DRAFT
WATER RESOURCES TECHNICAL REPORT

WEBER HYDROELECTRIC PROJECT RELICENSING
FERC PROJECT NO. 1744

Prepared for

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1. INTRODUCTION

PacifiCorp owns and operates the Weber Hydroelectric Project (Project)—Federal Energy Regulatory Commission (FERC or Commission) Project No. 1744—on the Weber River in Weber, Morgan, and Davis Counties, Utah, and plans to file a new application to relicense a major project. The current license will expire on May 31, 2020. Accordingly, PacifiCorp is seeking a new FERC license through a formal relicensing process. The Project has a generation capacity of 3.85 megawatts and is located partially on federal lands managed by the Wasatch-Cache National Forest, and partially on lands owned by the Union Pacific Railroad Company. PacifiCorp filed a Notice of Intent to File Application for New License and a Pre-Application Document (PAD) (PacifiCorp 2015) to initiate the FERC Alternative Licensing Process for the Project on May 29, 2015.

During preparation of the PAD, PacifiCorp conducted a desktop-level assessment to evaluate existing water resources data for the Weber River and to inform analysis of potential Project effects on water resources. One finding from the desktop-level assessment is that recent, comprehensive water quality data (within the last 10 years) for the portion of the Weber River in question (i.e., the Weber River-3 Assessment Unit [AU]) are lacking. This lack of data prohibits a rigorous assessment of potential Project impacts to this resource from Project operations without obtaining additional water quality data. The importance of such data is evident given that the Weber River is a highly valued and heavily used resource in Utah, with several stakeholder groups deeply vested for a variety of reasons that include agriculture, municipal water supply, recreation, and fishing.

For the purposes of this document, the FERC Project Boundary (or Project Boundary) is defined as all lands and waters within the existing FERC Project Boundary for the Weber Hydroelectric Project No. 1744, as denoted on the Project's Exhibit G. The Project Area is the area that contains all Project features (encompassing the FERC Project Boundary defined above) and extends out for the purposes of characterization and analysis from the farthest edge of the Project Boundary across the river to the far riverbank (including the river regardless of which side of the river the Project features are found), as shown in Figure 1.

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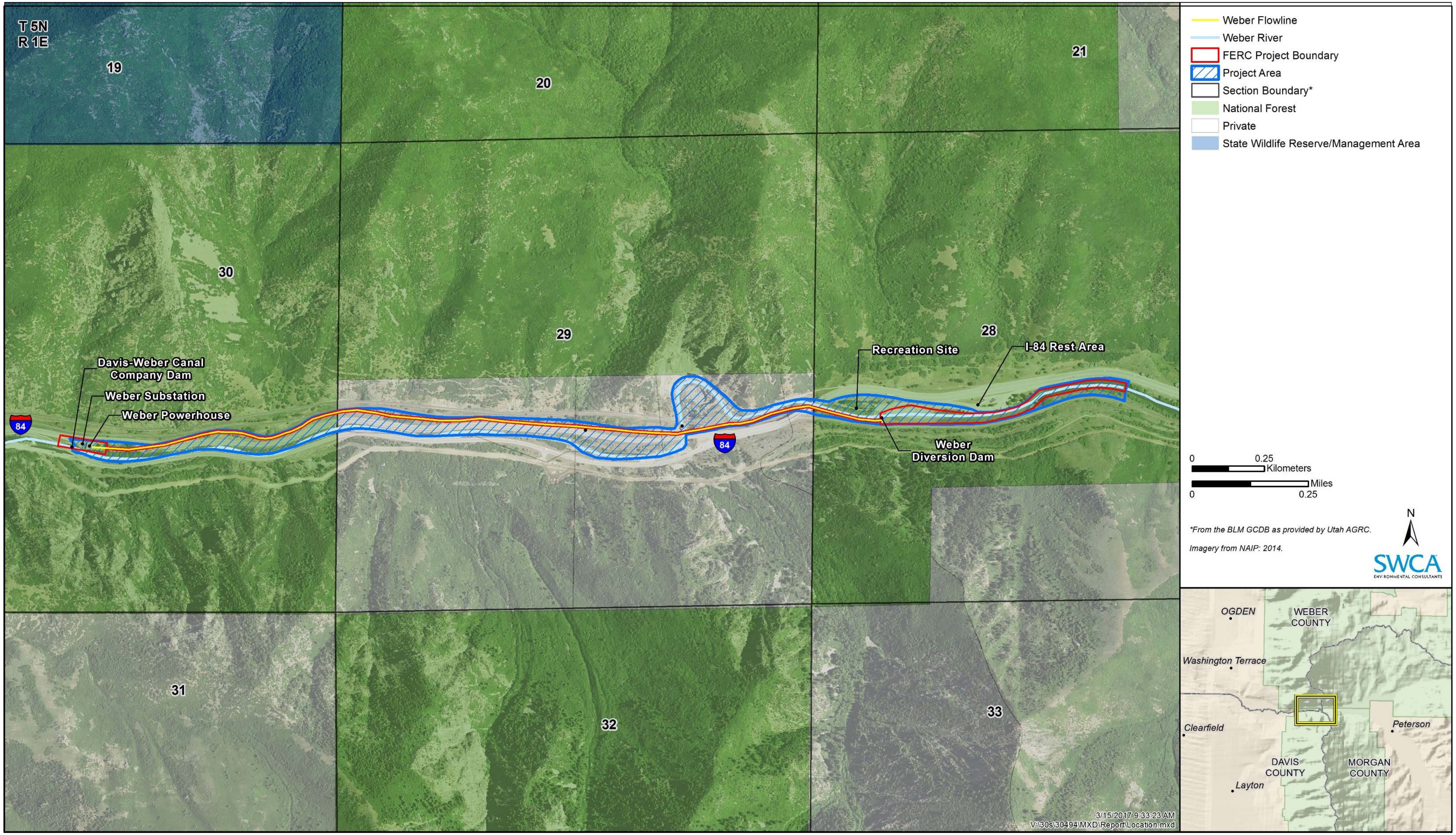

Figure 1. Project Area.

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2. PURPOSE

After assessing the results of the PAD, PacifiCorp developed the *Final Study Plan Water Resources* (Final Study Plan) (PacifiCorp 2016). The Final Study Plan has two components: 1) an analysis of hydrology, including information regarding the flow regime in the Project Area, and 2) a proposed water quality study plan. This water resources technical report for the Weber Project is a report of the water quality study plan, because that was the only portion of the approved Final Study Plan that specified new Project Area studies (rather than analysis of existing information).

The water quality study plan was developed to achieve two goals: 1) to gain a better understanding of current water quality in the Project Area, and 2) to determine the effect of Project operation on water quality and to address the specific Clean Water Act Section 401 water quality certification standards to ensure that the federally permitted or licensed activities are conducted in a manner that complies with applicable discharge and water quality requirements to maintain the chemical, physical, and biological integrity of waters of the United States within the state. As stated in the water quality study plan, the applicable discharge and water quality requirements are based on the beneficial uses and associated Utah water quality standards assigned by the Utah Department of Environmental Quality (UDEQ) Division of Water Quality to the portion of the Weber River within the Project Area (PacifiCorp 2016).

3. PROCEDURES AND METHODS

This section describes the procedure used to determine the water quality sampling locations, the water quality parameters selected for analysis, the methods used to collect water quality data and samples, the procedures and methods used to analyze the samples, and the methods used to evaluate the results.

3.1. Sampling Locations

In the water quality study plan, PacifiCorp selected three preliminary locations to monitor water quality: 1) upstream of the Weber diversion dam in the eastern portion of the Project Area, 2) downstream of the Weber diversion dam in the bypass reach, and 3) the lower end of the bypass reach just downstream of the point where bypass water mixes with powerhouse discharge and just upstream of the point where it enters the Davis-Weber Canal. A fourth site was considered immediately upstream of the Weber diversion dam for chlorophyll *a* analysis only.

The precise monitoring locations were selected during a site visit on January 19, 2016. All stakeholders were invited to participate. SWCA Environmental Consultants, PacifiCorp, and UDEQ Division of Water Quality staff attended the site visit. The final four locations (WR01, WR02, WR03, and WR04) were selected to ensure that water quality instrumentation was appropriately placed for the spectrum of annual flow variability, and to ensure that the entire stream channel was represented to the greatest extent possible. WR02 was chosen because there is a septic leach field system located immediately upstream of the Project Area at the Utah Department of Transportation rest area, and this leach field has the potential for resultant confounding effects. During the site visit, it was determined that because of safety and access issues associated with the Davis-Weber Canal Company dam as well as the potential for confounding effects associated with the Davis-Weber Canal Company dam, WR04 could not be placed downstream of the point where bypass water mixes with powerhouse discharge. The final location for WR04, technically inside and underneath PacifiCorp's Weber powerhouse, was selected instead. At this location, water that has been diverted through PacifiCorp's flowline and powerhouse to generate power is released from the flowline pipe into a chamber that is partially isolated from the river by a low wall, over which the water is discharged back into the river. Additional information regarding the final selected sampling site locations are summarized and described in Table 1 and shown in Figure 2.

Table 1. Sampling Site Locations and Descriptions

Sampling Site	Sampling Site Location Description
WR01	At U.S. Geological Survey station 10136500, Weber River, Gateway, Utah
WR02	Upstream of the Weber diversion dam
WR03	Downstream of the Weber diversion dam, in the bypassed reach of the river, approximately 100 meters upstream of PacifiCorp's Weber powerhouse
WR04	Within PacifiCorp's Weber powerhouse outflow, upstream of the Davis-Weber Canal Company dam

3.2. Water Quality Parameters

The water quality monitoring parameters defined in the water quality study plan and evaluated in this report are temperature, pH, specific conductivity, dissolved oxygen (DO), turbidity, and total suspended solids (TSS). Some of these water quality parameters have numeric water quality criteria for the beneficial uses designated by the State of Utah for the Weber River-3 AU[1]. Comparison of the water quality results collected for these parameters to Utah's numeric water quality criteria is one of the primary goals of the water quality study plan. Although TSS and specific conductivity do not have numeric water quality criteria, they lend additional insight into the water quality of the Weber River-3 AU. In addition to these water quality parameters, PacifiCorp elected to monitor chlorophyll *a* to assess algal biomass throughout the Project Area as a good faith effort to contribute to the overall understanding of water quality in the Weber River. Algae, as represented by chlorophyll *a*, is the primary food source for the bluehead sucker (*Catostomus discobolus*), a Utah state species of special concern, and it is important to understand how algae varies both spatially and temporally in the river.

The methods used to collect water quality data and water samples involved the use of sondes and water quality grab samples for laboratory analysis. A summary of the methods used to collect these data and the types of water quality parameters collected and analyzed at each monitoring location are provided in Table 2.

[1] The Weber River-3 AU extends from the confluence with the Ogden River upstream to the confluence with Cottonwood Creek. It is approximately 19.5 miles long and encompasses the entirety of the Weber Project Area.

Figure 2. Water quality sampling site locations.

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Table 2. Methods Used and Types of Water Quality Parameters Recorded or Collected at each Sampling Location

Sampling Site	Data Collection Method	Water Quality Parameters
WR01	Sonde	Temperature, pH, specific conductivity, DO, and turbidity
	Grab	TSS and Chlorophyll *a*
WR02	Grab	Chlorophyll *a*
WR03	Sonde	Temperature, pH, specific conductivity, DO, and turbidity
	Grab	TSS and Chlorophyll *a*
WR04	Sonde	Temperature, pH, specific conductivity, DO, and turbidity
	Grab	TSS and Chlorophyll *a*

Note: TSS grab samples were submitted to American West Analytical Laboratories for analysis; chlorophyll *a* grab samples were submitted to the Utah Department of Health Division of Laboratory Services for analysis.

3.3. Water Quality Sondes

Sondes were placed in the Weber River at WR01, WR03, and WR04. So that the data would be representative of the stream channel of the entire Project Area, the sondes at WR01 and WR03 were placed in the thalweg of the river (or deepest point that channels most of the flow), and at WR04, the sonde was placed in the powerhouse catch basin, as noted above in Section 3.1).

The sondes were placed inside an approximately 20-foot-long, 4-inch-diameter plastic pipe that was field screened by drilling 1-inch holes to allow water to pass through. The pipes at WR01 and WR03 were placed on a slope into the river and were anchored to the bank. The pipe at WR04 was placed vertically into the catch basin within the powerhouse and secured to the ladder that leads to the discharge flow below the powerhouse floor. The sondes were programmed to record temperature, pH, specific conductivity, DO, and turbidity data on 15-minute intervals. Sonde data were retrieved once a month from February 2016 to January 2017. Per stakeholder agreement, data for WR04 (below the Project Area) were collected only when the Project was operational. The Project was not operational in February 2016, December 2016, and January 2017.

3.4. Grab Samples

Grab samples were collected for laboratory analysis of TSS and chlorophyll *a* once a month from February 2016 to January 2017, with the exception at WR04 (see Table 2). Samples for both parameters were collected at the four locations, except for TSS, which was not sampled at WR02 (WR02 was sampled for chlorophyll *a* only). In total, 34 grab samples were analyzed for TSS and 46 grab samples were analyzed for chlorophyll *a*.

Grab samples were collected using the UDEQ Division of Water Quality standard operating procedures (UDEQ 2013a, 2013b, 2014). Grab samples were submitted to American West Analytical Laboratories (in Salt Lake City) for TSS analysis, and to the Utah Department of Health Division of Laboratory Services for chlorophyll *a* analysis.

3.4.1. Total Suspended Solids

TSS was monitored monthly at WR01, WR03, and WR04. TSS refers to the amount of solid material suspended in the water. It differs from turbidity in that it provides the actual weight of suspended matter. High TSS in a waterbody can often mean higher concentrations of bacteria, nutrients, pesticides, and metals in the water. These pollutants may attach to sediment particles on the land and be carried into waterbodies with stormwater. In the water, the pollutants may be released from the sediment or travel farther downstream. High TSS can also result in a decrease of light penetration into the water column, an increase in water temperatures, and a decrease in DO (Murphy 2007).

3.4.2. Chlorophyll a

Chlorophyll *a* was monitored monthly at the four monitoring sites described above. Chlorophyll *a* is a measure of the amount of algae growing in a waterbody. It can be used to classify the trophic condition of a waterbody. Algae is a natural part of freshwater ecosystems; however, too much algae can cause problems such as decreased levels of DO when algae is dead and decaying and biological oxygen demand is high. Some algae also produce toxins that can be a public health concern when found in high concentrations. One of the symptoms of degraded water quality condition is the increase of algae biomass as measured by the concentration of chlorophyll *a*. Waters with high levels of nutrients from fertilizers, septic systems, sewage treatment plants, and urban runoff may have high concentrations of chlorophyll *a* and excess amounts of algae (U.S. Environmental Protection Agency 2016).

4. QUALITY ASSURANCE AND QUALITY CONTROL

SWCA adhered to the quality assurance and quality control (QA/QC) procedures described in Section 4.2.3 of the Final Study Plan (PacifiCorp 2016), and as described in the UDEQ standard operating procedures for parameter collection, to ensure that the data were reliable and accurate and that they attained appropriate quality standards. SWCA conducted the following to adhere to the QA/QC procedures:

- Water quality sondes were calibrated and serviced on a monthly basis to ensure that sondes were recording data properly. All sondes were calibrated according to manufacturer's instructions, and batteries were replaced during the monthly checks.
- Before collecting grab samples, sample containers were acquired from American West Analytical Laboratories for TSS analysis. Filter collection pads for chlorophyll *a* analysis were obtained from the Utah Department of Health Division of Laboratory Services.
- Once collected, grab samples were kept on ice and delivered to each state-certified laboratory within the appropriate holding time and under the standard chain-of-custody protocols.

4.1. Calibration and Operation of Sondes

Sondes were calibrated and serviced on a monthly basis when data were downloaded. The servicing of the sondes included replacing batteries, cleaning all probes, replacing wiper blades, and examining the sondes for any damage or leakage. Calibration of the sondes was conducted according to YSI procedures and using YSI calibration standards.

4.2. Grab Sample Collection, Preservation, Analysis, and Custody

Grab samples (see Table 2) were collected from the thalweg of the river using clean collection bottles. Water from the collection bottles was then poured into bottles provided by the laboratory. All sample bottles were placed in a cooler on ice until they were delivered to their respective laboratories. All samples were submitted to the laboratories within their respective holding times. TSS samples were analyzed by American West Analytical Laboratories in Salt Lake City, Utah. Water samples for chlorophyll *a* analysis were poured into a filtration device, and the sampled water was hand pumped through a glass fiber filter. This filter was then wrapped in aluminum foil, sealed in a plastic bag, and placed in a cooler on ice. Chlorophyll *a* samples were analyzed by the Utah Department of Health Division of Laboratory Services in Taylorsville, Utah.

4.3. Duplicate Grab Samples

Per standard protocol, one duplicate sample was collected for every 20 grab samples collected. Table 3 shows the results of duplicate samples and the original sample results for TSS (in milligrams per liter [mg/L]) and for chlorophyll *a* (in micrograms per liter [µg/L]).

Table 3. Results of Original and Periodic Duplicate (every 20) Grab Samples for Total Suspended Solids and Chlorophyll *a*

Parameter	2016							
	April		August		October		December	
	Original	Duplicate	Original	Duplicate	Original	Duplicate	Original	Duplicate
TSS (mg/L)	4.40	5.60	N/A	N/A	3.20	3.20	N/A	N/A
Chlorophyll *a* (µg/L)	19.30	22.50	1.39	0.41	N/A	N/A	1.13	1.13

N/A = not applicable

Analytical precision was evaluated using relative percent difference (RPD) between the original and the duplicate results using the following equation:

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2)/2} \times 100$$

where,

RPD = Relative Percent Difference (as %)

$|X_1 - X_2|$ = Absolute value (always positive) of $X_1 - X_2$

X_1 = Original sample concentration

X_2 = Duplicate sample concentration

In general, an RPD of less than or equal to 20% typically serves as a recommended rule of thumb for aqueous samples. Table 4 shows the relative percent difference between those two numbers.

Table 4. Relative Percent Difference between Original and Duplicate Grab Samples for Total Suspended Solids and Chlorophyll *a*

Parameter	2016			
	April	August	October	December
TSS (mg/L)	24%	N/A	0%	N/A
Chlorophyll a (µg/L)	15%	109%	N/A	0%

N/A = not applicable

One duplicate sample collected for chlorophyll *a* in August 2016 was well above the recommended 20% RPD (109%). Therefore, the sample results for chlorophyll *a* collected in August 2016 at WR02 were excluded from the analysis. One duplicate sample collected for TSS in April 2016 was above the recommended 20% RPD (24%); however, because this exceedance was marginal, SWCA determined that these TSS data were acceptable to include in the analysis.

4.4. Data Validation and Reconciliation

Data generated by the state-certified laboratories were subject to the internal contract laboratory QA/QC processes before they were released. Data are assumed to be valid because the laboratories adhered to their internal QA/QC plan. Data recorded by the sondes are considered valid and usable because QA/QC procedures and processes were applied, evaluated, and determined acceptable.

The approach used to identify outliers in the sonde data was based on the statistical methods used to build a box plot. The box plot method for identifying outliers was developed by Tukey (1977) and makes no distributional assumptions, nor does it depend on a mean or standard deviation. Instead, the box plot method relies on calculating the lower quartile, upper quartile, inter-quartile range, lower extreme, and upper extreme of a dataset. This method for identifying outliers was applied to all data recorded by the sondes. Data determined to be outliers were rejected and not used in preparation of this report.

In addition, laboratory results that reported below the detection limit were to be reported as half the detection limit for the purpose of statistical analysis.

After data validation and database construction, data were statistically summarized for the following statistical calculations:

- Minimum
- Maximum
- Average
- Standard deviation

5. RESULTS

Statistical summaries, comparison to State of Utah water quality standards, and Project impacts on water quality for sonde data and grab samples are provided in the following subsections. The raw data are available in digital format upon request to SWCA's Lindsey Kester by email at lkester@swca.com or by telephone at 801-322-4307.

5.1. Water Quality Sonde Results

Statistical summaries for each of the parameters recorded by the sondes are presented in the sections below, followed by a discussion and graph of the results.

5.1.1. Temperature

The statistical summaries for the water temperature sonde data are provided in Table 5. Temperature recorded at the three sampling sites follows a typical seasonal pattern (Figure 3). Monthly average temperatures for the water temperature sonde data are provided in Table 6. Similar to the water quality data presented in the Final Study Plan for the Weber River-3 AU (PacifiCorp 2016), temperatures recorded at WR03 slightly exceed the State of Utah water quality standards for temperature (20 degrees Celsius [°C]) on 15 days between July 21, 2016, and August 8, 2016. Overall, the Project does not appear to affect water temperature.

It should be noted that the Weber River is designated as a cold water fishery (3A), for which maximum temperature change should not exceed 2°C. From WR01 (above project) to WR03 (downstream of the Weber diversion dam), there is no change in average temperature. From WR01 and WR03 to WR04 (cement catch basin in powerhouse below pipeline diversion), the average temperature change is 0.1°C when compared to the 8 months of data that all sites have in common, and 1.9°C when the 8 months of data available for WR04 are compared to the 12 months of data (including the 3 coldest months of the year) that were collected at WR01 and WR03 (see Table 5). Although this larger average change in temperature may suggest a potential impact to temperature from the water diversion, it is an artifact of the data collection set. That is, the average for WR04 is based on 8 months of data (by agreement with the stakeholders, data were not collected and therefore were not available for 3 months when the powerhouse was offline or the 1 month when there was a sonde malfunction), whereas the averages for WR01 and WR03 are based on 12 months of data. The averages for the same 8 months of data at WR01 and WR03 are more comparable to and in fact negligibly different from the WR04 average (these averages are shown in parentheses in Table 5).

Monthly averages show that temperature decreases from WR01 to WR03 and WR04 in some months and increases in others. The change is never greater than 1°C.

Table 5. Statistical Summaries for the Temperature Sonde Data in Degrees Celsius

Sampling Site	Minimum	Maximum	Average	Standard Deviation
WR01	-0.2	19.8	9.7 (11.5)*	5.7
WR03	-0.3	20.9	9.7 (11.8)*	5.8
WR04	0.0	20.0	11.6	4.4

* To provide a more comparable number, the temperatures in parentheses represent the average for the 8 months when WR04 data were available.

Table 6. Monthly Averages for the Temperature Sonde Data in Degrees Celsius

Sampling Site	2016											2017
	February	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**January**
WR01	3.51	6.49	9.21	11.48	14.24	16.67	17.45	14.97	11.01	6.71	2.18	1.37
WR03	3.70	6.37	9.18	11.46	15.02	16.87	17.09	14.72	10.12	5.66	1.78	0.98
WR04	ND	6.35	9.06	11.10	ND	17.51	17.59	15.17	10.99	7.33	ND	ND

ND = no data

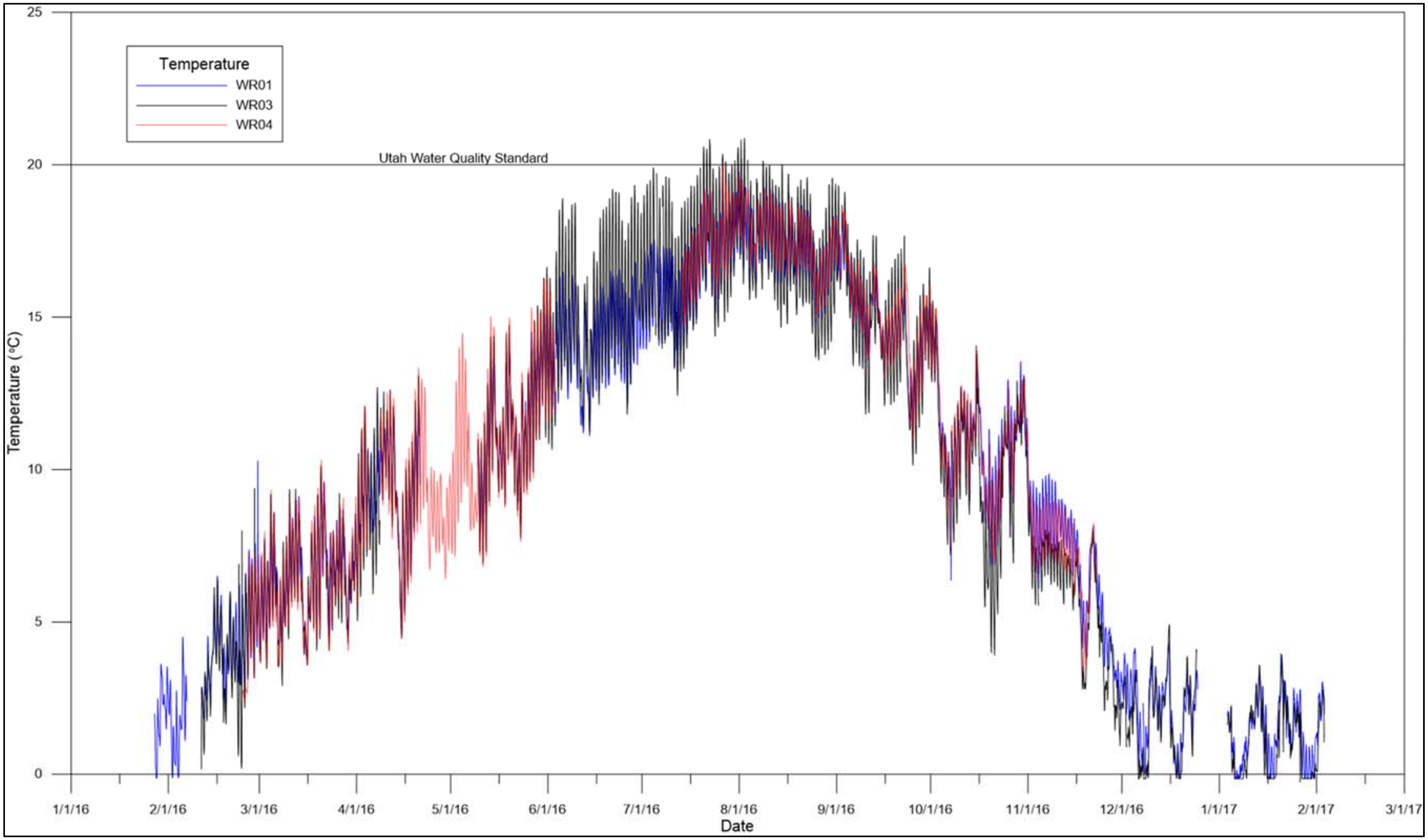

Figure 3. Water temperature sonde data.

Note: Data gaps are a result of the powerhouse being offline or from periodic sonde malfunctioning and associated data error, as are typical for long-term water quality field studies.

5.1.2. pH

The statistical summaries for the pH sonde data are provided in Table 7. pH data recorded at all sampling sites follow the same general trend (Figure 4) and are within the State of Utah water quality standard (6.5–9.0). The Project does not appear to affect pH.

Table 7. Statistical Summaries for the pH Sonde Data

Sampling Site	Minimum	Maximum	Average	Standard Deviation
WR01	7.5	8.8	8.1	0.2
WR03	7.8	8.9	8.3	0.2
WR04	7.8	8.9	8.2	0.2

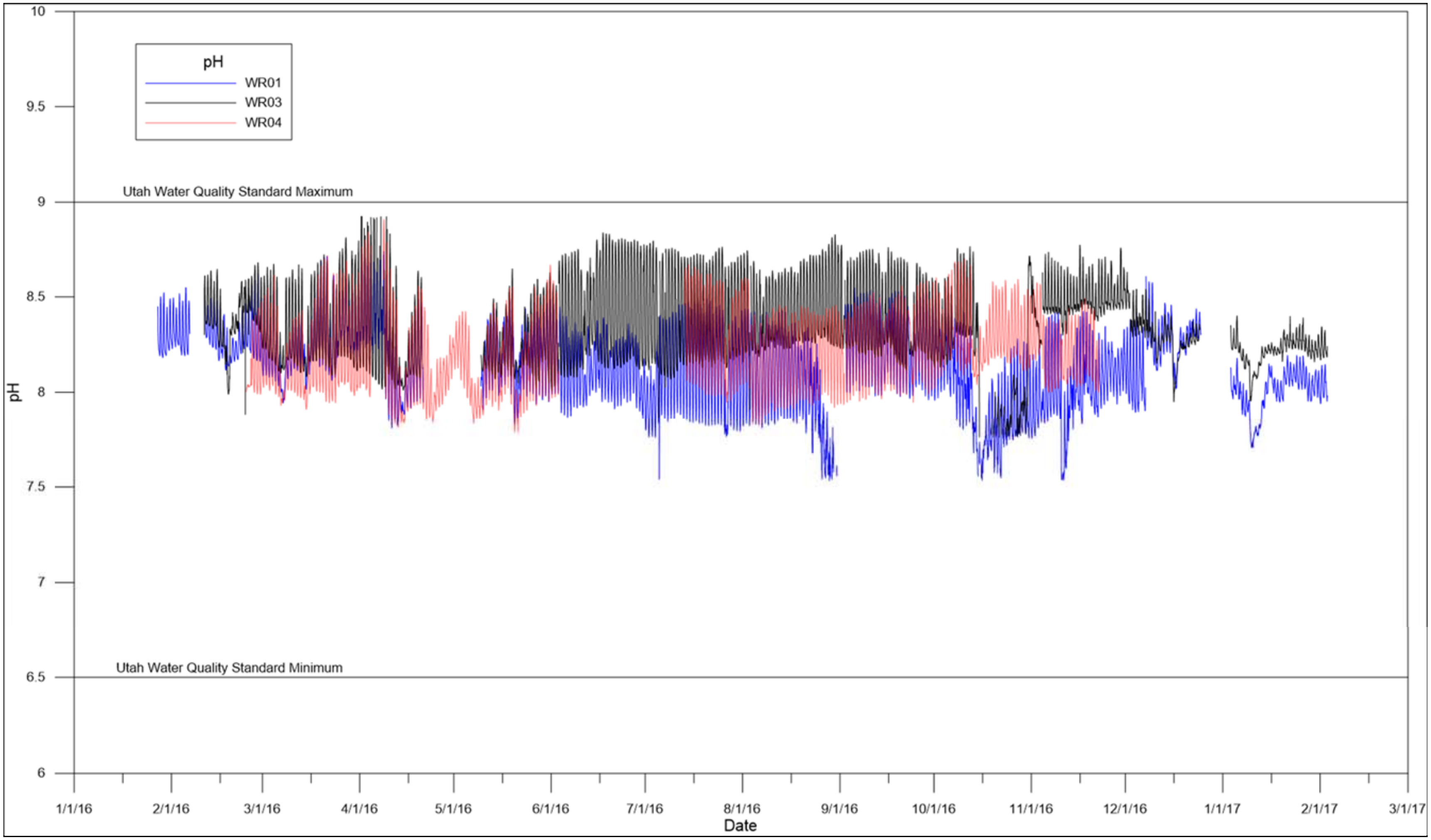

Figure 4. pH sonde data.

Note: Data gaps are a result of the powerhouse being offline or from periodic sonde malfunctioning and associated data error, as are typical for long-term water quality field studies.

5.1.3. Specific Conductivity

The statistical summaries for the specific conductivity sonde data are provided in Table 8. In general, specific conductivity at all sampling sites appears to be influenced by seasonal Weber River flows (Figure 5). Monthly average specific conductivity sonde data are provided in Table 9. As expected, high flows tend to dilute the salinity of the water, therefore lowering the specific conductivity. The Project does not appear to affect specific conductivity.

Table 8. Statistical Summaries for the Specific Conductivity Sonde Data in microSiemens

Sampling Site	Minimum	Maximum	Average	Standard Deviation
WR01	234	977	615	129
WR03	221	864	567	127
WR04	198	766	542	147

Table 9. Monthly Averages for the Specific Conductivity Data in microSiemens

Sampling Site	2016											2017
	February	March	April	May	June	July	August	September	October	November	December	January
WR01	703.07	601.70	444.09	433.40	576.98	535.62	529.18	608.93	701.34	722.89	696.96	751.33
WR03	578.11	502.34	374.49	320.16	495.46	591.24	612.11	627.36	628.69	701.93	660.29	646.04
WR04	ND	499.27	328.96	321.34	ND	616.67	601.43	623.67	681.82	711.37	ND	ND

ND = no data

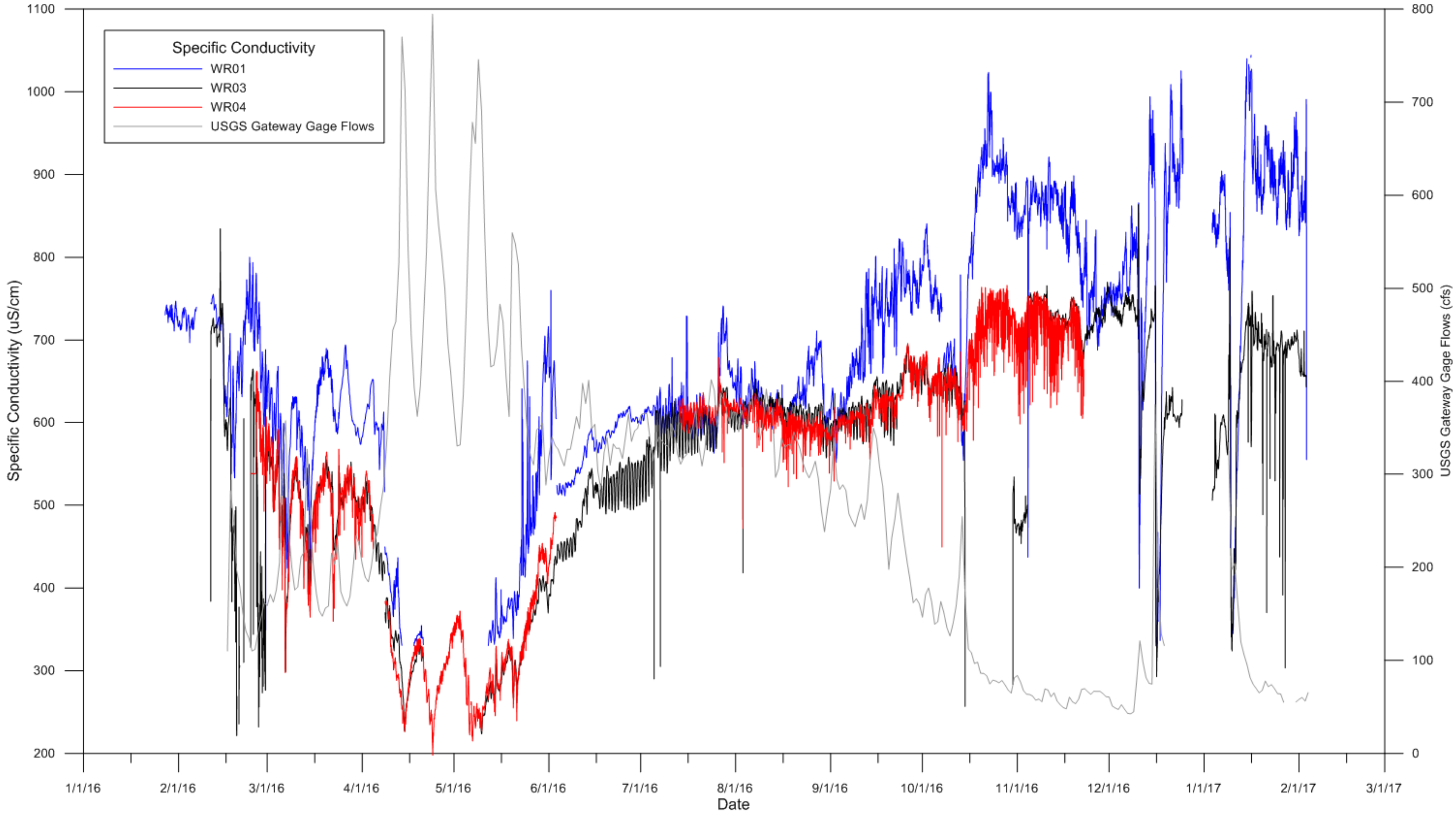

Figure 5. Specific conductivity sonde data.

Note: Data gaps are a result of the powerhouse being offline or from periodic sonde malfunctioning and associated data error, as are typical for long-term water quality field studies.

5.1.4. Dissolved Oxygen

The statistical summaries for the DO sonde data are provided in Table 10. DO concentrations recorded at WR03 and WR04 followed the same general trend (Figure 6). DO concentrations recorded at WR04 were equal to or above the State of Utah water quality criteria (minimum 30-day average of 6.5 mg/L). Similarly, DO concentrations recorded at WR03 were equal to or above the water quality criteria, except for a few instances in late September and early October when DO concentrations in the water flowing past WR01 station (above the Project Area) were extremely low.

DO concentrations measured at WR01 (above the Project Area) had a wide range of fluctuations. Initially it was thought that the probe calibration may have drifted; however, as shown on the graph, the probe was calibrated periodically throughout the monitoring period, and DO concentrations continued to fluctuate (see Figure 6). Next it was thought that temperature variations could be responsible, but that was also tested, and no correlation was observed. It is postulated that there is a pollutant source above WR01 that is periodically depressing DO at WR01. Overall, the Project appears to stabilize DO fluctuations as well as increase DO concentrations.

Table 10. Statistical Summaries for the Dissolved Oxygen Sonde Data in Milligrams per Liter

Sampling Site	Minimum	Maximum	Average	Standard Deviation
WR01	0.6	14.6	8.7	3.3
WR03	5.4	13.9	9.7	1.4
WR04	6.5	12.4	9.4	1.1

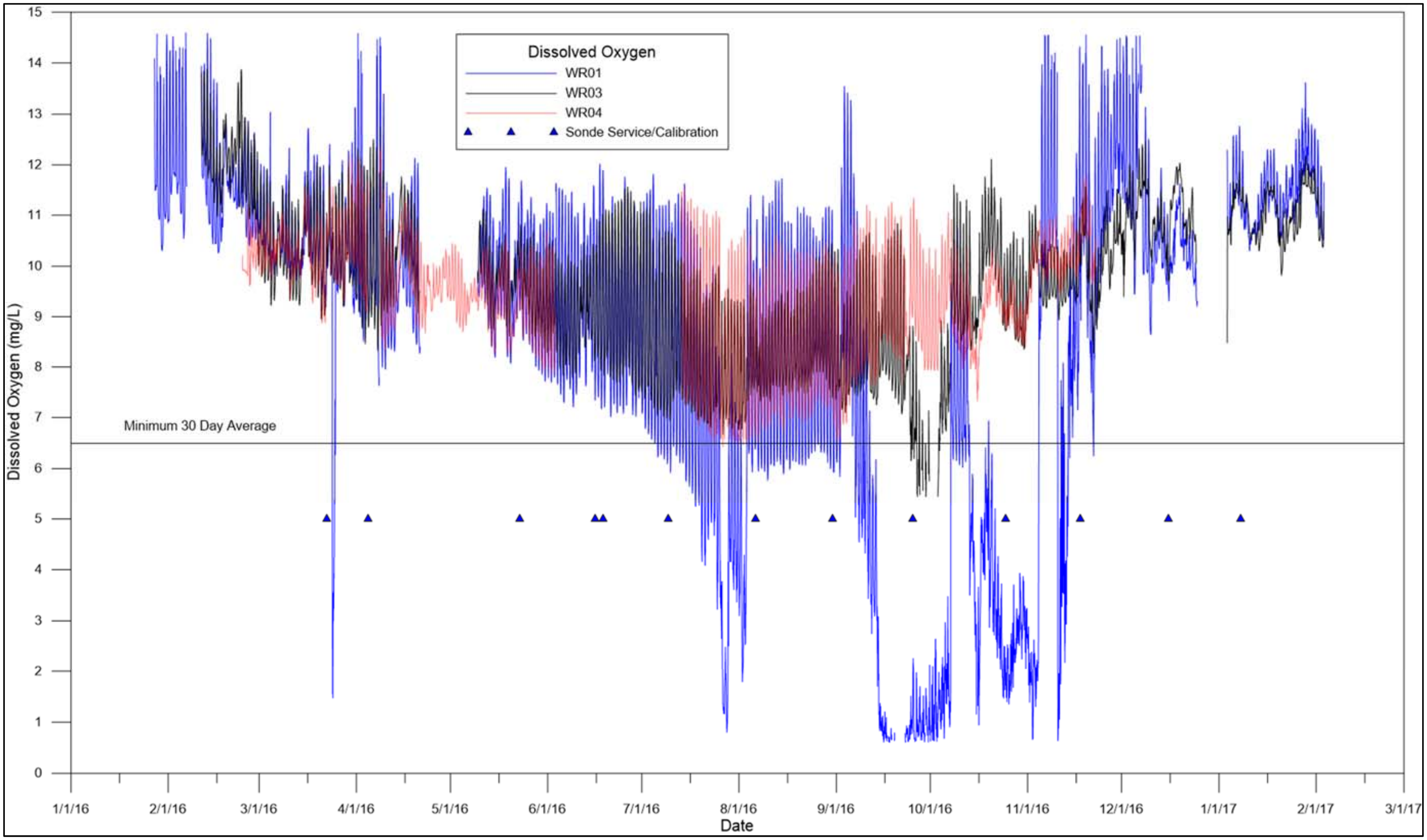

Figure 6. Dissolved oxygen sonde data.

Note: Data gaps are a result of the powerhouse being offline or from periodic sonde malfunctioning and associated data error, as are typical for long-term water quality field studies.

5.1.5. Turbidity

The statistical summaries for the turbidity sonde data are provided in Table 11. The three sampling sites follow the same general trend for turbidity. The minimum value of 3.5 nephelometric turbidity units (NTU) at the powerhouse is most likely the result of there being no opportunities for deposition in the diversion pipe. Furthermore, the water turbulence caused by the turbine in the powerhouse suspends sediment. It is also worth noting that the maximum at WR01 (74.8 NTU) is outside the Project Area (Figure 7). The turbidity standard for a 3A cold water fishery states that the turbidity increase must be less than or equal to 10 NTUs, and the data here meet this standard. For these reasons, the Project does not appear to affect turbidity.

Table 11. Statistical Summaries for the Turbidity Sonde Data in Nephelometric Turbidity Units

Sampling Site	Minimum	Maximum	Average	Standard Deviation
WR01	0.0	74.8	15.4	14.0
WR03	0.0	69.3	18.1	14.4
WR04	3.5	62.3	17.6	12.0

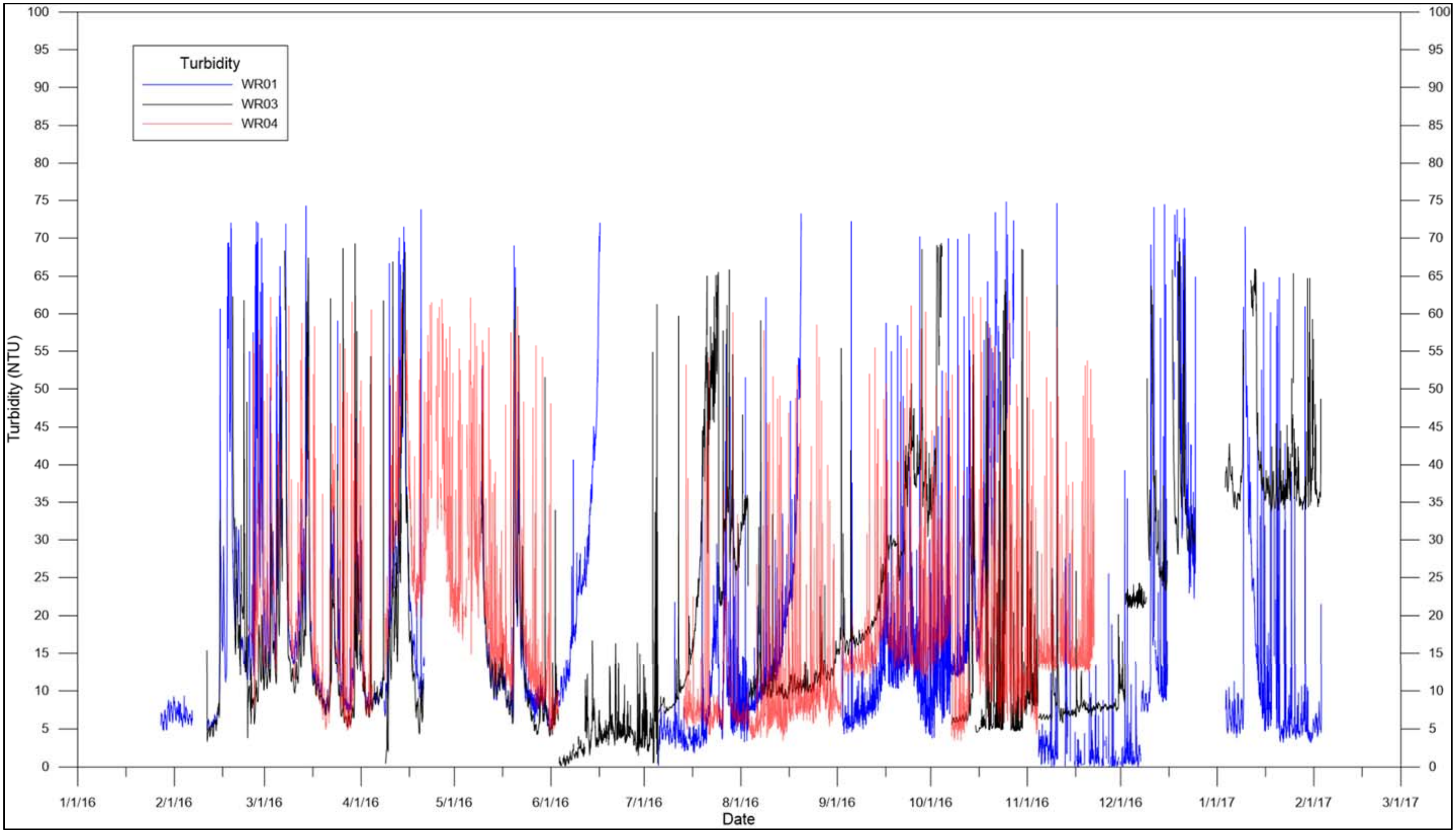

Figure 7. Turbidity sonde data.

Note: Data gaps are a result of the powerhouse being offline or from periodic sonde malfunctioning and associated data error, as are typical for long-term water quality field studies.

5.2. Grab Sample Results

5.2.1. Total Suspended Solids

Grab sample results for TSS are provided in Table 12.

Table 12. Grab Sample Data for Total Suspended Solids

Date	WR01	WR03	WR04
02/02/16	4.4	7.6	Powerhouse offline
02/29/16	7.2	17.2	19.6
04/08/16	4.4	1.5	3.2
05/06/16	18.0	25.6	22.8
06/03/16	11.6	1.5	8.0
07/05/16	10.8	5.2	9.6
08/03/16	7.6	0.5	6.4
09/02/16	8.8	3.6	14.4
10/03/16	3.2	1.5	5.6
11/04/16	8.4	1.5	1.5
12/02/16	1.5	1.5	1.5
01/03/17	20.4	13.2	Frozen-Powerhouse offline
Minimum	1.5	0.5	1.5
Maximum	20.4	25.6	22.8
Average	8.9	6.7	9.3
Standard Deviation	5.7	8.0	7.4

Note: The values in red are less than the laboratory detection limit. The value entered is half the detection limit.

TSS concentrations at all sampling sites follow the same general trend (Figure 8). TSS appears to be directly related to flows and peaks during spring runoff (see Figure 8). TSS is higher in the Project Area (WR03 and WR04) during spring runoff, but is less than upstream (WR01) for the duration of the year, except for an increase of 5 mg/L at WR04 between August 1, 2016 and October 7, 2016. For the same reasons described above for turbidity (i.e., reduced opportunities for deposition in the diversion pipe and water turbulence caused by the turbine in the powerhouse), TSS is expected to be higher at WR04. For these reasons, at times, the Project may appear to increase TSS; however, this increase is expected to settle out and resemble the concentrations observed at WR03.

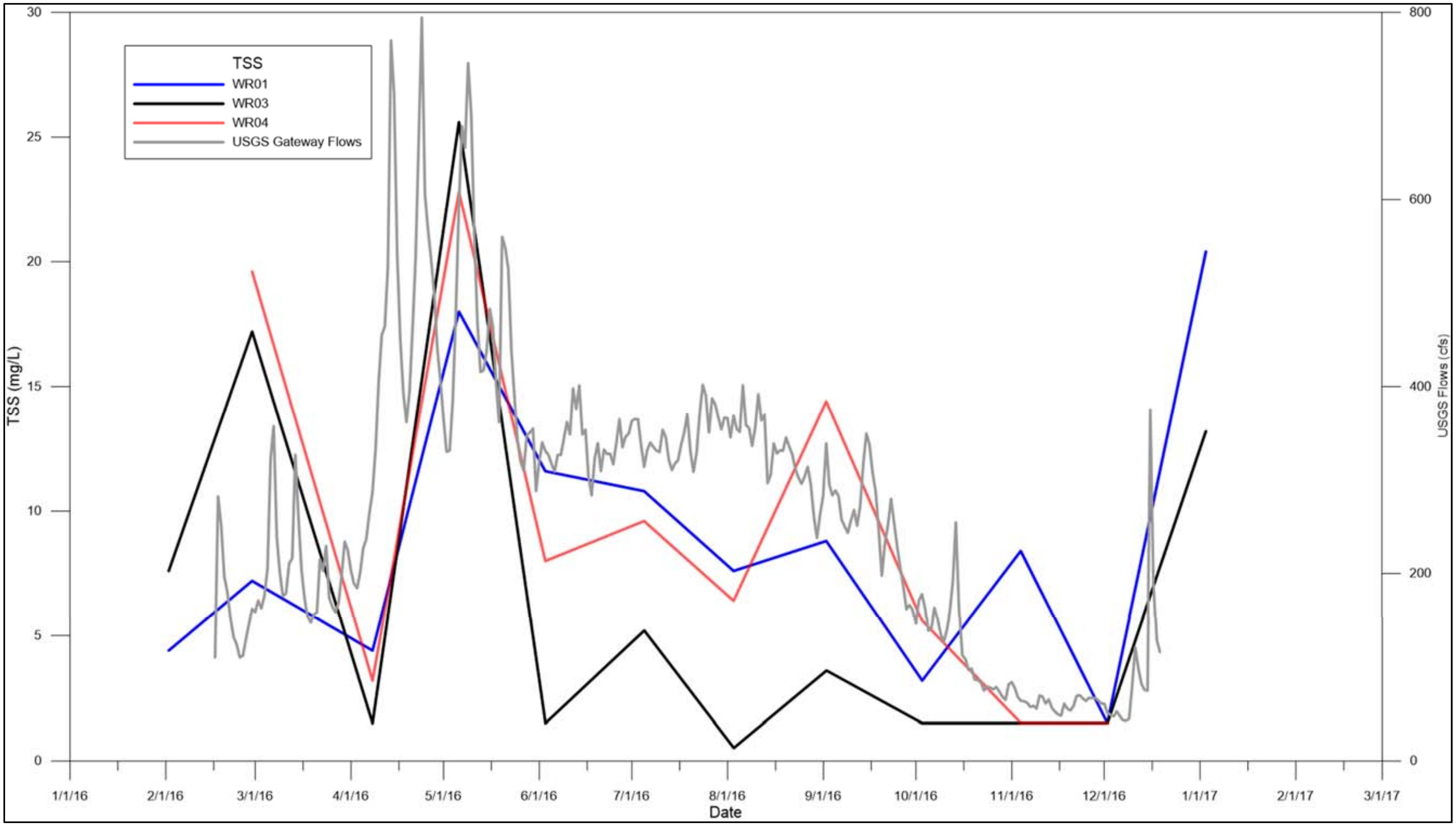

Figure 8. Total suspended solids grab sample data.

5.2.2. Chlorophyll a

Grab sample results for chlorophyll *a* are provided in Table 13.

Table 13. Grab Sample Data for Chlorophyll *a*

Date	WR01	WR02	WR03	WR04
02/02/16	3.80	3.60	7.10	Powerhouse offline
02/29/16	1.70	1.50	3.40	3.10
04/08/16	19.30	23.70	5.50	23.50
05/06/16	3.90	5.20	0.80	4.20
06/03/16	3.50	0.20	1.90	2.70
07/05/16	0.60	0.05	1.70	0.05
08/03/16	1.66	Excluded*	0.05	0.71
09/02/16	0.05	0.05	2.31	0.51
10/03/16	0.74	0.51	0.51	1.19
11/04/16	2.32	1.16	0.05	0.05
12/02/16	0.79	1.13	0.05	0.48
01/03/17	1.24	0.11	1.81	Frozen-Powerhouse offline
Minimum	0.05	0.05	0.05	0.05
Maximum	19.30	23.70	7.10	23.50
Average	3.30	3.38	2.10	3.65
Standard Deviation	5.20	6.94	2.24	7.12

Note: The values in red are less than the laboratory detection limit. The value entered is half the detection limit.

*The sample collected on 8/3/16 at WR02 was excluded because the duplicate sample was outside the acceptable range of precision.

Chlorophyll *a* concentrations at all sampling sites follow the same general trend (Figure 9), except at WR03, which cannot be explained. However, similar to TSS, there is a spike in chlorophyll *a* concentrations during spring runoff for WR01, WR02, and WR04. At this same time, chlorophyll *a* should be suppressed. After spring runoff, chlorophyll *a* concentrations at all sampling sites follow the same general trend. For this reason, the Project does not appear to affect chlorophyll *a*.

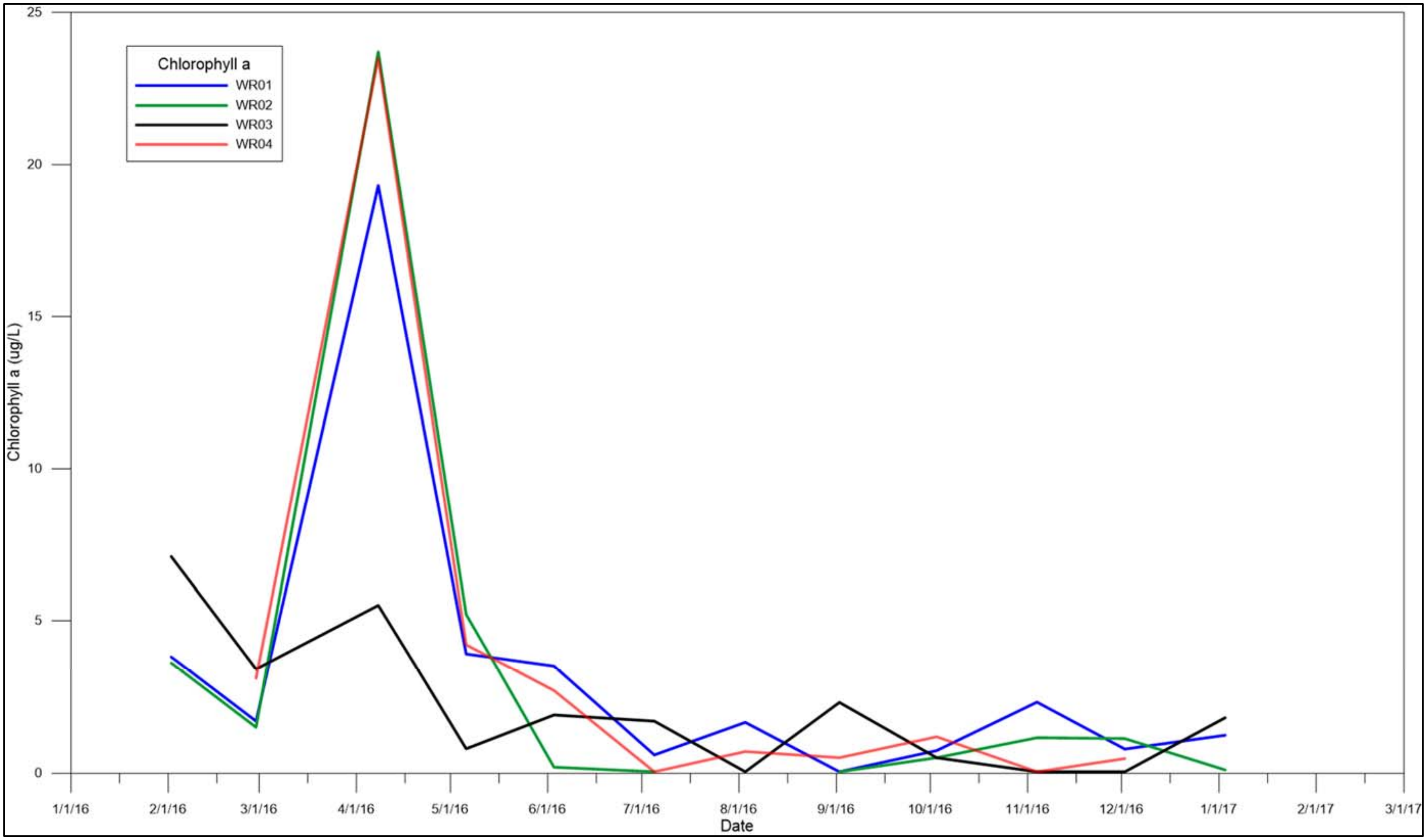

Figure 9. Chlorophyll *a* grab sample data.

6. CONCLUSIONS

Water quality can be affected by all types of hydroelectric projects with diversion infrastructure; however, the Weber Hydroelectric Project is a run-of-the-river facility with a very small forebay and associated short retention time. PacifiCorp does not flush the Project forebay to reduce sediment buildup, although limited dredging may occur periodically on an as-needed basis. Historically, when dredging has occurred, any dredged materials were removed and disposed of at an off-site location. Any future dredging would continue the practice of off-site removal.

In addition, the existing minimum instream flows in the Project Area appear to be protective of the fishery, including species of special concern. The Utah Division of Wildlife Resources (UDWR) rates the Project reach of the Weber River as Class IIIB, a quality fishery with species of special concern (Bonneville cutthroat trout [*Oncorhynchus clarki utah*] and bluehead sucker). Bonneville cutthroat trout is also listed as a sensitive species.

There are no proposed changes to the hydrologic regime of the Weber River resulting from the continued operation of the Project, and there are no other Project operations that are known to affect the water quality parameters evaluated in this report. In summary, the water quality results collected in 2016 and early 2017 show that all sampling sites largely follow the same general trend, with the exception of DO at WRO1 and chlorophyll *a* at WR03. The results also indicate that Project operations do not appear to substantially affect water resources in the Project Area, with the possible exception of improved DO in the Project reach.

The water quality results demonstrate that the beneficial uses and associated State of Utah water quality standards are being met. PacifiCorp expects that given the results of the recent water quality monitoring, during the new license period, the Project will comply with the Clean Water Act Section 401 water quality certification program through UDEQ to ensure that the federally permitted and licensed activities for continued operation of the Weber Hydroelectric Project are conducted in a manner that complies with applicable discharge and water quality requirements in order to maintain the chemical, physical, and biological integrity of the Weber River, which is a portion of the waters of the United States within the state of Utah.

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