El Dorado Hydroelectric Project
FERC Project No. 184

2016 Water Quality Monitoring Report

EL DORADO IRRIGATION DISTRICT
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1.0 Introduction

The El Dorado Irrigation District developed a water quality monitoring plan (Plan; EID 2007) to satisfy the water quality monitoring requirements as required by conditions of the Federal Energy Regulatory Commission (FERC) license for the El Dorado Hydroelectric Project (Project 184)[1]. The monitoring plan was designed to provide information regarding overall water quality within the vicinity of Project 184 (Project), identify potential water quality problems related to the Project operations and where the Project can control such factors, and develop resource measures for the protection, mitigation, and enhancement of water quality.

This report summarizes the results of the 2016 water quality monitoring effort, which is the fifth year of water quality monitoring conducted pursuant to the Plan. The data collected in 2016 were compiled and distributed electronically to the Forest Service (FS), State Water Resources Control Board (SWRCB), and the Project 184 Ecological Resources Committee (ERC) on January 31, 2017, as required by the Plan.

2.0 Sampling Locations

The following sampling locations are identified in the Plan and depicted in Figure 1:

- Echo Creek below Echo Lake dam (WQ1)
- Pyramid Creek below Lake Aloha dam (WQ2)
- Caples Creek below Caples Lake dam (WQ3)
- Silver Fork American River below Silver Lake dam (WQ4)
- South Fork American River upstream of Kyburz diversion dam (WQ5)
- South Fork American River downstream of Kyburz diversion dam (WQ6)
- Carpenter Creek above Carpenter Creek diversion dam (WQ7)
- Carpenter Creek below Carpenter Creek diversion dam (WQ8)
- No Name Creek above No Name Creek diversion dam (WQ9)
- No Name Creek below No Name Creek diversion dam (WQ10)
- Alder Creek above Alder Creek diversion dam (WQ11)
- Alder Creek below Alder Creek diversion dam (WQ12)
- Mill Creek above Mill Creek diversion dam (WQ13)
- Mill Creek below Mill Creek diversion dam (WQ14)
- Bull Creek above Bull Creek diversion dam (WQ15)

[1] Section 7 of the El Dorado Hydroelectric Project Relicensing Settlement Agreement, U.S. Forest Service 4(e) License Condition No. 37, and the California State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification Condition No. 15

- Bull Creek below Bull Creek diversion dam (WQ16)
- Ogilby Creek above Ogilby Creek diversion dam (WQ17)
- Ogilby Creek below Ogilby Creek diversion dam (WQ18)
- Esmeralda Creek above Esmeralda Creek diversion dam (WQ19)
- Esmeralda Creek below Esmeralda Creek diversion dam (WQ20)

The FS, SWRCB, Project 184 ERC, and FERC approved a one-year variance to: 1) discontinue monitoring at Mill Creek (WQ13 and WQ14) and Carpenter Creek (WQ7 and WQ8) in 2016 since the diversion structures on these creeks are not operational and 2) utilize Escherichia coli (E. coli) in lieu of fecal coliform as the bacterial indicator.

3.0 Collection

In-situ and analytical water quality monitoring were performed in 2016 as required by the Plan. Date, time, site location and in-situ water quality data were recorded on a standard form and later transcribed to electronic format in a Microsoft Excel spreadsheet. Sampling occurred over an eight-month period during March, May, June, July, August, September, first storm of the season (October 17, 2016), and December. E. coli samples were collected five times per month from May through September and were scheduled to capture days with high recreational periods (i.e., holiday weekends).

Temperature, dissolved oxygen, conductivity, and pH were measured in the field at each location using an YSI 556: Handheld Multi-Probe Meter. The meter was calibrated prior to each sampling period per manufacturer’s specifications. A HACH handheld pH meter was also calibrated and ready for use during each field monitoring event.

Water samples were collected at each location for laboratory analysis of the following parameters: copper, aluminum, conductivity, turbidity, TSS, alkalinity, hardness, and nitrate. California Laboratory Services (CLS) in Rancho Cordova, California, a state certified laboratory, analyzed water samples collected for this effort. All the samples were analyzed pursuant to methodologies approved by the United States Environmental Protection Agency (USEPA), the California Department of Public Health, or Environmental Laboratory Accreditation Program (ELAP) and results were certified to be in compliance both technically and for completeness. All samples met the appropriate hold times.

4.0 Parameters and Results

Temperature

Average, minimum, and maximum temperatures measured at each water quality monitoring site during the 2016 monitoring effort are reported in Table 1. Graphs depicting all *in situ* parameters measured at each monitoring site are provided in Figures 2 - 10.

Table 1. Average, minimum, and maximum water temperatures (°C) at each monitoring site

Site	AVG	MIN	MAX
WQ1	10.4	1.1	19.2
WQ2	15.0	12.6	18.0
WQ3	7.6	2.1	13.6
WQ4	10.8	1.0	18.8
WQ5	11.8	3.3	18.4
WQ6	12.1	4.0	17.6
WQ9	10.5	4.8	16.7
WQ10	10.8	4.9	16.8
WQ11	11.6	3.9	17.6
WQ12	12.7	3.4	19.7
WQ15	9.7	4.8	13.5
WQ16	9.0	3.5	12.8
WQ17	9.2	6.5	12.4
WQ18	10.7	4.6	14.9
WQ19	9.8	5.8	12.4
WQ20	10.5	4.7	14.7

A total of 101 water temperature measurements were recorded in 2016. Water temperatures ranged from a minimum of 1.0 °C at Silver Fork below Silver Lake Dam (WQ4) to 19.7 °C Alder Creek below Alder Creek Diversion Dam (WQ12). The average water temperature measured throughout the entire project area in 2016 was 10.7 °C. Water temperatures measured at all water quality monitoring sites in 2016 were suitable for trout and other coldwater species throughout the study period. A detailed evaluation of water temperatures in the stream reaches within the vicinity of the Project is provided in the Project No. 184 2016 Water Temperature Monitoring Report (EID 2017).

Dissolved Oxygen

Average, minimum, and maximum dissolved oxygen (DO) concentrations measured at each water quality monitoring site during the 2016 monitoring effort are reported in Table 2. Graphs depicting all *in situ* parameters measured at each monitoring site are provided in Figures 2 - 10.

Table 2. Average, minimum, and maximum DO concentrations (mg/L) at each monitoring site

Site	AVG	MIN	MAX
WQ1	8.4	6.3	11.5
WQ2	7.6	6.9	8.1
WQ3	8.2	6.4	11.1
WQ4	7.6	5.5	10.7
WQ5	8.1	6.5	10.2
WQ6	8.1	7.0	10.3
WQ9	10.4	7.8	13.4
WQ10	10.7	8.2	14.2
WQ11	9.3	7.2	12.4
WQ12	9.2	6.7	11.6
WQ15	9.7	7.6	12.1
WQ16	9.3	7.9	10.8
WQ17	8.9	7.0	10.6
WQ18	9.8	7.8	13.2
WQ19	9.1	7.5	11.9
WQ20	9.9	8.1	14.1

The Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins states "The DO concentrations shall not be reduced below the following minimum levels at any time…waters designated COLD 7.0 mg/L" (CVRWQCB, 1998; Fourth Edition revised October 2011).

A total of 90 DO measurements were recorded in 2016. DO ranged from 5.5 mg/L at Silver Fork American River below Silver Lake Dam (WQ4) to 14.2 mg/L at No Name Creek below No Name Diversion dam (WQ10). The average DO concentration throughout the entire project area in 2016 was 9.1 mg/L.

Eight DO measurements below 7.0 mg/L were recorded during the 2016 monitoring effort. Of the eight measurements below 7.0 mg/L, one was within the accuracy range of the meter (±2% of the reading or 0.2 mg/L; whichever is greater). The date, DO concentrations, and location for the remaining seven measurements below 7.0 mg/L are listed below:

June 30, 2016

- 6.2 mg/L at Silver Fork below Silver Lake Dam (WQ4)

July 21, 2016

- 5.7 mg/L at Silver Fork below Silver Lake Dam (WQ4)
- 6.5 mg/L at South Fork American River below Kyburz diversion dam (WQ5)

August 16, 2016

- 6.3 mg/L at Echo Lake below Echo Lake Dam (WQ1)
- 5.5 mg/L at Silver Fork below Silver Lake Dam (WQ4)
- 6.7 mg/L at Alder Creek below Alder Diversion Dam (WQ12)

September 30, 2016

- 6.4 mg/L at Caples Creek below Caples Lake Dam (WQ3)

Five measurements below 7.0 mg/L were recorded at high elevation sites (Echo Lake below Echo Lake Dam - WQ1, Pyramid Creek below Lake Aloha Dam - WQ2, Caples Creek below Caples Lake Dam - WQ3, and Silver Fork below Silver Lake Dam - WQ4. Dissolved oxygen levels are affected by barometric pressure and changes in elevation. It is likely that the low dissolved oxygen measurements recorded at the high elevation sites are due to improper venting of the probe to the atmosphere, which can happen if the calibration cup placed over the dissolved oxygen probe is not properly vented to the atmosphere during transport. The two remaining occurrences when dissolved oxygen levels were below 7.0 mg/L were collected on July 21, 2016 at the South Fork American River below Kyburz diversion dam (WQ5) and on August 16, 2016 at Alder Creek below Alder Diversion Dam (WQ12). No diversions for power generation were occurring at the diversion facilities located upstream of these sampling sites at the time of these measurements.

Conductivity

Average, minimum, and maximum conductivity levels recorded at each water quality monitoring site during the 2016 monitoring effort are reported in Table 3. Graphs depicting all *in situ* parameters measured at each monitoring site are provided in Figures 2 - 10.

Table 3. Average, minimum, and maximum conductivity levels (uS/cm³) at each monitoring site

Site	AVG	MIN	MAX
WQ1	11	6	15
WQ2	4	3	6
WQ3	18	8	21
WQ4	13	8	15
WQ5	33	18	47
WQ6	32	21	36
WQ9	97	47	153
WQ10	99	49	128
WQ11	43	30	78
WQ12	39	27	53
WQ15	65	43	87
WQ16	71	46	93
WQ17	54	44	70
WQ18	52	43	61
WQ19	45	30	57
WQ20	36	29	48

Currently there are no criteria or water quality objectives for conductivity specific to the American River watershed. A total of 101 conductivity measurements were recorded in 2016. Conductivity levels ranged from 3 uS/cm^3 at Echo Creek (WQ2) to 153 uS/cm^3 in No Name Creek above the diversion dam (WQ9). The average conductivity level throughout the entire project area in 2016 was 45 uS/cm^3.

pH

Average, minimum, and maximum pH levels recorded at each water quality monitoring site during the 2016 monitoring effort are reported in Table 4. Graphs depicting all *in situ* parameters measured at each monitoring site are provided in Figures 2 - 10.

Table 4. Average, minimum, and maximum pH levels at each monitoring site

Site	AVG	MIN	MAX
WQ1	6.3	5.3	7.1
WQ2	6.3	5.5	6.7
WQ3	6.9	6.3	7.5
WQ4	6.6	5.1	7.8
WQ5	6.9	6.3	7.8
WQ6	7.0	6.5	7.8
WQ9	7.5	6.8	8.3
WQ10	7.4	6.8	8.0
WQ11	7.1	6.1	8.1
WQ12	7.1	5.8	8.1
WQ15	7.4	6.5	8.5
WQ16	7.2	6.5	7.7
WQ17	6.9	5.8	7.5
WQ18	6.7	6.1	7.2
WQ19	7.1	5.6	8.1
WQ20	6.8	6.4	7.7

The Basin Plan states that "pH shall not be depressed below 6.5 nor raised above 8.5 and that changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD beneficial uses" ((CVRWQCB, 1998; Fourth Edition revised October 2011).

A total of 98 pH measurements were recorded in 2016. pH levels ranged from 5.1 at Silver Fork below Silver Lake Dam am (WQ4) to 8.5 at Bull Creek above Bull Creek diversion dam (WQ15). The average pH throughout the entire project area in 2016 was 7.0. There was no appreciable difference between the pH measurements upstream or downstream of the diversion at each monitoring site.

Sixteen pH measurements below 6.5 were recorded during the 2016 monitoring effort. Of the sixteen measurements below 6.5, six were within the accuracy range of the meter (±2 units). The date, pH measurement and location for the remaining ten measurements below 6.5 are listed below:

March 24, 2016

- 5.1 at Silver Fork American River below Silver Lake Dam (WQ4)

June 30, 2016

- 5.4 at Echo Creek below Echo Lake Dam (WQ1)

July 21, 2016

- 5.3 at Echo Creek below Echo Lake Dam (WQ1)

August 16, 2016

- 5.5 at Pyramid Creek below Lake Aloha Dam (WQ2)
- 6.2 at Ogilby Creek below Ogilby Creek Diversion Dam (WQ18)

September 30, 2016

- 6.2 at Echo Creek below Echo Lake Dam (WQ1)

December 19, 2016

- 5.8 at Alder Creek below of Alder Creek Diversion Dam (WQ12)
- 5.8 at Ogilby Creek above Ogilby Creek Diversion Dam (WQ17)
- 6.1 at Ogilby Creek below Ogilby Creek Diversion Dam (WQ18)
- 5.6 at Esmeralda Creek above Esmeralda Creek Diversion Dam (WQ19)

Consistent with Basin Plan standards, no pH levels were greater than 8.5 at all locations during all sampling events throughout the year.

Turbidity

Average, minimum, and maximum turbidity levels recorded during the 2016 monitoring effort at each water quality monitoring site are reported in Table 5. Turbidity measurements measured at each monitoring site in 2016 are presented with *in situ* parameters in Figures 2 - 10.

Table 5. Average, minimum, and maximum turbidity levels (NTUs) at each monitoring site

Site	AVG	MIN	MAX
WQ1	1.5	0.5	4.7
WQ2	0.2	0.0	0.3
WQ3	0.7	0.3	1.0
WQ4	0.9	0.5	1.6
WQ5	1.9	0.3	8.2
WQ6	1.2	0.3	3.3
WQ9	1.1	0.0	3.3
WQ10	3.2	0.2	7.2
WQ11	0.7	0.0	1.9
WQ12	0.7	0.0	2.2
WQ15	1.0	0.0	3.8
WQ16	2.0	0.2	3.6
WQ17	2.6	0.5	7.0
WQ18	0.8	0.0	2.4
WQ19	2.0	0.6	7.1
WQ20	1.5	0.0	4.0

The Basin Plan states, "where natural turbidity is less than 1 Nephelometric Turbidity Unit (NTU), controllable factors shall not cause downstream turbidity to exceed 2; where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU." (CVRWQCB, 1998; Fourth Edition revised October 2011).

Turbidity measurements were generally low throughout the study area (average = 1.4 NTUs). A comparison of turbidity measurements recorded upstream and downstream of diversion dams in 2016 found a total of seven occurrences where turbidity downstream of the diversion was greater than 1 NTU of the value measured upstream of the diversion dam. The location, date, and turbidity measurements for these occurrences are provided in Table 6.

Table 6. Turbidity levels (NTUs) above and below the diversions when turbidity levels below the diversion were > 1 NTU of the value measured above the diversion dam

	Date	Upstream	Downstream	Difference
No Name (WQ9/WQ10)	March 24, 2016	2.3	3.8	+1.5
	June 29, 2016	0.4	1.7	+1.3
	July 21, 2016	0.4	6.4	+6.0
	August 16, 2016	0.0	7.2	+7.2
Bull Creek (WQ15/WQ16)	June 29, 2016	0.4	3.6	+3.2
	December 19, 2016	1.2	2.9	+1.7
Esmeralda Creek (WQ19/WQ20)	March 23, 2016	2.3	3.8	+1.5

Four occurrences when turbidity measured downstream of the diversion were > 1 NTU of the value measured above the diversion dam were recorded at No Name Creek (WQ9/WQ10). As discussed in previous Project 184 Water Quality Monitoring Reports (EID 2009; EID 2011, EID 2013, EID 2015), a cabin owner has placed a decorative water wheel in the middle of No Name Creek upstream of the designated sampling location (WQ10) which causes an increase in sediment and organic matter to move downstream.

No diversions from these facilities or other Project related activities occurred to account for the increased turbidity measurements recorded at any of the three locations 2016.

Total Suspended Sediments

Total Suspended Sediment (TSS) concentrations measured at all sample sites in 2016 are plotted in Figure 11.

The Basin Plan has a narrative objective that states, "Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses" (CVRWQCB, 1998; Fourth Edition revised October 2011). TSS measurements were generally low throughout the project area. Of 118 samples analyzed, 82 samples had TSS levels that were not detectable in laboratory analysis. The highest TSS level was 75 mg/L measured at Silver Fork American River below Silver Lake dam (WQ4) on September 30, 2016.

Alkalinity

Alkalinity levels measured at all sample sites in 2016 are plotted in Figure 12.

There are currently no Basin Plan objectives for alkalinity. The U.S. Environmental Protection Agency recommends ambient water quality criteria for alkalinity to protect freshwater aquatic life to be measured as a continuous concentration 4-day average expressed as a total recoverable. The aquatic life 4-day average concentration for alkalinity is 20 mg/L. The recommendation also states that "20 mg/L is a minimum concentration except where natural concentrations are less (Water Quality Goals, 2011). The frequency of monitoring in the approved Plan does not provide for a direct relationship to the recommended average concentration.

Average, minimum, and maximum alkalinity concentrations measured during the 2016 monitoring effort at each water quality monitoring site are presented in Table 7.

Table 7. Average, minimum, and maximum alkalinity concentrations (mg/L) measured at each monitoring site

Site	AVG	MIN	MAX
WQ1	5.0	2.0	8.4
WQ2	0.7	0.0	2.0
WQ3	10.6	8.8	13.0
WQ4	6.8	5.1	9.0
WQ5	9.5	5.2	12.0
WQ6	11.6	6.8	14.0
WQ9	63.3	26.0	85.0
WQ10	57.9	25.0	87.0
WQ11	18.2	1.7	26.0
WQ12	17.2	1.6	28.0
WQ15	33.9	20.0	48.0
WQ16	35.8	22.0	51.0
WQ17	26.3	20.0	40.0
WQ18	23.6	18.0	46.0
WQ19	22.3	15.0	26.0
WQ20	17.5	15.0	21.0

The average alkalinity throughout the Project area was 22.9 mg/L. The sampling locations with the highest concentrations of alkalinity were No Name Creek (WQ-09 and WQ10; range 85 – 87 mg/L). The higher alkalinity concentrations measured at these sites is attributed to soil rich in calcium carbonate ($CaCO3$) that is present under these waters (USDA/NRCS, 2008).

Hardness (Calcium Carbonate)

Hardness levels measured at all sample sites in 2016 are plotted in Figure 13. Average, minimum, and maximum hardness concentrations measured during the 2016 monitoring effort at each water quality monitoring site are presented in Table 8.

Table 8. Average, minimum, and maximum hardness concentrations (mg/L) measured at each monitoring site

Site	AVG	MIN	MAX
WQ1	3.6	2.0	6.4
WQ2	0.5	0.0	0.9
WQ3	8.1	7.4	9.9
WQ4	5.3	4.6	7.0
WQ5	8.1	5.6	11.0
WQ6	9.1	7.4	10.0
WQ9	59.3	25.0	83.0
WQ10	49.6	15.0	84.0
WQ11	13.1	12.0	16.0
WQ12	18.3	1.2	57.0
WQ15	23.6	15.0	33.0
WQ16	26.4	17.0	38.0
WQ17	17.7	15.0	21.0
WQ18	19.1	15.0	24.0
WQ19	14.9	10.0	19.0
WQ20	11.7	9.8	15.0

There is currently no Basin Plan objective for hardness. The average hardness throughout the Project area was 18.6 mg/L. The sampling locations with the highest hardness value were No Name Creek (WQ9 and WQ10; range = 83 – 84 mg/L). The geology at this location contains large quantities of calcium carbonate that naturally leach into the streams (USDA/NRCS, 2008) producing higher hardness (and alkalinity) concentrations at these locations.

Nitrate (Nitrate plus Nitrite)

Nitrate levels measured at all sample sites in 2016 are plotted in Figure 14.

There are currently no Basin Plan objectives for nitrate. However, the EPA recommends ambient water quality criteria for non-cancer health effects to be 10 mg/L (Water Quality Goals, 2011). Additionally, both the California and Federal primary contaminated levels in drinking water are 10 mg/L. The nitrate levels were extremely low throughout the Project area (range 0 – 0.3 mg/L).

Copper

There is no specific Basin Plan objective for copper; however, the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP, 2005), and the California Toxics Rule (CTR, 2000), provide a formula for deciphering a one-hour total recoverable dissolved copper limit based on its hardness value. This standard has been incorporated by adoption into the Basin Plan. With this standard, the lower the hardness value, the lower the available copper is in the water (greater copper concentration can be allowed due to limited availability of copper in the water table), and the greater the hardness value, the lower the copper concentration must be (more available dissolved copper can affect aquatic life).

The maximum criteria concentrations are provided in Table 9, which is included with the Figures at the end of this report. Of the 117 samples collected, copper levels exceeded the SIP/CTR one-hour total recoverable dissolved copper limits for 11 samples:

March 23, 2016

- Alder Creek above of Alder Creek Diversion Dam (WQ11)
- Alder Creek below of Alder Creek Diversion Dam (WQ12)
- Bull Creek below Bull Creek Diversion Dam (WQ16)
- Ogilby Creek above Ogilby Creek Diversion Dam (WQ17)

July 21, 2016

- Pyramid Creek below Lake Aloha Dam (WQ2)
- Caples Creek below Caples Lake Dam (WQ3)
- Esmeralda Creek above Esmeralda Creek Diversion Dam (WQ19)

September 30, 2016

- Caples Creek below Caples Lake Dam (WQ3)
- South Fork American River downstream of Kyburz Diversion Dam (WQ6)
- Alder Creek below of Alder Creek Diversion Dam (WQ12)

October 16, 2016

- Echo Creek below Echo Lake Dam (WQ1)

Aluminum

Aluminum concentrations measured at all sample sites in 2016 are plotted in Figure 15.

There are currently no Basin Plan objectives for aluminum. The U.S. Environmental Protection Agency recommends ambient water quality criteria for freshwater aquatic life expressed at a maximum concentration 1-hour average to be 750 ug/L (Water Quality Goals, 2011). Of the 117 samples collected, all but two samples were below 750 ug/L: one sample at No Name Creek below the diversion dam (WQ10) had an aluminium concentration of 890 ug/L on July 21, 2016 and the other sample from the South Fork American River above Kyburz diversion dam (WQ5) had an aluminium concentration of 840 ug/L on December 19, 2016.

E. coli

E. coli concentrations measured at all sample sites in 2016 are plotted in Figure 16. The E. coli concentrations recorded at each site in 2016 are provided in Table 10, which is included with the Figures at the end of this report.

The FS, SWRCB, ERC, and FERC approved a variance from the Plan to utilize Escherichia coli (E. coli) as the bacterial monitoring constituent in lieu of fecal and total coliform testing for the 2012, 2014 and 2016 monitoring efforts. The Basin Plan currently does not contain objectives for E. coli; however, the following water quality objective for bacteria was utilized in previous Project No. 184 water quality monitoring reports: "In all waters designated for contact recreation (REC-1), the E. coli concentration, based on a minimum of not less than five samples equally spaced over a 30 day period, shall not exceed a geometric mean of 126/100 ml and shall not exceed 235 per 100ml in any single sample."

Six of the 347 samples collected in 2016 (1.7%) exceeded the single sample criterion (>235 MPN/100 ml). Five of these samples were collected at sites upstream of project facilities including four samples at Esmeralda Creek above the diversion (WQ19) on 7/1/16 = 276 MPN/100 ml; 7/28/16 = 488 MPN/100 ml; 8/22/16 = 980 MPN/100 ml; and 9/6/16 = 249 MPN/100 ml and one sample at Ogilby Creek above the diversion (WQ17). The geometric mean for five samples equally spaced over a 30 day period for each sample described above did not exceed 126 MPN/100 ml. The final sample that exceeded the single sample criterion was collected at Echo Creek below Echo Dam (WQ1) on 9/30/16 = >2,419 MPN/100 ml. The geometric mean for five samples at this site was 21.9 MPN/100 ml, which is well below the geometric mean criterion of 126 MPN/100 ml.

5.0 Conclusions

Measurements for *in-situ* parameters were similar above and below the diversion dams along each stream reach and provide normal distributions across the sampling locations based on stream flow elevation and time of year. Laboratory-measured analytical parameters were also similar above and below the diversion dams in the Project-affected stream reaches. Project operations do not show any measureable increase or decrease in water quality parameters in almost all cases. Therefore, project operations do not appear to affect water quality in the stream reaches.

Water quality in the Project area was within an acceptable range of most all applicable Basin Plan objectives and other criteria during the 2016 monitoring program. Therefore, Project operations did not appear to adversely affect water quality in the stream reaches within the vicinity of the Project.

6.0 Recommendations

The District plans to develop a proposal to reduce or eliminate future water quality monitoring efforts based on the water quality data collected during 2008, 2010, 2012, 2014, and 2016 monitoring seasons. The District plans to distribute the proposal for review and consideration of approval to the FS, SWRCB, and ERC in the summer 2017.

7.0 Literature Cited

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Figures

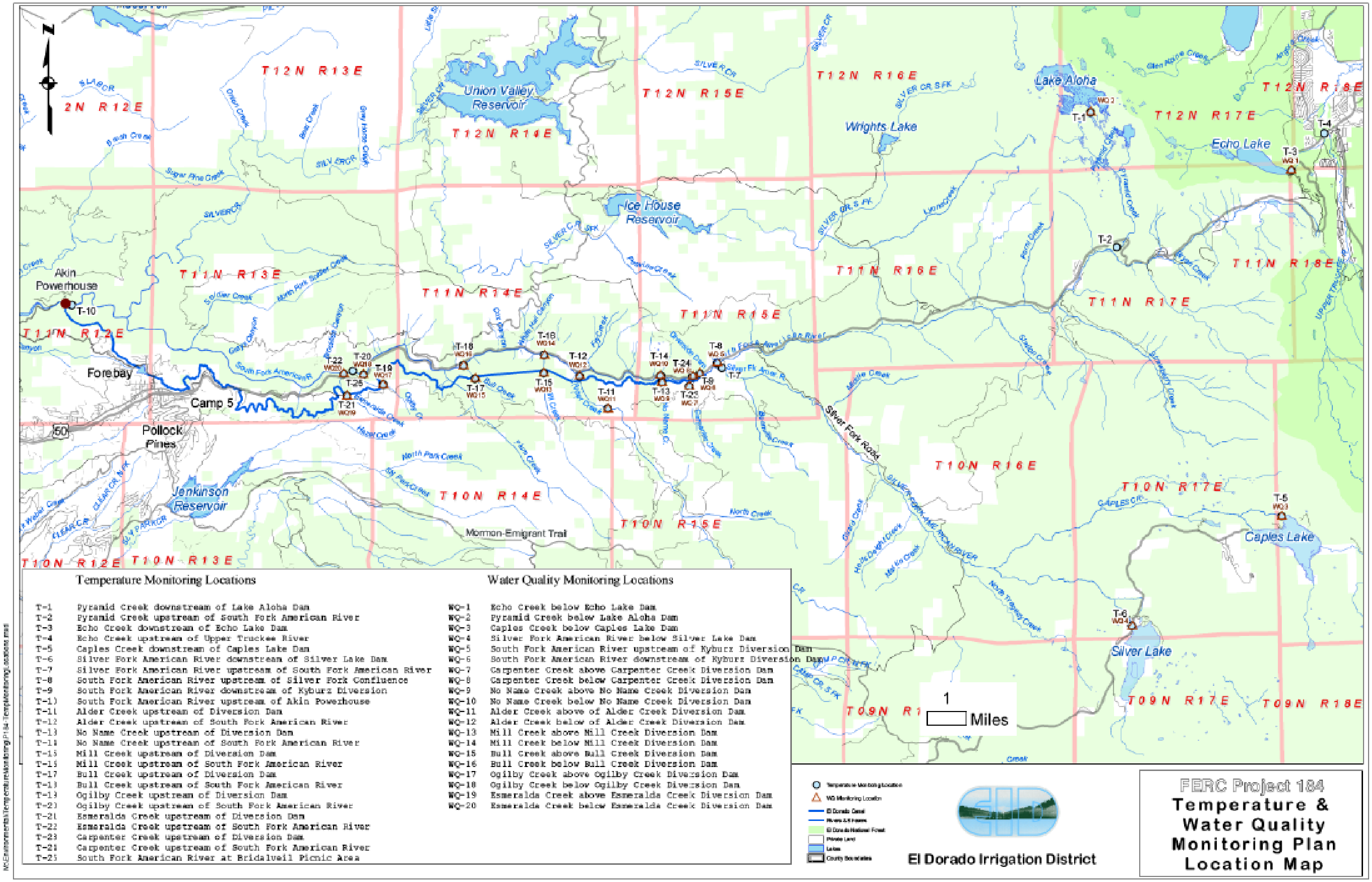

Figure 1. Water Quality Monitoring Sites

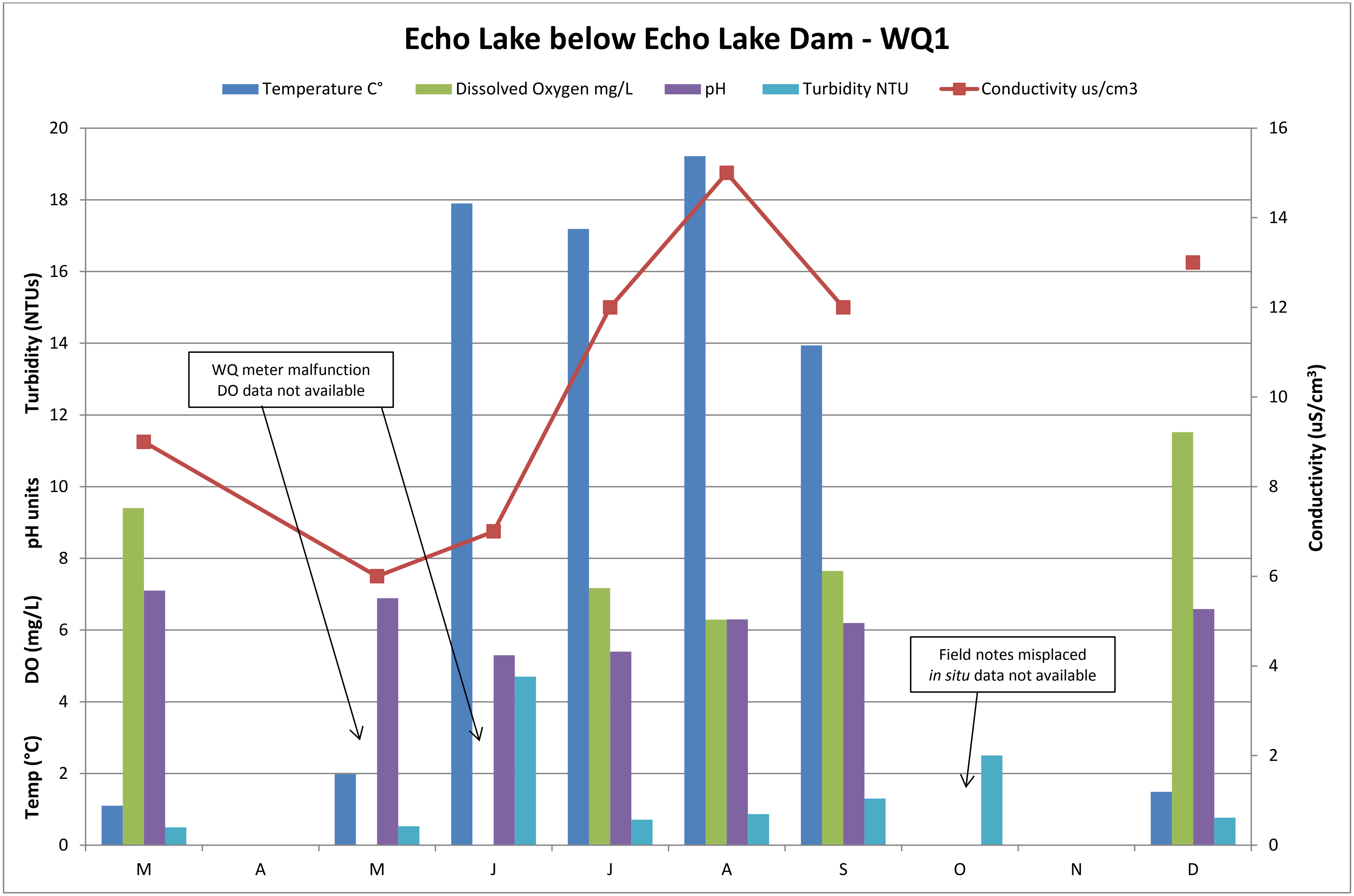

Figure 2. Water temperature, DO, pH, turbidity, and conductivity measured at Echo Lake below Echo Lake Dam - WQ1 in 2016

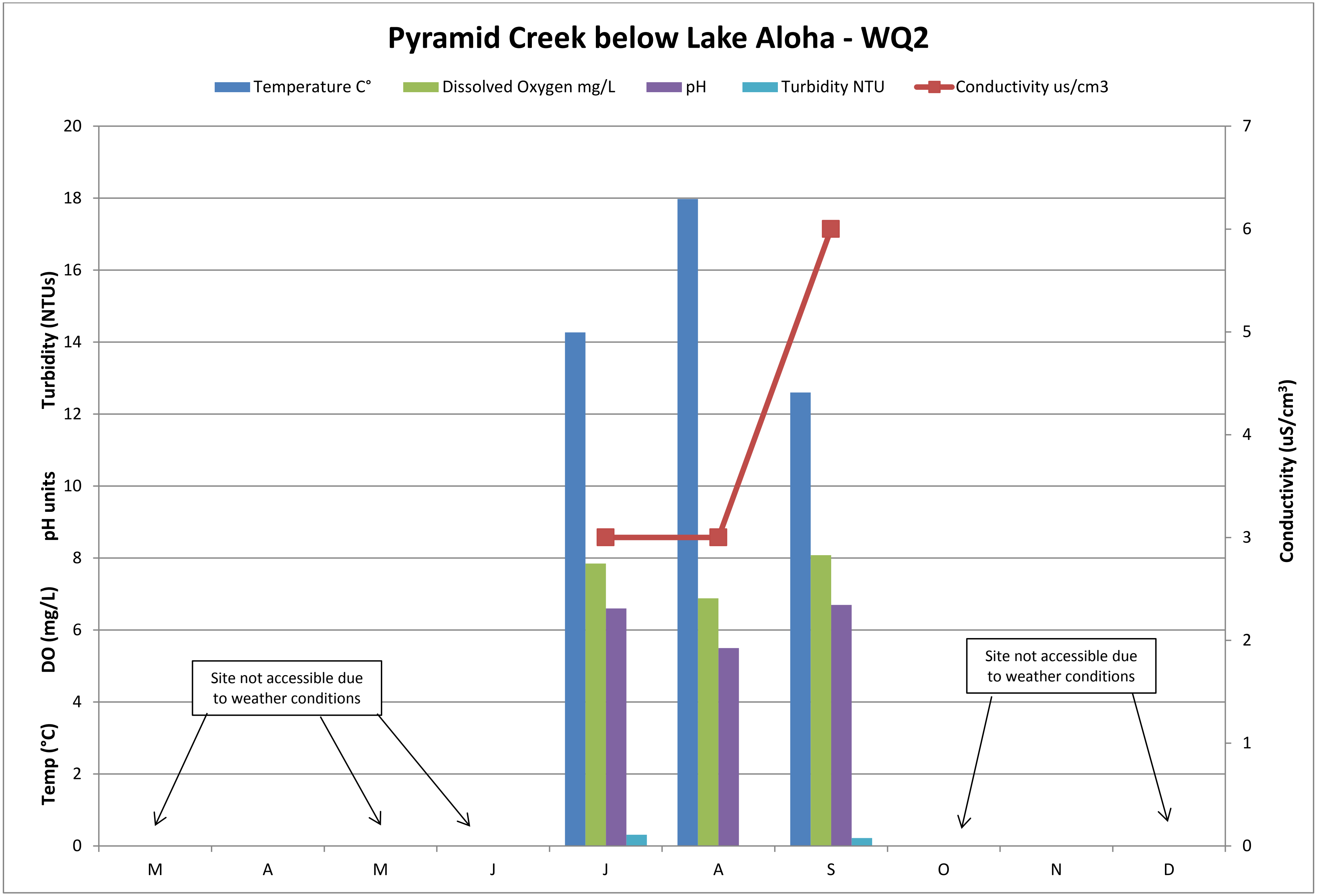

Figure 3. Water temperature, DO, pH, turbidity, and conductivity measured at Pyramid Creek below Lake Aloha - WQ2 in 2016

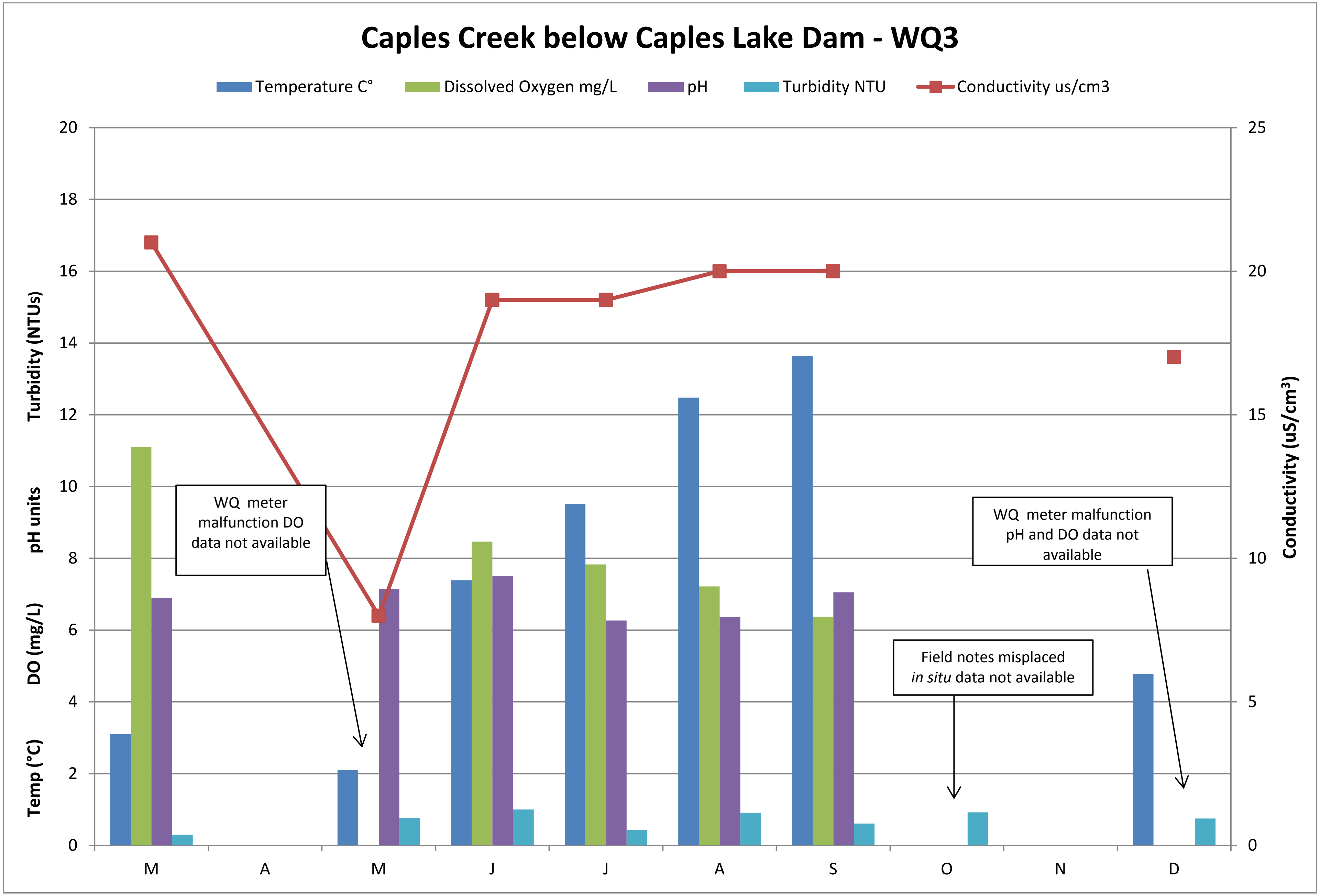

Figure 3. Water temperature, DO, pH, turbidity, and conductivity measured at Caples Creek below Caples Lake Dam – WQ3 in 2016

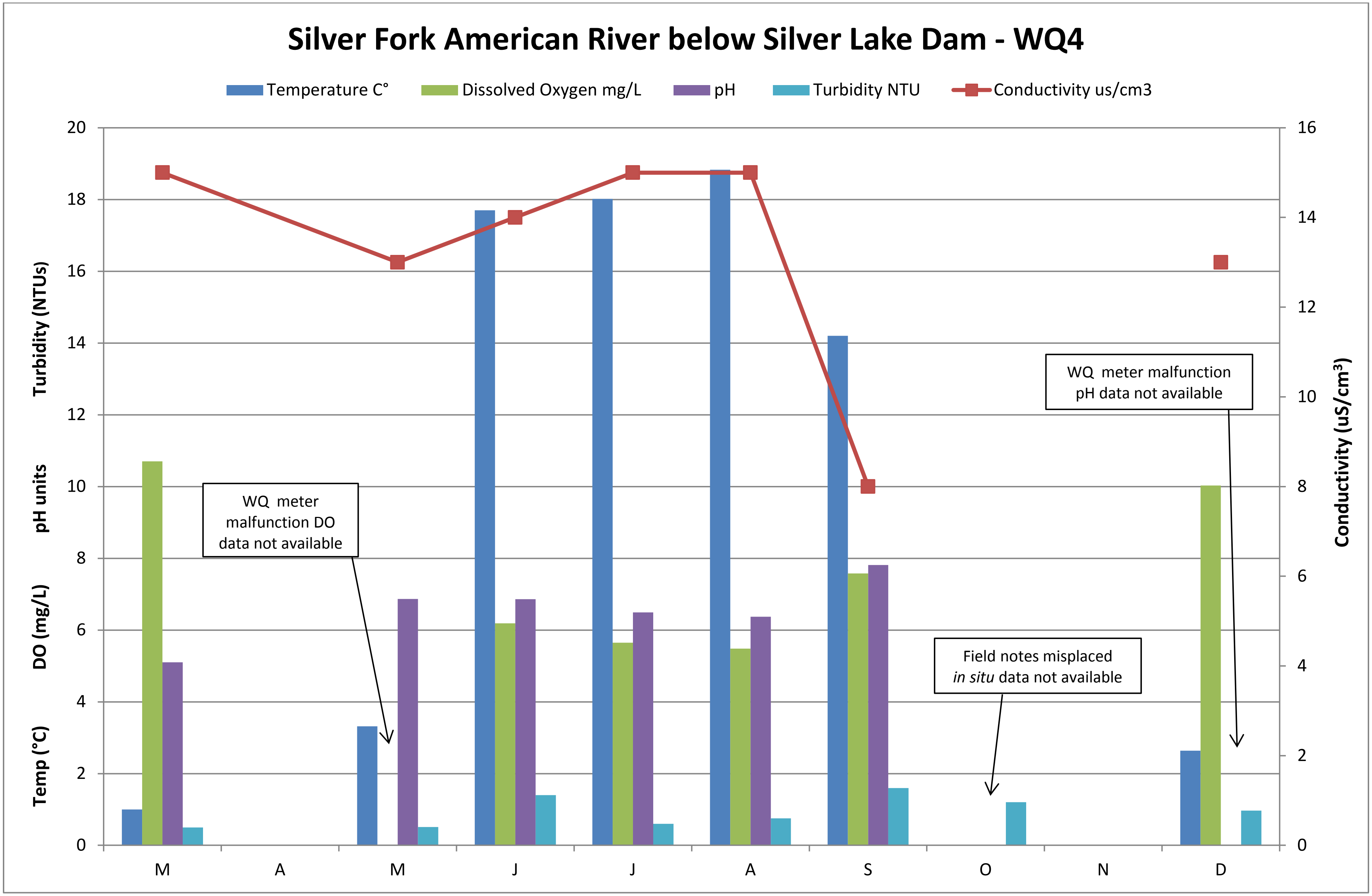

Figure 4. Water temperature, DO, pH, turbidity, and conductivity measured at Silver Fork American River below Silver Lake Dam - WQ4 in 2016

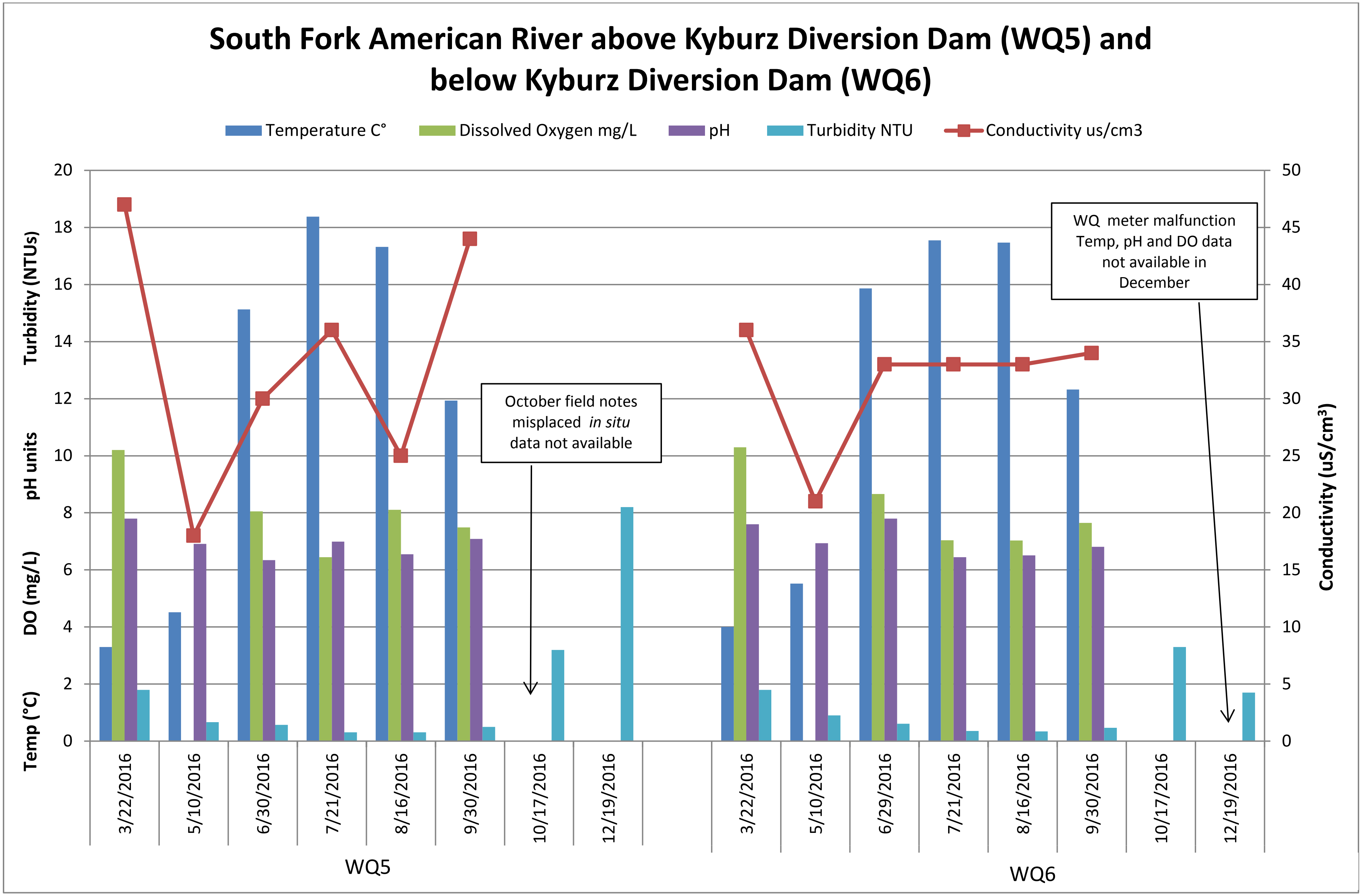

Figure 5. Water temperature, DO, pH, turbidity, and conductivity measured at SFAR above (WQ5) and below (WQ6) Kyburz Diversion Dam in 2016

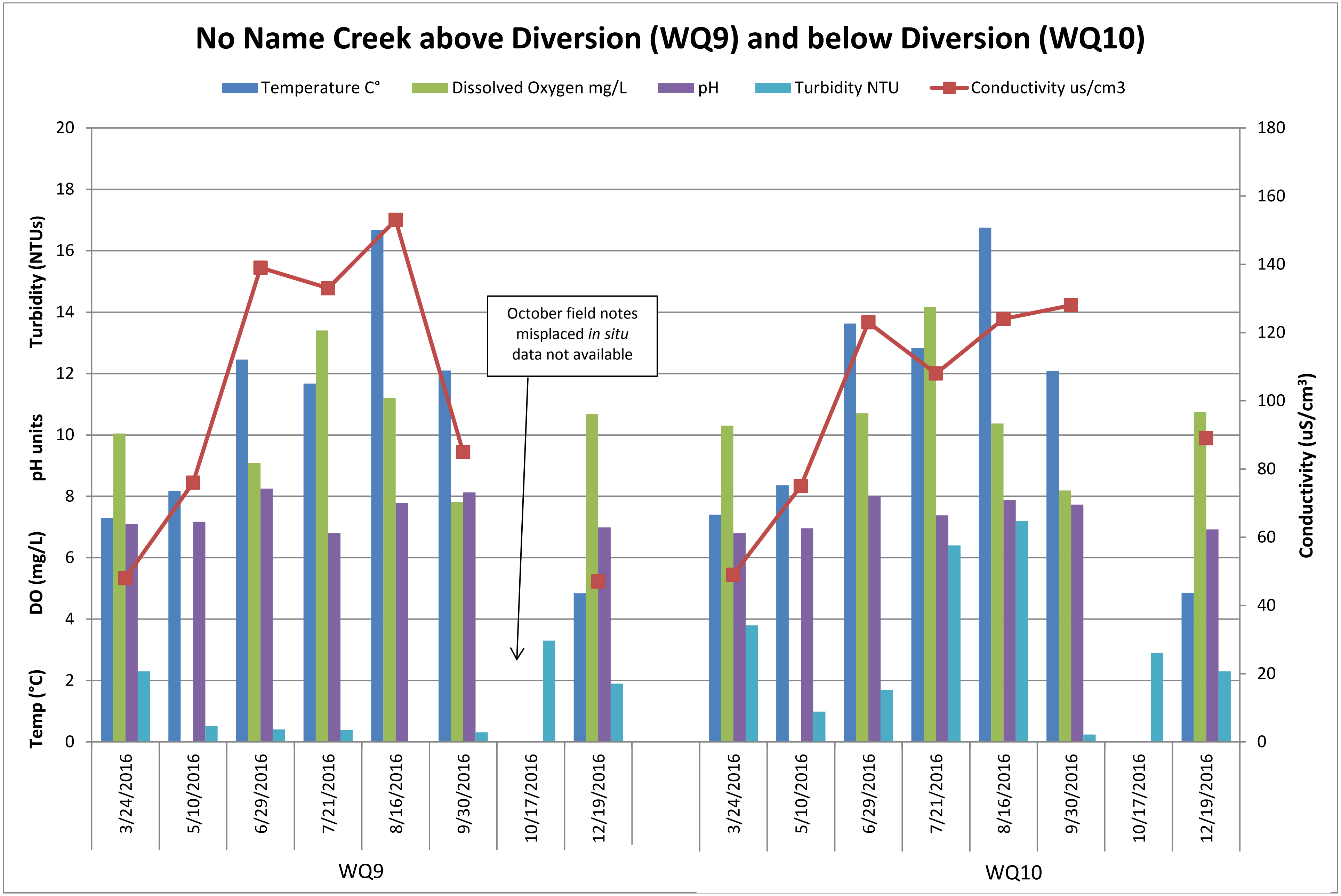

Figure 6. Water temperature, DO, pH, turbidity, and conductivity measured at No Name Creek above (WQ9) and below (WQ10) diversion in 2016

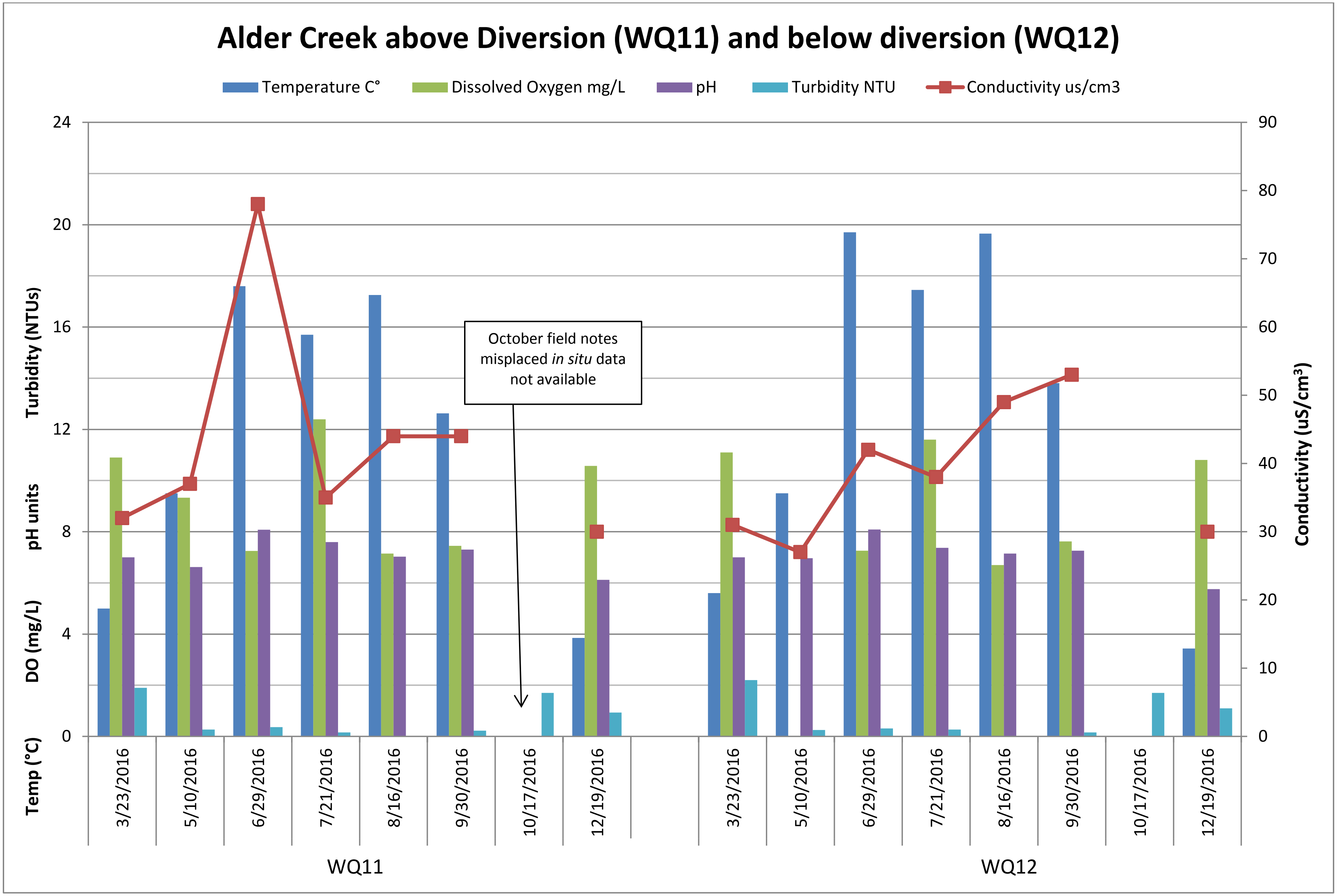

Figure 7. Water temperature, DO, pH, turbidity, and conductivity measured at Alder Creek above (WQ11) and below (WQ12) diversion in 2016

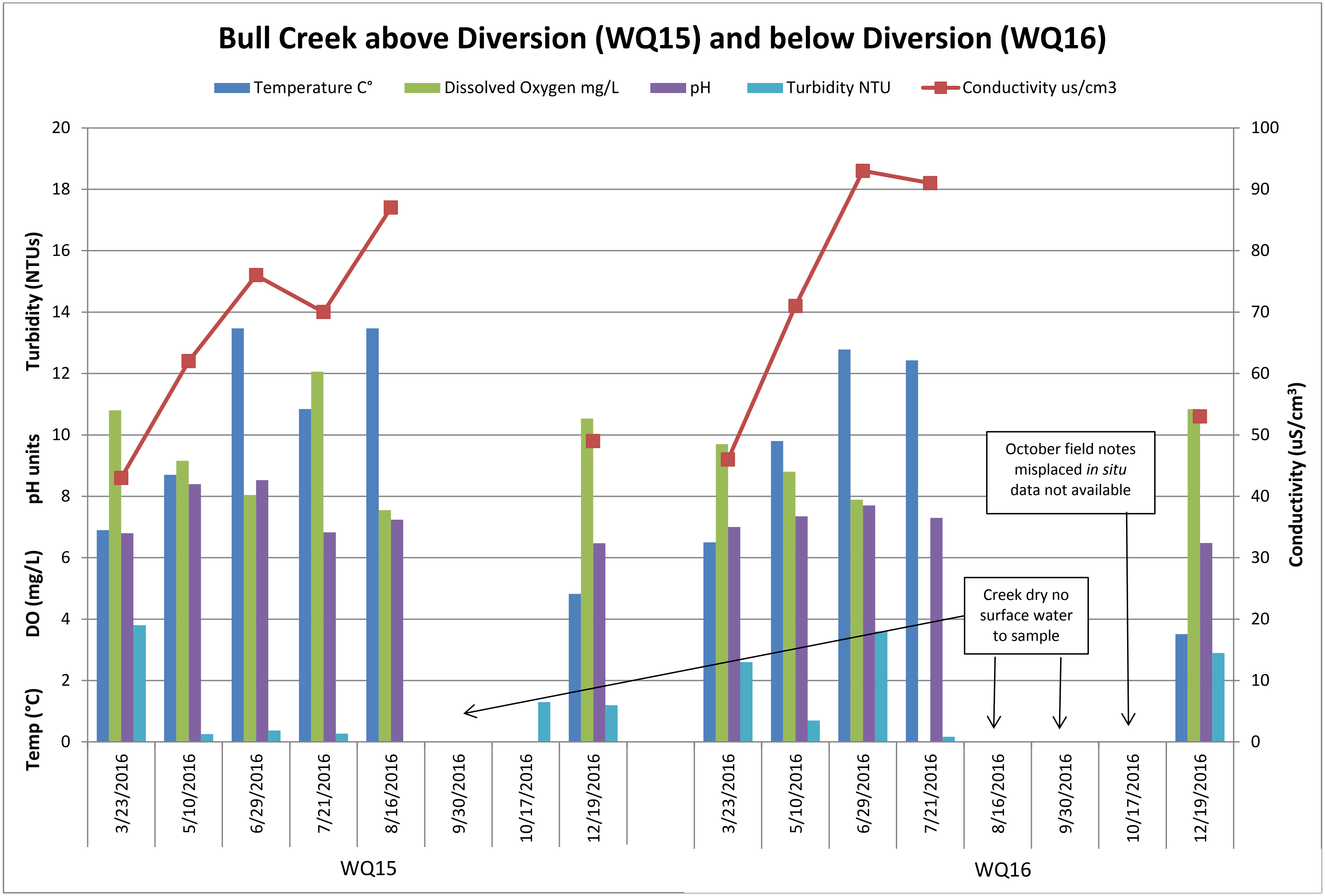

Figure 8. Water temperature, DO, pH, turbidity, and conductivity measured at Bull Creek above (WQ15) and below (WQ16) diversion in 2016

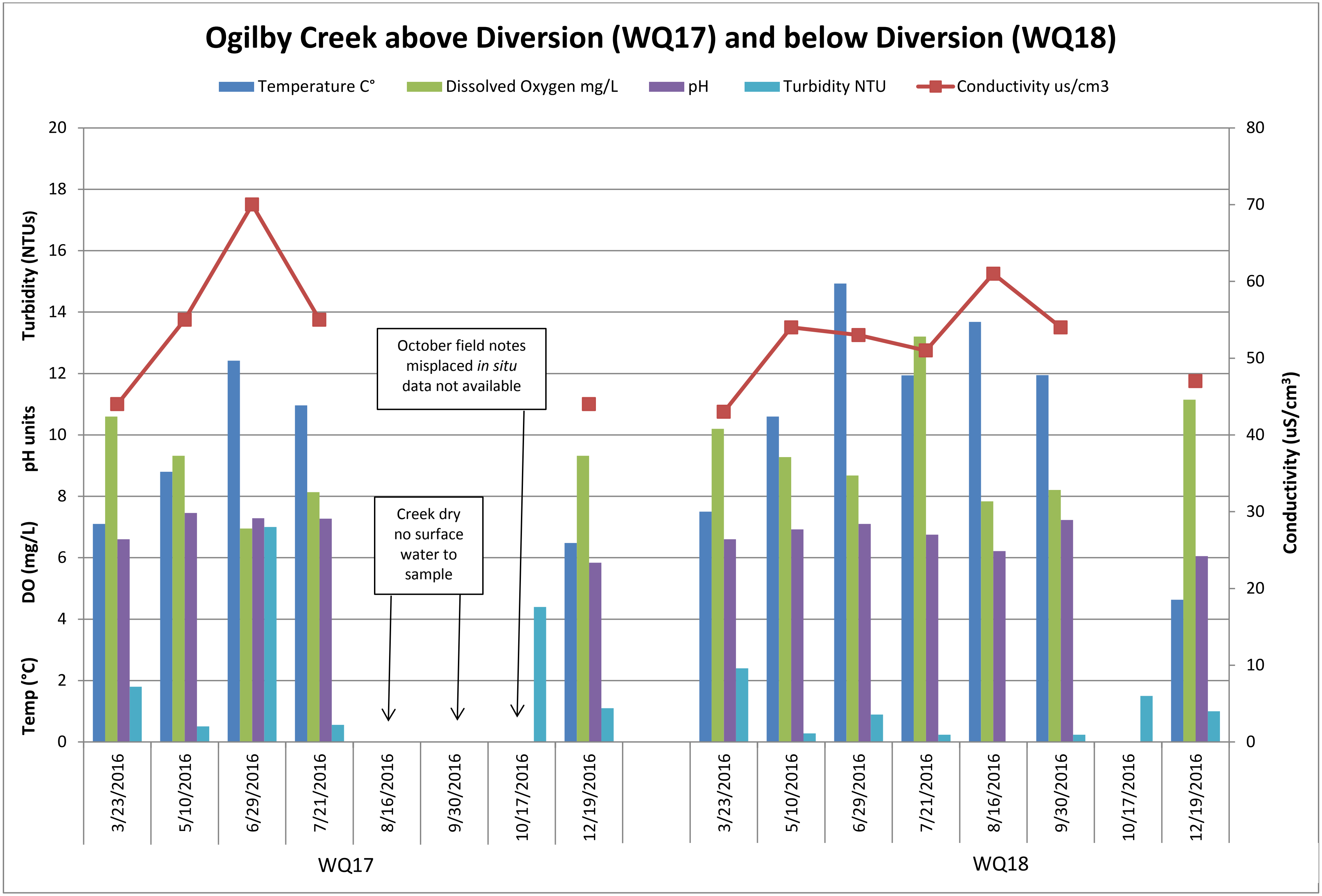

Figure 9. Water temperature, DO, pH, turbidity, and conductivity measured at Ogilby Creek above (WQ17) and below (WQ18) diversion in 2016

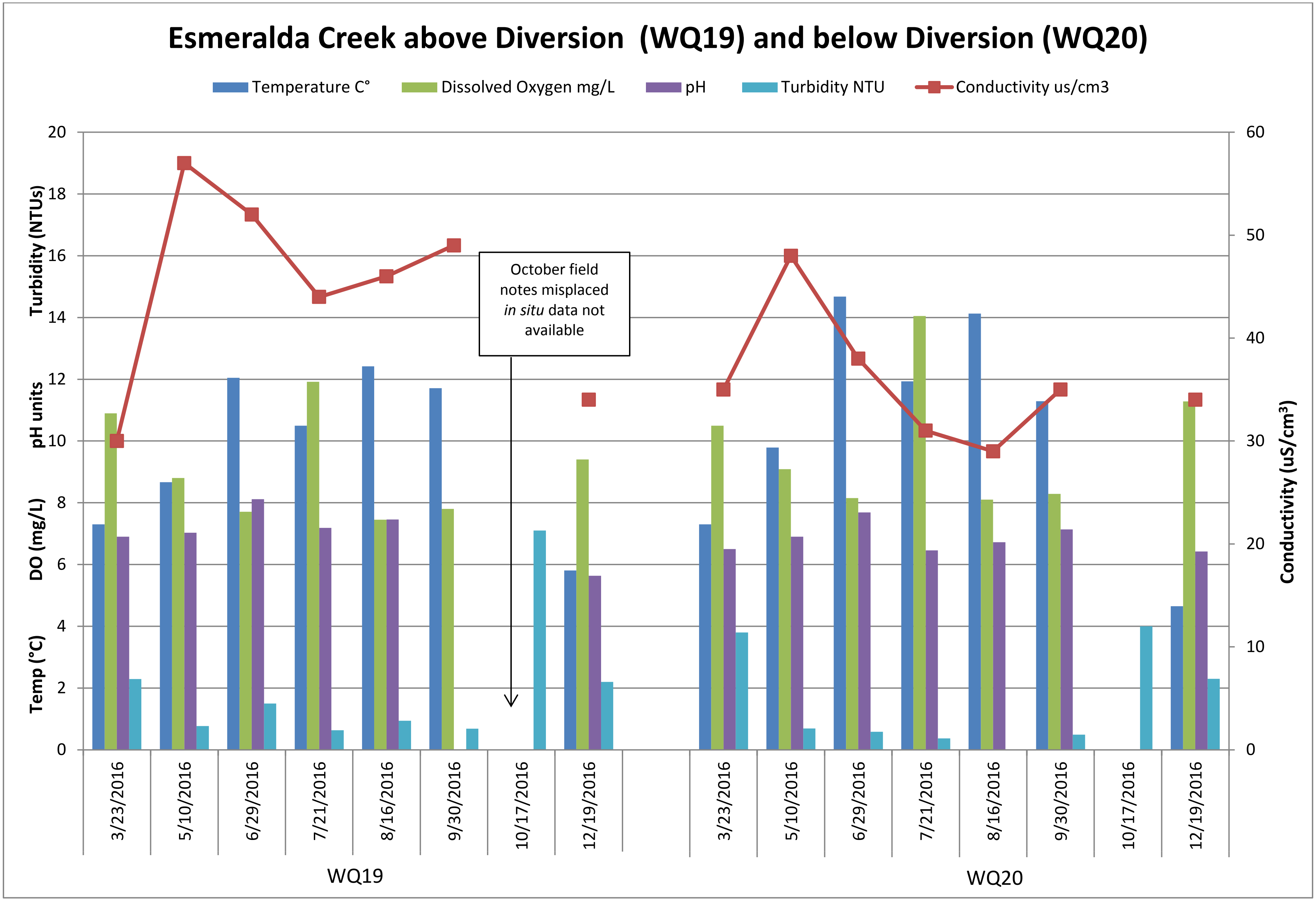

Figure 10. Water temperature, DO, pH, turbidity, and conductivity measured at Esmeralda Creek above (WQ19) and below (WQ20) diversion in 2016

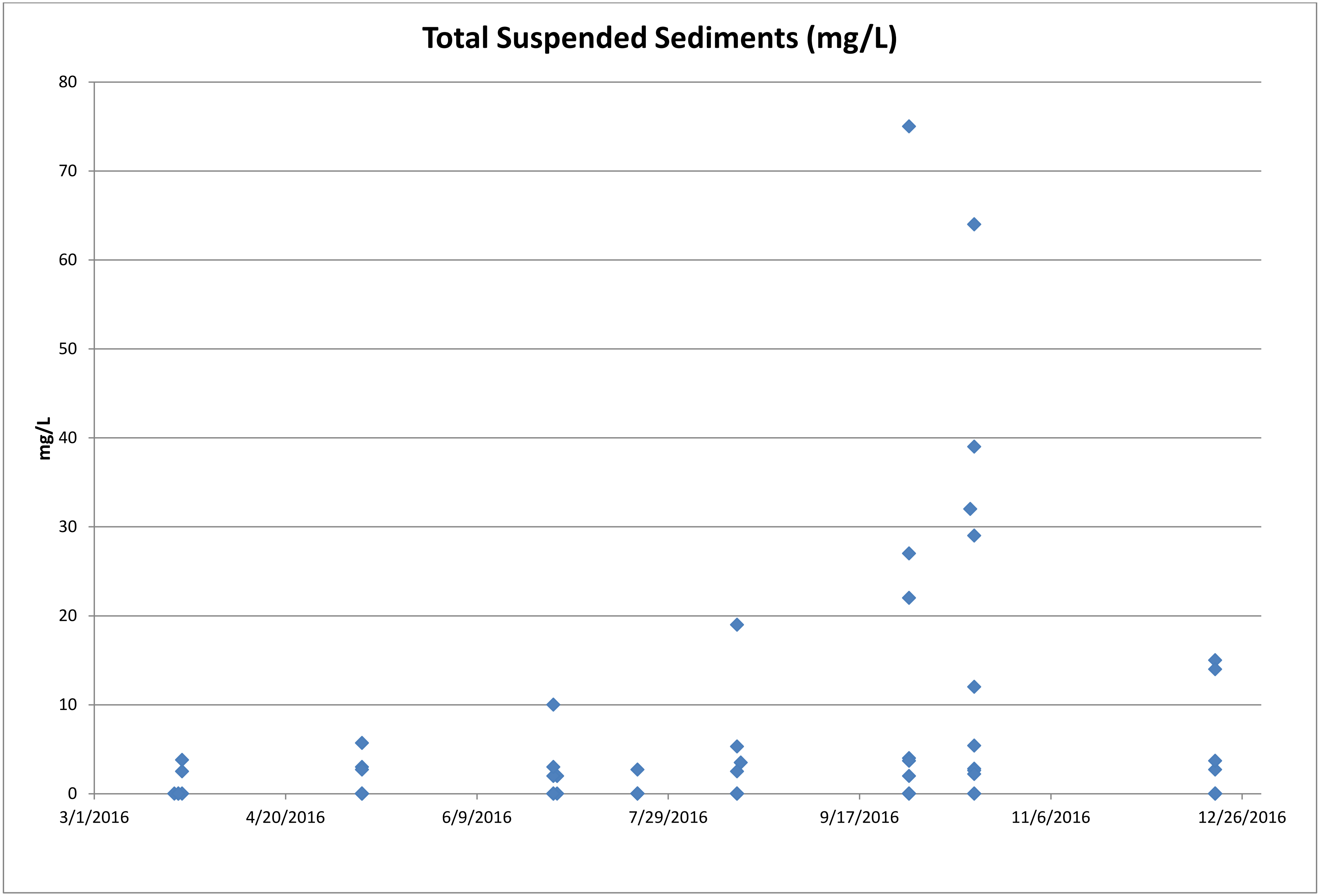

Figure 11. Total Suspended Sediment concentrations (mg/L) measured at all sample sites in 2016

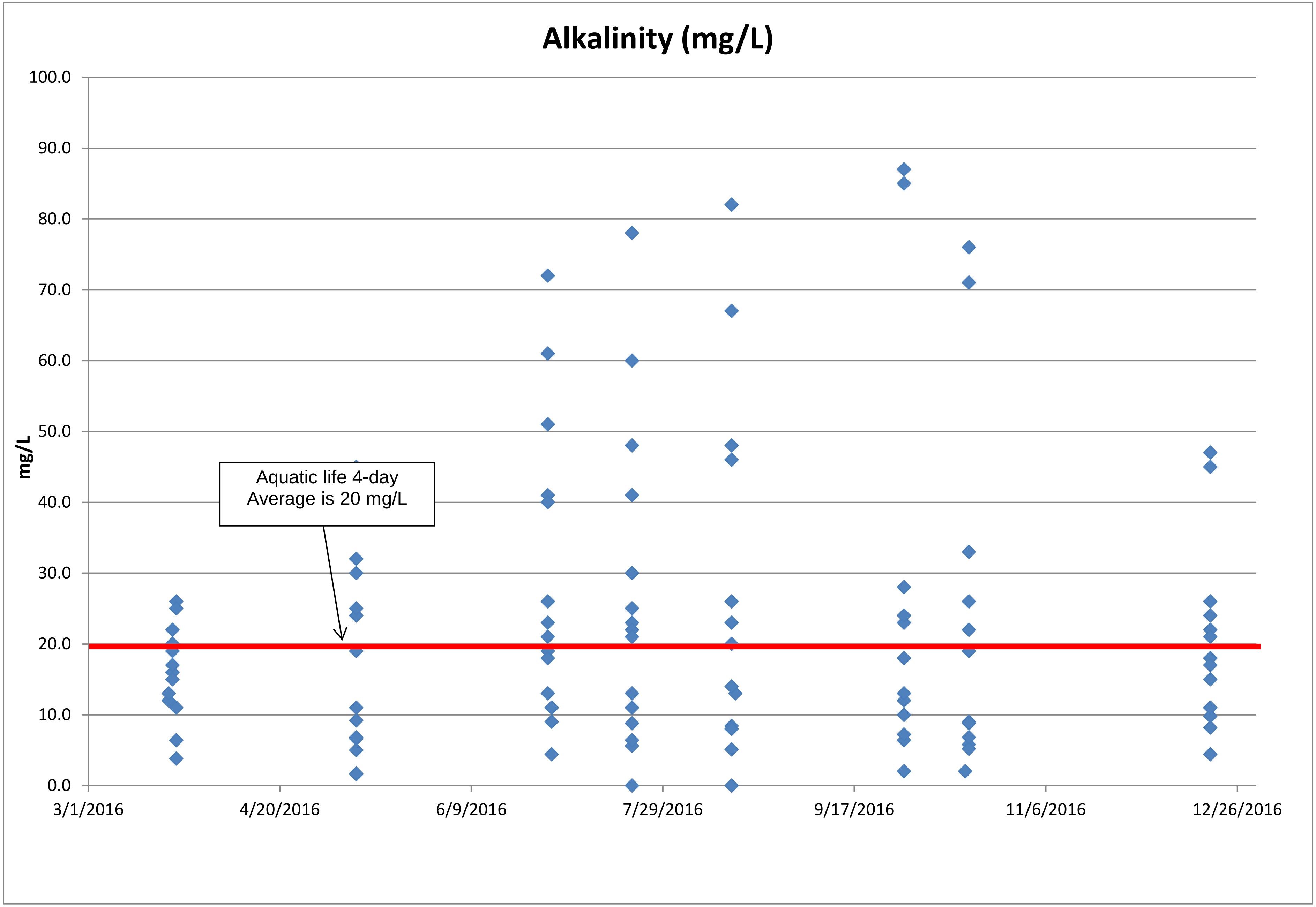

Figure 12. Alkalinity concentrations (mg/L) measured at all sample sites in 2016

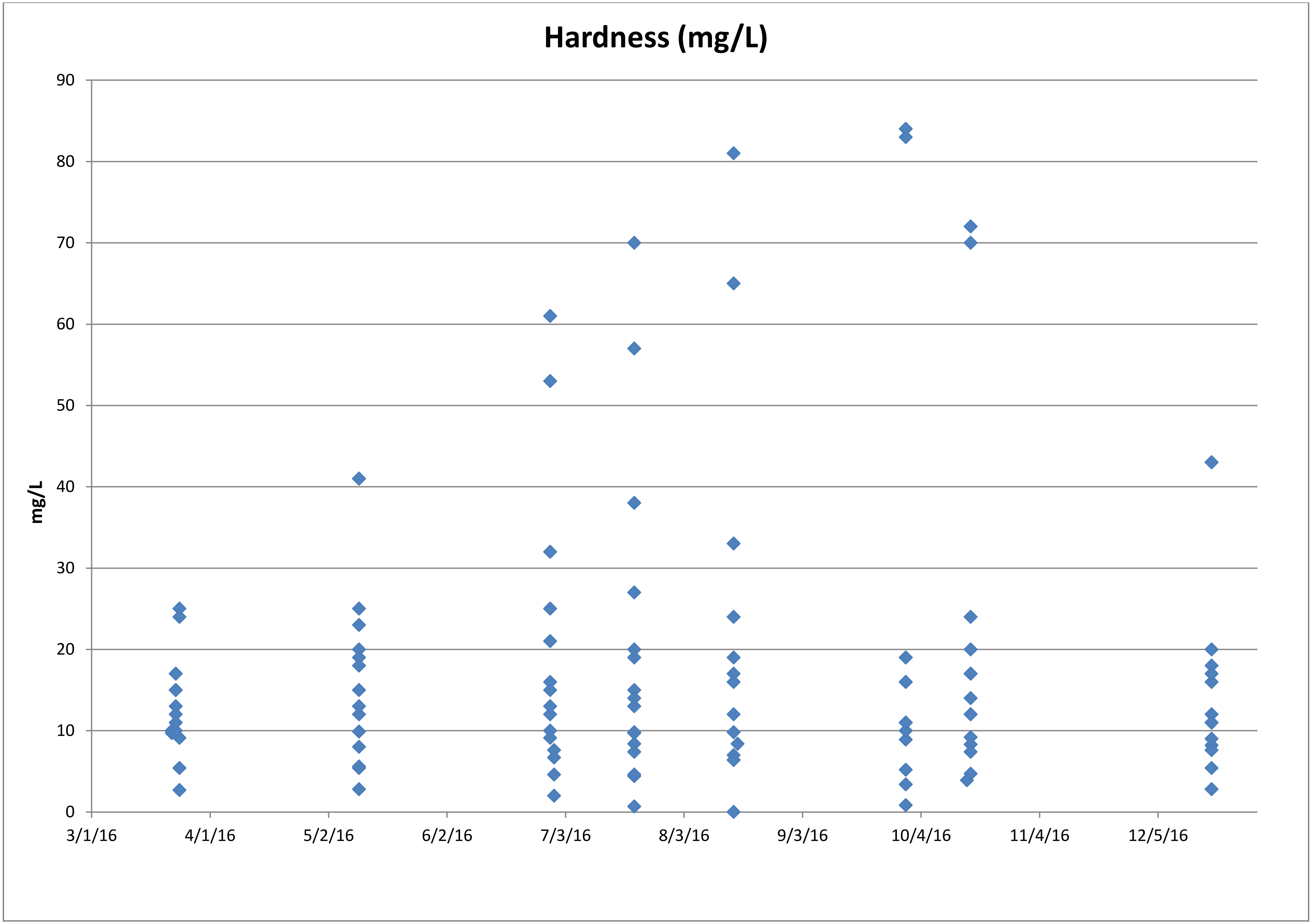

Figure 13. Hardness concentrations (mg/L) measured at all sample sites in 2016

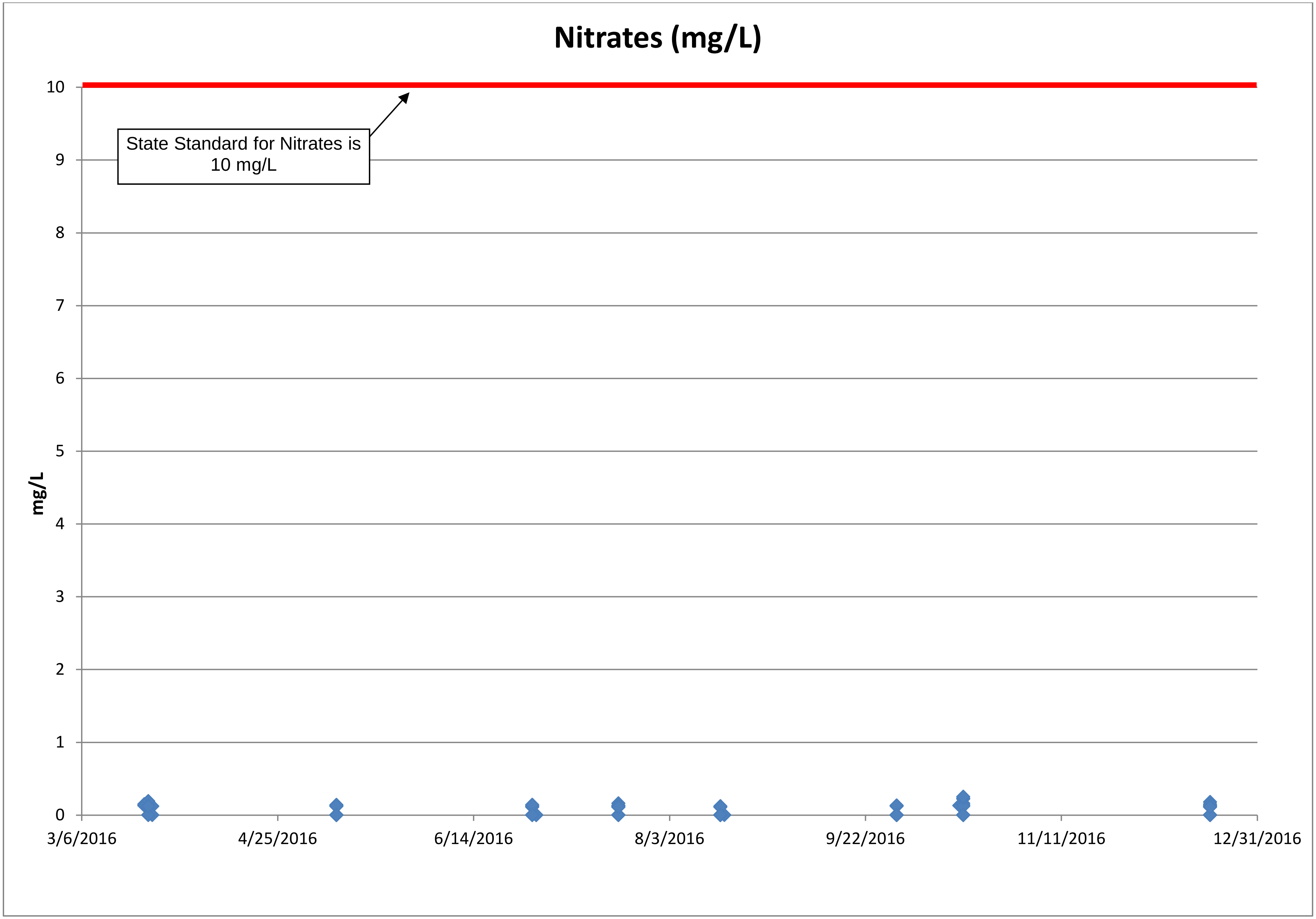

Figure 14. Nitrate concentrations (mg/L) measured at all sample sites in 2016

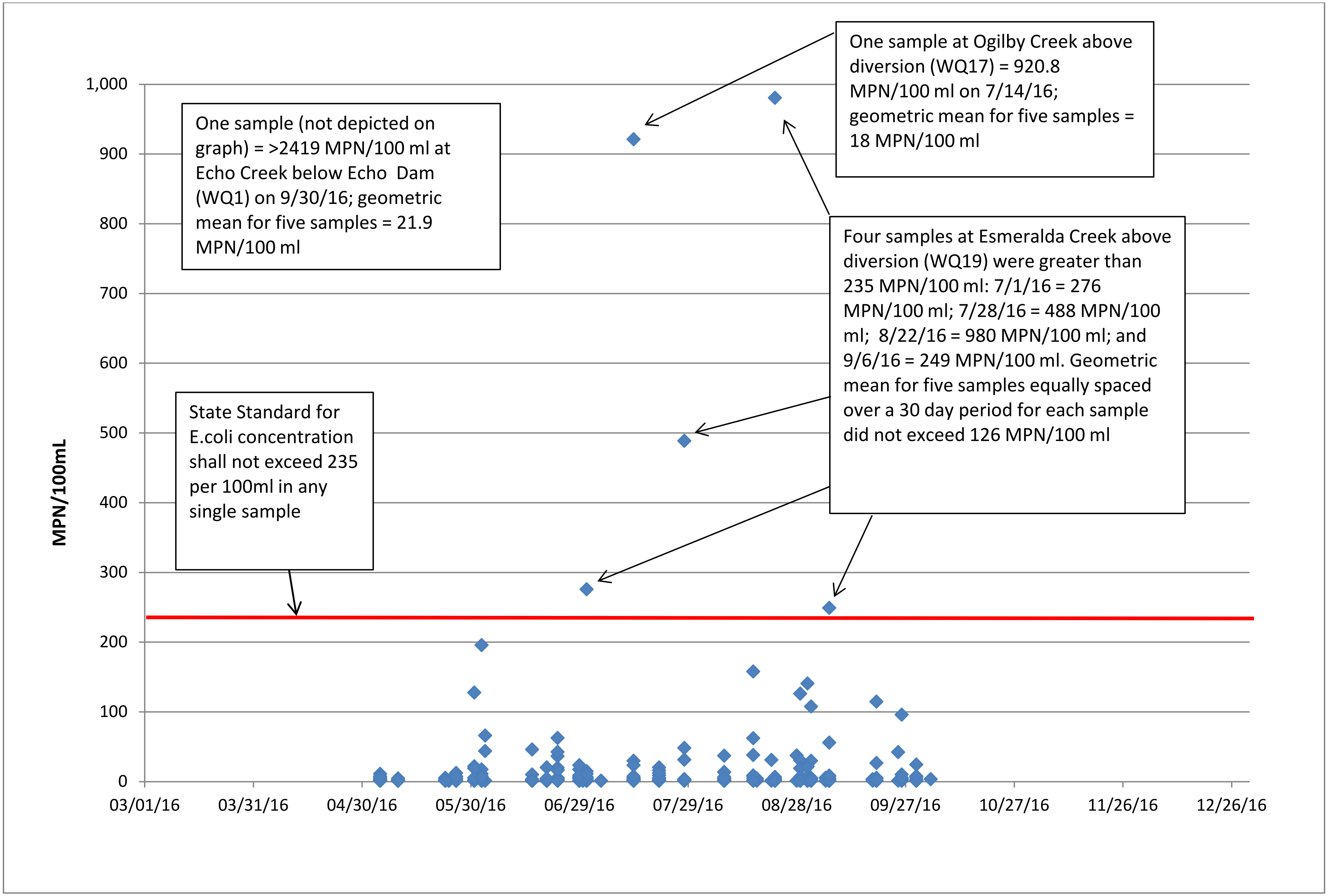

Figure 16. E.coli concentrations (MPN/100 mL) measured at all sample sites in 2016

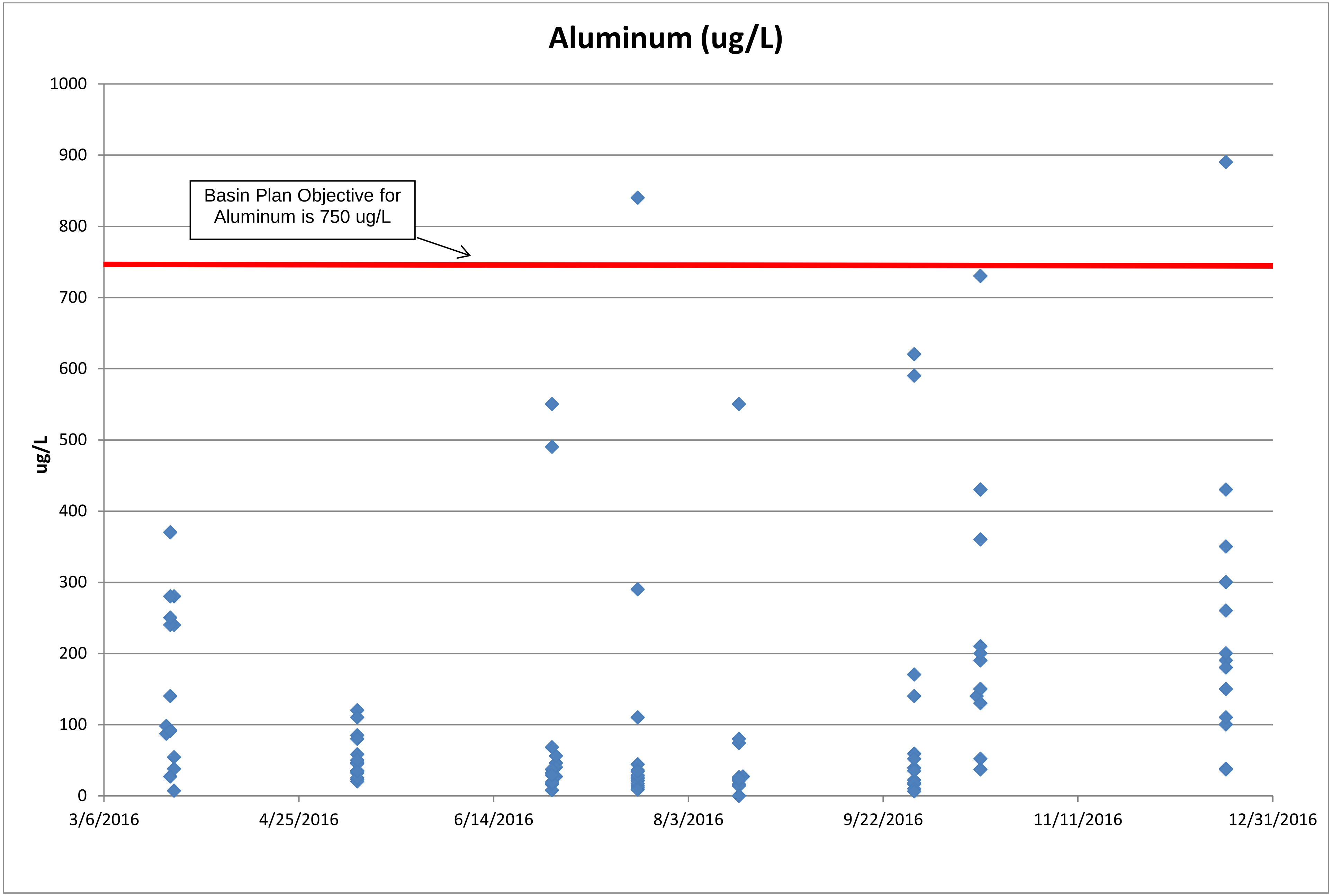

Figure 15. Aluminum concentrations (ug/L) measured at all sample sites in 2016

Table 9. Water Quality Limits for Constituents and Parameters for Copper per California Toxics Rule Criteria to protect freshwater aquatic life

Results based on the following equation:

Criteria Maximum Concentration (1-hour Average, dissolved) = (e{0.9422[ln(hardness)] – 1.700})

Sample ID	Date	Copper ug/L	Copper ug/L	Hardness CaCO3 mg/L	Max dissolved Concentration (ug/L)	Meet or exceed acute criterion
WQ-01	3/24/2016	ND	0	2.7	0.4471	ND
WQ-01	5/10/2016	0.36	0.36	2.8	0.4627	MEET
WQ-01	6/30/2016	0.21	0.21	2	0.3370	MEET
WQ-01	7/21/2016	0.38	0.38	4.4	0.7083	MEET
WQ-01	8/16/2016	ND	0	6.4	1.0082	ND
WQ-01	9/30/2016	0.3	0.3	3.4	0.5556	MEET
WQ-01	10/16/2016	1.1	1.1	3.9	0.6322	EXCEED
WQ-01	12/19/2016	0.33	0.33	2.8	0.4627	MEET
WQ-02	7/21/2016	0.23	0.23	0.68	0.0000	EXCEED
WQ-02	8/16/2016	ND	0	ND	0.0000	ND
WQ-02	9/30/2016	ND	0	0.85	0.1505	ND
WQ-03	3/24/2016	ND	0	9.1	0.0000	ND
WQ-03	5/10/2016	0.27	0.27	9.9	1.5208	MEET
WQ-03	6/30/2016	0.24	0.24	7.6	1.1854	MEET
WQ-03	7/21/2016	1.5	1.5	7.4	1.1560	EXCEED
WQ-03	8/17/2016	1.3	1.3	8.4	1.3026	MEET
WQ-03	9/30/2016	2.2	2.2	8.9	1.3756	EXCEED
WQ-03	10/17/2016	0.24	0.24	8.3	1.2880	MEET
WQ-03	12/19/2016	0.44	0.44	8.2	1.2734	MEET
WQ-04	3/24/2016	0.2	0.2	5.4	0.8591	MEET
WQ-04	5/10/2016	0.15	0.15	5.4	0.8591	MEET
WQ-04	6/30/2016	0.18	0.18	4.6	0.7386	MEET
WQ-04	7/21/2016	0.23	0.23	4.6	0.7386	MEET
WQ-04	8/16/2016	0.44	0.44	7.0	1.0970	MEET
WQ-04	9/30/2016	0.62	0.62	5.2	0.8291	MEET
WQ-04	10/17/2016	ND	0	4.7	0.7537	ND
WQ-04	12/19/2016	0.38	0.38	5.4	0.8591	MEET
WQ-05	3/22/2016	ND	0	9.7	1.4918	ND
WQ-05	5/10/2016	0.17	0.17	5.6	0.8890	MEET
WQ-05	6/30/2016	0.23	0.23	6.7	1.0527	MEET
WQ-05	7/21/2016	0.68	0.68	8.4	1.3026	MEET
WQ-05	8/16/2016	0.61	0.61	6.4	1.0082	MEET
WQ-05	9/30/2016	0.27	0.27	11.0	1.6795	MEET
WQ-05	10/17/2016	0.78	0.78	9.2	1.4192	MEET
WQ-05	12/19/2016	0.6	0.6	7.6	1.1854	MEET
WQ-06	3/22/2016	ND	0	10.0	1.5352	ND
WQ-06	5/10/2016	0.18	0.18	8.0	1.2441	MEET
WQ-06	6/29/2016	0.25	0.25	9.1	1.4047	MEET
WQ-06	7/21/2016	1.3	1.3	9.7	1.4918	MEET
WQ-06	8/16/2016	0.25	0.25	9.8	1.5063	MEET
WQ-06	9/30/2016	2	2	10.0	1.5352	EXCEED
WQ-06	10/17/2016	0.63	0.63	7.4	1.1560	MEET
WQ-06	12/19/2016	0.32	0.32	9.0	1.3901	MEET
WQ-09	3/24/2016	ND	0	25.0	3.6401	ND
WQ-09	5/10/2016	0.15	0.15	41.0	5.8014	MEET
WQ-09	6/29/2016	0.19	0.19	61.0	8.4355	MEET
WQ-09	7/21/2016	0.15	0.15	70.0	9.6033	MEET
WQ-09	8/16/2016	ND	0	81	11.0191	ND
WQ-09	9/30/2016	0.19	0.19	83.0	11.2752	MEET
WQ-09	10/17/2016	0.8	0.8	70.0	9.6033	MEET
WQ-09	12/19/2016	0.54	0.54	43.0	6.0677	MEET
WQ-10	3/24/2016	0.2	0.15	24.0	3.5027	MEET
WQ-10	5/10/2016	0.3	0.3	41.0	5.8014	MEET
WQ-10	6/29/2016	0.89	0.89	53.0	7.3890	MEET

Sample ID	Date	Copper ug/L	Copper ug/L	Hardness CaCO3 mg/L	Max dissolved Concentration (ug/L)	Meet or exceed acute criterion
WQ-10	7/21/2016	1.1	1.1	15.0	2.2495	MEET
WQ-10	8/16/2016	ND	0	65.0	8.9557	ND
WQ-10	9/30/2016	0.14	0.14	84.0	11.4032	MEET
WQ-10	10/17/2016	0.80	0.8	72.0	9.8616	MEET
WQ-10	12/19/2016	0.55	0.55	43.0	6.0677	MEET
WQ-11	3/23/2016	3.3	3.3	12.0	1.8230	EXCEED
WQ-11	5/10/2016	0.11	0.11	12.0	1.8230	MEET
WQ-11	6/29/2016	ND	0	12.0	1.8230	ND
WQ-11	7/21/2016	0.15	0.15	13.0	1.9657	MEET
WQ-11	8/16/2016	ND	0	16.0	2.3905	ND
WQ-11	9/30/2016	0.67	0.67	16.0	2.3905	MEET
WQ-11	10/17/2016	0.46	0.46	12.0	1.8230	MEET
WQ-11	12/19/2016	0.21	0.21	12.0	1.8230	MEET
WQ-12	3/23/2016	7.1	7.1	13.0	1.9657	EXCEED
WQ-12	5/10/2016	ND	0	13.0	1.9657	ND
WQ-12	6/29/2016	ND	0	13.0	1.9657	ND
WQ-12	7/21/2016	ND	0	57.0	7.9133	ND
WQ-12	8/16/2016	ND	0	19.0	2.8107	ND
WQ-12	9/30/2016	4.8	4.8	19.0	2.8107	EXCEED
WQ-12	10/17/2016	0.57	0.57	12.0	1.8230	MEET
WQ-12	12/19/2016	0.22	0.22	11.0	1.6795	MEET
WQ-15	3/23/2016	0.17	0.17	15.0	2.2495	MEET
WQ-15	5/10/2016	0.18	0.18	23.0	3.3650	MEET
WQ-15	6/29/2016	0.09	0.09	25.0	3.6401	MEET
WQ-15	7/21/2016	2.8	2.8	27.0	3.9138	MEET
WQ-15	8/16/2016	ND	0	33.0	4.7284	ND
WQ-15	10/17/2016	0.6	0.6	24.0	3.5027	MEET
WQ-15	12/19/2016	0.7	0.7	18.0	2.6711	MEET
WQ-16	3/23/2016	14.00	14	17.0	2.5310	EXCEED
WQ-16	5/10/2016	0.51	0.51	25.0	3.6401	MEET
WQ-16	6/29/2016	1.1	1.1	32.0	4.5933	MEET
WQ-16	7/21/2016	0.4	0.4	38.0	5.4006	MEET
WQ-16	12/19/2016	0.64	0.64	20.0	2.9499	MEET
WQ-17	3/23/2016	6.4	6.4	15.0	2.2495	EXCEED
WQ-17	5/10/2016	0.11	0.11	18.0	2.6711	MEET
WQ-17	6/29/2016	0.13	0.13	21.0	3.0886	MEET
WQ-17	7/21/2016	0.21	0.21	19.0	2.8107	MEET
WQ-17	10/17/2016	0.51	0.51	17.0	2.5310	MEET
WQ-17	12/19/2016	0.21	0.21	16.0	2.3905	MEET
WQ-18	3/23/2016	ND	0	17.0	2.5310	ND
WQ-18	5/10/2016	0.35	0.35	20.0	2.9499	MEET
WQ-18	6/29/2016	0.23	0.23	16	2.3905	MEET
WQ-18	7/21/2016	0.4	0.4	20.0	2.9499	MEET
WQ-18	8/16/2016	ND	0	24.0	3.5027	ND
WQ-18	9/30/2016	0.25	0.25	19.0	2.8107	MEET
WQ-18	10/17/2016	1.3	1.3	20.0	2.9499	MEET
WQ-18	12/19/2016	0.32	0.32	17.0	2.5310	MEET
WQ-19	3/23/2016	ND	0	10.0	1.5352	ND
WQ-19	5/10/2016	ND	0	19.0	2.8107	ND
WQ-19	6/29/2016	ND	0	15.0	2.2495	ND
WQ-19	7/21/2016	3.7	3.7	14.0	2.1079	EXCEED
WQ-19	8/16/2016	ND	0	17.0	2.5310	ND

Sample ID	Date	Copper ug/L	Copper ug/L	Hardness CaCO3 mg/L	Max dissolved Concentration (ug/L)	Meet or exceed acute criterion
WQ-19	9/30/2016	0.33	0.33	16.0	2.3905	MEET
WQ-19	10/17/2016	0.61	0.61	17.0	2.5310	MEET
WQ-19	12/19/2016	0.23	0.23	11.0	1.6795	MEET
WQ-20	3/23/2016	ND	0	11.0	1.6795	ND
WQ-20	5/10/2016	0.16	0.16	15.0	2.2495	MEET
WQ-20	6/29/2016	0.11	0.11	10.0	1.5352	MEET
WQ-20	7/21/2016	0.37	0.37	9.8	1.5063	MEET
WQ-20	8/16/2016	ND	0	12.0	1.8230	ND
WQ-20	9/30/2016	1.3	1.3	11.0	1.6795	MEET
WQ-20	10/17/2016	0.89	0.89	14.0	2.1079	MEET
WQ-20	12/19/2016	0.33	0.33	11.0	1.6795	MEET

E.coli concentrations (MPN/100 mL) for all sample sites in 2016

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-01	5/5/2016	9:10	3.1
WQ-01	5/10/2016	10:20	1.0
WQ-01	5/24/2016	10:10	1.0
WQ-01	5/26/2016	9:15	1.0
WQ-01	5/31/2016	9:05	1.0
WQ-01	6/3/2016	10:50	43.5
WQ-01	6/16/2016	9:30	1.0
WQ-01	6/20/2016	9:30	1.0
WQ-01	6/23/2016	8:00	16.9
WQ-01	6/29/2016	4:00	1.0
WQ-01	7/5/2016	1:57	1.0
WQ-01	7/14/2016	1:28	5.2
WQ-01	7/21/2016	2:05	2.0
WQ-01	7/28/2016	2:05	3.0
WQ-01	8/8/2016	1:35	1.0
WQ-01	8/16/2016	1:05	62.0
WQ-01	8/21/2016	3:15	30.9
WQ-01	8/28/2016	2:15	37.3
WQ-01	8/31/2016	5:22	21.6
WQ-01	9/1/2016	12:28	29.5
WQ-01	9/5/2016	5:30	5.2
WQ-01	9/18/2016	2:30	3.1
WQ-01	9/25/2016	1:54	42.0
WQ-01	9/30/2016	2:07	2419.6
WQ-01	10/4/2016	9:55	3.1

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-02	5/5/2016		*
WQ-02	5/10/2016		*
WQ-02	5/24/2016		*
WQ-02	5/26/2016		*
WQ-02	5/31/2016		*
WQ-02	6/3/2016		*
WQ-02	6/16/2016		*
WQ-02	6/20/2016		*
WQ-02	6/23/2016		*
WQ-02	6/29/2016		*
WQ-02	7/5/2016	11:11	1.0
WQ-02	7/14/2016	10:55	1.0
WQ-02	7/21/2016	11:03	1.0
WQ-02	7/28/2016	11:20	1.0
WQ-02	8/8/2016	10:55	1.0
WQ-02	8/16/2016	11:20	1.0
WQ-02	8/21/2016	12:45	1.0
WQ-02	8/28/2016	12:00	1.0
WQ-02	8/31/2016	3:15	1.0
WQ-02	9/1/2016	10:20	1.0
WQ-02	9/5/2016	3:15	1.0
WQ-02	9/18/2016	12:05	1.0
WQ-02	9/25/2016	11:45	1.0
WQ-02	9/30/2016	11:43	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-03	5/5/2016	8:05	1.0
WQ-03	5/10/2016	8:10	1.0
WQ-03	5/24/2016	9:25	1.0
WQ-03	5/26/2016	8:00	1.0
WQ-03	5/31/2016	8:00	1.0
WQ-03	6/3/2016	9:55	1.0
WQ-03	6/16/2016	8:30	1.0
WQ-03	6/20/2016	8:15	1.0
WQ-03	6/23/2016	8:40	3.1
WQ-03	6/30/2016	9:15	1.0
WQ-03	7/1/2016	8:25	1.0
WQ-03	7/14/2016	8:15	1.0
WQ-03	7/21/2016	10:20	1.0
WQ-03	7/28/2016	2:23	1.0
WQ-03	8/8/2016	8:30	1.0
WQ-03	8/17/2016	9:15	1.0
WQ-03	8/22/2016	2:45	1.0
WQ-03	8/29/2016	9:00	1.0
WQ-03	8/31/2016	8:40	1.0
WQ-03	9/1/2016	8:20	1.0
WQ-03	9/6/2016	8:30	1.0
WQ-03	9/19/2016	1:55	1.0
WQ-03	9/26/2016	12:31	1.0
WQ-03	9/30/2016	9:30	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-04	5/5/2016	8:25	1.0
WQ-04	5/10/2016	8:30	1.0
WQ-04	5/24/2016	9:05	1.0
WQ-04	5/26/2016	8:15	1.0
WQ-04	5/31/2016	8:15	21.6
WQ-04	6/3/2016	10:07	65.7
WQ-04	6/16/2016	8:45	1.0
WQ-04	6/20/2016	8:30	1.0
WQ-04	6/23/2016	9:00	1.0
WQ-04	6/30/2016	10:00	1.0
WQ-04	7/1/2016	8:40	1.0
WQ-04	7/14/2016	8:30	3.1
WQ-04	7/21/2016	11:05	2.0
WQ-04	7/28/2016	2:10	1.0
WQ-04	8/8/2016	8:45	6.3
WQ-04	8/17/2016	9:55	3.1
WQ-04	8/22/2016	2:28	1.0
WQ-04	8/29/2016	9:15	30.1
WQ-04	8/31/2016	8:55	1.0
WQ-04	9/1/2016	8:35	1.0
WQ-04	9/6/2016	8:45	1.0
WQ-04	9/19/2016	1:18	114.5
WQ-04	9/26/2016	12:02	1.0
WQ-04	9/30/2016	9:55	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-05	5/5/2016	9:45	2.0
WQ-05	5/10/2016	11:20	4.1
WQ-05	5/23/2016	1:55	1.0
WQ-05	5/26/2016	9:50	2.0
WQ-05	5/31/2016	9:30	2.0
WQ-05	6/2/2016	1:55	1.0
WQ-05	6/16/2016	10:00	1.0
WQ-05	6/20/2016	9:50	2.0
WQ-05	6/23/2016	10:00	19.9
WQ-05	6/30/2016	11:20	4.1
WQ-05	7/1/2016	9:30	5.2
WQ-05	7/14/2016	9:20	5.2
WQ-05	7/21/2016	1:25	1.0
WQ-05	7/28/2016	1:25	3.0
WQ-05	8/8/2016	9:30	1.0
WQ-05	8/17/2016	11:15	4.1
WQ-05	8/22/2016	1:50	1.0
WQ-05	8/29/2016	10:00	1.0
WQ-05	8/31/2016	10:00	1.0
WQ-05	9/1/2016	9:30	4.1
WQ-05	9/6/2016	9:45	4.1
WQ-05	9/19/2016	12:01	5.2
WQ-05	9/26/2016	10:59	4.1
WQ-05	9/30/2016	11:05	5.2

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-06	5/5/2016	10:00	1.0
WQ-06	5/10/2016	11:35	1.0
WQ-06	5/23/2016	1:45	1.0
WQ-06	5/26/2016	10:00	4.1
WQ-06	5/31/2016	9:40	5.1
WQ-06	6/2/2016	1:45	2.0
WQ-06	6/16/2016	10:10	2.0
WQ-06	6/20/2016	10:00	4.1
WQ-06	6/23/2016	10:10	36.4
WQ-06	6/30/2016	11:55	1.0
WQ-06	7/1/2016	9:40	5.2
WQ-06	7/14/2016	9:30	4.1
WQ-06	7/21/2016	1:45	8.5
WQ-06	7/28/2016	1:10	3.1
WQ-06	8/8/2016	8:40	1.0
WQ-06	8/17/2016	11:25	4.1
WQ-06	8/22/2016	1:30	1.0
WQ-06	8/29/2016	10:10	1.0
WQ-06	8/31/2016	10:10	7.5
WQ-06	9/1/2016	9:42	4.1
WQ-06	9/6/2016	9:55	7.5
WQ-06	9/19/2016	11:50	4.1
WQ-06	9/26/2016	10:50	2.0
WQ-06	9/30/2016	11:15	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-09	5/5/2016	10:15	1.0
WQ-09	5/10/2016	12:00	4.1
WQ-09	5/23/2016	1:20	2.0
WQ-09	5/26/2016	10:10	1.0
WQ-09	5/31/2016	9:50	1.0
WQ-09	6/2/2016	1:20	17.1
WQ-09	6/16/2016	10:20	1.0
WQ-09	6/20/2016	10:10	1.0
WQ-09	6/23/2016	10:30	1.0
WQ-09	6/30/2016	12:30	3.1
WQ-09	7/1/2016	9:50	3.0
WQ-09	7/14/2016	9:45	3.1
WQ-09	7/21/2016	2:25	1.0
WQ-09	7/28/2016	12:45	3.1
WQ-09	8/8/2016	9:50	2.0
WQ-09	8/16/2016	2:45	1.0
WQ-09	8/22/2016	1:20	2.0
WQ-09	8/29/2016	10:20	18.9
WQ-09	8/31/2016	10:20	1.0
WQ-09	9/1/2016	9:50	1.0
WQ-09	9/6/2016	10:10	55.6
WQ-09	9/19/2016	11:30	1.0
WQ-09	9/26/2016	10:30	3.0
WQ-09	9/30/2016	1:15	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-10	5/5/2016	10:25	4.1
WQ-10	5/10/2016	12:20	2.0
WQ-10	5/23/2016	1:40	2.0
WQ-10	5/26/2016	10:20	2.0
WQ-10	5/31/2016	10:00	1.0
WQ-10	6/2/2016	1:38	10.8
WQ-10	6/16/2016	10:30	3.1
WQ-10	6/20/2016	10:20	1.0
WQ-10	6/23/2016	10:20	2.0
WQ-10	6/30/2016	12:40	1.0
WQ-10	7/1/2016	10:00	1.0
WQ-10	7/14/2016	10:00	1.0
WQ-10	7/21/2016	2:00	4.0
WQ-10	7/28/2016	1:00	2.0
WQ-10	8/8/2016	10:00	1.0
WQ-10	8/16/2016	2:35	1.0
WQ-10	8/22/2016	1:07	3.1
WQ-10	8/29/2016	10:15	3.0
WQ-10	8/31/2016	10:30	21.1
WQ-10	9/1/2016	10:00	4.1
WQ-10	9/6/2016	10:20	1.0
WQ-10	9/19/2016	11:35	1.0
WQ-10	9/26/2016	10:39	1.0
WQ-10	9/30/2016	1:25	2.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-11	5/5/2016	11:00	1.0
WQ-11	5/10/2016	12:35	1.0
WQ-11	5/23/2016	12:35	1.0
WQ-11	5/26/2016	11:00	1.0
WQ-11	5/31/2016	10:40	2.0
WQ-11	6/2/2016	12:50	1.0
WQ-11	6/16/2016	11:20	1.0
WQ-11	6/20/2016	11:00	3.1
WQ-11	6/23/2016	11:10	5.2
WQ-11	6/29/2016	1:15	1.0
WQ-11	7/1/2016	10:40	6.3
WQ-11	7/14/2016	10:30	1.0
WQ-11	7/21/2016	1:10	1.0
WQ-11	7/28/2016	11:50	2.0
WQ-11	8/8/2016	10:30	13.5
WQ-11	8/16/2016	1:50	7.5
WQ-11	8/22/2016	9:30	4.1
WQ-11	8/29/2016	11:00	1.0
WQ-11	8/31/2016	11:15	1.0
WQ-11	9/1/2016	10:50	2.0
WQ-11	9/6/2016	10:55	3.0
WQ-11	9/19/2016	10:37	1.0
WQ-11	9/26/2016	9:46	2.0
WQ-11	9/30/2016	12:30	2.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-12	5/5/2016	11:30	3.0
WQ-12	5/10/2016	12:45	1.0
WQ-12	5/23/2016	1:00	1.0
WQ-12	5/26/2016	11:30	1.0
WQ-12	5/31/2016	11:10	18.9
WQ-12	6/2/2016	12:15	7.5
WQ-12	6/16/2016	11:50	9.8
WQ-12	6/20/2016	11:30	1.0
WQ-12	6/23/2016	11:30	5.2
WQ-12	6/29/2016	2:00	6.3
WQ-12	7/1/2016	11:10	3.0
WQ-12	7/14/2016	11:10	1.0
WQ-12	7/21/2016	1:45	1.0
WQ-12	7/28/2016	11:05	2.0
WQ-12	8/8/2016	11:00	4.1
WQ-12	8/16/2016	12:45	4.1
WQ-12	8/22/2016	8:40	6.3
WQ-12	8/29/2016	11:30	2.0
WQ-12	8/31/2016	11:40	3.0
WQ-12	9/1/2016	10:20	2.0
WQ-12	9/6/2016	10:20	1.0
WQ-12	9/19/2016	9:58	1.0
WQ-12	9/26/2016	9:13	5.2
WQ-12	9/30/2016	11:45	2.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-15	5/5/2016		*
WQ-15	5/10/2016	9:45	1.0
WQ-15	5/23/2016	10:30	2.0
WQ-15	5/26/2016	1:15	1.0
WQ-15	5/31/2016	10:20	1.0
WQ-15	6/2/2016	10:40	1.0
WQ-15	6/16/2016	10:45	1.0
WQ-15	6/20/2016	10:25	1.0
WQ-15	6/23/2016	10:20	4.1
WQ-15	6/29/2016	11:10	1.0
WQ-15	7/1/2016	10:25	1.0
WQ-15	7/14/2016	11:05	29.5
WQ-15	7/21/2016	9:00	1.0
WQ-15	7/28/2016	9:10	3.0
WQ-15	8/8/2016	12:00	36.9
WQ-15	8/16/2016	10:30	157.6
WQ-15	8/22/2016	12:00	2.0
WQ-15	8/29/2016	10:05	1.0
WQ-15	8/31/2016	10:10	1.0
WQ-15	9/1/2016		***
WQ-15	9/6/2016		***
WQ-15	9/19/2016		***
WQ-15	9/26/2016		***
WQ-15	9/30/2016		***

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-16	5/5/2016	11:52	1.0
WQ-16	5/10/2016	11:40	1.0
WQ-16	5/23/2016	11:55	5.2
WQ-16	5/26/2016	11:45	1.0
WQ-16	5/31/2016	11:43	2.0
WQ-16	6/2/2016	12:00	1.0
WQ-16	6/16/2016	11:40	1.0
WQ-16	6/20/2016	11:30	1.0
WQ-16	6/23/2016	11:25	3.0
WQ-16	6/29/2016	12:20	4.1
WQ-16	7/1/2016	11:25	1.0
WQ-16	7/14/2016	11:20	1.0
WQ-16	7/21/2016	12:15	2.0
WQ-16	7/28/2016		***
WQ-16	8/8/2016		***
WQ-16	8/16/2016		***
WQ-16	8/22/2016		***
WQ-16	8/29/2016		***
WQ-16	8/31/2016		***
WQ-16	9/1/2016		***
WQ-16	9/6/2016		***
WQ-16	9/19/2016		***
WQ-16	9/26/2016		***
WQ-16	9/30/2016		***

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-17	5/5/2016	11:14	11.0
WQ-17	5/10/2016	10:40	1.0
WQ-17	5/23/2016	9:48	1.0
WQ-17	5/26/2016	2:00	7.4
WQ-17	5/31/2016	9:35	1.0
WQ-17	6/2/2016	9:55	1.0
WQ-17	6/16/2016	9:48	1.0
WQ-17	6/20/2016	9:45	1.0
WQ-17	6/23/2016	9:40	16.0
WQ-17	6/29/2016	10:15	5.2
WQ-17	7/1/2016	9:50	5.2
WQ-17	7/14/2016	10:20	920.8
WQ-17	7/21/2016	10:00	5.2
WQ-17	7/28/2016		***
WQ-17	8/8/2016		***
WQ-17	8/16/2016		***
WQ-17	8/22/2016		***
WQ-17	8/29/2016		***
WQ-17	8/31/2016		***
WQ-17	9/1/2016		***
WQ-17	9/6/2016		***
WQ-17	9/19/2016		***
WQ-17	9/26/2016		***
WQ-17	9/30/2016		***
WQ-17			

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-18	5/5/2016	12:05	1.0
WQ-18	5/10/2016	11:20	1.0
WQ-18	5/23/2016	11:40	2.0
WQ-18	5/26/2016	3:00	1.0
WQ-18	5/31/2016	12:10	1.0
WQ-18	6/2/2016	2:20	1.0
WQ-18	6/16/2016	12:15	2.0
WQ-18	6/20/2016	12:00	2.0
WQ-18	6/23/2016	12:00	1.0
WQ-18	6/29/2016	2:30	17.3
WQ-18	7/1/2016	12:00	14.6
WQ-18	7/14/2016	11:30	2.0
WQ-18	7/21/2016	11:15	16.0
WQ-18	7/28/2016	10:10	47.9
WQ-18	8/8/2016	2:00	4.1
WQ-18	8/16/2016	12:07	8.6
WQ-18	8/22/2016	10:30	6.3
WQ-18	8/29/2016	11:25	6.3
WQ-18	8/31/2016	11:30	6.3
WQ-18	9/1/2016	12:00	5.2
WQ-18	9/6/2016	9:35	1.0
WQ-18	9/19/2016	9:27	2.0
WQ-18	9/26/2016	8:40	9.8
WQ-18	9/30/2016	2:00	7.4
WQ-18			

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-19	5/5/2016	11:35	7.5
WQ-19	5/10/2016	10:50	1.0
WQ-19	5/23/2016	9:43	3.1
WQ-19	5/26/2016	2:15	12.1
WQ-19	5/31/2016	9:25	127.4
WQ-19	6/2/2016	9:45	195.6
WQ-19	6/16/2016	9:36	45.7
WQ-19	6/20/2016	9:20	20.1
WQ-19	6/23/2016	9:30	42.2
WQ-19	6/29/2016	9:55	23.3
WQ-19	7/1/2016	9:40	275.5
WQ-19	7/14/2016	10:10	23.1
WQ-19	7/21/2016	10:20	20.2
WQ-19	7/28/2016	8:20	488.4
WQ-19	8/8/2016	12:45	13.5
WQ-19	8/16/2016	9:30	37.9
WQ-19	8/22/2016	11:20	980.4
WQ-19	8/29/2016	9:22	125.9
WQ-19	8/31/2016	9:30	140.6
WQ-19	9/1/2016	12:40	107.6
WQ-19	9/6/2016	9:10	248.9
WQ-19	9/19/2016	8:55	26.5
WQ-19	9/26/2016	8:12	95.8
WQ-19	9/30/2016	2:40	7.4

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-20	5/5/2016	12:10	6.0
WQ-20	5/10/2016	11:00	1.0
WQ-20	5/23/2016	11:35	1.0
WQ-20	5/26/2016	2:30	6.3
WQ-20	5/31/2016	11:12	5.2
WQ-20	6/2/2016	11:50	6.1
WQ-20	6/16/2016	11:35	1.0
WQ-20	6/20/2016	11:20	4.1
WQ-20	6/23/2016	11:20	62.4
WQ-20	6/29/2016	12:00	8.5
WQ-20	7/1/2016	11:30	10.9
WQ-20	7/14/2016	11:40	7.4
WQ-20	7/21/2016	10:45	12.1
WQ-20	7/28/2016	9:55	31.3
WQ-20	8/8/2016	2:30	4.1
WQ-20	8/16/2016	11:45	1.0
WQ-20	8/22/2016	12:50	1.0
WQ-20	8/29/2016	11:07	1.0
WQ-20	8/31/2016	11:05	1.0
WQ-20	9/1/2016	12:30	2.0
WQ-20	9/6/2016	9:20	8.4
WQ-20	9/19/2016	9:08	2.0
WQ-20	9/26/2016	8:20	5.1
WQ-20	9/30/2016	2:25	24.3

* Unsafe to reach location due to weather conditions

*** Creek dry - no surface water to sample in vicintiy of sample site

No data available