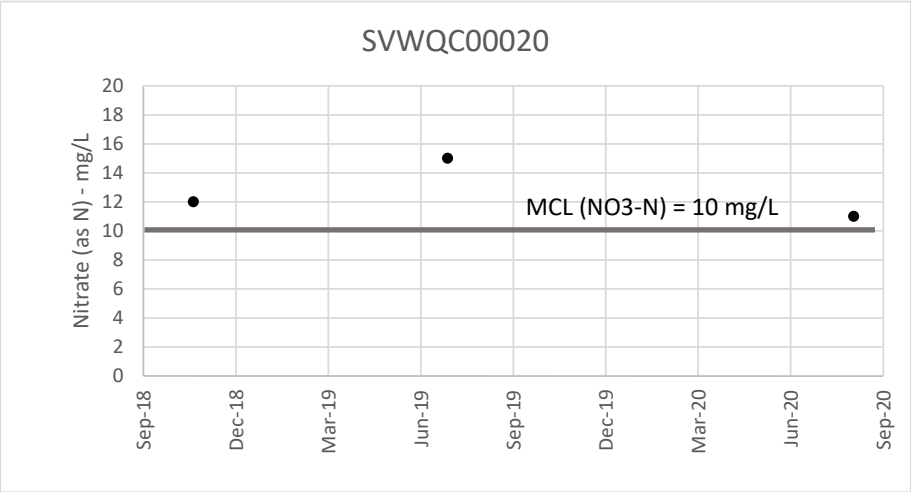

SVWQC00015
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
Likely sampling different well or sample location
Nov-98
Jul-01
Apr-04
Jan-07
Oct-09
Jul-12
Apr-15
Dec-17
Sep-20

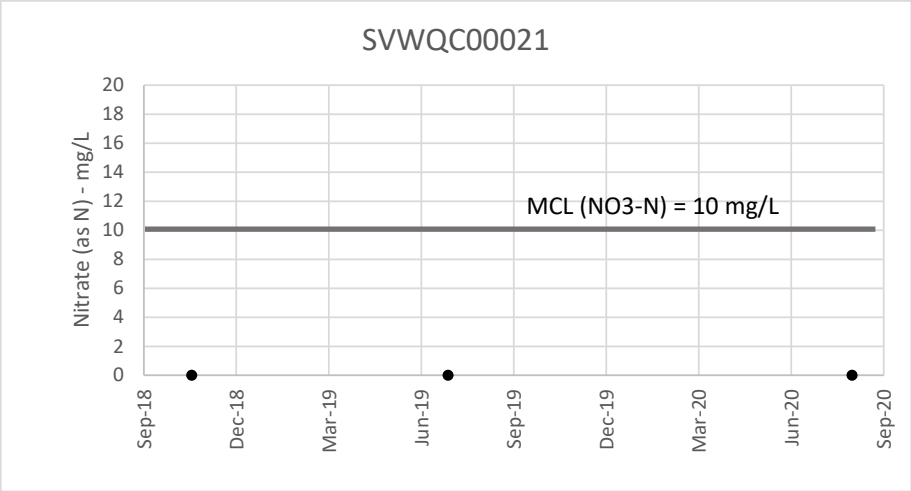

SVWQC00016
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
Nov-98
Jul-01
Apr-04
Jan-07
Oct-09
Jul-12
Apr-15
Dec-17
Sep-20

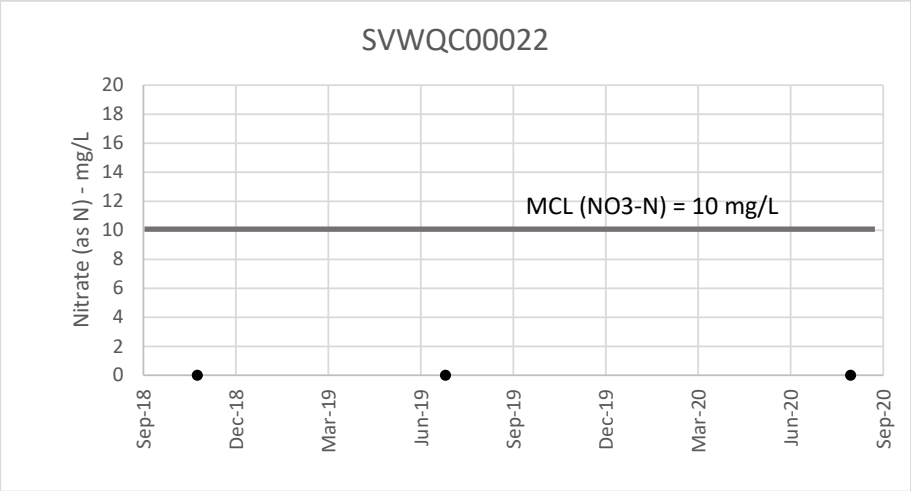

SVWQC00017
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

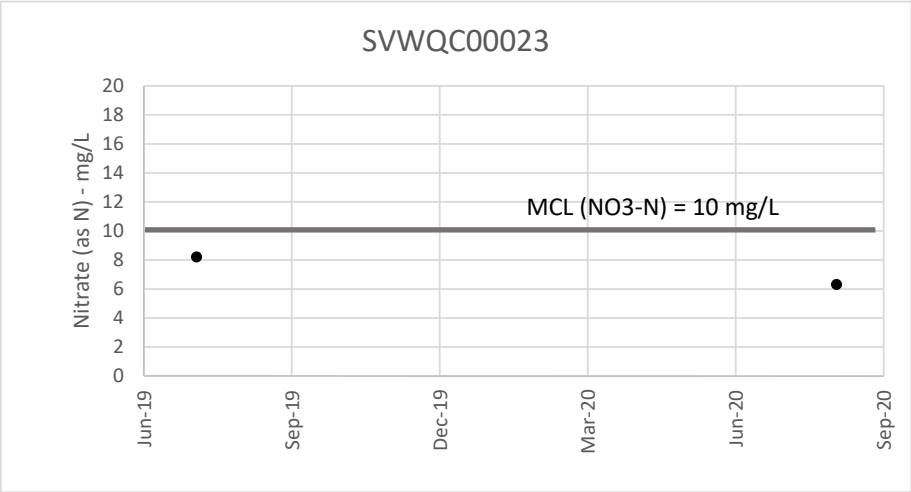

SVWQC00018
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

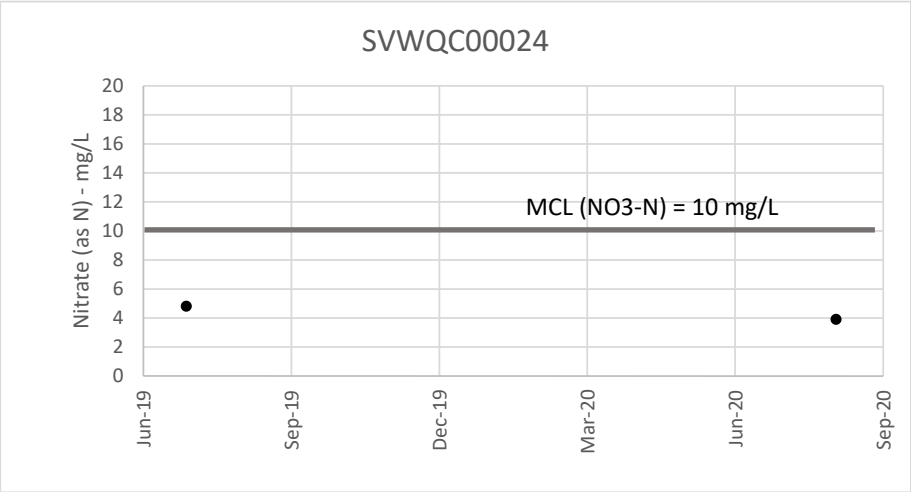

SVWQC00019
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
20
18
16
14
12
10
8
6
4
2
0
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

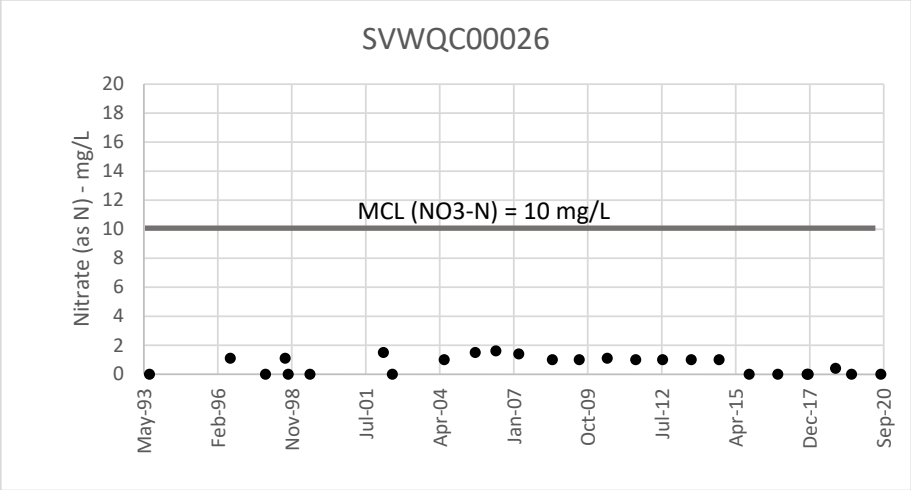

SVWQC00020
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
20
18
16
14
12
10
8
6
4
2
0
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

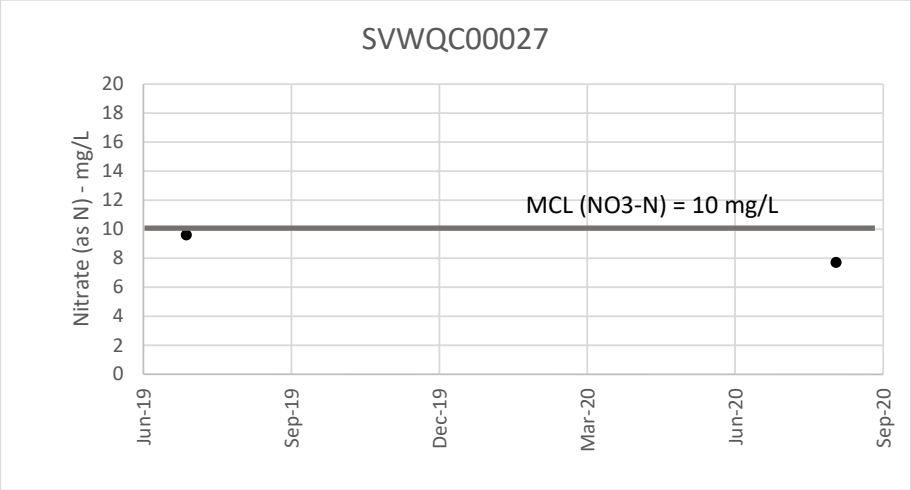

SVWQC00021
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
20
18
16
14
12
10
8
6
4
2
0
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

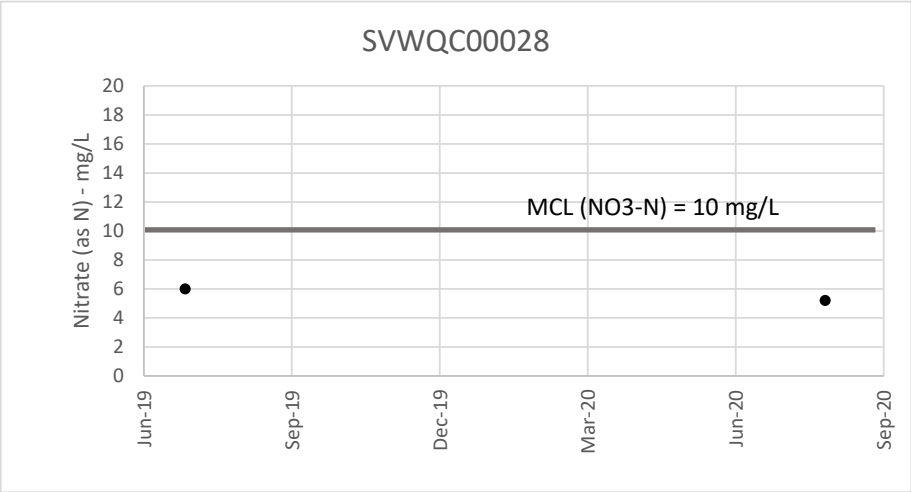

SVWQC00022
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
20
18
16
14
12
10
8
6
4
2
0
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

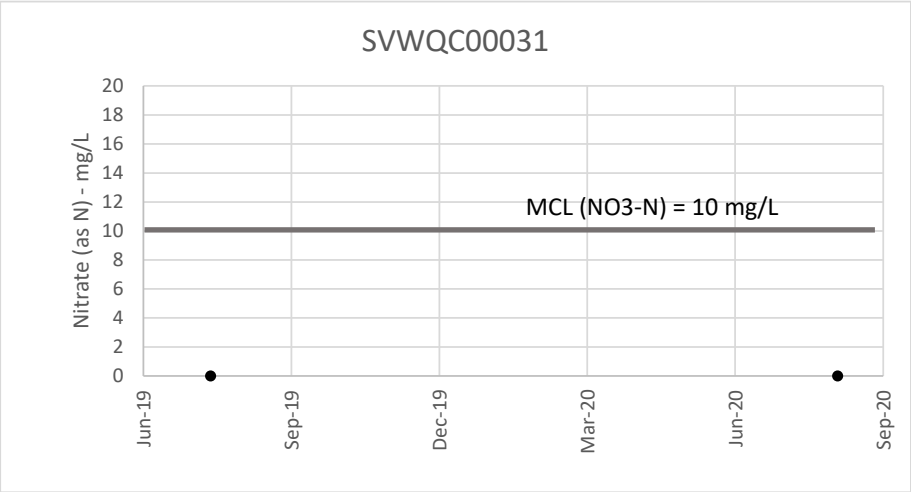

SVWQC00023
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

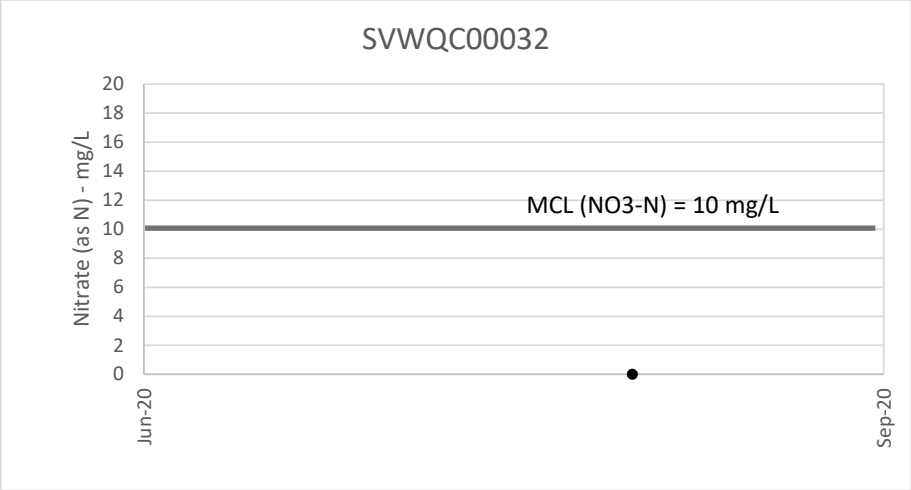

SVWQC00024
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20

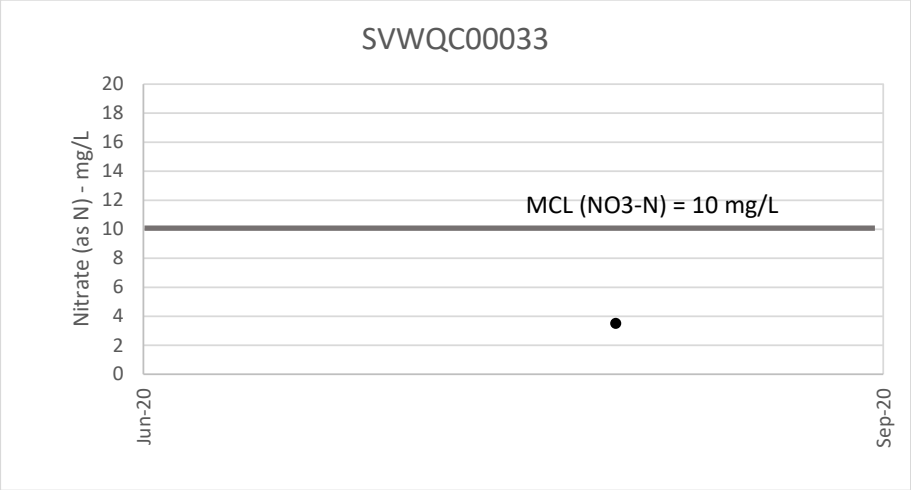

SVWQC00026
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
May-93
Feb-96
Nov-98
Jul-01
Apr-04
Jan-07
Oct-09
Jul-12
Apr-15
Dec-17
Sep-20


SVWQC00027
Nitrate (as N) - mg/L
MCL (NO3-N) = 10 mg/L
Jun-19
Sep-19
Dec-19
Mar-20
Jun-20
Sep-20







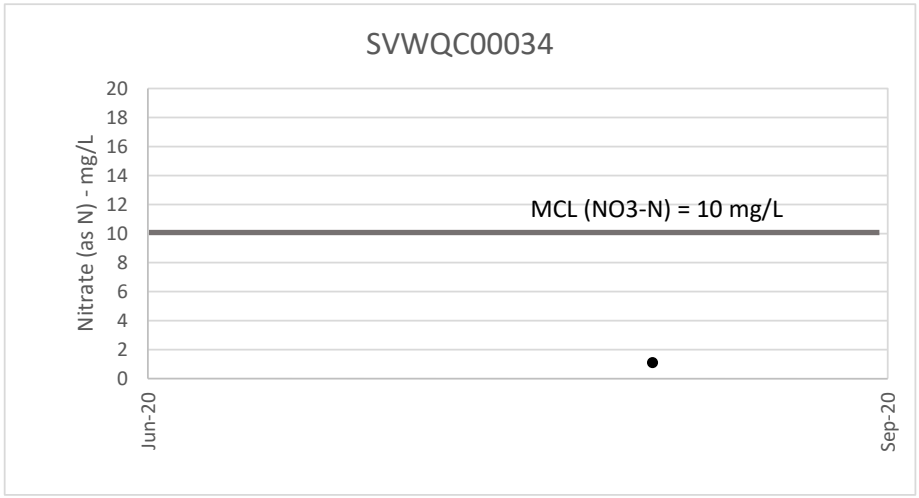


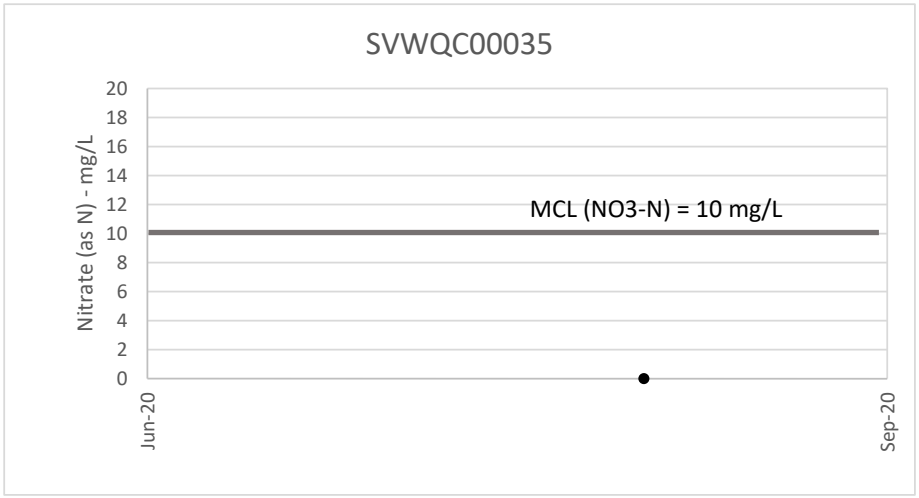
Luhdorff & Scalmanini
Consulting Engineers

GQTM Network Well Nitrate Concentration Time-Series Plots

Groundwater Quality Trend Monitoring
Sacramento Valley Water Quality Coalition

Appendix A


SVWQC00034
Nitrate (as N) - mg/L
20
18
16
14
12
10
8
6
4
2
0
MCL (NO3-N) = 10 mg/L
Jun-20
Sep-20


SVWQC00035
Nitrate (as N) - mg/L
20
18
16
14
12
10
8
6
4
2
0
MCL (NO3-N) = 10 mg/L
Jun-20
Sep-20

Appendix B:
Electronic Data Submittal

This appendix is submitted separately as an electronic data submittal containing data submittal requirements including tabular summary data sheets of sampling results, original laboratory analytical report files, field forms, analytical methods, and GIS files