Water Quality Monitoring Report (2019) and Five-Year Water Quality Summary (2015 – 2019)

Sacramento Municipal Utility District

Hydro License Implementation • June 2020

Upper American River Project

FERC Project No. 2101

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Acronyms and Abbreviations

Acronym	Definition
ATL	Advisory Tissue Level
BLM	U.S. Bureau of Land Management
BPWQO	Sacramento and San Joaquin River Basin Plan Numerical Water Quality Objectives
CDFW	California Department of Fish and Wildlife
CTR	California Toxics Rule
COLD	cold freshwater habitat
ºC	degrees Celsius
DO	dissolved oxygen
EPA	United States Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
hr	hour
m	Meter
MQO	Measurement Quality Objective
MDL	Method Detection Limit
ug/L	micrograms per liter
uS/cm	microsiemens per centimeter
mg/L	milligram per liter
mL	milliliter
MPN	Most Probable Number
MRL	Method Reporting Limit
ng/L	nanograms per liter
NRWQC	National Recommended Water Quality Criteria
NTU	Nephelometric Turbidity Unit
OEHHA	Office of Environmental Health Hazard Assessment
% Sat	percent saturation
QA/QC	quality assurance and quality control
RWQCB	Regional Water Quality Control Board
SFAR	South Fork American River
SMUD	Sacramento Municipal Utility District
SPWN	spawning, reproduction and/or early development
SWRCB	State Water Resources Control Board
SM	standard methods
s.u.	standard unit of pH
SWAMP	Surface Water Ambient Monitoring Program
USFS	United States Forest Service
UARP	Upper American River Project
ww	wet weight
YSI	Yellow Springs Instruments

1.0 INTRODUCTION AND BACKGROUND

This Water Quality Monitoring Report (Report) addresses monitoring requirements set forth in Sacramento Municipal Utility District's (SMUD) Water Quality Monitoring Plan (Plan) (SMUD 2016a). The requirements for this Plan are found in State Water Resources Control Board (SWRCB) Condition 8.J, and U.S. Forest Service (USFS) 4(e) Condition 31.10, located in Appendices A and B, respectively, of the Federal Energy Regulatory Commission's (FERC) Order Issuing New License for the Upper American River Project (UARP), dated July 23, 2014. The Plan was developed by SMUD (SMUD 2015) in coordination with the Consultation Group and Resource Agencies stipulated in the license (FERC 2014). The Plan was revised in 2015 (Revision 1) and again in 2016 (Revision 2) to update the referenced analytical methods for various sub-programs within the Plan.

Condition 8.J of Appendix A of the FERC license requires monitoring throughout the duration of the license term, with sampling frequency varying by water quality constituent. The sampling frequency over the first five years of the monitoring program is dictated by Condition 8.J. and includes annual sampling for *in situ* parameters and bacteria and sampling for metals bioaccumulation and general chemistry in Years 2 (2016) and 3 (2017), respectively. At the completion of the first five years of monitoring, SMUD will consult with the SWRCB, Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), USFS, and U.S. Bureau of Land Management (BLM) to determine if the results warrant further modifications to the Plan (SMUD 2016a); 2019 marks the end of the first five years of monitoring.

This Report describes the results of the fifth year (2019) of water quality monitoring of basic *in situ* parameters and bacteria for the UARP, and presents a summary of *in situ* parameters, general chemistry, bacteria, and metals bioaccumulation for the first five years of monitoring (2015–2019).

SMUD owns and operates the UARP, which is licensed by FERC. The UARP (FERC Project No. 2101) lies within El Dorado and Sacramento counties, primarily within lands of the Eldorado National Forest. The UARP consists of three major storage reservoirs (Loon Lake, Union Valley, and Ice House) with a combined capacity of approximately 379,000 acre-feet, eight smaller regulating or diversion reservoirs, and eight powerhouses. The UARP also includes recreation facilities containing over 700 campsites, five boat ramps, hiking paths, and bicycle trails at the reservoirs.

2.0 MONITORING OBJECTIVE

The objective of the 2019 monitoring program was to perform *in situ* water quality and bacteria monitoring in reservoirs and stream reaches of the UARP, in order to meet the objectives and rationale of SWRCB Water Quality Certification Condition 8.J.

The rationale for water quality monitoring, as described by the SWRCB Water Quality Certification, is as follows:

Water quality monitoring is important for determining compliance with state and federal water quality standards and examining long-term trends in water quality. The frequency of monitoring for any compound can be reduced if shown to be at background or non-detect levels for a statistically significant period of time.

3.0 STUDY AREA

The study area included UARP reservoirs and diverted stream reaches. All UARP reservoirs (Rubicon, Buck Island, Loon Lake, Gerle Creek, Ice House, Union Valley, Junction, Camino, Brush Creek, and Slab Creek) were included in the monitoring program; the relatively small Robbs Peak Forebay (30 acre-feet) was not included. [Note: Rockbound Lake, although hydraulically associated with the UARP, is not a UARP reservoir and is not included within the FERC-defined UARP boundary.] The diverted stream reaches included in the monitoring program represented all streams and rivers downstream of UARP reservoirs (Figure 3-1).

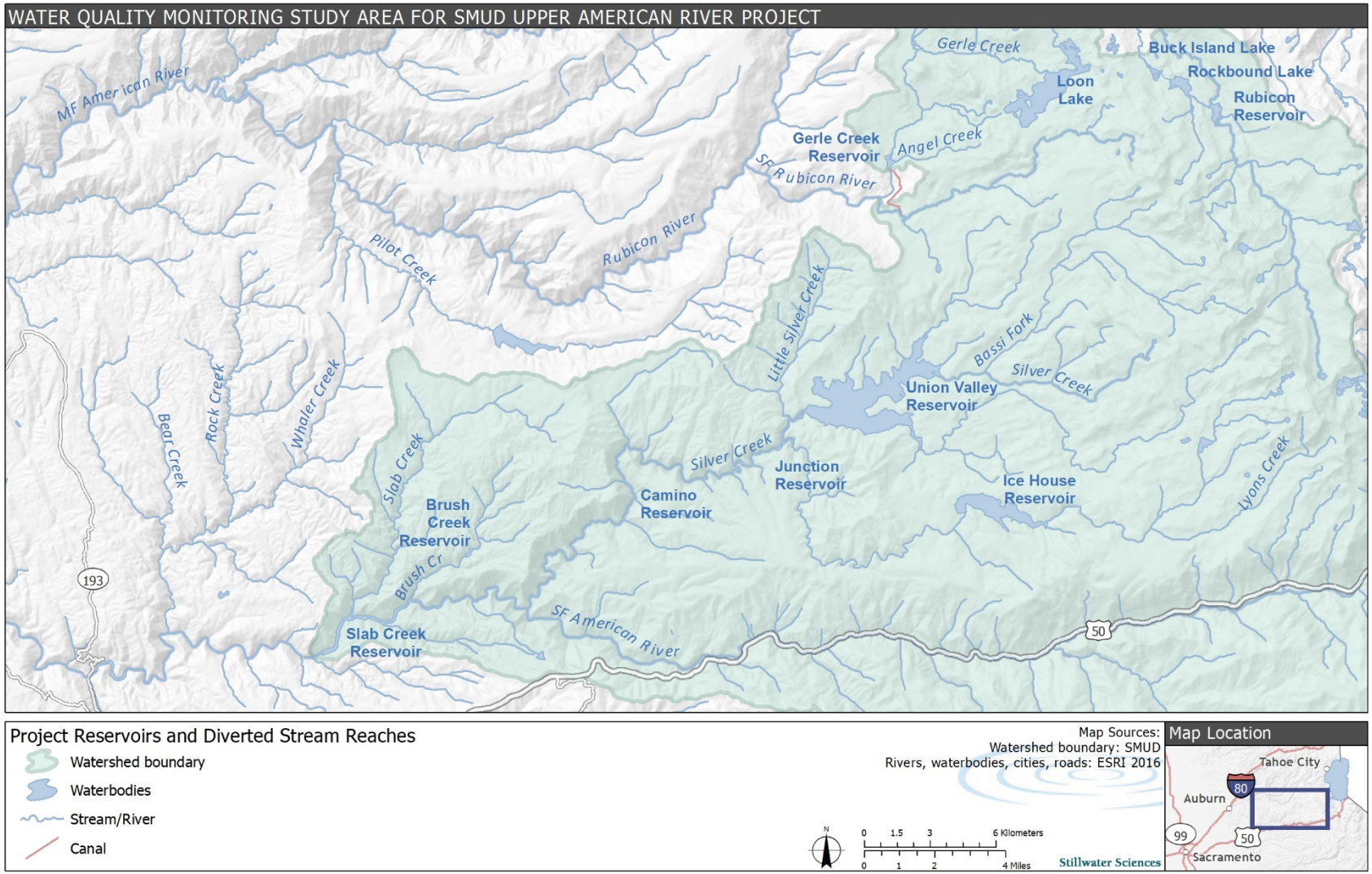

Figure 3-1. Study area for SMUD Upper American River Project *in situ* and bacteria monitoring.

4.0 SAMPLING FREQUENCY AND LOCATIONS

Year 5 (2019) sampling frequency for *in situ* water quality was generally consistent with winter, spring, summer, and fall monitoring periods designated in the Plan (SMUD 2016a) (Table 4-1); the spring reservoir sampling event occurred in early June, outside its normal monitoring period of April and May due to unfavorable weather conditions. Required bacteria monitoring was conducted by sampling the middle elevation UARP reservoir sites (Gerle Creek, Union Valley, Junction, Ice House, Brush Creek, Slab Creek) during the 30-day period surrounding 4th of July and sampling the upper elevation UARP reservoir sites (Loon Lake, Buck Island) during the 30-day period surrounding Labor Day.

Table 4-1. Sampling Frequency for *In situ* Parameters and Bacteria.

Type	2019 (Year 5) Frequency
In situ reservoir	Once in spring – April/May[1] Once in fall – October
In situ riverine	Once in winter – January/February Once in spring – April/May Once in summer – August Once in fall – November
Bacteria	Five samples within 30 days – around 4th of July Five samples within 30 days – around Labor Day

[1] The spring 2019 *in situ* reservoir sampling event occurred in early June due to unfavorable weather conditions in April and May.

Specific sampling locations within reservoirs and diverted stream reaches varied depending on the general constituent under study. As specified in the Plan, *in situ* monitoring occurred at 15 representative reservoir locations (Figure 4-1 and Figure 4-2, Table 4-2) and 19 representative stream reaches (Figure 4-1 and Figure 4-2, Table 4-4). Several reservoir and riverine sites could not be sampled during the winter, spring, and fall survey periods due to snow accumulation, reservoir spilling, and restricted access (Table 4-3 and Table 4-5). Bacteria sampling occurred at 15 locations (Figure 4-1 and Figure 4-2, Table 4-6).

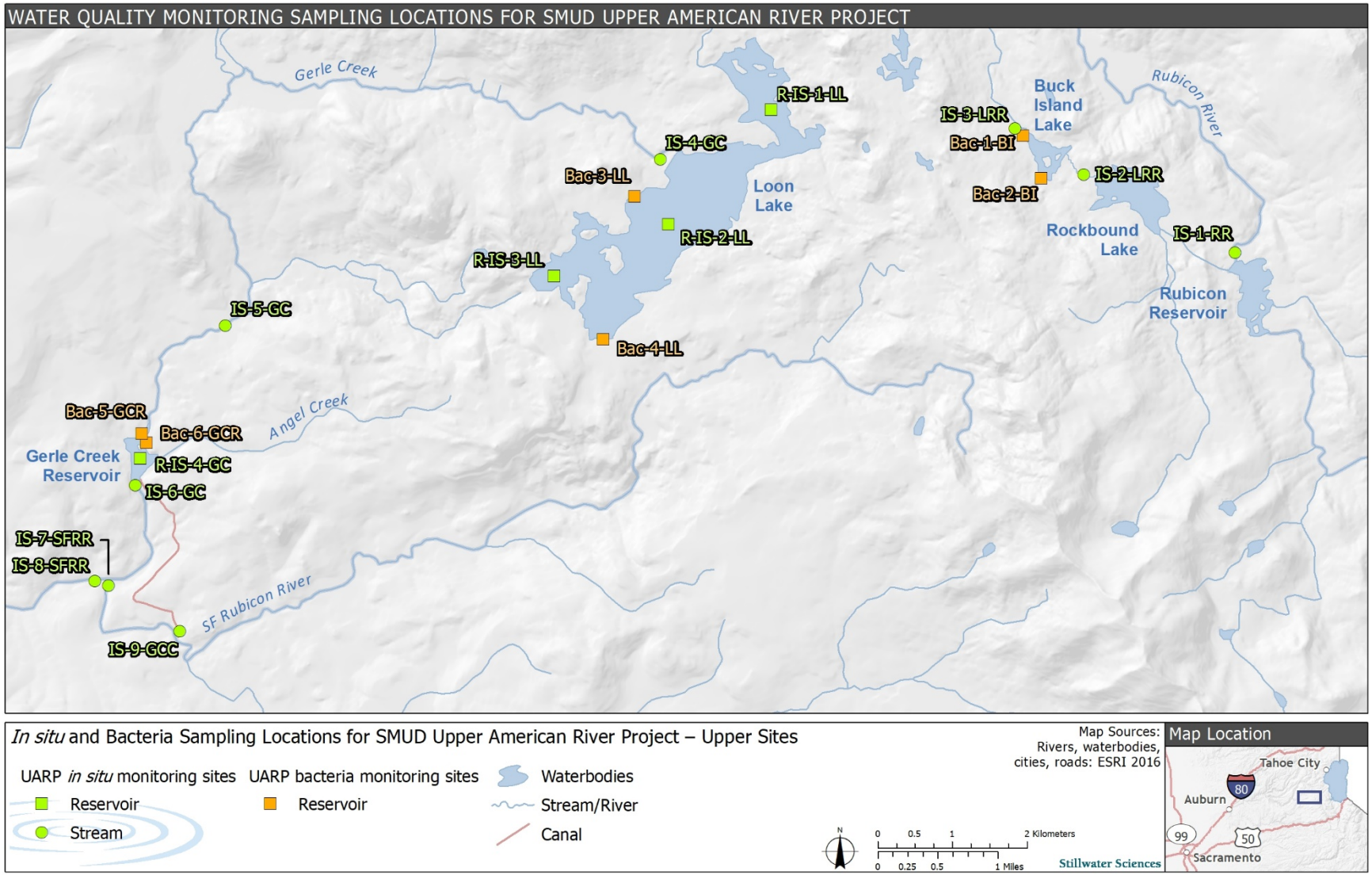

Figure 4-1. *In situ* water quality and bacteria sampling locations for SMUD Upper American River Project – upper sites.

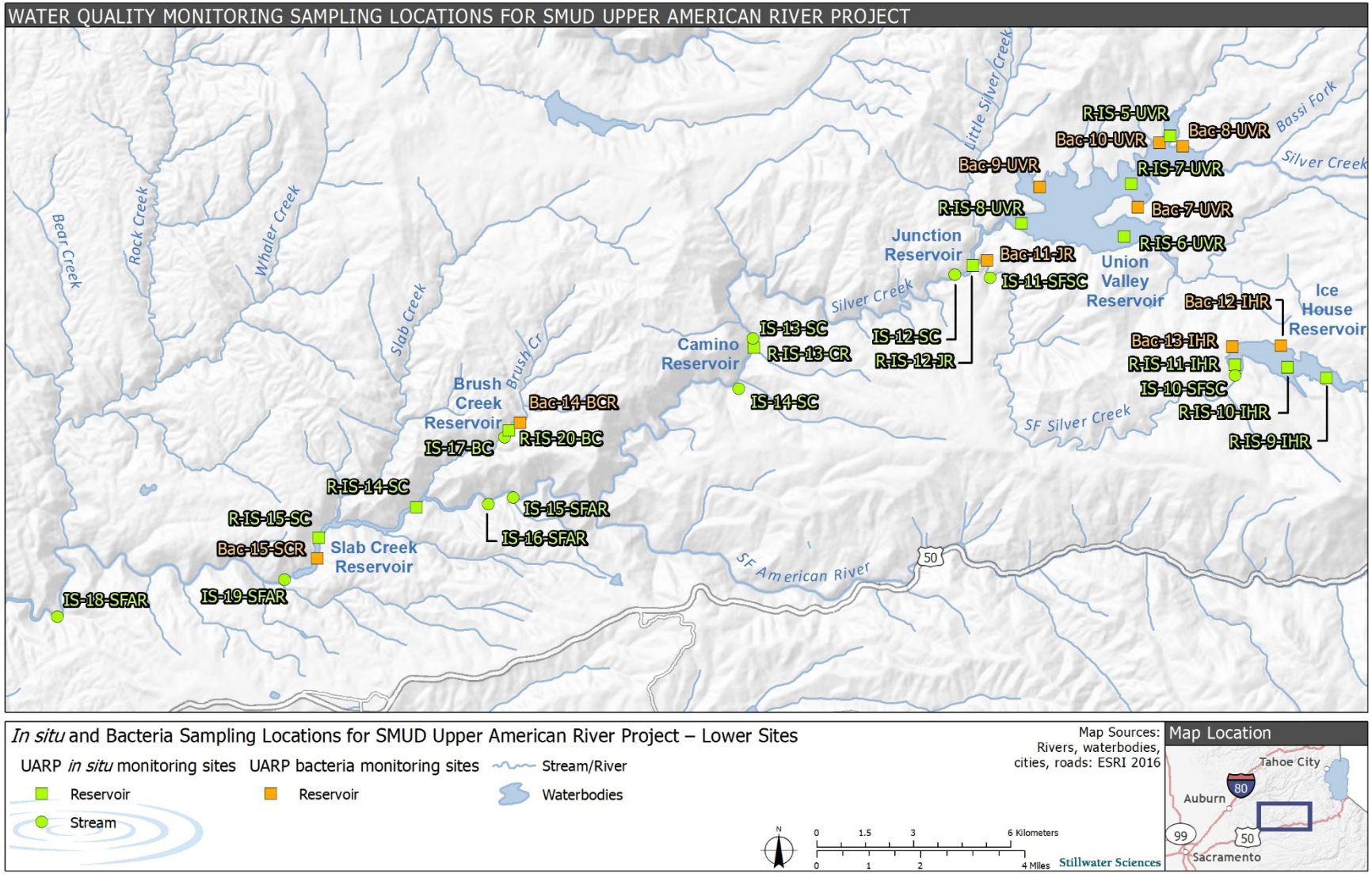

Figure 4-2. *In situ* water quality and bacteria sampling locations for SMUD Upper American River Project – lower sites.

Table 4-2. *In situ* Water Quality Sampling Locations and Dates for SMUD Upper American River Project Reservoir Sites.

SMUD Site Name	Site ID	Location	2019 *In situ* Survey Sample Date
R-4C	R-IS-1-LL	Loon Lake, upper reservoir (northeast body)	6/7, 10/22
R-4B	R-IS-2-LL	Loon Lake, mid-reservoir (west body)	6/7, 10/22
R-4A	R-IS-3-LL	Loon Lake, near dam	6/7, 10/22
R-5	R-IS-4-GC	Gerle Creek Reservoir, mid-reservoir	6/6, 10/25
R-6C	R-IS-5-UVR	Union Valley Reservoir, Robbs PH tailrace zone	6/4, 10/22
R-6D	R-IS-6-UVR	Union Valley Reservoir, Jones Fork Silver Creek arm	6/4, 10/25
R-6B	R-IS-7-UVR	Union Valley Reservoir, mid-reservoir	6/4, 10/25
R-6A	R-IS-8-UVR	Union Valley Reservoir, near dam	10/23
R-7C	R-IS-9-IHR	Ice House Reservoir, upper lake body	6/5, 10/21
R-7B	R-IS-10-IHR	Ice House Reservoir, mid-reservoir	6/5, 10/21
R-7A	R-IS-11-IHR	Ice House Reservoir, near dam	6/5, 10/21
R-8	R-IS-12-JR	Junction Reservoir, mid-reservoir between arms	10/23
R-9	R-IS-13-CR	Camino Reservoir, mid-reservoir	10/23
R-11B	R-IS-14-SC	Slab Creek Reservoir, upper-reservoir	10/24
R-11A	R-IS-15-SC	Slab Creek Reservoir, mid-reservoir	10/24

Table 4-3. *In situ* Water Quality Sampling Locations Not Sampled for SMUD Upper American River Project Reservoir Sites.

SMUD Site Name	Site ID	Location	Reason not sampled for 2019 *In situ* Survey
June (Spring)			
R-6A	R-IS-8-UVR	Union Valley Reservoir, near dam	Spilling
R-8	R-IS-12-JR	Junction Reservoir, mid-reservoir between arms	Spilling
R-9	R-IS-13-CR	Camino Reservoir, mid-reservoir	Spilling
R-11B	R-IS-14-SC	Slab Creek Reservoir, upper-reservoir	Spilling
R-11A	R-IS-15-SC	Slab Creek Reservoir, mid-reservoir	Spilling

Table 4-4. *In situ* Water Quality Sampling Locations and Dates for SMUD Upper American River Project Riverine Sites.

SMUD Site Name	Site ID	Location	2019 *In situ* Survey Sample Date
2	IS-1-RR	Rubicon River outflow from Rubicon Reservoir	8/5, 10/6
5	IS-2-LRR	Little Rubicon River outflow from Rockbound Lake	8/5, 10/6
6	IS-3-LRR	Little Rubicon River outflow from Buck Island Lake	8/5, 10/6
7	IS-4-GC	Gerle Creek outflow from Loon Lake	5/22, 8/7, 10/4
14	IS-5-GC	Gerle Creek inflow to Gerle Creek Reservoir	5/22, 8/7, 10/4
15	IS-6-GC	Gerle Creek outflow from Gerle Creek Reservoir	5/22, 8/7, 10/4
18	IS-7-SFRR	S.F. Rubicon upstream of Gerle Creek confluence	5/22, 8/7, 10/4
19	IS-8-SFRR	S.F. Rubicon downstream of Gerle Creek confluence	5/22, 8/7, 10/4
16	IS-9-GCC	Gerle Creek Canal inflow to Robbs Forebay	5/22, 8/7, 10/4
25	IS-10-SFSC	S.F. Silver Creek outflow from Ice House Reservoir	5/22, 8/6, 10/4
27	IS-11-SFSC	S.F. Silver Creek inflow to Junction Reservoir	2/25, 5/21, 8/6, 10/5
29	IS-12-SC	Silver Creek outflow from Junction Reservoir	2/25, 5/21, 8/6, 10/5
32	IS-13-SC	Silver Creek inflow to Camino Reservoir	2/25, 5/21, 8/6, 10/5
34	IS-14-SC	Silver Creek outflow from Camino Reservoir	2/25, 5/21, 8/6, 10/5
38	IS-15-SFAR	South Fork American River (SFAR) upstream of Camino Powerhouse	2/25, 5/21, 8/6, 10/5
41	IS-16-SFAR	SFAR downstream of Camino Powerhouse	2/25, 5/21, 8/6, 10/5
40	IS-17-BC	Brush Creek outflow from Brush Creek Reservoir	2/25, 5/21, 8/6, 10/5
60	IS-18-SFAR	SFAR upstream of White Rock Powerhouse	2/6, 5/23, 8/8, 10/7
43	IS-19-SFAR	SFAR downstream of Slab Creek Reservoir	2/6, 5/22, 8/8, 10/7

Table 4-5. *In situ* Water Quality Sampling Locations Not Sampled for SMUD Upper American River Project Riverine Sites.

SMUD Site Name	Site ID	Location	Reason not sampled for 2019 *In situ* Survey
February (Winter)			
2	IS-1-RR	Rubicon River outflow from Rubicon Reservoir	Snow accumulation
5	IS-2-LRR	Little Rubicon River outflow from Rockbound Lake	Snow accumulation
6	IS-3-LRR	Little Rubicon outflow from Buck Island Lake	Snow accumulation
7	IS-4-GC	Gerle Creek outflow from Loon Lake	Snow accumulation
14	IS-5-GC	Gerle Creek inflow to Gerle Creek Reservoir	Snow accumulation
15	IS-6-GC	Gerle Creek outflow from Gerle Creek Reservoir	Snow accumulation
18	IS-7-SFRR	S.F. Rubicon upstream of Gerle Creek confluence	Snow accumulation
19	IS-8-SFRR	S.F. Rubicon downstream of Gerle Creek confluence	Snow accumulation
16	IS-9-GCC	Gerle Creek Canal inflow to Robbs Peak Forebay	Snow accumulation
25	IS-10-SFSC	South Fork Silver Creek outflow from Ice House Reservoir	Snow accumulation
May (Spring)			
2	IS-1-RR	Rubicon River outflow from Rubicon Reservoir	Snow accumulation
5	IS-2-LRR	Little Rubicon River outflow from Rockbound Lake	Snow accumulation
6	IS-3-LRR	Little Rubicon outflow from Buck Island Lake	Snow accumulation
November (Fall)			
283	IS-17-BC	Brush Creek outflow from Brush Creek Reservoir	Access restricted

Table 4-6. Bacteria Sampling Locations and Dates for SMUD Upper American River Project Sites.

Reservoir	SMUD Site Name	Site ID	Location	2019 Sample Dates
Buck Island Reservoir (beach locations)	R-3B	Bac-1-BI	On Northshore, near dam and Off-Highway Vehicle camping	8/22, 8/29, 9/5, 9/12, 9/19
	77	Bac-2-BI	On south shore, near Rubicon hiking trail	8/22, 8/29, 9/5, 9/12, 9/19
Loon Lake Reservoir (beach locations)	64	Bac-3-LL	West of main dam, near Red Fir Campground	8/22, 8/29, 9/5, 9/12, 9/19
	65	Bac-4-LL	West of Loon Lake Campground, near boat launch	8/22, 8/29, 9/5, 9/12, 9/19
Gerle Creek Reservoir (beach locations)	66	Bac-5-GCR	Near Gerle Creek Campground	6/19, 6/26, 7/3, 7/10, 7/17
	67	Bac-6-GCR	Near Angel Creek picnic area	6/19, 6/26, 7/3, 7/10, 7/17
Union Valley Reservoir (swim areas)	R-6H	Bac-7-UVR	At Fashoda Beach	6/19, 6/26, 7/3, 7/10, 7/17
	R-6E	Bac-8-UVR	Near Wench Creek Campground	6/19, 6/26, 7/3, 7/10, 7/17
	FC-2	Bac-9-UVR	Near Camino Cove Campground	6/19, 6/26, 7/3, 7/10, 7/17
	R-6F	Bac-10-UVR	Near Yellowjacket Campground	6/19, 6/26, 7/3, 7/10, 7/17
Other UARP Locations	R-8B	Bac-11-JR	Junction Reservoir, near boat launch	6/18, 6/25, 7/2, 7/9, 7/16
Ice House Reservoir (beach locations)	68	Bac-12-IHR	Northshore near private campground access	6/18, 6/25, 7/2, 7/9, 7/16
	69	Bac-13-IHR	East of boat launch and picnic area	6/18, 6/25, 7/2, 7/9, 7/16
Other UARP locations	R-10B	Bac-14-BCR	Brush Creek Reservoir, near boat launch	6/18, 6/25, 7/2, 7/9, 7/16
	R-11C	Bac-15-SCR	Slab Creek Reservoir, near boat launch	6/18, 6/25, 7/2, 7/9, 7/16

5.0 METHODS

5.1 *IN SITU* PARAMETERS

Reservoir *in situ* water quality monitoring was conducted by watercraft to access mid-reservoir areas (Figure 5-1). A multi-probe Sonde (Yellow Springs Instruments [YSI] EXO2) was deployed from a boat for measurement of *in situ* parameters, including water temperature, conductivity, dissolved oxygen, pH, and turbidity (Table 5-1).

Figure 5-1. Example of mid-reservoir *in situ* water quality sampling site (R-IS-1-LL) at Loon Lake Reservoir.

At each reservoir site, a vertical water column profile was collected for all *in situ* water quality parameters at one-meter depth intervals. For bottom water samples, the Sonde was drawn back 0.5 meter (m) from the sediment layer before taking a reading. Prior to taking each reading, the Sonde was allowed to stabilize (typically requiring no more than 90 seconds). Water transparency was measured at reservoir stations with a standard 7.9-inch-diameter Secchi disk.

At riverine sites, Sonde readings were obtained where sufficient stream turbulence provided good lateral and vertical mixing of the water, and as near as possible to the stream thalweg (Figure 5-2). Prior to taking each reading, the Sonde was allowed to stabilize (typically requiring no more than 90 seconds) such that there was little variability in parameter readings at each location.

Figure 5-2. Example of an *in situ* water quality sampling site (IS-12-SC) at the Silver Creek outflow from Junction Reservoir.

For both reservoir and riverine *in situ* monitoring, Sonde calibration was conducted prior to the start of each sampling day, and a post-sampling calibration check was conducted following each sampling day, using standard solutions and recorded on calibration logs (Appendix E). Comparisons between Post-sampling and Post-calibration values were made and Measurement Quality Objective (MQO) codes (Accept, Qualify, Reject) were assigned to each parameter. MQO criteria for each *in situ* parameter are provided in Table 5-2.

Other data gathered at each monitoring station included date, time, site name, sampling location, collector's name, weather conditions, and any other pertinent observations related to the monitoring station. Following each field event, data was added to a database template provided by SMUD, for eventual transfer into SMUD's master database. All *in situ* water quality sampling was conducted in compliance with the approved Plan (SMUD 2016a).

Table 5-1. *In situ* Water Quality Methods.

Parameter	Method	Units	Reporting Resolution
Water temperature	EPA 170.1	degrees Celsius (ºC)	0.1
Conductivity	SM 2510-B	microsiemens per centimeter (uS/cm)	1.0
DO	SM 4500-O(G)	milligrams per liter (mg/L)	0.1
pH	SM 4500-H	standard unit of pH (s.u.)	0.1
Turbidity	SM 2130B	Nephelometric Turbidity Unit (NTU)	0.1
Secchi depth (Secchi disk)	USGS	meter (m)	0.1

DO = dissolved oxygen
EPA = Environmental Protection Agency
SM = Standard Method

Table 5-2. Measurement Quality Objectives Criteria for *In situ* Parameters.

Measurement Quality Objectives (MQO)				
Parameter	**Units**	**Accept**	**Qualify**	**Reject**
Dissolved Oxygen	% Saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

NTU = Nephelometric Turbidity Unit
s.u. = standard unit of pH
uS/cm = microsiemens per centimeter

5.2 BACTERIA

Bacteria grab samples were collected near reservoir and river shorelines in shallow water, and in particular at swim areas/beach locations (Table 4-6, Figure 5-3). Samples were collected in sterilized bottles supplied by the analytical laboratory. Field sampling personnel wearing sterile gloves filled each sample bottle by direct immersion in the reservoir or stream. Immediately after collection, samples were placed on ice for transport to the analytical laboratory within the required field hold time (Table 5-3).

Figure 5-3. Example of a bacteria sampling site in Union Valley Reservoir (Bac-7-UVR).

Table 5-3. Bacteria Analytical Methods and Field Hold Times.

Analyte	Method	Units	MDL	Hold Time
Escherichia coli	SM9223B (Quantitray)	MPN/100 mL	1.0	8 hr
Fecal coliform	SM9221E (MPN 15 or 25)	MPN/100 mL	1.8	8 hr

hr = hour
MDL = method detection limit
mL = milliliter
MPN = most probable number
SM = Standard Method

Field-based Quality Assurance/Quality Control (QA/QC) for bacterial samples was assured by accurate and thoroughly completed sample labels, field sheets, chain of custody, and sample log forms. Sample labels included sample identification code, date, time, preservative, client name, collector's name, reservoir/river name, sampling location, and analysis/sample type. All sample labels were cross-checked by a second field technician before delivering samples to the analytical laboratory.

6.0 RESULTS

6.1. *IN SITU* PARAMETERS

6.1.1. Riverine Sites

Detailed *In situ* water quality dates and measurements for UARP riverine sites can be found in Table 6-1 below this narrative, and field data sheets are provided in Appendix D. Several riverine sites were not sampled during the 2019 February (Winter), May (Spring), and November (Fall) sampling events due to snow accumulation and restricted access (Table 4-5).

February (Winter) In situ Water Quality Sampling Event

During the February sampling event, water temperatures ranged from 3.2 to 5.7 °C. Riverine dissolved oxygen ranged from 11.5 to 12.7 milligrams per liter (mg/L) (86 to 98% saturation), with no measurements falling below the Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region (Basin Plan) instantaneous minimum concentration of 7.0 mg/L for cold freshwater habitat (COLD) and spawning, reproduction, and/or early development (SPWN) designated beneficial uses (CRWQCB 2016). pH at riverine sites ranged from 6.5 to 7.2 standard units (s.u.), with no exceedances of the Basin Plan instantaneous minimum or maximum pH objectives (6.5 s.u. and 8.5 s.u., respectively).

Typical of granitic watersheds, conductivity at the riverine sites was low, ranging from 10 to 41 microsiemens per centimeter (uS/cm).

Turbidity measurements during the February sampling event were low, ranging from 0.2 to 12.2 Nephelometric Turbidity Unit (NTU). Turbidity at Site IS-17-BC was 12.2 NTU during this survey, which was higher than other sites sampled during the February sample event. This may be due to the increased runoff from the King Fire area that burned over 97,000 acres of land in El Dorado County, California, in mid-September to mid-October 2014. Turbidity at Site IS-17-BC during the 2019 winter sampling event was notably lower than the highest values recorded at this site from 2015–2017, which occurred during the fall and winter surveys, and slightly higher than the values recorded in the fall and winter of 2018 (Table 6-2).

May (Spring) In situ Water Quality Sampling Event

During the May sampling event, water temperatures (2.5 to 11.0°C) exhibited a greater range and were generally higher than temperatures measured during the winter sampling event. Dissolved oxygen ranged from 10.0 to 11.8 mg/L (82 to 98% saturation) across all riverine sites, which is well above the minimum Basin Plan concentration of 7.0 mg/L for COLD and SPWN. pH ranged from 6.5 to 7.4 s.u., with no exceedances of the Basin Plan instantaneous minimum or maximum pH objectives (6.5 s.u. and 8.5 s.u., respectively).

Conductivity at the riverine sites was low, ranging from 4 to 32 uS/cm during the May sampling event.

Turbidity measurements were low, ranging from 0.1 to 7.3 NTU.

August (Summer) In situ Water Quality Sampling Event

During the August sampling event, water temperatures ranged from 7.0 to 21.2°C and were variable by site. Riverine dissolved oxygen during the August sampling event ranged from 7.4 to 11.0 mg/L (80 to 97.7% saturation), with zero measurements falling below the Basin Plan instantaneous minimum criterion of 7.0 mg/L for COLD and SPWN. Riverine pH ranged from 6.2 to 7.5 s.u. with two measurements falling just below the Basin Plan instantaneous minimum pH objective (6.5 s.u.) and zero exceedances of the instantaneous maximum (8.5 s.u.). Measured pH below the Basin Plan instantaneous minimum occurred at sites IS-4-GC (6.2 s.u) and IS-10-SFSC (6.32 s.u.).

Conductivity at the riverine sites was low, ranging from 6 to 46 uS/cm.

During the August sampling event, turbidity measurements were low, ranging from 0.1 to 10.0 NTU.

November (Fall) In situ Water Quality Sampling Event

Water temperatures during the November sampling event ranged from 2.5 to 10.5°C. Riverine dissolved oxygen ranged from 9.4 to 12.1 mg/L (79 to 98% saturation), with zero measurements falling below the Basin Plan instantaneous minimum concentration of 7.0 mg/L for COLD and SPWN. Riverine pH ranged from 6.6 to 7.4 s.u. during the November event with zero measurements below the Basin Plan instantaneous minimum pH objective (6.5 s.u.) and zero exceedances of the instantaneous maximum (8.5 s.u).

Conductivity at the riverine sites was low, ranging from 6 to 37 uS/cm during the November sampling event.

Turbidity at riverine sites was low, ranging from 0.0 to 0.6 NTU.

Table 6-1. *In situ* Water Quality for UARP Riverine Sites.

Site ID	2019 Sample Date	Water Temperature (°C)	pH (s.u.)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	Turbidity (NTU)
February (Winter)							
IS-1-RR	--	--	--	--	--	--	--
IS-2-LRR	--	--	--	--	--	--	--
IS-3-LRR	--	--	--	--	--	--	--
IS-4-GC	--	--	--	--	--	--	--
IS-5-GC	--	--	--	--	--	--	--
IS-6-GC	--	--	--	--	--	--	--
IS-7-SFRR	--	--	--	--	--	--	--
IS-8-SFRR	--	--	--	--	--	--	--
IS-9-GCC	--	--	--	--	--	--	--
IS-10-SFSC	--	--	--	--	--	--	--
IS-11-SFSC	2/25	4.0	6.5	11.5	88	14	0.2
IS-12-SC	2/25	3.2	6.5	11.5	86	10	0.5
IS-13-SC	2/25	5.0	6.8	11.9	93	14	0.5
IS-14-SC	2/25	5.0	7.0	11.8	93	18	0.2
IS-15-SFAR	2/25	5.0	7.2	12.3	96	41	0.9
IS-16-SFAR	2/25	4.6	7.1	12.7	98	19	0.5
IS-17-BC	2/25	4.8	6.9	11.8	92	17	12.2
IS-18-SFAR	2/6	5.7	7.2	--[R]	--[R]	39	3.4
IS-19-SFAR	2/6	5.1	6.7	--[R]	--[R]	24	2.4
May (Spring)							
IS-1-RR	--	--	--	--	--	--	--
IS-2-LRR	--	--	--	--	--	--	--
IS-3-LRR	--	--	--	--	--	--	--
IS-4-GC	5/22	2.5	6.9	11.2	82	4	0.7
IS-5-GC	5/22	2.8	6.8	11.4	84	6	0.1
IS-6-GC	5/22	2.9	6.7	11.4	85	5	0.1
IS-7-SFRR	5/22	4.0	7.1	11.3	86	7	0.2
IS-8-SFRR	5/22	4.2	7.0	11.3	87	7	0.1
IS-9-GCC	5/22	3.0	6.7	11.7	87	5	0.2
IS-10-SFSC	5/22	5.7	7.0	10.8	86	8	0.6
IS-11-SFSC	5/21	4.5	6.5	11.3	88	10	0.4
IS-12-SC	5/21	6.7	7.0	10.9	89	8	0.5

Site ID	2019 Sample Date	Water Temperature (°C)	pH (s.u.)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	Turbidity (NTU)
IS-13-SC	5/21	7.4	7.1	11.3	94	9	0.6
IS-14-SC	5/21	7.3	7.1	11.4	94	9	0.5
IS-15-SFAR	5/21	7.6	7.4	11.7	98	18	2.2
IS-16-SFAR	5/21	7.6	7.3	11.8	98	17	1.3
IS-17-BC	5/21	11.0	7.3	10.0	91	19	7.3
IS-18-SFAR	5/23	10.0	7.4	11.0	98	32	1.5
IS-19-SFAR	5/22	8.2	7.3	11.5	97	16	0.8
August (Summer)							
IS-1-RR	8/5	18.1	6.5	7.7	81	9	0.2
IS-2-LRR	8/5	20.1	6.7	7.5	83	7	0.3
IS-3-LRR	8/5	21.0	6.8	7.4	83	8	0.2
IS-4-GC	8/7	10.6	6.2	8.9	80	6	0.3
IS-5-GC	8/7	14.2	6.6	8.4	82	8	0.2
IS-6-GC	8/7	14.6	6.5	8.5	83	6	0.1
IS-7-SFRR	8/7	14.9	6.8	8.5	84	7	0.1
IS-8-SFRR	8/7	15.0	6.7	8.6	85	7	0.2
IS-9-GCC	8/7	14.7	6.5	8.7	86	6	0.1
IS-10-SFSC	8/6	7.0	6.3	10.3 [Q]	85 [Q]	7	0.5
IS-11-SFSC	8/6	12.9	6.8	9.2 [Q]	87 [Q]	12	0.2
IS-12-SC	8/6	9.3	6.7	9.8 [Q]	85 [Q]	9	0.3
IS-13-SC	8/6	16.0	6.7	9.0 [Q]	91 [Q]	14	0.3
IS-14-SC	8/6	11.3	6.8	10.2 [Q]	93 [Q]	12	0.2
IS-15-SFAR	8/6[a]	21.2	7.5	8.1 [Q]	92 [Q]	46	0.4
IS-16-SFAR	8/6[a]	10.0	6.5	11.0 [Q]	98 [Q]	12	0.3
IS-17-BC	8/6	17.1	7.0	8.8	91	31	10.0
IS-18-SFAR	8/7	17.6	7.1	9.5	99	29	0.2
IS-19-SFAR	8/7	12.2	6.7	10.2	95	15	0.4
November (Fall)							
IS-1-RR	11/6	7.6	6.7	9.5	79	10	0.2
IS-2-LRR	11/6	8.0	7.1	9.9	84	7	0.2
IS-3-LRR	11/6	8.9	6.8	9.4	81	6	0.0
IS-4-GC	11/4	8.5	6.6	9.5	81	6	0.4
IS-5-GC	11/4	6.4	6.9	10.3	84	6	0.2
IS-6-GC	11/4	6.0	6.9	10.2	82	7	0.2

Site ID	2019 Sample Date	Water Temperature (°C)	pH (s.u.)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	Turbidity (NTU)
IS-7-SFRR	11/4	6.5	6.9	10.5	86	9	0.3
IS-8-SFRR	11/4	6.1	6.7	10.7	86	9	0.2
IS-9-GCC	11/4	7.5	7.1	9.6	80	9	0.2
IS-10-SFSC	11/4	8.1	6.6	9.7	82	8	0.4
IS-11-SFSC	11/5	2.5	6.8	12.1	89	10	0.2
IS-12-SC	11/5	7.2	7.0	10.4	86	8	0.3
IS-13-SC	11/5	6.1	6.6	11.5	93	10	0.2
IS-14-SC	11/5	10.0	7.0	10.4	92	10	0.2
IS-15-SFAR	11/5	6.4	7.2	11.8	96	37	0.1
IS-16-SFAR	11/5	7.1	7.1	11.7	97	37	0.2
IS-17-BC	–	–	–	–	–	–	–
IS-18-SFAR	11/7	10.2	7.4	11.1	98	15	0.6
IS-19-SFAR	11/7	10.5	6.9	10.8	97	12	0.2

°C = degrees Celsius
s.u. = standard unit of pH
mg/L = milligrams per liter
% sat = percent saturation
uS/cm = microsiemens per centimeter
NTU = Nephelometric Turbidity Unit
"–" Indicates that data were not collected due to site inaccessibility. See Table 4-5.
"Q" Indicates data that are designated as "qualified" because the post-sampling calibration check measurement quality objective (MQO) for acceptability was not met (see Table 5-2 and Appendix E).
"R" Indicates data that are designated as "rejected" because the post-sampling calibration check measurement quality objective (MQO) for acceptability was not met (see Table 5-2 and Appendix E).
[a] Dissolved oxygen measurement number two is reported here, following field re-calibration of the YSI EXO2 dissolved oxygen sensor due to concern regarding dissolved oxygen measurement number one. Field re-calibration of the YSI EXO2 dissolved oxygen sensor at this site on this date did not improve adherence to the MQO and the dissolved oxygen reading remains "qualified" (see also "Q" footnote above).

Table 6-2. Turbidity Measurements at Site IS-17-BC, 2015–2019.

Site ID	Sample Date	Turbidity (NTU)
IS-17-BC	8/27/2015	3.0
IS-17-BC	11/3/2015	295.4
IS-17-BC	2/8/2016	46.0
IS-17-BC	5/3/2016	20.1
IS-17-BC	8/26/2016	3.4
IS-17-BC	11/10/2016	39.6
IS-17-BC	5/8/2017	13.7
IS-17-BC	8/14/2017	5.8
IS-17-BC	11/28/2017	44.6
IS-17-BC	1/30/2018	7.5
IS-17-BC	5/9/2018	3.9
IS-17-BC	8/14/2018	1.2
IS-17-BC	11/16/2018	1.3
IS-17-BC	2/25/2019	12.2
IS-17-BC	5/21/2019	7.3
IS-17-BC	8/6/2019	10.0

[1] Turbidity monitoring did not occur at Site IS-17-BC in the winter of 2017 (SMUD 2018) and in the fall of 2019 due to reservoir spilling and access restrictions (see also Table 4-5).

6.1.2. Reservoir Sites

In situ water quality data for selected UARP reservoir sites are presented in Figures 6-1 and 6-2 as representative of vertical profiles at other similar sites. Data for all sites are presented in Appendices A and B. As noted in Section 5, *in situ* water quality parameters were collected as part of Spring and Fall *in situ* sampling events in 2019, consistent with the Plan (SMUD 2016a). Several reservoir sites were not sampled during the 2019 June (Spring) sampling event due to safety restrictions associated with the reservoir spilling (Table 4-3).

June (Spring) In situ Water Quality Sampling Event

During the June (Spring) sampling event, thermal stratification was apparent in Union Valley and Ice House reservoirs, with the thermocline located between appoximately 4 m and 10 m depth and water temperatures ranging from approximately 13° to 15°C at the surface to 5° to 7°C in bottom waters (Figure 6-1 and Appendix B, Figures B.1-3 to B.1-5). In Loon Lake and Gerle Creek reservoirs, water temperature decreased more gradually and consistently with depth, varying by only approximately 2.5°C between the surface and bottom waters (Appendix B, Figures B.1-1 to B.1-2). pH and turbidity were generally consistent with depth in all four reservoirs during June (Spring). In Union Valley and Ice House reservoirs, dissolved oxygen concentrations increased slightly (0 to 1.5 mg/L) within the thermocline before decreasing gradually with depth; dissolved oxygen concentrations in Loon Lake and Gerle Creek reservoirs were generally consistent with depth. Dissolved oxygen concentrations were above 9.4 mg/L at all reservoir sites during the June (Spring) sampling event, which is greater than the Basin Plan instantaneous minimum concentration of 7.0 mg/L for COLD and SPAWN designated beneficial uses. pH values showed little variation among reservoirs and with depth, ranging from 6.1 to

7.7 s.u. Three sites (R-IS-1-LL, R-IS-2-LL, R-IS-3-LL) exhibited pH values that fell below the Basin Plan instantaneous minimum pH objective (6.5 s.u.). There were zero exceedances of the instantaneous maximum pH objective (8.5 s.u.). Turbidity levels were very low (less than or equal to 1 NTU) (Figure 6-1).

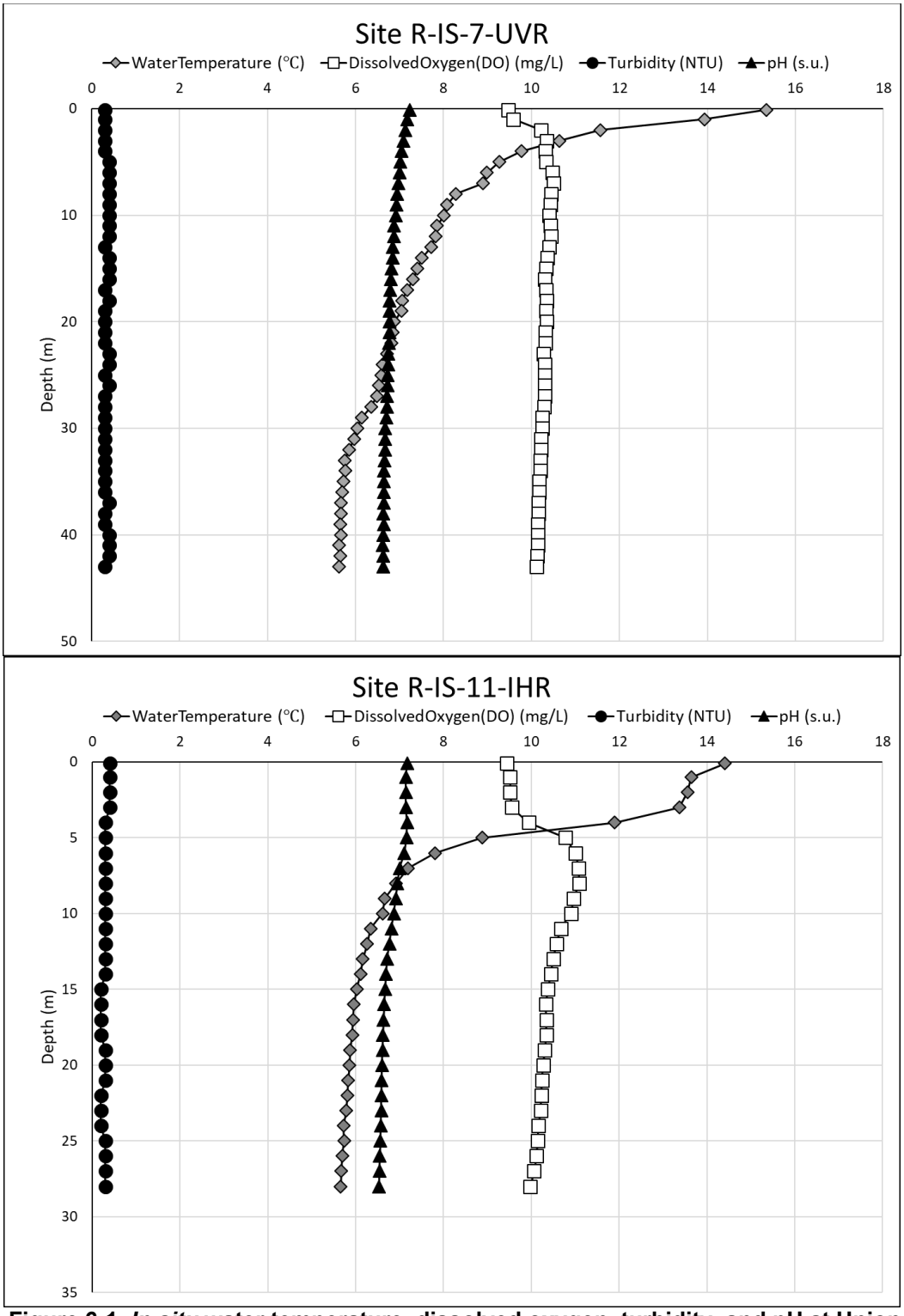

Figure 6-1. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Union Valley Reservoir and Ice House Reservoir sites R-IS-7-UVR (top) and R-IS-11-IHR (bottom) during June (Spring) 2019.

October (Fall) In situ Sampling Event

During the October (Fall) sampling event, surface water temperatures across all reservoir sites ranged from 10.2° to 15.2°C and bottom water temperatures ranged from 6.4° to 14.8°C. Several sites exhibited a slight warming at the surface with little to no additional variation in water temperature with depth, indicating that the reservoirs were generally well mixed (Figure 6-2 and Appendix B, Figures B.1-6 to B.1-13). The exception was a site at Union Valley Reservoir (Site R-IS-8-UVR), which exhibited a broad, deep thermocline between 37 and 63 m (Appendix B, Figure B.1-9). Dissolved oxygen, pH, and turbidity at all reservoir sites were generally consistent with depth (Figure 6-2), with few exceptions. Dissolved oxygen concentrations increased by 0.5 to 0.75 mg/L near the bottom of the thermocline in Union Valley Reservoir (Site R-IS-8-UVR; Appendix B, Figure B.1-9) as water temperatures decreased by several degrees. At all reservoir sites during the October (Fall) sampling event, dissolved oxygen concentrations were above the Basin Plan instantaneous minimum concentration of 7.0 mg/L for COLD and SPAWN designated beneficial uses. pH values exhibited little variation with depth, ranging from 5.6 to 7.4 s.u. At Ice House Reservoir, pH increased by 1.5 s.u. at 10 and 11 m at Site R-IS-11-IHR before returning to a relatively constant 6.2 to 6.3 s.u. in the remainder of the water column (Appendix B, Figure B.1-11). Loon Lake (Site R-IS-1-LL), Union Valley Reservoir (sites R-IS-5-UVR, R-IS-6-UVR, R-IS-7-UVR, and R-IS-8-UVR), Ice House Reservoir (sites R-IS-9-IHR, R-IS-10-IHR, and R-IS-11-IHR), Junction Reservoir (Site R-IS-12-JR), Camino Reservoir (Site R-IS-13-CR), and Slab Creek (Site-R-IS-15-SC) all exhibited values below the Basin Plan instantaneous minimum pH objective (6.5 s.u.) either throughout the water column or in the deeper portions of the water column (Appendix B, Figures B.1-8, B.1-9, B.1-10, B.1-11, B.1-12, and B.1-13 respectively). There were no exceedances of the instantaneous maximum pH objective (8.5 s.u.). Turbidity levels were low (less than or equal to 1.6 NTU).

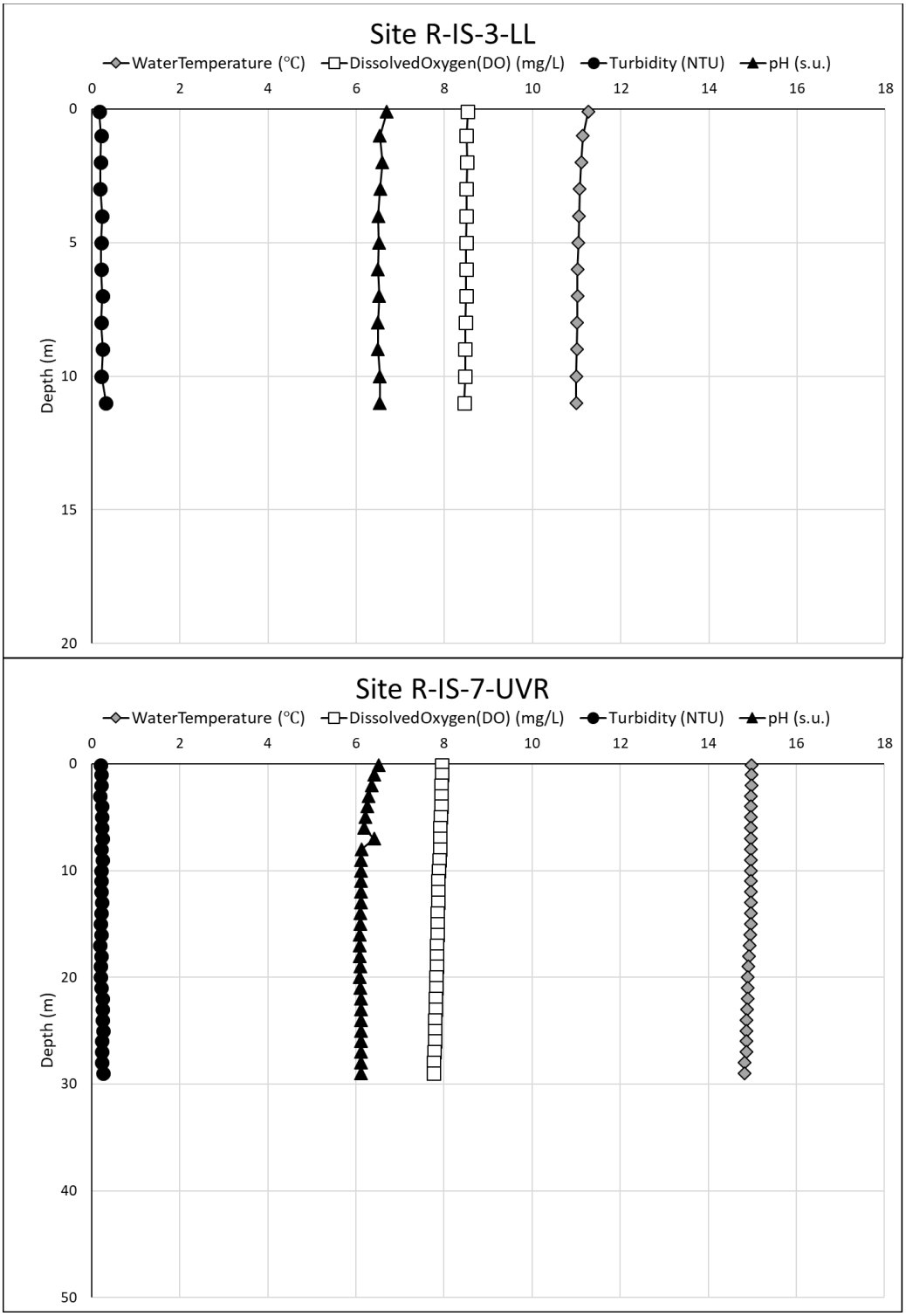

Figure 6-2. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Loon Lake and Union Valley Reservoir sites R-IS-3-LL (top) and R-IS-7-UVR (bottom) during October (Fall) 2019.

6.2. BACTERIA

Instantaneous fecal coliform counts ranged from less than the MDL (i.e., 1.8 most probable number per 100 milliliters [MPN/100 mL]) to greater than 1,600 MPN/100 mL during both the 2019 Independence Day and Labor Day sampling events (Appendix C, Tables C-1 and C-2). Three of the 2019 samples, one at Site Bac-10-UVR, one at Site Bac-11-JR, and one at Site Bac-15-SCR, exceeded the instantaneous maximum Basin Plan objective of 400 MPN/100 mL (Appendix C, Table C-1). The fifth Independence Day sampling event at Site Bac-11-JR had an instantaneous fecal coliform count greater than the maximum allowable count for a 15-tube laboratory analytical test (1,600 MPN/100 mL). Geometric means were calculated for each site using instantaneous fecal coliform counts from five samples collected over a 30 day period. Instantaneous fecal coliform counts less than the MDL were treated as 0.5 x MDL for the calculation of the geometric mean. The instantaneous fecal coliform count for the fifth sampling event at Site Bac-11-JR was treated as double the maximum allowable count (3,200 MPN/100 mL) for the calculation of the geometric mean at this site. Although not precisely known, the relatively higher count for this sampling event is unlikely to have resulted in a geometric mean value that exceeded the Basin Plan objective (200 MPN/100 mL) for Site Bac-11-JR because the calculated required sample result associated with a geometric mean exceedance of 200 MPN/100 mL would have needed to be greater than 3,700,000 MPN/100 mL, a value which is several orders of magnitude greater than any fecal coliform sample reported at a UARP site.

Fecal coliform geometric mean counts in 2019 were well below the Basin Plan objective of 200 MPN/100 mL, for the recreational water contact (REC-1) designated beneficial use. The lowest geometric mean fecal coliform counts (1.1 MPN/100 mL) were calculated for samples from Loon Lake Reservoir (Site Bac-4-LL) during the Labor Day sampling event. The highest geometric mean fecal coliform count (48.6 MPN/100 mL) was calculated for samples from Junction Reservoir (Site Bac-11-JR) during the Independence Day sampling event (Table 6-3).

Instantaneous *Escherichia coli* (*E. coli*) counts ranged from less than the MDL (i.e., <1.0 MPN/100 mL) to 770.1 MPN/100 mL during the 2019 Independence Day and Labor Day sampling events (Appendix C, Tables C-1 and C-2). Geometric means were calculated for each site using instantaneous *E. coli* counts from five samples collected over a 30 day period. Instantaneous *E.* coli counts less than the MDL were treated as 0.5 x MDL for the calculation of the geometric mean.

E. coli geometric mean counts in 2019 ranged from 0.5 MPN/100 mL, calculated for samples from Loon Lake Reservoir (Site Bac-3-LL) during the Labor Day sampling event, to 96.2 MPN/100 mL, calculated for samples from Union Valley Reservoir (Site Bac-7-UVR) during the Independence Day sampling event (Table 6-3). There is no Basin Plan numeric objective for *E. coli*.

Table 6-3. Bacteria Counts for UARP Reservoir Sites.

Site ID	Fecal Coliform Geometric Mean [1,2] (MPN/100 mL)	*E. coli* Geometric Mean (MPN/100 mL)
Independence Day		
Bac-5-GCR	3.2	3.4
Bac-6-GCR	2.0	1.6
Bac-7-UVR	41.2	96.2
Bac-8-UVR	16.5	17.6
Bac-9-UVR	9.5	12.8
Bac-10-UVR	5.0	2.6
Bac-11-JR	48.6	18.5
Bac-12-IHR	4.2	3.8
Bac-13-IHR	3.8	2.3
Bac-14-BCR	13.0	1.7
Bac-15-SCR	23.0	7.5
Labor Day		
Bac-1-BI	2.3	1.4
Bac-2-BI	1.2	0.9
Bac-3-LL	1.2	0.5
Bac-4-LL	1.1	0.6

MPN/100 mL = most probable number per 100 milliliters

[1] Method detection limit (MDL for fecal coliform = 1.8 MPN/100 mL. MDL for *E. coli* = 1.0 MPN/100 mL). Individual results less than the MDL were treated as 0.5 x MDL for the geometric mean calculations. Individual results greater than 1,600 MPN/100 mL (maximum allowable count for a 15-tube laboratory analytical test) were treated as 2.0 x 1,600 for the geometric mean calculations.

[2] The Basin Plan REC-1 water quality objective for fecal coliform is 200 MPN/100 mL expressed as the geometric mean of five samples collected over 30 days.

7.0 FIVE-YEAR WATER QUALITY SUMMARY (2015 – 2019)

2019 marks the end of the first five years of water quality monitoring required under Condition 8.J of Appendix A of the FERC license for the UARP. The 2015−2019 monitoring program included *in situ* parameters, general chemistry, bacteria, and metals bioaccumulation, with sampling frequency varying by water quality constituent as shown in Table 7-1. *In situ* and bacteria monitoring site locations for the 2015−2019 period are provided in Figure 4-1 and Figure 4-2, general chemistry monitoring site locations are provided in Figure 7-1 and Figure 7-2, and metal bioaccumulation monitoring locations are provided in Figure 7-3 and Figure 7-4. A summary of the first five years of the UARP water quality monitoring program is provided below.

Table 7-1. Sampling Frequency of Water Quality Constituents for the First Five Years of the UARP Water Quality Monitoring Program

Calendar Year	*In Situ* Parameters	General Chemistry	Bacterial	Metals Bioaccumulation
2015 (Year 1)	X		X	
2016 (Year 2)	X		X	X
2017 (Year 3)	X	X	X	
2018 (Year 4)	X		X	
2019 (Year 5)	X		X	

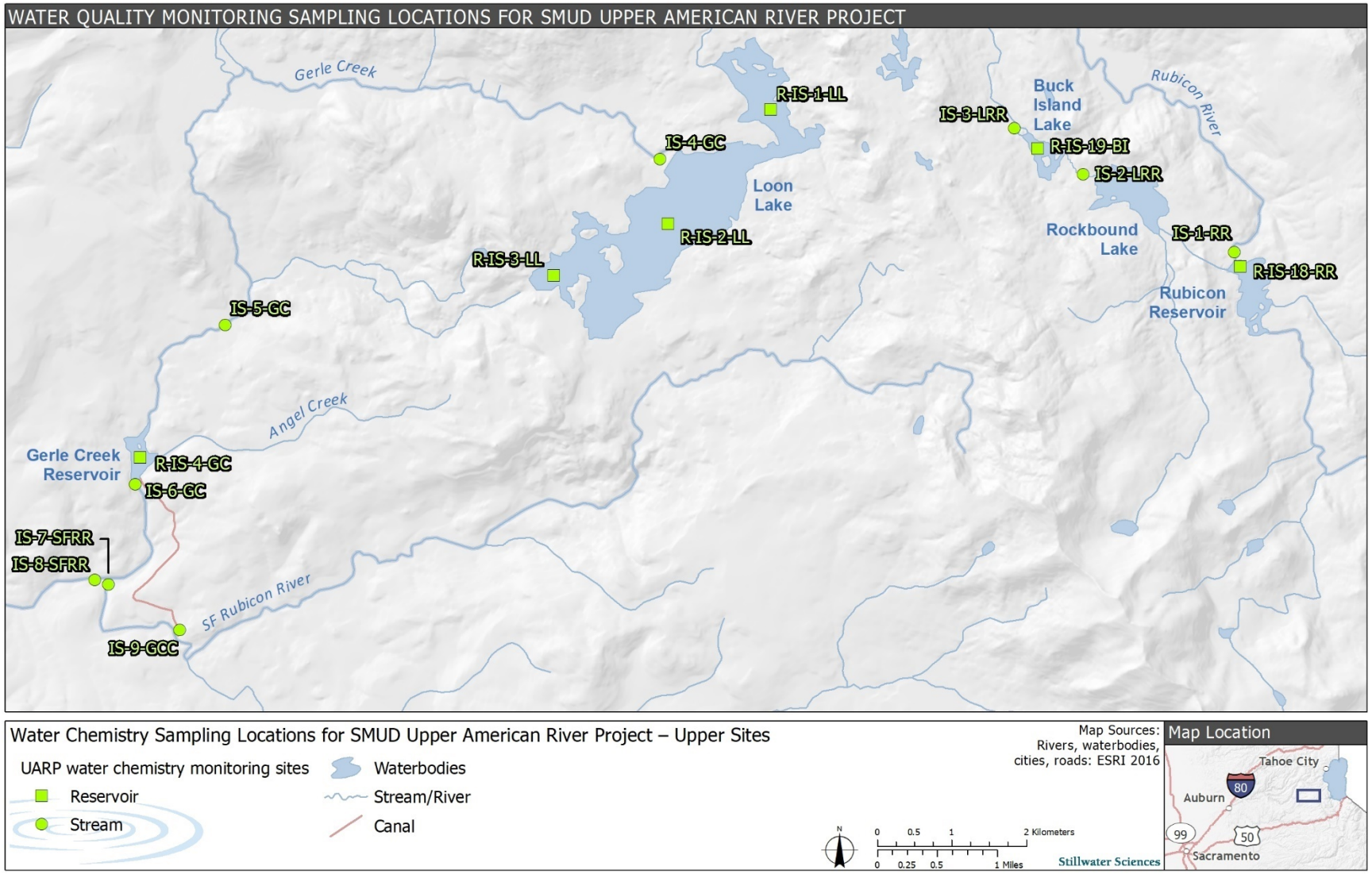

Figure 7-1. General chemistry sampling locations for SMUD Upper American River Project – upper sites.

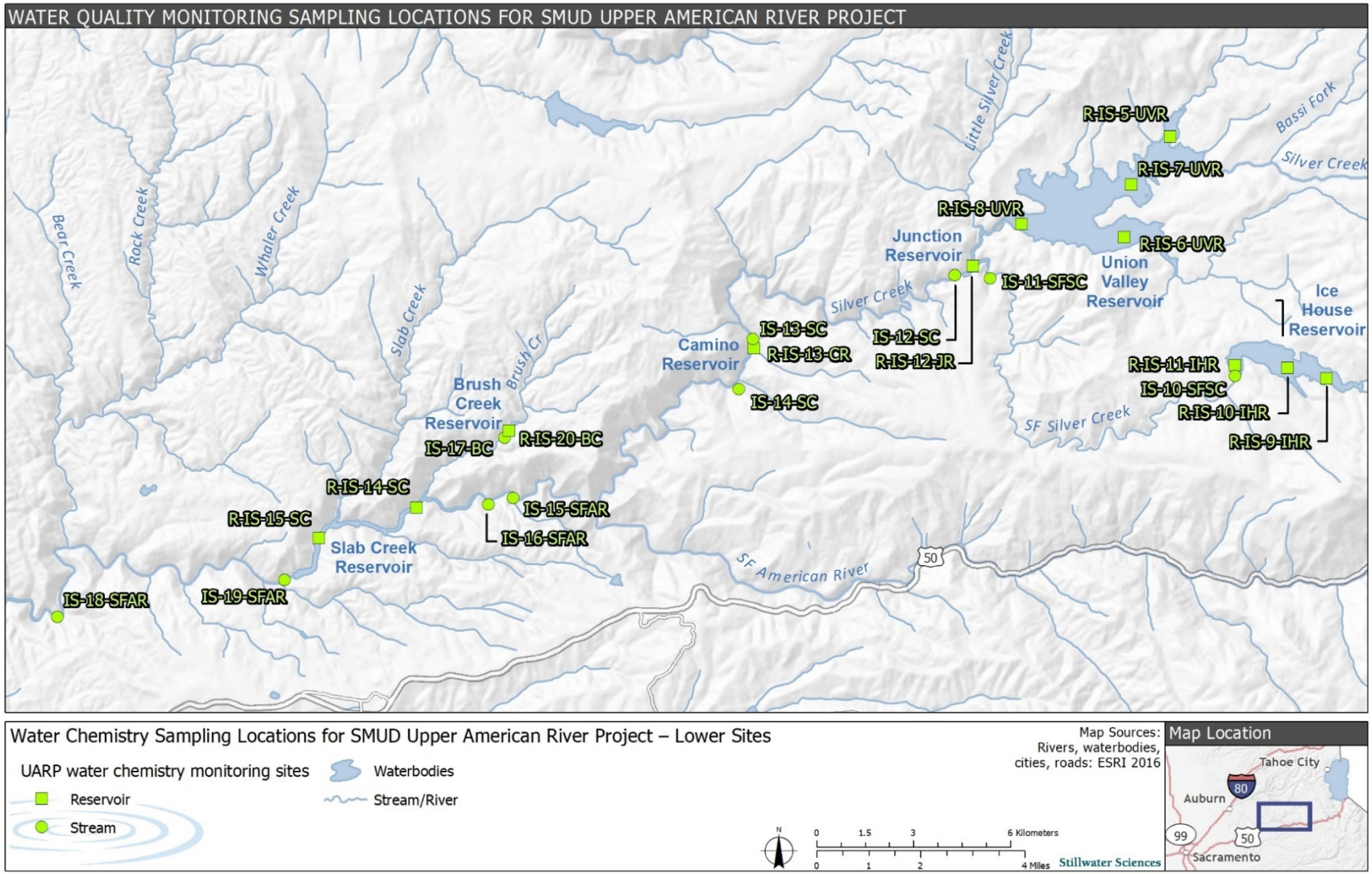

Figure 7-2. General chemistry sampling locations for SMUD Upper American River Project – lower sites.

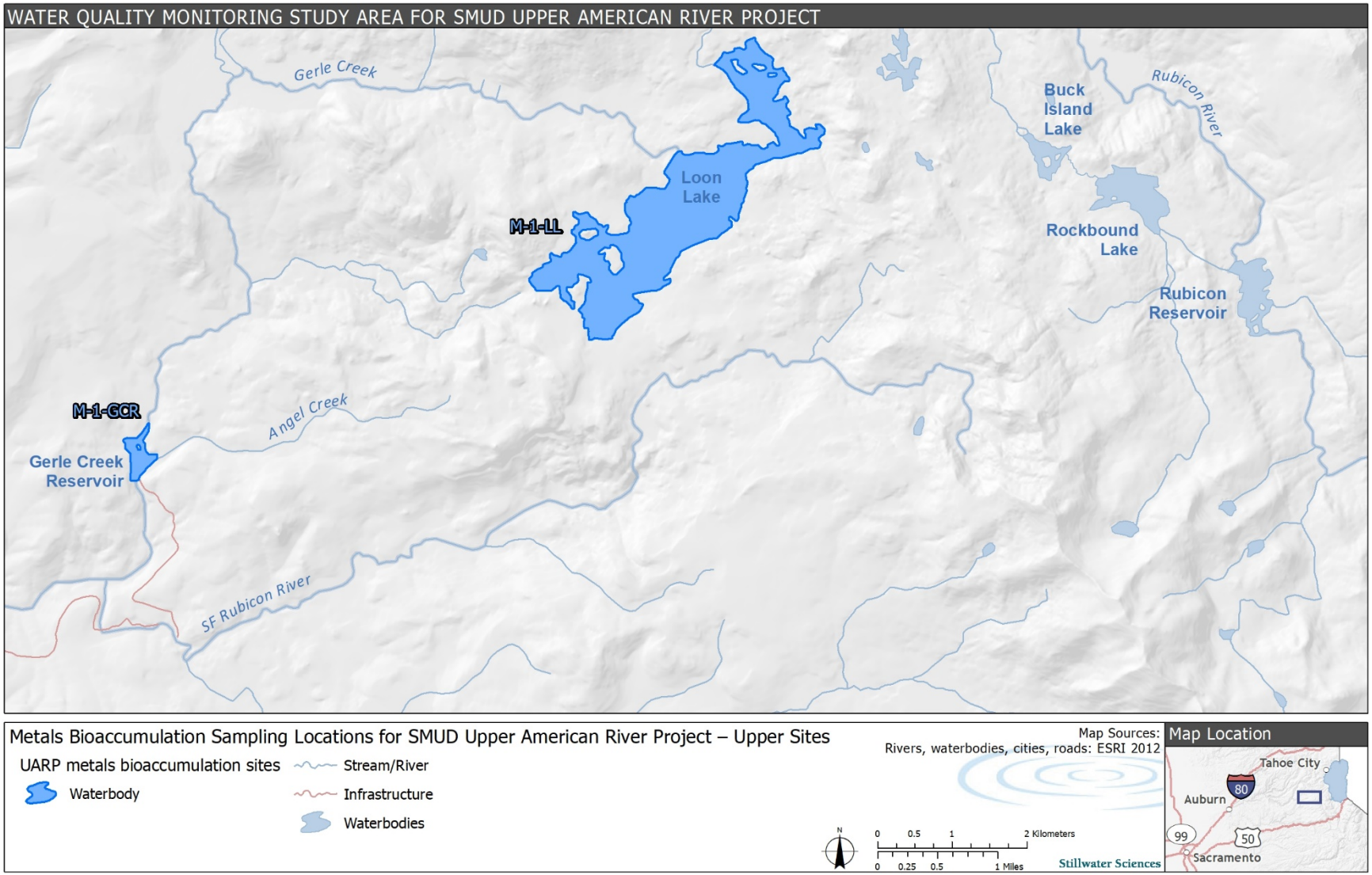

Figure 7-3. Metals bioaccumulation sampling locations for SMUD Upper American River Project – upper sites.

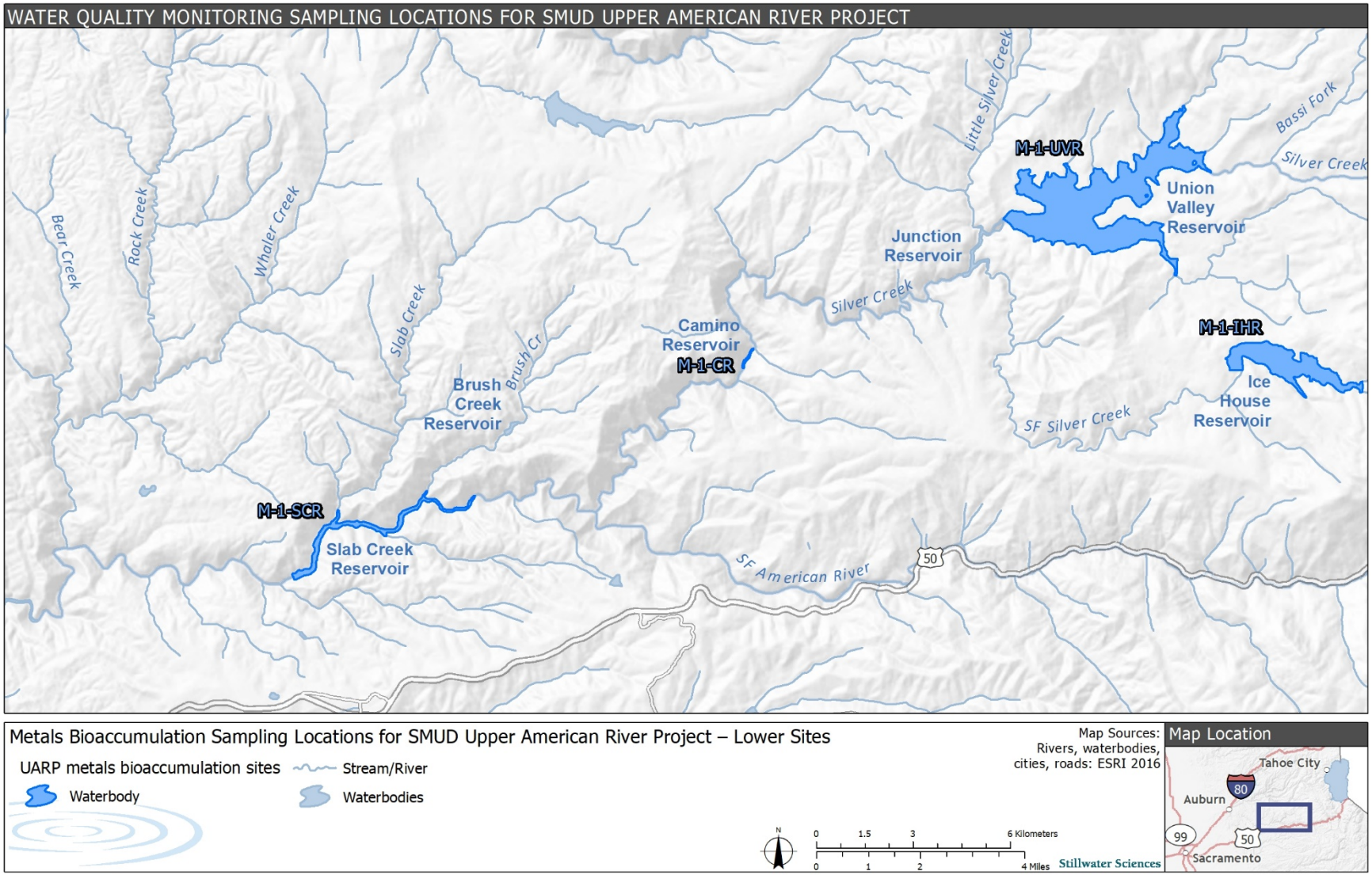

Figure 7-4. Metals bioaccumulation sampling locations for SMUD Upper American River Project – lower sites.

7.1. *IN SITU* PARAMETERS

In situ water quality monitoring at UARP riverine and reservoir sites occurred during each year of the 2015−2019 monitoring period. Monitoring was conducted during the winter, spring, summer, and fall at 19 representative stream reaches and during the spring and summer at 15 representative reservoir locations (Tables 4-2 and 4-3, Figures 4-1 and 4-2). *In situ* sampling methods are provided in Section 5.1 of this report, as well as in SMUD (2016b, 2017, 2018, 2019).

7.1.1. Riverine Sites

In situ water temperature followed a seasonal pattern throughout the 2015−2019 monitoring period, with the highest temperatures occurring during the summer sampling events and the lowest temperatures occurring during the winter sampling events (Figure 7-5). The observed seasonal pattern is generally consistent with Sierra Nevada stream reaches that are sensitive to seasonal air temperatures and the amount of ambient solar radiation. Winter water temperatures were similar across years, ranging only 6 ^{o}C (from approximately 2^{o}C to 8^{o}C) during the 2015−2019 monitoring period, based upon the limited number of sites that were consistently accessible for sampling (10 of 19 total sites, or 53% of sites). For the spring and fall surveys, when a greater number of monitoring sites were consistently accessible (16 of 19 total sites, or 84% of sites, in the spring; 19 of 19 total sites, or 100% of sites, in the fall [with the exception of five instances related to non-recurring construction activities or weather-related issues]), water temperatures were also generally similar within and across seasons and across years, ranging 3^{o}C to 12^{o}C during the 2015−2017 and 2019. The exception to the general inter-year similarity for spring and fall water temperatures was 2018, which was designated as a Below Normal water year type and exhibited relatively warmer temperatures during the spring and cooler temperatures during the fall compared with other years. UARP riverine sites exhibited the greatest range of water temperatures during the summer sampling period for all years, with three high elevation sites (IS-1-RR [Rubicon River outflow from Rubicon Reservoir], IS-2-LRR [Little Rubicon River outflow from Rockbound Lake], IS-3-LRR [Little Rubicon River outflow from Buck Island Lake]) and two middle elevation sites (IS-15-SFAR [upstream of Camino Powerhouse], IS-17-BC [Brush Creek outflow from Brush Creek Reservoir]), exhibiting summer water temperatures at the high end of the range in three or more years, and two middle elevation sites (IS-10-SFSC [S.F. Silver Creek outflow from Ice House Reservoir], IS-12-SC [Silver Creek outflow from Junction Reservoir and downstream of Union Valley Reservoir]) exhibiting summer water temperatures at the low end of the range in three or more years.

Maximum water temperatures occurred in the summer sampling periods for water years designated as Critically Dry (2015) and Below Normal (2018), when water temperatures at 9 sites were above 20ºC, corresponding to generally low inflows to the upstream reservoirs during those years (Table 7-2).

Table 7-2. Water Year Types in UARP Area, 2015–2019 (FERC 2014)

Water Year	Date	Water Year Type
2015	October 2014 – September 2015	Critically Dry
2016	October 2015 – September 2016	Above Normal[a]
2017	October 2016 – September 2017	Wet
2018	October 2017 – September 2018	Below Normal
2019	October 2018 – September 2019	Wet

[a] The California Department of Water Resources (DWR) May Bulletin 120 forecasted the 2016 water year type as Above Normal, and the UARP was operated under this scenario for the remainder of the water year. However, the final 2016 water year type was later re-classified as “Below Normal” based on DWR’s Full Natural Flow record for the American River at Folsom in October 2016.

Riverine dissolved oxygen concentrations (mg/L) also followed a seasonal pattern during the 2015−2019 monitoring period, with higher riverine concentrations occurring during colder seasons (winter, fall) and lower concentrations occurring during the warmest season (summer) (Figure 7-6). This trend is expected given that oxygen solubility is temperature dependent, with higher solubility in colder water and lower solubility in warmer water. During the 2015−2019 monitoring period, while dissolved oxygen was variable across sites and seasons, the vast majority of dissolved oxygen measurements (300 of 307, or 98% of total measurements) and sites (15 of 19 total sites, or 79% of sites) were above the Basin Plan instantaneous minimum concentration of 7.0 mg/L for COLD and SPWN designated beneficial uses (Figure 7-6). Three of the four sites that exhibited infrequent dissolved oxygen below 7.0 mg/L were the high elevation, relatively shallow sites (IS-1-RR [Rubicon River outflow from Rubicon Reservoir], IS-2-LRR [Little Rubicon River outflow from Rockbound Lake], and IS-3-LRR [Little Rubicon River outflow from Buck Island Lake]), which also exhibited relatively high water temperature (20.5 ºC to 22.5 ºC and 66 to 79% dissolved oxygen saturation) for those samples. As noted above, oxygen solubility is lower in warmer water and is often lower at higher elevation locations due to relatively low atmospheric pressure. The lowest dissolved oxygen (6.1 mg/L and 82% dissolved oxygen saturation) measurement was an isolated measurement that occurred at a mid-elevation site, Site IS-9-GCC (Gerle Creek Canal inflow to Robbs Forebay), during the fall 2017 survey, when the water temperature was 6.7ºC.

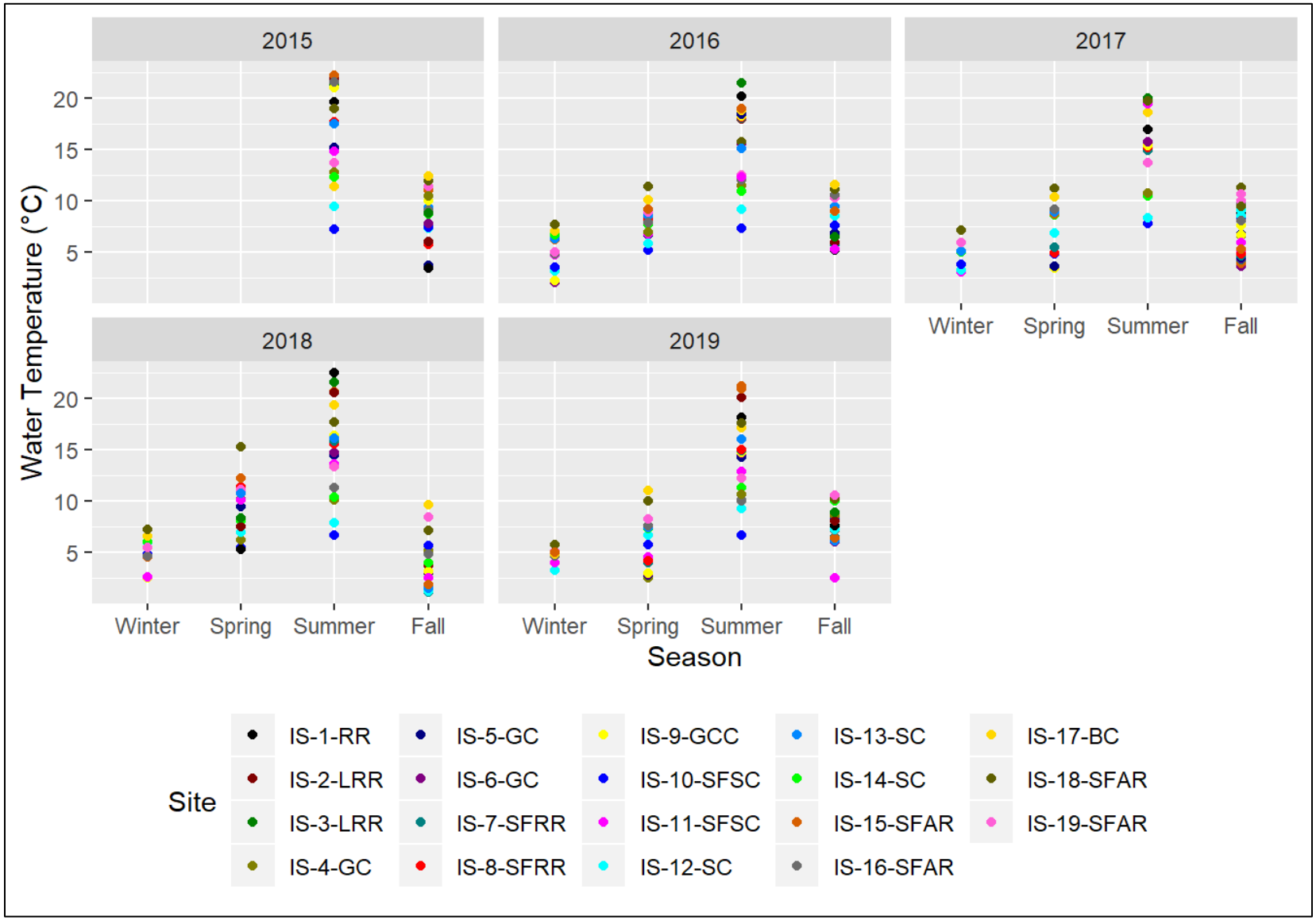

Figure 7-5. *In situ* water temperature at riverine monitoring sites, 2015–2019.

Figure 7-6. *In situ* dissolved oxygen (mg/L) at riverine monitoring sites, 2015−2019. Orange line indicates the 7 mg/L Basin Plan instantaneous minimum water quality objective for dissolved oxygen.

There was no obvious seasonal or water year pattern for the range of riverine dissolved oxygen % saturation (Figure 7-7). The majority of measurements were greater than 80% saturation (n=281 of 307, or 92% of total measurements). There was no obvious seasonal or water year pattern for the range of riverine pH (Figure 7-8). Of the 302 total pH measurements collected at riverine sites during the 2015−2019 monitoring period, 49 (16%) were below the Basin Plan instantaneous minimum pH objective of 6.5 s.u. and zero were above the Basin Plan instantaneous maximum pH objective of 8.5 s.u. The occasional low pH is likely due to the low buffering capacity characteristic of headwater reaches in granitic watersheds, whereby the relatively low weathering rates of the predominant geology (i.e., granite) results in low alkalinity (<17/mg/L across all sites in 2017; SMUD [2018]) and low hardness (<20 mg/L across all sites in 2017; SMUD [2018]) making the waters susceptible to pH decreases when naturally acidic inputs occur, such as snow melt, rainfall, and tannins from surrounding vegetation. The occasionally low pH measured during the 2015−2019 monitoring period may represent background conditions for the UARP watershed, particularly in the upper reaches of the study area. The 2015−2019 monitoring data are consistent with relicensing data from 2002–2004, when 25 of 221 riverine pH measurements (11%) were below 6.5 s.u., with most instances (21) occurring in the upper reaches of the study area (Devine Tarbell & Associates 2005).

Turbidity values were generally low (< 5 NTU) for all sites, seasons, and years, with few exceptions (Figure 7-9). Turbidity measurements at one site along South Fork Silver Creek (IS-11-SFSC), two sites along Silver Creek (IS-13-SC, IS-14-SC), two sites along the South Fork American River (IS-15-SFAR and IS-16-SFAR), one site along Brush Creek (IS-17-BC), and two sites along the South Fork American River (IS-18-SFAR, IS-19-SFAR) were occasionally high (10 to 295 NTU), which is likely due to increased runoff from the King Fire area that burned over 97,000 acres of land in El Dorado County, California, in mid-September to mid-October 2014. Over the 2015–2019 monitoring period, turbidity measurements grew progressively lower at these sites, and by 2019 the measurements were all below 12 NTU, consistent with revegetation and decreased erosion from the King Fire area over time.

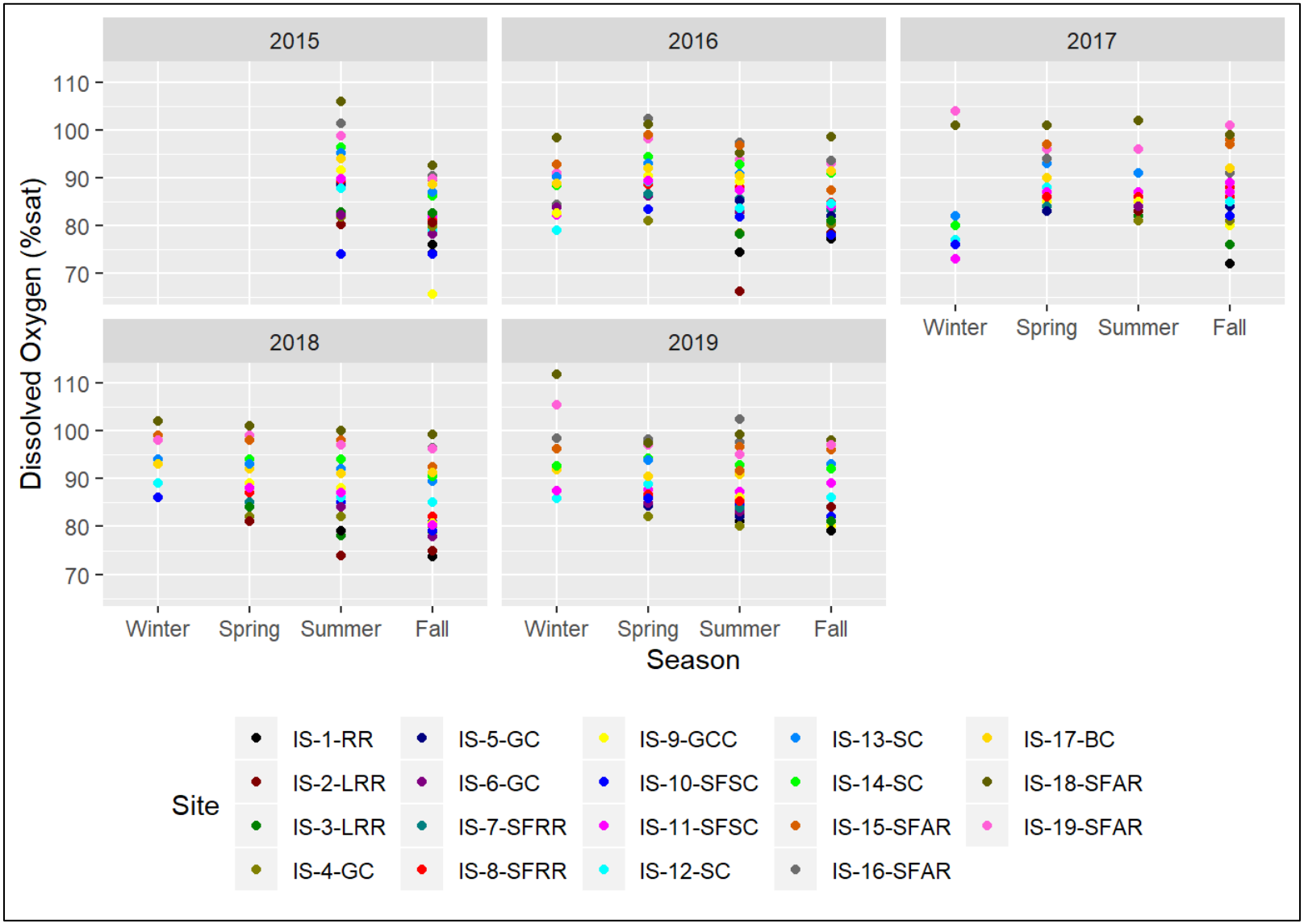

Figure 7-7. *In situ* dissolved oxygen (% saturation) at riverine monitoring sites, 2015−2019.

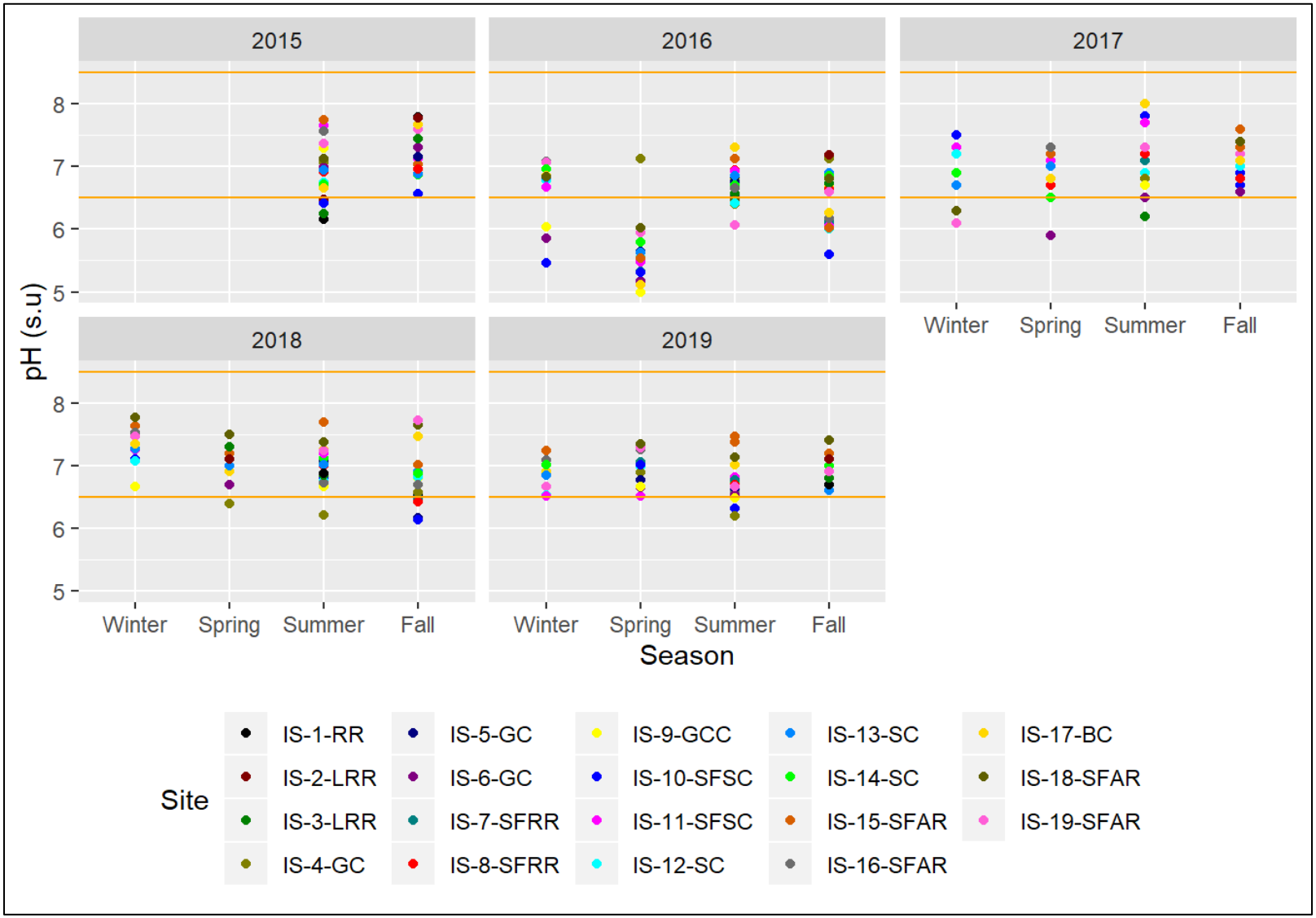

Figure 7-8. *In situ* pH at riverine monitoring sites, 2015−2019. Orange lines indicate the Basin Plan 6.5 s.u. instantaneous minimum and 8.5 s.u. instantaneous maximum water quality objectives for pH.

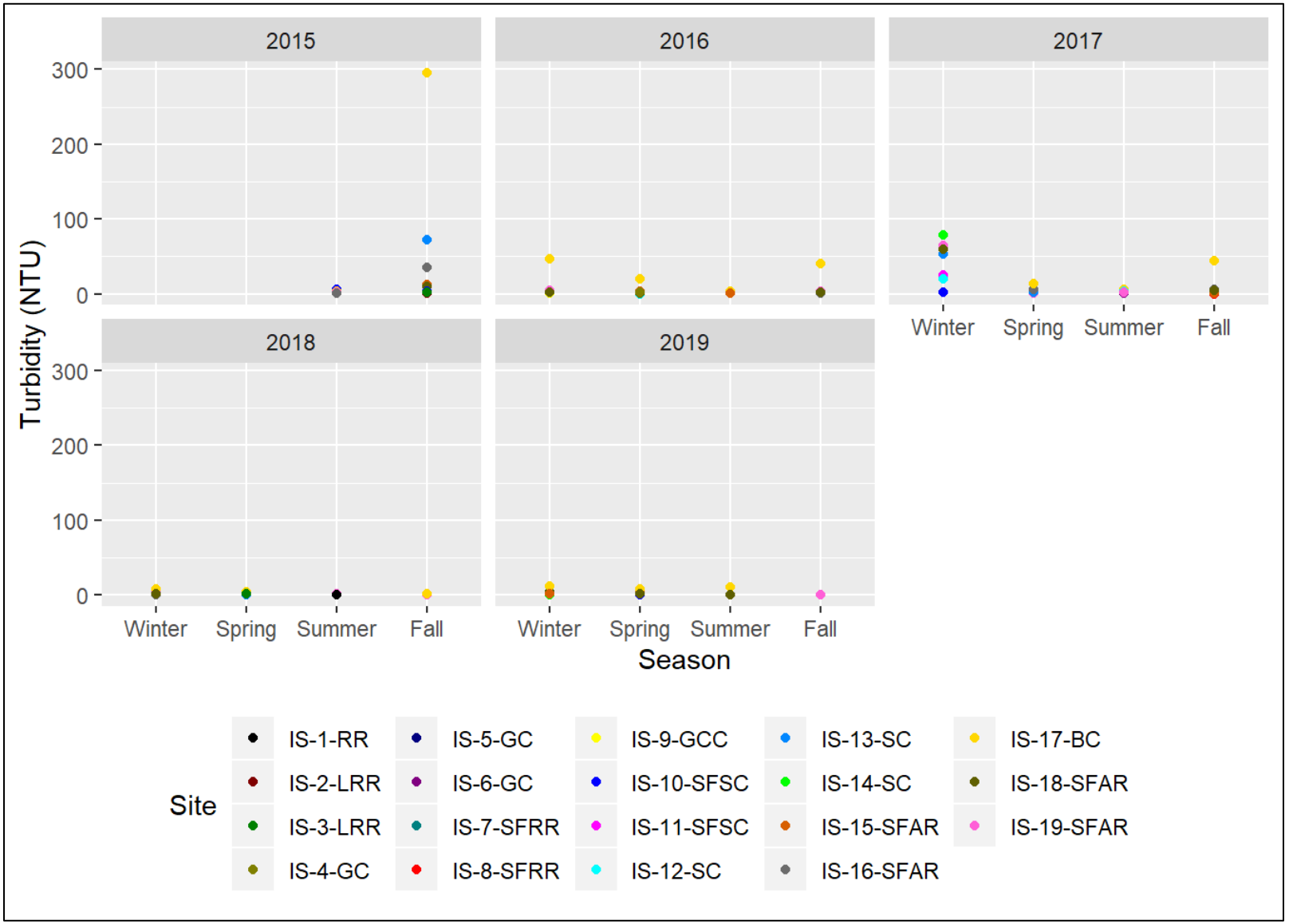

Figure 7-9. *In situ* turbidity at riverine monitoring sites, 2015–2019.

7.1.2. Reservoir Sites

Figure 7-10 and Figure 7-11 present *in situ* vertical profiles for dissolved oxygen (mg/L), water temperature, and pH by season for the 2015−2019 monitoring period for selected UARP reservoir sites that are representative of vertical profiles at other sites. Vertical profiles for all sites are presented in Appendix B, Figures B.2-1 to B.2-14. As noted in Section 5 of this report, *in situ* water quality parameters were collected as part of spring and fall *in situ* sampling events in all years, consistent with the Plan (SMUD 2016a). Water temperature, dissolved oxygen, and pH profiles in the medium-sized and smaller reservoirs, including Loon Lake, Gerle Creek, Junction Reservoir, Camino Reservoir, and Slab Creek Reservoir (Figure 7-10) did not consistently indicate the presence of a thermocline or a chemocline for either season. Water temperature, dissolved oxygen, and pH in these reservoirs remained generally constant with increasing depth, regardless of location in the reservoir (i.e., deeper sites near the dam behaved similarly to more shallow sites away from the dam). The larger and deeper Ice House and Union Valley reservoirs exhibited the onset of thermal stratification at approximately the same relatively shallow initial depths across years during the spring sampling period (Figure 7-11). In some years, the thermocline had descended through the water column by the fall sampling period. During late fall/early winter when stratification was still present, occasional *in situ* values were measured below the Basin Plan instantaneous minimum objectives for dissolved oxygen (5 mg/L) in the bottom waters of the deepest sites (i.e., sites nearest the dam). The deeper sites near Ice House and Union Valley dams exhibited the most consistent seasonal stratification patterns, with more shallow sites in the reservoir arms exhibiting similar vertical trends as the near-dam sites, albeit with occasional evidence of relatively more water column mixing given the less extensive water columns (Appendix B, Figures B.2-5 to B.2-11).

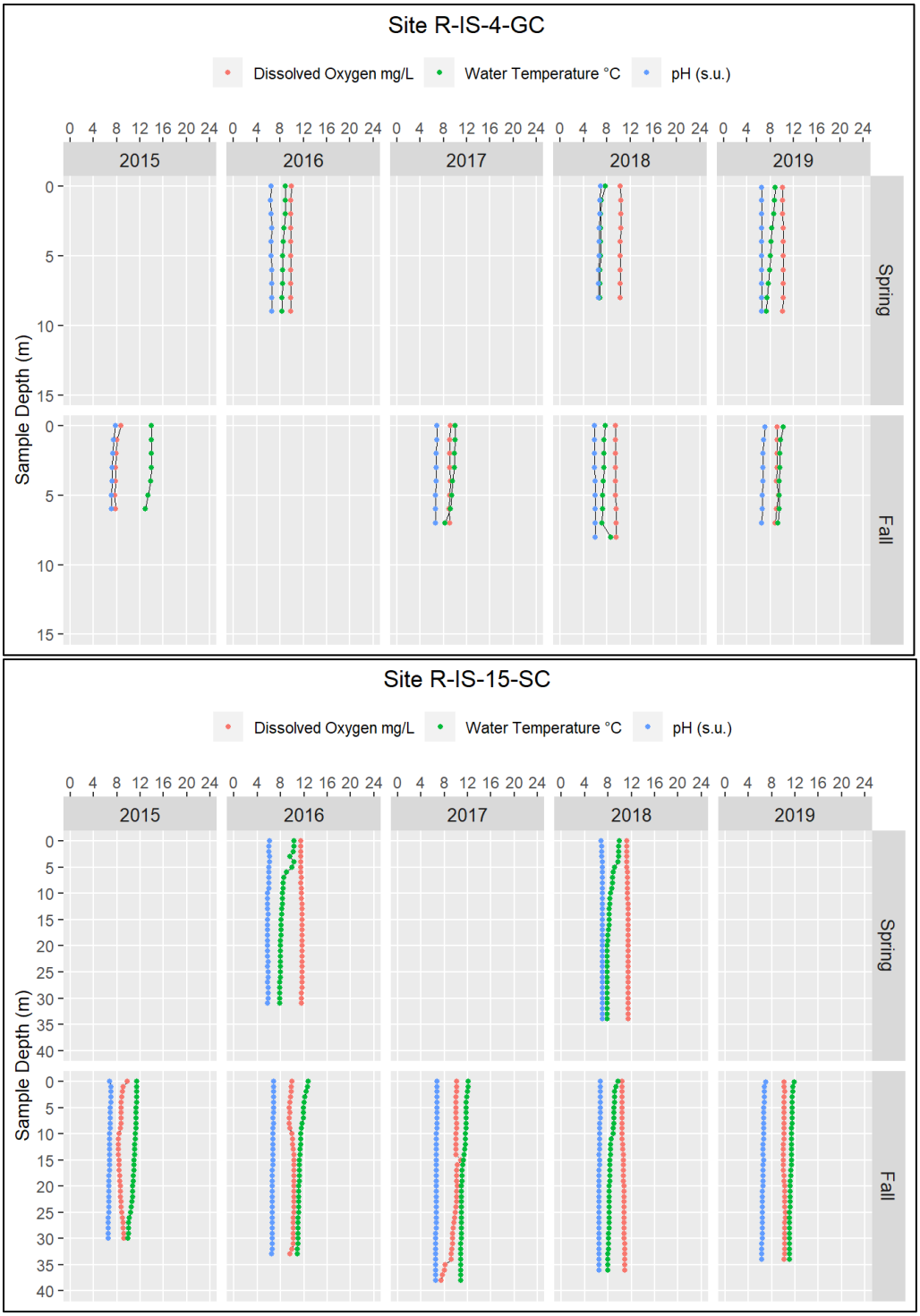

Figure 7-10. *In situ* dissolved oxygen, water temperature, and pH at Gerle Creek Reservoir and Slab Creek Reservoir sites R-IS-4-GC (top) and R-IS-15-SC (bottom) during 2015−2019.

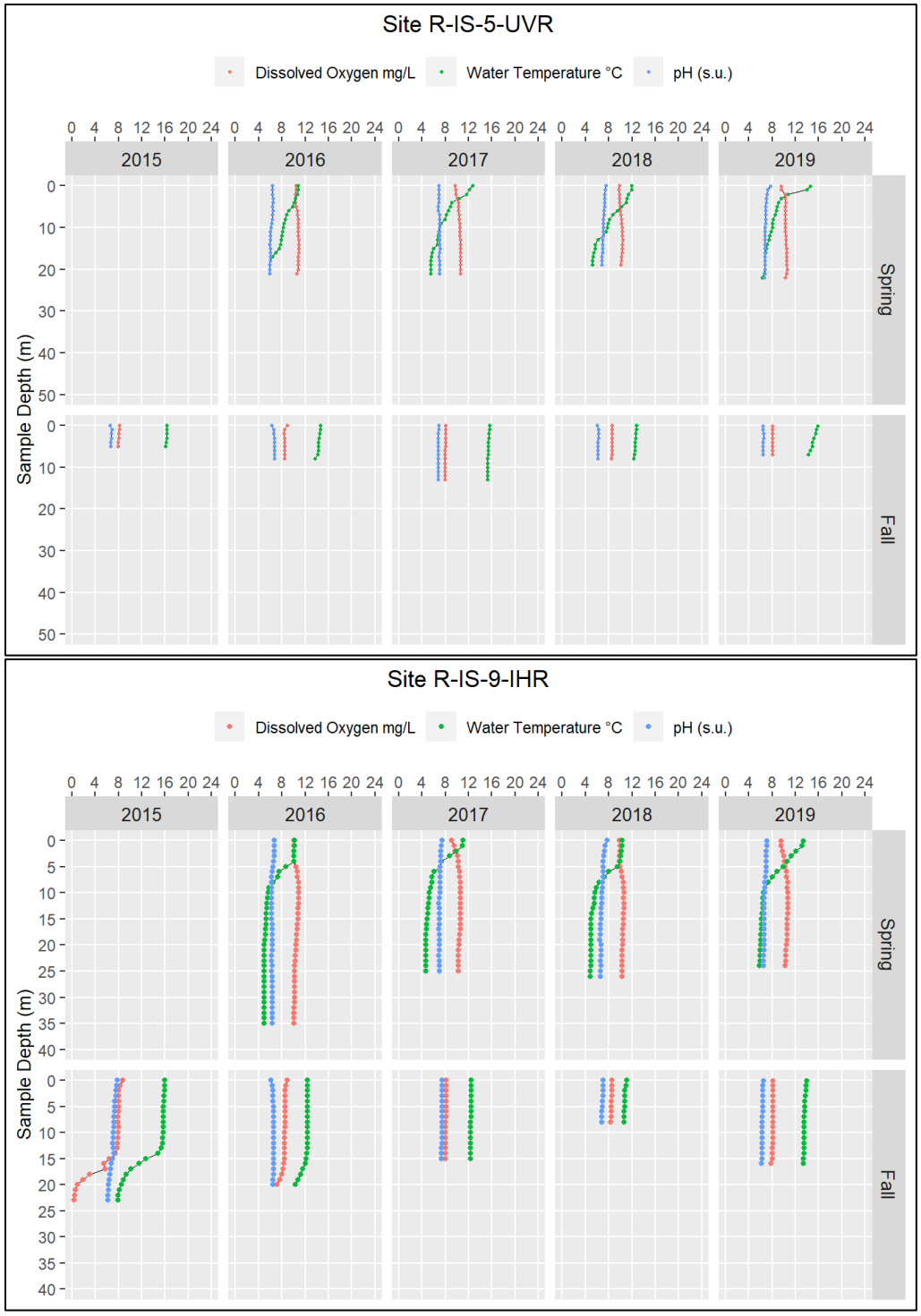

Figure 7-11. *In situ* dissolved oxygen, water temperature, and pH at Union Valley Reservoir and Ice House Reservoir sites R-IS-5-UVR (top) and R-IS-9-IHR (bottom) during 2015−2019.

7.2. GENERAL CHEMISTRY

General water chemistry monitoring was conducted at 19 representative stream reaches (Table 7-3, Figures 7-1 and 7-2) and 18 representative reservoir locations (Table 7-4, Figures 7-1 and 7-2) and in the spring, summer, fall, and late-fall of Year 3 (2017) of the monitoring program. General chemistry samples were analyzed for 52 separate chemical constituents, which were divided into four categories: miscellaneous, nutrients, trace elements, and standard minerals. Chemistry results were compared to the Sacramento and San Joaquin River Basin Plan Numerical Water Quality Objectives (BPWQOs) (CRWQCB 2016), the California Toxics Rule (CTR) standards (USEPA 2000), and US Environmental Protection Agency National Recommended Water Quality Criteria (NRWQC) (USEPA 1986), where applicable. Results were further assessed for potential trends with season, reservoir sampling depth, and longitudinal (i.e., upstream to downstream) movement of flow through the system. Inclusion of analytes in the trend analysis was predicated on the majority of results for the analyte of interest being above the analyte-specific method reporting limit (MRL). Seasonal analysis was performed by comparison of results across the four sampling periods (spring, summer, fall, and fall-winter). Depth analysis at reservoir sites was performed on a sample site basis and longitudinal flow analysis was assessed throughout two upstream to downstream flow transects. Transects originated at either Union Valley or Ice House reservoirs, with both terminating at IS-18-SFAR, the most downstream UARP riverine sampling site on the South Fork American River. General chemistry sampling and analytical methods are further detailed in SMUD (2018).

Table 7-3. General Chemistry Sampling Locations and Dates for SMUD Upper American River Project Riverine Sites.

SMUD Site Name	Site ID	Location	2017 General Chemistry Survey Sample Date
2	IS-1-RR	Rubicon River outflow from Rubicon Reservoir	8/9, 11/1
5	IS-2-LRR	Little Rubicon River outflow from Rockbound Lake	8/9, 11/1
6	IS-3-LRR	Little Rubicon outflow from Buck Island Lake	8/2, 11/1
7	IS-4-GC	Gerle Creek outflow from Loon Lake	8/17, 11/2, 11/16
14	IS-5-GC	Gerle Creek inflow to Gerle Creek Reservoir	5/3, 8/16, 11/2, 11/20
15	IS-6-GC	Gerle Creek outflow from Gerle Creek Reservoir	5/2, 8/17, 11/2, 11/20
18	IS-7-SFRR	S.F. Rubicon upstream of Gerle Creek confluence	5/2, 8/17, 11/7, 11/20
19	IS-8-SFRR	S.F. Rubicon downstream of Gerle Creek confluence	5/2, 8/17,11/7, 11/20
16	IS-9-GCC	Gerle Creek Canal inflow to Robbs Forebay	5/2, 8/17, 11/7, 11/16
25	IS-10-SFSC	S.F. Silver Creek outflow from Ice House	5/1, 8/10, 11/7, 11/16
27	IS-11-SFSC	S.F. Silver Creek inflow to Junction Reservoir	5/1, 8/15, 11/8, 11/20
29	IS-12-SC	Silver Creek outflow from Junction Reservoir	5/1, 8/16, 11/8, 11/20
32	IS-13-SC	Silver Creek inflow to Camino Reservoir	5/8, 8/15
34	IS-14-SC	Silver Creek outflow from Camino Reservoir	5/8, 8/15
38	IS-15-SFAR	South Fork American River (SFAR) upstream of Camino Powerhouse	5/8, 11/6, 11/28
41	IS-16-SFAR	SFAR downstream of Camino Powerhouse	5/8, 11/6, 11/28
40	IS-17-BC	Brush Creek outflow from Brush Creek Reservoir	5/8, 8/14, 11/28
60	IS-18-SFAR	SFAR upstream of White Rock Powerhouse	5/3, 8/16, 11/6, 11/29
43	IS-19-SFAR	SFAR downstream of Slab Creek Reservoir	5/3, 8/21, 11/7, 11/27

Table 7-4. General Chemistry Sampling Locations and Dates for SMUD Upper American River Project Reservoir Sites.

SMUD Site Name	Site ID	Location	2017 General Chemistry Survey Sample Date
R-4C	R-IS-1-LL	Loon Lake, upper reservoir (northeast body)	8/7, 10/25, 11/14
R-4B	R-IS-2-LL	Loon Lake, mid-reservoir (west body)	8/7, 10/25, 11/14
R-4A	R-IS-3-LL	Loon Lake, near dam	7/31, 10/25, 11/14
R-5	R-IS-4-GC	Gerle Creek Reservoir, mid-reservoir	8/16, 11/2, 11/21
R-6C	R-IS-5-UVR	Union Valley Reservoir, Robbs PH tailrace zone	5/10, 8/8, 10/24, 11/15
R-6D	R-IS-6-UVR	Union Valley Reservoir, Jones Fork Silver Creek arm	5/10, 8/8, 10/24, 11/15
R-6B	R-IS-7-UVR	Union Valley Reservoir, mid-reservoir	5/10, 8/8, 10/24, 11/15
R-6A	R-IS-8-UVR	Union Valley Reservoir, near dam	5/11, 8/8, 10/24, 11/15
R-7C	R-IS-9-IHR	Ice House Reservoir, upper lake body	5/9, 8/10, 10/23, 11/13
R-7B	R-IS-10-IHR	Ice House Reservoir, mid-reservoir	5/9, 8/10, 10/23, 11/13
R-7A	R-IS-11-IHR	Ice House Reservoir, near dam	5/9, 8/10, 10/23, 11/13
R-8	R-IS-12-JR	Junction Reservoir, mid-reservoir between arms	8/15, 11/2, 11/21
R-9	R-IS-13-CR	Camino Reservoir, mid-reservoir	8/15
	R-IS-20-BC	Brush Creek Reservoir, near dam	5/11, 8/14, 11/28
R-11B	R-IS-14-SC	Slab Creek Reservoir, upper reservoir	8/3, 10/30, 11/27
R-11A	R-IS-15-SC	Slab Creek Reservoir, mid-reservoir	8/3, 10/30, 11/27
	R-IS-18-RR	Rubicon Reservoir, mid-reservoir	8/9, 10/31
	R-IS-19-BI	Buck Island Reservoir, mid-reservoir	8/2, 10/18

The 2017 general chemistry monitoring results indicated that riverine and reservoir water quality in the UARP study area generally met water quality criteria, with a small number of exceedances of the National Recommended Water Quality Criteria (NRWQC), Basin Plan Water Quality Objectives (BPWQOs), and/or the California Toxics Rule (CTR) standards. Suspended and dissolved solids, total organic carbon (TOC), fuels and oils, nutrients, and total alkalinity were low and there were no exceedances of water quality standards. Hardness was also very low (< 17 mg/L) at all sites, resulting in low acute and chronic hardness-dependent criteria for associated metals and occasional exceedances. Despite this, across a total of 2,693 analyte records for riverine samples, there were only 29 instances of exceedances (1%). Across a total of 3,368 analyte records for reservoir samples, there were only 31 instances of exceedances (0.9%) (Tables 7-5 and Table 7-6). Trace elements (aluminum, cadmium, copper, iron, lead, manganese, mercury, silver, zinc) accounted for all exceedances of water quality criteria during riverine and reservoir sampling.

Table 7-5. Exceedances of Water Quality Standards Observed During 2017 UARP General Chemistry Riverine Sampling Events.

Site ID	Total Aluminum (ug/L)	Total Cadmium (ug/L)	Dissolved Cadmium (ug/L)	Total Copper (ug/L)	Total Iron (ug/L)	Manganese (ug/L)	Total Silver (ug/L)[1]	Dissolved Silver (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)
Water Quality Standards										
NRWQC	750	0.14	NA	NA	1,000	50	0.03	NA	12	NA
BPWQO	NA	5.0	NA	1.0	300	50	NA	NA	NA	NA
CTR	NA	0.29	NA	1.0	NA	NA	0.03	NA	12	NA
May (Spring)										
IS-10-SFSC	--	--	--	--	--	--	0.82	--	--	--
IS-11-SFSC	--	--	--	--	--	--	1.3	--	--	--
IS-12-SC	--	--	--	--	--	--	1.1	--	--	--
IS-17-BC	--	--	--	--	400	80	--	--	--	--
August (Summer)										
IS-3-LRR	--	--	--	--	--	--	--	0.28[2,3,J]	--	--
IS-6-GC	--	--	--	--	--	--	--	0.15[2,3,J]	--	--
IS-18-SFAR	--	--	--	--	--	--	--	0.17[2,3,J]	--	--
November (Fall)										
IS-2-LRR	--	--	--	--	--	--	0.07[J]	0.26[2,3,J]	--	--
IS-7-SFRR	--	--	--	--	--	--	0.18[J]	--	--	--
IS-8-SFRR	--	--	--	--	--	--	0.24[J]	--	--	--
IS-9-GCC	--	--	--	--	--	--	0.34[J]	--	--	--
IS-10-SFSC	--	--	--	--	390	160	0.23[J]	--	--	--
IS-11-SFSC	--	--	--	--	--	--	0.12[J]	--	--	--
IS-19-SFAR	--	--	--	--	--	--	0.16[J]	--	--	--

Site ID	Total Aluminum (ug/L)	Total Cadmium (ug/L)	Dissolved Cadmium (ug/L)	Total Copper (ug/L)	Total Iron (ug/L)	Manganese (ug/L)	Total Silver (ug/L)[1]	Dissolved Silver (ug/L)	Total Zinc (ug/L)	Dissolved Zinc (ug/L)
Late-November (Fall-Winter)										
IS-4-GC	--	0.27	0.14[1]	2.66[FB]	--	--	--	--	23.6	17.8[1]
IS-10-SFSC	--	--	--	--	450	200	--	--	--	--
IS-16-SFAR	--	--	--	--	--	64	--	--	--	--
IS-17-BC	2,400	--	--	--	2,400	76	--	--	--	--

ug/L = micrograms per liter
NA = Not applicable
NRWQC = National Recommended Water Quality Criteria (USEPA 1986)
BPWQO = Basin Plan Water Quality Objectives (CRWQCB 2016)
CTR = California Toxics Rule (USEPA 2000)
-- = No exceedance observed
[1] Note that the MDL for total silver is 0.07 ug/L, which is greater than the NWRQC and CTR criteria
[2] Exceeds USEPA National Recommended Water Quality Criteria, hardness dependent acute and/or chronic criteria (USEPA 2017) (Appendix C, Tables C-9 through C-12)
[3] Dissolved fraction is greater than total fraction, which may be a result of reporting near the detection limit
[J] Result falls between method detection limit and reporting limit
FB = Field Blank was greater than the MDL for this analyte. Field blank for Late November (Fall-Winter) riverine and reservoir sampling events corresponded to sample “IS-8-SFRR-FBL”

Table 7-6. Exceedances of Water Quality Standards Observed During 2017 UARP General Chemistry Reservoir Sampling Events.

Site ID	Total Aluminum (ug/L)	Total Cadmium (ug/L)	Total Copper (ug/L)	Total Iron (ug/L)	Total Lead (ug/L)	Manganese (ug/L)	Total Mercury (ng/L)	Total Silver (ug/L)[1]	Dissolved Silver (ug/L)	Total Zinc (ug/L)
Water Quality Standards										
NRWQC	750	0.14	NA	1,000	3	50	1,400	0.03	NA	12
BPWQO	NA	5.0	1.0	300	15	50	NA	NA	NA	NA
CTR	NA	0.29	1.0	NA	3	NA	50	0.03	NA	12
May (Spring)										
R-IS-8-UVR-BOT	1,200	--	--	790	--	66	--	--	--	
August (Summer)										
R-IS-1-LL-BOT	--	--	1.09	510	--	--	--	--	--	--
R-IS-9-IHR-BOT	--	--	2.1	--	--	--	--	--	--	--
R-IS-14-SC-SUR	--	--	--	--	--	--	--	--	0.28[2,3,J]	--
R-IS-14-SC-BOT	--	--	1.35	--	--	--	--	--	0.25[2,3,J]	--
R-IS-15-SC-SUR	--	--	--	--	--	--	--	--	0.26[2,3,J]	--
R-IS-15-SC-BOT	--	--	--	--	--	--	--	--	--	--
R-IS-19-BI-SUR	--	--	--	--	--	--	--	--	0.25[2,3,J]	--
R-IS-19-BI-BOT	--	0.22	4.18	650	5.84	--	96.3	--	0.28[2,3,J]	17.3
R-IS-20-BR-BOT	--	--	--	--	--	180	--	--	--	--
October-November (Fall)										
R-IS-1-LL-SUR	--	--	--	--	--	--	--	0.08[J]	--	--
R-IS-2-LL-SUR	--	--	--	--	--	--	--	0.09[J]	--	--
R-IS-11-IHR-BOT	1,300	--	--	1,400	--	120	--	--	--	--
R-IS-19-BI-SUR	--	--	--	--	--	--	--	--	0.29[2,3,J]	--

Site ID	Total Aluminum (ug/L)	Total Cadmium (ug/L)	Total Copper (ug/L)	Total Iron (ug/L)	Total Lead (ug/L)	Manganese (ug/L)	Total Mercury (ng/L)	Total Silver (ug/L)[1]	Dissolved Silver (ug/L)	Total Zinc (ug/L)
Late-November (Fall-Winter)										
R-IS-5-UVR-SUR	--	--	--	--	--	--	--	0.11[J]	--	--
R-IS-6-UVR-SUR	--	--	--	--	--	--	--	--	0.18[2,3,J]	--
R-IS-14-SC-SUR	850	--	--	650	--	--	--	--	--	--
R-IS-20-BR-SUR	2,200	--	--	2,100	--	--	--	--	--	--

ng/L = nanograms per liter
ug/L = micrograms per liter
NA = Not applicable
NRWQC = National Recommended Water Quality Criteria (USEPA 1986)
BPWQO = Basin Plan Water Quality Objectives (CRWQCB 2016)
CTR = California Toxics Rule (USEPA 2000)
-- = No exceedance observed
[1] Note that the MDL for total silver is 0.07 ug/L, which is greater than the NWRQC and CTR criteria
[2] Exceeds USEPA National Recommended Water Quality Criteria, hardness dependent acute and/or chronic criteria (USEPA 2017) (Appendix C, Tables C-9 through C-12)
[3] Dissolved fraction is greater than total fraction, which may be a result of reporting near the detection limit
[J] Result falls between method detection limit and reporting limit

There were several analytes that exhibited seasonal, reservoir depth, or riverine longitudinal (i.e., upstream to downstream) flow trends. The most pronounced seasonal trends were observed for total mercury and TOC. Total mercury concentrations in surface water samples (reservoir and riverine) were generally low (< 2 ng/L) and were relatively higher during Spring and Fall-Winter sampling events, which may have been due to increased runoff and elevated flows during these seasons (Figure 7-12). Total mercury concentrations in reservoir bottom water samples were slightly higher during the spring and summer sampling events; however, a greater number of bottom samples were collected during these seasons due to thermal stratification in several UARP reservoirs, so confirmation of a trend in bottom water concentrations cannot be discerned from the available data. TOC in surface water samples decreased slightly from the Spring to Fall-Winter seasons, with increases observed with distance downstream for a given season (Figure 7-13). Differences in analyte concentrations with depth were observed for dissolved metals aluminum and zinc. Reservoir bottom water samples for both analytes were higher compared to surface water samples (reservoir and riverine) at multiple sites and in various seasons throughout the year (Figure 7-14 and 7-15). Longitudinal flow trends were observed for bicarbonate, copper, total alkalinity, and total hardness in multiple, but not all, seasons. When a longitudinal trend was apparent, concentrations tended to increase with distance downstream; an example of this trend for the analyte bicarbonate (as $CaCO_3$) is presented in Figure 7-16.

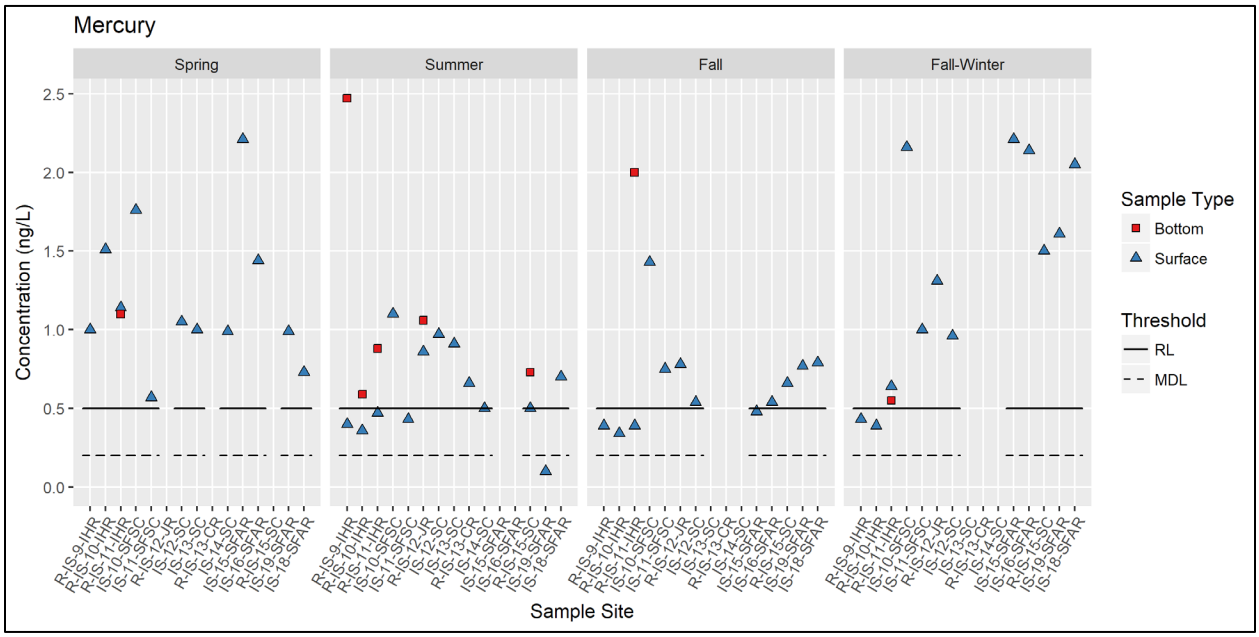

Figure 7-12. Total mercury results for transect R-IS-9-IHR through IS-18-SFAR by survey during 2017 UARP general chemistry sampling events.

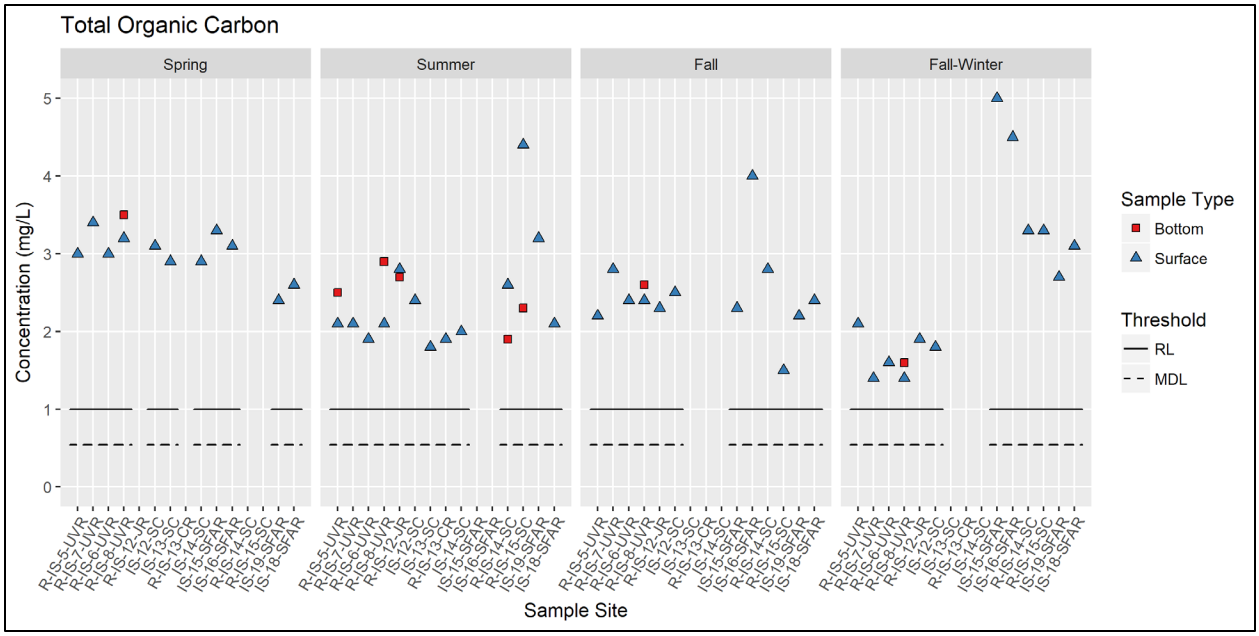

Figure 7-13. Total organic carbon (TOC) results for transect R-IS-5-UVR through IS-18-SFAR by survey during 2017 UARP general chemistry sampling events.

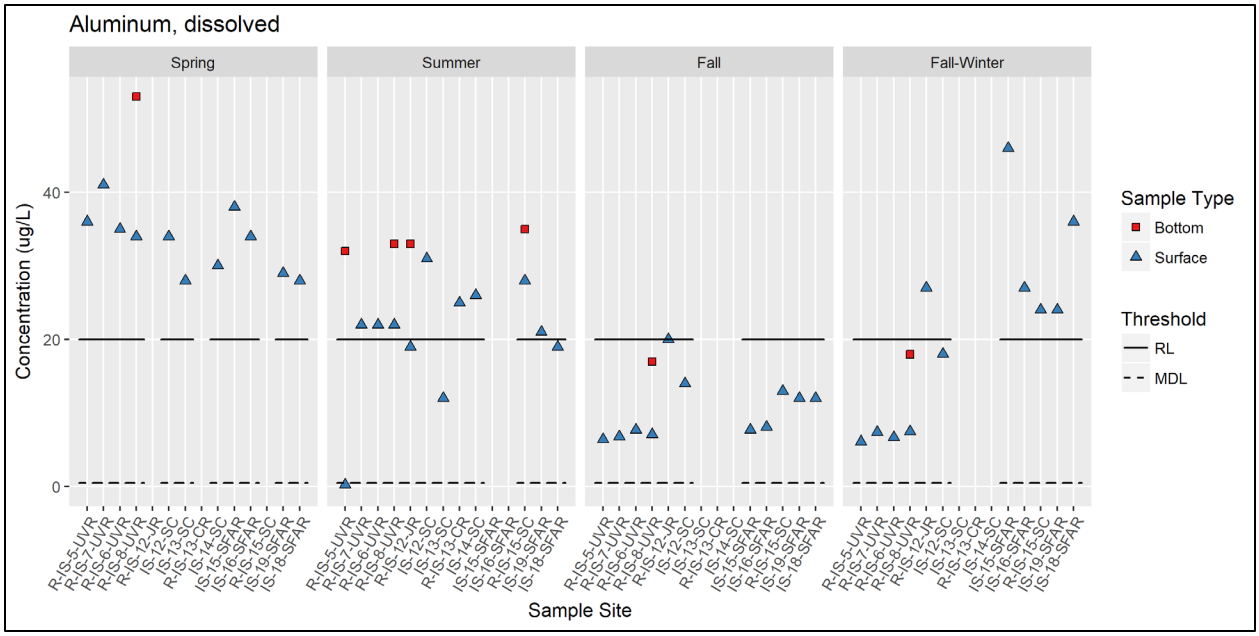

Figure 7-14. Dissolved aluminum results for transect R-IS-5-UVR through IS-18-SFAR by survey during 2017 UARP general chemistry sampling events.

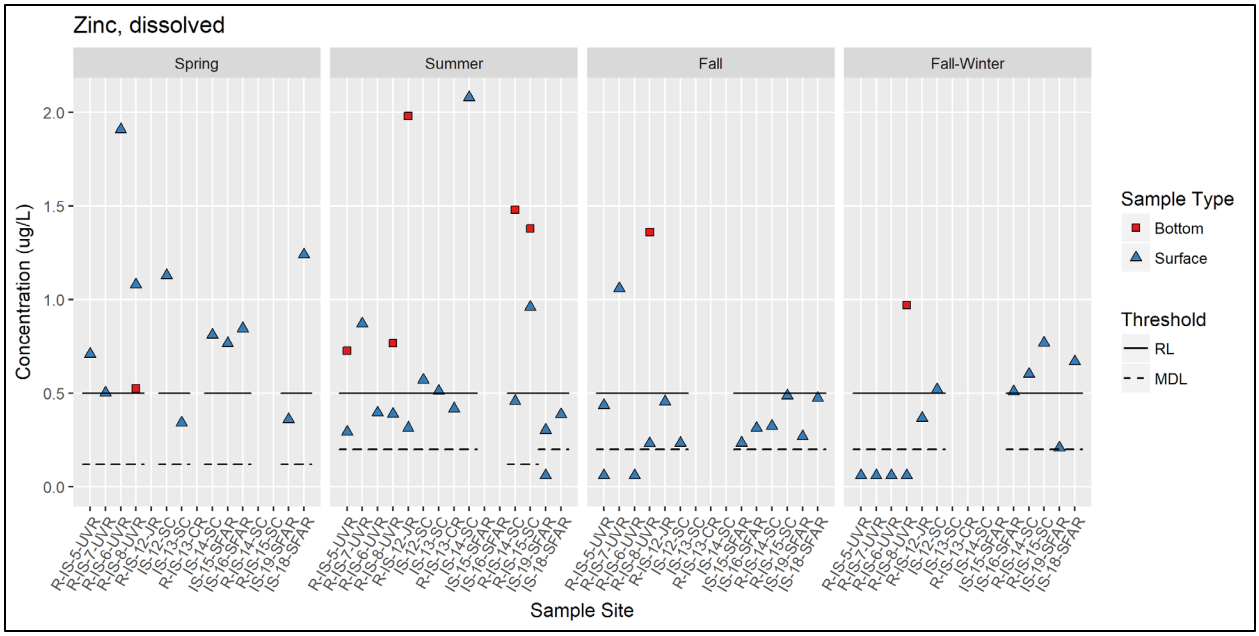

Figure 7-15. Dissolved zinc results for transect R-IS-5-UVR through IS-18-SFAR by survey during 2017 UARP general chemistry sampling events.

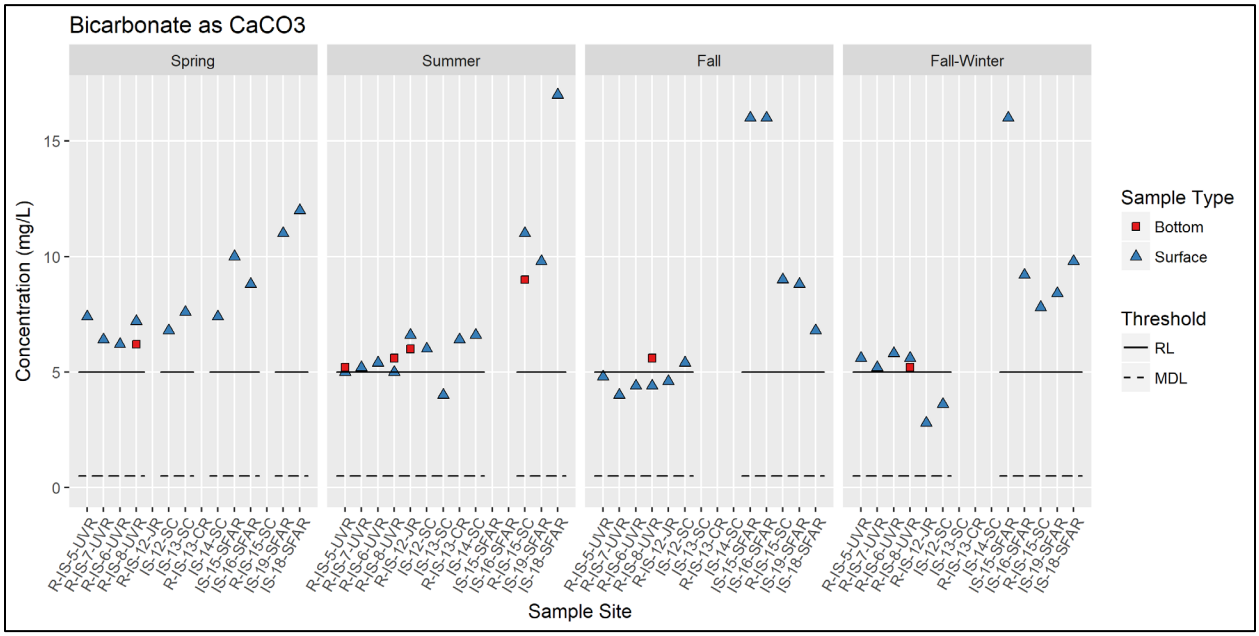

Figure 7-16. Bicarbonate as $CaCO_3$ results for transect R-IS-5-UVR through IS-18-SFAR by survey during 2017 UARP general chemistry sampling events.

7.3. BACTERIA

Bacteria monitoring for fecal coliform and *E. coli* at UARP sites was conducted during each year of the 2015−2019 monitoring period. Bacteria sampling occurred at 15 locations (Figure 4-1 and Figure 4-2, Table 4-6), including locations at the middle elevation UARP reservoir sites (Gerle Creek, Union Valley, Junction, Ice House, Brush Creek, Slab Creek) during the 30-day period surrounding 4th of July, and locations at the upper elevation UARP reservoir sites (Loon Lake, Buck Island) during the 30-day period surrounding Labor Day. Bacteria sampling methods are presented in Section 5.2 of this report, as well as in SMUD (2016b, 2017, 2018, 2019).

Of the 15 locations monitored for fecal coliform and *E. coli* during the 2015−2019 period, none exhibited exceedances of the Basin Plan objective of 200 MPN/100 mL as a geometric mean of five samples collected over 30 days. The following 10 locations (67% of total locations) also exhibited no exceedances of Basin Plan fecal coliform objectives (instantaneous maximum of 400 MPN/100 mL, geometric mean of 200 MPN/100 mL from five samples collected over a 30 day period) for protection of REC-1 designated waters: Bac-1-BI, Bac-2-BI, Bac-3-LL, Bac-4-LL, Bac-5-GCR, Bac-6-GCR, Bac-8-UVR, Bac-9-UVR, Bac-12-IHR, and Bac-14-BCR.

Overall, there were no perceivable site-specific trends across years in either fecal coliform or *E. coli* counts over the five year monitoring period (Figure 7-17). However, all exceedences of the Basin Plan instantaneous maximum objective of 400 MPN/100 mL for fecal coliform occurred during the wet years of 2017 and 2019. Higher fecal coliform counts at some sites during the Independence Day sampling events in 2017 and 2019 coincided with wet water years, which could be the result of generally higher levels of runoff transporting bacteria in association with suspended materials during wetter water years.

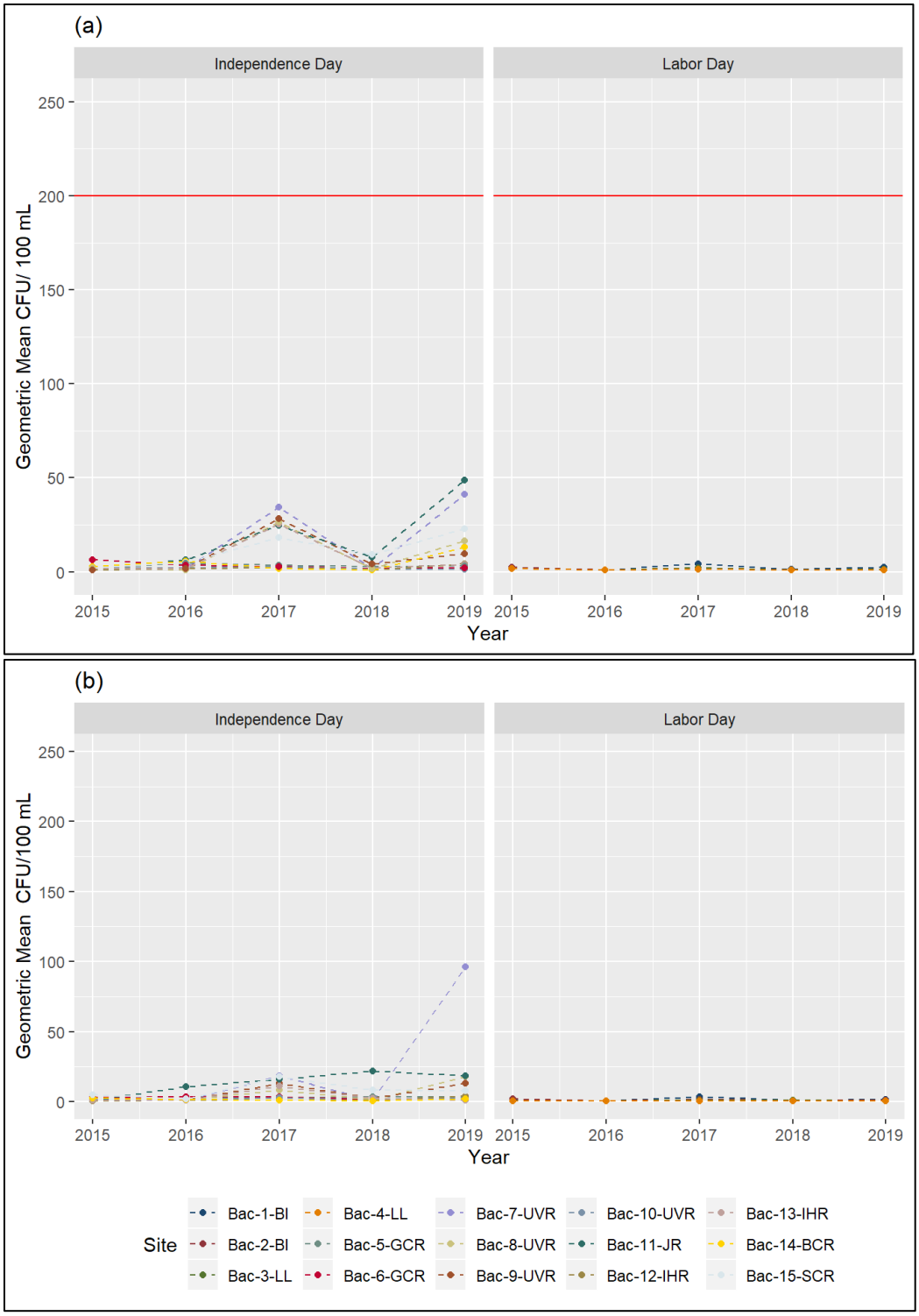

Figure 7-17. Geometric means counts of (a) fecal coliform and (b) *E. coli*, during the period 2015-2019. The red line denotes the Basin Plan objective of 200 MPN/100 mL, as a geometric mean of five samples collected over 30 days, for the recreational water contact (REC-1) designated beneficial use.

7.4. METALS BIOACCUMULATION

Metals bioaccumulation monitoring was conducted during Year 2 (2016) of the monitoring program to assess potential bioaccumulation of metals in resident fish within specific UARP reservoirs. Fish tissue samples were collected by the California Department of Fish and Wildlife (CDFW) on August 29, 2016 and analyzed at their Marine Pollution Studies Laboratories at Moss Landing, in accordance with protocols of the SWRCB Surface Water Ambient Monitoring Program (SWAMP). Sampling occurred in six UARP reservoirs consistent with the Plan (SMUD 2016a) (Figures 7-3 and 7-4, Table 7-7). Sampling and analytical methods are detailed in SMUD (2016b).

Table 7-7. Metals Bioaccumulation Sampling Locations and Dates for SMUD Upper American River Project Reservoir Sites.

Reservoir	SMUD Site Name	Site ID	Locations[1]	2016 Sample Dates
Loon Lake Reservoir	80	M-1-LL	Various	8/30
Gerle Creek Reservoir	81	M-1-GCR	Various	8/31
Union Valley Reservoir[2]	82	M-1-UVR	Various	8/30, 9/1
Ice House Reservoir	83	M-1-IHR	Various	8/29
Camino Reservoir	84	M-1-CR	Various	8/30
Slab Creek Reservoir	85	M-1-SCR	Various	8/31

Metals bioaccumulation data for UARP reservoirs are presented in Table 7-8 and Figures 7-18 and 7-19. Results indicated that all sampled reservoirs contained fish tissue mercury concentrations that were greater than the most protective Office of Environmental Health Hazard Assessment (OEHHA) Advisory Tissue Level (ATL) (0.07 ug/g wet weight [ww]); no fish tissue samples were greater than the next most protective ATL of 0.44 ug/g ww[1]. The percentage of captured fish with total mercury concentrations exceeding OEHHA's ATL of 0.07 ug/g methylmercury ranged from 7% at Camino Reservoir to 65% at Slab Creek Reservoir. The highest average mercury concentration across all species and sampled reservoirs occurred in brown trout, particularly those from Ice House Reservoir (0.409 ug/g ww) and Loon Lake Reservoir (0.322 ug/g ww). Smallmouth bass had the highest individual mercury concentration (0.713 ug/g ww) and averaged 0.219 ug/g ww; all smallmouth bass specimens were captured at Union Valley Reservoir. Rainbow trout were captured at Loon Lake Reservoir, Union Valley Reservoir, Ice House Reservoir, and Slab Creek Reservoir, and average mercury concentrations ranged from 0.015 ug/g ww at Loon Lake Reservoir to 0.032 ug/g ww at Slab Creek Reservoir. Average mercury concentrations for other species sampled for metals bioaccumulation were 0.116 ug/g ww for kokanee (Union Valley Reservoir, 0.110 ug/g ww for lake trout (Union Valley

[1] OEHHA's two most protective methylmercury ATLs include (Klasing and Brodberg 2008):
- 0.070 ug/g wet weight − OEHHA would begin to consider advising children and women of child-bearing age to limit consumption to fewer than eight meals per month;
- 0.44 ug/g wet weight − OEHHA may recommend no consumption by children and women of child-bearing age.

Reservoir), 0.039 ug/g ww for Lahontan cutthroat trout (Camino Reservoir), and 0.251 ug/g ww for Sacramento pikeminnow (Slab Creek Reservoir) (Table 7-8).

Copper concentrations varied depending on location and species, but all were less than 0.35 ug/g wet weight. Lead and silver concentrations were generally near or below the method detection limits (<0.002 ug/g wet weight and <0.003 ug/g wet weight, respectively) (Table 7-8). There are no existing advisory levels for copper, lead, or silver.

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Table 7-8. Fish Tissue Metals Concentrations in UARP Reservoirs.

Location	Species Common Name	2016 Sampling Date	Number of Fish Sampled	Mercury (Hg) (ug/g ww)				Copper (Cu) (ug/g ww)			Lead (Pb) (ug/g ww)			Silver (Ag) (ug/g ww)		
				Range		Avg[1]	ATL[2]	Range		Avg [1]	Range		Avg [1]	Range		Avg [1]
Loon Lake Reservoir (M-1-LL)	rainbow trout	8/30	4	0.012	0.018	0.015	0.07/ 0.44	0.140	0.190	0.155	< 0.002	0.015	0.012	< 0.003	< 0.003	0.002
	brown trout		3	0.206	0.416	0.322		0.150	0.220	0.180	< 0.002	0.003	0.004	< 0.003	< 0.003	0.002
Gerle Creek Reservoir (M-1-GCR)	brown trout	8/31	14	0.029	0.171	0.067		0.130	0.320	0.209	< 0.002	0.011	0.031	< 0.003	< 0.003	0.002
Union Valley Reservoir (M-1-UVR)	smallmouth bass	8/30, 8/31, 9/1	10	0.076	0.713	0.219		0.120	0.200	0.156	< 0.002	0.004	0.003	< 0.003	< 0.003	0.002
	rainbow trout		18	0.011	0.049	0.017		0.140	0.250	0.182	< 0.002	0.018	0.008	< 0.003	< 0.003	0.002
	kokanee		4	0.068	0.247	0.116		0.230	0.280	0.260	< 0.002	< 0.002	0.001	< 0.003	< 0.003	0.002
	brown trout		1	0.145	0.145	0.145		0.260	0.260	0.260	< 0.002	< 0.002	0.001	< 0.003	< 0.003	0.002
	lake trout		5	0.053	0.202	0.110		0.200	0.320	0.244	< 0.002	0.017	0.023	< 0.003	< 0.003	0.002
Ice House Reservoir (M-1-IHR)	rainbow trout	8/28	5	0.013	0.042	0.030		0.200	0.240	0.216	< 0.002	< 0.002	0.001	< 0.003	< 0.003	0.002
	brown trout		3	0.255	0.585	0.409		0.180	0.240	0.203	< 0.002	0.015	0.021	< 0.003	< 0.003	0.002
Camino Reservoir (M-1-CR)	Lahontan cutthroat trout	8/30	3	0.029	0.045	0.039		0.160	0.190	0.173	< 0.002	< 0.002	0.001	< 0.003	< 0.003	0.002
	brown trout		10	0.034	0.092	0.047		0.150	0.270	0.216	< 0.002	0.017	0.008	< 0.003	< 0.003	0.002
Slab Creek Reservoir (M-1-SCR)	rainbow trout	8/31	4	0.025	0.036	0.032		0.200	0.300	0.240	< 0.002	0.005	0.006	< 0.003	< 0.003	0.002
	Sacramento pikeminnow		7	0.125	0.516	0.251		0.110	0.260	0.160	< 0.002	< 0.002	0.001	< 0.003	< 0.003	0.002
	brown trout		4	0.046	0.406	0.211		0.200	0.210	0.205	< 0.002	< 0.002	0.001	< 0.003	< 0.003	0.002

ATL = Advisory Tissue Level
ug/g = microgram per gram
ww = wet weight
dw= dry weight
[1] Results <MDL were treated as 0.5 x MDL for the calculation of averages.
[2] At 0.070 ug/g ww OEHHA would begin to consider advising children and women of child-bearing age to limit consumption to fewer than either meals per month, and at 0.44 ug/g ww OEHHA may recommend no consumption by children and women of child bearing age (Klasing and Brodberg 2008).

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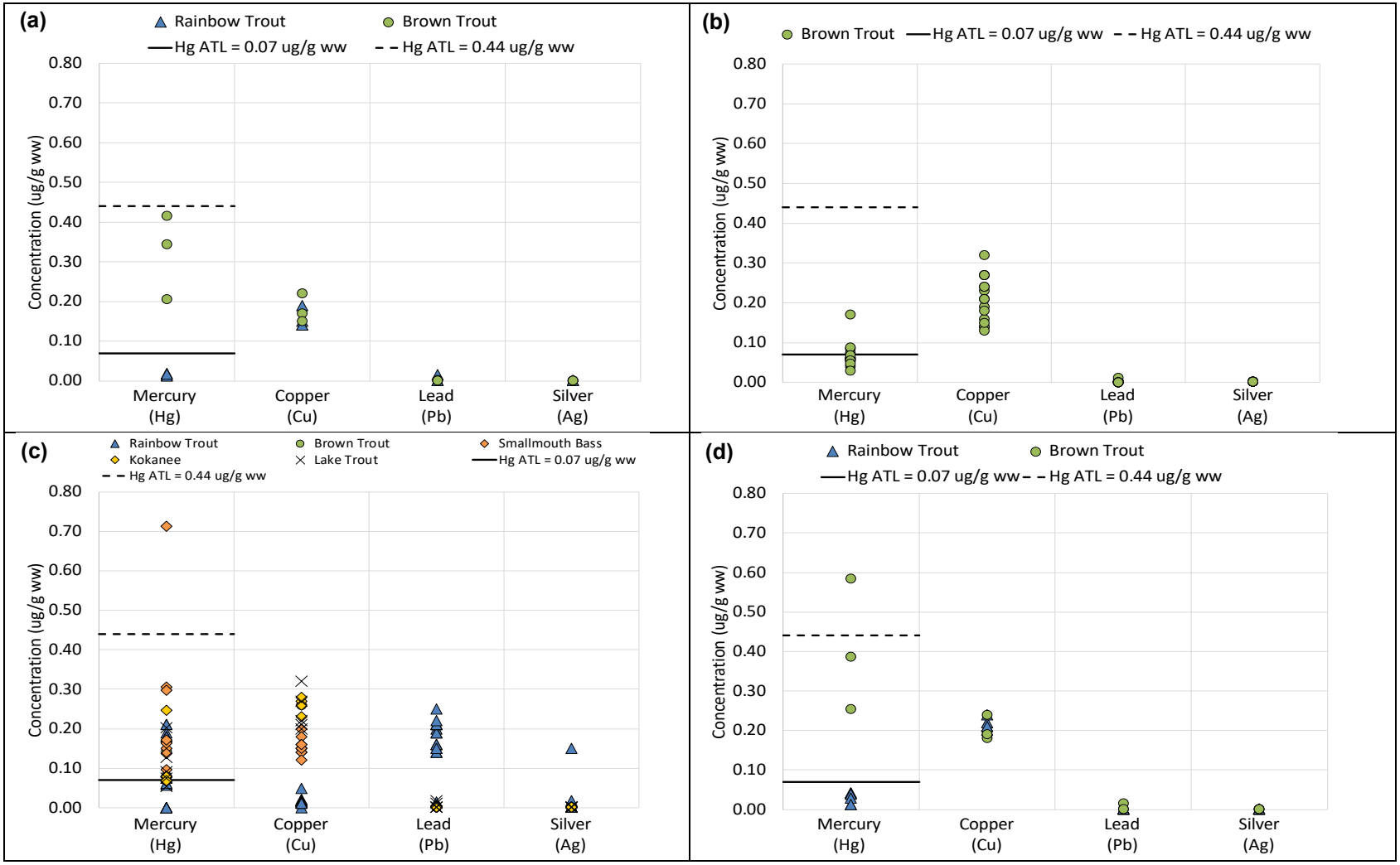

Figure 7-18. Fish tissue metals concentrations in (a) Loon Lake Reservoir, (b) Gerle Creek Reservoir, (c) Union Valley Reservoir and (d) Ice House Reservoir during August and September 2016.

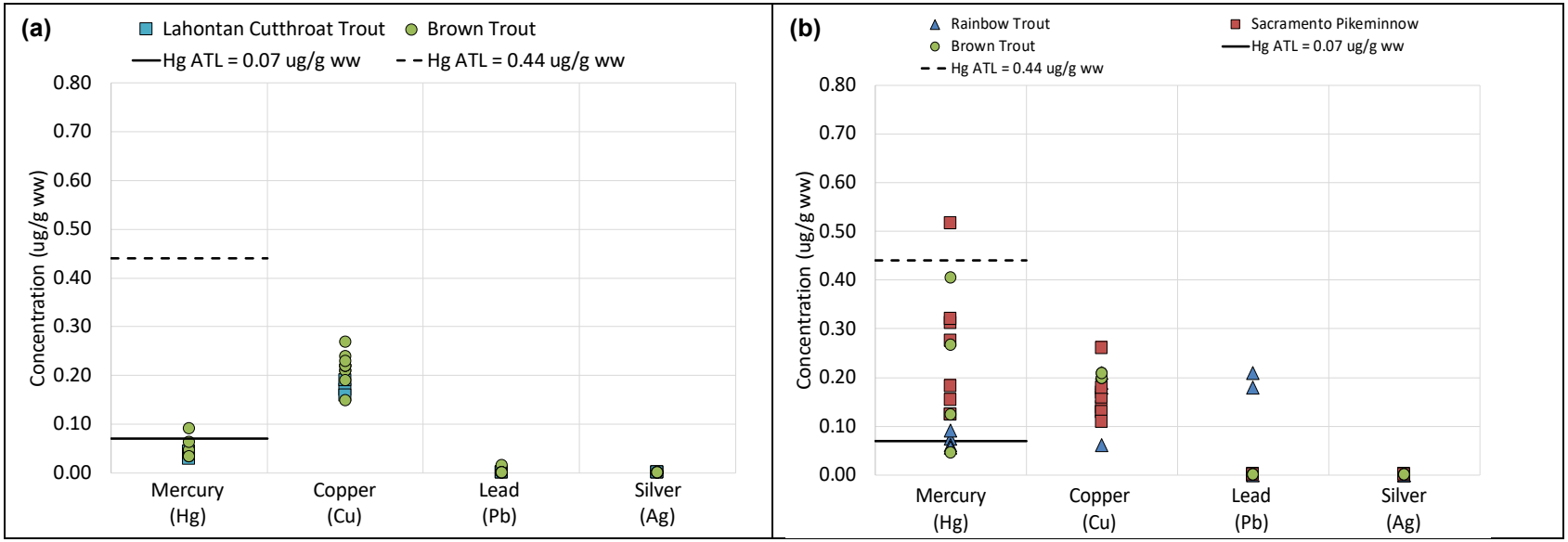

Figure 7-19. Fish tissue metals concentrations in (a) Camino Reservoir and (b) Slab Creek Reservoir during August and September 2016.

8.0 CONCLUSIONS

8.1. 2019 MONITORING YEAR

Based on 2019 *in situ* monitoring results, riverine water quality in the UARP study area consistently met Basin Plan water quality objectives for dissolved oxygen and pH. There were zero instances of dissolved oxygen measured below the Basin Plan instantaneous minimum objective (7.0 mg/L) for COLD and SPWN. There were two instances of pH measured below the Basin Plan instantaneous minimum objective (6.5 s.u.), which is the fewest measured during 2015–2019 *in situ* water quality monitoring at riverine sites. There were no instances of pH measured above the Basin Plan instantaneous maximum objective (8.5 s.u.). There were no instances of elevated turbidity.

Reservoir water quality in 2019 was also generally good, with zero values measuring below the Basin Plan instantaneous minimum objectives for dissolved oxygen (7 mg/L) for COLD and SPWN in either the Spring (June) or October (Fall) surveys. There were instances of pH measuring below the Basin Plan instantaneous minimum objective (6.5 s.u.) in surface and bottom waters at Loon Lake Reservoir during the June (Spring) survey and at each of the UARP reservoirs during the October (Fall) surveys. This may be due to the low buffering capacity characteristic of headwater reaches in granitic watersheds. There were no instances of pH measured above the Basin Plan instantaneous maximum objective (8.5 s.u.). There were no instances of elevated turbidity.

Sampling results for 2019 indicated no exceedances of the fecal coliform Basin Plan objective of 200 MPN/100 mL (geometric mean of five samples collected over 30 days), and only three of 75 samples exceeded the instantaneous maximum Basin Plan objective of 400 MPN/100 mL.

Despite occasional low reservoir pH measurements, 2019 monitoring results indicate that overall, surface waters of the UARP study area support designated beneficial uses, including COLD, SPWN, and REC-1.

8.2. FIVE-YEAR WATER QUALITY SUMMARY (2015 – 2019)

Over the five-year monitoring period (2015−2019), *in situ* riverine water quality in the UARP study area generally met Basin Plan water quality objectives for dissolved oxygen, pH, and turbidity across 19 sites, with the vast majority (98%) of dissolved oxygen measurements above the Basin Plan instantaneous minimum objective (7.0 mg/L) for COLD and SPWN, most pH measurements (67%) above the Basin Plan instantaneous minimum objective of 6.5 s.u., all pH measurements (100%) below the Basin Plan instantaneous maximum objective of 8.5 s.u., and generally low turbidity (< 5 NTU). The occasionally low riverine pH is likely due to low buffering capacity characteristic of headwater reaches in granitic watersheds, and the associated measurements may represent background for the UARP study area. The infrequent instances of elevated

riverine turbidity measurements corresponded to sites located downstream of the King Fire area that burned over 97,000 acres of land in El Dorado County, California, in mid-September to mid-October 2014. Over the 2015−2019 monitoring period, turbidity levels at these sites progressively decreased.

Annual riverine water temperatures in the UARP study area conistently followed seasonal patterns with the highest temperatures occurring during the summer sampling events and the lowest temperatures occurring during the winter sampling events. Maximum water temperatures occurred in the summer sampling periods for water years designated as Critically Dry (2015) and Below Normal (2018), corresponding to generally lower flows during those years. Winter water temperatures were the least variable, with only an approximately 6ºC range across sites and years. There was a consistent, albeit relatively broader, range of water temperatures (3ºC to 12ºC) across sites and years for the spring (n=16) and fall (n=19) seasons during 2015−2017 and 2019 monitoring; 2018 exhibited a slightly broader range of temperatures (1ºC to 15ºC).

Reservoir water quality in the UARP study area was consistently good across 15 represenative sites for the 2015−2019 monitoring period. The medium-sized and smaller UARP reservoirs, including Loon Lake, Gerle Creek, Junction Reservoir, Camino Reservoir, and Slab Creek Reservoir, did not consistently thermally stratify for either monitoring season (spring, fall). Water temperature, dissolved oxygen, pH, and turbidity in these reservoirs remained generally constant with increasing depth, tended to reflect riverine values of these parameters, and generally met Basin Plan objectives. The larger and deeper Ice House and Union Valley reservoirs exhibited the onset of thermal stratification during each spring and tended to mix in the late fall to early winter. Occasional *in situ* values were measured below the Basin Plan instantaneous minimum objectives for dissolved oxygen (5 mg/L) in the bottom waters of the deepest sites at Union Valley Reservoir and Ice House Reservoir in the fall/early winter, where these resrvoirs were stratified at the time of sampling. The latter result is not uncommon for deep waterbodies that have been thermally stratified for several months. There were multiple instances of pH measured below the Basin Plan instantaneous minimum objective (6.5 s.u.) in the UARP reservoirs in general, which, similar to the riverine pH results, may be due to low buffering capacity characteristic of headwater reaches in granitic watersheds. There were no instances of reservoir pH measured above the Basin Plan instantaneous maximum objective (8.5 s.u.). There were no instances of elevated turbidity in the UARP reservoirs.

The 2017 general chemistry monitoring results indicate that riverine and reservoir water quality in the UARP study area generally meets applicable federal and state water quality standards. Suspended and dissolved solids, total organic carbon (TOC), fuels and oils, and nutrients were low and there were no exceedances of water quality standards. Total alkalinity and hardness were also very low (i.e., less than 17 mg/L), resulting in low acute and chronic hardness-dependent criteria for associated metals and occasional exceedances. Despite the low criteria, there were very few instances of exceedances (i.e., 1% of total riverine analyte records and 0.9% of total reservoir analyte records,

involving the trace elements aluminum, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc), indicating that metals toxicity due to water concentrations is unlikely throughout the UARP study area. Overall, the 2017 general chemistry monitoring results indicate no particular analytes of concern for the UARP study area.

Throughout the five-year monitoring period (2015−2019), bacteria levels associated with the recreational water contact (REC-1) designated beneficial use were low, with no locations exceeding the Basin Plan geomteric mean objective of 200 MPN/100 mL, and 10 of 15 locations exhibiting no exceedances of the instantaneous maximum Basin Plan objective of 400 MPN/100 mL. *E. coli* geometric means were similarly low. Relatively higher fecal coliform counts at some sites during the Independence Day sampling events in 2017 and 2019 coincided with wet water years, which could be the result of generally higher levels of runoff transporting bacteria in association with suspended materials during wetter water years. However, other than generally low levels, there were no perceivable site-specific or overall trends for either fecal coliform or *E. coli* counts over the five year period.

Metals bioaccumulation monitoring in 2016 indicated that, with the exception of Camino Reservoir, fish tissue mercury concentrations were greater than the most protective OEHHA ATL (0.07 ug/g wet weight) for 24−65% of samples, particularly for larger fish (FL>300 mm). A small number (n=3) of fish exhibited mercury concentrations greater than the next most protective ATL of 0.44 ug/g wet weight in Union Valley, Ice House, and Slab Creek reservoirs. One trophic level 3 (prey) fish and 13 trophic level 4 (sport) fish exceeded the SWRCB's proposed water quality objective (0.2 ug/g) in Loon Lake, Union Valley, Ice House, and Slab Creek reservoirs. Copper tissue concentrations varied depending on location and species, but all were less than 0.35 ug/g wet weight. Lead and silver tissue concentrations were generally near or below the method detection limits (<0.002 ug/g wet weight and <0.003 ug/g wet weight, respectively). There are no existing advisory levels for copper, lead, or silver.

Based on SWRCB Condition 8.J, SMUD will propose to the SWRCB that the Plan be revised to reduce sampling of some constituents due to a consistent lack of exceedances to Basin Plan water quality objectives during the five-year monitoring period (2015−2019).

9.0 LITERATURE CITED

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APPENDIX A
In situ Vertical Profile Data for UARP Reservoir Sites

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Table A-1. Vertical Profile Data for UARP Reservoir Sites – June (Spring) *In situ* Surveys.

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
Loon Lake Reservoir									
R-IS-1-LL	6/7	0.1	9.2	9.8	86	5	6.4	0.1	8.9
		1	9.2	9.9	86	5	6.4	0.2	
		2	9.2	9.8	86	5	6.3	0.2	
		3	9.2	9.8	85	5	6.3	0.2	
		4	9.2	9.8	85	5	6.3	0.2	
		5	9.0	9.9	86	5	6.3	0.2	
		6	8.6	10.0	85	5	6.2	0.2	
		7	8.5	10.0	86	5	6.2	0.2	
		8	8.1	10.2	86	5	6.2	0.2	
		9	8.0	10.2	86	5	6.2	0.2	
		10	8.0	10.1	86	5	6.1	0.1	
		11	7.7	10.2	85	5	6.1	0.2	
		12	7.6	10.2	85	5	6.1	0.2	
		13	7.3	10.2	85	5	6.1	0.2	
		14	7.2	10.2	85	5	6.1	0.2	
		15	7.2	10.2	85	5	6.2	0.3	
R-IS-2-LL	6/7	0.1	8.1	10.1	85	5	6.6	0.2	10.3
		1	8.1	10.1	85	5	6.5	0.2	
		2	8.0	10.1	85	5	6.5	0.2	
		3	8.0	10.1	85	5	6.5	0.1	
		4	8.0	10.1	85	5	6.5	0.2	
		5	7.6	10.1	85	5	6.4	0.2	
		6	7.2	10.2	85	5	6.4	0.2	
		7	7.0	10.2	84	5	6.4	0.2	
		8	7.0	10.2	84	5	6.4	0.2	
		9	6.8	10.3	84	5	6.4	0.2	
		10	6.8	10.2	84	5	6.4	0.2	
		11	6.7	10.3	84	5	6.4	0.2	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		12	6.7	10.2	84	5	6.4	0.2	
		13	6.2	10.3	83	5	6.4	0.2	
		14	6.0	10.3	83	5	6.4	0.2	
		15	5.6	10.3	82	5	6.4	0.2	
		16	5.5	10.4	82	5	6.4	0.2	
		17	5.5	10.4	82	5	6.3	0.2	
		18	5.5	10.4	82	5	6.3	0.2	
		19	5.5	10.3	82	5	6.3	0.2	
		20	5.4	10.3	81	5	6.3	0.2[1]	
R-IS-3-LL	6/7	0.1	5.7	10.4	83	5	6.5	0.2	9.9
		1	5.7	10.5	83	5	6.4	0.2	
		2	5.7	10.5	83	5	6.4	0.2	
		3	5.7	10.5	83	5	6.4	0.2	
		4	5.6	10.4	83	5	6.4	0.2	
		5	5.6	10.4	83	5	6.4	0.2	
		6	5.6	10.4	83	5	6.4	0.2	
		7	5.6	10.4	83	5	6.4	0.2	
		8	5.5	10.4	83	5	6.4	0.2	
		9	5.5	10.4	82	5	6.4	0.2	
		10	5.5	10.4	82	5	6.4	0.2	
		11	5.4	10.4	82	5	6.4	0.2	
		12	5.4	10.4	82	5	6.4	0.2	
		13	5.3	10.4	82	5	6.3	0.2	
		14	5.2	10.3	81	5	6.3	0.2	
		15	5.2	10.3	81	5	6.3	0.2	
		16	5.2	10.3	81	5	6.3	0.2	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
Gerle Reservoir									
R-IS-4-GC	6/6	0.1	8.8	10.1	87	6	6.6	0.3	6.2
		1	8.7	10.1	87	6	6.6	0.3	
		2	8.6	10.1	87	6	6.6	0.3	
		3	8.3	10.2	87	6	6.6	0.3	
		4	8.2	10.2	86	6	6.5	0.3	
		5	8.0	10.2	86	6	6.5	0.3	
		6	7.9	10.2	86	6	6.5	0.3	
		7	7.7	10.2	85	6	6.5	0.3	
		8	7.4	10.2	85	6	6.5	0.3	
		9	7.3	10.1	84	6	6.5	0.3[1]	
Union Valley Reservoir									
R-IS-5-UVR	6/4	0.1	14.5	9.5	93	10	7.7	0.3	7.8
		1	14.0	9.5	92	9	7.2	0.3	
		2	10.7	10.2	92	8	7.1	0.3	
		3	9.5	10.3	90	8	7.0	0.3	
		4	9.1	10.4	90	7	7.0	0.3	
		5	8.8	10.3	89	7	6.9	0.3	
		6	8.7	10.3	89	7	6.9	0.3	
		7	8.5	10.3	88	7	6.9	0.3	
		8	8.2	10.3	88	7	6.8	0.4	
		9	8.0	10.3	87	7	6.8	0.4	
		10	8.0	10.3	87	7	6.8	0.4	
		11	7.8	10.3	87	7	6.8	0.4	
		12	7.6	10.4	87	7	6.8	0.4	
		13	7.4	10.4	87	7	6.8	0.4	
		14	7.1	10.4	86	7	6.7	0.3	
		15	7.0	10.5	86	7	6.7	0.4	
		16	6.9	10.5	86	7	6.7	0.4	
		17	6.8	10.5	86	7	6.7	0.4	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		18	6.7	10.5	86	6	6.7	0.3	
		19	6.7	10.5	86	6	6.7	0.4	
		20	6.7	10.6	86	6	6.7	0.4	
		21	6.6	10.5	85	6	6.7	0.4	
		22	6.3	10.2	82	7	6.7	0.4[1]	
R-IS-6-UVR	6/4	0.1	14.0	9.7	94	9	7.1	0.3	6.7
		1	13.7	9.8	94	9	7.1	0.3	
		2	10.9	10.4	94	9	7.1	0.4	
		3	10.0	10.5	93	8	7.1	0.4	
		4	9.4	10.6	92	8	7.1	0.4	
		5	9.0	10.7	92	8	7.0	0.4	
		6	8.8	10.7	92	8	7.0	0.4	
		7	8.6	10.6	91	8	7.0	0.5	
		8	8.5	10.7	91	8	7.0	0.4	
		9	8.3	10.5	90	8	7.0	0.4	
		10	8.2	10.7	91	8	6.9	0.4	
		11	8.0	10.6	90	8	6.9	0.5	
		12	7.9	10.5	88	8	6.9	0.5	
		13	7.8	10.5	88	8	6.9	0.4	
		14	7.7	10.5	88	8	6.9	0.4	
		15	7.5	10.4	87	8	6.8	0.4	
		16	7.5	10.4	86	8	6.8	0.4	
		17	7.4	10.3	86	8	6.8	0.4	
		18	7.2	10.3	85	8	6.8	0.4	
		19	7.2	10.3	85	8	6.8	0.4	
		20	7.1	10.3	85	8	6.8	0.4	
		21	7.0	10.3	85	8	6.8	0.4	
		22	6.9	10.4	85	8	6.8	0.3	
		23	6.8	10.4	85	8	6.8	0.4	
		24	6.7	10.4	85	8	6.8	0.4	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		25	6.5	10.3	84	8	6.8	0.4	
		26	6.4	10.3	84	8	6.8	0.4	
		27	6.4	10.4	84	8	6.7	0.3	
		28	6.3	10.4	84	8	6.7	0.4	
		29	6.1	10.4	84	8	6.7	0.3	
		30	6.0	10.4	83	8	6.7	0.3	
		31	5.9	10.4	83	8	6.7	0.3	
		32	5.7	10.3	83	8	6.7	0.3	
		33	5.7	10.3	82	8	6.7	0.3	
		34	5.6	10.2	81	8	6.7	0.3	
		35	5.6	10.2	81	8	6.7	0.4	
		36	5.5	10.2	81	8	6.7	0.3	
		37	5.5	10.2	81	8	6.7	0.4	
R-IS-7-UVR	6/4	0.1	15.3	9.5	94	10	7.2	0.3	8.1
		1	13.9	9.6	93	9	7.2	0.3	
		2	11.6	10.2	94	9	7.1	0.3	
		3	10.6	10.4	93	8	7.1	0.3	
		4	9.8	10.3	91	8	7.1	0.3	
		5	9.3	10.3	90	8	7.0	0.4	
		6	9.0	10.5	91	8	7.0	0.4	
		7	8.9	10.5	91	8	7.0	0.4	
		8	8.3	10.5	89	8	7.0	0.4	
		9	8.1	10.4	88	7	6.9	0.4	
		10	8.0	10.4	88	7	6.9	0.4	
		11	7.9	10.4	88	8	6.9	0.4	
		12	7.8	10.5	88	8	6.9	0.4	
		13	7.7	10.4	87	8	6.9	0.3	
		14	7.5	10.4	87	8	6.8	0.4	
		15	7.4	10.3	86	8	6.8	0.4	
		16	7.3	10.3	86	8	6.8	0.4	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		17	7.2	10.3	85	8	6.8	0.3	
		18	7.1	10.4	85	8	6.8	0.4	
		19	7.0	10.3	85	8	6.8	0.3	
		20	6.9	10.3	85	7	6.8	0.3	
		21	6.9	10.3	85	7	6.8	0.3	
		22	6.8	10.3	85	7	6.8	0.3	
		23	6.7	10.3	84	7	6.8	0.4	
		24	6.6	10.3	84	7	6.7	0.4	
		25	6.6	10.3	84	7	6.7	0.3	
		26	6.5	10.3	84	7	6.7	0.4	
		27	6.5	10.3	84	7	6.7	0.3	
		28	6.4	10.3	83	7	6.7	0.3	
		29	6.1	10.3	83	8	6.7	0.3	
		30	6.0	10.2	82	8	6.7	0.3	
		31	6.0	10.2	82	8	6.7	0.3	
		32	5.9	10.2	82	8	6.7	0.3	
		33	5.8	10.2	82	8	6.7	0.3	
		34	5.8	10.2	81	8	6.7	0.3	
		35	5.7	10.2	81	8	6.6	0.3	
		36	5.7	10.2	81	8	6.6	0.3	
		37	5.7	10.2	81	8	6.6	0.4	
		38	5.7	10.2	81	8	6.6	0.3	
		39	5.7	10.2	81	8	6.6	0.3	
		40	5.7	10.1	81	8	6.6	0.4	
		41	5.6	10.2	81	8	6.6	0.4	
		42	5.7	10.1	81	8	6.6	0.4	
		43	5.6	10.1	81	8	6.6	0.3	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
Ice House Reservoir									
R-IS-9-IHR	6/5	0.1	13.4	9.6	92	9	7.1	0.3	5.7
		1	13.1	9.6	91	9	7.1	0.3	
		2	12.1	9.8	91	9	7.0	0.4	
		3	11.3	10.0	91	9	7.0	0.4	
		4	10.6	10.1	90	8	7.0	0.4	
		5	9.9	10.3	91	8	7.0	0.4	
		6	8.9	10.5	90	7	7.0	0.4	
		7	8.0	10.5	88	6	6.9	0.6	
		8	7.3	10.7	88	6	6.8	1.0	
		9	6.8	10.6	87	6	6.7	0.6	
		10	6.5	10.7	87	6	6.7	0.7	
		11	6.4	10.7	87	6	6.7	0.7	
		12	6.4	10.7	87	6	6.7	0.6	
		13	6.4	10.7	86	6	6.7	0.7	
		14	6.3	10.7	86	6	6.7	0.6	
		15	6.2	10.6	86	6	6.7	0.6	
		16	6.2	10.6	86	6	6.7	0.6	
		17	6.2	10.6	86	6	6.7	0.6	
		18	6.1	10.6	85	6	6.6	0.5	
		19	6.1	10.6	85	6	6.6	0.5	
		20	6.1	10.5	85	6	6.6	0.5	
		21	6.0	10.4	84	6	6.6	0.5	
		22	5.9	10.4	83	6	6.6	0.5	
		23	5.9	10.4	83	6	6.6	0.4	
		24	5.8	10.2	81	7	6.5	0.4[1]	
R-IS-10-IHR	6/5	0.1	14.7	9.4	93	10	7.2	0.3	6.9
		1	13.9	9.5	92	10	7.1	0.3	
		2	13.5	9.5	92	9	7.1	0.4	
		3	11.3	10.1	92	9	7.2	0.4	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		4	10.2	10.3	92	9	7.1	0.4	
		5	9.8	10.4	91	8	7.2	0.4	
		6	8.9	10.5	91	8	7.1	0.4	
		7	8.0	10.6	89	7	7.0	0.4	
		8	7.6	10.7	90	7	7.0	0.3	
		9	7.4	10.7	89	7	7.0	0.3	
		10	7.3	10.7	89	7	6.9	0.4	
		11	7.2	10.7	88	7	6.9	0.3	
		12	7.1	10.7	88	7	6.9	0.3	
		13	7.0	10.6	88	7	6.9	0.3	
		14	6.9	10.6	87	7	6.8	0.4	
		15	6.8	10.6	87	7	6.8	0.4	
		16	6.6	10.5	86	7	6.8	0.4	
		17	6.3	10.4	84	7	6.8	0.4	
R-IS-11-IHR	6/5	0.1	14.4	9.4	93	10	7.2	0.4	5.7
		1	13.6	9.5	92	10	7.1	0.4	
		2	13.6	9.5	92	10	7.1	0.4	
		3	13.4	9.6	91	9	7.1	0.4	
		4	11.9	9.9	92	9	7.2	0.3	
		5	8.9	10.8	93	8	7.2	0.3	
		6	7.8	11.0	93	8	7.1	0.3	
		7	7.2	11.1	92	8	7.0	0.3	
		8	6.9	11.1	91	8	7.0	0.3	
		9	6.7	11.0	90	8	6.9	0.3	
		10	6.6	10.9	89	7	6.9	0.3	
		11	6.3	10.7	86	7	6.8	0.3	
		12	6.3	10.6	86	7	6.8	0.3	
		13	6.2	10.5	85	7	6.7	0.3	
		14	6.1	10.4	84	7	6.7	0.3	
		15	6.0	10.4	84	7	6.7	0.2	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		16	6.0	10.3	83	7	6.7	0.2	
		17	5.9	10.3	83	7	6.6	0.2	
		18	5.9	10.3	83	7	6.6	0.2	
		19	5.9	10.3	83	7	6.6	0.3	
		20	5.9	10.3	82	7	6.6	0.3	
		21	5.8	10.2	82	7	6.6	0.3	
		22	5.8	10.2	82	7	6.6	0.2	
		23	5.8	10.2	82	7	6.6	0.2	
		24	5.7	10.2	81	7	6.6	0.2	
		25	5.7	10.1	81	7	6.6	0.3	
		26	5.7	10.1	81	7	6.6	0.3	
		27	5.7	10.1	80	7	6.5	0.3	
		28	5.7	10.0	79	7	6.5	0.3[1]	

°C = degrees Celsius
m = meter(s)
mg/L = milligrams per liter
% sat = percent saturation
s.u = standard unit of pH
uS/cm = microsiemens per centimeter
NTU = Nephelometric Turbidity Unit

[1] Turbidity values are recorded as the values from the previous depth. Higher turbidity values on the data sheet reflect turbidity caused by the probe coming into contact with reservoir bottom sediments.

Table A-2. Vertical Profile Data for UARP Reservoir Sites – October (Fall*) In situ* Surveys.

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
Loon Lake									
R-IS-1-LL	10/22	0.1	11.1	8.5	77	6	7.4	0.2	9.7
		1.0	11.2	8.4	77	6	7.2	0.2	
		2.0	11.1	8.5	77	6	7.0	0.2	
		3.0	11.0	8.4	77	6	6.9	0.2	
		4.0	11.0	8.4	77	6	6.8	0.2	
		5.0	11.0	8.4	77	6	6.7	0.2	
		6.0	11.0	8.4	76	6	6.7	0.3	
		7.0	11.0	8.4	76	6	6.6	0.2	
		8.0	11.0	8.4	76	6	6.6	0.2	
		9.0	11.0	8.4	76	6	6.5	0.2	
		10.0	11.0	8.4	76	6	6.5	0.2	
		11.0	11.0	8.4	76	6	6.5	0.2	
		12.0	11.0	8.4	76	6	6.4	0.2	
		13.0	11.1	8.4	76	6	6.4	0.2	
		14.0	11.0	8.4	76	6	6.4	0.2	
		15.0	11.0	8.4	76	6	6.4	0.2	
R-IS-2-LL	10/22	0.1	11.2	8.5	77	6	6.6	0.2	10.0
		1.0	11.2	8.5	77	6	6.6	0.2	
		2.0	11.2	8.4	77	6	6.6	0.2	
		3.0	11.1	8.4	77	6	6.6	0.2	
		4.0	11.1	8.4	77	6	6.6	0.2	
		5.0	11.1	8.4	77	6	6.6	0.2	
		6.0	11.1	8.4	77	6	6.5	0.2	
		7.0	11.1	8.4	77	6	6.5	0.2	
		8.0	11.1	8.4	77	6	6.5	0.2	
		9.0	11.1	8.4	76	6	6.5	0.2	
		10.0	11.1	8.4	76	6	6.5	0.2	
		11.0	11.1	8.4	76	6	6.5	0.2	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		12.0	11.0	8.4	76	6	6.5	0.3	
R-IS-3-LL	10/22	0.1	11.3	8.5	78	6	6.7	0.2	9.3
		1.0	11.1	8.5	77	6	6.5	0.2	
		2.0	11.1	8.5	77	6	6.6	0.2	
		3.0	11.1	8.5	77	6	6.5	0.2	
		4.0	11.1	8.5	77	6	6.5	0.2	
		5.0	11.0	8.5	77	6	6.5	0.2	
		6.0	11.0	8.5	77	6	6.5	0.2	
		7.0	11.0	8.5	77	6	6.5	0.2	
		8.0	11.0	8.5	77	6	6.5	0.2	
		9.0	11.0	8.5	77	6	6.5	0.3	
		10.0	11.0	8.5	77	6	6.5	0.2	
		11.0	11.0	8.5	77	6	6.5	0.3	
Gerle Creek Reservoir									
R-IS-4-GC	10/25	0.1	10.2	9.2	82	9	7.1	0.2	7.3
		1.0	9.8	9.2	81	9	6.9	0.3	
		2.0	9.7	9.2	81	9	6.8	0.3	
		3.0	9.7	9.2	81	9	6.7	0.3	
		4.0	9.6	9.1	80	9	6.7	0.3	
		5.0	9.6	9.4	80	9	6.6	0.3	
		6.0	9.5	9.1	80	9	6.6	0.3	
		7.0	9.3	8.9	77	9	6.5	0.3	
Union Valley Reservoir									
R-IS-5-UVR	10/22	0.1	15.8	8.0	81	9	6.4	0.3	5.9
		1	15.6	8.0	80	9	6.4	0.3	
		2	15.5	8.0	80	9	6.5	0.3	
		3	15.1	8.0	79	9	6.5	0.3	
		4	14.9	8.0	79	9	6.4	0.3	
		5	14.9	8.0	79	9	6.4	0.3	
		6	14.6	8.0	79	10	6.4	0.3	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		7	14.2	8.0	78	10	6.4	0.4	
R-IS-6-UVR	10/25	0.1	15.0	8.0	79	9	6.7	0.2	9.8
		1	15.0	8.0	79	9	6.5	0.2	
		2	15.0	7.9	79	9	6.4	0.2	
		3	15.0	7.9	79	9	6.4	0.0	
		4	15.0	7.9	79	9	6.3	0.2	
		5	15.0	7.9	79	9	6.3	0.2	
		6	15.0	7.9	78	9	6.3	0.2	
		7	15.0	7.9	78	9	6.3	0.2	
		8	15.0	7.9	78	9	6.3	0.2	
		9	15.0	7.9	78	9	6.3	0.2	
		10	15.0	7.9	78	9	6.2	0.2	
		11	15.0	7.9	78	9	6.2	0.2	
		12	15.0	7.9	78	9	6.2	0.2	
		13	14.9	7.9	78	9	6.2	0.2	
		14	14.9	7.9	78	9	6.2	0.3	
		15	14.9	7.9	78	9	6.2	0.2	
		16	14.9	7.9	78	9	6.1	0.2	
		17	14.9	7.8	78	9	6.1	0.2	
		18	14.9	7.8	78	9	6.1	0.2	
		19	14.9	7.8	78	9	6.1	0.2	
		20	14.9	7.8	78	9	6.1	0.2	
		21	14.9	7.8	77	9	6.0	0.2	
		22	14.8	7.8	77	9	6.0	0.2	
		23	14.8	7.8	77	9	6.0	0.2	
		24	14.8	7.8	77	9	6.0	0.2	
R-IS-7-UVR	10/25	0.1	15.0	8.0	79	9	6.5	0.2	8.0
		1	15.0	8.0	79	9	6.4	0.2	
		2	15.0	7.9	79	9	6.4	0.2	
		3	15.0	7.9	79	9	6.3	0.2	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		4	15.0	7.9	79	9	6.3	0.2	
		5	15.0	7.9	79	9	6.2	0.2	
		6	15.0	7.9	78	9	6.2	0.2	
		7	15.0	7.9	78	9	6.4	0.3	
		8	15.0	7.9	78	9	6.1	0.2	
		9	15.0	7.9	78	9	6.1	0.3	
		10	15.0	7.9	78	9	6.1	0.2	
		11	15.0	7.9	78	9	6.1	0.2	
		12	15.0	7.9	78	9	6.1	0.2	
		13	15.0	7.9	78	9	6.1	0.2	
		14	15.0	7.9	78	9	6.1	0.2	
		15	15.0	7.9	78	9	6.1	0.2	
		16	15.0	7.9	78	9	6.1	0.2	
		17	14.9	7.8	78	9	6.1	0.2	
		18	14.9	7.8	78	9	6.1	0.2	
		19	14.9	7.8	78	9	6.1	0.2	
		20	14.9	7.8	77	9	6.1	0.2	
		21	14.9	7.8	77	9	6.1	0.2	
		22	14.9	7.8	77	9	6.1	0.3	
		23	14.9	7.8	77	9	6.1	0.2	
		24	14.9	7.8	77	9	6.1	0.2	
		25	14.9	7.8	77	9	6.1	0.3	
		26	14.9	7.8	77	9	6.1	0.2	
		27	14.9	7.8	77	9	6.1	0.2	
		28	14.8	7.8	77	9	6.1	0.2	
		29	14.8	7.8	77	9	6.1	0.3	
R-IS-8-UVR	10/23	0.1	15.2	7.9	79	9	7.1	0.1	9.7
		1	15.2	7.9	78	9	6.9	0.1	
		2	15.2	7.9	78	9	6.8	0.1	
		3	15.2	7.9	78	9	6.7	0.1	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		4	15.1	7.8	78	9	6.6	0.1	
		5	15.1	7.8	78	9	6.6	0.1	
		6	15.1	7.8	78	9	6.6	0.1	
		7	15.1	7.8	78	9	6.5	0.1	
		8	15.1	7.8	78	9	6.5	0.1	
		9	15.1	7.8	78	9	6.5	0.1	
		10	15.1	7.8	78	9	6.4	0.1	
		11	15.1	7.8	78	9	6.4	0.1	
		12	15.1	7.8	77	9	6.4	0.1	
		13	15.1	7.8	77	9	6.4	0.1	
		14	15.1	7.8	77	9	6.3	0.1	
		15	15.1	7.8	77	9	6.3	0.1	
		16	15.1	7.8	77	9	6.3	0.1	
		17	15.1	7.8	77	9	6.3	0.1	
		18	15.1	7.7	77	9	6.3	0.1	
		19	15.1	7.7	77	9	6.3	0.1	
		20	15.1	7.7	77	9	6.2	0.1	
		21	15.1	7.7	77	9	6.2	0.1	
		22	15.1	7.7	77	9	6.2	0.1	
		23	15.1	7.7	77	9	6.2	0.1	
		24	15.1	7.7	77	9	6.2	0.1	
		25	15.1	7.7	77	9	6.1	0.1	
		26	15.1	7.7	76	9	6.1	0.1	
		27	15.1	7.7	76	9	6.1	0.1	
		28	15.1	7.7	76	9	6.1	0.1	
		29	15.1	7.7	76	9	6.1	0.1	
		30	15.1	7.7	76	9	6.1	0.1	
		31	15.1	7.6	76	9	6.1	0.1	
		32	15.1	7.6	76	9	6.1	0.1	
		33	15.0	7.6	76	9	6.1	0.1	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		34	15.0	7.6	75	9	6.1	0.1	
		35	15.0	7.6	75	9	6.1	0.1	
		36	14.9	7.5	74	8	6.0	0.0	
		37	14.6	7.4	73	8	6.0	0.0	
		38	14.4	7.4	72	8	5.9	0.0	
		39	13.9	7.4	72	8	5.8	0.0	
		40	13.5	7.5	72	8	5.8	0.0	
		41	13.3	7.5	72	8	5.8	0.0	
		42	13.1	7.6	72	8	5.8	0.0	
		43	13.0	7.6	72	8	5.8	0.0	
		44	12.9	7.6	72	8	5.8	0.0	
		45	12.7	7.6	72	8	5.8	0.0	
		46	12.6	7.6	72	8	5.8	0.0	
		47	12.5	7.6	71	8	5.8	0.0	
		48	12.4	7.6	71	8	5.8	0.0	
		49	12.2	7.6	71	8	5.8	0.0	
		50	12.1	7.7	71	8	5.8	0.0	
		51	12.0	7.7	71	8	5.8	0.0	
		52	11.9	7.6	71	8	5.7	0.0	
		53	11.8	7.6	70	8	5.7	0.1	
		54	11.7	7.6	71	8	5.7	0.0	
		55	11.5	7.5	69	8	5.7	0.0	
		56	11.4	7.3	67	8	5.7	0.0	
		57	11.2	7.1	65	8	5.7	0.0	
		58	11.0	7.1	65	9	5.7	0.0	
		59	10.7	7.2	64	9	5.7	0.0	
		60	10.5	7.1	64	9	5.7	0.1	
		61	9.6	7.1	62	8	5.7	0.1	
		62	8.2	7.5	63	9	5.7	0.1	
		63	7.4	7.6	63	9	5.7	0.1	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		64	7.4	7.6	63	9	5.7	0.1	
		65	7.2	7.7	64	8	5.7	0.1	
		66	7.1	7.9	65	8	5.7	0.1	
		67	6.9	7.7	63	8	5.7	0.2	
		68	6.8	7.7	63	8	5.6	0.1	
		69	6.7	7.7	64	8	5.7	0.1	
		70	6.6	8.0	66	8	5.7	0.1	
		71	6.6	8.2	66	9	5.7	0.1	
		72	6.5	8.2	67	9	5.7	0.1	
		73	6.5	8.2	67	9	5.7	0.1	
		74	6.5	8.2	66	9	5.7	0.1	
		75	6.5	8.1	66	9	5.7	0.1	
		76	6.5	8.1	66	9	5.7	0.1	
		77	6.5	8.0	65	9	5.7	0.1	
		78	6.5	8.0	65	9	5.7	0.2	
		79	6.5	7.9	64	9	5.7	0.2	
		80	6.5	7.9	64	9	5.7	0.2	
		81	6.4	7.7	63	9	5.7	0.2	
		82	6.4	7.6	61	9	5.7	0.2[1]	
Ice House Reservoir									
R-IS-9-IHR	10/21	0.1	14.0	8.2	80	8	6.5	0.2	8.5
		1	13.9	8.2	79	8	6.4	0.2	
		2	13.8	8.2	79	8	6.4	0.2	
		3	13.7	8.2	79	8	6.4	0.2	
		4	13.6	8.2	79	8	6.4	0.2	
		5	13.6	8.1	78	8	6.4	0.2	
		6	13.6	8.1	78	8	6.4	0.2	
		7	13.5	8.1	78	8	6.3	0.2	
		8	13.5	8.1	78	8	6.3	0.2	
		9	13.5	8.1	78	8	6.3	0.2	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		10	13.5	8.1	77	8	6.3	0.2	
		11	13.5	8.1	77	8	6.3	0.2	
		12	13.5	8.1	77	8	6.3	0.2	
		13	13.5	8.0	77	8	6.3	0.2	
		14	13.5	8.0	77	8	6.3	0.2	
		15	13.4	8.0	76	8	6.3	0.2	
		16	13.4	7.8	74	8	6.2	0.2[1]	
R-IS-10-IHR	10/21	0.1	14.0	8.2	80	8	6.6	0.1	5.9
		1	13.8	8.2	79	8	6.4	0.1	
		2	13.8	8.2	79	8	6.5	0.2	
		3	13.5	8.2	79	8	6.5	0.2	
		4	13.5	8.2	79	8	6.5	0.1	
		5	13.5	8.2	79	8	6.5	0.2	
		6	13.5	8.2	78	8	6.5	0.2	
R-IS-11-IHR	10/21	0.1	13.8	8.2	79	8	6.6	0.1	9.6
		1	13.6	8.2	79	8	6.5	0.2	
		2	13.5	8.2	79	8	6.5	0.2	
		3	13.5	8.2	79	8	6.5	0.2	
		4	13.5	8.2	79	8	6.4	0.2	
		5	13.5	8.2	79	8	6.4	0.2	
		6	13.5	8.2	79	8	6.4	0.2	
		7	13.4	8.2	78	8	6.4	0.1	
		8	13.4	8.1	78	8	6.4	0.2	
		9	13.4	8.1	78	8	6.4	0.2	
		10	13.4	8.1	78	8	6.4	0.2	
		11	13.4	8.1	78	8	6.4	0.2	
		12	13.4	8.1	78	8	6.4	0.2	
		13	13.4	8.1	78	8	6.4	0.2	
		14	13.4	8.1	78	8	6.4	0.2	
		15	13.4	8.1	77	8	6.4	0.2	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		16	13.4	8.1	77	8	6.4	0.2	
		17	13.4	8.1	77	8	6.4	0.2	
		18	13.4	8.0	77	8	6.5	0.2[1]	
Junction Reservoir									
R-IS-12-JR	10/23	0.1	12.2	10.2	95	8	6.2	0.0	6.7
		1	11.9	10.3	95	8	6.1	0.0	
		2	11.7	10.3	94	8	6.1	0.0	
		3	11.6	10.2	94	8	6.1	0.1	
		4	11.5	10.3	94	8	6.0	0.1	
		5	11.4	10.3	94	8	6.0	0.1	
		6	11.4	10.2	94	8	6.0	0.1	
		7	11.4	10.2	94	8	6.0	0.1	
		8	11.3	10.2	93	8	6.0	0.1	
		9	11.3	10.2	93	8	6.0	0.1	
		10	11.2	10.1	92	8	6.0	0.1	
		11	11.0	10.0	91	9	6.0	0.1	
		12	10.9	10.0	91	9	6.0	0.1	
		13	10.9	10.0	91	9	6.1	0.1	
		14	10.9	10.0	91	9	6.0	0.1	
		15	10.8	10.0	91	9	6.1	0.1	
		16	10.8	10.1	91	9	6.1	0.1	
		17	10.5	10.1	90	9	6.1	0.1	
		18	10.1	10.1	90	9	6.1	0.1	
		19	9.9	10.1	89	9	6.1	0.3	
Camino Reservoir									
R-IS-13-CR	10/23	0.1	12.6	10.2	95	9	6.6	0.0	6.0
		1	11.6	10.2	94	9	6.5	0.0	
		2	11.5	10.3	94	9	6.4	0.0	
		3	11.4	10.3	94	9	6.3	0.1	
		4	11.3	10.3	94	9	6.3	0.1	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		5	10.3	10.4	93	10	6.3	0.1	
Slab Creek Reservoir									
R-IS-14-SC	10/24	0.1	11.1	10.6	97	16	6.9	0.4	7.1
		1	11.1	10.6	97	16	6.8	0.3	
		2	11.1	10.6	96	16	6.8	0.3	
		3	11.1	10.6	96	16	6.7	0.3	
		4	11.1	10.6	96	16	6.7	0.3	
		5	11.1	10.6	96	16	6.7	0.3	
		6	11.0	10.3	94	19	6.6	0.6	
		7	11.0	10.2	93	22	6.6	0.6[1]	
R-IS-15-SC	10/24	0.1	11.9	10.1	94	15	6.9	0.2	9.2
		1	11.7	10.1	93	15	6.8	0.2	
		2	11.6	10.2	93	15	6.7	0.3	
		3	11.5	10.1	93	15	6.7	0.3	
		4	11.5	10.1	93	15	6.7	0.2	
		5	11.5	10.1	93	15	6.6	0.3	
		6	11.5	10.1	93	15	6.6	0.3	
		7	11.5	10.1	93	15	6.6	0.2	
		8	11.5	10.1	92	15	6.6	0.2	
		9	11.4	10.1	92	15	6.6	0.2	
		10	11.4	10.1	92	15	6.6	0.3	
		11	11.4	10.1	92	15	6.6	0.2	
		12	11.4	10.0	92	15	6.5	0.2	
		13	11.4	10.0	92	15	6.5	0.4	
		14	11.4	10.0	92	15	6.5	0.3	
		15	11.4	10.0	92	15	6.5	0.3	
		16	11.4	10.0	91	15	6.5	0.2	
		17	11.3	10.0	91	15	6.5	0.3	
		18	11.3	10.1	92	14	6.5	0.3	
		19	11.2	10.1	92	14	6.5	0.3	

Site ID	2019 Sample Date	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% sat)	Conductivity (uS/cm)	pH (s.u.)	Turbidity (NTU)	Secchi disk (m)
		20	11.2	10.2	93	14	6.5	0.3	
		21	11.2	10.2	93	14	6.4	0.4	
		22	11.2	10.3	93	14	6.4	0.4	
		23	11.2	10.3	94	14	6.4	0.3	
		24	11.2	10.3	94	14	6.4	0.4	
		25	11.1	10.4	94	14	6.4	0.4	
		26	11.1	10.4	94	14	6.4	0.4	
		27	11.1	10.3	94	14	6.4	0.4	
		28	11.1	10.3	94	14	6.4	0.5	
		29	11.1	10.3	94	14	6.4	0.4	
		30	11.1	10.3	94	14	6.4	0.4	
		31	11.1	10.3	94	14	6.3	0.5	
		32	11.1	10.3	93	14	6.3	0.8	
		33	11.1	10.2	92	14	6.3	0.8	
		34	11.1	10.1	91	9	6.3	0.8[1]	

°C = degrees Celsius
m = meter(s)
mg/L = milligrams per liter
% sat = percent saturation
s.u. = standard unit of pH
uS/cm = microsiemens per centimeter
NTU = Nephelometric Turbidity Unit

[1] Turbidity values are recorded as the values from the previous depth. Higher turbidity values on the data sheet reflect turbidity caused by the probe coming into contact with reservoir bottom sediments

APPENDIX B
In situ Vertical Profiles for UARP Reservoir Sites

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APPENDIX B.1
2019 Profiles

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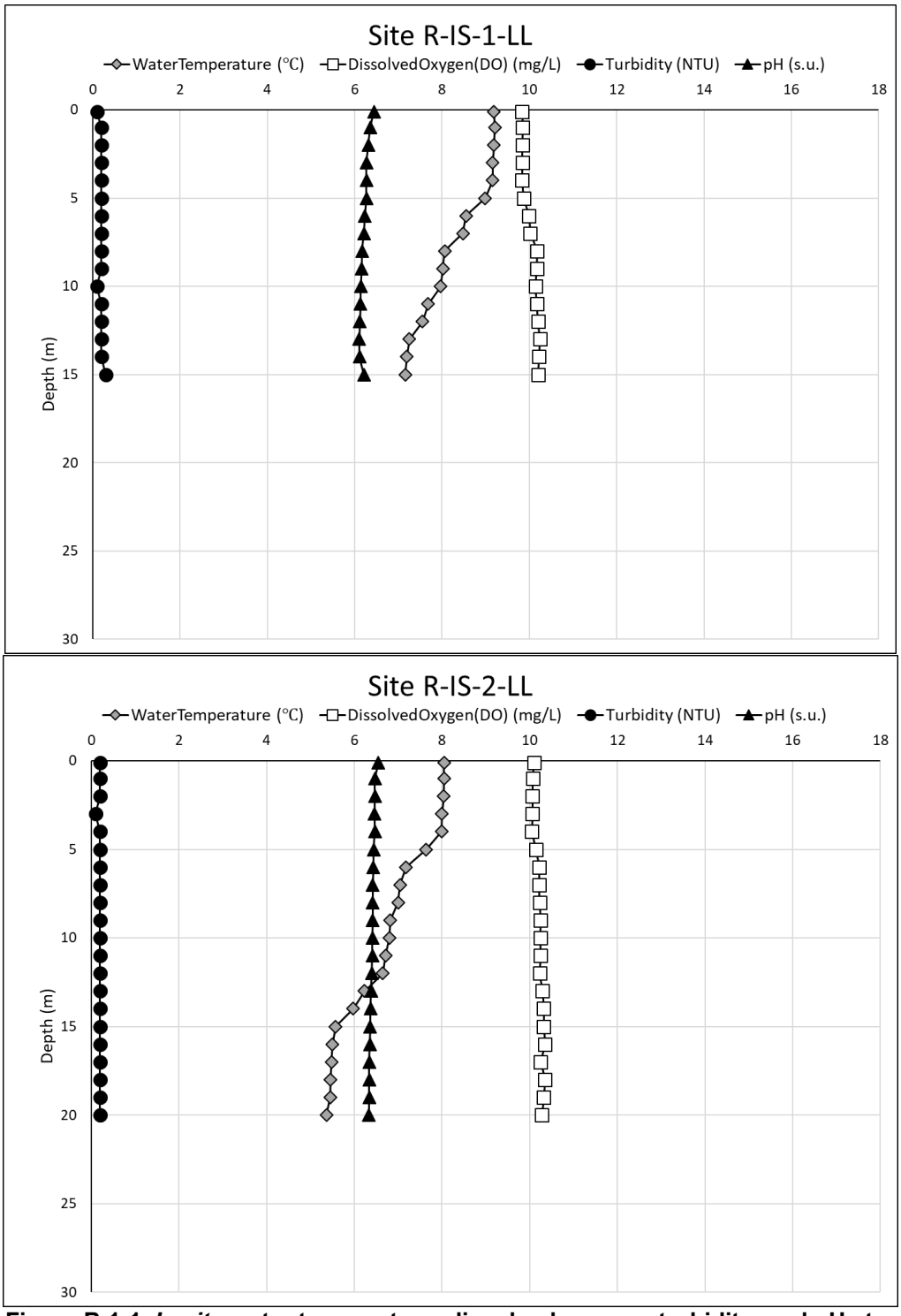

Figure B.1-1. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Loon Lake sites R-IS-1-LL and R-IS-2-LL during June (Spring) 2019.

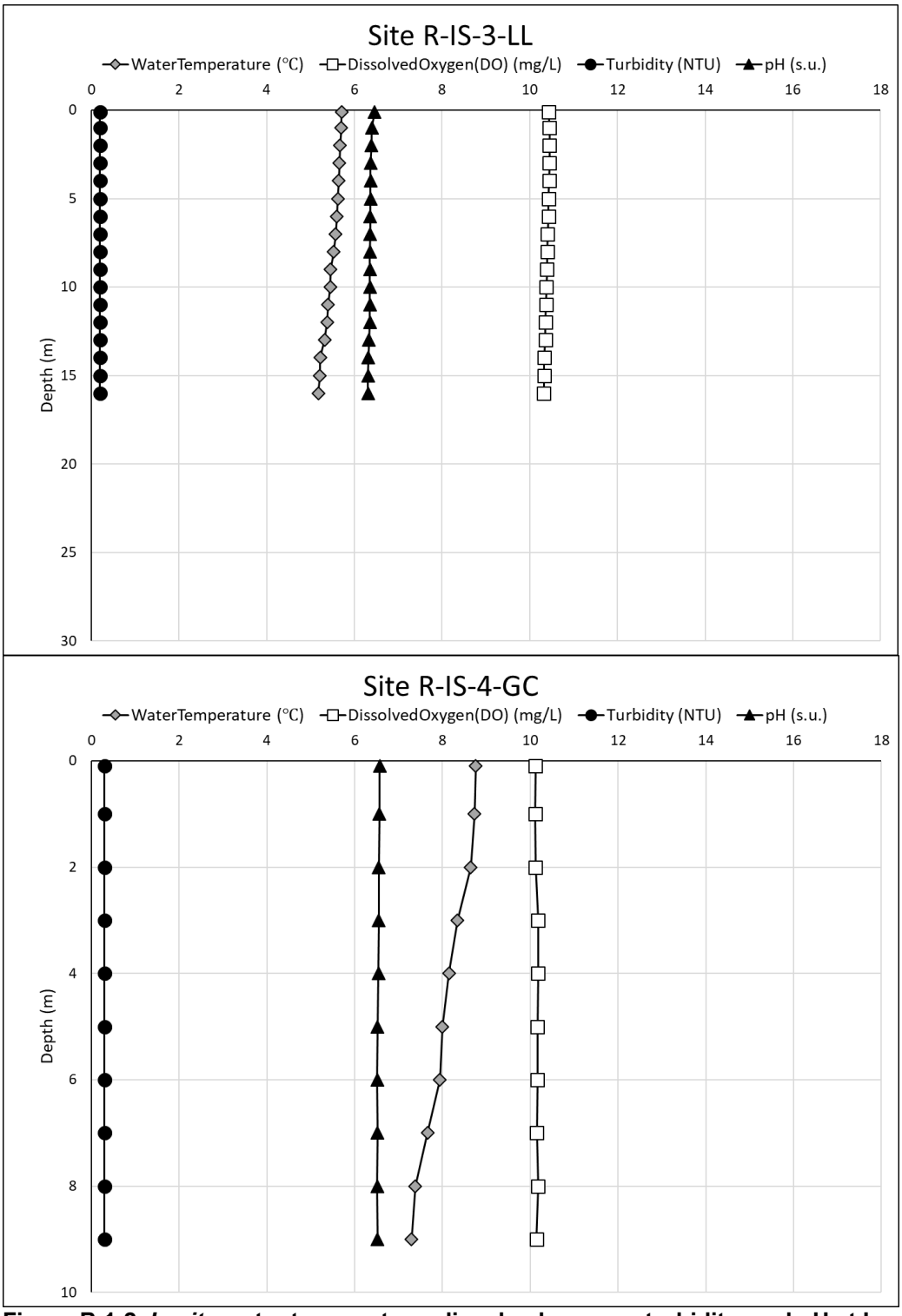

Figure B.1-2. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Loon Lake and Gerle Creek Reservoir sites R-IS-3-LL and R-IS-4-GC during June (Spring) 2019.

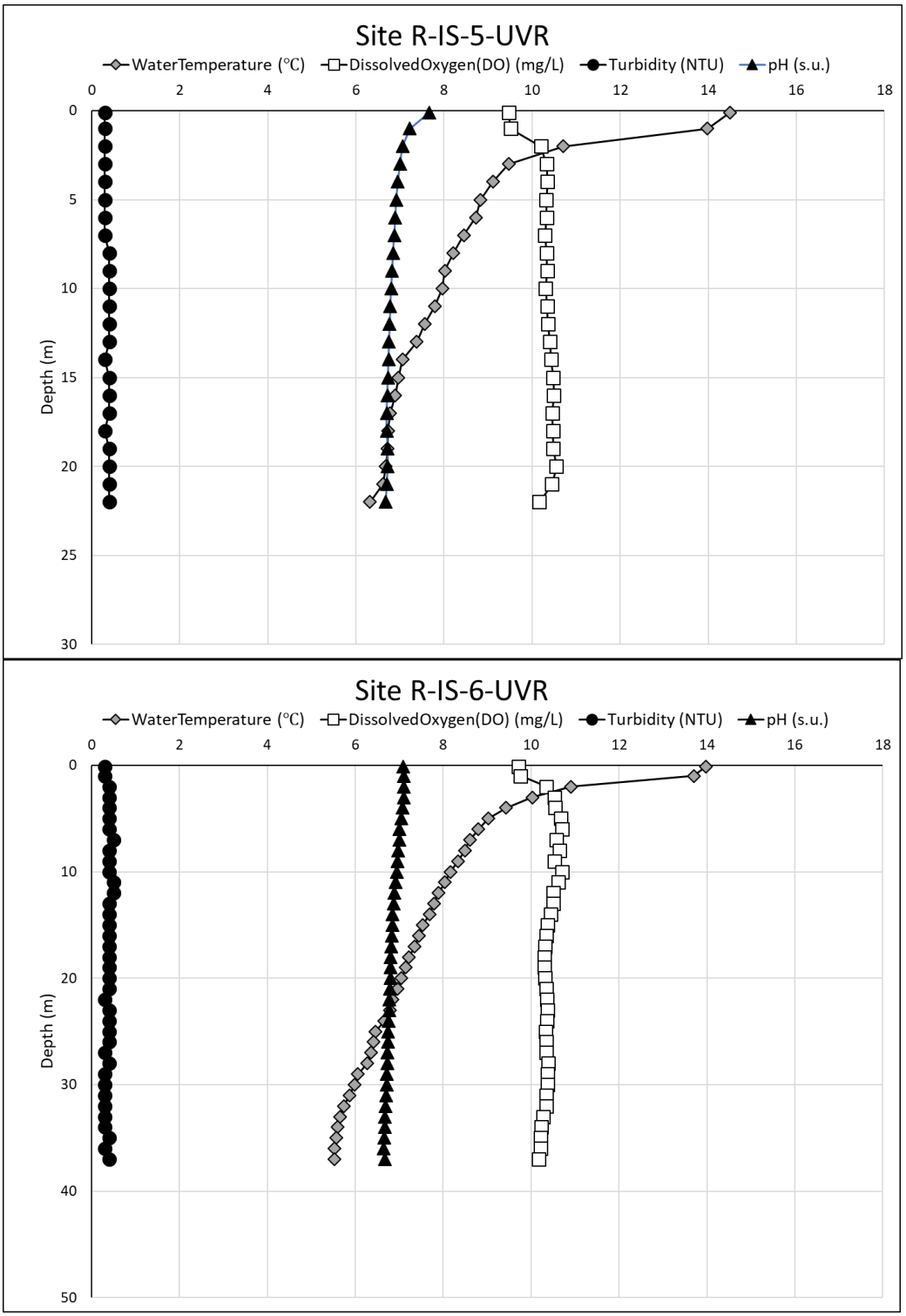

Figure B.1-3. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Union Valley Reservoir sites R-IS-5-UVR and R-IS-6-UVR during June (Spring) 2019.

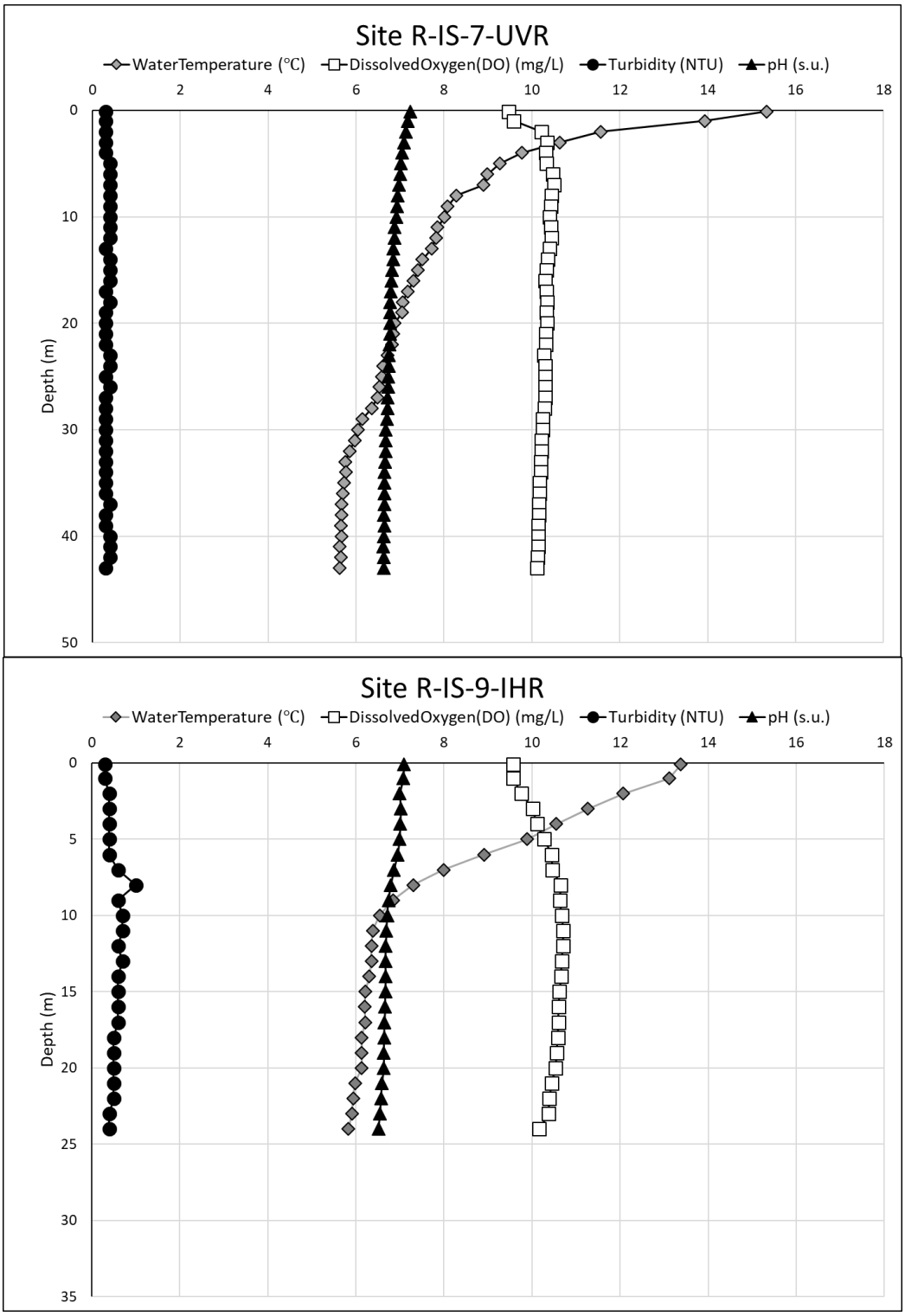

Figure B.1-4. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Union Valley Reservoir site R-IS-7-UVR and Ice House Reservoir site R-IS-9-IHR during June (Spring) 2019.

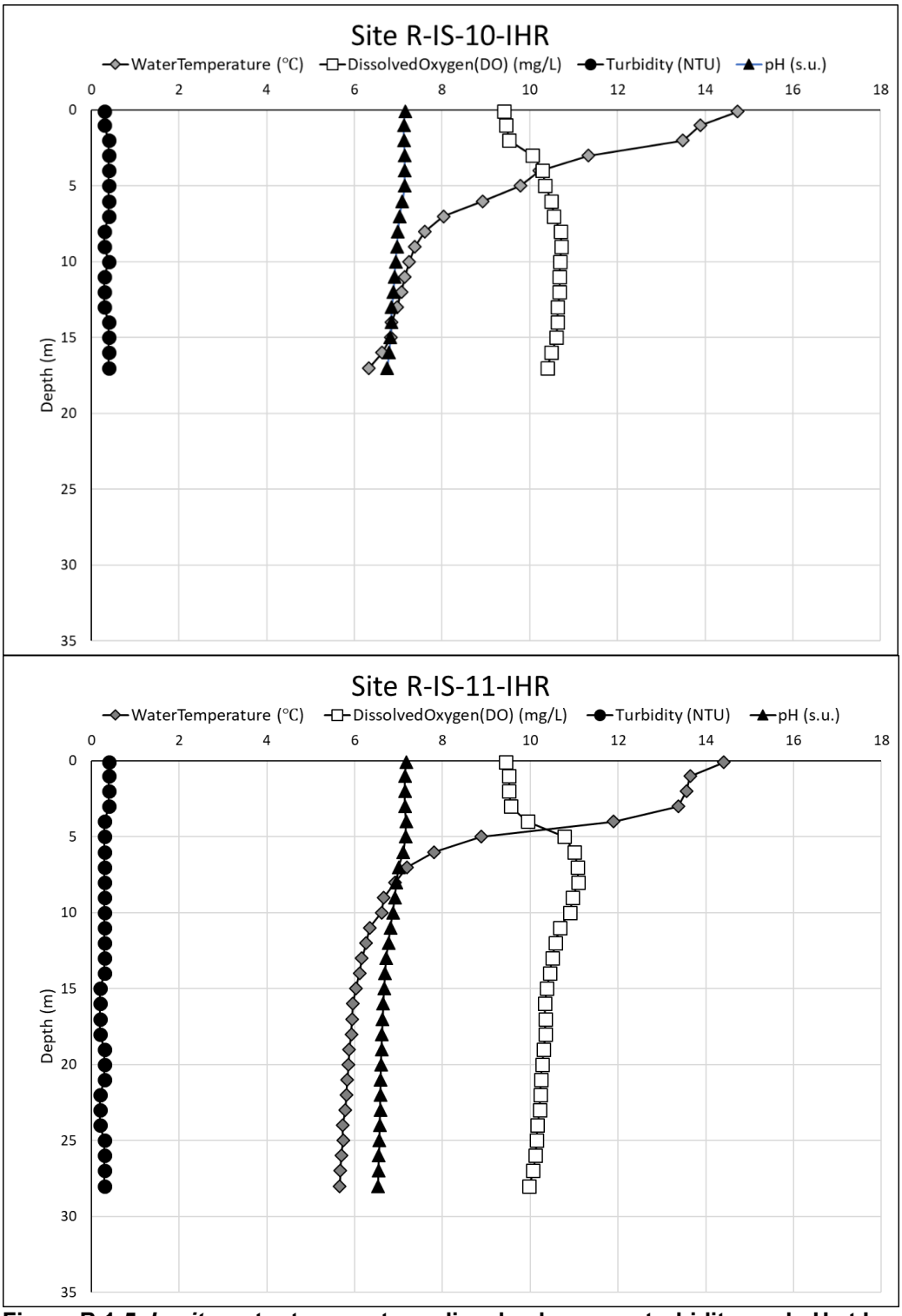

Figure B.1-5. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Ice House Reservoir sites R-IS-10-IHR and R-IS-11-IHR during June (Spring) 2019.

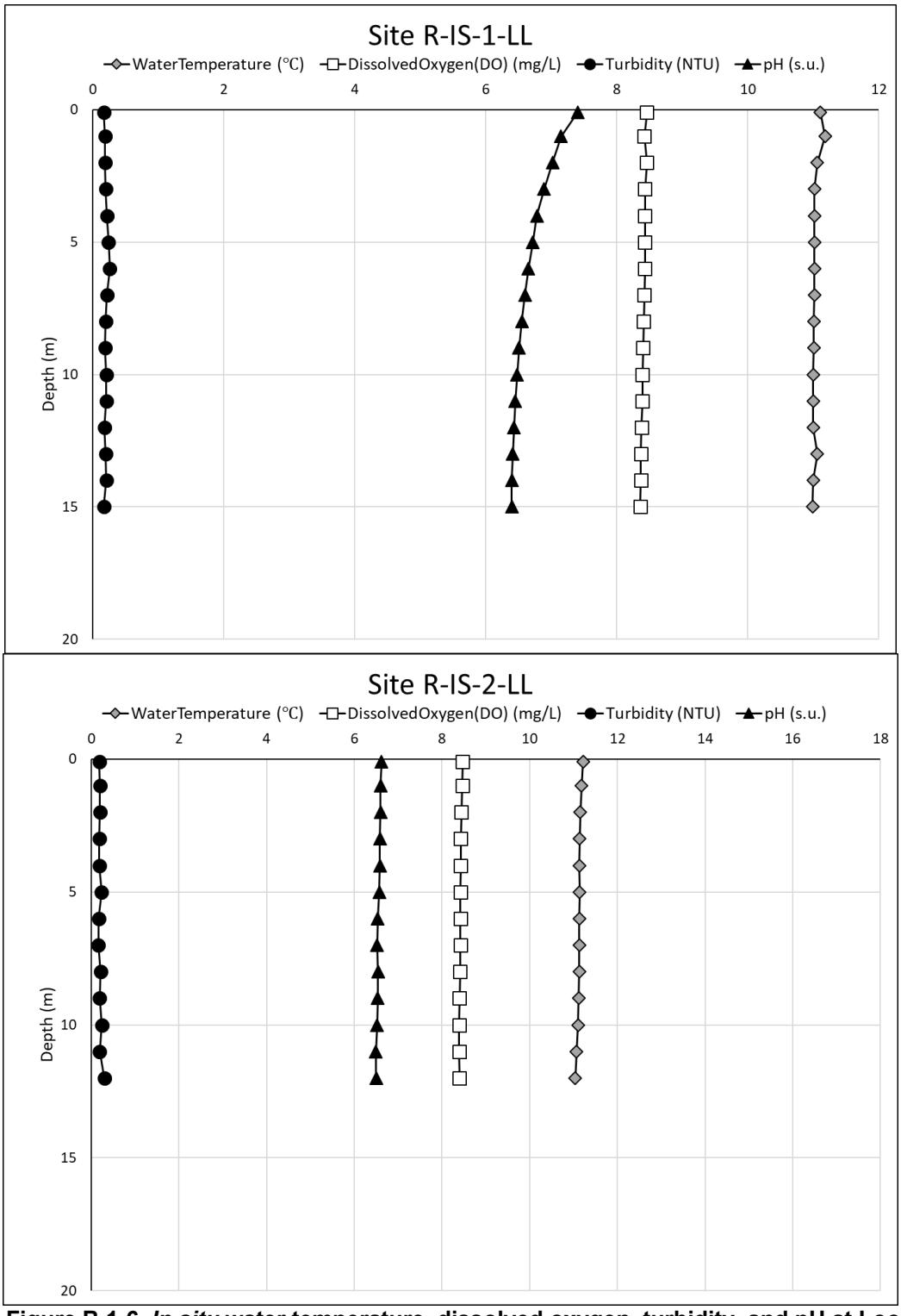

Figure B.1-6. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Loon Lake sites R-IS-1-LL and R-IS-2-LL during October (Fall) 2019.

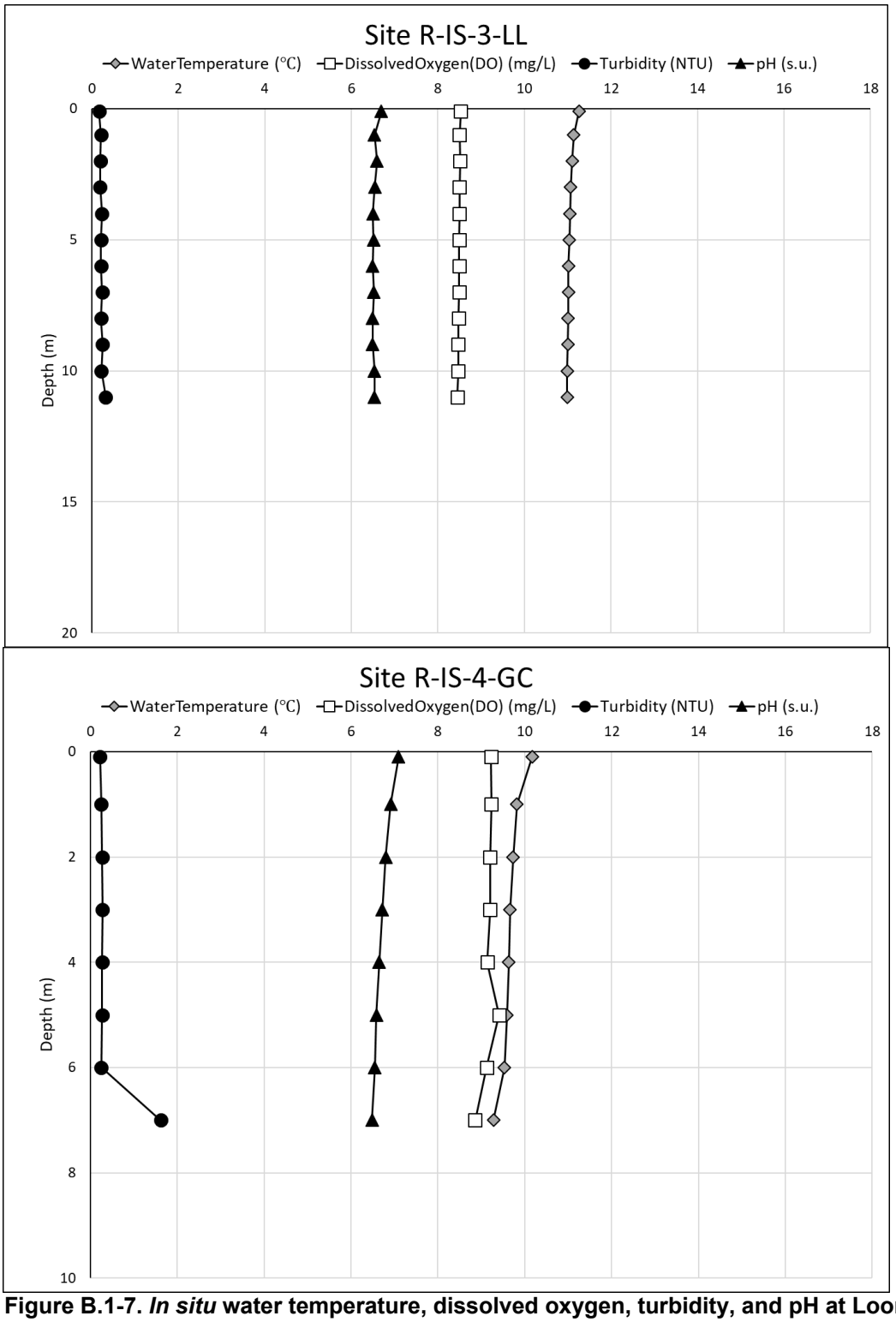

Figure B.1-7. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Loon Lake and Gerle Creek Reservoir sites R-IS-3-LL and R-IS-4-GC during October (Fall) 2019.

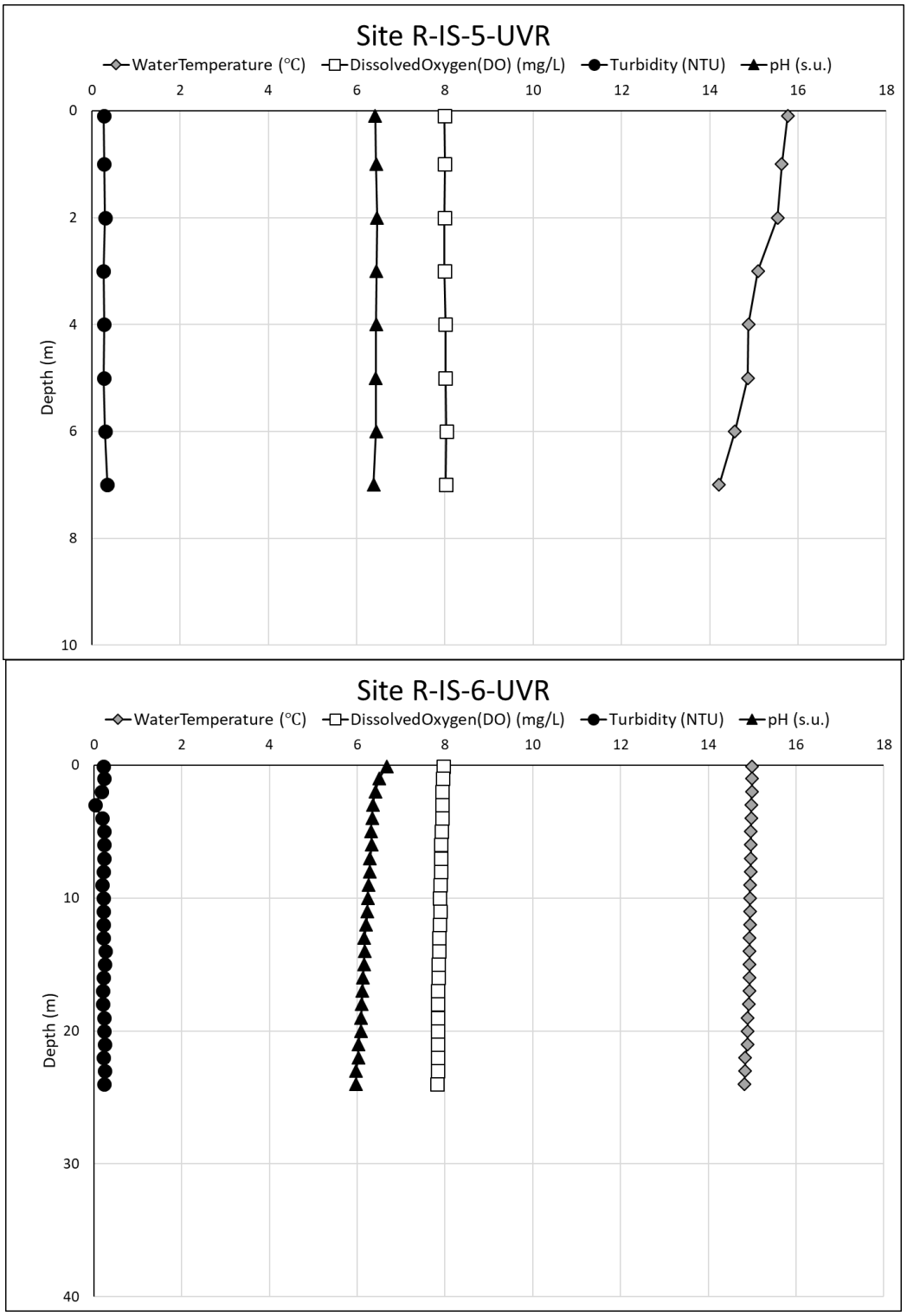

Figure B.1-8. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Union Valley Reservoir sites R-IS-5-UVR and R-IS-6-UVR during October (Fall) 2019.

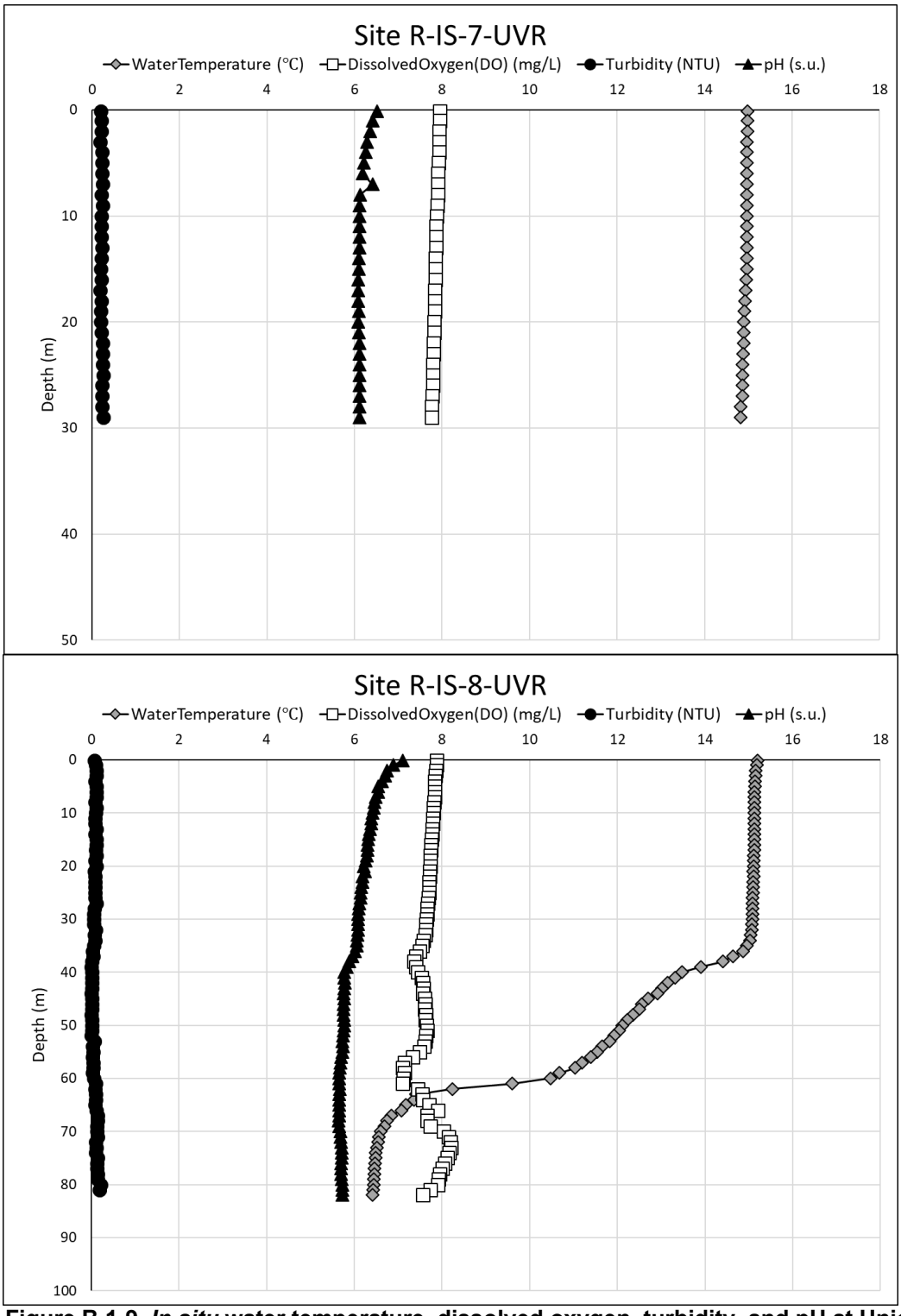

Figure B.1-9. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Union Valley Reservoir sites R-IS-7-UVR and R-IS-8-UVR during October (Fall) 2019.

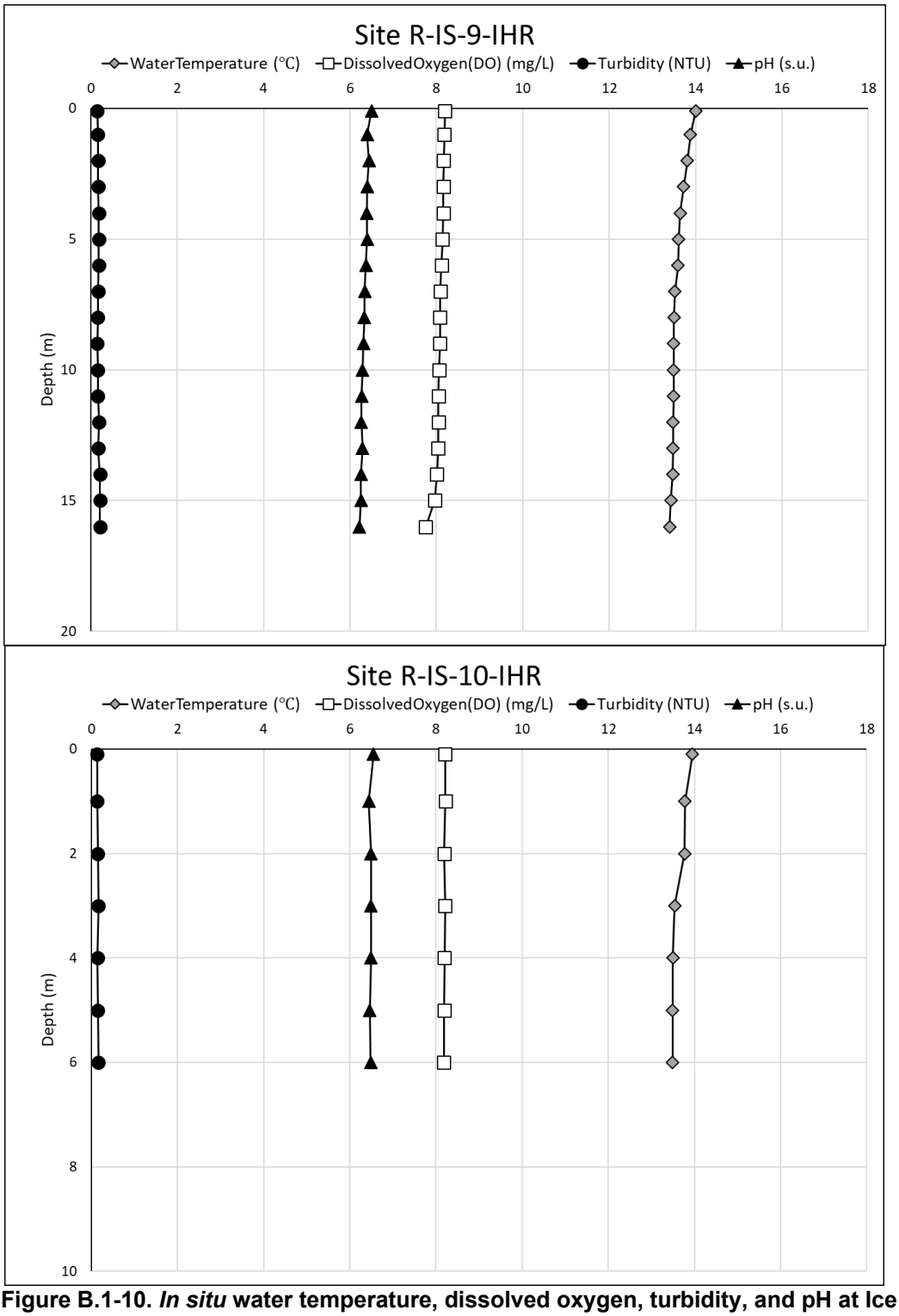

Figure B.1-10. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Ice House Reservoir sites R-IS-9-IHR and R-IS-10-IHR during October (Fall) 2019.

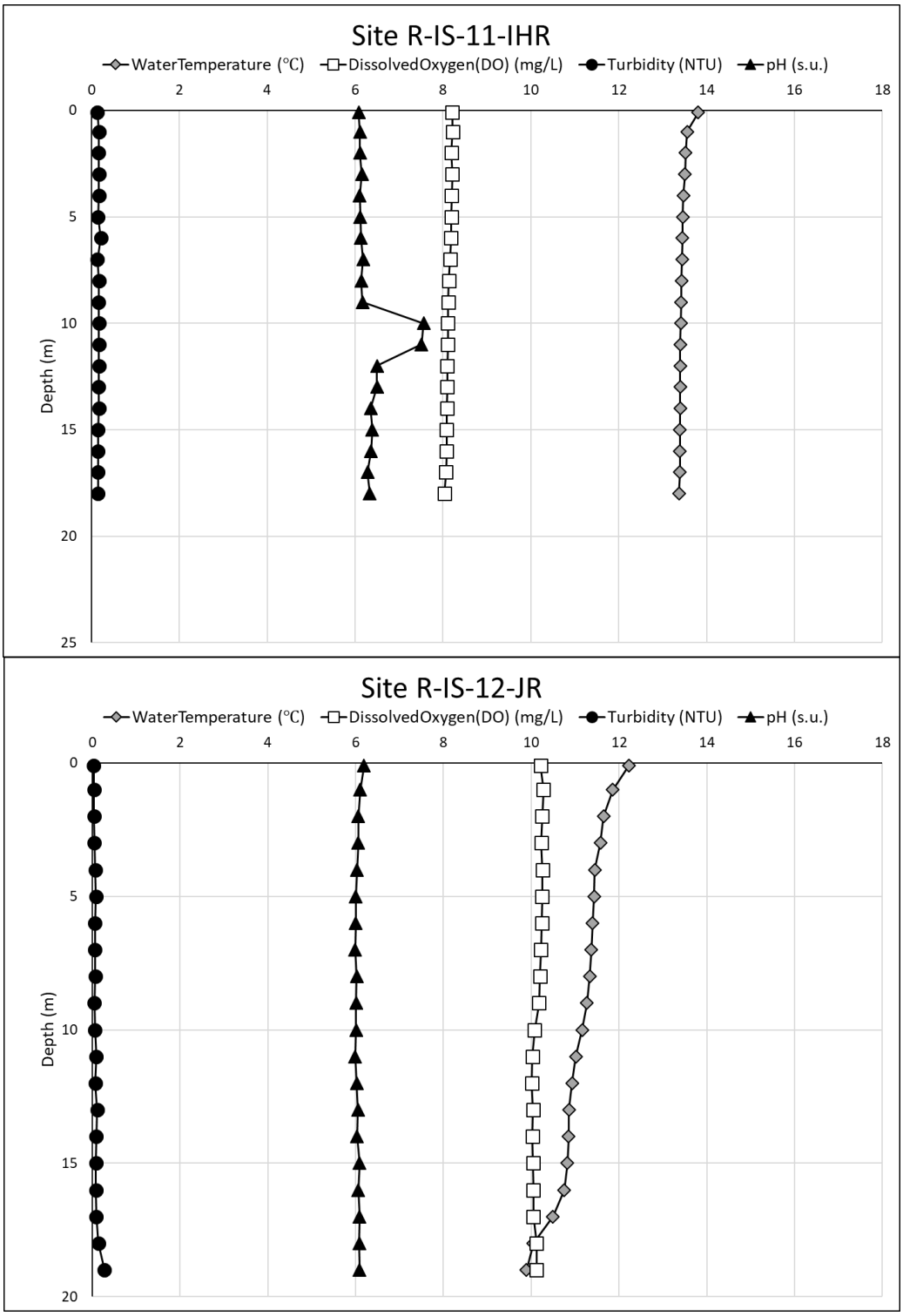

Figure B.1-11. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Ice House Reservoir and Junction Reservoir sites R-IS-11-IHR and R-IS-12-JR during October (Fall) 2019.

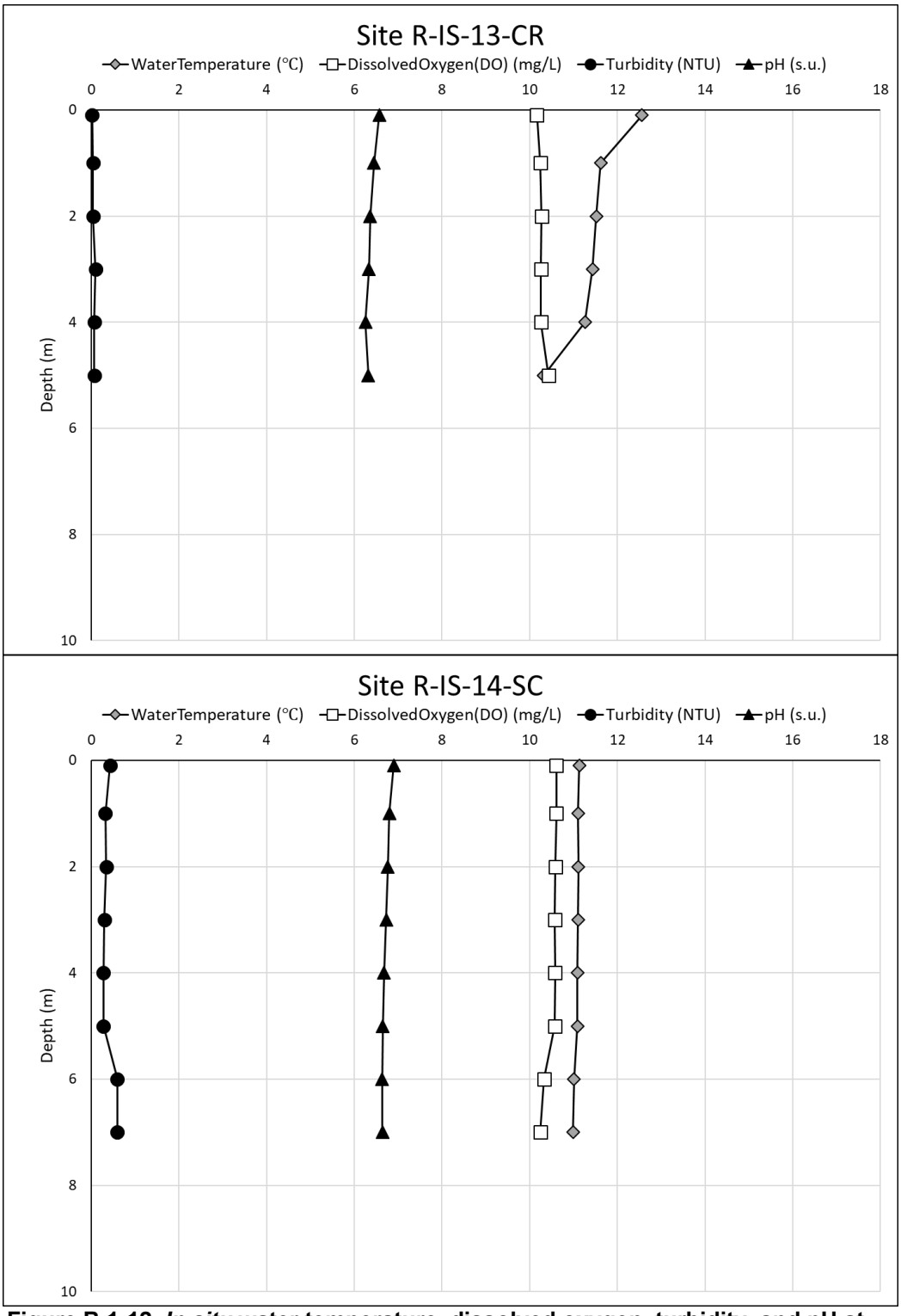

Figure B.1-12. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Camino Reservoir and Slab Creek Reservoir sites R-IS-13-JR and R-IS-14-SC during October (Fall) 2019.

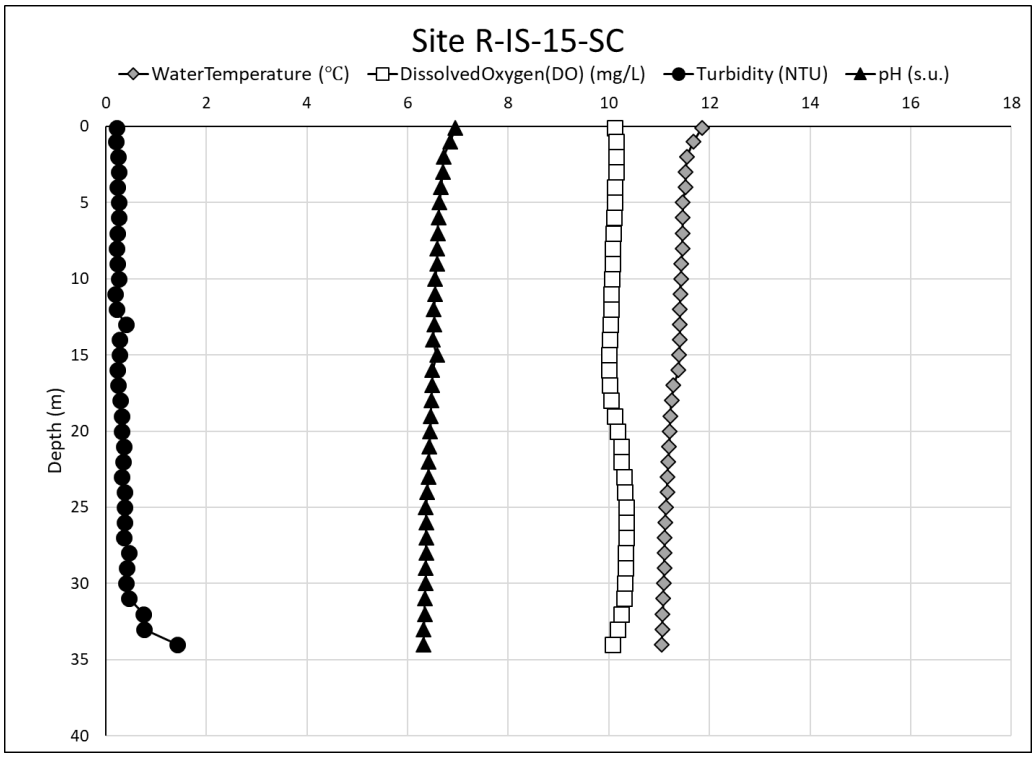

Figure B.1-13. *In situ* water temperature, dissolved oxygen, turbidity, and pH at Slab Creek Reservoir site R-IS-15-SC during October (Fall) 2019.

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APPENDIX B.2
2015−2019 Profile

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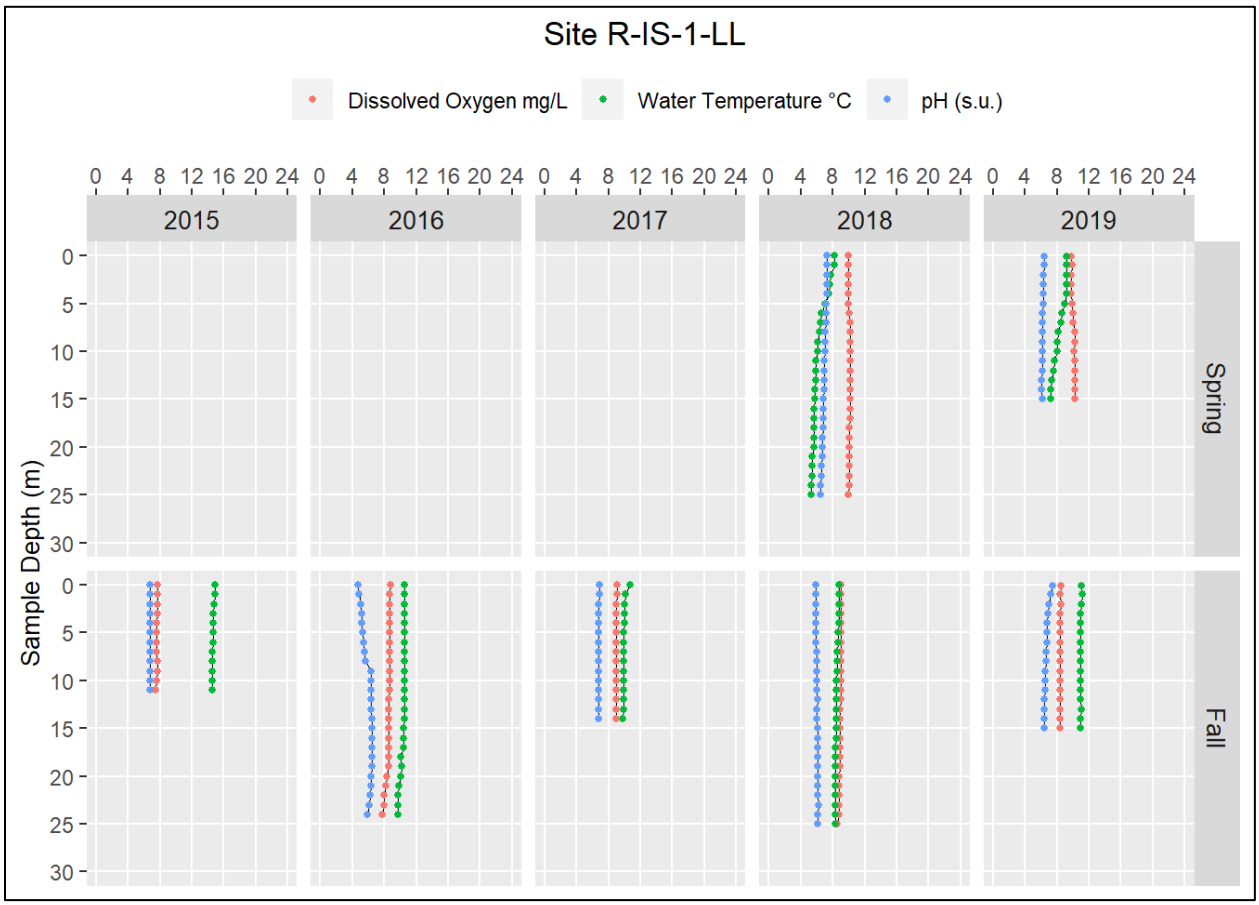

Figure B.2-1. In situ dissolved oxygen, water temperature, and pH at Loon Lake Site R-IS-1-LL during 2015–2019.

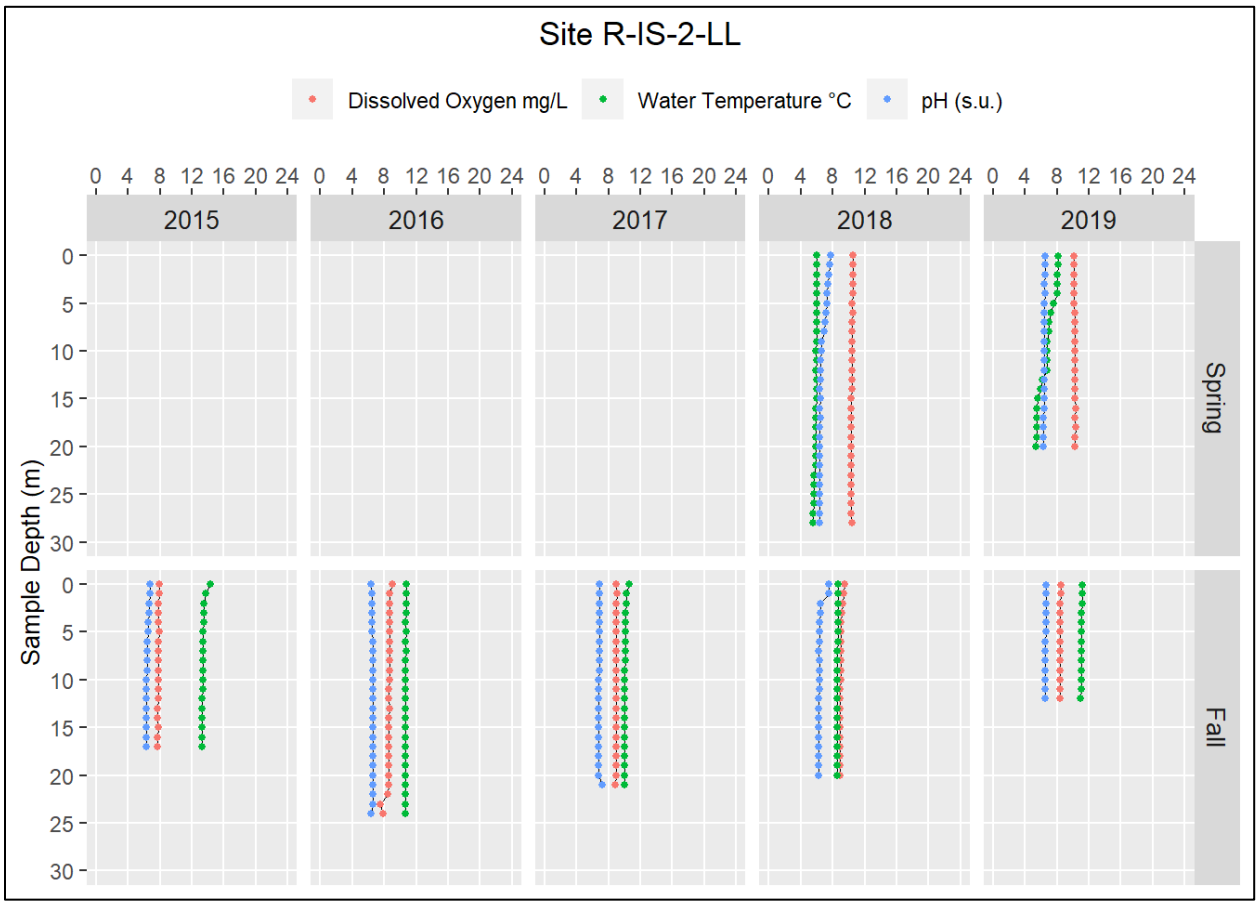

Figure B.2-2. In situ dissolved oxygen, water temperature, and pH at Loon Lake Site R-IS-2-LL during 2015-2019.

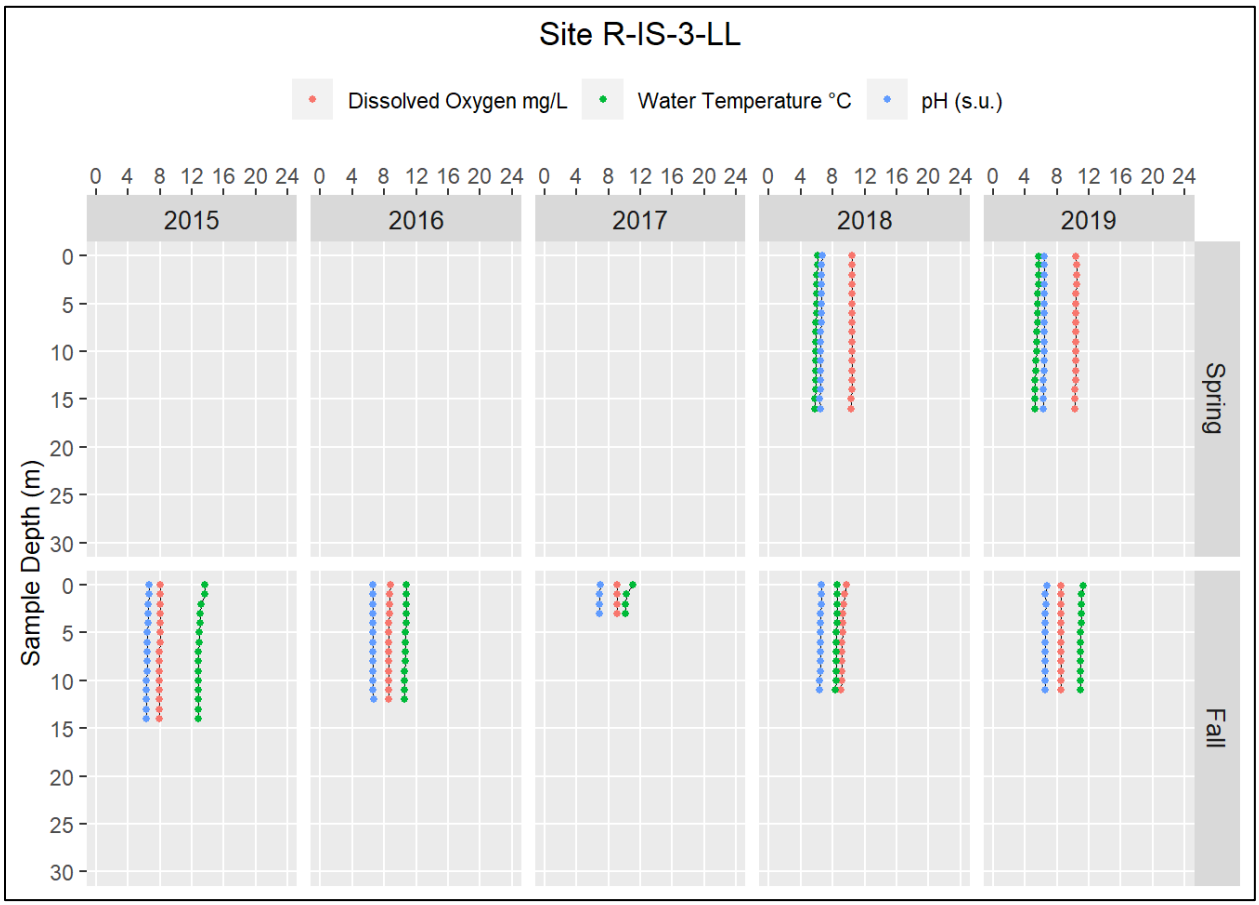

Figure B.2-3. In situ dissolved oxygen, water temperature, and pH at Loon Lake Site R-IS-3-LL during 2015-2019.

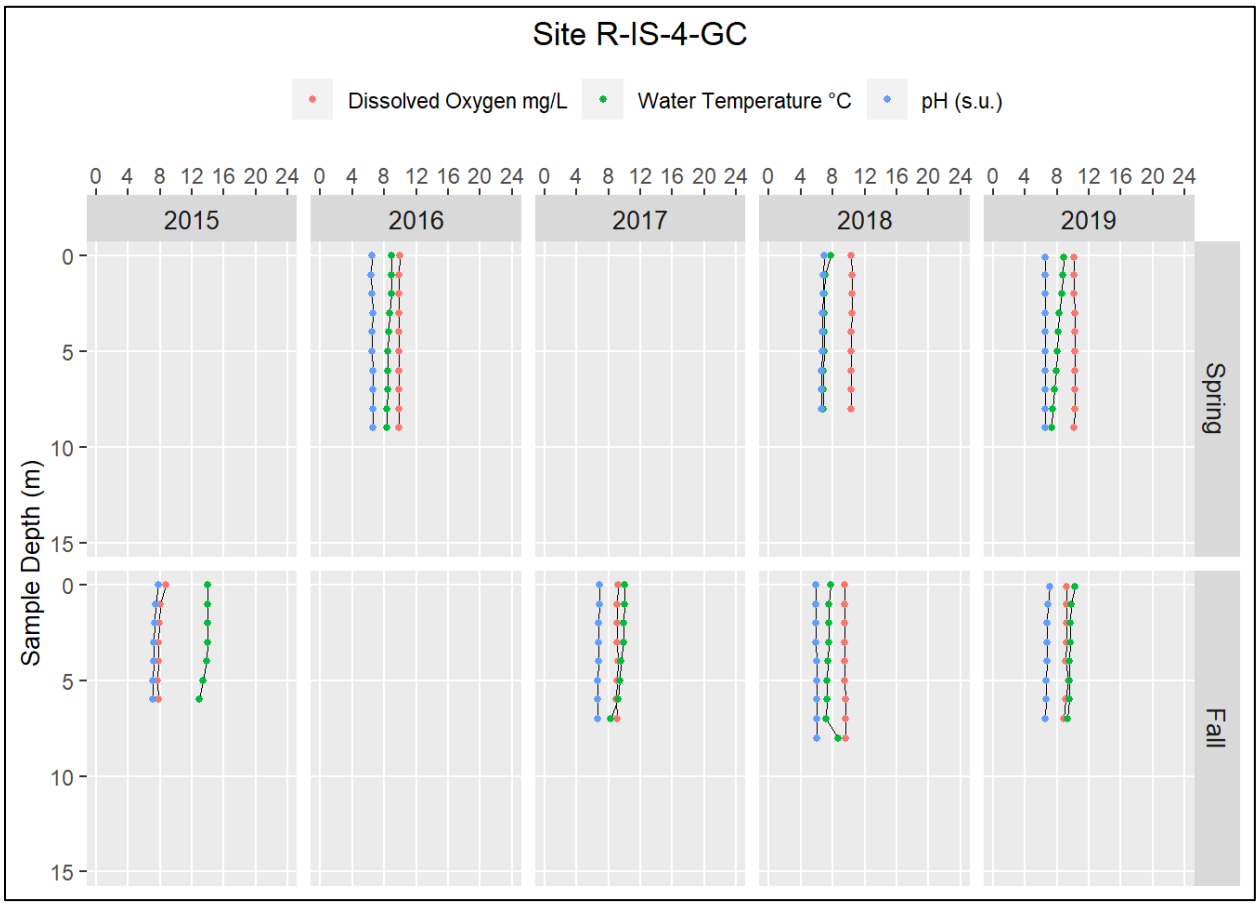

Figure B.2-4. In situ dissolved oxygen, water temperature, and pH at Gerle Creek Reservoir Site R-IS-4-GC during 2015-2019.

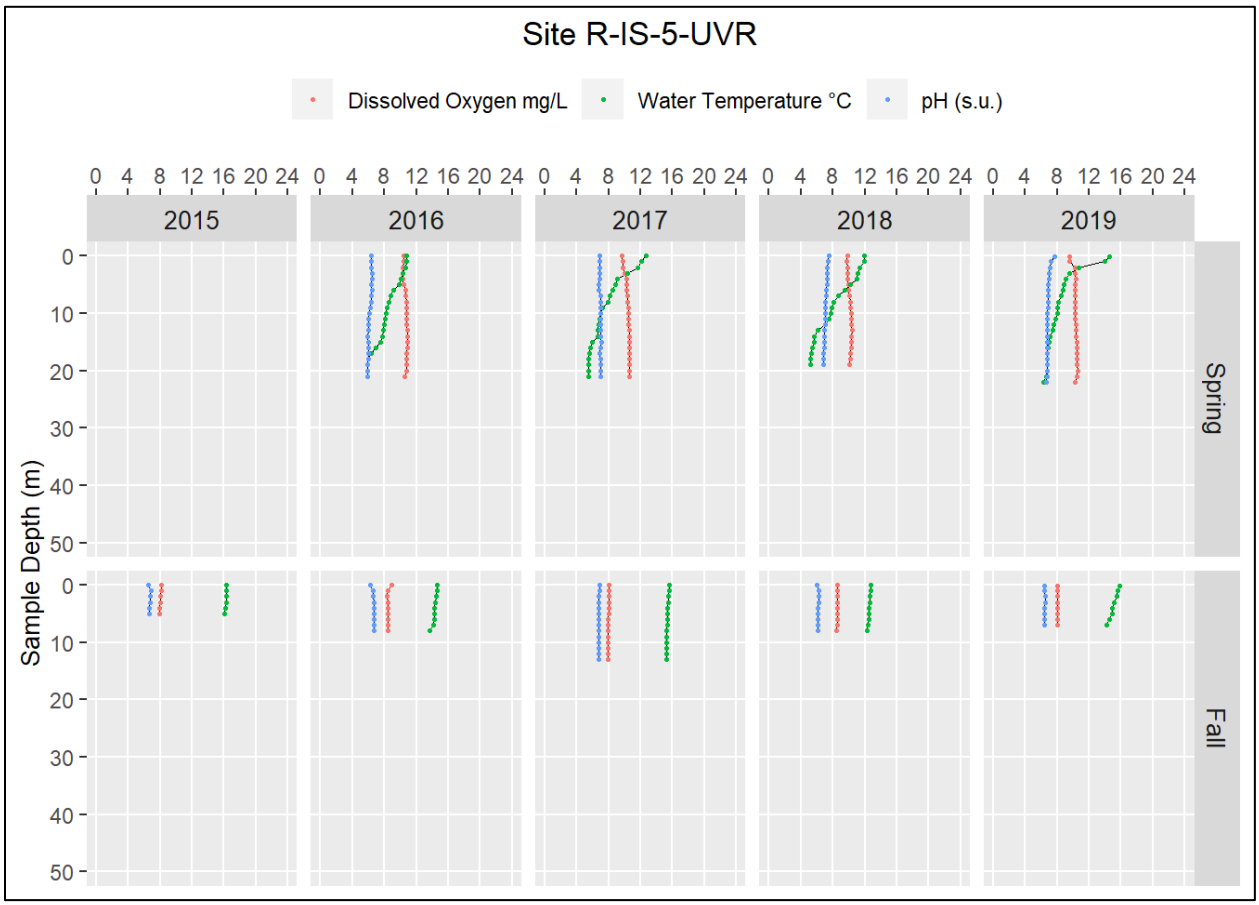

Figure B.2-5. In situ dissolved oxygen, water temperature, and pH at Union Valley Reservoir Site R-IS-5-UVR during 2015-2019.

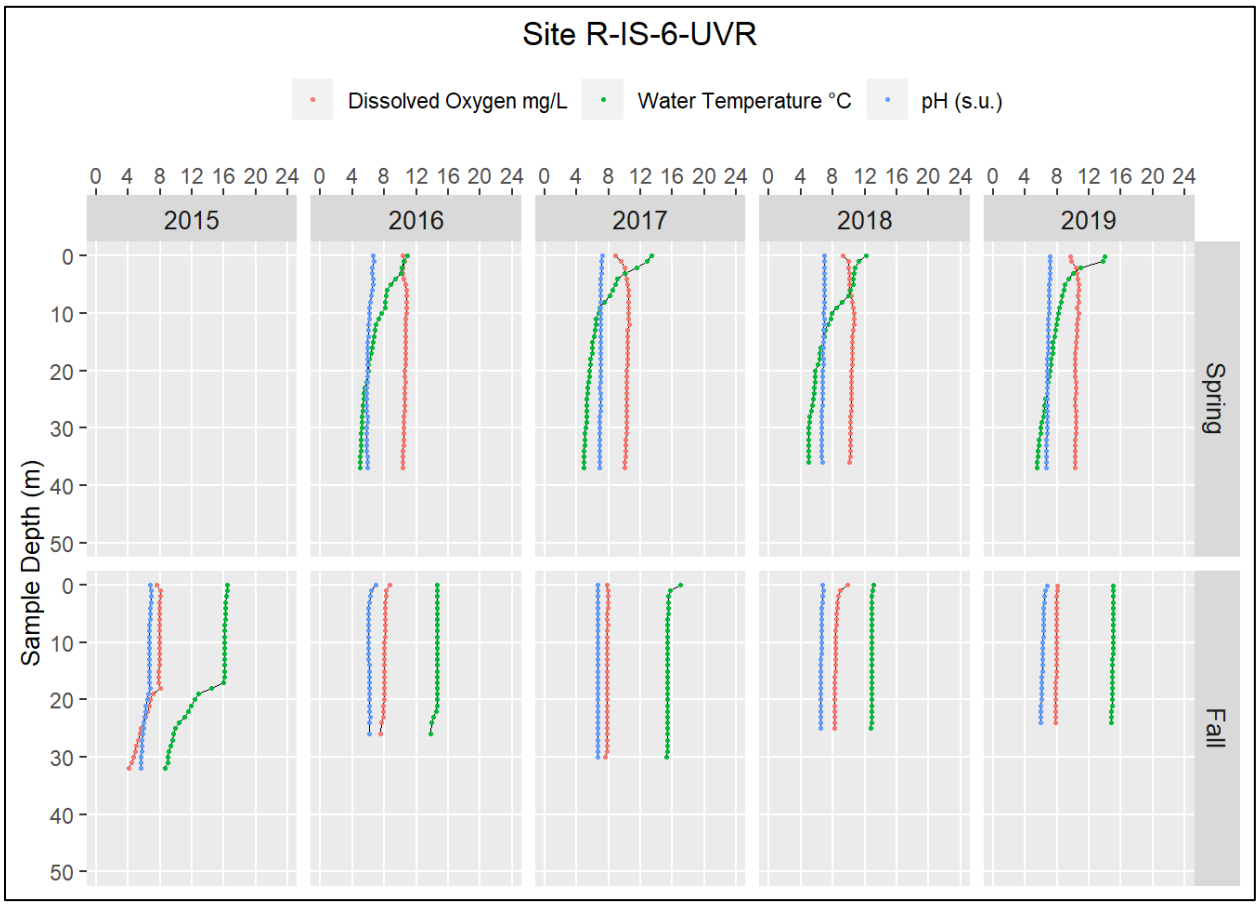

Figure B.2-6. In situ dissolved oxygen, water temperature, and pH at Union Valley Reservoir Site R-IS-6-UVR during 2015-2019.

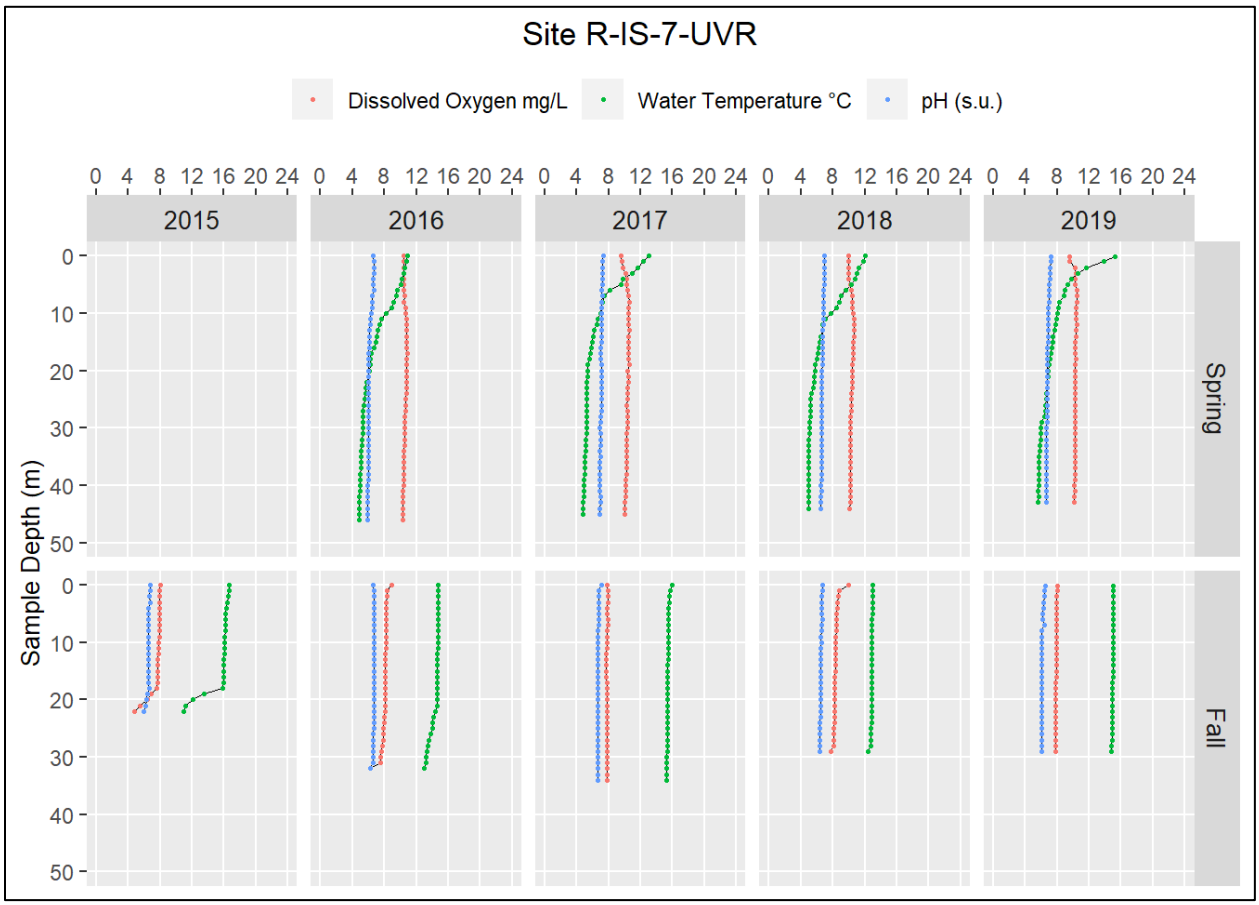

Figure B.2-7. In situ dissolved oxygen, water temperature, and pH at Union Valley Reservoir Site R-IS-7-UVR during 2015-2019.

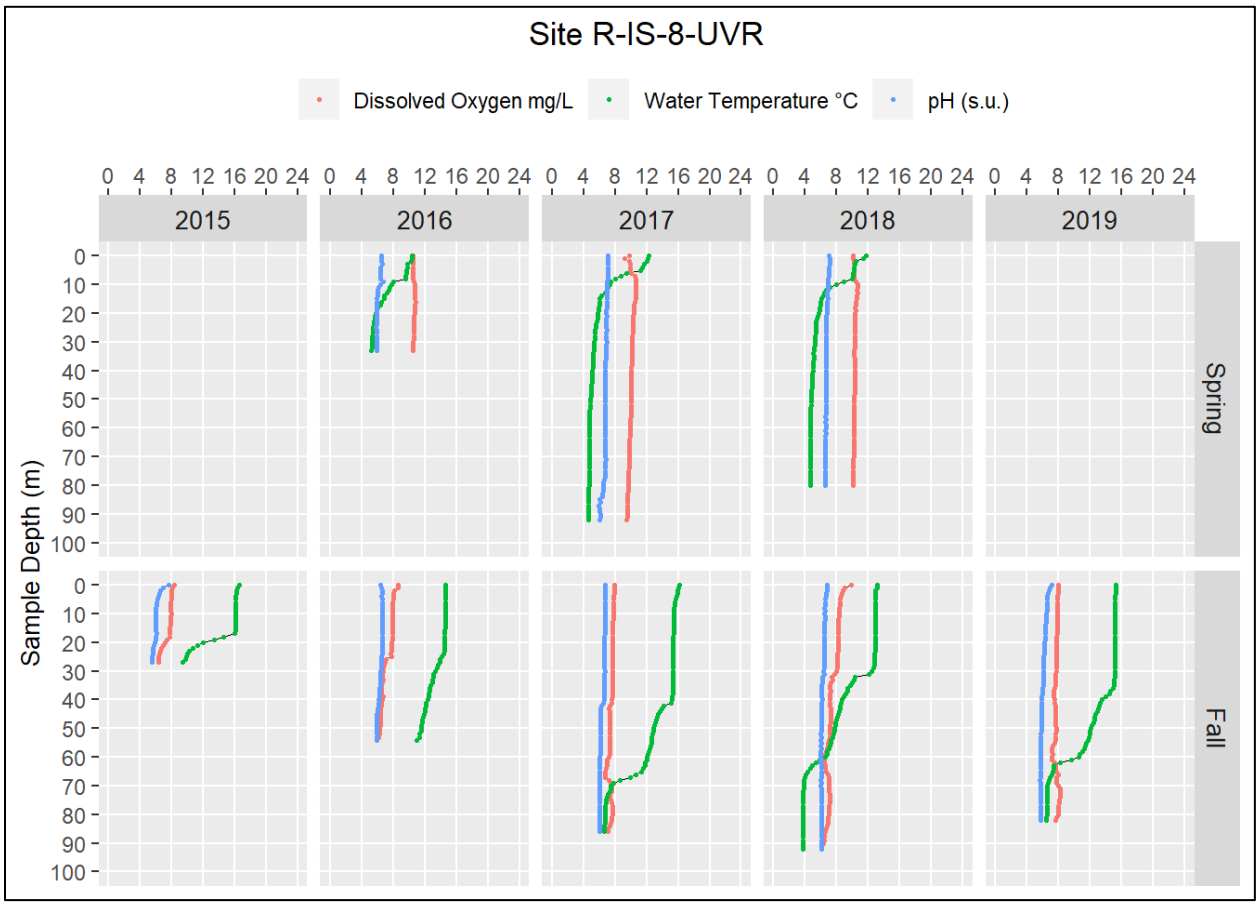

Figure B.2-8. In situ dissolved oxygen, water temperature, and pH at Union Valley Reservoir Site R-IS-8-UVR during 2015-2019.

Figure B.2-9. In situ dissolved oxygen, water temperature, and pH at Ice House Reservoir Site R-IS-9-IHR during 2015-2019.

Figure B.2-10. In situ dissolved oxygen, water temperature, and pH at Ice House Reservoir Site R-IS-10-IHR during 2015-2019.

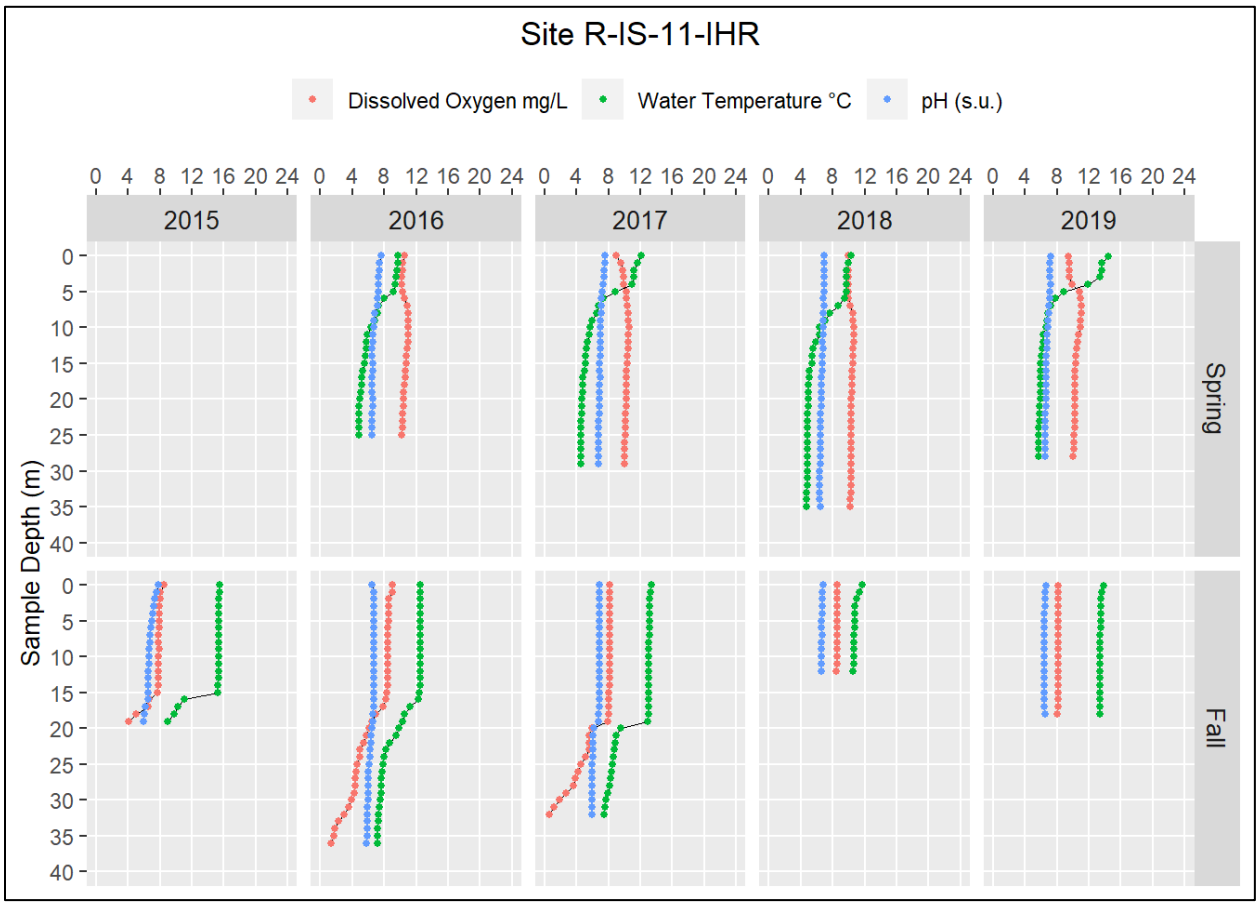

Figure B.2-11. In situ dissolved oxygen, water temperature, and pH at Ice House Reservoir Site R-IS-11-IHR during 2015-2019.

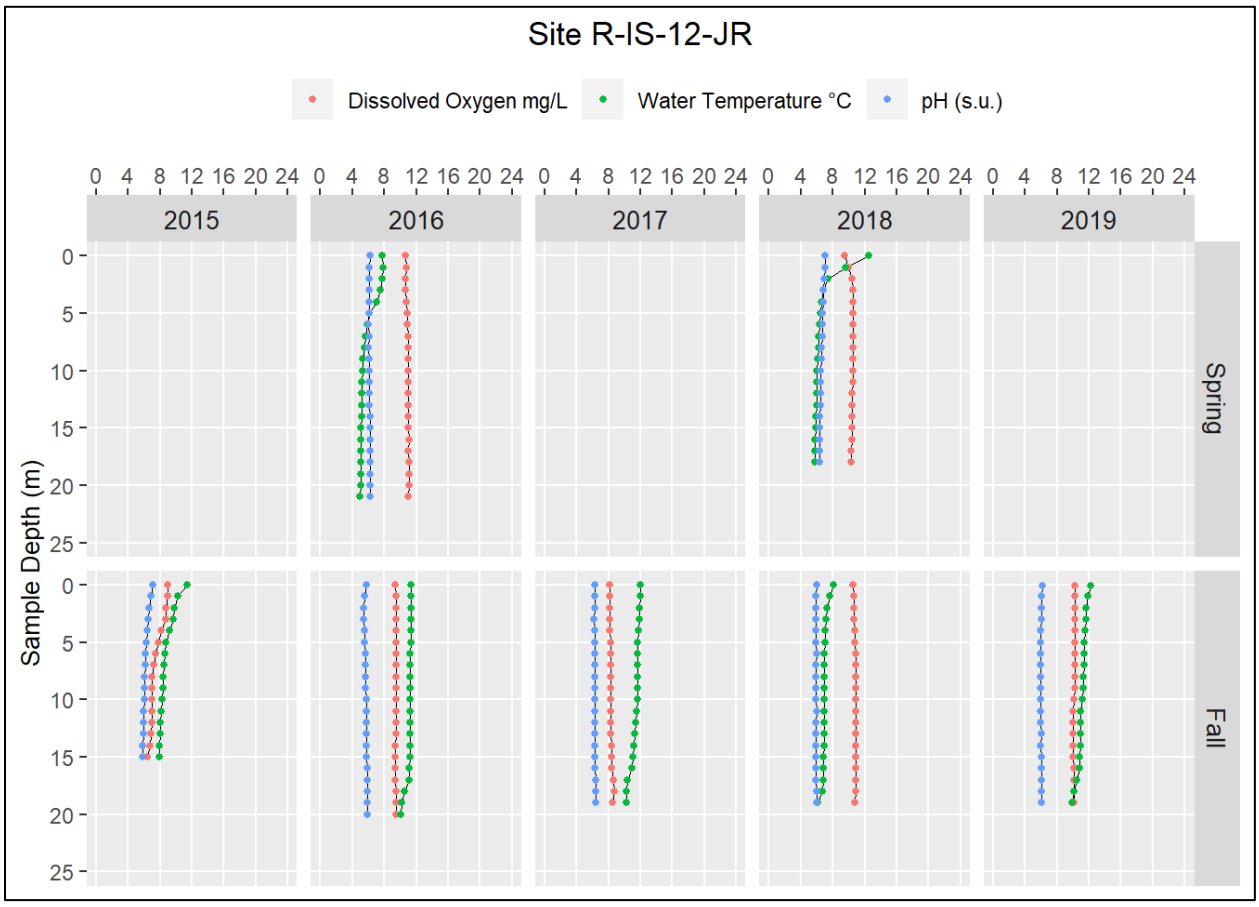

Figure B.2-12. In situ dissolved oxygen, water temperature, and pH at Junction Reservoir Site R-IS-12-JR during 2015-2019.

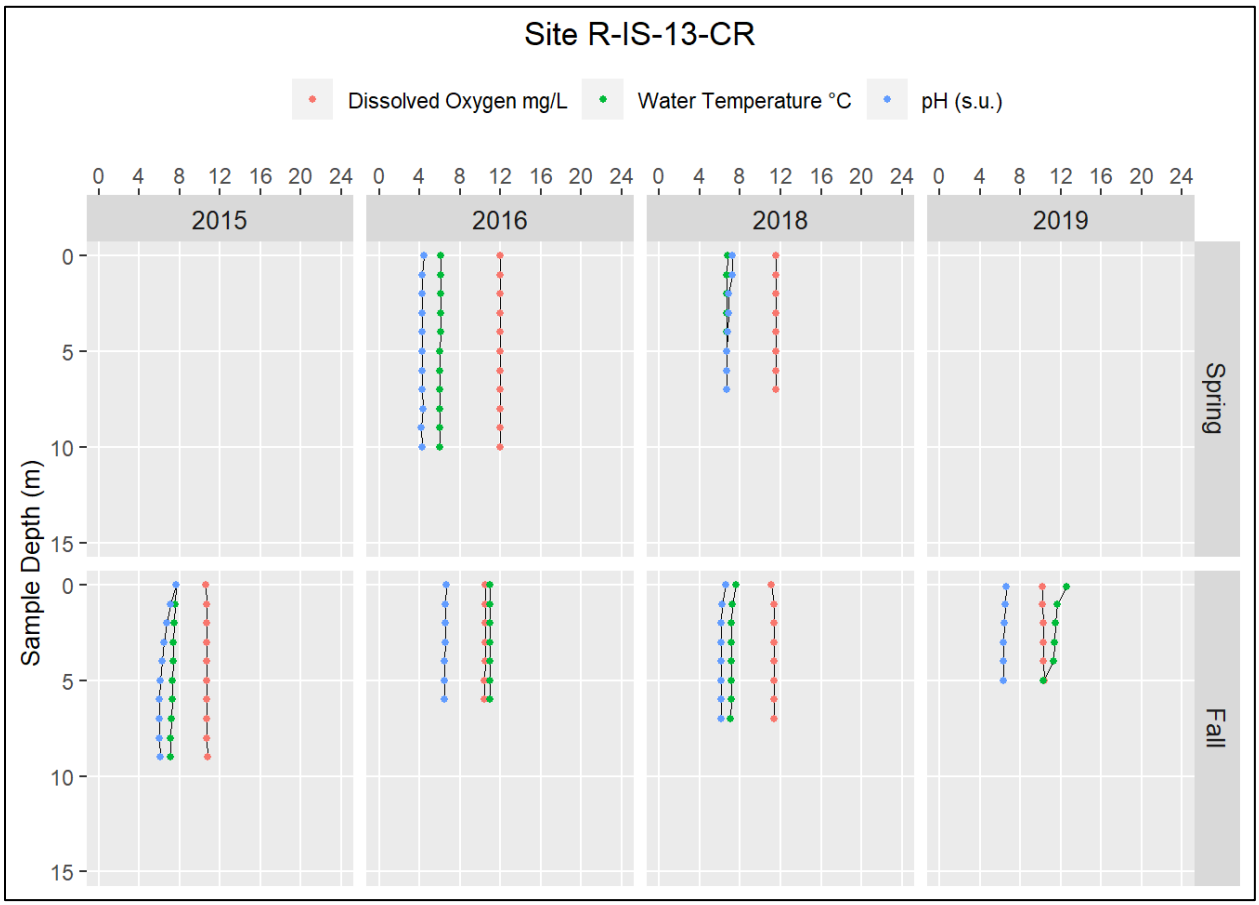

Figure B.2-13. In situ dissolved oxygen, water temperature, and pH at Camino Reservoir Site R-IS-13-CR during 2015-2019.

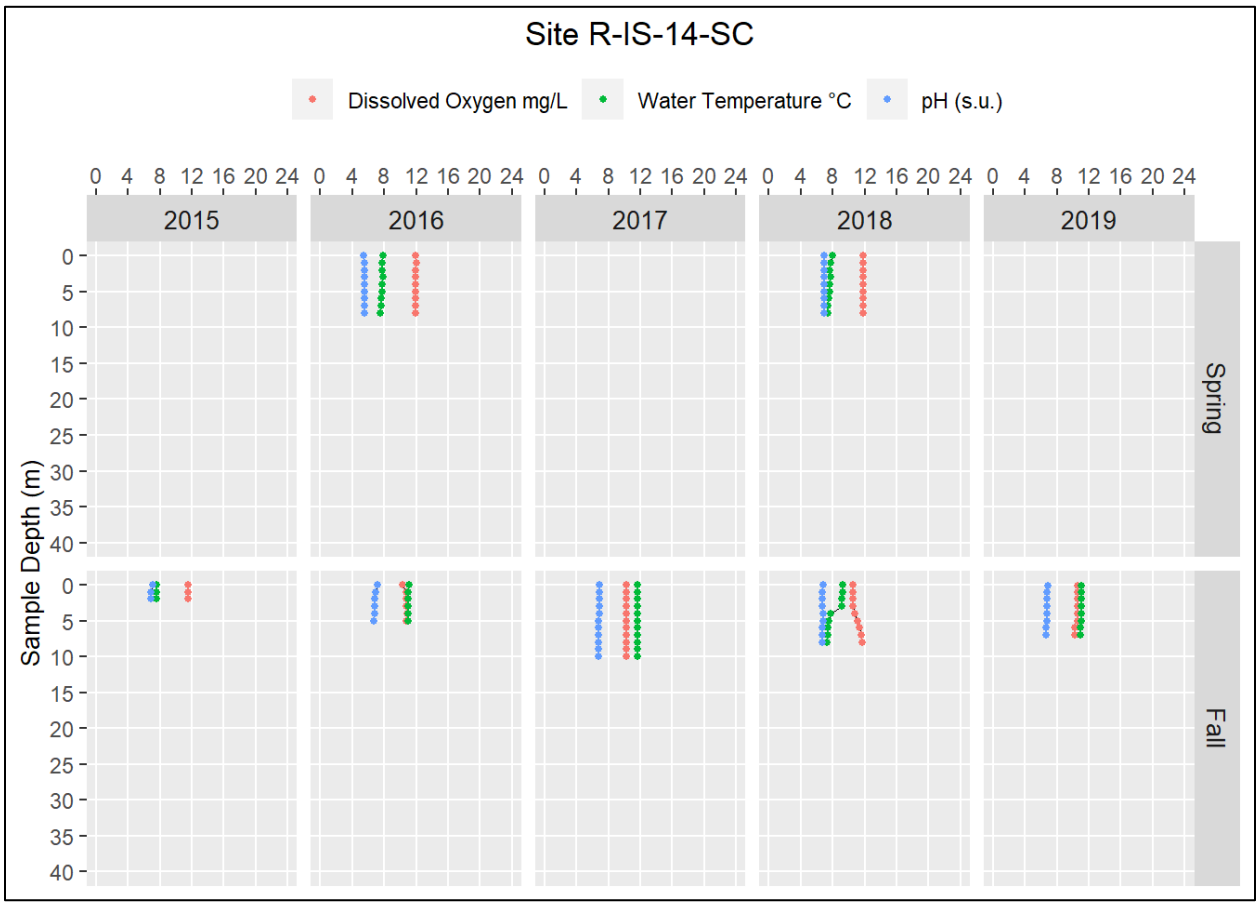

Figure B.2-14. In situ dissolved oxygen, water temperature, and pH at Slab Creek Reservoir Site R-IS-14-SC during 2015-2019.

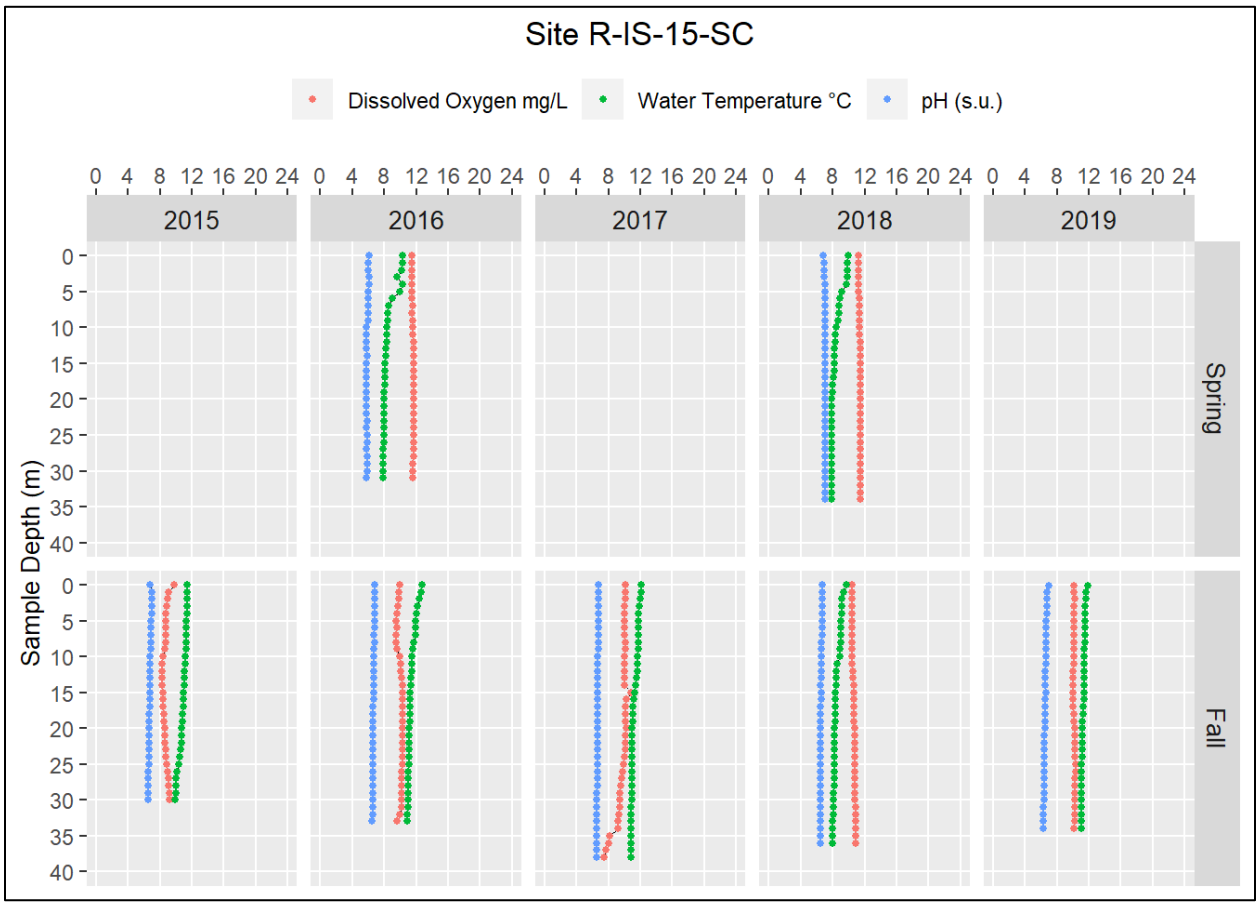

Figure B.2-15. In situ dissolved oxygen, water temperature, and pH at Slab Creek Reservoir Site R-IS-15-SC during 2015-2019.

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APPENDIX C
Bacteria Results for UARP Reservoir and Riverine Sites

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Table C-1. Bacteria (MPN/100mL) for UARP Sites During the 30-day Period Surrounding Independence Day[1, 2].

Site ID	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		Fecal coliform geometric mean[1]	*E. coli* geometric mean[1]
	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*		
Bac-5-GCR	<1.8	3.1	4	3.1	4.5	11	23	8.6	<1.8	<1	3.2	3.4
Bac-6-GCR	2	<1	23	9.8	<1.8	1	<1.8	2	<1.8	1	2.0	1.6
Bac-7-UVR	350	770.1	23	14.5	79	66.3	17	184.2	11	60.5	41.2	96.2
Bac-8-UVR	2	1	79	65	79	151.5	4.5	4.1	22	42	16.5	17.6
Bac-9-UVR	2	<1	49	13.4	23	365.4	2	3	17	46.4	9.5	12.8
Bac-10-UVR	<1.8	<1	<1.8	<1	540	193.5	<1.8	<1	7.8	5.2	5.0	2.6
Bac-11-JR	13	12.2	1.8	<1	46	21.8	79	135.4	>1600	121	48.6	18.5
Bac-12-IHR	<1.8	35.9	13	16.9	13	<1	4.5	5.2	2	<1	4.2	3.8
Bac-13-IHR	4	6.3	6.8	2	4	<1	7.8	5.2	<1.8	2	3.8	2.3
Bac-14-BCR	13	3	4	<1	21	<1	170	39.5	2	<1	13.0	1.7
Bac-15-SCR	7.8	6	4.5	1	26	14.2	13	4.1	540	69.7	23.0	7.5
MDL	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	-	-
MRL	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	-	-

[1] Individual results < MDL were treated as 0.5 x MDL for the geometric mean calculations.
[2] Individual results >1600 were treated as 2.0 x 1,600 for the geometric mean calculations.
MDL = method detection limit
MRL = method reporting limit

Table C-2. Bacteria (MPN/100mL) for UARP Sites During the 30-day Period Surrounding Labor Day[1].

Site ID	Sample 1		Sample 2		Sample 3		Sample 4		Sample 5		Fecal coliform geometric mean [1]	*E. coli* geometric mean [1]
	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*	Fecal coliform	*E. coli*		
Bac-1-BI	2	3.1	<1.8	1	2	2	4	1.0	4.5	1.0	2.3	1.4
Bac-2-BI	<1.8	2	2	<1	2	1	<1.8	<1	<1.8	1.0	1.2	0.9
Bac-3-LL	<1.8	<1	<1.8	<1	3.7	<1	<1.8	<1	<1.8	<1	1.2	0.5
Bac-4-LL	<1.8	<1	<1.8	<1	2	1	<1.8	<1	<1.8	<1	1.1	0.6
MDL	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	-	-
MRL	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	1.8	1.0	-	-

[1] Individual results <MDL were treated as 0.5 x MDL for the geometric mean calculations.
MDL = method detection limit
MRL = method reporting limit

APPENDIX D
In situ Field Data Sheets

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Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Instrument(s) used: YSI EXO **Crew:** EES SPK

Site Location: IS-19-SFAR GPS:
Date: 2-6-2019 Time: 0949
Photos: Weather: partly cloudy, cold
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
5.05	13.44	105.4	23.8	0.039	6.67	2.42	

Site Location: IS-18-SFAR GPS:
Date: 2-6-2019 Time: 1103
Photos: Weather: clear, cold
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
5.70	14.03	111.9	38.5	0.061	7.24	3.41	

Site Location: GPS:
Date: Time:
Photos: Weather:
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Instrument(s) used: YSI EXO **Crew:** EES MLS

Site Location: IS-11-SFSC GPS:
Date: 2/25/19 Time: 1058
Photos: Weather: overcast
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.03	11.46	87.5	14.0	0.023	6.51	0.22	

Site Location: IS-12-SC GPS:
Date: 2/25/19 Time: 1145
Photos: Weather: overcast
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
3.19	11.49	85.9	10.2	0.018	6.53	0.45	

Site Location: IS-13-SC GPS:
Date: 2/25/19 Time: 1304
Photos: Weather: overcast
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.95	11.85	92.7	14.1	0.023	6.84	0.47	

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Instrument(s) used: YSI EXO **Crew:** EES MLS

Site Location: IS-14-SC GPS:
Date: 2-25-19 Time: 1342
Photos: Weather: overcast
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.95	11.84	92.6	18.2	0.030	7.01	0.23	

Site Location: IS-17-BC GPS:
Date: 2-25-19 Time: 1620
Photos: Weather: light rain
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.79	11.78	91.8	17.1	0.028	6.90	12.15	

Site Location: IS-15-SFAR GPS:
Date: 2-25-19 Time: 1704
Photos: Weather: light rain
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
5.01	12.27	96.2	40.6	0.066	7.24	0.94	

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Instrument(s) used: YSI EXO **Crew:** EES MLS

Site Location: IS-16-SFAR GPS:
Date: 2-25-19 Time: 1721
Photos: Weather: rain
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.64	12.68	98.4	19.4	0.032	7.09	0.53	

Site Location: GPS:
Date: Time:
Photos: Weather:
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	

Site Location: GPS:
Date: Time:
Photos: Weather:
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Instrument(s) used: YSI EXO **Crew:** EES CMB RL

Site Location: 1S-11-SESC GPS:
Date: 5-21-2019 Time: 08:44
Photos: 4268 - 4265 Weather: snowing
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.50	11.33	87.6	9.7	0.016	6.52	0.43	

Site Location: 5S-12-SC GPS:
Date: 5-21-19 Time: 09:15
Photos: ~~4269~~, iphone Weather: Snow/rain
Notes: Junction reservoir spilling

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
6.65	10.88	88.8	8.4	0.013	6.98	0.48	

Site Location: 1S-13-SC GPS:
Date: 5-21-19 Time: 10:20
Photos: 4271-73 Weather: Cool, misty, light rain
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.43	11.26	93.8	8.8	0.013	7.06	0.55	bare 682mm Hg

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Instrument(s) used: YSI EXO **Crew:** EES CMB BL

Site Location: IS-14-SC
Date: 5-21-19
Photos: 4274-4277
Notes: reservoir spilling
GPS:
Time: 10:51
Weather: raining

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.28	11.36	94.2	8.7	0.013	7.05	0.54	

Site Location: IS-17-BC
Date: 5-21-19
Photos: 4278-4280
Notes: reservoir not spilling
GPS:
Time: 13:34
Weather: raining

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
10.95	9.99	90.5	18.8	0.026	7.30	7.30	water cloudy

Site Location: IS-15-SFAR
Date: 5-21-19
Photos: 4281-4283
Notes:
GPS:
Time: 14:22
Weather: cool, overcast

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.63	11.67	97.7	17.9	0.027	7.36	2.18	

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Instrument(s) used: YSI-EXO **Crew:** EES CMB BL

Site Location: IS-16-SFAR
Date: 5-21-19
Photos: 4284-4286
Notes:
GPS:
Time: 14:40
Weather: Cool, sprinkling

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.59	11.75	98.2	16.6	0.025	7.25	1.26	

Site Location: IS-4-GC
Date: 5-22-19
Photos: 4287-4289
Notes:
GPS:
Time: 09:10
Weather: Sunny, cold

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
2.52	11.20	82.1	4.4	0.008	6.89	0.65	

Site Location: IS-5-GC
Date: 5-22-19
Photos: 4290-4292
Notes:
GPS:
Time: 09:47
Weather: Sunny, cool

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
2.77	11.42	84.3	5.6	0.010	6.77	0.13	

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Instrument(s) used: YSI EXO **Crew:** EES BL

Site Location: IS-6-GC
Date: 5-22-19
Photos: 4293-4296
Notes: Dam not spilling
GPS:
Time: 10:09
Weather: Sunny, cool

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
2.94	11.44	84.8	5.2	0.009	6.65	0.13	

Site Location: IS-9-GCC
Date: 5-22-19
Photos: 4297-4300
Notes:
GPS:
Time: 10:33
Weather: Partly cloudy, cool

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
3.01	11.66	86.6	5.1	0.009	6.66	0.15	

Site Location: IS-7-SFRR
Date: 5-22-19
Photos: 4301-4303
Notes:
GPS:
Time: 11:08
Weather: Sunny

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.04	11.25	85.9	7.0	0.012	7.06	0.19	

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Instrument(s) used: YSI EXO **Crew:** EES BL

Site Location: 1S-8-SFRR GPS:
Date: 5-22-19 Time: 11:26
Photos: 4304-4306 Weather: cloudy, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
4.16	11.32	86.7	6.9	0.011	7.02	0.07	

Site Location: 1S-10-SFSC GPS:
Date: 5-22-19 Time: 12:21
Photos: 4307-4309 Weather: sunny, breeze
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
5.71	10.77	85.9	7.6	0.012	7.01	0.58	

Site Location: 1S-19-SFAR GPS:
Date: 5-22-19 Time: 13:54
Photos: 4310-4312 Weather: cool, light sprinkle
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
8.16	11.45	97.1	16.0	0.024	7.29	0.78	

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Instrument(s) used: YSI EXO **Crew:** ES DR

Site Location: IS-18 - SFAR GPS:
Date: 5/23/2019 Time: 0747
Photos: 4313 – 4315 Weather: sunny, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
10.03	11.0	97.5	32.1	0.045	7.35	1.48	

Site Location: GPS:
Date: Time:
Photos: Weather:
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	

Site Location: GPS:
Date: Time:
Photos: Weather:
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	

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Instrument(s) used: YSI EXO **Crew:** EES SPK

Site Location: IS-1-RR GPS:
Date: 8/5/19 Time: 1320
Photos: 003, 004 Weather: overcast, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 605.1 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
18.13	7.65	81.0	9.1	0.010	6.50	0.23	

Site Location: IS-2-LRR GPS:
Date: 8-5-19 Time: 1441
Photos: 005-008 Weather: overcast, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 605.7 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
20.1	7.49	82.5	7.2	0.008	6.65	0.26	

Site Location: IS-3-LRR GPS:
Date: 8-5-19 Time: 1528
Photos: 009-011 Weather: overcast, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 607.0 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
21.0	7.43	83.3	8.0	0.008	6.80	0.17	

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Instrument(s) used: YSI EXO **Crew:** EES DKR

Site Location: 15-10-SFSC GPS:
Date: 8/6/19 Time: 0815
Photos: Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 631.2 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
6.97	10.27	84.6	7.2	0.011	6.32	0.54	

Site Location: 15-11-SFSC GPS:
Date: 8/6/19 Time: 0911
Photos: Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 656.3 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
12.87	9.23	87.3	11.7	0.015	6.82	0.22	

Site Location: 15-12-SC GPS:
Date: 8/6/19 Time: 0938
Photos: 0012-0014 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 654.0 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
9.29	9.81	85.4	8.8	0.013	6.70	0.33	

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Instrument(s) used: YSI EXO **Crew:** EES DKR

Site Location: 1S-13-SC GPS:
Date: 8-6-19 Time: 1044
Photos: 6015 - 6017 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 686.0 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
16.0	8.99	91.1	13.8	0.017	6.70	0.30	

Site Location: 1S-14-SC GPS:
Date: 8-6-19 Time: 1128
Photos: 6018-6019 Weather: partly cloudy, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 689.4 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
11.28	10.18	92.9	11.6	0.016	6.76	0.21	

Site Location: 1S-17-BC GPS:
Date: 8-6-19 Time: 1417
Photos: 6020-6022 Weather: clear, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 689.8 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
17.11	8.75	90.8	31.4	0.037	7.01	10.02	

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Instrument(s) used: YSI EXO Crew: EES DKR

Site Location: 15-15-SFAR GPS:
Date: 8/6/19 Time: 1516
Photos: 0025-0029 Weather: hot
Notes: Sample # 1

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 710.4 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
20.90	8.64	96.7	45.5	0.049	7.37	0.42	

Site Location: 15-16-SFAR GPS:
Date: 8-6-19 Time: 1541
Photos: 0025-0026 Weather: hot
Notes: sample #1

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 710.4 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
10.15	11.35	102.4	12.1	0.017	6.57	0.27	Recalibrated DO% after this measurement

Site Location: 15-16-SFAR GPS:
Date: 8-6-19 Time: 1554
Photos: Weather: hot
Notes: Sample # 2

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
10.02	11.02	97.7	12.0	0.017	6.54	0.30	

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Instrument(s) used: YSI EXO Crew: CES DKR

Site Location: 17-15-SPAR GPS:
Date: 8-6-19 Time: 1613
Photos: 0023-0024 Weather: hot
Notes: sample #2

In situ

Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Notes
21.21	8.14	91.7	45.7	0.049	7.46	0.42	710.4 mm Hg

Site Location: 15-4-GC GPS:
Date: 8-7-19 Time: 0905
Photos: 0027 Weather: clear, cool
Notes:

In situ

Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Notes
10.62	8.91	80.1	5.8	0.008	6.20	0.27	608.9 mm Hg

Site Location: 15-5-GC GPS:
Date: 8-7-19 Time: 0950
Photos: 28-29 Weather: clear, cool
Notes:

In situ

Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Notes
14.24	8.41	82.0	8.4	0.011	6.64	0.17	629.3 mm Hg

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Instrument(s) used: YSI EXO **Crew:** DKR EES

Site Location: 15-6-GC GPS:
Date: 8-7-19 Time: 1020
Photos: 30-31 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 633.4 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
14.59	8.45	83.0	6.4	0.008	6.53	0.09	

Site Location: 15-9-GCC GPS:
Date: 8-7-19 Time: 1049
Photos: 32-33 Weather: clear, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 632.4 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
14.69	8.73	86.0	6.4	0.008	6.48	0.06	

Site Location: 15-7-SFRR GPS:
Date: 8-7-19 Time: 1131
Photos: 34-35 Weather: clear, warm
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 637.5 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
14.88	8.48	83.9	7.0	0.009	6.77	0.06	

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Instrument(s) used: YSI EXO **Crew:** EES DKR

Site Location: 1S-8-SFAR
Date: 8-7-19
Photos: 36-37
Notes:
GPS:
Time: 1149
Weather: clear, warm

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 638.3 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
14.95	8.61	85.3	7.3	0.009	6.70	0.18	

Site Location: 1S-19-SFAR
Date: 8-8-19
Photos: 38
Notes:
GPS:
Time: 0921
Weather: clear, cool

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 716.7 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
12.20	10.19	95.0	14.6	0.019	6.67	0.43	

Site Location: 1S-18-SFAR
Date: 8-8-19
Photos: 39
Notes:
GPS:
Time: 1028
Weather: clear, hot

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 733.2 mm Hg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
17.58	9.48	99.3	28.7	0.033	7.14	0.24	

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Instrument(s) used: YSI EXO **Crew:** EES EMB

Site Location: IS-4-GC GPS:
Date: 11/4/19 Time: 0848
Photos: #4636 & 4637 Weather: clear, cool
Notes: ~~BAR 30 MM HG~~

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
8.50	9.49	81.0	5.5	0.008	6.58	0.36	608.3 MMHG

Site Location: IS-5-GC GPS:
Date: 11/4/19 Time: 0925
Photos: #4638 & 4639 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
6.35	10.30	83.5	6.3	0.010	6.94	0.20	628.9 MMHG

Site Location: IS-6-GC GPS:
Date: 11/4/19 Time: 0947
Photos: #4640 & 4641 Weather: Cool, clear
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
5.99	10.21	82.0	7.3	0.011	6.88	0.18	633.1 MMHG

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Instrument(s) used: YSI EXO **Crew:** EES EMB

Site Location: IS-9-GCC GPS:
Date: 11/4/19 Time: 10:45
Photos: #4642 & 4643 Weather: Clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.47	9.63	80.3	8.9	0.013	7.06	0.17	631.9 MMHG

Site Location: IS-7-SFRR GPS:
Date: 11/4/19 Time: 10:33
Photos: #4644 & 4645 Weather: Clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
6.48	10.53	85.6	8.8	0.014	6.87	0.29	637.1 MMHG

Site Location: IS-8-SFRR GPS:
Date: 11/4/19 Time: 10:53
Photos: #4646 & 4647 Weather: Clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
6.11	10.73	86.4	8.5	0.013	6.68	0.22	638.1 MMHG

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Instrument(s) used: YSI EXO **Crew:** EES EMB

Site Location: IS-10-SFSC GPS:
Date: 11/4/19 Time: 11:40
Photos: 4648 & 4649 Weather: Clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
8.07	9.70	82.1	8.2	0.012	6.56	0.38	629.8 MMHG

Site Location: IS-11-SFSC GPS:
Date: 11/5/19 Time: 0800
Photos: 4650-4651 Weather: clear, cold 38°
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 652.2
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
2.50	12.06	88.5	9.8	0.017	6.75	0.21	

Site Location: IS-12-SC GPS:
Date: 11-5-19 Time: 0826
Photos: 4652-4653 Weather: clear, cold
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 655.9
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.16	10.40	86.0	8.0	0.012	6.75	0.31	

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Instrument(s) used: YSI-EXO **Crew:** DKR-EES

Site Location: IS-13-SC GPS:
Date: 11-5-19 Time: 0922
Photos: 4654-4655 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 6888
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
6.14	11.50	92.7	10.0	0.016	6.57	0.18	

Site Location: IS-14-SC GPS:
Date: 11-5-19 Time: 1007
Photos: 4656-4657 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 692.1
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
10.00	10.35	92.0	10.2	0.014	7.04	0.23	

Site Location: IS-15-SEAR GPS:
Date: 11-5-19 Time: 1257
Photos: 4658-4659 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 713.2
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
6.36	11.83	96.0	37.0	0.057	7.17	0.11	

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Instrument(s) used: YSI - EXO **Crew:** EES - DKR

Site Location: IS-16-SEAR GPS:
Date: 11-5-19 Time: 1312
Photos: 4660 Weather: Clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 713.3
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.13	11.71	96.8	36.9	0.056	7.05	0.23	

Site Location: IS-1-RR GPS:
Date: 11/6/19 Time: 1218
Photos: 4661-4662 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 602.7 mmHg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
7.61	9.50	79.4	9.8	0.015	6.70	0.22	

Site Location: IS-2-LRR GPS:
Date: 11/6/19 Time: 1402
Photos: 4663-4664 Weather: Clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 602.8 mmHg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
8.01	9.94	84.0	7.0	0.010	7.06	0.15	

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Instrument(s) used: YSI-EXO Crew: CES EMB

Site Location: IS-3-LRR GPS:
Date: 11/6/19 Time: 1454
Photos: 4665-4666 Weather: Cool, clear
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 604.5 mmHg
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
8.92	9.35	80.7	60.3	0.009	6.83	0.01	

Site Location: IS-19-SEAR GPS:
Date: 11/7/19 Time: 0800
Photos: 4667-4668 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 721.1
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
10.47	10.78	96.6	12.2	0.017	6.90	0.23	

Site Location: IS-18-SEAR GPS:
Date: 11-7-19 Time: 0856
Photos: 4669-4670 Weather: clear, cool
Notes:

In situ

Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Notes 738.2
(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)	
10.17	11.07	98.4	15.4	0.022	7.36	0.61	

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 6/7/19
Time: 0740

Reservoir - Water Quality Vertical Profiles

Instrument used: EXO
Water depth: 44.9 ft

Site Location: R-15-1-LL
Lat/Long (NAD83):

Secchi (ft): 29.2 ft

Personnel: EES DLB

Site Notes: Photos 211-214

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		9.19	9.83	85.5	5.2	0.007	6.44	0.1		
3.3	1	9.21	9.85	85.6	5.2	0.007	6.35	0.2		
6.6	2	9.19	9.84	85.5	5.2	0.007	6.31	0.2		
9.8	3	9.16	9.84	85.4	5.2	0.007	6.27	0.2		
13.1	4	9.16	9.83	85.4	5.2	0.007	6.27	0.2		
16.4	5	8.99	9.87	85.5	5.2	0.007	6.27	0.2		
19.7	6	8.55	9.99	85.4	5.1	0.007	6.23	0.2		
23.0	7	8.48	10.02	85.6	5.1	0.007	6.21	0.2		
26.2	8	8.06	10.18	86.1	5.1	0.007	6.17	0.2		
29.5	9	8.02	10.17	85.9	5.0	0.007	6.16	0.2		
32.8	10	7.97	10.14	85.5	5.1	0.007	6.14	0.1		
36.1	11	7.68	10.17	85.2	5.0	0.007	6.13	0.2		
39.4	12	7.55	10.20	85.1	5.0	0.007	6.12	0.2		
42.7	13	7.25	10.24	85.0	4.9	0.007	6.10	0.2		
45.9	14	7.19	10.22	84.5	4.9	0.007	6.11	0.2		
49.2	15	7.16	10.20	85.4	4.9	0.007	6.21	0.3		Bottom
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 6/7/19
Time: 0955

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-2-LL
Lat/Long (NAD83):

Personnel: EES DLR

Instrument used: EXO
Water depth: 69.0 ft

Secchi (ft): 33.7

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		8.05	10.10	85.3	5.1	0.008	6.55	0.2		
3.3	1	8.05	10.07	85.1	5.1	0.008	6.47	0.2		
6.6	2	8.04	10.06	85.1	5.1	0.008	6.47	0.2		
9.8	3	8.00	10.06	84.9	5.1	0.008	6.46	0.1		
13.1	4	7.99	10.05	84.9	5.1	0.008	6.47	0.2		
16.4	5	7.64	10.04	84.9	5.1	0.008	6.44	0.2		
19.7	6	7.18	10.22	84.6	5.0	0.008	6.43	0.2		
23.0	7	7.04	10.21	84.3	5.0	0.008	6.42	0.2		
26.2	8	7.00	10.23	84.2	5.0	0.008	6.42	0.2		
29.5	9	6.82	10.25	84.1	5.0	0.008	6.42	0.2		
32.8	10	6.80	10.24	84.0	5.0	0.008	6.41	0.2		
36.1	11	6.71	10.25	83.8	5.0	0.008	6.41	0.2		
39.4	12	6.65	10.23	83.5	5.0	0.008	6.40	0.2		
42.7	13	6.23	10.29	83.2	4.9	0.008	6.38	0.2		
45.9	14	5.97	10.32	82.8	4.9	0.008	6.37	0.2		
49.2	15	5.57	10.32	82.0	4.8	0.008	6.36	0.2		
52.5	16	5.50	10.35	82.1	4.8	0.008	6.35	0.2		
55.8	17	5.48	10.35	82.0	4.8	0.008	6.34	0.2		
59.1	18	5.46	10.35	81.9	4.8	0.008	6.34	0.2		
62.3	19	5.45	10.32	81.8	4.8	0.008	6.34	0.2		
65.6	20	5.36	10.28	81.2	4.8	0.008	6.33	16.0		BOTTOM
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 6/7/19
Time: 0900

Reservoir - Water Quality Vertical Profiles

Instrument used: EXO
Water depth: 55.2 ft

Site Location: R-15-3-LL
Lat/Long (NAD83):

Secchi (ft): 32.6

Personnel: EES, DLB

Site Notes: Photos 215-217

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		5.71	10.43	83.2	4.8	0.008	6.46	0.2		
3.3	1	5.70	10.45	83.3	4.8	0.008	6.40	0.2		
6.6	2	5.67	10.45	83.2	4.8	0.008	6.39	0.2		
9.8	3	5.66	10.45	83.2	4.8	0.008	6.37	0.2		
13.1	4	5.64	10.44	83.1	4.8	0.008	6.37	0.2		
16.4	5	5.62	10.43	83.0	4.8	0.008	6.37	0.2		
19.7	6	5.60	10.43	82.9	4.8	0.008	6.36	0.2		
23.0	7	5.57	10.41	82.7	4.8	0.008	6.36	0.2		
26.2	8	5.53	10.40	82.5	4.8	0.008	6.35	0.2		
29.5	9	5.46	10.39	82.3	4.8	0.008	6.35	0.2		
32.8	10	5.45	10.38	82.2	4.8	0.008	6.35	0.2		
36.1	11	5.40	10.37	82.0	4.8	0.008	6.35	0.2		
39.4	12	5.38	10.36	81.9	4.8	0.008	6.35	0.2		
42.7	13	5.32	10.36	81.7	4.8	0.008	6.33	0.2		
45.9	14	5.22	10.33	81.3	4.8	0.008	6.32	0.2		
49.2	15	5.21	10.33	81.3	4.8	0.008	6.31	0.2		
52.5	16	5.18	10.32	81.2	4.8	0.008	6.31	0.2		BOTTOM
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 6/6/19
Time: 1137

Reservoir - Water Quality Vertical Profiles

Instrument used: EXO
Site Location: R-1S-4-GC
Water depth: 29.5
Lat/Long (NAD83):
Secchi (ft): 20.2

Personnel: EES DLB

Site Notes: 629.4 mmHg Photos 209-210

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		8.76	10.12	87.2	6.1	0.009	6.57	0.3		
3.3	1	8.73	10.11	86.9	6.1	0.009	6.56	0.3		
6.6	2	8.64	10.12	86.7	6.1	0.009	6.55	0.3		
9.8	3	8.34	10.18	86.6	6.0	0.009	6.55	0.3		
13.1	4	8.15	10.18	86.3	6.0	0.009	6.54	0.3		
16.4	5	8.00	10.16	85.8	6.0	0.009	6.52	0.3		
19.7	6	7.94	10.16	85.6	6.0	0.009	6.51	0.3		
23.0	7	7.66	10.15	84.9	6.0	0.009	6.52	0.3		
26.2	8	7.38	10.18	84.9	6.0	0.009	6.51	0.3		
29.5	9	7.29	10.14	84.2	6.4	0.010	6.52	15.15		Bottom = 8.58 m
32.8	10									
36.1	11									
39.4	12									
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 6/4/19
Time: 0945

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-5-UVR
Lat/Long (NAD83):

Instrument used: EXO
Water depth: 72.0 ft

Secchi (ft): 25.5

Personnel: EES CMB DLB

Site Notes: Photos 175-185

Depth		Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Water Sample	Notes
(ft)	(m)	(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)		
surface		14.50	9.47	93.0	9.5	0.012	7.67	0.3		
3.3	1	13.98	9.51	92.1	9.2	0.012	7.72	0.3		
6.6	2	10.71	10.20	91.5	8.0	0.011	7.06	0.3		
9.8	3	9.47	10.33	90.4	7.5	0.011	7.00	0.3		
13.1	4	9.11	10.35	89.7	7.4	0.011	6.95	0.3		
16.4	5	8.83	10.32	88.9	7.4	0.011	6.91	0.3		
19.7	6	8.72	10.33	88.8	7.4	0.011	6.89	0.3		
23.0	7	8.45	10.29	87.8	7.3	0.011	6.87	0.3		
26.2	8	8.21	10.33	87.7	7.2	0.011	6.84	0.4		
29.5	9	8.02	10.34	87.4	7.1	0.011	6.82	0.4		
32.8	10	7.96	10.31	87.0	7.1	0.010	6.80	0.4		
36.1	11	7.79	10.34	86.9	7.1	0.011	6.78	0.4		
39.4	12	7.56	10.36	86.5	6.9	0.010	6.76	0.4		
42.7	13	7.38	10.41	86.6	7.0	0.010	6.75	0.4		
45.9	14	7.06	10.43	86.0	6.7	0.010	6.74	0.3		
49.2	15	6.96	10.48	86.2	6.6	0.010	6.73	0.4		
52.5	16	6.89	10.49	86.2	6.5	0.010	6.71	0.4		
55.8	17	6.78	10.46	85.6	6.5	0.010	6.70	0.4		
59.1	18	6.73	10.47	85.6	6.4	0.010	6.70	0.3		
62.3	19	6.72	10.48	85.8	6.3	0.010	6.72	0.4		
65.6	20	6.68	10.55	86.2	6.1	0.009	6.72	0.4		
68.9	21	6.61	10.45	85.3	6.4	0.010	6.70	0.4		
72.2	22	6.32	10.16	82.3	7.0	0.011	6.68	5.3		BOTTOM
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 6/4/19
Time: 1245

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-6-UVR
Lat/Long (NAD83):

Instrument used: EXO
Water depth: 128.0 ft

Secchi (ft): 22.0

Personnel: EES CMB DLB

Site Notes: Photos 197-201

Depth		Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Water Sample	Notes
(ft)	(m)	(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)		
surface		13.98	9.72	94.4	9.4	0.012	7.09	0.3		
3.3	1	13.70	9.76	94.0	9.3	0.012	7.10	0.3		
6.6	2	10.91	10.35	94.1	8.6	0.012	7.11	0.4		
9.8	3	10.03	10.54	93.3	8.3	0.012	7.10	0.4		
13.1	4	9.43	10.55	92.2	8.1	0.012	7.08	0.4		
16.4	5	9.02	10.67	92.4	8.1	0.012	7.04	0.4		
19.7	6	8.80	10.70	92.1	8.1	0.012	7.01	0.4		
23.0	7	8.61	10.57	90.6	7.9	0.012	7.00	0.5		
26.2	8	8.49	10.65	91.0	8.0	0.012	6.98	0.4		
29.5	9	8.34	10.53	89.6	7.8	0.012	6.96	0.4		
32.8	10	8.16	10.70	90.7	7.8	0.012	6.94	0.4		
36.1	11	8.04	10.62	89.7	8.0	0.012	6.92	0.5		
39.4	12	7.89	10.51	88.4	7.9	0.012	6.89	0.5		
42.7	13	7.79	10.50	88.2	7.8	0.012	6.87	0.4		
45.9	14	7.69	10.45	87.6	7.8	0.012	6.85	0.4		
49.2	15	7.54	10.37	86.6	7.9	0.012	6.84	0.4		
52.5	16	7.45	10.35	86.3	7.9	0.012	6.83	0.4		
55.8	17	7.35	10.32	85.6	7.7	0.012	6.82	0.4		
59.1	18	7.22	10.30	85.3	7.9	0.012	6.80	0.4		
62.3	19	7.15	10.31	85.2	8.3	0.013	6.80	0.4		
65.6	20	7.05	10.32	85.1	8.3	0.013	6.80	0.4		
68.9	21	6.96	10.34	86.1	8.2	0.013	6.79	0.4		
72.2	22	6.85	10.36	84.9	8.1	0.012	6.78	0.3		
75.5	23	6.79	10.37	84.9	8.1	0.012	6.77	0.4		
78.7	24	6.66	10.36	84.6	8.1	0.012	6.76	0.4		
82.0	25	6.46	10.33	84.0	8.1	0.012	6.75	0.4		
85.3	26	6.42	10.34	84.0	8.0	0.012	6.75	0.4		
88.6	27	6.36	10.35	83.9	8.1	0.013	6.73	0.3		
91.9	28	6.27	10.39	84.1	8.1	0.013	6.73	0.4		
95.1	29	6.06	10.38	83.5	8.1	0.013	6.71	0.3		
98.4	30	5.98	10.38	83.3	8.2	0.013	6.71	0.3		
101.7	31	5.87	10.35	82.9	8.2	0.013	6.70	0.3		
105.0	32	5.74	10.34	82.5	8.2	0.013	6.69	0.3		
108.3	33	5.65	10.28	81.8	8.2	0.013	6.68	0.3		
111.5	34	5.60	10.23	81.4	8.2	0.013	6.67	0.3		

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Stillwater Sciences

Reservoir - Water Quality Vertical Profiles

R-15-6-UVR
6/4/19

Depth		Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Water Sample	Notes
(ft)	(m)	(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)		
(CONTINUED)										
114.8	35	5.57	10.22	81.2	8.2	0.013	6.66	0.4		
118.1	36	5.53	10.22	81.1	8.2	0.013	6.65	0.3		
121.4	37	5.53	10.18	80.8	8.2	0.013	6.68	0.4		BOTTOM
124.7	38									
128.0	39									
131.2	40									
134.5	41									
137.8	42									
141.1	43									
144.4	44									
147.6	45									
150.9	46									
154.2	47									
157.5	48									
160.8	49									
164.0	50									
167.3	51									
170.6	52									
173.9	53									
177.2	54									
180.4	55									
183.7	56									
187.0	57									
190.3	58									
193.6	59									
196.8	60									
200.1	61									
203.4	62									
206.7	63									
210.0	64									
213.3	65									
216.5	66									
219.8	67									
223.1	68									
226.4	69									
229.7	70									
232.9	71									
236.2	72									

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 6/4/19
Time: 1100

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-7-UVR
Lat/Long (NAD83):

Instrument used: EXO
Water depth: 151

Secchi (ft): 26.5

Personnel: EES CMB DLB

Site Notes: Photos 186–190

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		15.34	9.47	94.4	9.6	0.012	7.23	0.3		
3.3	1	13.93	9.59	92.8	9.3	0.012	7.17	0.3		
6.6	2	11.57	10.21	93.7	8.6	0.012	7.13	0.3		
9.8	3	10.64	10.35	93.2	8.2	0.011	7.09	0.3		
13.1	4	9.77	10.32	91.0	7.8	0.011	7.05	0.3		
16.4	5	9.27	10.33	89.9	7.6	0.011	7.02	0.4		
19.7	6	8.99	10.47	90.5	7.5	0.011	7.00	0.4		
23.0	7	8.89	10.51	90.8	7.8	0.011	6.98	0.4		
26.2	8	8.28	10.45	88.7	7.5	0.011	6.95	0.4		
29.5	9	8.08	10.43	88.2	7.4	0.011	6.93	0.4		
32.8	10	8.01	10.40	87.9	7.3	0.011	6.91	0.4		
36.1	11	7.85	10.43	87.8	7.6	0.011	6.88	0.4		
39.4	12	7.82	10.45	87.9	7.6	0.011	6.87	0.4		
42.7	13	7.72	10.40	87.2	7.7	0.011	6.85	0.3		
45.9	14	7.51	10.36	86.5	7.6	0.011	6.84	0.4		
49.2	15	7.41	10.33	86.0	7.5	0.011	6.82	0.4		
52.5	16	7.31	10.31	85.6	7.6	0.011	6.80	0.4		
55.8	17	7.18	10.33	85.4	7.6	0.012	6.79	0.3		
59.1	18	7.06	10.35	85.3	7.6	0.012	6.78	0.4		
62.3	19	7.04	10.33	85.2	7.5	0.011	6.77	0.3		
65.6	20	6.88	10.34	84.9	7.3	0.011	6.77	0.3		
68.9	21	6.85	10.32	84.7	7.3	0.011	6.77	0.3		
72.2	22	6.82	10.32	84.6	7.3	0.011	6.76	0.3		
75.5	23	6.71	10.28	84.1	7.4	0.011	6.75	0.4		
78.7	24	6.62	10.30	84.0	7.4	0.011	6.74	0.4		
82.0	25	6.59	10.30	84.0	7.4	0.011	6.73	0.3		
85.3	26	6.53	10.30	83.9	7.4	0.011	6.73	0.4		
88.6	27	6.48	10.30	83.7	7.3	0.011	6.72	0.3		
91.9	28	6.35	10.29	83.4	7.4	0.011	6.71	0.3		
95.1	29	6.14	10.25	82.6	7.6	0.012	6.70	0.3		
98.4	30	6.04	10.24	82.3	7.7	0.012	6.68	0.3		
101.7	31	5.97	10.22	81.9	7.7	0.012	6.68	0.3		
105.0	32	5.85	10.21	81.7	7.8	0.012	6.67	0.3		
108.3	33	5.76	10.20	81.5	7.9	0.012	6.66	0.3		
111.5	34	5.77	10.20	81.4	7.9	0.012	6.65	0.3		

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Stillwater Sciences

R-15-7-UVR
6/4/19

Reservoir - Water Quality Vertical Profiles

Depth		Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Water Sample	Notes
(ft)	(m)	(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)		
(CONTINUED)										
114.8	35	5.72	10.17	81.1	7.9	0.012	6.64	0.3		
118.1	36	5.69	10.17	81.0	7.9	0.013	6.64	0.3		
121.4	37	5.67	10.16	81.0	7.9	0.013	6.64	0.4		
124.7	38	5.67	10.16	80.9	7.9	0.013	6.63	0.3		
128.0	39	5.66	10.15	80.8	7.9	0.013	6.64	0.3		
131.2	40	5.67	10.14	80.8	7.9	0.013	6.63	0.4		
134.5	41	5.62	10.15	80.8	8.0	0.013	6.62	0.4		
137.8	42	5.66	10.13	80.7	8.0	0.013	6.63	0.4		
141.1	43	5.63	10.12	80.5	8.0	0.013	6.63	0.3		BOTTOM
144.4	44									
147.6	45									
150.9	46									
154.2	47									
157.5	48									
160.8	49									
164.0	50									
167.3	51									
170.6	52									
173.9	53									
177.2	54									
180.4	55									
183.7	56									
187.0	57									
190.3	58									
193.6	59									
196.8	60									
200.1	61									
203.4	62									
206.7	63									
210.0	64									
213.3	65									
216.5	66									
219.8	67									
223.1	68									
226.4	69									
229.7	70									
232.9	71									
236.2	72									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 6/5/19
Time: 0944

Reservoir - Water Quality Vertical Profiles

Site Location: R-1S-9-IHR
Lat/Long (NAD83):

Instrument used: EXO
Water depth: 84 ft

Secchi (ft): 18.6 ft

Personnel: EES DLB

Site Notes: PHOTOS 202-206

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		13.38	9.57	91.6	9.3	0.012	7.09	0.3		
3.3	1	13.11	9.57	91.1	9.3	0.012	7.08	0.3		
6.6	2	12.07	9.76	90.7	8.8	0.012	6.99	0.4		
9.8	3	11.27	10.01	91.2	8.5	0.012	7.02	0.4		
13.1	4	10.55	10.11	90.3	8.1	0.011	7.01	0.4		
16.4	5	9.89	10.27	90.7	7.9	0.011	6.99	0.4		
19.7	6	8.91	10.45	90.3	7.4	0.011	6.95	0.41		
23.0	7	7.99	10.46	88.3	6.4	0.009	6.86	0.6		
26.2	8	7.30	10.65	88.4	6.0	0.009	6.79	1.0		
29.5	9	6.84	10.63	87.3	6.2	0.010	6.74	0.6		
32.8	10	6.54	10.67	86.9	5.9	0.009	6.71	0.7		
36.1	11	6.38	10.71	86.8	5.9	0.009	6.69	0.7		
39.4	12	6.35	10.70	86.7	6.0	0.009	6.68	0.6		
42.7	13	6.35	10.67	86.4	6.0	0.009	6.67	0.7		
45.9	14	6.30	10.66	86.3	6.0	0.009	6.68	0.6		
49.2	15	6.21	10.62	85.9	6.1	0.009	6.67	0.6		
52.5	16	6.26	10.60	85.6	6.1	0.009	6.66	0.6		
55.8	17	6.21	10.60	85.6	6.1	0.009	6.65	0.6		
59.1	18	6.13	10.59	85.4	6.0	0.009	6.64	0.5		
62.3	19	6.13	10.56	85.1	6.1	0.009	6.63	0.5		
65.6	20	6.13	10.54	85.0	6.1	0.010	6.63	0.5		
68.9	21	5.98	10.44	83.9	6.2	0.010	6.59	0.5		
72.2	22	5.94	10.39	83.3	6.3	0.010	6.57	0.5		
75.5	23	5.91	10.37	83.1	6.3	0.010	6.55	0.4		
78.7	24	5.83	10.16	81.3	6.6	0.010	6.51	1.4		BOTTOM
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 6/5/19
Time: 10:56

Reservoir - Water Quality Vertical Profiles

Site Location: R-IS-10-IHR
Lat/Long (NAD83):

Instrument used: EXO
Water depth: 58.5 ft

Secchi (ft): 22.5

Personnel: EES; DLB.

Site Notes: 626.4 mmhg Photo 207

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		14.74	9.41	92.7	9.7	0.012	7.16	0.3		
3.3	1	13.86	9.46	91.6	9.5	0.012	7.13	0.3		
6.6	2	13.49	9.53	91.5	9.4	0.012	7.13	0.4		
9.8	3	11.34	10.06	91.8	8.9	0.012	7.15	0.4		
13.1	4	10.22	10.29	91.6	8.6	0.012	7.14	0.4		
16.4	5	9.78	10.35	91.2	8.3	0.012	7.15	0.4		
19.7	6	8.93	10.49	90.6	7.6	0.011	7.09	0.4		
23.0	7	8.03	10.55	89.2	7.0	0.010	7.03	0.4		
26.2	8	7.61	10.70	89.5	7.4	0.011	6.99	0.3		
29.5	9	7.38	10.72	89.1	7.4	0.011	6.97	0.3		
32.8	10	7.25	10.69	88.6	7.4	0.011	6.94	0.4		
36.1	11	7.15	10.68	88.4	7.4	0.011	6.91	0.3		
39.4	12	7.07	10.68	88.2	7.4	0.011	6.89	0.3		
42.7	13	6.97	10.64	87.6	7.4	0.011	6.85	0.3		
45.9	14	6.85	10.63	87.2	7.4	0.011	6.84	0.4		
49.2	15	6.83	10.61	87.1	7.4	0.011	6.82	0.4		
52.5	16	6.63	10.49	85.6	7.3	0.011	6.79	0.4		
55.8	17	6.33	10.40	84.3	7.2	0.011	6.75	1.54		Bottom
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 6/5/19
Time: 11:50

Reservoir - Water Quality Vertical Profiles

Instrument used: EXO
Water depth: 103 ft,

Site Location: R-IS-11-IHR
Lat/Long (NAD83):

Secchi (ft): 18.8 ft.

Personnel: EES, DLB

Site Notes: 626.5 mmhg Photo 208

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		14.41	9.44	92.5	9.7	0.012	7.17	0.4		
3.3	1	13.64	9.52	91.7	9.5	0.012	7.14	0.4		
6.6	2	13.56	9.52	91.5	9.5	0.012	7.14	0.4		
9.8	3	13.37	9.55	91.4	9.4	0.012	7.14	0.4		
13.1	4	11.90	9.94	91.7	9.1	0.012	7.17	0.3		
16.4	5	8.88	10.78	93.0	8.2	0.012	7.16	0.3		
19.7	6	7.81	11.00	92.5	7.8	0.012	7.11	0.3		
23.0	7	7.19	11.08	91.6	7.5	0.011	7.00	0.3		
26.2	8	6.92	11.09	91.1	7.5	0.011	6.95	0.3		
29.5	9	6.66	10.97	89.7	7.5	0.012	6.91	0.3		
32.8	10	6.61	10.90	89.0	7.4	0.011	6.87	0.3		
36.1	11	6.34	10.67	86.3	7.3	0.011	6.81	0.3		
39.4	12	6.26	10.57	85.6	7.3	0.011	6.77	0.3		
42.7	13	6.16	10.50	84.7	7.2	0.011	6.71	0.3		
45.9	14	6.11	10.44	84.0	7.2	0.011	6.69	0.3		
49.2	15	6.02	10.38	83.5	7.2	0.011	6.67	0.2		
52.5	16	5.96	10.33	82.9	7.2	0.011	6.65	0.2		
55.8	17	5.94	10.34	83.0	7.2	0.011	6.63	0.2		
59.1	18	5.92	10.34	82.8	7.2	0.011	6.62	0.2		
62.3	19	5.87	10.31	82.5	7.2	0.011	6.61	0.3		
65.6	20	5.86	10.27	82.2	7.2	0.011	6.60	0.3		
68.9	21	5.83	10.24	81.9	7.2	0.011	6.59	0.3		
72.2	22	5.81	10.23	81.8	7.2	0.011	6.58	0.2		
75.5	23	5.79	10.21	81.5	7.2	0.011	6.58	0.2		
78.7	24	5.72	10.16	81.0	7.2	0.011	6.57	0.2		
82.0	25	5.74	10.14	80.9	7.2	0.011	6.56	0.3		
85.3	26	5.69	10.12	80.6	7.2	0.011	6.55	0.3		
88.6	27	5.67	10.06	80.1	7.2	0.011	6.54	0.3		
91.9	28	5.66	9.98	79.4	7.3	0.012	6.53	2.6		Bottom
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/22/19
Time: 1005

Reservoir - Water Quality Vertical Profiles

Site Location: R-1S-1-LL
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 51.4
Secchi (ft): 31.8

Personnel: EFS DLTB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		11.11	8.46	77.0	6.0	0.008	7.40	0.17		
3.3	1	11.18	8.42	76.7	6.0	0.008	7.15	0.19		
6.6	2	11.06	8.46	76.8	6.0	0.008	7.02	0.19		
9.8	3	11.02	8.43	76.5	6.0	0.008	6.89	0.20		
13.1	4	11.02	8.43	76.5	6.0	0.008	6.78	0.22		
16.4	5	11.02	8.43	76.5	6.0	0.008	6.72	0.24		
19.7	6	11.02	8.43	76.4	6.0	0.008	6.65	0.26		
23.0	7	11.02	8.42	76.4	6.0	0.008	6.60	0.22		
26.2	8	11.01	8.41	76.3	6.0	0.008	6.55	0.20		
29.5	9	11.01	8.40	76.2	6.0	0.008	6.51	0.19		
32.8	10	11.00	8.39	76.1	6.0	0.008	6.48	0.21		
36.1	11	11.00	8.39	76.1	6.0	0.008	6.45	0.21		
39.4	12	11.00	8.38	76.0	6.0	0.008	6.43	0.18		
42.7	13	11.00	8.37	75.9	6.0	0.008	6.41	0.20		
45.9	14	11.00	8.37	75.8	6.0	0.008	6.46	0.21		
49.2	15	10.99	8.36	75.8	6.0	0.008	6.40	0.17		Bottom
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/22/19
Time: 1031

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-2-LL
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 35.9
Secchi (ft): 32.8

Personnel: EES DLB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		11.22	8.47	77.2	5.9	0.008	6.62	0.18		
3.3	1	11.18	8.46	77.1	5.9	0.008	6.60	0.20		
6.6	2	11.15	8.44	76.8	5.9	0.008	6.60	0.20		
9.8	3	11.14	8.43	76.7	5.9	0.008	6.58	0.18		
13.1	4	11.13	8.43	76.7	5.9	0.008	6.58	0.18		
16.4	5	11.14	8.42	76.6	5.9	0.008	6.57	0.23		
19.7	6	11.13	8.42	76.6	5.9	0.008	6.53	0.17		
23.0	7	11.13	8.42	76.5	5.9	0.008	6.52	0.16		
26.2	8	11.13	8.41	76.5	5.9	0.008	6.54	0.21		
29.5	9	11.12	8.40	76.4	5.9	0.008	6.53	0.19		
32.8	10	11.10	8.39	76.3	5.9	0.008	6.52	0.24		
36.1	11	11.07	8.38	76.2	5.9	0.008	6.49	0.19		
39.4	12	11.04	8.40	76.2	5.9	0.008	6.50	0.30		Bottom
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/22/19
Time: 1058

Reservoir - Water Quality Vertical Profiles

Instrument used: YSI EXO
Water depth: 39.8
Secchi (ft): 30.5

Site Location: R-15-3-4
Lat/Long (NAD83):

Personnel: EES DLB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		11.26	8.53	77.8	5.9	0.008	6.69	0.17		
3.3	1	11.14	8.50	77.4	5.9	0.008	6.53	0.21		
6.6	2	11.10	8.51	77.3	5.9	0.008	6.59	0.20		
9.8	3	11.07	8.50	77.2	5.9	0.008	6.54	0.19		
13.1	4	11.05	8.50	77.1	5.9	0.008	6.50	0.23		
16.4	5	11.04	8.49	77.1	5.9	0.008	6.51	0.21		
19.7	6	11.02	8.49	77.1	5.9	0.008	6.49	0.21		
23.0	7	11.02	8.49	77.0	5.9	0.008	6.52	0.24		
26.2	8	11.01	8.48	76.9	5.9	0.008	6.49	0.21		
29.5	9	11.00	8.47	76.8	5.9	0.008	6.49	0.25		
32.8	10	10.99	8.47	76.8	5.9	0.008	6.53	0.22		
36.1	11	10.99	8.45	76.6	5.9	0.008	6.53	0.32		BOTTOM
39.4	12									
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/25/19
Time: 1203

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-4-GC
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 24 ft

Secchi (ft): 24

Personnel: DCG DLB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		10.17	9.22	82.0	9.1	0.013	7.09	0.22		
3.3	1	9.82	9.23	81.4	9.0	0.013	6.91	0.25		
6.6	2	9.73	9.20	81.0	8.8	0.012	6.80	0.27		
9.8	3	9.66	9.20	80.9	8.8	0.012	6.72	0.28		
13.1	4	9.63	9.14	80.3	8.8	0.012	6.65	0.27		
16.4	5	9.59	9.11	80.2	8.9	0.013	6.58	0.27		
19.7	6	9.53	9.12	79.9	8.8	0.012	6.55	0.25		
23.0	7	9.28	8.86	77.1	8.8	0.012	6.48	1.62		BOTTOM
26.2	8									
29.5	9									
32.8	10									
36.1	11									
39.4	12									
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/22/2019
Time: 1450

Reservoir - Water Quality Vertical Profiles

Site Location: R-1S-5- UVR
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 26 ft

Secchi (ft): 19.5

Personnel: BES DLB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		15.77	7.99	80.6	9.3	0.011	6.42	0.27		
3.3	1	15.63	8.00	80.4	9.3	0.011	6.44	0.28		
6.6	2	15.54	7.99	80.1	9.3	0.011	6.46	0.30		
9.8	3	15.09	7.99	79.4	9.3	0.011	6.45	0.26		
13.1	4	14.88	8.01	79.2	9.3	0.012	6.44	0.28		
16.4	5	14.86	8.01	79.2	9.3	0.012	6.43	0.27		
19.7	6	14.57	8.03	78.9	9.6	0.012	6.44	0.30		
23.0	7	14.21	8.02	78.2	10.2	0.013	6.38	0.35		BOTTOM
26.2	8									
29.5	9									
32.8	10									
36.1	11									
39.4	12									
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 10/25/19
Time: 0950

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-6 -UVR
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 82 ft

Secchi (ft): 32.1

Personnel: QES DLB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		15.00	7.97	79.0	8.9	0.011	6.67	0.22		
3.3	1	15.00	7.95	78.8	8.9	0.011	6.50	0.23		
6.6	2	14.99	7.94	78.7	8.9	0.011	6.41	0.19		
9.8	3	14.98	7.93	78.6	8.8	0.011	6.35	0.24		
13.1	4	14.98	7.93	78.6	8.8	0.011	6.34	0.19		
16.4	5	14.97	7.92	78.5	8.8	0.011	6.31	0.23		
19.7	6	14.97	7.91	78.4	8.8	0.011	6.33	0.23		
23.0	7	14.97	7.91	78.3	8.8	0.011	6.29	0.23		
26.2	8	14.96	7.90	78.3	8.9	0.011	6.28	0.21		
29.5	9	14.95	7.89	78.2	8.8	0.011	6.25	0.19		
32.8	10	14.95	7.88	78.1	8.8	0.011	6.24	0.22		
36.1	11	14.95	7.89	78.2	8.9	0.011	6.23	0.22		
39.4	12	14.95	7.88	78.0	8.9	0.011	6.20	0.22		
42.7	13	14.94	7.87	77.9	8.9	0.011	6.16	0.21		
45.9	14	14.94	7.86	77.9	8.9	0.011	6.17	0.26		
49.2	15	14.94	7.85	77.8	8.9	0.011	6.15	0.24		
52.5	16	14.94	7.85	77.7	8.8	0.011	6.13	0.21		
55.8	17	14.94	7.84	77.7	8.8	0.011	6.12	0.20		
59.1	18	14.92	7.84	77.6	8.9	0.011	6.10	0.20		
62.3	19	14.90	7.84	77.6	8.9	0.011	6.09	0.23		
65.6	20	14.90	7.83	77.5	8.9	0.011	6.08	0.23		
68.9	21	14.89	7.83	77.4	8.9	0.011	6.02	0.24		
72.2	22	14.84	7.83	77.4	8.9	0.011	6.02	0.21		
75.5	23	14.82	7.83	77.3	8.9	0.011	5.97	0.24		
78.7	24	14.82	7.82	77.2	8.9	0.011	5.97	0.23		Bottom
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Reservoir - Water Quality Vertical Profiles

Date: 10/25/19
Time: 0909

Site Location: R-15-7-UVR
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 105

Secchi (ft): 26.1

Personnel: EES DCB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		14.98	7.95	78.9	9.0	0.011	6.51	0.20		
3.3	1	14.98	7.95	78.8	9.0	0.011	6.41	0.21		
6.6	2	14.98	7.94	78.7	9.0	0.011	6.36	0.21		
9.8	3	14.97	7.94	78.6	9.0	0.011	6.29	0.19		
13.1	4	14.97	7.93	78.6	9.0	0.011	6.26	0.23		
16.4	5	14.97	7.92	78.5	9.0	0.011	6.22	0.23		
19.7	6	14.97	7.91	78.4	9.0	0.011	6.19	0.23		
23.0	7	14.97	7.91	78.3	9.0	0.011	6.41	0.25		
26.2	8	14.97	7.90	78.2	9.0	0.011	6.13	0.21		
29.5	9	14.97	7.89	78.2	9.0	0.011	6.12	0.25		
32.8	10	14.96	7.88	78.1	9.0	0.011	6.11	0.21		
36.1	11	14.96	7.87	78.0	9.0	0.011	6.12	0.22		
39.4	12	14.96	7.87	77.9	9.0	0.011	6.11	0.22		
42.7	13	14.96	7.86	77.9	9.0	0.011	6.12	0.23		
45.9	14	14.96	7.85	77.8	9.0	0.011	6.10	0.21		
49.2	15	14.96	7.85	77.7	9.0	0.011	6.10	0.20		
52.5	16	14.95	7.85	77.7	9.0	0.011	6.09	0.22		
55.8	17	14.94	7.84	77.6	9.0	0.011	6.09	0.19		
59.1	18	14.92	7.84	77.6	9.0	0.011	6.09	0.21		
62.3	19	14.91	7.83	77.5	9.0	0.011	6.10	0.20		
65.6	20	14.90	7.82	77.4	9.0	0.011	6.09	0.20		
68.9	21	14.90	7.82	77.3	9.0	0.011	6.10	0.21		
72.2	22	14.89	7.81	77.2	9.0	0.011	6.11	0.25		
75.5	23	14.88	7.80	77.2	9.1	0.011	6.11	0.24		
78.7	24	14.87	7.79	77.1	9.1	0.011	6.12	0.24		
82.0	25	14.87	7.79	77.0	9.1	0.011	6.12	0.26		
85.3	26	14.86	7.78	77.0	9.0	0.011	6.11	0.23		
88.6	27	14.86	7.78	76.9	9.1	0.011	6.12	0.23		
91.9	28	14.83	7.77	76.7	9.1	0.011	6.12	0.23		
95.1	29	14.82	7.76	76.6	9.1	0.011	6.11	0.26		Bottom
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/23/19
Time: 0955

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-8-UR
Lat/Long (NAD83):

Personnel: EES DCTS

Instrument used: YSI EXO
Water depth: 260 ft
Secchi (ft): 31.8

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		15.20	7.88	78.5	8.9	0.011	7.11	0.07		
3.3	1	15.18	7.88	78.4	8.9	0.011	6.89	0.10		
6.6	2	15.15	7.87	78.2	8.9	0.011	6.75	0.11		
9.8	3	15.15	7.85	78.1	8.9	0.011	6.70	0.12		
13.1	4	15.14	7.84	78.0	8.9	0.011	6.63	0.09		
16.4	5	15.14	7.83	77.9	8.8	0.011	6.55	0.11		
19.7	6	15.13	7.83	77.9	8.8	0.011	6.55	0.11		
23.0	7	15.13	7.83	77.8	8.8	0.011	6.49	0.11		
26.2	8	15.13	7.82	77.8	8.9	0.011	6.46	0.08		
29.5	9	15.13	7.81	77.7	8.8	0.011	6.45	0.11		
32.8	10	15.13	7.80	77.6	8.8	0.011	6.42	0.10		
36.1	11	15.13	7.79	77.5	8.8	0.011	6.38	0.08		
39.4	12	15.13	7.79	77.4	8.8	0.011	6.39	0.09		
42.7	13	15.13	7.78	77.4	8.9	0.011	6.36	0.11		
45.9	14	15.13	7.78	77.3	8.8	0.011	6.33	0.09		
49.2	15	15.13	7.77	77.2	8.8	0.011	6.31	0.11		
52.5	16	15.12	7.75	77.1	8.8	0.011	6.30	0.11		
55.8	17	15.12	7.75	77.0	8.9	0.011	6.30	0.10		
59.1	18	15.11	7.73	76.9	8.9	0.011	6.28	0.11		
62.3	19	15.11	7.73	76.8	8.9	0.011	6.26	0.08		
65.6	20	15.11	7.73	76.8	8.8	0.011	6.22	0.11		
68.9	21	15.10	7.72	76.7	8.8	0.011	6.24	0.07		
72.2	22	15.11	7.72	76.7	8.9	0.011	6.19	0.08		
75.5	23	15.10	7.71	76.6	8.9	0.011	6.18	0.08		
78.7	24	15.10	7.71	76.6	8.9	0.011	6.16	0.09		
82.0	25	15.09	7.70	76.5	8.9	0.011	6.14	0.08		
85.3	26	15.08	7.69	76.4	8.9	0.011	6.14	0.09		
88.6	27	15.08	7.68	76.3	8.9	0.011	6.12	0.11		
91.9	28	15.08	7.67	76.2	8.9	0.011	6.10	0.07		
95.1	29	15.08	7.66	76.1	8.9	0.011	6.09	0.06		
98.4	30	15.08	7.65	76.0	8.9	0.011	6.08	0.06		
101.7	31	15.07	7.64	75.9	8.9	0.011	6.09	0.06		
105.0	32	15.07	7.64	75.8	8.8	0.011	6.08	0.10		
108.3	33	15.04	7.62	75.6	8.7	0.011	6.07	0.07		
111.5	34	15.03	7.58	75.2	8.6	0.011	6.05	0.08		

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Stillwater Sciences

Reservoir - Water Quality Vertical Profiles

R-15-8-WR 10/23/19

Depth		Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Water Sample	Notes
(ft)	(m)	(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)		
(CONTINUED)										
114.8	35	14.95	7.55	74.8	8.5	0.011	6.06	0.06		
118.1	36	14.86	7.49	74.0	8.3	0.011	6.01	0.03		
121.4	37	14.63	7.41	72.9	8.3	0.011	5.95	0.04		
124.7	38	14.41	7.36	72.1	8.3	0.011	5.88	0.01		
128.0	39	13.91	7.41	71.7	8.2	0.011	5.82	0.00		
131.2	40	13.49	7.45	71.5	8.2	0.011	5.77	0.01		
134.5	41	13.31	7.53	71.9	8.2	0.011	5.77	0.01		
137.8	42	13.14	7.56	72.0	8.1	0.011	5.79	0.01		
141.1	43	13.01	7.57	71.8	8.1	0.011	5.77	0.01		
144.4	44	12.91	7.56	71.6	8.1	0.011	5.76	0.02		
147.6	45	12.70	7.61	71.8	8.1	0.011	5.77	0.01		
150.9	46	12.55	7.62	71.6	8.0	0.011	5.76	0.01		
154.2	47	12.50	7.60	71.3	8.1	0.011	5.76	0.02		
157.5	48	12.36	7.63	71.4	8.1	0.011	5.76	0.00		
160.8	49	12.22	7.62	71.1	8.1	0.011	5.77	0.02		
164.0	50	12.11	7.65	71.2	8.1	0.011	5.77	0.02		
167.3	51	12.04	7.66	71.1	8.2	0.011	5.75	0.02		
170.6	52	11.93	7.63	70.7	8.3	0.011	5.74	0.00		
173.9	53	11.82	7.62	70.4	8.3	0.011	5.73	0.07		
177.2	54	11.65	7.59	70.9	8.1	0.011	5.74	0.03		
180.4	55	11.54	7.49	68.8	8.1	0.011	5.72	0.04		
183.7	56	11.40	7.33	67.0	8.1	0.012	5.70	0.03		
187.0	57	11.20	7.14	65.0	8.3	0.012	5.68	0.04		
190.3	58	11.04	7.10	64.5	8.6	0.013	5.67	0.04		
193.6	59	10.68	7.15	64.3	8.6	0.013	5.66	0.03		
196.8	60	10.48	7.12	63.8	8.5	0.013	5.65	0.06		
200.1	61	9.60	7.11	62.4	8.3	0.013	5.65	0.10		
203.4	62	8.24	7.45	63.3	8.7	0.013	5.67	0.09		
206.7	63	7.41	7.55	62.8	8.7	0.013	5.65	0.10		
210.0	64	7.36	7.56	62.8	8.7	0.013	5.65	0.10		
213.3	65	7.17	7.70	63.9	8.4	0.013	5.65	0.08		
216.5	66	7.07	7.90	65.3	8.4	0.013	5.66	0.11		
219.8	67	6.85	7.67	62.9	8.3	0.013	5.66	0.15		
223.1	68	6.75	7.66	62.7	8.3	0.013	5.64	0.14		
226.4	69	6.69	7.74	63.5	8.4	0.013	5.66	0.13		
229.7	70	6.60	8.03	65.5	8.4	0.013	5.68	0.13		
232.9	71	6.56	8.15	66.4	8.5	0.013	5.68	0.14		
236.2	72	6.54	8.19	66.7	8.5	0.013	5.70	0.10		

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Stillwater Sciences

Reservoir - Water Quality Vertical Profiles

R-15-8-UVR 10/23/19

Depth		Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Water Sample	Notes
(ft)	(m)	(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)		
(CONTINUED)										
239.5	73	6.52	8.21	66.8	8.6	0.013	5.71	0.12		
242.8	74	6.49	8.16	66.3	8.6	0.013	5.71	0.10		
246.1	75	6.48	8.12	66.0	8.7	0.013	5.71	0.14		
249.3	76	6.47	8.07	65.5	8.8	0.014	5.70	0.13		
252.6	77	6.46	8.01	65.1	9.0	0.014	5.70	0.13		
255.9	78	6.46	7.95	64.6	9.0	0.014	5.70	0.15		
259.2	79	6.45	7.92	64.3	9.0	0.014	5.71	0.15		
262.5	80	6.45	7.90	64.2	9.2	0.014	5.72	0.21		
265.7	81	6.43	7.74	62.8	9.1	0.014	5.72	0.18		
269.0	82	6.41	7.56	61.3	9.2	0.014	5.72	7.28		BOTTOM
272.3	83									
275.6	84									
278.9	85									
282.1	86									
285.4	87									
288.7	88									
292.0	89									
295.3	90									
298.6	91									
301.8	92									
305.1	93									
308.4	94									
311.7	95									
315.0	96									
318.2	97									
321.5	98									
324.8	99									
328.1	100									
331.4	101									
334.6	102									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Date: 10/21/19
Time: 1151

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-9-1HR
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 54.5

Secchi (ft): 27.9

Personnel: EES DLB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		14.00	8.20	79.5	8.1	0.010	6.50	0.15		
3.3	1	13.88	8.18	79.2	8.0	0.010	6.40	0.16		
6.6	2	13.81	8.17	78.9	8.0	0.010	6.44	0.17		
9.8	3	13.72	8.16	78.7	8.0	0.010	6.40	0.17		
13.1	4	13.64	8.16	78.5	8.0	0.010	6.39	0.18		
16.4	5	13.61	8.14	78.3	8.0	0.010	6.40	0.18		
19.7	6	13.59	8.12	78.1	8.0	0.010	6.37	0.18		
23.0	7	13.52	8.09	77.7	8.0	0.010	6.34	0.17		
26.2	8	13.50	8.08	77.5	8.0	0.010	6.33	0.16		
29.5	9	13.49	8.08	77.5	8.0	0.010	6.31	0.15		
32.8	10	13.49	8.06	77.4	8.0	0.010	6.29	0.16		
36.1	11	13.49	8.05	77.3	8.0	0.010	6.27	0.16		
39.4	12	13.48	8.05	77.2	8.0	0.010	6.26	0.19		
42.7	13	13.48	8.04	77.1	8.0	0.010	6.29	0.17		
45.9	14	13.47	8.01	76.8	8.0	0.010	6.25	0.21		
49.2	15	13.43	7.96	76.3	8.0	0.010	6.25	0.21		
52.5	16	13.40	7.75	74.2	8.0	0.010	6.22	1.63		Bottom
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

Page 1 of 1

Reservoir - Water Quality Vertical Profiles

Date: 10/21/19
Time: 1243

Site Location: R-15-10-1HR
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 26.3

Secchi (ft): 19.2

Personnel: EES DL BJ

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		13.45	8.21	79.5	8.0	0.010	6.55	0.13		
3.3	1	13.78	8.22	79.4	7.9	0.010	6.44	0.13		
6.6	2	13.77	8.19	79.0	7.9	0.010	6.49	0.15		
9.8	3	13.54	8.21	78.8	7.9	0.010	6.49	0.16		
13.1	4	13.56	8.20	78.6	7.9	0.010	6.49	0.14		
16.4	5	13.49	8.19	78.5	7.9	0.010	6.46	0.15		
19.7	6	13.49	8.18	78.4	7.9	0.010	6.48	0.16		BOTTOM
23.0	7									
26.2	8									
29.5	9									
32.8	10									
36.1	11									
39.4	12									
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

Stillwater Sciences

SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/21/19
Time: 1307

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-11 - 1 M R
Lat/Long (NAD83):

Personnel: EGS DLB

Instrument used: YSI EXO
Water depth: 75 ft

Secchi (ft): 31.6

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		13.81	8.21	79.4	7.9	0.010	6.60	0.13		
3.3	1	13.56	8.22	79.0	7.9	0.010	6.51	0.17		
6.6	2	13.52	8.19	78.6	7.9	0.010	6.45	0.16		
9.8	3	13.51	8.21	78.8	7.9	0.010	6.45	0.17		
13.1	4	13.47	8.20	78.6	7.9	0.010	6.42	0.17		
16.4	5	13.46	8.19	78.5	7.9	0.010	6.43	0.15		
19.7	6	13.45	8.18	78.5	7.9	0.010	6.41	0.21		
23.0	7	13.44	8.16	78.2	7.8	0.010	6.40	0.13		
26.2	8	13.43	8.13	77.9	7.8	0.010	6.40	0.17		
29.5	9	13.42	8.12	77.7	7.8	0.010	6.42	0.16		
32.8	10	13.41	8.11	77.7	7.8	0.010	6.42	0.17		
36.1	11	13.40	8.11	77.7	7.8	0.010	6.44	0.17		
39.4	12	13.40	8.10	77.6	7.8	0.010	6.42	0.17		
42.7	13	13.40	8.10	77.5	7.8	0.010	6.42	0.16		
45.9	14	13.40	8.09	77.5	7.8	0.010	6.42	0.17		
49.2	15	13.39	8.08	77.4	7.8	0.010	6.41	0.15		
52.5	16	13.39	8.08	77.3	7.8	0.010	6.40	0.15		
55.8	17	13.39	8.07	77.3	7.9	0.010	6.42	0.15		
59.1	18	13.37	8.03	76.8	8.0	0.010	6.46	26.52		BOTTOM
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/23/19
Time: 1637

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-12-SR
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 67

Secchi (ft): 21.9

Personnel: GES DLB

Site Notes:

Depth		Temp	DO		Conductivity	Specific Conductance	pH	Turbidity	Water Sample	Notes
(ft)	(m)	(°C)	(mg/L)	(%)	(µS/cm)	(mS/cm)	(s.u.)	(NTU)		
surface		12.72	10.21	95.2	8.3	0.011	6.19	0.03		
3.3	1	11.86	10.28	95.0	8.2	0.011	6.10	0.04		
6.6	2	11.65	10.25	94.4	8.2	0.011	6.06	0.04		
9.8	3	11.58	10.23	94.0	8.2	0.011	6.06	0.05		
13.1	4	11.45	10.26	94.0	8.1	0.011	6.03	0.07		
16.4	5	11.43	10.25	93.9	8.1	0.011	6.00	0.08		
19.7	6	11.46	10.24	93.7	8.1	0.011	6.00	0.06		
23.0	7	11.37	10.22	93.5	8.1	0.011	5.99	0.06		
26.2	8	11.33	10.20	93.2	8.1	0.011	6.02	0.07		
29.5	9	11.27	10.18	92.9	8.2	0.011	6.01	0.05		
32.8	10	11.16	10.08	91.8	8.3	0.011	6.01	0.06		
36.1	11	11.02	10.03	91.0	8.5	0.012	5.99	0.09		
39.4	12	10.93	10.01	90.6	8.6	0.012	6.02	0.07		
42.7	13	10.86	10.04	90.8	8.6	0.012	6.05	0.11		
45.9	14	10.85	10.03	90.7	8.6	0.012	6.03	0.09		
49.2	15	10.82	10.04	90.7	8.5	0.012	6.09	0.08		
52.5	16	10.75	10.05	90.6	8.5	0.012	6.06	0.08		
55.8	17	10.69	10.05	90.1	8.6	0.012	6.09	0.09		
59.1	18	10.05	10.12	89.8	8.6	0.012	6.08	0.14		
62.3	19	9.89	10.12	89.4	8.7	0.012	6.09	0.28		Bottom
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/23/19
Time: 1456

Reservoir - Water Quality Vertical Profiles

Instrument used: YSI EXO
Site Location: R-15-13-CR
Water depth: 19.8
Lat/Long (NAD83):
Secchi (ft): 19.8
Personnel: CES DCB

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		12.56	10.16	95.4	8.8	0.012	6.57	0.02		
3.3	1	11.62	10.24	94.2	8.6	0.012	6.45	0.04		
6.6	2	11.52	10.27	94.2	8.5	0.012	6.36	0.04		
9.8	3	11.43	10.26	93.9	8.5	0.011	6.33	0.10		
13.1	4	11.26	10.26	93.6	8.5	0.012	6.25	0.07		
16.4	5	10.32	10.43	93.2	10.2	0.014	6.32	0.07		BOTTOM
19.7	6									
23.0	7									
26.2	8									
29.5	9									
32.8	10									
36.1	11									
39.4	12									
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

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SMUD *In situ* Monitoring in the Upper American River Project and Chili Bar Project

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Date: 10/24/19
Time: 1120

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-14-SC
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 23.4

Personnel: EES DLB

Secchi (ft): 23.4

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		11.13	10.61	96.6	15.9	0.022	6.90	0.43		
3.3	1	11.10	10.61	96.5	15.8	0.022	6.80	0.32		
6.6	2	11.11	10.59	96.2	15.8	0.022	6.76	0.34		
9.8	3	11.10	10.57	96.1	15.9	0.022	6.73	0.30		
13.1	4	11.09	10.58	96.1	15.9	0.022	6.68	0.28		
16.4	5	11.09	10.57	96.0	16.1	0.022	6.65	0.28		
19.7	6	11.01	10.33	93.6	19.3	0.026	6.63	0.59		
23.0	7	10.99	10.24	92.8	21.7	0.030	6.64	35.78		Bottom
26.2	8									
29.5	9									
32.8	10									
36.1	11									
39.4	12									
42.7	13									
45.9	14									
49.2	15									
52.5	16									
55.8	17									
59.1	18									
62.3	19									
65.6	20									
68.9	21									
72.2	22									
75.5	23									
78.7	24									
82.0	25									
85.3	26									
88.6	27									
91.9	28									
95.1	29									
98.4	30									
101.7	31									
105.0	32									
108.3	33									
111.5	34									

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Date: 10/24/19
Time: 1218

Reservoir - Water Quality Vertical Profiles

Site Location: R-15-15-SC
Lat/Long (NAD83):

Instrument used: YSI EXO
Water depth: 114

Personnel: EES DLB

Secchi (ft): 30.3

Site Notes:

Depth (ft)	Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Conductivity (µS/cm)	Specific Conductance (mS/cm)	pH (s.u.)	Turbidity (NTU)	Water Sample	Notes
surface		11.85	10.12	93.6	15.1	0.020	6.92	0.21		
3.3	1	11.68	10.14	93.4	15.0	0.020	6.84	0.20		
6.6	2	11.55	10.15	93.2	14.9	0.020	6.71	0.25		
9.8	3	11.53	10.14	93.1	14.9	0.020	6.70	0.26		
13.1	4	11.52	10.12	92.9	14.9	0.020	6.66	0.23		
16.4	5	11.47	10.12	92.7	14.9	0.020	6.63	0.26		
19.7	6	11.47	10.10	92.6	14.8	0.020	6.61	0.26		
23.0	7	11.46	10.09	92.5	14.8	0.020	6.60	0.23		
26.2	8	11.46	10.09	92.4	14.8	0.020	6.59	0.21		
29.5	9	11.44	10.08	92.3	14.7	0.020	6.58	0.23		
32.8	10	11.43	10.06	92.2	14.7	0.020	6.55	0.26		
36.1	11	11.42	10.05	92.0	14.7	0.020	6.55	0.19		
39.4	12	11.41	10.04	91.9	14.8	0.020	6.52	0.21		
42.7	13	11.41	10.03	91.8	14.8	0.020	6.53	0.40		
45.9	14	11.41	10.02	91.7	14.8	0.020	6.50	0.27		
49.2	15	11.40	10.00	91.6	14.8	0.020	6.50	0.27		
52.5	16	11.38	10.00	91.4	14.8	0.020	6.49	0.23		
55.8	17	11.28	10.01	91.4	14.6	0.020	6.49	0.25		
59.1	18	11.25	10.05	91.8	14.4	0.019	6.47	0.29		
62.3	19	11.22	10.12	92.3	14.1	0.019	6.46	0.31		
65.6	20	11.21	10.18	92.8	13.9	0.019	6.45	0.31		
68.9	21	11.20	10.24	93.3	13.6	0.018	6.43	0.36		
72.2	22	11.18	10.25	93.4	13.7	0.019	6.42	0.35		
75.5	23	11.16	10.31	93.4	13.5	0.018	6.41	0.31		
78.7	24	11.16	10.32	94.0	13.7	0.019	6.39	0.37		
82.0	25	11.13	10.35	94.2	14.0	0.019	6.36	0.37		
85.3	26	11.12	10.35	94.1	13.7	0.019	6.37	0.38		
88.6	27	11.11	10.34	94.0	13.7	0.019	6.37	0.36		
91.9	28	11.10	10.33	93.9	13.7	0.019	6.37	0.46		
95.1	29	11.10	10.33	93.9	13.8	0.019	6.36	0.41		
98.4	30	11.09	10.32	93.8	13.8	0.019	6.36	0.46		
101.7	31	11.08	10.30	93.6	14.1	0.019	6.34	0.46		
105.0	32	11.07	10.25	93.1	14.2	0.019	6.34	0.75		
108.3	33	11.06	10.17	92.4	14.3	0.020	6.32	0.76		
111.5	34	11.05	10.07	91.2	9.0	0.011	6.32	1.42		bottom

APPENDIX E
In situ Field Calibration Sheets

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD WQ UARP WINTER SURVEY 2019

Unit ID: YSI EXO

Sampling Event Date(s): 2/6, 2/25

PRE-SAMPLING CALIBRATION

Date and time 2/5/19 2115 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	20.38	1313	1000	
Cond (uS/cm @ 25°C)	1,413	20.68	1852	1413	
DO (%)		17.1	94.0	94.2	
DO (mg/L)*		17.4	9.03	9.64	Check solubility table* 714.1 mmHg ↳ 9.0 mg/L
pH4	pH4	18.7	4.20	4.00	
pH 7	pH 7	19.2	6.94	7.00	
pH 10	pH 10	19.8	10.24	10.00	
Turbidity	12.4	21.0	12.58	12.40	
Turbidity					

POST-SAMPLING CALIBRATION CHECK

Date and time 2/6/19 1719 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	20.39	998	N		A	
Cond (uS/cm @ 25°C)	1,413	20.95	1417	N		A	
DO (%)		20.45	105.8	Y	94.6	R	719.2 mmHg
*DO (mg/L)		20.22	9.61	Y	8.62	R	Check solubility table* ↳ 8.6 mg/L
pH4	pH 4	17.13	4.00	N		A	
pH 7	pH 7	18.03	7.08	N		A	
pH 10	pH 10	18.22	9.93	N		A	
Turbidity	12.4	20.75	12.43	N		A	
Turbidity							

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD WQ UARP WINTER SURVEY 2019

Unit ID: YSI EXO

Sampling Event Date(s): 2/6, 2/25

PRE-SAMPLING CALIBRATION

Date and time 2/25/19 0923 Name Eric Sommeraner

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	15.9	912	1000	
Cond (uS/cm @ 25°C)	1,413	14.4	1334	1413	
DO (%)		17.1	87.6	87.7	
DO (mg/L)*		16.7	8.56	8.53	*Check solubility table* 666.3 mm Hg → 8.5 mg/L
pH4	pH4	15.2	3.73	4.00	
pH 7	pH 7	15.4	7.02	7.00	
pH 10	pH 10	14.3	10.10	10.00	
Turbidity	12.4	15.2	12.34	12.40	
Turbidity					

POST-SAMPLING CALIBRATION CHECK

Date and time 2/25/19 1756 Name Eric Sommeraner

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	14.04	986	N		A	
Cond (uS/cm @ 25°C)	1,413	13.53	1379	N		A	
DO (%)		7.23	88.1	N		A	657 mm Hg
*DO (mg/L)		7.23	10.52	N		A	*Check solubility table* → 10.5 mg/L
pH4	pH 4	10.48	3.92	N		A	
pH 7	pH 7	13.45	6.95	N		A	
pH 10	pH 10	11.93	9.98	N		A	
Turbidity	12.4	14.29	12.81	N		A	
Turbidity							

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 5/20/19 1430 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	20.8	1255	1000	
Cond (uS/cm @ 25°C)	1,413	21.1	—	1409	
DO (%)	~99.5	22.7	99.5	99.8	758.6 mmHg
DO (mg/L)*	~8.6	22.7	—	8.6	Check solubility table*
pH4	pH4	20.2	2.78	4.00	
pH 7	pH 7	20.9	5.90	7.00	
pH 10	pH 10	21.0	9.07	10.00	
Turbidity	124	21.6	13.06	12.40	
Turbidity	0	12.5	-0.10	0.0	

POST-SAMPLING CALIBRATION CHECK

Date and time 5/21/19 1614 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	14.43	995	N		A	
Cond (uS/cm @ 25°C)	1,413	16.35	1404	N		A	
DO (%)	~~92.5~~ 9.1	16.11	92.7	N		A	706.6 mm Hg
*DO (mg/L)		16.11	9.13	N		A	Check solubility table*
pH4	pH 4	16.26	4.04	N		A	
pH 7	pH 7	16.45	7.02	N		A	
pH 10	pH 10	16.41	10.04	N		A	
Turbidity	0	16.60	0.13	N		A	
Turbidity	12.4	16.49	11.96	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21–23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 5/21/2019 1700 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	16.9	990	1000	
Cond (uS/cm @ 25°C)	1,413	16.4	—	1407	
DO (%)	~92.5	16.3	92.8	93.0	706.5 mm Hg
DO (mg/L)*	9.1	16.3	—	9.11	*Check solubility table**
pH4	pH4	16.8	4.03	4.0	
pH 7	pH 7	16.9	7.04	7.0	
pH 10	pH 10	16.7	9.94	10.0	
Turbidity	0	17.5	0.11	0.0	
Turbidity	12.4	17.7	12.00	12.4	

POST-SAMPLING CALIBRATION CHECK

Date and time 5/22/19 1510 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	17.02	994	N		A	
Cond (uS/cm @ 25°C)	1,413	16.93	1408	N		A	
DO (%)	~95%	16.59	93.1	N		A	
*DO (mg/L)	9.1	16.59	9.07	N		A	*Check solubility table**
pH4	pH 4	16.44	4.01	N		A	
pH 7	pH 7	16.88	7.05	N		A	
pH 10	pH 10	16.79	10.06	N		A	
Turbidity	0	18.69	-0.06	N		A	
Turbidity	12.4	18.24	12.31	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WQ

Unit ID: YSI EXO

Sampling Event Date(s): 5/21 – 5/23, 6/4 – 6/7

PRE-SAMPLING CALIBRATION

Date and time 5/22/19 15 47 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	17.095	1004	1000	
Cond (uS/cm @ 25°C)	1,413	17.205	—	1413	
DO (%)	~93%	16.7	93.1	92.9	706.0 mmHg
DO (mg/L)*	~9.0	16.7	—	9.02	*Check solubility table**
pH4	pH4	17.1	3.97	4.00	
pH 7	pH 7	17.0	7.02	7.00	
pH 10	pH 10	16.6	10.08	10.00	
Turbidity	0.00	18.5	0.20	0.00	
Turbidity	12.4	17.4	12.27	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 5/23/19 1553 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	22.83	1382	N		A	
Cond (uS/cm @ 25°C)	1,413	20.98	993	N		A	
DO (%)	~99.5	25.45	99.6	N		A	754.8 mmHg
*DO (mg/L)	~8.1	25.45	8.16	N		A	*Check solubility table**
pH4	pH 4	20.56	4.05	N		A	
pH 7	pH 7	21.22	7.02	N		A	
pH 10	pH 10	20.76	9.99	N		A	
Turbidity	0.00	21.89	0.04	N		A	
Turbidity	12.4	21.18	12.45	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23/2019, 6/4-6/7

PRE-SAMPLING CALIBRATION

Date and time 6/3/19 1341 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	23.2	1002	1000	
Cond (uS/cm @ 25°C)	1,413	23.2	~~~	1417	
DO (%)	~99.5	23.9	99.2	99.5	756.2 mm Hg
DO (mg/L)*	~ 8.4	23.9	~~~	8.4	*Check solubility table*
pH4	pH4	23.1	4.10	4.00	
pH 7	pH 7	23.2	7.04	7.00	
pH 10	pH 10	23.2	10.03	10.00	
Turbidity	0.0	24.4	-0.47	0.00	
Turbidity	12.4	24.0	12.38	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 6/4/19 1640 Name CRISTINA BUCK/ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	24.23	1,000	N	—	A	
Cond (uS/cm @ 25°C)	1,413	24.16	1,415	N	—	A	
DO (%)	~93.5	26.36	93.4	N	—	A	709.9 mmHg
*DO (mg/L)	~7.5	26.36	7.52	N	—	A	*Check solubility table*
pH4	pH 4	23.98	4.12	N	—	A	
pH 7	pH 7	23.89	7.09	N	—	A	
pH 10	pH 10	23.75	10.12	N	—	A	
Turbidity FNU	0.0	18.84	0.06	N	—	A	
Turbidity FNU	12.4	23.27	12.52	N	—	A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 6/4/2019 @1730 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	24.1	1,000	1,000	
Cond (uS/cm @ 25°C)	1,413	24.0	—	1,410	
DO (%)	~93.5	26.4	93.3	93.4	baro = 709.9 mmHg
DO (mg/L)*	~7.5	26.4	7.52	7.52	*Check solubility table*
pH4	pH4	23.98	4.12	4.00	
pH 7	pH 7	23.9	7.05	7.00	
pH 10	pH 10	23.6	10.07	10.0	
Turbidity PNU	0	21.1	0.16	0.00	
Turbidity PNU	12.4	24.3	12.39	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 6/5/19 1537 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	22.6	1000	N		A	
Cond (uS/cm @ 25°C)	1,413	22.9	1411	N		A	
DO (%)	~93.5	26.9	93.4	N		A	709.5 mm Hg
*DO (mg/L)	~7.4	26.9	7.44	N		A	*Check solubility table*
pH4	pH 4	23.1	4.01	N		A	
pH 7	pH 7	22.8	7.01	N		A	
pH 10	pH 10	22.6	10.05	N		A	
Turbidity	0	18.4	0.02	N		A	
Turbidity	12.4	22.7	12.43	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD UARP WATER QUALITY 2019

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 6/5/19 1608 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	22.6	1002	1000	
Cond (uS/cm @ 25°C)	1,413	25.4	—	1414	
DO (%)	~93.5	21.3	93.4	93.5	709.4 mm Hg
DO (mg/L)*	~8.3	21.3	—	8.28	*Check solubility table*
pH4	pH4	22.6	4.02	4.00	
pH 7	pH 7	22.7	7.01	7.00	
pH 10	pH 10	22.7	10.08	10.00	
Turbidity	0.0	22.8	-0.04	0.00	
Turbidity	12.4	22.0	12.34	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 6/6/19 1533 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	23.66	1021	N		A	
Cond (uS/cm @ 25°C)	1,413	23.52	1398	N		A	
DO (%)	~93.5	23.39	93.2	N		A	710.0 mm Hg
*DO (mg/L)	~8.0	23.39	7.93	N		A	*Check solubility table*
pH4	pH 4	23.78	3.98	N		A	
pH 7	pH 7	23.72	7.00	N		A	
pH 10	pH 10	23.45	10.03	N		A	
Turbidity	0.00	19.11	0.03	N		A	
Turbidity	12.40	23.41	12.47	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 6/6/19 1710 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	23.65	1002	1000	
Cond (uS/cm @ 25°C)	1,413	23.71	—	1408	
DO (%)	~93.5	22.4	94.0	93.4	709.8 mm Hg
DO (mg/L)*	~8.1	22.5	—	8.09	*Check solubility table**
pH4	pH4	24.1	4.08	4.00	
pH 7	pH 7	24.2	6.95	7.00	DO recalibrated @ elevation
pH 10	pH 10	23.8	9.93	10.00	6/7/19 0652
Turbidity	0.0	21.5	0.03	0.00	601.3 mm Hg, 14.6°C
Turbidity	12.4	23.7	12.46	12.40	mean 78.3, post-cal 79.1%

POST-SAMPLING CALIBRATION CHECK

Date and time 6/7/19 1610 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	20.22	0998	N		A	
Cond (uS/cm @ 25°C)	1,413	20.51	1404	N		A	
DO (%)	~100%	23.43	99.9	N		A	759.6 mm Hg
*DO (mg/L)	~8.5	23.43	8.51	N		A	*Check solubility table**
pH4	pH 4	20.66	3.98	N		A	
pH 7	pH 7	21.46	7.01	N		A	
pH 10	pH 10	19.62	10.07	N		A	
Turbidity	0.0	20.06	0.08	N		A	
Turbidity	12.4	22.09	12.38	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 5/20/19 1430 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	20.8	1255	1000	
Cond (uS/cm @ 25°C)	1,413	21.1	—	1409	
DO (%)	~99.5	22.7	99.5	99.8	758.6 mmHg
DO (mg/L)*	~8.6	22.7	—	8.6	Check solubility table*
pH4	pH4	20.2	2.78	4.00	
pH 7	pH 7	20.9	5.90	7.00	
pH 10	pH 10	21.0	9.07	10.00	
Turbidity	12.4	21.6	13.06	12.40	
Turbidity	0	12.5	-0.10	0.0	

POST-SAMPLING CALIBRATION CHECK

Date and time 5/21/19 1614 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	14.43	995	N		A	
Cond (uS/cm @ 25°C)	1,413	16.35	1404	N		A	
DO (%)	~99.5	16.11	92.7	N		A	706.6 mm Hg
*DO (mg/L)	9.1	16.11	9.13	N		A	Check solubility table*
pH4	pH 4	16.26	4.04	N		A	
pH 7	pH 7	16.45	7.02	N		A	
pH 10	pH 10	16.41	10.04	N		A	
Turbidity	0	16.60	0.13	N		A	
Turbidity	12.4	16.49	11.96	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21–23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 5/21/2019 1700 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	16.9	990	1000	
Cond (uS/cm @ 25°C)	1,413	16.4	—	1407	
DO (%)	~92.5	16.3	92.8	93.0	706.5 mm Hg
DO (mg/L)*	9.1	16.3	—	9.11	*Check solubility table**
pH4	pH4	16.8	4.03	4.0	
pH 7	pH 7	16.9	7.04	7.0	
pH 10	pH 10	16.7	9.94	10.0	
Turbidity	0	17.5	0.11	0.0	
Turbidity	12.4	17.7	12.00	12.4	

POST-SAMPLING CALIBRATION CHECK

Date and time 5/22/19 1510 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	17.02	994	N		A	
Cond (uS/cm @ 25°C)	1,413	16.93	1408	N		A	
DO (%)	~95%	16.59	93.1	N		A	
*DO (mg/L)	9.1	16.59	9.07	N		A	*Check solubility table**
pH4	pH 4	16.44	4.01	N		A	
pH 7	pH 7	16.88	7.05	N		A	
pH 10	pH 10	16.79	10.06	N		A	
Turbidity	0	18.69	-0.06	N		A	
Turbidity	12.4	18.24	12.31	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WQ

Unit ID: YSI EXO

Sampling Event Date(s): 5/21 ~~-5/23~~ 5/23 6/4 - 6/7

PRE-SAMPLING CALIBRATION

Date and time 5/22/19 15 47 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	17.095	1004	1000	
Cond (uS/cm @ 25°C)	1,413	17.205	—	1413	
DO (%)	~93%	16.7	93.1	92.9	706.0 mmHg
DO (mg/L)*	~9.0	16.7	—	9.02	Check solubility table*
pH4	pH4	17.1	3.97	4.00	
pH 7	pH 7	17.0	7.02	7.00	
pH 10	pH 10	16.6	10.08	10.00	
Turbidity	0.00	18.5	0.20	0.00	
Turbidity	12.4	17.4	12.27	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 5/23/19 1553 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	22.83	1382	N		A	
Cond (uS/cm @ 25°C)	1,413	20.98	993	N		A	
DO (%)	~99.5	25.45	99.6	N		A	754.8 mmHg
*DO (mg/L)	~8.1	25.45	8.16	N		A	Check solubility table*
pH4	pH 4	20.56	4.05	N		A	
pH 7	pH 7	21.22	7.02	N		A	
pH 10	pH 10	20.76	9.99	N		A	
Turbidity	0.00	21.89	0.04	N		A	
Turbidity	12.4	21.18	12.45	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23/2019, 6/4-6/7

PRE-SAMPLING CALIBRATION

Date and time 6/3/19 1341 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	23.2	1002	1000	
Cond (uS/cm @ 25°C)	1,413	23.2	~~~	1417	
DO (%)	~99.5	23.9	99.2	99.5	756.2 mm Hg
DO (mg/L)*	~ 8.4	23.9	~~~	8.4	*Check solubility table**
pH4	pH4	23.1	4.10	4.00	
pH 7	pH 7	23.2	7.04	7.00	
pH 10	pH 10	23.2	10.03	10.00	
Turbidity	0.0	24.4	-0.47	0.00	
Turbidity	12.4	24.0	12.38	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 6/4/19 1640 Name CRISTINA BUCK/ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	24.23	1,000	N	—	A	
Cond (uS/cm @ 25°C)	1,413	24.16	1,415	N	—	A	
DO (%)	93.5	26.36	93.4	N	—	A	709.9 mmHg
*DO (mg/L)	~7.5	26.36	7.52	N	—	A	*Check solubility table**
pH4	pH 4	23.98	4.12	N	—	A	
pH 7	pH 7	23.89	7.09	N	—	A	
pH 10	pH 10	23.75	10.12	N	—	A	
Turbidity FNU	0.0	18.84	0.06	N	—	A	
Turbidity FNU	12.4	23.27	12.52	N	—	A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 6/4/2019 C1730 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	24.1	1,000	1,000	
Cond (uS/cm @ 25°C)	1,413	24.0	—	1,410	
DO (%)	~93.5	26.4	93.3	93.4	baro = 709.9mmHg
DO (mg/L)*	~7.5	26.4	7.52	7.52	*Check solubility table*
pH4	pH4	23.98	4.12	4.00	
pH 7	pH 7	23.9	7.05	7.00	
pH 10	pH 10	23.6	10.07	10.0	
Turbidity PNU	0	21.1	0.16	0.00	
Turbidity PNU	12.4	24.3	12.39	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 6/5/19 1537 Name Eric Sommerauer

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	22.6	1000	N		A	
Cond (uS/cm @ 25°C)	1,413	22.9	1411	N		A	
DO (%)	~93.5	26.9	93.4	N		A	709.5 mm Hg
*DO (mg/L)	~7.4	26.9	7.44	N		A	*Check solubility table*
pH4	pH 4	23.1	4.01	N		A	
pH 7	pH 7	22.8	7.01	N		A	
pH 10	pH 10	22.6	10.05	N		A	
Turbidity	0	18.4	0.02	N		A	
Turbidity	12.4	22.7	12.43	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD UARP WATER QUALITY 2019

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 6/5/19 1608 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	22.6	1002	1000	
Cond (uS/cm @ 25°C)	1,413	25.4	—	1414	
DO (%)	~93.5	21.3	93.4	93.5	709.4 mm Hg
DO (mg/L)*	~8.3	21.3	—	8.28	Check solubility table*
pH4	pH4	22.6	4.02	4.00	
pH 7	pH 7	22.7	7.01	7.00	
pH 10	pH 10	22.7	10.08	10.00	
Turbidity	0.0	22.8	-0.04	0.00	
Turbidity	12.4	22.0	12.34	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 6/6/19 1533 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	23.66	1021	N		A	
Cond (uS/cm @ 25°C)	1,413	23.52	1398	N		A	
DO (%)	~93.5	23.39	93.2	N		A	710.0 mm Hg
*DO (mg/L)	~8.0	23.39	7.93	N		A	Check solubility table*
pH4	pH 4	23.78	3.98	N		A	
pH 7	pH 7	23.72	7.00	N		A	
pH 10	pH 10	23.45	10.03	N		A	
Turbidity	0.00	19.11	0.03	N		A	
Turbidity	12.40	23.41	12.47	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 5/21-23, 6/4-7

PRE-SAMPLING CALIBRATION

Date and time 6/6/19 1710 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	23.65	1002	1000	
Cond (uS/cm @ 25°C)	1,413	23.71	—	1408	
DO (%)	~93.5	22.4	94.0	93.4	709.8 mm Hg
DO (mg/L)*	~8.1	22.5	—	8.09	Check solubility table*
pH4	pH4	24.1	4.08	4.00	
pH 7	pH 7	24.2	6.95	7.00	DO recalibrated for elevation
pH 10	pH 10	23.8	9.93	10.00	6/7/19 0652
Turbidity	0.0	21.5	0.03	0.00	681.3 mm Hg, 19.6°C
Turbidity	12.4	23.7	12.46	12.40	Meas 78.3, post-cal 79.1%

POST-SAMPLING CALIBRATION CHECK

Date and time 6/7/19 1610 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	20.22	0998	N		A	
Cond (uS/cm @ 25°C)	1,413	20.51	1404	N		A	
DO (%)	~100%	23.43	99.9	N		A	759.6 mm Hg
*DO (mg/L)	~8.5	23.43	8.51	N		A	Check solubility table*
pH4	pH 4	20.66	3.98	N		A	
pH 7	pH 7	21.46	7.01	N		A	
pH 10	pH 10	19.62	10.07	N		A	
Turbidity	0.0	20.06	0.08	N		A	
Turbidity	12.4	22.09	12.38	N		A	
[1] See Table 1							

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 8/5-8/2019

PRE-SAMPLING CALIBRATION

Date and time 8/5/19 0540 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	23.4	995	1000	
Cond (uS/cm @ 25°C)	1,413	23.6	—	1417	
DO (%)	~ 100	23.5	99.3	99.9	758.9 mm Hg
DO (mg/L)*	~ 8.5	23.6	—	8.48	Check solubility table*
pH4	pH4	23.4	4.07	4.00	
pH 7	pH 7	23.6	7.09	7.00	
pH 10	pH 10	23.7	10.21	10.00	
Turbidity	0.0	23.4	0.26	0.00	
Turbidity	12.4	23.5	13.50	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 8/5/19 2118 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	29.6	994	N		A	
Cond (uS/cm @ 25°C)	1,413	28.9	1418	N		A	
DO (%)	~99.5	28.7	99.5	N		A	
*DO (mg/L)	~7.7	28.7	7.70	N		A	Check solubility table*
pH4	pH 4	29.4	4.12	N		A	757.3 mm Hg
pH 7	pH 7	29.5	7.01	N		A	
pH 10	pH 10	28.2	10.06	N		A	
Turbidity	0.0	24.7	0.01	N		A	
Turbidity	12.4	29.3	12.58	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WQ

Unit ID: YSI EXO

Sampling Event Date(s): 8/5-8/19

PRE-SAMPLING CALIBRATION

Date and time 8/6/2019 0509 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	26.4	1002	1000	
Cond (uS/cm @ 25°C)	1,413	26.5	—	1420	
DO (%)	100	26.5	100.0	99.6	
DO (mg/L)*	8.0	26.5	—	8.00	Check solubility table*
pH4	pH4	26.7	4.02	4.00	757.3 mm Hg
pH 7	pH 7	26.6	7.01	7.00	
pH 10	pH 10	26.4	10.03	10.00	
Turbidity	0	24.3	-0.23	0.00	
Turbidity	12.4	25.9	11.89	12.4	

POST-SAMPLING CALIBRATION CHECK

Date and time 8/6/19 1910 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	29.08	990	N		A	
Cond (uS/cm @ 25°C)	1,413	28.76	1415	N		A	
DO (%)	~99.5	28.23	94.4	N		Q	
*DO (mg/L)	7.7	28.46	7.33	N		A	Check solubility table* 755.7 mm Hg
pH4	pH 4	29.76	4.09	N		A	DO RECALIBRATED @ 1549, 710.4 mm Hg
pH 7	pH 7	29.42	7.05	N		A	
pH 10	pH 10	28.72	10.05	N		A	12.56
Turbidity	0.00	25.5	0.02	N		A	actual reading: 98.5
Turbidity	12.4	29.9	12.33	N		A	calibration value = 93.5

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 8/5-8/19

PRE-SAMPLING CALIBRATION

Date and time 8/7/19 0535 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	24.8	997	1000	DO CALIBRATED @ 0905
Cond (uS/cm @ 25°C)	1,413	24.6	—	1409	
DO (%)	~80	23.6	81.4	80.0	
DO (mg/L)*	~6.7	23.6	—	6.78	Check solubility table* 608.3mm Hg
pH4	pH4	24.9	3.93	4.00	
pH 7	pH 7	24.8	6.88	7.00	
pH 10	pH 10	25.0	10.01	10.00	
Turbidity	0.0	24.4	0.10	0.00	
Turbidity	12.4	25.7	12.51	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 8/7/19 1609 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	26.46	998	N		A	
Cond (uS/cm @ 25°C)	1,413	26.15	1418	N		A	
DO (%)	~84	18.93	84.1	N		A	
*DO (mg/L)	~7.7	18.93	7.79	N		A	Check solubility table*
pH4	pH 4	25.43	4.11	N		A	
pH 7	pH 7	26.31	7.07	N		A	
pH 10	pH 10	26.22	10.07	N		A	
Turbidity	0	27.42	0.02	N		A	
Turbidity	12.4	26.21	12.32	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD UARP/CB WATER QUALITY

Unit ID: YSI EXO

Sampling Event Date(s): 8/5-8/2019

PRE-SAMPLING CALIBRATION

Date and time 8/8/19 0540 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	23.9	1003	1000	
Cond (uS/cm @ 25°C)	1,413	24.7	—	1408	
DO (%)	~98	21.8	96.3	97.9	744.1 mm Hg
DO (mg/L)*	~8.5	21.8	—	8.59	*Check solubility table*
pH4	pH4	24.8	4.06	4.00	
pH 7	pH 7	24.6	6.97	7.00	
pH 10	pH 10	24.3	10.04	10.00	
Turbidity	0.0	23.5	0.02	0.00	
Turbidity	12.4	25.0	12.24	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time _____ Name _____

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	25.2	1002	N		A	DO CHECK @ 1537
Cond (uS/cm @ 25°C)	1,413	25.2	1403	N		A	
DO (%)	~96.5	27.26	96.3	N		A	735.6 mm Hg
*DO (mg/L)	~7.7	27.34	7.6	N		A	*Check solubility table*
pH4	pH 4	25.1	4.12	N		A	
pH 7	pH 7	25.3	7.04	N		A	
pH 10	pH 10	25.1	10.05	N		A	
Turbidity	0.0	25.6	-0.07	N		A	
Turbidity	12.4	25.8	12.38	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD WQ in situ Fall Reservoir

Unit ID: YSI EXO

Sampling Event Date(s): 10/21-25/2019

PRE-SAMPLING CALIBRATION

Date and time 10/21/19 0800 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	20.08	999	1000	
Cond (uS/cm @ 25°C)	1,413	19.75	—	1414	DO @ 1130
DO (%)	~83%	19.4	85.4	82.8	629.6 mm Hg
DO (mg/L)*	~7.6	19.46	~	7.62	*Check solubility table**
pH4	pH4	20.3	4.28	4.00	
pH 7	pH 7	20.2	7.11	7.00	
pH 10	pH 10	19.8	10.12	10.00	
Turbidity	0.0	18.7	-0.07	0.00	
Turbidity	12.4	20.0	12.49	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 10/21/19 1652 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	21.40	1000	N		A	
Cond (uS/cm @ 25°C)	1,413	21.12	1402	N		A	
DO (%)	~83%	20.70	83.8	N		A	DO cal @ 1355
*DO (mg/L)	~7.3	20.75	7.5	N		A	*Check solubility table**
pH4	pH 4	21.42	3.89	N		A	629.5 mm Hg
pH 7	pH 7	21.34	6.90	N		A	
pH 10	pH 10	21.88	9.99	N		A	
Turbidity	0.0	18.71	0.02	N		A	
Turbidity	12.4	20.75	12.48	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD WQ in situ FALL

Unit ID: YSI Exo

Sampling Event Date(s): 10/21-25/2019

PRE-SAMPLING CALIBRATION

Date and time 10/22/19 0615 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	20.35	997	1000	
Cond (uS/cm @ 25°C)	1,413	20.25	—	1417	
DO (%)	~80%	18.6	80.8	80.4	DO 6 of 47
DO (mg/L)*	7.5	18.6	—	7.52	*Check solubility table*
pH4	pH4	20.5	3.87	4.00	610.8 mV Mg
pH 7	pH 7	20.4	6.94	7.00	
pH 10	pH 10	20.2	10.06	10.00	
Turbidity	0.0	19.9	-0.03	0.00	
Turbidity	12.4	20.4	12.39	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 10/22/19 1808 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	21.41	1002	N		A	
Cond (uS/cm @ 25°C)	1,413	22.62	1416	N		A	
DO (%)	~100	20.99	99.6	N		A	
*DO (mg/L)	~8.9	20.99	8.88	N		A	*Check solubility table*
pH4	pH 4	21.79	4.00	N		A	761 mV Mg
pH 7	pH 7	21.65	6.91	N		A	
pH 10	pH 10	22.06	9.88	N		A	
Turbidity	0.0	20.66	0.01	N		A	
Turbidity	12.4	21.82	12.38	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD in situ WQ surveys Fall Reservoir

Unit ID: YSI EXO

Sampling Event Date(s): 10/21-25/2019

PRE-SAMPLING CALIBRATION

Date and time 10/23/19 0600 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	20.13	1002	1000	
Cond (uS/cm @ 25°C)	1,413	20.05	—	1415	
DO (%)	~100	19.20	99.0	100.02	761.3 mm Hg
DO (mg/L)*	~9.3	19.20	—	9.26	*Check solubility table**
pH4	pH4	20.4	4.08	4.00	
pH 7	pH 7	20.3	6.96	7.00	
pH 10	pH 10	20.1	10.00	10.00	
Turbidity	0.0	19.7	0.08	0.00	
Turbidity	12.4	20.7	12.39	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 10/23/19 1934 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	22.22	1002	N		A	
Cond (uS/cm @ 25°C)	1,413	22.06	1414	N		A	
DO (%)	~100	18.88	100.1	N		A	758.1
*DO (mg/L)	~9.3	18.88	9.31	N		A	*Check solubility table**
pH4	pH 4	21.54	3.94	N		A	
pH 7	pH 7	21.68	6.92	N		A	
pH 10	pH 10	21.61	9.89	N		A	
Turbidity	0.0	21.82	-0.07	N		A	
Turbidity	12.4	21.93	12.27	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: 2019 SMUD WQ in situ Fall Reservoir Surveys

Unit ID: YSI EXO

Sampling Event Date(s): 10/21-25/19

PRE-SAMPLING CALIBRATION

Date and time 10/24/19 0600 Name ERIC SOMMERLOT

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	20.47	1000	1000	
Cond (uS/cm @ 25°C)	1,413	20.47	—	1403	
DO (%)	~100	20.40	100.2	100.1	761.2
DO (mg/L)*	~9.1	20.40	—	9.04	Check solubility table*
pH4	pH4	20.6	4.01	4.00	
pH 7	pH 7	20.5	6.99	7.00	
pH 10	pH 10	20.5	10.06	10.00	
Turbidity	0.0	19.7	-0.05	0.00	
Turbidity	12.4	20.6	12.38	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 10/24/19 1600 Name ERIC SOMMERLOT

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	20.78	1000	N		A	
Cond (uS/cm @ 25°C)	1,413	20.99	1403	N		A	
DO (%)	~100	21.80	100.6	N		A	761.4 mmHg
*DO (mg/L)	~8.7	21.80	8.83	N		A	Check solubility table*
pH4	pH 4	20.75	4.00	N		A	
pH 7	pH 7	20.91	6.96	N		A	
pH 10	pH 10	20.90	9.88	N		A	
Turbidity	0.0	20.01	0.01	N		A	
Turbidity	12.4	21.89	12.53	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD WQ in situ Folk Reservoir studies

Unit ID: YSI EXO

Sampling Event Date(s): 10/21 – 10/25 2019

PRE-SAMPLING CALIBRATION

Date and time 10/25/19 0600 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	18.45	998	1000	
Cond (uS/cm @ 25°C)	1,413	18.78	–	1416	
DO (%)	~100.5	18.50	100.7	100.5	763.4 mm Hg
DO (mg/L)*	~9.4	18.47	–	9.42	Check solubility table*
pH4	pH4	18.59	4.17	4.00	
pH 7	pH 7	18.20	7.05	7.00	
pH 10	pH 10	18.30	10.07	10.00	
Turbidity	0.0	20.1	-0.04	0.00	
Turbidity	12.4	19.0	12.35	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time _____ Name _____

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	22.04	1002	N		A	
Cond (uS/cm @ 25°C)	1,413	21.82	1417	N		A	
DO (%)	~100	24.96	99.3	N		A	760.6 mm Hg
*DO (mg/L)	~8.2	24.96	8.21	N		A	Check solubility table*
pH4	pH 4	21.48	3.99	N		A	
pH 7	pH 7	21.27	6.93	N		A	
pH 10	pH 10	21.72	9.91	N		A	
Turbidity	0.0	19.09	0.07	N		A	
Turbidity	~4	20.98	12.44	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Stillwater Sciences

pg 1 of 4

Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD UARP IN SITU RIVERINE Fall

Unit ID: YSI EXO

Sampling Event Date(s): 11/4-7/2019

PRE-SAMPLING CALIBRATION

Date and time 11/4/19 0520 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	16.71	1002	1000	
Cond (uS/cm @ 25°C)	1,413	17.30	—	1414	
DO (%)	~80%	17.0	80.5	79.6	605.3 mm Hg
DO (mg/L)*	~7.6	16.92	—	7.69	*Check solubility table*
pH4	pH4	16.6	3.94	4.00	
pH 7	pH 7	16.8	6.81	7.00	
pH 10	pH 10	16.4	9.96	10.00	
Turbidity	0.0	17.3	0.14	0.00	
Turbidity	12.4	16.8	12.40	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 11/4/19 1700 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	17.46	999	N		A	
Cond (uS/cm @ 25°C)	1,413	17.63	1408	N		A	
DO (%)	~100	19.12	98.8	N		A	759.4 mm Hg
*DO (mg/L)	~9.1	19.12	9.14	N		A	*Check solubility table*
pH4	pH 4	17.00	4.03	N		A	
pH 7	pH 7	17.10	7.02	N		A	
pH 10	pH 10	17.56	10.17	N		A	
Turbidity	0.0	17.51	0.02	N		A	
Turbidity	12.4	17.62	12.40	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

Ver. 01/2016

Stillwater Sciences

pg 2 of 4

Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD IN SITU FALL RIVERINE

Unit ID: YSI EXO

Sampling Event Date(s): 11/4 – 7 / 2019

PRE-SAMPLING CALIBRATION

Date and time 11/5/19 0510 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	17.25	997	1000	
Cond (uS/cm @ 25°C)	1,413	16.79	—	1413	
DO (%)	~100	15.9	99.3	100.3	762.1 mm/Hg
DO (mg/L)*	~9.8	15.86	—	9.93	*Check solubility table**
pH4	pH4	17.3	4.04	4.00	
pH 7	pH 7	17.3	7.00	7.00	
pH 10	pH 10	16.7	10.19	10.00	
Turbidity	0.0	16.6	0.00	0.00	
Turbidity	12.4	17.1	12.47	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 11/5/19 1832 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	17.82	1000	N		A	
Cond (uS/cm @ 25°C)	1,413	17.91	1411	N		A	
DO (%)	~100	18.64	99.4	N		A	758.2
*DO (mg/L)	~9.7	18.64	9.26	N		A	*Check solubility table**
pH4	pH 4	17.24	4.01	N		A	
pH 7	pH 7	17.31	7.09	N		A	
pH 10	pH 10	17.29	10.12	N		A	
Turbidity	0.0	17.87	0.07	N		A	
Turbidity	12.4	17.56	12.43	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Stillwater Sciences

pg 3 of 4

Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD in situ fall riverine

Unit ID: YSI EXO

Sampling Event Date(s): 11/4/19 – 11/7/19

PRE-SAMPLING CALIBRATION

Date and time 11/6/19 0510 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	17.34	999	1000	
Cond (uS/cm @ 25°C)	1,413	17.26	—	1408	
DO (%)	~100	15.3	99.9	100.2	761.1 mmHg
DO (mg/L)*	~10.0	15.3	—	10.04	Check solubility table*
pH4	pH4	16.8	4.10	4.00	
pH 7	pH 7	17.1	6.98	7.00	
pH 10	pH 10	16.9	10.08	10.00	
Turbidity	0.0	16.1	0.11	0.00	
Turbidity	12.4	16.9	12.22	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 11/6/19 2000 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	17.71	999	N		A	
Cond (uS/cm @ 25°C)	1,413	17.74	1404	N		A	
DO (%)	~100	18.21	100.2	N		A	759.1
*DO (mg/L)	~9.4	18.21	9.46	N		A	Check solubility table*
pH4	pH 4	17.22	4.02	N		A	
pH 7	pH 7	17.18	7.05	N		A	
pH 10	pH 10	17.36	10.12	N		A	
Turbidity	0.0	17.88	0.02	N		A	
Turbidity	12.4	17.95	12.39	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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Stillwater Sciences

pg 4 of 4

Water Quality YSI 6920 Sonde Calibration – Daily Use

Project: SMUD FALL RIVERINE IN SITU

Unit ID: YSI EXO

Sampling Event Date(s): 11/4/19 – 11/7/19

PRE-SAMPLING CALIBRATION

Date and time 11/7/19 0510 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Pre-Cal Value	Post-Cal Value	Notes
Cond (uS/cm @ 25°C)	1,000	16.85	1002	1000	
Cond (uS/cm @ 25°C)	1,413	16.87	~	1414	
DO (%)	~100	15.9	100.4	100.3	762.4 mmHg
DO (mg/L)*	~ 9.9	15.92	~	9.93	Check solubility table*
pH4	pH4	17.2	3.97	4.00	
pH 7	pH 7	17.1	6.90	7.00	
pH 10	pH 10	16.9	9.94	10.00	
Turbidity	0.0	17.1	0.03	0.00	
Turbidity	12.4	17.0	12.53	12.40	

POST-SAMPLING CALIBRATION CHECK

Date and time 11/7/19 1700 Name ERIC SOMMERAUER

Parameter	Std. Value	Std. Temp (°C)	Post-Sampling Value	Re-Cal Yes or No?	Post-Cal Value	MQO Code[1]	Notes
Cond (uS/cm @ 25°C)	1,000	18.01	1000	N		A	
Cond (uS/cm @ 25°C)	1,413	18.23	1415	N		A	
DO (%)	~100	19.51	99.4	N		A	757.9 mmHg
*DO (mg/L)	~9.2	19.51	9.18	N		A	Check solubility table*
pH4	pH 4	18.20	4.04	N		A	
pH 7	pH 7	18.34	6.99	N		A	
pH 10	pH 10	18.17	10.10	N		A	
Turbidity	0.0	18.86	0.04	N		A	
Turbidity	12.4	18.57	12.40	N		A	

[1] See Table 1

Table 1: Measurement Quality Objectives – comparisons are between Post-sampling Value and Post-calibration Value

Parameter	Units	Accept	Qualify	Reject
Dissolved oxygen	% saturation	≤ 5%	> 5% and ≤ 10%	> 10%
Conductivity	uS/cm	≤ 5%	> 5% and ≤ 15%	> 15%
pH	s.u.	≤ 0.2	> 0.2 and ≤ 0.5	> 0.5
Turbidity	NTU	≤ 5%	> 5% and ≤ 10%	> 10%

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APPENDIX F
Analytical Laboratory Bacteria Reports

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CALIFORNIA LABORATORY SERVICES
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June 25, 2019

CLS Work Order #: 19F1029
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 06/18/19 14:30. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 19F1029 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705

Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By:
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliform-15 Tube; E. coli Quanti-tray
PRESERVATIVES

GEOTRACKER
EDF REPORT: YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
6/18/19	0855	Bac-15-SCR		Surface water			6	X	X				X	
6/18/19	1025	Bac-14-BCR		Surface water			6	X	X				X	
6/18/19	1145	Bac-11-JR		Surface water			6	X	X				X	
6/18/19	1225	Bac-13-IHR		Surface water			6	X	X				X	
6/18/19	1250	Bac-12-IHR		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO_3 (3) = COLD (4) = H_2SO_4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Cathy Applequist/Stillwater	6/18/14:30		

RECEIVED AT LAB BY: | DATE/TIME: 6/18/19 1430 | CONDITIONS/COMMENTS: 1.4

SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER _____ AIR BILL # _____

CALIFORNIA LABORATORY SERVICES
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06/25/19 15:25

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19F1029**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-15-SCR (19F1029-01) Surface Water	**Sampled: 06/18/19 08:55**	**Received: 06/18/19 14:30**							
Fecal Coliforms	**7.8**	1.8	MPN/100 mL	1	1905030	06/18/19 15:00	06/21/19	SM 9221	
E. Coli	**6.0**	1.0	"	"	1905036	"	06/19/19	SM9223	
BAC-14-BCR (19F1029-02) Surface Water	**Sampled: 06/18/19 10:25**	**Received: 06/18/19 14:30**							
Fecal Coliforms	**13**	1.8	MPN/100 mL	1	1905030	06/18/19 15:00	06/21/19	SM 9221	
E. Coli	**3.0**	1.0	"	"	1905036	"	06/19/19	SM9223	
BAC-11-JR (19F1029-03) Surface Water	**Sampled: 06/18/19 11:45**	**Received: 06/18/19 14:30**							
Fecal Coliforms	**13**	1.8	MPN/100 mL	1	1905030	06/18/19 15:00	06/21/19	SM 9221	
E. Coli	**12.2**	1.0	"	"	1905036	"	06/19/19	SM9223	
BAC-13-IHR (19F1029-04) Surface Water	**Sampled: 06/18/19 12:25**	**Received: 06/18/19 14:30**							
Fecal Coliforms	**4.0**	1.8	MPN/100 mL	1	1905030	06/18/19 15:00	06/21/19	SM 9221	
E. Coli	**6.3**	1.0	"	"	1905036	"	06/19/19	SM9223	
BAC-12-IHR (19F1029-05) Surface Water	**Sampled: 06/18/19 12:50**	**Received: 06/18/19 14:30**							
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1905030	06/18/19 15:00	06/21/19	SM 9221	
E. Coli	**35.9**	1.0	"	"	1905036	"	06/19/19	SM9223	

CALIFORNIA LABORATORY SERVICES
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 06/25/19 15:25

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19F1029**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4	<1.8
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CALIFORNIA LABORATORY SERVICES
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June 26, 2019

CLS Work Order #: 19F1148
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 06/19/19 15:00. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 177148 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: ES EHA SPK
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliform-15 Tube; E. coli Quanti-tray
PRESERVATIVES

GEOTRACKER
EDF REPORT: YES [x] NO [ ]
GLOBAL ID.
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
6/19/19	1300	Bac-5-GCR		Surface water			6	X	X				X	
6/19/19	1240	Bac-6-GCR		Surface water			6	X	X				X	
6/19/19	1010	Bac-7-UVR		Surface water			6	X	X				X	
6/19/19	1030	Bac-8-UVR		Surface water			6	X	X				X	
6/19/19	1145	Bac-9-UVR		Surface water			6	X	X				X	
6/19/19	1055	Bac-10-UVR		Surface water			6	X	X				X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME:
PRESERVATIVES (1) HCL (2) HNO_3 (3) = COLD (4) = H_2SO_4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Applegate/Stillwater	6/19/19 1500		

RECEIVED AT LAB BY: DATE/TIME: 6/19/19 1500 CONDITIONS/COMMENTS: 2.5

SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER AIR BILL #

CALIFORNIA LABORATORY SERVICES
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 06/26/19 15:41

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19F1148**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-5-GCR (19F1148-01) Surface Water	**Sampled: 06/19/19 13:00**	**Received: 06/19/19 15:00**							
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1905066	06/19/19 15:15	06/22/19	SM 9221	
E. Coli	**3.1**	1.0	"	"	1905069	06/19/19 15:20	06/20/19	SM9223	
BAC-6-GCR (19F1148-02) Surface Water	**Sampled: 06/19/19 12:40**	**Received: 06/19/19 15:00**							
Fecal Coliforms	**2.0**	1.8	MPN/100 mL	1	1905066	06/19/19 15:15	06/22/19	SM 9221	
E. Coli	<1	1.0	"	"	1905069	06/19/19 15:20	06/20/19	SM9223	
BAC-7-UVR (19F1148-03) Surface Water	**Sampled: 06/19/19 10:10**	**Received: 06/19/19 15:00**							
Fecal Coliforms	**350**	1.8	MPN/100 mL	1	1905066	06/19/19 15:15	06/22/19	SM 9221	
E. Coli	**770.1**	1.0	"	"	1905069	06/19/19 15:20	06/20/19	SM9223	
BAC-8-UVR (19F1148-04) Surface Water	**Sampled: 06/19/19 10:30**	**Received: 06/19/19 15:00**							
Fecal Coliforms	**2.0**	1.8	MPN/100 mL	1	1905066	06/19/19 15:15	06/22/19	SM 9221	
E. Coli	**1.0**	1.0	"	"	1905069	06/19/19 15:20	06/20/19	SM9223	
BAC-9-UVR (19F1148-05) Surface Water	**Sampled: 06/19/19 11:45**	**Received: 06/19/19 15:00**							
Fecal Coliforms	**2.0**	1.8	MPN/100 mL	1	1905066	06/19/19 15:15	06/22/19	SM 9221	
E. Coli	<1	1.0	"	"	1905069	06/19/19 15:20	06/20/19	SM9223	
BAC-10-UVR (19F1148-06) Surface Water	**Sampled: 06/19/19 10:55**	**Received: 06/19/19 15:00**							
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1905066	06/19/19 15:15	06/22/19	SM 9221	
E. Coli	<1	1.0	"	"	1905069	06/19/19 15:20	06/20/19	SM9223	

3249 Fitzgerald Road, Rancho Cordova, CA 95742 | 800.638.7301 | Tel: 916.638.7301 x102 | Fax: 916.638.4510 | www.californialab.com
Small Business #2916 | ELAP #1233 | NAICS #541380 | CA SWRCB ELAP Accreditation/Registration Number 1233

CALIFORNIA LABORATORY SERVICES
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 06/26/19 15:41

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19F1148**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

3249 Fitzgerald Road, Rancho Cordova, CA 95742 | 800.638.7301 | Tel: 916.638.7301 x102 | Fax: 916.638.4510 | www.californialab.com
Small Business #2916 | ELAP #1233 | NAICS #541380 | CA SWRCB ELAP Accreditation/Registration Number 1233

CALIFORNIA LABORATORY SERVICES
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July 02, 2019

CLS Work Order #: 19F1411
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 06/25/19 14:21. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 19F1911 (1 of 2)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: EGS EHA DKR
Job Description: Monitor seasonal bacteria levels in UARP reaches
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED
PRESERVATIVES
Fecal coliform-15 Tube
E. coli Quanti-tray

GEOTRACKER
EDF REPORT YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
6-25-19	0855	Bac-15-SCR		Surface water			6	X	X				X	
6-25-19	1015	Bac-14-RCR		Surface water			6	X	X				X	
6-25-19	1145	Bac-11-JR		Surface water			6	X	X				X	
6-25-19	1220	Bac-13-JHR		Surface water			6	X	X				X	
6-25-19	1240	Bac-12-JHR		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (3) = COLD (2) HNO3 (4) = H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Eric Sommerauer / St. Water Sciences	6 25 19	M2	

RECEIVED AT LAB BY: CR DATE/TIME: 6 25 19 1921 CONDITIONS/COMMENTS: 2 5

SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER _____ AIR BILL # _____

CALIFORNIA LABORATORY SERVICES
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 07/02/19 14:52

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0100.02	**CLS Work Order #: 19F1411**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bac - 15 - SCR (19F1411-01) SurfaceWater Sampled: 06/25/19 08:55 Received: 06/25/19 14:21									
Fecal Coliforms	**4.5**	1.8	MPN/100 mL	1	1905243	06/25/19 14:45	06/28/19	SM 9221	
E. Coli	**1.0**	1.0	"	"	1905247	06/25/19 14:40	06/26/19	SM9223	
Bac - 14 - BCR (19F1411-02) SurfaceWater Sampled: 06/25/19 10:15 Received: 06/25/19 14:21									
Fecal Coliforms	**4.0**	1.8	MPN/100 mL	1	1905243	06/25/19 14:45	06/28/19	SM 9221	
E. Coli	<1	1.0	"	"	1905247	06/25/19 14:40	06/26/19	SM9223	
Bac - 11 - JR (19F1411-03) SurfaceWater Sampled: 06/25/19 11:45 Received: 06/25/19 14:21									
Fecal Coliforms	**1.8**	1.8	MPN/100 mL	1	1905243	06/25/19 14:45	06/28/19	SM 9221	
E. Coli	<1	1.0	"	"	1905247	06/25/19 14:40	06/26/19	SM9223	
Bac - 13 - IHR (19F1411-04) SurfaceWater Sampled: 06/25/19 12:20 Received: 06/25/19 14:21									
Fecal Coliforms	**6.8**	1.8	MPN/100 mL	1	1905243	06/25/19 14:45	06/28/19	SM 9221	
E. Coli	**2.0**	1.0	"	"	1905247	06/25/19 14:40	06/26/19	SM9223	
Bac - 12 - IHR (19F1411-05) SurfaceWater Sampled: 06/25/19 12:40 Received: 06/25/19 14:21									
Fecal Coliforms	**13**	1.8	MPN/100 mL	1	1905243	06/25/19 14:45	06/28/19	SM 9221	
E. Coli	**16.9**	1.0	"	"	1905247	06/25/19 14:40	06/26/19	SM9223	

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Small Business #2916 | ELAP #1233 | NAICS #541380 | CA SWRCB ELAP Accreditation/Registration Number 1233

CALIFORNIA LABORATORY SERVICES
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 07/02/19 14:52

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0100.02	**CLS Work Order #: 19F1411**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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CALIFORNIA LABORATORY SERVICES
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July 03, 2019

CLS Work Order #: 19F1504
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 06/26/19 14:05. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 19F1504 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: EES DKR EHP
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[X] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliform-15 Tube; E. coli Quanti-tray
PRESERVATIVES

GEOTRACKER
EDF REPORT: YES [X] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	CONTAINER MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
6/26/19	0910	Bac-7-UVR		Surface water			6	X	X				X	
6/26/19	0930	Bac-8-UVR		Surface water			6	X	X				X	
6/26/19	0950	Bac-10-UVR		Surface water			6	X	X				X	
6/26/19	1045	Bac-9-UVR		Surface water			6	X	X				X	
6/26/19	1130	Bac-6-GCR		Surface water			6	X	X				X	
6/26/19	1155	Bac-5-GCR		Surface water			6	X	X				X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO, (3) = COLD (4)= H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
ERIC SUMMERAUER	Stillwater Sciences	6/26/19 1405		

RECEIVED AT LAB BY: DATE/TIME: 6-26-19 1405 CONDITIONS/COMMENTS: 03

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CALIFORNIA LABORATORY SERVICES
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 07/03/19 13:59

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19F1504**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-7-UVR (19F1504-01) Surface Water	**Sampled: 06/26/19 09:10**	**Received: 06/26/19 14:05**							
Fecal Coliforms	**23**	1.8	MPN/100 mL	1	1905294	06/26/19 14:30	06/29/19	SM 9221	
E. Coli	**14.5**	1.0	"	"	1905301	06/26/19 15:25	06/27/19	SM9223	
BAC-8-UVR (19F1504-02) Surface Water	**Sampled: 06/26/19 09:30**	**Received: 06/26/19 14:05**							
Fecal Coliforms	**79**	1.8	MPN/100 mL	1	1905294	06/26/19 14:30	06/29/19	SM 9221	
E. Coli	**65.0**	1.0	"	"	1905301	06/26/19 15:25	06/27/19	SM9223	
BAC-10-UVR (19F1504-03) Surface Water	**Sampled: 06/26/19 09:50**	**Received: 06/26/19 14:05**							
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1905294	06/26/19 14:30	06/29/19	SM 9221	
E. Coli	<1	1.0	"	"	1905301	06/26/19 15:25	06/27/19	SM9223	
BAC-9-UVR (19F1504-04) Surface Water	**Sampled: 06/26/19 10:45**	**Received: 06/26/19 14:05**							
Fecal Coliforms	**49**	1.8	MPN/100 mL	1	1905294	06/26/19 14:30	06/29/19	SM 9221	
E. Coli	**13.4**	1.0	"	"	1905301	06/26/19 15:25	06/27/19	SM9223	
BAC-6-GCR (19F1504-05) Surface Water	**Sampled: 06/26/19 11:30**	**Received: 06/26/19 14:05**							
Fecal Coliforms	**23**	1.8	MPN/100 mL	1	1905294	06/26/19 14:30	06/29/19	SM 9221	
E. Coli	**9.8**	1.0	"	"	1905301	06/26/19 15:25	06/27/19	SM9223	
BAC-5-GCR (19F1504-06) Surface Water	**Sampled: 06/26/19 11:55**	**Received: 06/26/19 14:05**							
Fecal Coliforms	**4.0**	1.8	MPN/100 mL	1	1905294	06/26/19 14:30	06/29/19	SM 9221	
E. Coli	**3.1**	1.0	"	"	1905301	06/26/19 15:25	06/27/19	SM9223	

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CALIFORNIA LABORATORY SERVICES
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 07/03/19 13:59

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19F1504**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CALIFORNIA LABORATORY SERVICES
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July 10, 2019

CLS Work Order #: 19G0164
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 07/02/19 14:10. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 19G0164 (of)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By:
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliform-15 Tube; E. coli Quanti-tray
PRESERVATIVES

GEOTRACKER
EDF REPORT YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	CONTAINER MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
7/2/19	0845	Bac-15-SCR		Surface water			6	X	X				X	
7/2/19	1010	Bac-14-BCR		Surface water			6	X	X				X	
7/2/19	1155	Bac-11-JR		Surface water			6	X	X				X	
7/2/19	1210	Bac-13-UAR		Surface water			6	X	X				X	
7/2/19	1230	Bac-12-UAR		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO_3 (3) = COLD (4) = H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Stillwater	7/2/19 1410		

RECEIVED AT LAB BY: DATE/TIME: 7/2/19 1410 CONDITIONS/COMMENTS: 2
SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER AIR BILL #

CALIFORNIA LABORATORY SERVICES
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07/10/19 15:03

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G0164**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bac - 15 - SCR (19G0164-01) SurfaceWater Sampled: 07/02/19 08:45 Received: 07/02/19 14:10									
Fecal Coliforms	**26**	1.8	MPN/100 mL	1	1905468	07/02/19 14:30	07/05/19	SM 9221	
E. Coli	**14.2**	1.0	"	"	1905479	07/02/19 14:40	07/03/19	SM9223	
Bac - 14 - BCR (19G0164-02) SurfaceWater Sampled: 07/02/19 10:10 Received: 07/02/19 14:10									
Fecal Coliforms	**21**	1.8	MPN/100 mL	1	1905468	07/02/19 14:30	07/05/19	SM 9221	
E. Coli	<1	1.0	"	"	1905479	07/02/19 14:40	07/03/19	SM9223	
Bac - 11 - JR (19G0164-03) SurfaceWater Sampled: 07/02/19 11:35 Received: 07/02/19 14:10									
Fecal Coliforms	**46**	1.8	MPN/100 mL	1	1905468	07/02/19 14:30	07/05/19	SM 9221	
E. Coli	**21.8**	1.0	"	"	1905479	07/02/19 14:40	07/03/19	SM9223	
Bac - 13 - IHR (19G0164-04) SurfaceWater Sampled: 07/02/19 12:10 Received: 07/02/19 14:10									
Fecal Coliforms	**4.0**	1.8	MPN/100 mL	1	1905468	07/02/19 14:30	07/05/19	SM 9221	
E. Coli	<1	1.0	"	"	1905479	07/02/19 14:40	07/03/19	SM9223	
BAC-12-IHR (19G0164-05) Surface Water Sampled: 07/02/19 12:30 Received: 07/02/19 14:10									
Fecal Coliforms	**13**	1.8	MPN/100 mL	1	1905468	07/02/19 14:30	07/05/19	SM 9221	
E. Coli	<1	1.0	"	"	1905479	07/02/19 14:40	07/03/19	SM9223	

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CALIFORNIA LABORATORY SERVICES
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07/10/19 15:03

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G0164**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CALIFORNIA LABORATORY SERVICES
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July 11, 2019

CLS Work Order #: 19G0286
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 07/03/19 12:47. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 190286 (1 of 1)

Report To:

Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705

Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: EES BRL
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[X] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliform-15 Tube; E coli Quanti-tray

GEOTRACKER
EDF REPORT: YES [X] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E coli Quanti-tray	TURNAROUND TIME IN DAYS: 1	2	3	5	SPECIAL INSTRUCTIONS
7-3-19	0800	Bac-6-GCR		Surface water			6	X	X				X	
7-3-19	0825	Bac-5-GCR		Surface water			6	X	X				X	
7-3-19	0855	Bac-10-UVR		Surface water			6	X	X				X	
7-3-19	1000	Bac-9-UVR		Surface water			6	X	X				X	
7-3-19	1045	Bac-8-UVR		Surface water			6	X	X				X	
7-3-19	1105	Bac-7-UVR		Surface water			6	X	X				X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO_3 (3) = COLD (4) = H_2SO_4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Eric Sommer/Stillwater	7-3-19/1247		

RECEIVED AT LAB BY: DATE/TIME: 7/3/19 1247 CONDITIONS/COMMENTS: 4.3

SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER AIR BILL #

CALIFORNIA LABORATORY SERVICES
Committed. Responsive. Flexible.

 07/11/19 12:18

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G0286**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-6-GCR (19G0286-01) Surface Water	**Sampled: 07/03/19 08:00**	**Received: 07/03/19 12:47**							
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1905524	07/03/19 13:10	07/06/19	SM 9221	
E. Coli	**1.0**	1.0	"	"	1905512	07/03/19 13:15	07/04/19	SM9223	
BAC-5-GCR (19G0286-02) Surface Water	**Sampled: 07/03/19 08:25**	**Received: 07/03/19 12:47**							
Fecal Coliforms	**4.5**	1.8	MPN/100 mL	1	1905524	07/03/19 13:10	07/06/19	SM 9221	
E. Coli	**11.0**	1.0	"	"	1905512	07/03/19 13:15	07/04/19	SM9223	
BAC-10-UVR (19G0286-03) Surface Water	**Sampled: 07/03/19 08:55**	**Received: 07/03/19 12:47**							
Fecal Coliforms	**540**	1.8	MPN/100 mL	1	1905524	07/03/19 13:10	07/06/19	SM 9221	
E. Coli	**193.5**	1.0	"	"	1905512	07/03/19 13:15	07/04/19	SM9223	
BAC-9-UVR (19G0286-04) Surface Water	**Sampled: 07/03/19 10:00**	**Received: 07/03/19 12:47**							
Fecal Coliforms	**23**	1.8	MPN/100 mL	1	1905524	07/03/19 13:10	07/06/19	SM 9221	
E. Coli	**365.4**	1.0	"	"	1905512	07/03/19 13:15	07/04/19	SM9223	
BAC-8-UVR (19G0286-05) Surface Water	**Sampled: 07/03/19 10:45**	**Received: 07/03/19 12:47**							
Fecal Coliforms	**79**	1.8	MPN/100 mL	1	1905524	07/03/19 13:10	07/06/19	SM 9221	
E. Coli	**151.5**	1.0	"	"	1905512	07/03/19 13:15	07/04/19	SM9223	
BAC-7-UVR (19G0286-06) Surface Water	**Sampled: 07/03/19 11:05**	**Received: 07/03/19 12:47**							
Fecal Coliforms	**79**	1.8	MPN/100 mL	1	1905524	07/03/19 13:10	07/06/19	SM 9221	
E. Coli	**66.3**	1.0	"	"	1905512	07/03/19 13:15	07/04/19	SM9223	

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 07/11/19 12:18

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G0286**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4	<1.8
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CALIFORNIA LABORATORY SERVICES
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July 16, 2019

CLS Work Order #: 19G0545
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 07/09/19 14:45. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES
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07/16/19 09:51

Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project: SMUD In situ, Bac-T, & Chemistry Monitoring
Project Number: 750.10 Task 0300.02
Project Manager: Maia Singer

CLS Work Order #: 19G0545
COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-13-1HR (19G0545-01) Surface Water	**Sampled: 07/09/19 09:25**		**Received: 07/09/19 14:45**							
E. Coli	**5.2**	1.0	1.0	MPN/100 mL	1	1905636	07/09/19	07/10/19	SM9223	
Fecal Coliforms	**7.8**	1.8	1.8	"	"	1905632	07/09/19	07/12/19	SM 9221	
BAC-12-1HR (19G0545-02) Surface Water	**Sampled: 07/09/19 09:45**		**Received: 07/09/19 14:45**							
E. Coli	**5.2**	1.0	1.0	MPN/100 mL	1	1905636	07/09/19	07/10/19	SM9223	
Fecal Coliforms	**4.5**	1.8	1.8	"	"	1905632	07/09/19	07/12/19	SM 9221	
BAC-11-JR (19G0545-03) Surface Water	**Sampled: 07/09/19 10:30**		**Received: 07/09/19 14:45**							
E. Coli	**135.4**	1.0	1.0	MPN/100 mL	1	1905636	07/09/19	07/10/19	SM9223	
Fecal Coliforms	**79**	1.8	1.8	"	"	1905632	07/09/19	07/12/19	SM 9221	
BAC-14-BCR (19G0545-04) Surface Water	**Sampled: 07/09/19 12:00**		**Received: 07/09/19 14:45**							
E. Coli	**39.5**	1.0	1.0	MPN/100 mL	1	1905636	07/09/19	07/10/19	SM9223	
Fecal Coliforms	**170**	1.8	1.8	"	"	1905632	07/09/19	07/12/19	SM 9221	
BAC-15-SCR (19G0545-05) Surface Water	**Sampled: 07/09/19 13:05**		**Received: 07/09/19 14:45**							
E. Coli	**4.1**	1.0	1.0	MPN/100 mL	1	1905636	07/09/19	07/10/19	SM9223	
Fecal Coliforms	**13**	1.8	1.8	"	"	1905632	07/09/19	07/12/19	SM 9221	

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CALIFORNIA LABORATORY SERVICES
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07/16/19 09:51

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G0545**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

This is a "MDL Report", thus if the report denotes an "ND" for a particular analyte, it should be noted that the analyte was not detected at or above the MDL.

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CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 1960545 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: Emily Applegate
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

GEOTRACKER
EDF REPORT: YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	ANALYSIS REQUESTED: Fecal coliform-15 Tube	E coli Quanti-tray	TURNAROUND TIME IN DAYS: 1	2	3	5	SPECIAL INSTRUCTIONS
7/9/19	0925	Bac-13-1HR		Surface water			6	X	X				X	
7/9/19	0945	Bac-12-1HR		Surface water			6	X	X				X	
7/9/19	1030	Bac-11-JR		Surface water			6	X	X				X	
7/9/19	1200	Bac-14-BCR		Surface water			6	X	X				X	
7/9/19	1305	Bac-15-SCR		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS SAMPLE RETENTION TIME PRESERVATIVES (1) HCL (2) HNO3 (3) = COLD (4)= H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Applegate / Stillwater	7/9/19/1445		

RECEIVED AT LAB BY: DATE/TIME: 7-9-19 1445 CONDITIONS/COMMENTS: 1.6

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CALIFORNIA LABORATORY SERVICES
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July 17, 2019

CLS Work Order #: 19G0621
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 07/10/19 15:05. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

Page 1 of 4

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 1760621 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: Emily Applequist, Pat Keanse
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[X] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED
PRESERVATIVES: 6
Fecal coliform-LS Tube
E. coli Quanti-tray

GEOTRACKER
EDF REPORT: YES [X] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	Fecal coliform-LS Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
7/10/19	1015	Bac-7-UVR		Surface water			X	X				X	
7/10/19	1045	Bac-8-UVR		Surface water			X	X				X	
7/10/19	1100	Bac-10-UVR		Surface water			X	X				X	
7/10/19	1230	Bac-6-GCR		Surface water			X	X				X	
7/10/19	1250	Bac-5-GCR		Surface water			X	X				X	
7/10/19	1145	Bac-9-UVR		Surface water			X	X				X	
				Surface water								X	INVOICE TO:
				Surface water								X	Stillwater Sciences
				Surface water								X	Same as above
				Surface water								X	
				Surface water								X	Project No. 750.10 Task 0300.02
				Surface water								X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO3 (3) = COLD (4) = H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Applequist / Stillwater Sciences	7/10/19 1505		

RECEIVED AT LAB BY: DATE/TIME: 7/10/19 CONDITIONS/COMMENTS: 1.2

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Page 2 of 4

CALIFORNIA LABORATORY SERVICES
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 07/17/19 16:22

Stillwater Sciences	Project:	SMUD In situ, Bac-T, & Chemistry Monitoring
2855 Telegraph Ave., Suite 400	Project Number:	750.10 Task 0300.02 **CLS Work Order #: 19G0621**
Berkeley, CA 94705	Project Manager:	Maia Singer COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-7-UVR (19G0621-01) Surface Water	**Sampled: 07/10/19 10:15**	**Received: 07/10/19 15:05**							
E. Coli	**184.2**	1.0	MPN/100 mL	1	1905687	07/10/19	07/11/19	SM9223	
Fecal Coliforms	**17**	1.8	"	"	1905681	07/10/19	07/13/19	SM 9221	
BAC-8-UVR (19G0621-02) Surface Water	**Sampled: 07/10/19 10:45**	**Received: 07/10/19 15:05**							
E. Coli	**4.1**	1.0	MPN/100 mL	1	1905687	07/10/19	07/11/19	SM9223	
Fecal Coliforms	**4.5**	1.8	"	"	1905681	07/10/19	07/13/19	SM 9221	
BAC-10-UVR (19G0621-03) Surface Water	**Sampled: 07/10/19 11:00**	**Received: 07/10/19 15:05**							
E. Coli	<1	1.0	MPN/100 mL	1	1905687	07/10/19	07/11/19	SM9223	
Fecal Coliforms	<1.8	1.8	"	"	1905681	07/10/19	07/13/19	SM 9221	
BAC-6-GCR (19G0621-04) Surface Water	**Sampled: 07/10/19 12:30**	**Received: 07/10/19 15:05**							
E. Coli	**2.0**	1.0	MPN/100 mL	1	1905687	07/10/19	07/11/19	SM9223	
Fecal Coliforms	<1.8	1.8	"	"	1905681	07/10/19	07/13/19	SM 9221	
BAC-5-GCR (19G0621-05) Surface Water	**Sampled: 07/10/19 12:50**	**Received: 07/10/19 15:05**							
E. Coli	**8.6**	1.0	MPN/100 mL	1	1905687	07/10/19	07/11/19	SM9223	
Fecal Coliforms	**23**	1.8	"	"	1905681	07/10/19	07/13/19	SM 9221	
BAC-9-UVR (19G0621-06) Surface Water	**Sampled: 07/10/19 11:45**	**Received: 07/10/19 15:05**							
E. Coli	**3.0**	1.0	MPN/100 mL	1	1905687	07/10/19	07/11/19	SM9223	
Fecal Coliforms	**2.0**	1.8	"	"	1905681	07/10/19	07/13/19	SM 9221	

CALIFORNIA LABORATORY SERVICES
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 07/17/19 16:22

Stillwater Sciences	Project:	SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number:	750.10 Task 0300.02	**CLS Work Order #: 19G0621**
Berkeley, CA 94705	Project Manager:	Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CALIFORNIA LABORATORY SERVICES
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July 23, 2019

CLS Work Order #: 19G0948
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 07/16/19 14:25. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES
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07/23/19 14:27

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G0948**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-15-5CR (19G0948-01) Surface Water	**Sampled: 07/16/19 08:45**		**Received: 07/16/19 14:25**							
E. Coli	**69.7**	1.0	1.0	MPN/100 mL	1	1905864	07/16/19	07/17/19	SM9223	
Fecal Coliforms	**540**	1.8	1.8	"	"	1905856	"	07/19/19	SM 9221	
BAC-14-BCR (19G0948-02) Surface Water	**Sampled: 07/16/19 10:05**		**Received: 07/16/19 14:25**							
E. Coli	<1	1.0	1.0	MPN/100 mL	1	1905864	07/16/19	07/17/19	SM9223	
Fecal Coliforms	**2.0**	1.8	1.8	"	"	1905856	"	07/19/19	SM 9221	
BAC-11-JR (19G0948-03) Surface Water	**Sampled: 07/16/19 11:30**		**Received: 07/16/19 14:25**							
E. Coli	**121.0**	1.0	1.0	MPN/100 mL	1	1905864	07/16/19	07/17/19	SM9223	
Fecal Coliforms	**>1600**	1.8	1.8	"	"	1905856	"	07/19/19	SM 9221	
BAC-13-1HR (19G0948-04) Surface Water	**Sampled: 07/16/19 12:05**		**Received: 07/16/19 14:25**							
E. Coli	**2.0**	1.0	1.0	MPN/100 mL	1	1905864	07/16/19	07/17/19	SM9223	
Fecal Coliforms	<1.8	1.8	1.8	"	"	1905856	"	07/19/19	SM 9221	
BAC-12-1HR (19G0948-05) Surface Water	**Sampled: 07/16/19 12:25**		**Received: 07/16/19 14:25**							
E. Coli	<1	1.0	1.0	MPN/100 mL	1	1905864	07/16/19	07/17/19	SM9223	
Fecal Coliforms	**2.0**	1.8	1.8	"	"	1905856	"	07/19/19	SM 9221	

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CALIFORNIA LABORATORY SERVICES
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07/23/19 14:27

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G0948**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-5	>1600
BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

This is a "MDL Report", thus if the report denotes an "ND" for a particular analyte, it should be noted that the analyte was not detected at or above the MDL.

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CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 196098 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: Emily Pipkgaist, David Rosen
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

GEOTRACKER
EDF REPORT: YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	ANALYSIS REQUESTED: Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS: 1	2	3	5	SPECIAL INSTRUCTIONS
7/16/19	0845	Bac-15-SCR		Surface water			6	X	X				X	
7/16/19	1005	Bac-14-BCR		Surface water			6	X	X				X	
7/16/19	1130	Bac-11-JR		Surface water			6	X	X				X	
7/16/19	1205	Bac-13-1HR		Surface water			6	X	X				X	
7/16/19	1225	Bac-12-1HR		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO_3 (3) = COLD (4) = H_2SO_4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Pipkgaist / Stillwater	7/16/19 1425		

RECEIVED AT LAB BY: DATE/TIME: 7-16-19 1425 CONDITIONS/COMMENTS: 2.0

SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER _____ AIR BILL# _____

CALIFORNIA LABORATORY SERVICES
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July 24, 2019

CLS Work Order #: 19G1103
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 07/17/19 15:00. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES
Committed. Responsive. Flexible.

07/24/19 15:10

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G1103**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-7-UVR (19G1103-01) Surface Water	**Sampled: 07/17/19 09:15**		**Received: 07/17/19 15:00**							
E. Coli	**60.5**	1.0	1.0	MPN/100 mL	1	1905916	07/17/19	07/18/19	SM9223	
Fecal Coliforms	**11**	1.8	1.8	"	"	1905912	07/17/19	07/20/19	SM 9221	
BAC-8-UVR (19G1103-02) Surface Water	**Sampled: 07/17/19 09:40**		**Received: 07/17/19 15:00**							
E. Coli	**42.0**	1.0	1.0	MPN/100 mL	1	1905916	07/17/19	07/18/19	SM9223	
Fecal Coliforms	**22**	1.8	1.8	"	"	1905912	07/17/19	07/20/19	SM 9221	
BAC-10-UVR (19G1103-03) Surface Water	**Sampled: 07/17/19 10:00**		**Received: 07/17/19 15:00**							
E. Coli	**5.2**	1.0	1.0	MPN/100 mL	1	1905916	07/17/19	07/18/19	SM9223	
Fecal Coliforms	**7.8**	1.8	1.8	"	"	1905912	07/17/19	07/20/19	SM 9221	
BAC-9-UVR (19G1103-04) Surface Water	**Sampled: 07/17/19 12:50**		**Received: 07/17/19 15:00**							
E. Coli	**46.4**	1.0	1.0	MPN/100 mL	1	1905916	07/17/19	07/18/19	SM9223	
Fecal Coliforms	**17**	1.8	1.8	"	"	1905912	07/17/19	07/20/19	SM 9221	
BAC-6-GCR (19G1103-05) Surface Water	**Sampled: 07/17/19 11:05**		**Received: 07/17/19 15:00**							
E. Coli	**1.0**	1.0	1.0	MPN/100 mL	1	1905916	07/17/19	07/18/19	SM9223	
Fecal Coliforms	<1.8	1.8	1.8	"	"	1905912	07/17/19	07/20/19	SM 9221	
BAC-5-GCR (19G1103-06) Surface Water	**Sampled: 07/17/19 11:30**		**Received: 07/17/19 15:00**							
E. Coli	<1	1.0	1.0	MPN/100 mL	1	1905916	07/17/19	07/18/19	SM9223	
Fecal Coliforms	<1.8	1.8	1.8	"	"	1905912	07/17/19	07/20/19	SM 9221	

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CALIFORNIA LABORATORY SERVICES
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07/24/19 15:10

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19G1103**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

This is a "MDL Report", thus if the report denotes an "ND" for a particular analyte, it should be noted that the analyte was not detected at or above the MDL.

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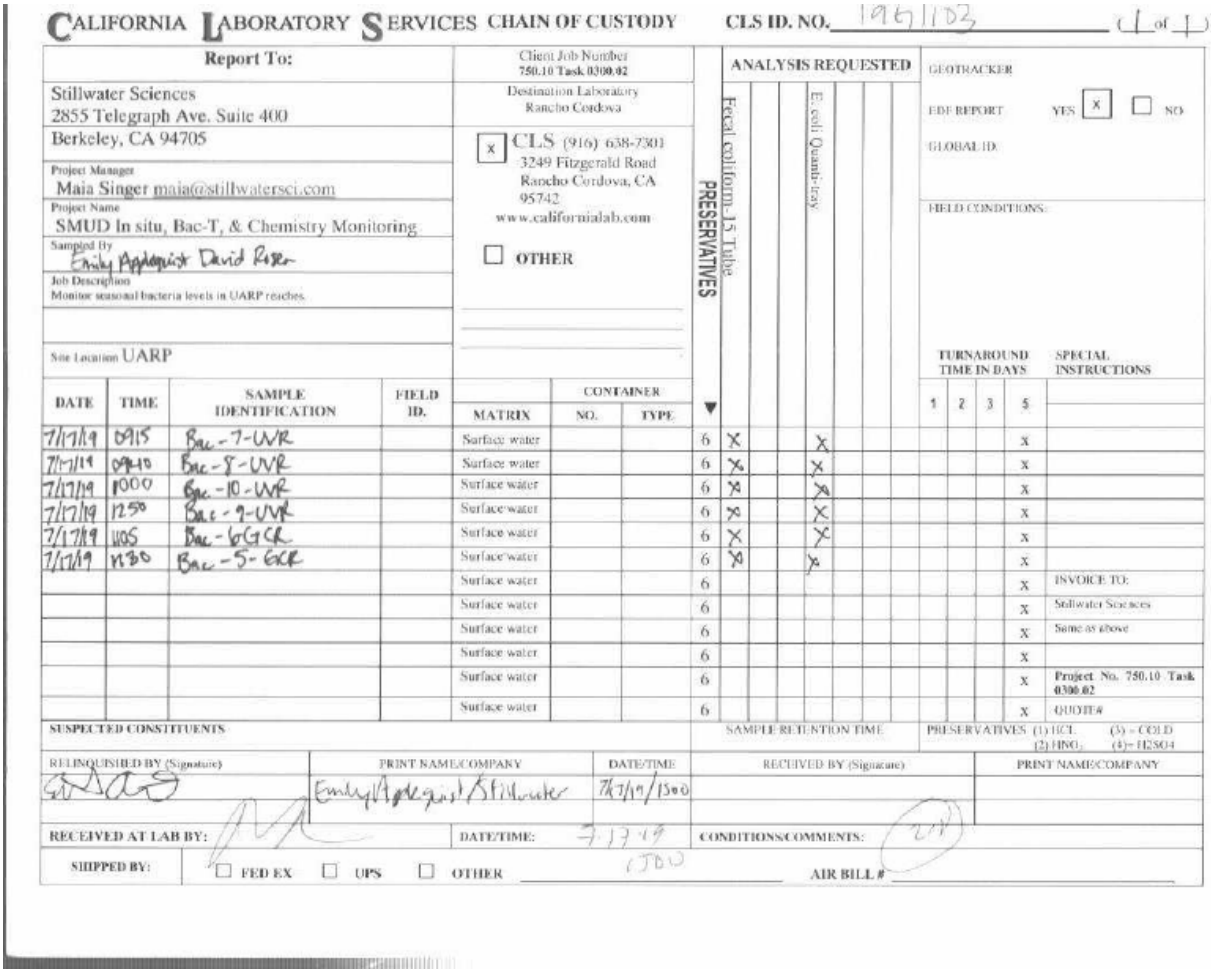

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY

CLS ID. NO. 196102 (1 of 1)

Report To:

Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705

Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: Emily Applegate David Rose
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliform-15 Tube; E. coli Quanti-tray

PRESERVATIVES

GEOTRACKER
EDF REPORT: YES [X] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
7/17/19	0915	Bac-7-UVR		Surface water			6	X	X				X	
7/17/19	0940	Bac-8-UVR		Surface water			6	X	X				X	
7/17/19	1000	Bac-10-UVR		Surface water			6	X	X				X	
7/17/19	1250	Bac-9-UVR		Surface water			6	X	X				X	
7/17/19	1105	Bac-6GCR		Surface water			6	X	X				X	
7/17/19	1130	Bac-5-GCR		Surface water			6	X	X				X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS

SAMPLE RETENTION TIME

PRESERVATIVES (1) HCL (3) = COLD (2) HNO3 (4) = H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Applegate/Stillwater	7/17/19/1300		

RECEIVED AT LAB BY: DATE/TIME: 7.17.19 CONDITIONS/COMMENTS:

SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER AIR BILL #

CALIFORNIA LABORATORY SERVICES
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August 29, 2019

CLS Work Order #: 19H1382
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 08/22/19 16:55. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES
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 08/29/19 14:37

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19H1382**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bac-1-BI (19H1382-01) Water Sampled: 08/22/19 11:25 Received: 08/22/19 16:55									
Fecal Coliforms	**2.0**	1.8	MPN/100 mL	1	1907023	08/22/19 17:00	08/25/19	SM 9221	
E. Coli	**3.1**	1.0	"	"	1907028	"	08/23/19	SM9223	
Bac-2-BI (19H1382-02) Water Sampled: 08/22/19 11:55 Received: 08/22/19 16:55									
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1907023	08/22/19 17:00	08/25/19	SM 9221	
E. Coli	**2.0**	1.0	"	"	1907028	"	08/23/19	SM9223	
Bac-3-LL (19H1382-03) Water Sampled: 08/22/19 14:50 Received: 08/22/19 16:55									
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1907023	08/22/19 17:00	08/25/19	SM 9221	
E. Coli	<1	1.0	"	"	1907028	"	08/23/19	SM9223	
Bac-4-LL (19H1382-04) Water Sampled: 08/22/19 14:28 Received: 08/22/19 16:55									
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1907023	08/22/19 17:00	08/25/19	SM 9221	
E. Coli	<1	1.0	"	"	1907028	"	08/23/19	SM9223	

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CALIFORNIA LABORATORY SERVICES
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08/29/19 14:37

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 19H1382**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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CALIFORNIA LABORATORY SERVICES
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September 06, 2019

CLS Work Order #: 19H1729
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 08/29/19 15:47. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 19H1729 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: EES, EHA, DLB
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED
PRESERVATIVES ▼
Fecal coliform-15 Tube
E. coli Quantitray

GEOTRACKER
EDF REPORT: YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES ▼	Fecal coliform-15 Tube	E. coli Quantitray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
8/29/19	1025	Bac-1-BI		Surface water			6	X	X				X	
8/29/19	1050	Bac-2-BI		Surface water			6	X	X				X	
8/29/19	1530	Bac-4-LL		Surface water			6	X	X				X	
8/29/19	1345	Bac-3-LL		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO_3 (3) = COLD (4) = H_2SO_4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Applegate/Stillwater	8/29/19/1547		

RECEIVED AT LAB BY: DATE/TIME: 8/29/19 1947
CONDITIONS/COMMENTS: 2.1°
SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER AIR BILL #

Page 2 of 4

CALIFORNIA LABORATORY SERVICES
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09/06/19 12:50

Stillwater Sciences	Project:	SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number:	750.10 Task 0300.02	**CLS Work Order #: 19H1729**
Berkeley, CA 94705	Project Manager:	Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bac-1-BI (19H1729-01) Water Sampled: 08/29/19 10:25 Received: 08/29/19 15:47									
E. Coli	**1.0**	1.0	MPN/100 mL	1	1907246	08/29/19	08/30/19	SM9223	
Fecal Coliforms	<1.8	1.8	"	"	1907245	"	09/01/19	SM 9221	
Bac-2-BI (19H1729-02) Water Sampled: 08/29/19 10:50 Received: 08/29/19 15:47									
E. Coli	<1	1.0	MPN/100 mL	1	1907246	08/29/19	08/30/19	SM9223	
Fecal Coliforms	**2.0**	1.8	"	"	1907245	"	09/01/19	SM 9221	
Bac-4-LL (19H1729-03) Water Sampled: 08/29/19 13:30 Received: 08/29/19 15:47									
E. Coli	<1	1.0	MPN/100 mL	1	1907246	08/29/19	08/30/19	SM9223	
Fecal Coliforms	<1.8	1.8	"	"	1907245	"	09/01/19	SM 9221	
Bac-3-LL (19H1729-04) Water Sampled: 08/29/19 13:45 Received: 08/29/19 15:47									
E. Coli	<1	1.0	MPN/100 mL	1	1907246	08/29/19	08/30/19	SM9223	
Fecal Coliforms	<1.8	1.8	"	"	1907245	"	09/01/19	SM 9221	

CALIFORNIA LABORATORY SERVICES
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Stillwater Sciences	Project:	SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number:	750.10 Task 0300.02	**CLS Work Order #: 19H1729**
Berkeley, CA 94705	Project Manager:	Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CALIFORNIA LABORATORY SERVICES
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September 12, 2019

CLS Work Order #: 19I0281
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 09/05/19 15:58. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 19I0291 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: EHA, EMB
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliform-15 Tube; E. coli Quanti-tray
PRESERVATIVES

GEOTRACKER
EDF REPORT: YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
9/5/19	1000	Bac-1-BIR		Surface water			6	X	X				X	
9/5/19	1030	Bac-2-BIR		Surface water			6	X	X				X	
9/5/19	1310	Bac-4-LLR		Surface water			6	X	X				X	
9/5/19	1335	Bac-3-LLR		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO3 (3) = COLD (4) = H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Applegate			
RECEIVED AT LAB BY:		DATE/TIME: 9/5/19 1558	CONDITIONS/COMMENTS: 1.4/1.6	
SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER		9/5/19 1550	AIR BILL #	

CALIFORNIA LABORATORY SERVICES
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 09/12/19 16:24

Stillwater Sciences	Project:	SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number:	750.10 Task 0300.02	**CLS Work Order #: 19I0281**
Berkeley, CA 94705	Project Manager:	Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
BAC-1-BIR (19I0281-01) Surface Water	**Sampled: 09/05/19 10:00**		**Received: 09/05/19 15:58**						
E. Coli	**2.0**	1.0	MPN/100 mL	1	1907468	09/05/19	09/06/19	SM9223	
Fecal Coliforms	**2.0**	1.8	"	"	1907464	09/05/19	09/08/19	SM 9221	
BAC-2-BIR (19I0281-02) Surface Water	**Sampled: 09/05/19 10:30**		**Received: 09/05/19 15:58**						
E. Coli	**1.0**	1.0	MPN/100 mL	1	1907468	09/05/19	09/06/19	SM9223	
Fecal Coliforms	**2.0**	1.8	"	"	1907464	09/05/19	09/08/19	SM 9221	
BAC-4-LLR (19I0281-03) Surface Water	**Sampled: 09/05/19 13:10**		**Received: 09/05/19 15:58**						
E. Coli	**1.0**	1.0	MPN/100 mL	1	1907468	09/05/19	09/06/19	SM9223	
Fecal Coliforms	**2.0**	1.8	"	"	1907464	09/05/19	09/08/19	SM 9221	
BAC-3-LLR (19I0281-04) Surface Water	**Sampled: 09/05/19 13:35**		**Received: 09/05/19 15:58**						
E. Coli	<1	1.0	MPN/100 mL	1	1907468	09/05/19	09/06/19	SM9223	
Fecal Coliforms	**3.7**	1.8	"	"	1907464	09/05/19	09/08/19	SM 9221	

CALIFORNIA LABORATORY SERVICES
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09/12/19 16:24

Stillwater Sciences	Project:	SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number:	750.10 Task 0300.02	**CLS Work Order #: 1910281**
Berkeley, CA 94705	Project Manager:	Maia Singer	COC #:

Notes and Definitions

BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

CALIFORNIA LABORATORY SERVICES
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September 19, 2019

CLS Work Order #: 1910726
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 09/12/19 15:55. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES
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09/19/19 13:49

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 TAsk 0300.02	**CLS Work Order #: 1910726**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bac-1-BIR (1910726-01) Water	**Sampled: 09/12/19 09:55**		**Received: 09/12/19 15:55**							
E. Coli	**1.0**	1.0	1.0	MPN/100 mL	1	1907692	09/12/19	09/13/19	SM9223	
Fecal Coliforms	**4.0**	1.8	1.8	"	"	1907678	"	09/15/19	SM 9221	
Bac-2-BIR (1910726-02) Water	**Sampled: 09/12/19 10:25**		**Received: 09/12/19 15:55**							
E. Coli	<1	1.0	1.0	MPN/100 mL	1	1907692	09/12/19	09/13/19	SM9223	
Fecal Coliforms	<1.8	1.8	1.8	"	"	1907678	"	09/15/19	SM 9221	
Bac-4-LLR (1910726-03) Water	**Sampled: 09/12/19 13:15**		**Received: 09/12/19 15:55**							
E. Coli	<1	1.0	1.0	MPN/100 mL	1	1907692	09/12/19	09/13/19	SM9223	
Fecal Coliforms	<1.8	1.8	1.8	"	"	1907678	"	09/15/19	SM 9221	
Bac-3-LLR (1910726-04) Water	**Sampled: 09/12/19 13:30**		**Received: 09/12/19 15:55**							
E. Coli	<1	1.0	1.0	MPN/100 mL	1	1907692	09/12/19	09/13/19	SM9223	
Fecal Coliforms	<1.8	1.8	1.8	"	"	1907678	"	09/15/19	SM 9221	

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Small Business #2916 | ELAP #1233 | NAICS #541380 | CA SWRCB ELAP Accreditation/Registration Number 1233

CALIFORNIA LABORATORY SERVICES
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09/19/19 13:49

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 TAsk 0300.02	**CLS Work Order #: 1910726**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

This is a "MDL Report", thus if the report denotes an "ND" for a particular analyte, it should be noted that the analyte was not detected at or above the MDL.

3249 Fitzgerald Road, Rancho Cordova, CA 95742 | 800.638.7301 | Tel: 916.638.7301 x102 | Fax: 916.638.4510 | www.californialab.com
Small Business #2916 | ELAP #1233 | NAICS #541380 | CA SWRCB ELAP Accreditation/Registration Number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 195 0726 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer maia@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: EHA, AMS
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[x] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED
PRESERVATIVES: 6

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	Fecal coliform-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5
9/12/19	0955	Bac-1-BIR		Surface water			X	X				X
9/12/19	1025	Bac-2-BIR		Surface water			X	X				X
9/12/19	1315	Bac-4-LLR		Surface water			X	X				X
9/12/19	1330	BAC-3-LLR		Surface water			X	X				X
				Surface water								X
				Surface water								X
				Surface water								X
				Surface water								X
				Surface water								X
				Surface water								X
				Surface water								X
				Surface water								X

GEOTRACKER
EDF REPORT: YES [x] NO [ ]
GLOBAL ID:
FIELD CONDITIONS:
SPECIAL INSTRUCTIONS
INVOICE TO: Stillwater Sciences
Same as above
Project No. 750.10 Task 0300.02
QUOTE #

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO3 (3) = COLD (4) = H2SO4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Applequist / Stillwater	9/12/19 1551		

RECEIVED AT LAB BY: DATE/TIME: 9/12/19
CONDITIONS/COMMENTS: 1555 2.7/2.7
SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER AIR BILL #

CALIFORNIA LABORATORY SERVICES
Committed. Responsive. Flexible.

September 26, 2019

CLS Work Order #: 1911110
COC #:

Maia Singer
Stillwater Sciences
2855 Telegraph Ave., Suite 400
Berkeley, CA 94705

Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 09/19/19 15:35. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that the results are in compliance both technically and for completeness. Any comments and exceptions are addressed under the Notes and Definitions section.

Analytical results are attached to this letter. Please call if we can provide additional assistance.

Sincerely,

James Liang, Ph.D.
Laboratory Director

CA SWRCB ELAP Accreditation/Registration number 1233

CALIFORNIA LABORATORY SERVICES CHAIN OF CUSTODY CLS ID. NO. 191110 (1 of 1)

Report To:
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705
Project Manager: Maia Singer main@stillwatersci.com
Project Name: SMUD In situ, Bac-T, & Chemistry Monitoring
Sampled By: EHA, BRL
Job Description: Monitor seasonal bacteria levels in UARP reaches.
Site Location: UARP

Client Job Number: 750.10 Task 0300.02
Destination Laboratory: Rancho Cordova
[X] CLS (916) 638-7301, 3249 Fitzgerald Road, Rancho Cordova, CA 95742, www.californialab.com
[ ] OTHER

ANALYSIS REQUESTED: Fecal coliforms-15 Tube; E. coli Quanti-tray
PRESERVATIVES

GEOTRACKER
EDF REPORT: YES [X] NO [ ]
GLOBAL ID.
FIELD CONDITIONS:

DATE	TIME	SAMPLE IDENTIFICATION	FIELD ID.	MATRIX	CONTAINER NO.	CONTAINER TYPE	PRESERVATIVES ▼	Fecal coliforms-15 Tube	E. coli Quanti-tray	TURNAROUND TIME IN DAYS 1	2	3	5	SPECIAL INSTRUCTIONS
9/19/19	0950	Bac-1-B1R		Surface water			6	X	X				X	
9/19/19	1010	Bac-2-B1R		Surface water			6	X	X				X	
9/19/19	1245	Bac-4-LLR		Surface water			6	X	X				X	
9/19/19	1305	Bac-3-LLR		Surface water			6	X	X				X	
				Surface water			6						X	
				Surface water			6						X	
				Surface water			6						X	INVOICE TO:
				Surface water			6						X	Stillwater Sciences
				Surface water			6						X	Same as above
				Surface water			6						X	
				Surface water			6						X	Project No. 750.10 Task 0300.02
				Surface water			6						X	QUOTE#

SUSPECTED CONSTITUENTS
SAMPLE RETENTION TIME
PRESERVATIVES (1) HCL (2) HNO3 (3) = COLD (4)= 1125C4

RELINQUISHED BY (Signature)	PRINT NAME/COMPANY	DATE/TIME	RECEIVED BY (Signature)	PRINT NAME/COMPANY
	Emily Hylkema / Stillwater	9/19/19 1535		

RECEIVED AT LAB BY: DATE/TIME: 9.19.19 1575 CONDITIONS/COMMENTS: 2.6/2.4

SHIPPED BY: [ ] FED EX [ ] UPS [ ] OTHER _____ AIR BILL # _____

CALIFORNIA LABORATORY SERVICES
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 09/26/19 14:44

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 1911110**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Microbiological Parameters by APHA Standard Methods

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bac-1-BIR (1911110-01) Water Sampled: 09/19/19 09:50 Received: 09/19/19 15:35									
Fecal Coliforms	**4.5**	1.8	MPN/100 mL	1	1907923	09/19/19 15:45	09/22/19	SM 9221	
E. Coli	**1.0**	1.0	"	"	1907911	09/19/19 16:30	09/20/19	SM9223	
Bac-2-BIR (1911110-02) Water Sampled: 09/19/19 10:10 Received: 09/19/19 15:35									
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1907923	09/19/19 15:45	09/22/19	SM 9221	
E. Coli	**1.0**	1.0	"	"	1907911	09/19/19 16:30	09/20/19	SM9223	
Bac-4-LLR (1911110-03) Water Sampled: 09/19/19 12:45 Received: 09/19/19 15:35									
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1907923	09/19/19 15:45	09/22/19	SM 9221	
E. Coli	<1	1.0	"	"	1907911	09/19/19 16:30	09/20/19	SM9223	
Bac-3-LLR (1911110-04) Water Sampled: 09/19/19 13:05 Received: 09/19/19 15:35									
Fecal Coliforms	<1.8	1.8	MPN/100 mL	1	1907923	09/19/19 15:45	09/22/19	SM 9221	
E. Coli	<1	1.0	"	"	1907911	09/19/19 16:30	09/20/19	SM9223	

3249 Fitzgerald Road, Rancho Cordova, CA 95742 | 800.638.7301 | Tel: 916.638.7301 x102 | Fax: 916.638.4510 | www.californialab.com
Small Business #2916 | ELAP #1233 | NAICS #541380 | CA SWRCB ELAP Accreditation/Registration Number 1233

CALIFORNIA LABORATORY SERVICES
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 09/26/19 14:44

Stillwater Sciences	Project: SMUD In situ, Bac-T, & Chemistry Monitoring	
2855 Telegraph Ave., Suite 400	Project Number: 750.10 Task 0300.02	**CLS Work Order #: 1911110**
Berkeley, CA 94705	Project Manager: Maia Singer	COC #:

Notes and Definitions

BT-4a	<1.8
BT-4	<1
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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