El Dorado Hydroelectric Project
FERC Project No. 184

2012 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.

The Plan requires water quality data to be collected eight times per year during the first three monitoring years. This report summarizes the results of the 2012 water quality monitoring effort, which is the third year of water quality monitoring conducted pursuant to the Plan. The data collected in 2012 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, 2013, 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)

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[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

- Mill Creek below Mill Creek diversion dam (WQ14)
- Bull Creek above Bull Creek diversion dam (WQ15)
- 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 discontinue monitoring at Mill Creek (WQ13 and WQ14) and Carpenter Creek (WQ7 and WQ8) in 2012 since the diversion structures on these creeks are not operational. Therefore, no water quality monitoring was conducted at these sites in 2012.

3.0 Collection

In-situ and analytical water quality monitoring were performed in 2012 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 24, 2012), and December. E. coli samples were collect 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. As recommended in the Project No. 184 2010 Water Quality Monitoring Report, 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 2012 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	11.1	1.6	19.2
WQ2	15.7	12.4	17.5
WQ3	10.4	2.3	17.2
WQ4	11.3	1.3	19.6
WQ5	11.0	3.3	17.0
WQ6	10.7	3.4	17.2
WQ9	9.0	5.2	12.1
WQ10	9.7	5.3	13.3
WQ11	11.7	4.0	16.7
WQ12	13.2	4.8	18.0
WQ15	9.7	5.0	13.7
WQ16	10.1	6.0	13.2
WQ17	8.3	2.5	12.5
WQ18	10.5	6.3	13.7
WQ19	9.4	5.7	11.8
WQ20	10.3	6.0	14.5

A total of 119 water temperature measurements were recorded in 2012. Water temperatures ranged from a minimum of 1.3 °C at Silver Fork of the American River below Silver Lake Dam (WQ4) to 19.6 °C at the same location. The average water temperature measured throughout the entire project area in 2012 was 10.5 °C. Water temperatures measured at all water quality monitoring sites in 2012 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 184 2012 Water Temperature Monitoring Report (EID 2013).

Dissolved Oxygen

Average, minimum, and maximum dissolved oxygen (DO) concentrations measured at each water quality monitoring site during the 2012 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	9.7	6.3	14.0
WQ2	7.7	7.4	8.4
WQ3	9.7	9.0	10.5
WQ4	9.9	9.4	11.2
WQ5	12.4	10.9	15.1
WQ6	11.4	6.9	13.1
WQ9	11.0	5.8	13.2
WQ10	10.7	5.0	12.4
WQ11	10.0	6.9	12.3
WQ12	9.6	4.5	12.6
WQ15	8.7	5.8	11.7
WQ16	8.9	5.2	12.3
WQ17	8.8	6.3	12.4
WQ18	9.2	5.8	12.9
WQ19	8.3	5.3	11.3
WQ20	9.2	5.7	12.1

Basin Plan objectives state, "The DO concentrations shall not be reduced below the following minimum levels at any time…waters designated COLD 7.0 mg/L" (RWQCB-5, 2005). A total of 119 DO measurements were recorded in 2012. DO ranged from 4.5 mg/L at Alder Creek below Alder Creek diversion dam (WQ12) to 15.1 mg/L at South Fork of the American River upstream of Kyburz diversion dam (WQ1). The average DO concentration throughout the entire project area in 2012 was 9.7 mg/L. Sixteen DO measurements below 7.0 mg/L were recorded during the 2012 monitoring effort. The date, DO concentrations, and location for these measurements are listed below:

March 21, 2012

- 6.9 mg/L at South Fork American River below Kyburz diversion dam (WQ6)
- 5.8 mg/L at No Name Creek above No Name diversion dam (WQ9)
- 5.0 mg/L at No Name Creek below No Name Creek diversion dam (WQ10)
- 6.4 at Ogilby Creek below Ogilby Creek diversion dam (WQ18)

July 11, 2012

- 6.8 mg/L at Echo Creek below Echo Lake Dam (WQ1)
- 6.9 mg/L at Alder Creek above of Alder Creek diversion dam (WQ11)
- 6.3 mg/L at Ogilby Creek above Ogilby Creek diversion dam (WQ17)

August 2, 2012

- 6.3 mg/L at Echo Creek below Echo Lake Dam (WQ1)
- 6.1 mg/L at Bull Creek below Bull Creek diversion dam (WQ16)

September 11, 2012

- 6.6 mg/L at Echo Creek below Echo Lake Dam (WQ1)
- 4.5 mg/L at Alder Creek below of Alder Creek diversion dam (WQ12)
- 5.8 mg/L at Bull Creek above Bull Creek diversion dam (WQ15)
- 5.2 mg/L at Bull Creek below Bull Creek diversion dam (WQ16)
- 5.8 mg/L at Ogilby Creek below Ogilby Creek diversion dam (WQ18)
- 5.3 mg/L at Esmeralda Creek above Esmeralda Creek diversion dam (WQ19)
- 5.8 mg/L at Esmeralda Creek below Esmeralda Creek diversion dam (WQ20)

Of the sixteen measurements below 7.0 mg/L, three were within the accuracy range of the meter (±2% of the reading or 0.2 mg/L; whichever is greater). A total of nine measurements below 7.0 mg/L were recorded at sampling locations on canal tributaries upstream (n=4) and downstream (n=5) of the diversions during periods when diversions are not occurring at these locations (i.e., July, August, and September). Three measurements less than 7.0 mg/L were recorded at Echo Creek below Echo Lake dam; two of these measurements were collected in July and August when no diversions were occurring. Two measurements recorded at No Name Creek on March 21, 2012 were less than 7.0 mg/L at sample sites upstream (5.8 mg/L) and downstream (5.0 mg/L) of the diversion.

Conductivity

Average, minimum, and maximum conductivity levels recorded at each water quality monitoring site during the 2012 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/cm^3) at each monitoring site

Site	AVG	MIN	MAX
WQ1	13	6	21
WQ2	4	2	9
WQ3	18	13	20
WQ4	15	13	18
WQ5	38	21	66
WQ6	38	27	50
WQ9	135	100	165
WQ10	128	97	147
WQ11	36	26	45
WQ12	38	29	53
WQ15	71	56	80
WQ16	84	57	102
WQ17	50	43	62
WQ18	57	47	69
WQ19	45	36	52
WQ20	37	34	40

Currently there are no criteria or water quality objectives for conductivity within the American River watershed. A total of 119 conductivity measurements were recorded in 2012. Conductivity levels ranged from 2 uS/cm^3 at Echo Creek (WQ2) to 165 uS/cm^3 in No Name Creek above the diversion dam (WQ9). The average conductivity level throughout the entire project area in 2012 was 52 uS/cm^3.

pH

Average, minimum, and maximum pH levels recorded at each water quality monitoring site during the 2012 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	7.3	7.1	7.7
WQ2	7.0	7.0	7.0
WQ3	7.3	6.4	8.1
WQ4	7.1	6.3	7.4
WQ5	7.3	6.9	7.6
WQ6	7.1	6.5	7.9
WQ9	7.7	7.3	8.4
WQ10	7.7	7.3	8.3
WQ11	7.3	6.3	7.8
WQ12	7.6	7.1	8.0
WQ15	7.7	7.4	8.2
WQ16	7.7	7.3	8.0
WQ17	7.5	7.3	7.6
WQ18	7.6	7.1	8.1
WQ19	7.4	6.8	7.6
WQ20	7.7	6.9	8.1

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" (RWQCB-5, 2005). A total of 119 pH measurements were recorded in 2012. pH levels ranged from 6.3 at Silver Fork American River below Silver Lake Dam (WQ3) and Alder Creek above Alder Creek diversion dam (WQ11) to 8.4 at No Name Creek above No Name Creek diversion dam (WQ9). The average pH throughout the entire project area in 2012 was 7.5. Three pH measurements below 6.5 were recorded during the 2012 monitoring effort. The pH measurement, location, and date for these measurements include:

- 6.3 at Silver Fork American River below Silver Lake Dam (WQ4) on May 31, 2012
- 6.4 at Caples Creek below Caples Lake Dam (WQ3) on June 27, 2012
- 6.3 at Alder Creek above Alder Creek diversion dam (WQ11) on December 10, 2012

Consistent with Basin Plan standards, all pH levels were below 8.5 at all locations during all sampling events throughout the year.

Turbidity

Average, minimum, and maximum turbidity levels recorded during the 2012 monitoring effort at each water quality monitoring site are reported in Table 5.

Turbidity measurements measured at each monitoring site in 2012 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	0.7	0.0	2.5
WQ2	0.0	0.0	0.0
WQ3	0.8	0.0	1.4
WQ4	0.9	0.6	1.3
WQ5	0.3	0.0	1.3
WQ6	0.5	0.0	1.2
WQ9	1.2	0.6	3.2
WQ10	2.2	0.9	6.1
WQ11	0.1	0.0	0.7
WQ12	0.1	0.0	0.7
WQ15	1.7	0.0	6.0
WQ16	2.4	0.0	16.0
WQ17	1.0	0.0	1.9
WQ18	0.8	0.6	1.2
WQ19	1.3	0.0	4.1
WQ20	2.0	0.6	4.6

* 0 denotes a non-detect result from laboratory analysis

The Basin Plan states, "where natural turbidity is between 0 and 5 NTUs, increases shall not exceed 1 NTU. Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent" (RWQCB-5, 2005). All turbidity measurements were generally low throughout the study area (average = 1.5 NTUs). Four turbidity measurements were recorded greater than 5 NTUs. The date, turbidity level, and location for these measurements as well as the corresponding turbidity level at the paired site are listed below:

March 21, 2012

- 6.1 NTUs at No Name Creek below No Name Creek diversion dam (WQ10)
- 6.0 NTUs at Bull Creek above Bull Creek diversion dam (WQ15)

August 2, 2012

- 5.6 NTUs at Bull Creek above Bull Creek diversion dam (WQ15)

September 11, 2012

- 16 NTUs at Bull Creek below Bull Creek diversion dam (WQ16)

Three of the measurements greater than 5 NTUs were recorded at Bull Creek sample locations. Two of these three measurements were recorded at the sample location upstream of the diversion.

A comparison of turbidity measurements recorded upstream and downstream of diversion dams in 2012 found a total of six 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 21, 2012	3.2	6.1	+ 2.9
	August 2, 2012	0.93	2.5	+1.6
	September 11, 2012	0.86	2.0	+1.1
Bull Creek (WQ15/WQ16)	September 11, 2012	0.53	16	+ 15.5
Esmeralda Creek (WQ19/WQ20)	August 2, 2102	0.63	3.1	+ 2.5
	September 11, 2012	0	4.6	+4.6

As discussed in the 2008 and 2010 Project 184 Water Quality Monitoring Report (EID 2009; EID 2011), 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 Project related activities occurred to account for the increased turbidity measurements in Bull Creek in September 2012. The downstream monitoring site is located adjacent to cabins and subject to recreational pressure.

No Project related activities occurred to account for the increased turbidity measurements recorded in Esmeralda Creek below Esmeralda Creek diversion dam (WQ20) in August and September 2012. This monitoring site is located at the base of Bridal Veil Falls and subject to frequent visits by the public travelling on Highway 50. The District was performing work for the Esmeralda Creek Restoration Project during August and September 2012; however, the work performed during the August 2 and September 11 sampling events did not involve any in-water activities that would account for the increased turbidity levels. All results of construction-related water quality monitoring related to this effort were in compliance with permit requirements.

Total Suspended Sediments

Total Suspended Sediment (TSS) concentrations measured at all sample sites in 2012 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" (RWQCB-5, 2005). TSS measurements were extremely low throughout the project area. Of 122 samples analyzed, 113 samples had TSS levels that were not detectable in laboratory analysis. The highest TSS level was 77 mg/L measured at Bull Creek above Bull Creek diversion dam (WQ15) on August 2, 2012.

Alkalinity

Alkalinity levels measured at all sample sites in 2012 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, 2008). 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 2012 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	7.0	0.0	12.0
WQ2	0.0	0.0	0.0
WQ3	12.6	10.0	22.0
WQ4	8.6	7.0	11.0
WQ5	12.9	8.0	21.0
WQ6	15.8	12.0	22.0
WQ9	73.3	52.0	95.0
WQ10	68.0	52.0	85.0
WQ11	19.3	15.0	23.0
WQ12	20.4	16.0	24.0
WQ15	34.4	25.0	39.0
WQ16	39.4	26.0	48.0
WQ17	27.5	22.0	36.0
WQ18	23.4	18.0	28.0
WQ19	23.9	19.0	32.0
WQ20	14.5	0.0	21.0

The average alkalinity throughout the Project area was 28.5 mg/L. There was no appreciable difference between the alkalinity measurements upstream or downstream of the diversion at each monitoring site. The sampling locations with the highest concentrations of alkalinity were No Name Creek (WQ-09 and WQ10). 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 2012 are plotted in Figure 13. Average, minimum, and maximum hardness concentrations measured during the 2012 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	4.8	2.0	7.9
WQ2	0.3	0.0	1.0
WQ3	8.0	7.4	8.9
WQ4	5.0	4.4	5.5
WQ5	8.9	5.7	14.0
WQ6	10.6	8.8	14.0
WQ9	64.6	46.0	82.0
WQ10	59.9	45.0	75.0
WQ11	12.9	10.0	17.0
WQ12	13.6	10.0	19.0
WQ15	24.9	16.0	29.0
WQ16	31.9	19.0	43.0
WQ17	16.2	13.0	18.0
WQ18	20.9	16.0	24.0
WQ19	14.8	10.0	18.0
WQ20	10.3	4.6	12.0

There is currently no Basin Plan objective for hardness. The average hardness throughout the Project area was 19.9 mg/L. There was no appreciable difference between the hardness measurements upstream or downstream of the diversion at each monitoring site. The sampling locations with the highest hardness value were No Name Creek (WQ9 and WQ10; range = 52 – 95 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 2012 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, 2008). 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. Of 122 samples analyzed, all samples had nitrate levels that were not detectable in laboratory analysis.

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. Therefore, 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). Of the 122 samples analyzed, two samples exceeded the copper criteria:

May 31, 2012

- 2.6 ug/L (criteria maximum concentration = 1.5 ug/L) at Esmeralda Creek below Esmeralda Creek diversion dam (WQ20)

June 27, 2012

- 4.2 ug/L (criteria maximum concentration = 1.5 ug/L) at South Fork of the American River below Kyburz diversion dam (WQ6)

Both sites with copper concentrations that exceeded the criteria are located immediately adjacent to Highway 50. All other copper levels were below the SIP/CTR one-hour total recoverable dissolved copper limits. The maximum criteria concentrations are provided in Table 9, which is included with the Figures at the end of this report.

Aluminum
Aluminum concentrations measured at all sample sites in 2012 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, 2008). One sample collected at No Name Creek below the diversion dam (WQ-10) on March 21, 2012 exceeded this criterion with an aluminum concentration of 850 ug/L. As discussed in the 2008 and 2010 Project 184 Water Quality Monitoring Reports (EID 2009; EID 2011), as well as previously in this report, 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.

E. coli

E. coli concentrations measured at all sample sites in 2012 are plotted in Figure 16. The E. coli concentrations recorded at each site in 2012 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 monitoring effort. The Basin Plan currently does not contain objectives for E. coli; however, the following water quality objective for bacteria is under consideration by the SWRCB as an amendment to the Basin Plan: "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." These criteria were identified in the approved variance to be used to evaluate the bacterial results for this monitoring effort.

Only one sample of the 382 (0.3%) collected in 2012 exceeded the single sample criterion (>235 MPN/100 ml). A sample collected at No Name Cr above diversion dam (WQ-9) on May 24, 2012 was 687 MPN/100 ml. The geometric mean for samples (n=8) collected over a 30-day period at this same site between May 23, 2012 and June 25, 2012 was 12 MPN/100 ml, which is well below the geometric mean criterion of 126 MPN/100 ml.

5.0 Conclusions

Measurements for *in-situ* parameters did not vary 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 also did not vary in the stream reaches above and below the diversion dams. Project operations did not show any measureable increase or decrease in water quality parameters in almost all cases. Therefore, project operations do not 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 2012 monitoring program. Therefore, Project operations did not seem 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, and 2012 monitoring seasons. This proposal will be prepared in consultation with the FS, SWRCB, and ERC.

7.0 Literature Cited

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Figures

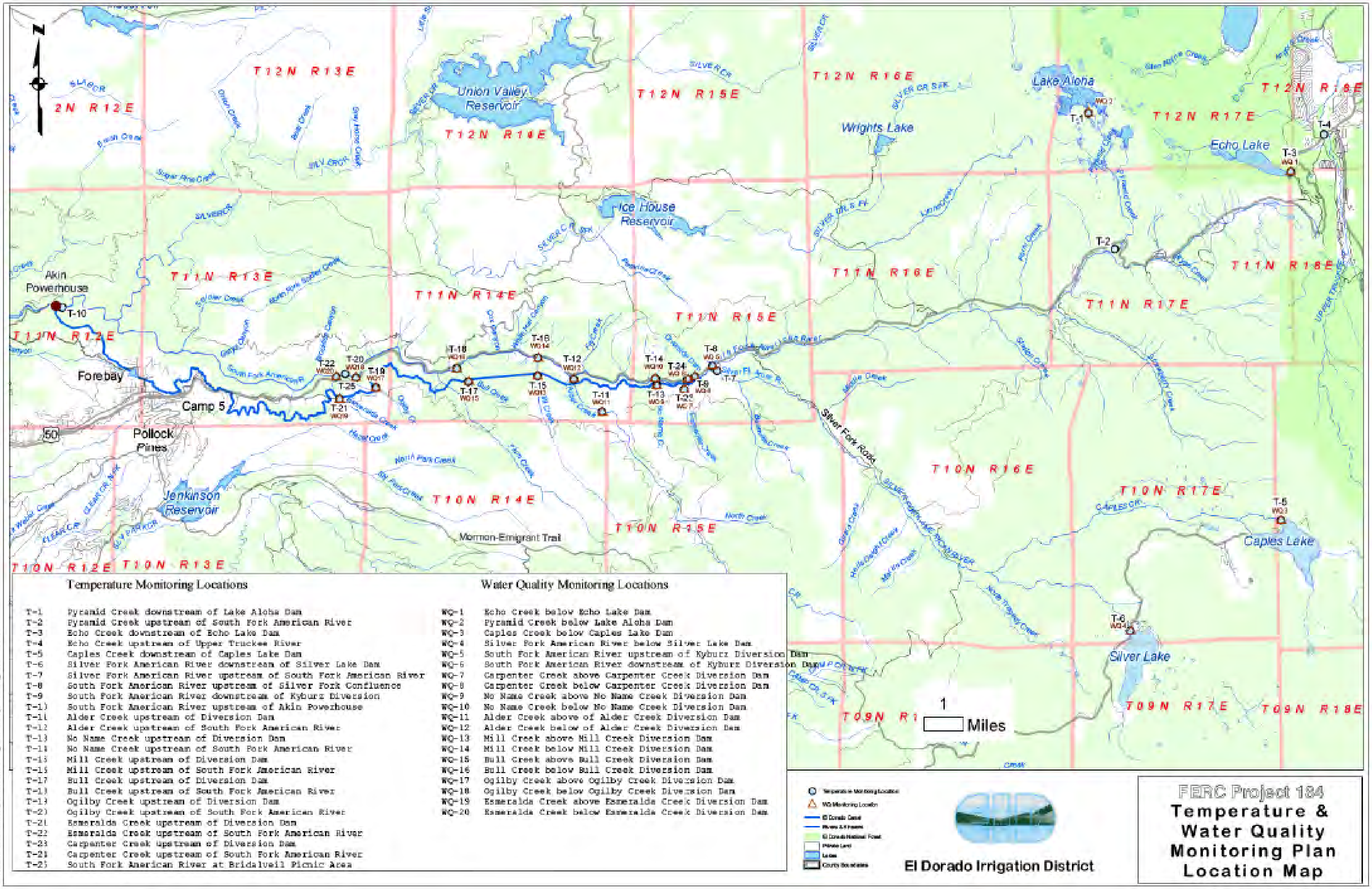

Figure 1. Water Quality Monitoring Sites

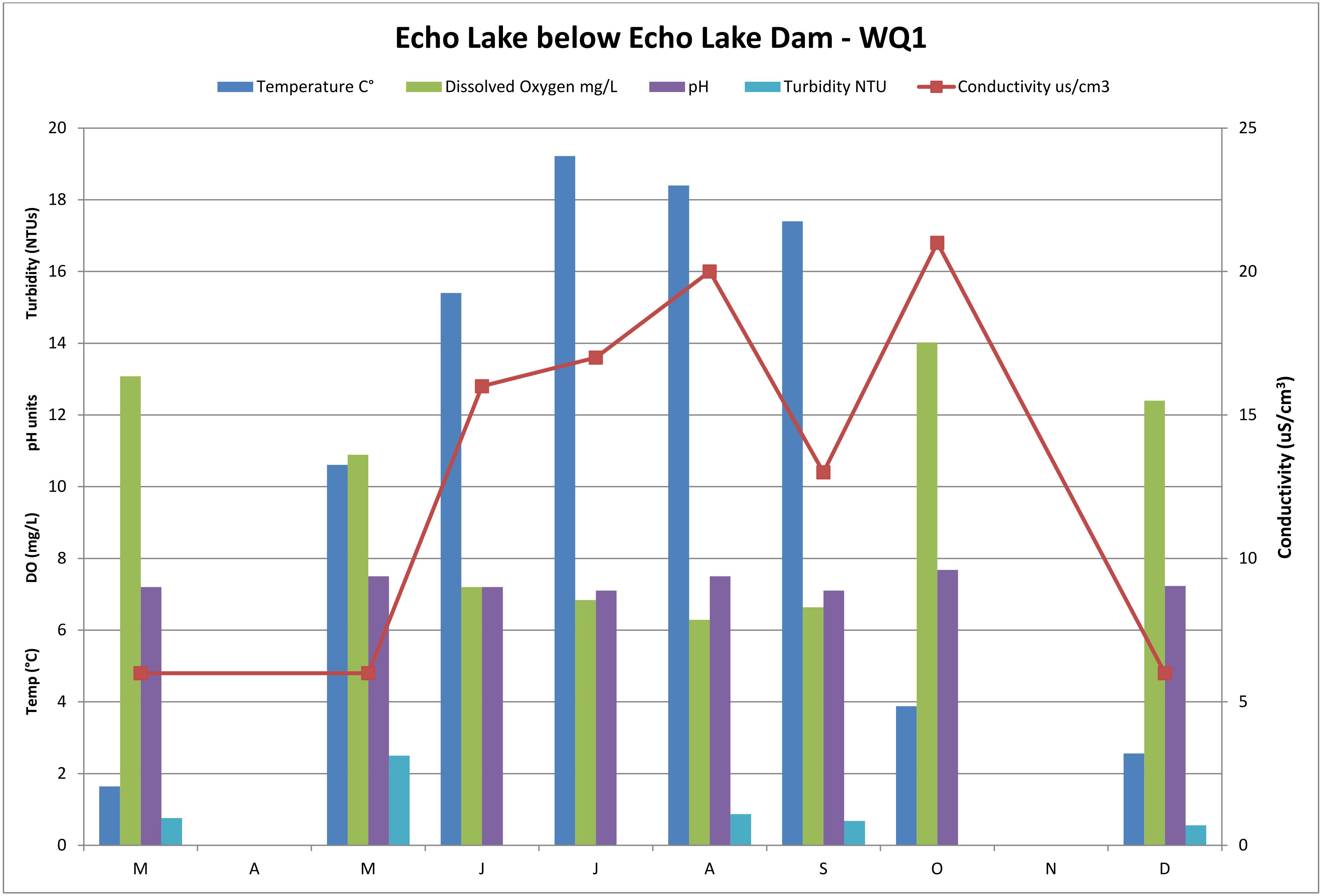

Figure 2. Water temperature, DO, pH, turbidity, and conductivity measured at Echo Lake below Echo Lake Dam - WQ1 in 2012

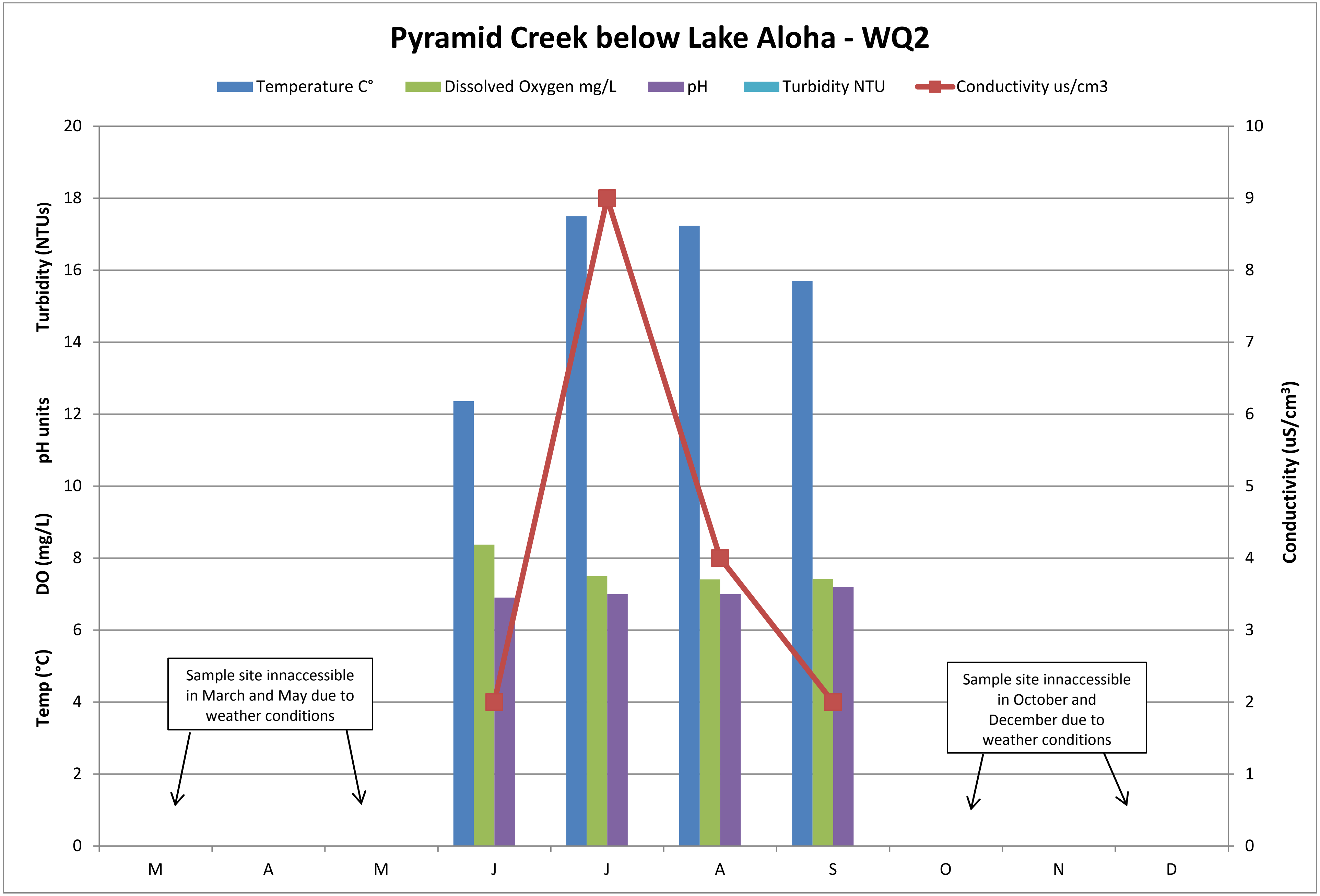

Figure 3. Water temperature, DO, pH, turbidity, and conductivity measured at Pyramid Creek below Lake Aloha - WQ2 in 2012

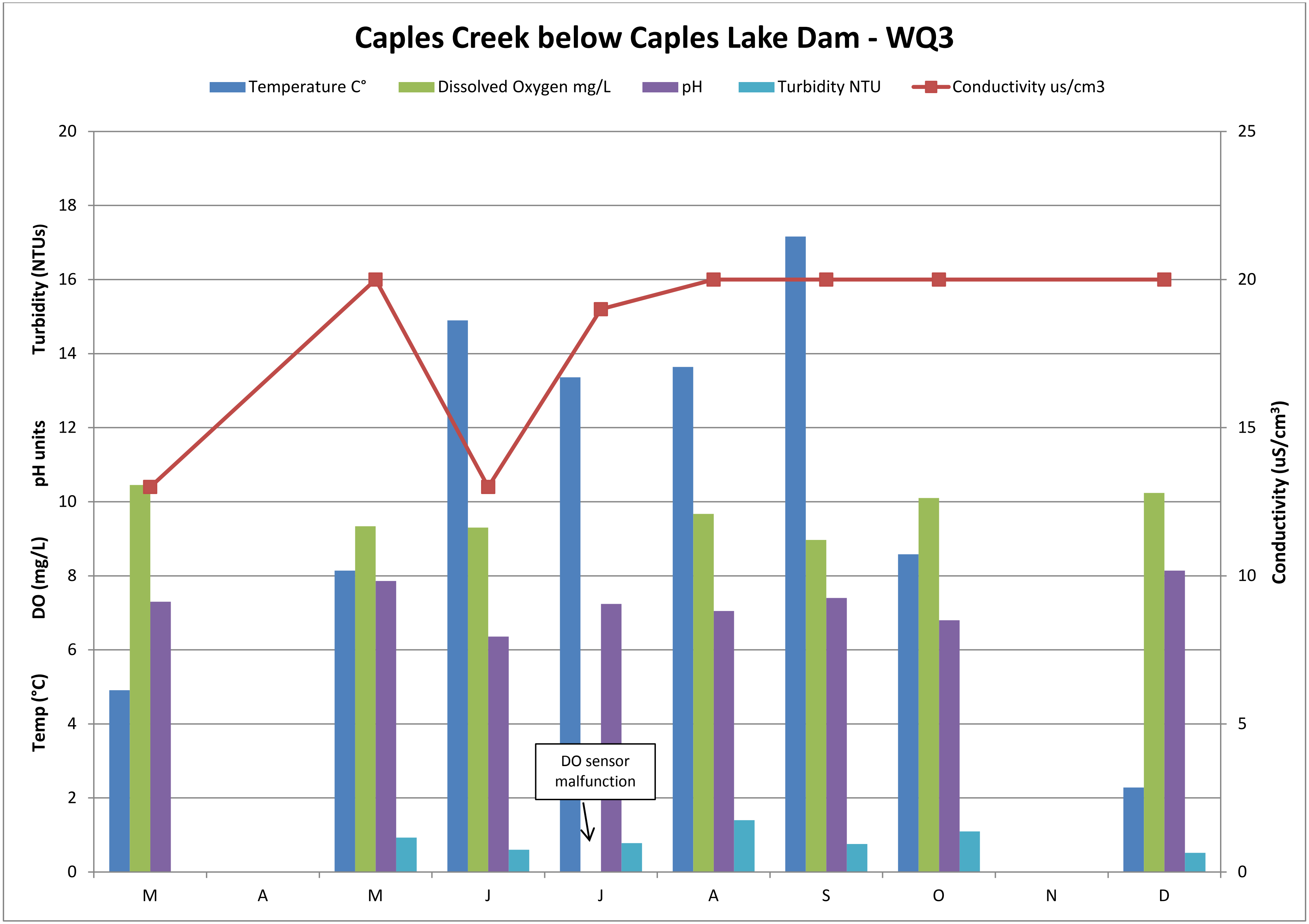

Figure 3. Water temperature, DO, pH, turbidity, and conductivity measured at Caples Creek below Caples Lake Dam – WQ3 in 2012

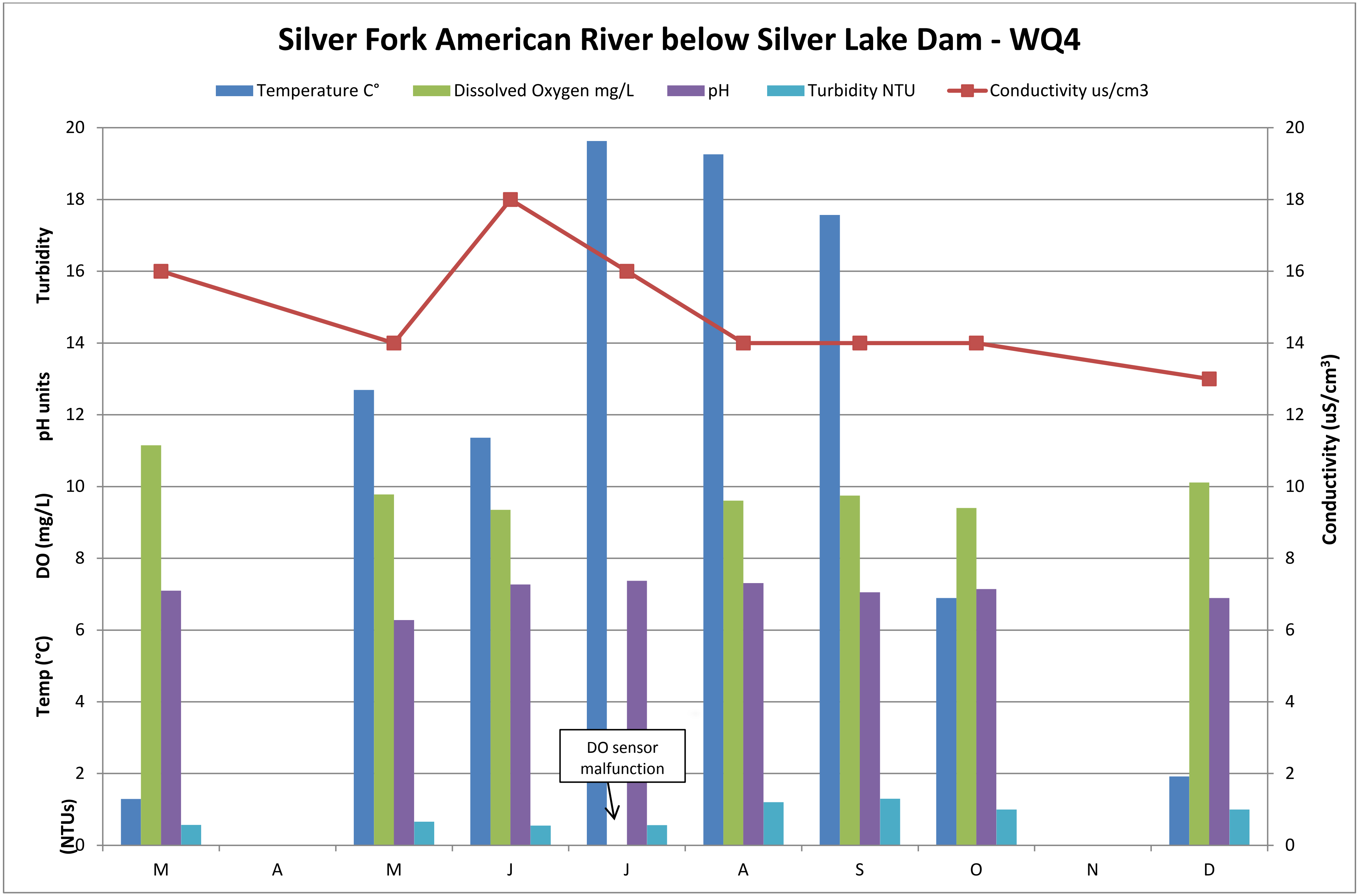

Figure 4. Water temperature, DO, pH, turbidity, and conductivity measured at Silver Fork American River below Silver Lake Dam - WQ4 in 2012

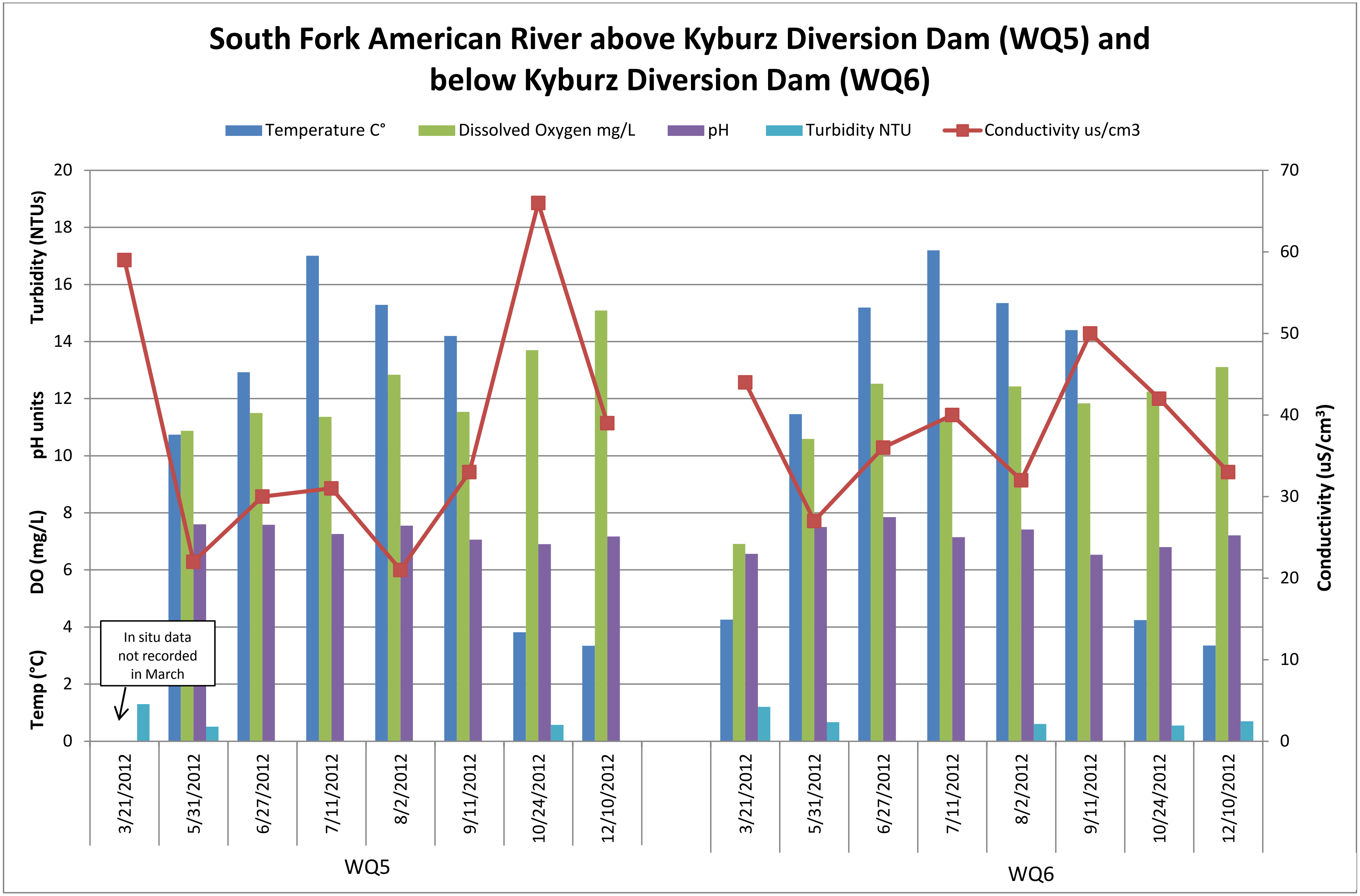

Figure 5. Water temperature, DO, pH, turbidity, and conductivity measured at SFAR above (WQ5) and below (WQ6) Kyburz Diversion Dam in 2012

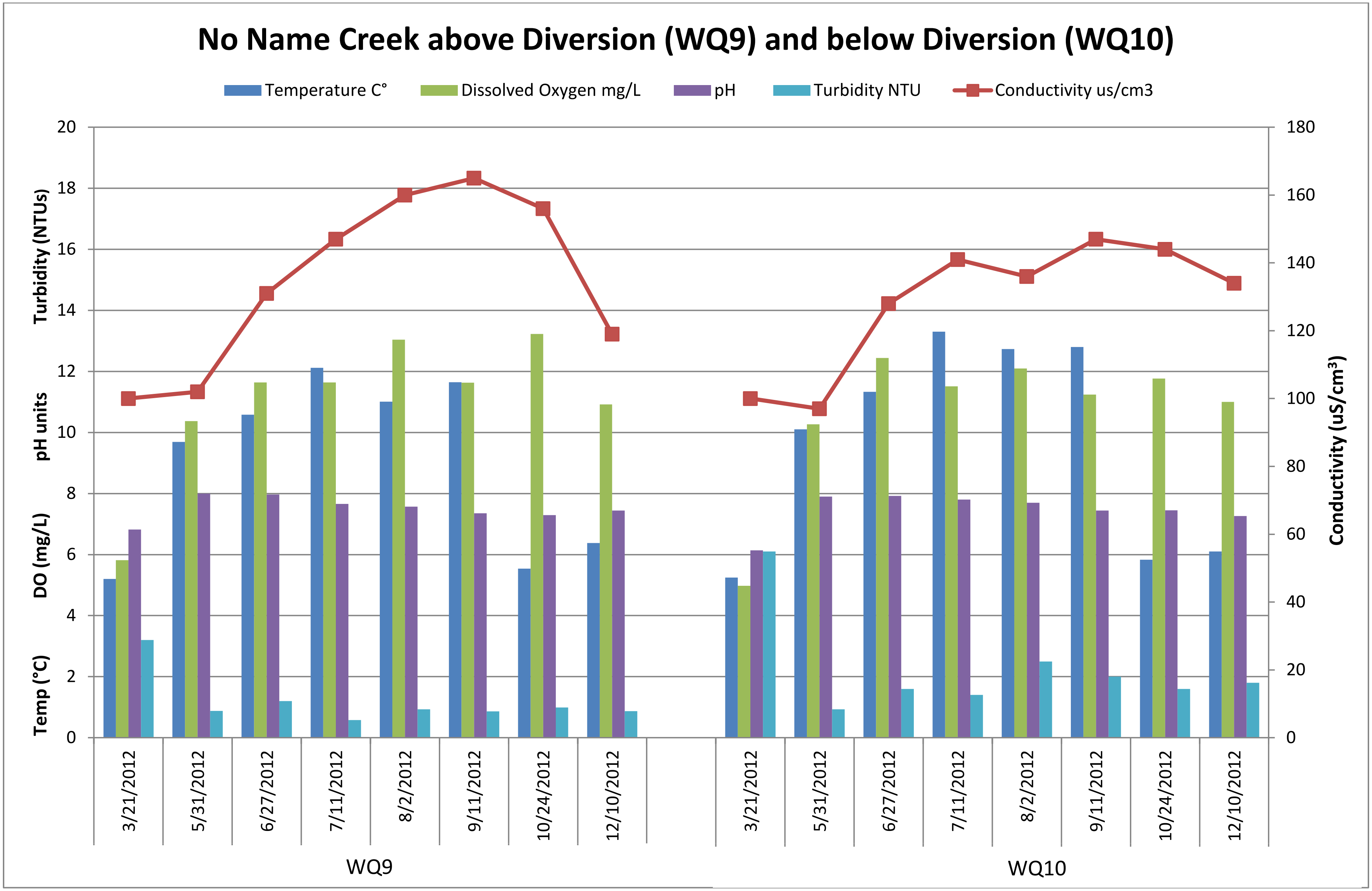

Figure 6. Water temperature, DO, pH, turbidity, and conductivity measured at No Name Creek above (WQ9) and below (WQ10) diversion in 2012

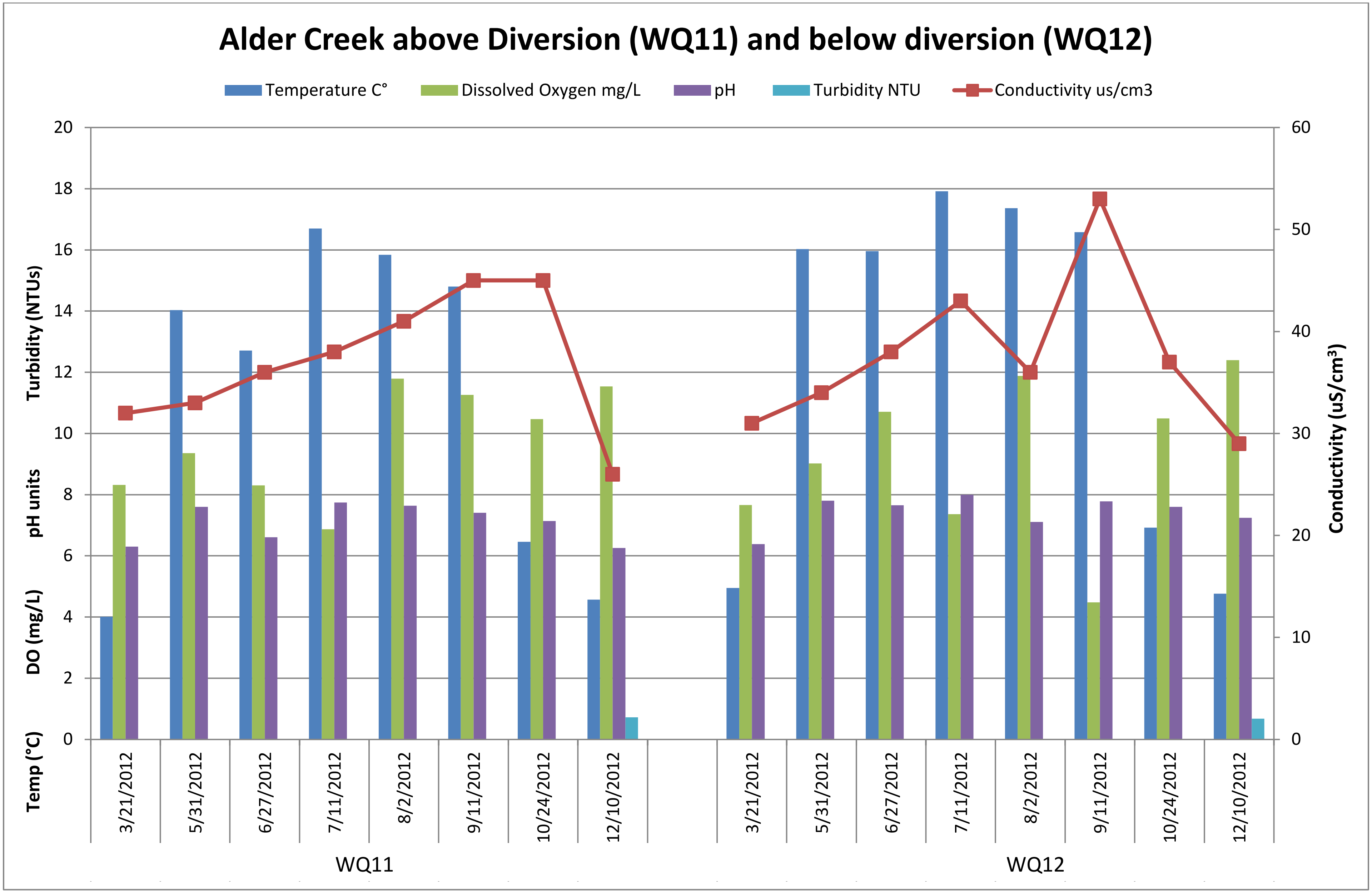

Figure 7. Water temperature, DO, pH, turbidity, and conductivity measured at Alder Creek above (WQ11) and below (WQ12) diversion in 2010

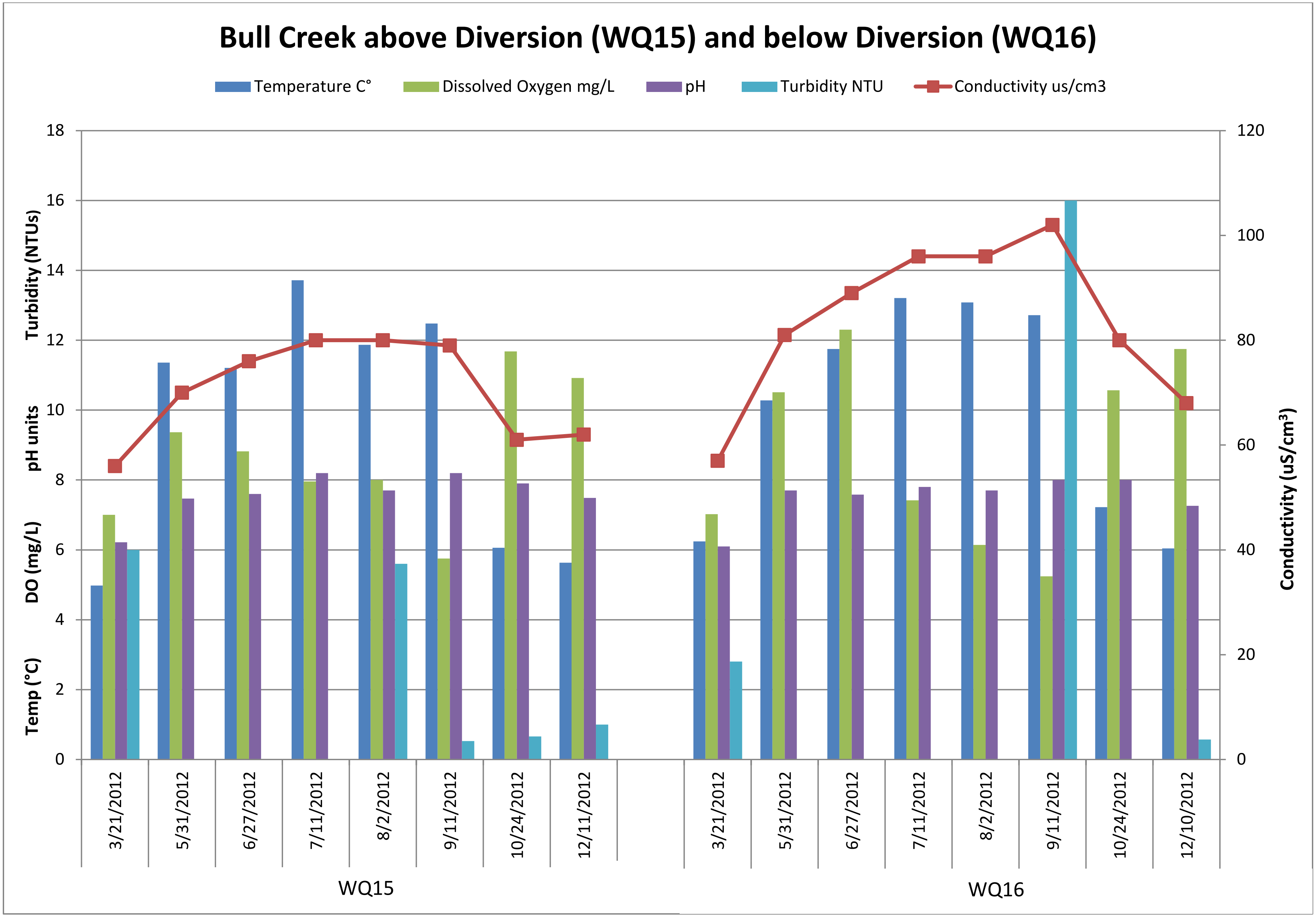

Figure 8. Water temperature, DO, pH, turbidity, and conductivity measured at Bull Creek above (WQ15) and below (WQ16) diversion in 2012

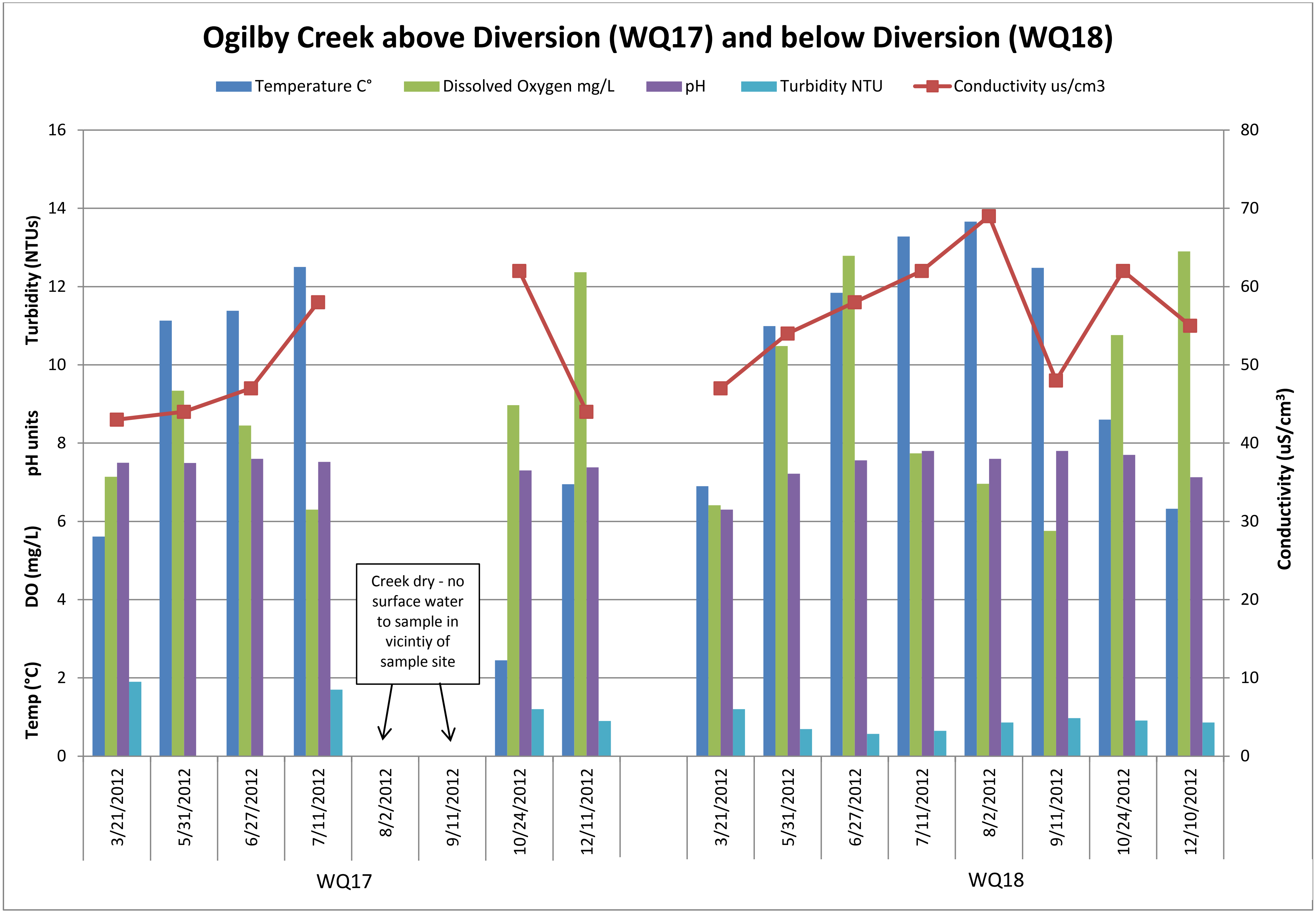

Figure 9. Water temperature, DO, pH, turbidity, and conductivity measured at Ogilby Creek above (WQ17) and below (WQ18) diversion in 2012

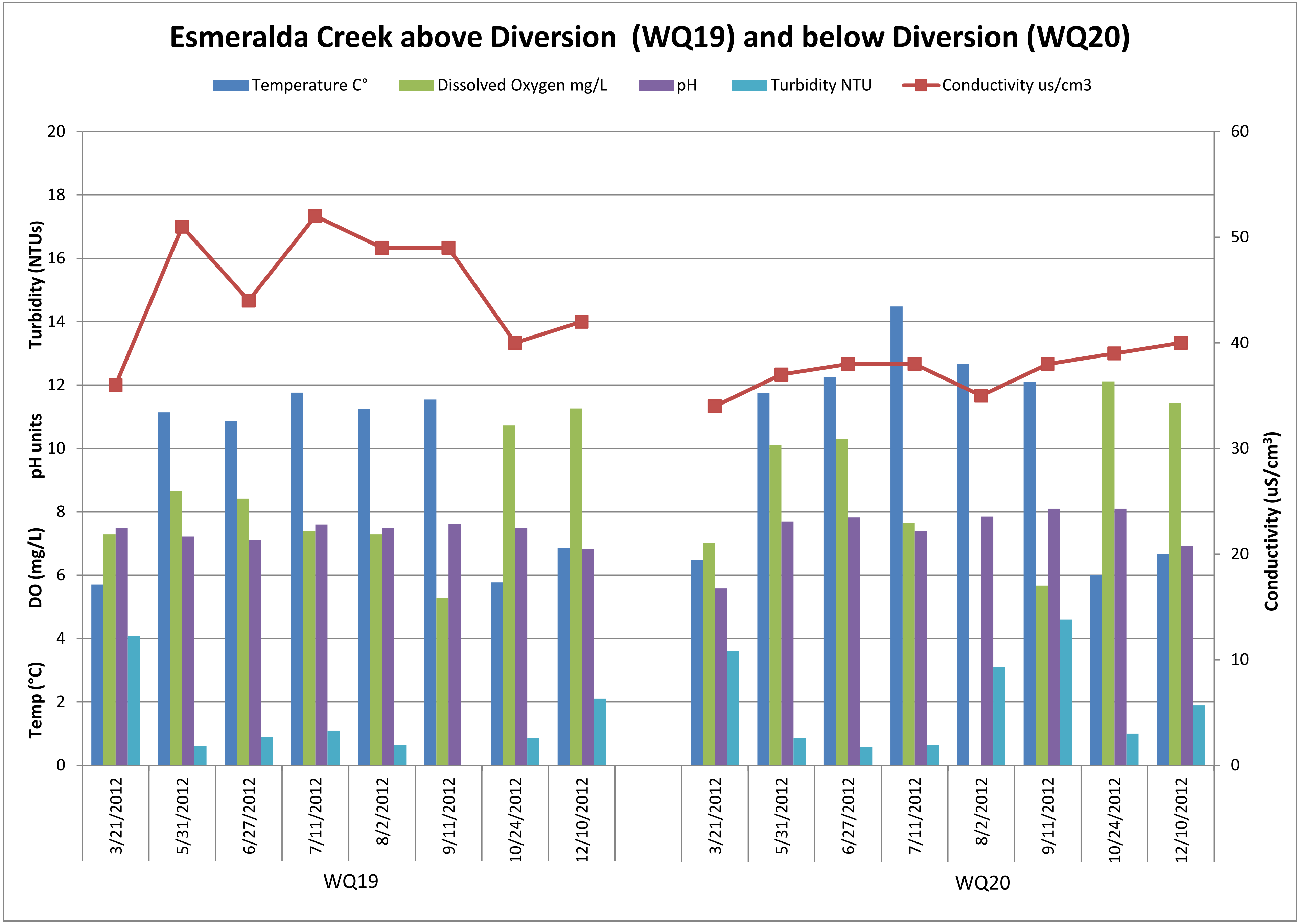

Figure 10. Water temperature, DO, pH, turbidity, and conductivity measured at Esmeralda Creek above (WQ19) and below (WQ20) diversion in 2012

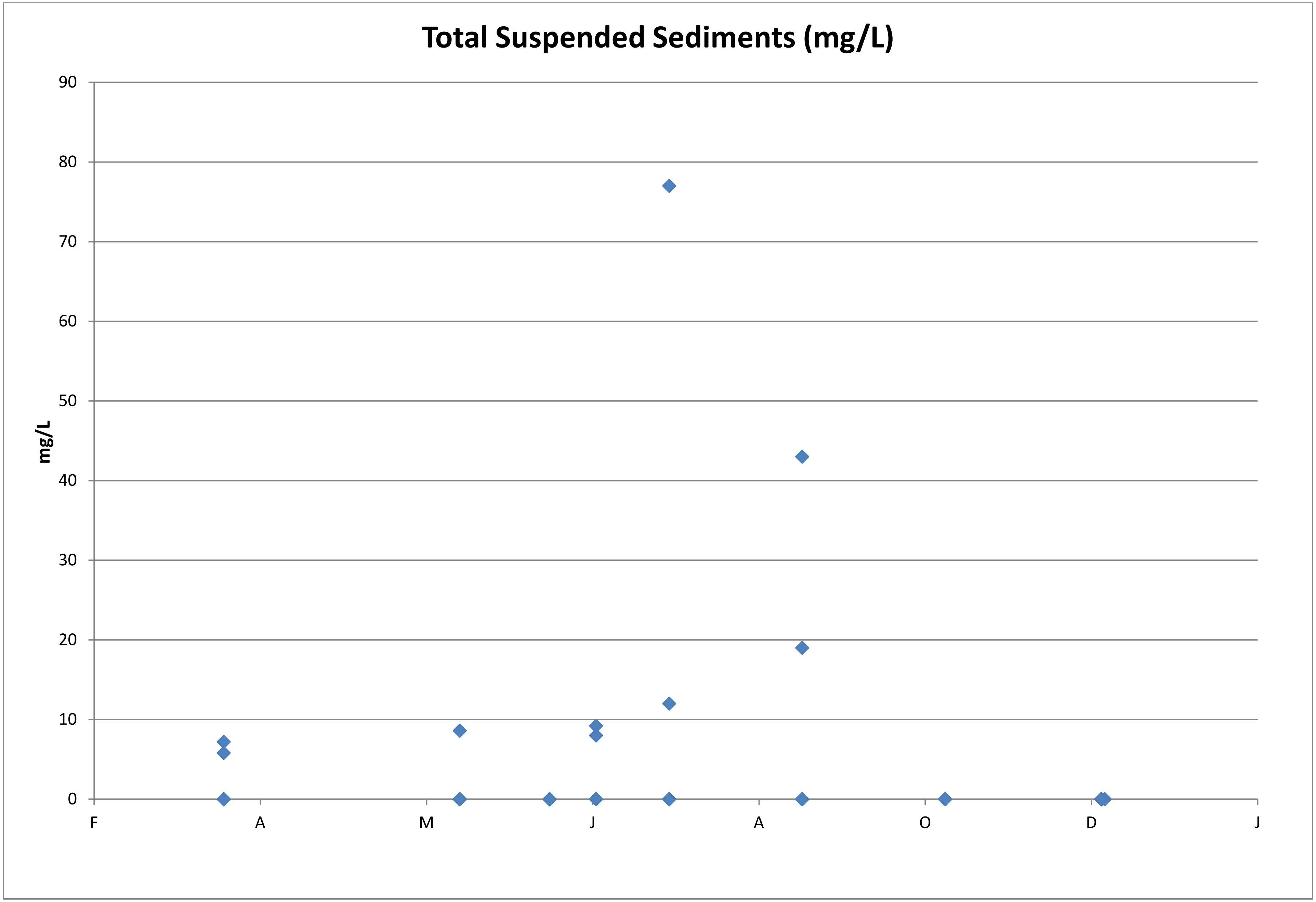

Figure 11. Total Suspended Sediment concentrations (mg/L) measured at all sample sites in 2012

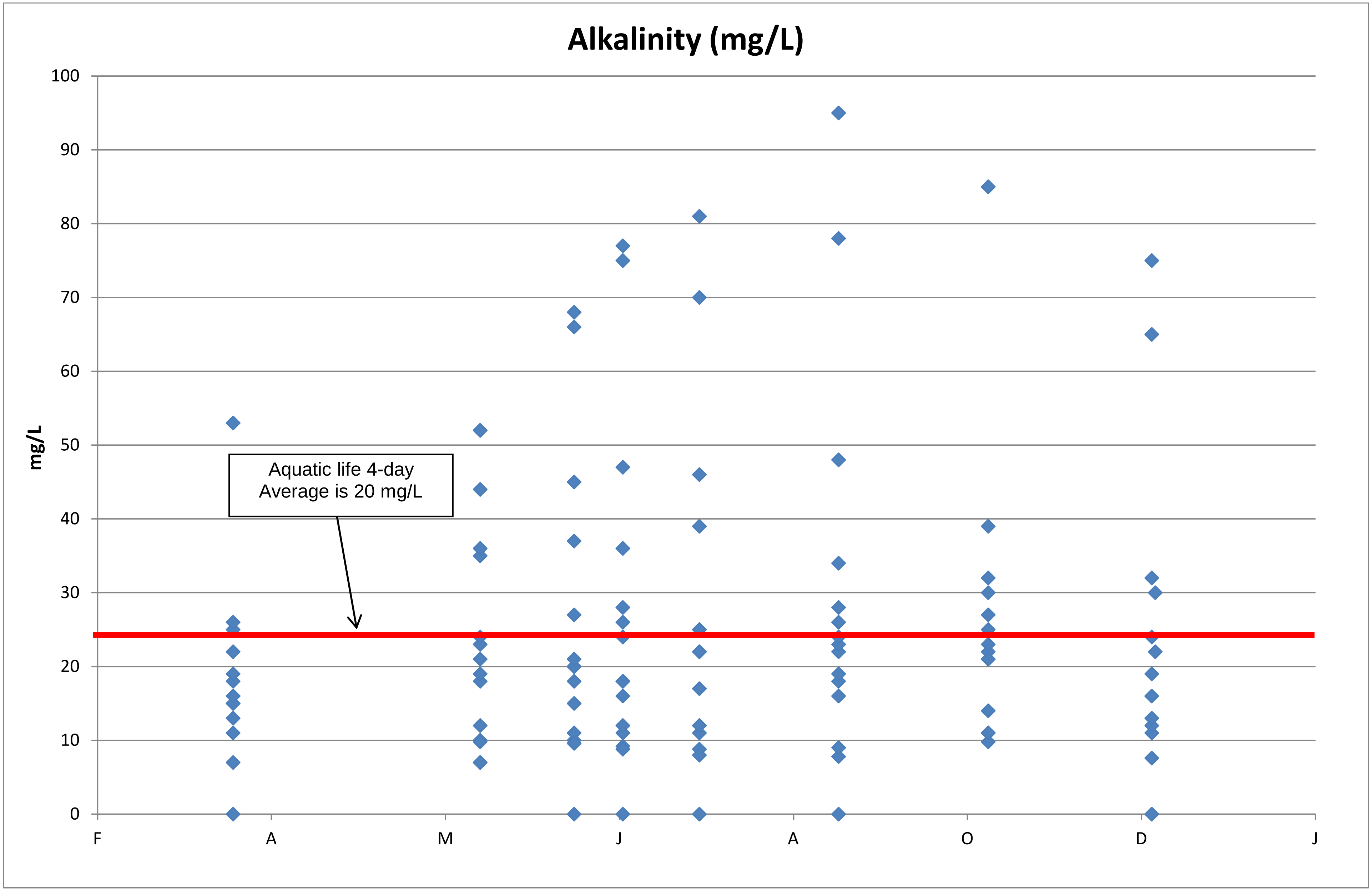

Figure 12. Alkalinity concentrations (mg/L) measured at all sample sites in 2012

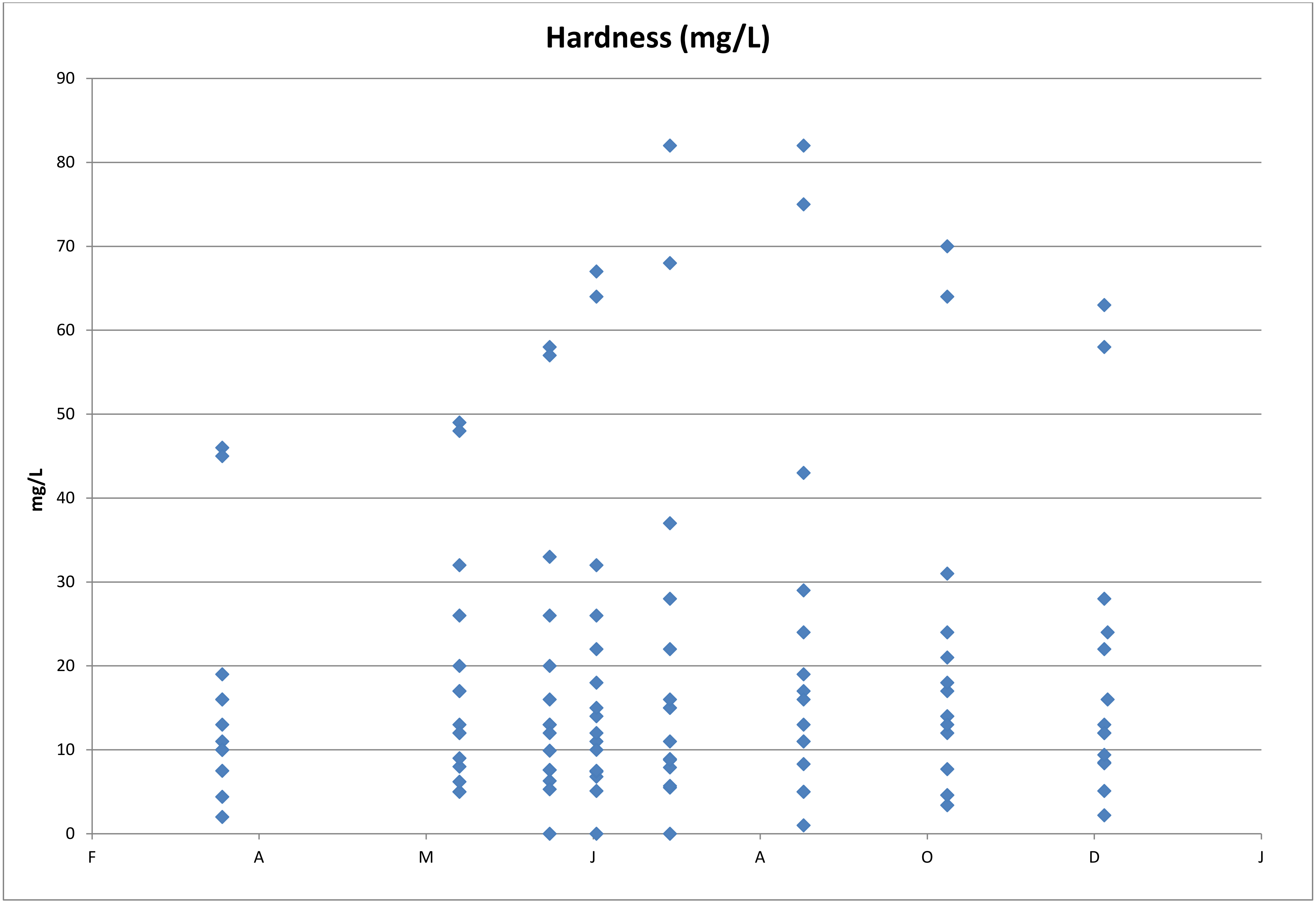

Figure 13. Hardness concentrations (mg/L) measured at all sample sites in 2012

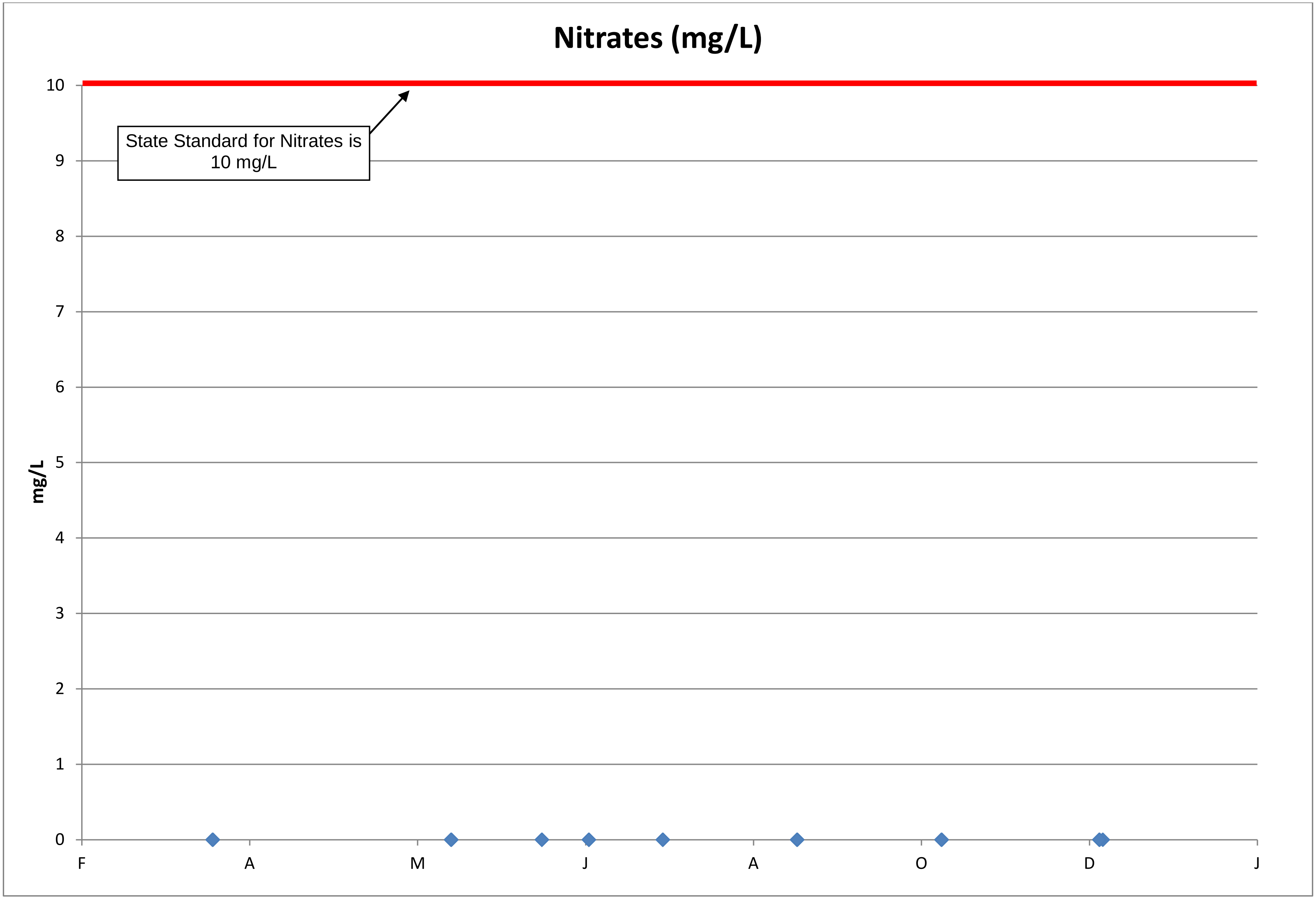

Figure 14. Nitrate concentrations (mg/L) measured at all sample sites in 2012

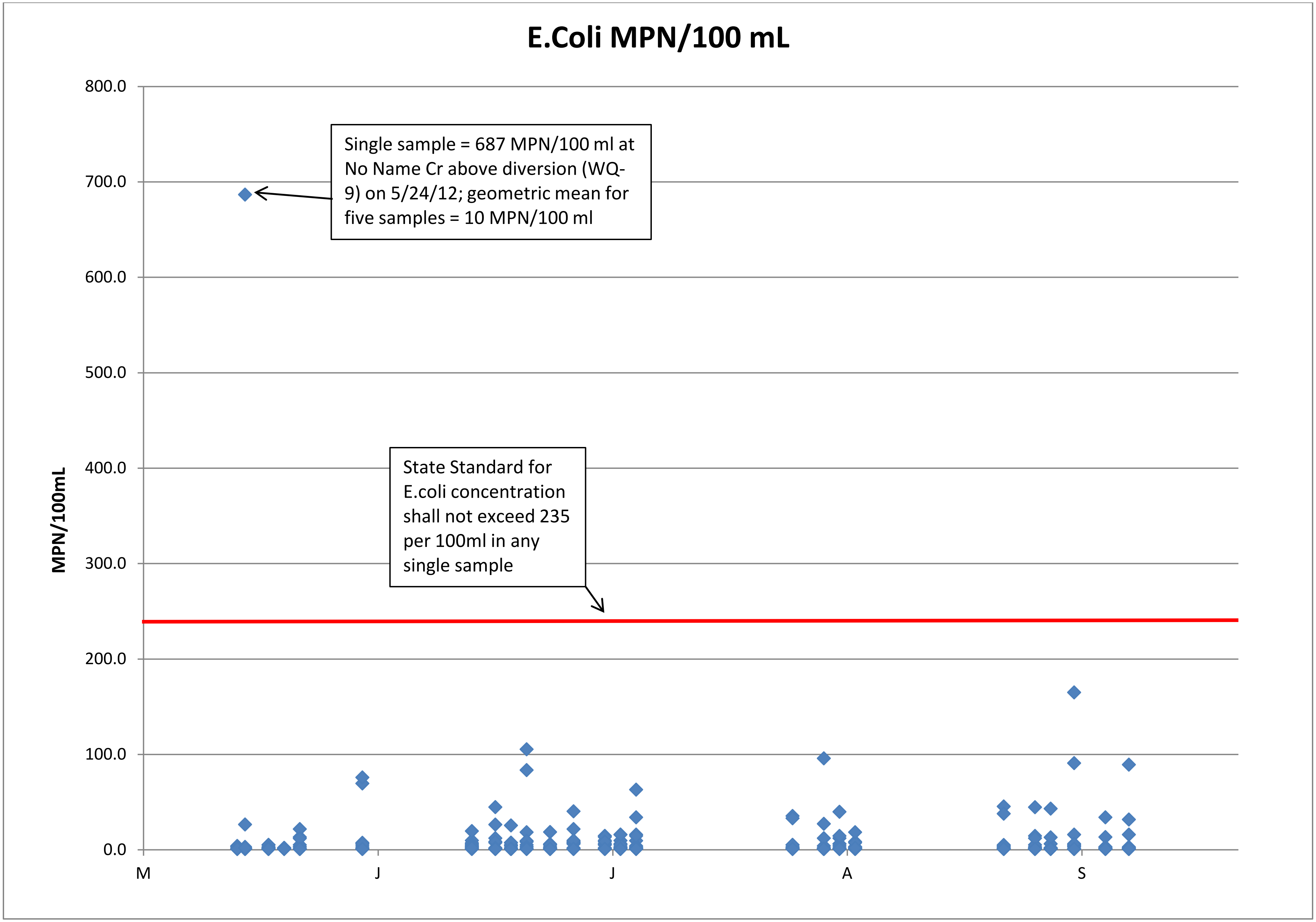

Figure 16. E.coli concentrations (MPN/100 mL) measured at all sample sites in 2012

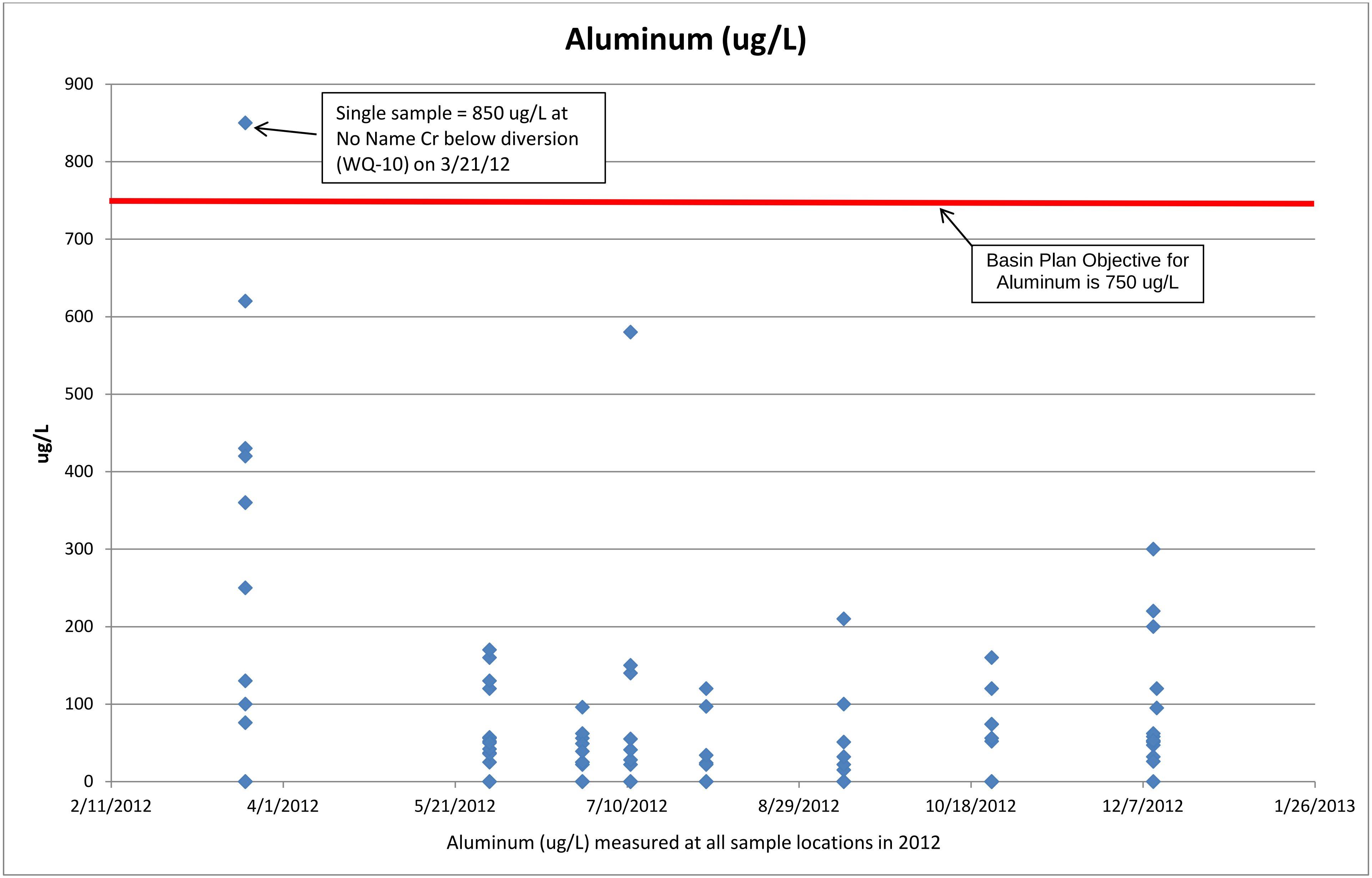

Figure 15. Aluminum concentrations (ug/L) measured at all sample sites in 2012

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	Hardness CaCO3 mg/L	Max dissolved Concentration (ug/L)	Exceedances noted and highlighted
WQ-01	3/21/2012	ND	2	0.3370	
WQ-01	5/31/2012	ND	5.0	0.7990	
WQ-01	6/27/2012	ND	6.3	0.9934	
WQ-01	7/11/2012	ND	6.8	1.0675	
WQ-01	8/2/2012	ND	7.9	1.2295	
WQ-01	9/11/2012	ND	5.0	0.7990	
WQ-01	10/24/2012	ND	3.4	0.5556	
WQ-01	12/10/2012	ND	2.2	0.3686	
WQ-02	6/27/2012	ND	0	0.0000	
WQ-02	7/11/2012	ND	0	0.0000	
WQ-02	8/2/2012	ND	0	0.0000	
WQ-02	9/11/2012	ND	1.0	0.1754	
WQ-03	3/21/2012	ND	7.5	1.1707	
WQ-03	5/31/2012	ND	8.0	1.2441	
WQ-03	6/27/2012	ND	7.6	1.1854	
WQ-03	7/11/2012	ND	7.4	1.1560	
WQ-03	8/2/2012	ND	8.9	1.3756	
WQ-03	9/11/2012	ND	8.3	1.2880	
WQ-03	10/24/2012	ND	7.7	1.2001	
WQ-03	12/10/2012	ND	8.5	1.3173	
WQ-04	3/21/2012	ND	4.4	0.7083	
WQ-04	5/31/2012	ND	5.0	0.7990	
WQ-04	6/27/2012	ND	5.3	0.8441	
WQ-04	7/11/2012	ND	5.1	0.8140	
WQ-04	8/2/2012	ND	5.5	0.8741	
WQ-04	9/11/2012	ND	5.0	0.7990	
WQ-04	10/24/2012	ND	4.6	0.7386	
WQ-04	12/10/2012	ND	5.1	0.8140	
WQ-05	3/21/2012	ND	11.0	1.6795	
WQ-05	5/31/2012	ND	6.2	0.9785	
WQ-05	6/27/2012	ND	7.6	1.1854	
WQ-05	7/11/2012	ND	7.5	1.1707	
WQ-05	8/2/2012	ND	5.7	0.9040	
WQ-05	9/11/2012	ND	11.0	1.6795	
WQ-05	10/24/2012	ND	14.0	2.1079	
WQ-05	12/10/2012	ND	8.4	1.3026	
WQ-06	3/21/2012	ND	10.0	1.5352	
WQ-06	5/31/2012	ND	9.0	1.3901	
WQ-06	6/27/2012	4.2	9.9	1.5208	Exceed
WQ-06	7/11/2012	ND	11	1.6795	
WQ-06	8/2/2012	ND	8.8	1.3610	
WQ-06	9/11/2012	ND	13.0	1.9657	
WQ-06	10/24/2012	ND	14.0	2.1079	
WQ-06	12/10/2012	ND	9.4	1.4483	
WQ-09	3/21/2012	ND	46.0	6.4658	
WQ-09	5/31/2012	ND	49.0	6.8624	
WQ-09	6/27/2012	ND	58.0	8.0440	
WQ-09	7/11/2012	ND	67.0	9.2151	
WQ-09	8/2/2012	ND	82.0	11.1472	

Sample ID	Date	Copper ug/L	Hardness CaCO3 mg/L	Max dissolved Concentration (ug/L)	
WQ-09	9/11/2012	ND	82.0	11.1472	
WQ-09	10/24/2012	ND	70.0	9.6033	
WQ-09	12/10/2012	ND	63.0	8.6958	
WQ-10	3/21/2012	1.0	45.0	6.3333	
WQ-10	5/31/2012	ND	48.0	6.7303	
WQ-10	6/27/2012	ND	57.0	7.9133	
WQ-10	7/11/2012	ND	64.0	8.8258	
WQ-10	8/2/2012	ND	68.0	9.3446	
WQ-10	9/11/2012	ND	75.0	10.2483	
WQ-10	10/24/2012	ND	64.0	8.8258	
WQ-10	12/10/2012	ND	58.0	8.0440	
WQ-11	3/21/2012	ND	10.0	1.5352	
WQ-11	5/31/2012	ND	12.0	1.8230	
WQ-11	6/27/2012	ND	13.0	1.9657	
WQ-11	7/11/2012	ND	12.0	1.8230	
WQ-11	8/2/2012	ND	15.0	2.2495	
WQ-11	9/11/2012	ND	17.0	2.5310	
WQ-11	10/24/2012	ND	12.0	1.8230	
WQ-11	12/10/2012	ND	12.0	1.8230	
WQ-12	3/21/2012	ND	10.0	1.5352	
WQ-12	5/31/2012	ND	13.0	1.9657	
WQ-12	6/27/2012	ND	13.0	1.9657	
WQ-12	7/11/2012	ND	14.0	2.1079	
WQ-12	8/2/2012	ND	15.0	2.2495	
WQ-12	9/11/2012	ND	19.0	2.8107	
WQ-12	10/24/2012	ND	13.0	1.9657	
WQ-12	12/10/2012	ND	12.0	1.8230	
WQ-15	3/21/2012	1.2	16.0	2.3905	
WQ-15	5/31/2012	ND	26.0	3.7771	
WQ-15	6/27/2012	ND	26.0	3.7771	
WQ-15	7/11/2012	ND	26.0	3.7771	
WQ-15	8/2/2012	ND	28.0	4.0503	
WQ-15	9/11/2012	ND	29.0	4.1864	
WQ-15	10/24/2012	ND	24.0	3.5027	
WQ-15	12/11/2012	ND	24.0	3.5027	
WQ-16	3/21/2012	ND	19.0	2.8107	
WQ-16	5/31/2012	ND	32.0	4.5933	
WQ-16	6/27/2012	ND	33.0	4.7284	
WQ-16	7/11/2012	ND	32.0	4.5933	
WQ-16	8/2/2012	ND	37.0	5.2666	
WQ-16	9/11/2012	ND	43.0	6.0677	
WQ-16	10/24/2012	ND	31.0	4.4579	
WQ-16	12/10/2012	ND	28.0	4.0503	
WQ-17	3/21/2012	ND	13.0	1.9657	
WQ-17	5/31/2012	ND	17.0	2.5310	
WQ-17	6/27/2012	ND	16.0	2.3905	
WQ-17	7/11/2012	ND	18.0	2.6711	
WQ-17	10/24/2012	ND	17.0	2.5310	
WQ-17	12/11/2012	ND	16.0	2.3905	
WQ-18	3/21/2012	ND	16.0	2.3905	
WQ-18	5/31/2012	ND	20.0	2.9499	
WQ-18	6/27/2012	ND	20	2.9499	
WQ-18	7/11/2012	ND	22.0	3.2270	
WQ-18	8/2/2012	ND	22.0	3.2270	
WQ-18	9/11/2012	ND	24.0	3.5027	
WQ-18	10/24/2012	ND	21.0	3.0886	
WQ-18	12/10/2012	ND	22.0	3.2270	

Sample ID	Date	Copper ug/L	Hardness CaCO3 mg/L	Max dissolved Concentration (ug/L)	
WQ-19	3/21/2012	ND	10.0	1.5352	
WQ-19	5/31/2012	ND	17.0	2.5310	
WQ-19	6/27/2012	ND	13.0	1.9657	
WQ-19	7/11/2012	ND	15.0	2.2495	
WQ-19	8/2/2012	ND	16.0	2.3905	
WQ-19	9/11/2012	ND	16.0	2.3905	
WQ-19	10/24/2012	ND	18.0	2.6711	
WQ-19	12/10/2012	ND	13.0	1.9657	
WQ-20	3/21/2012	ND	10.0	1.5352	
WQ-20	5/31/2012	2.6	12.0	1.8230	Exceed
WQ-20	6/27/2012	ND	12.0	1.8230	
WQ-20	7/11/2012	ND	10.0	1.5352	
WQ-20	8/2/2012	ND	11.0	1.6795	
WQ-20	9/11/2012	ND	11.0	1.6795	
WQ-20	10/24/2012	ND	4.6	0.7386	
WQ-20	12/10/2012	ND	12.0	1.8230	

Table 10. E.coli concentrations (MPN/100 mL) for all sample sites in 2012

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-01	5/23/2012	9:15	1.0
WQ-01	5/24/2012	9:15	1.0
WQ-01	5/27/2012	9:00	1.0
WQ-01	5/29/2012	9:15	1.0
WQ-01	5/31/2012	7:55	1.0
WQ-01	6/8/2012	14:45	1.0
WQ-01	6/22/2012	14:50	3.1
WQ-01	6/25/2012	15:00	1.0
WQ-01	6/27/2012	14:45	5.2
WQ-01	6/29/2012	14:45	18.5
WQ-01	7/2/2012	14:45	18.7
WQ-01	7/5/2012	14:50	6.3
WQ-01	7/9/2012	14:50	1.0
WQ-01	7/11/2012	13:55	3.0
WQ-01	7/13/2012	14:30	34.1
WQ-01	8/2/2012	14:45	35.5
WQ-01	8/6/2012	14:40	27.3
WQ-01	8/8/2012	14:45	12.2
WQ-01	8/10/2012	14:45	8.5
WQ-01	8/29/2012	14:40	2.0
WQ-01	9/2/2012	14:45	1.0
WQ-01	9/4/2012	14:40	1.0
WQ-01	9/7/2012	14:35	16.0
WQ-01	9/11/2012	14:35	1.0
WQ-01	9/14/2012	14:30	2.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-02	*	*	*
WQ-02	*	*	*
WQ-02	*	*	*
WQ-02	*	*	*
WQ-02	*	*	*
WQ-02	6/8/2012	11:50	1.0
WQ-02	6/22/2012	11:55	1.0
WQ-02	6/25/2012	12:05	1.0
WQ-02	6/27/2012	12:12	1.0
WQ-02	6/29/2012	11:55	1.0
WQ-02	7/2/2012	11:37	1.0
WQ-02	7/5/2012	11:55	1.0
WQ-02	7/9/2012	11:55	1.0
WQ-02	7/11/2012	11:45	1.0
WQ-02	7/13/2012	11:50	1.0
WQ-02	8/2/2012	11:55	1.0
WQ-02	8/6/2012	11:55	1.0
WQ-02	8/8/2012	12:10	1.0
WQ-02	8/10/2012	11:55	1.0
WQ-02	8/29/2012	11:55	1.0
WQ-02	9/2/2012	11:50	1.0
WQ-02	9/4/2012	11:50	1.0
WQ-02	9/7/2012	11:55	1.0
WQ-02	9/11/2012	11:50	1.0
WQ-02	9/14/2012	11:45	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-03	5/23/2012	7:45	1.0
WQ-03	5/24/2012	8:20	1.0
WQ-03	5/27/2012	8:10	1.0
WQ-03	5/29/2012	8:20	1.0
WQ-03	5/31/2012	8:20	1.0
WQ-03	6/8/2012	8:15	1.0
WQ-03	6/22/2012	8:20	1.0
WQ-03	6/25/2012	8:50	1.0
WQ-03	6/27/2012	8:40	1.0
WQ-03	6/29/2012	9:10	1.0
WQ-03	7/2/2012	14:45	1.0
WQ-03	7/5/2012	8:45	1.0
WQ-03	7/9/2012	9:15	1.0
WQ-03	7/11/2012	8:10	1.0
WQ-03	7/13/2012	8:50	1.0
WQ-03	8/2/2012	8:10	1.0
WQ-03	8/6/2012	8:35	1.0
WQ-03	8/8/2012	8:45	1.0
WQ-03	8/10/2012	8:40	1.0
WQ-03	8/29/2012	8:55	1.0
WQ-03	9/2/2012	9:00	1.0
WQ-03	9/4/2012	8:50	6.3
WQ-03	9/7/2012	9:10	1.0
WQ-03	9/11/2012	8:15	2.0
WQ-03	9/14/2012	9:00	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-04	5/23/2012	8:15	1.0
WQ-04	5/24/2012	7:50	1.0
WQ-04	5/27/2012	7:45	3.1
WQ-04	5/29/2012	7:50	1.0
WQ-04	5/31/2012	8:50	1.0
WQ-04	6/8/2012	8:40	1.0
WQ-04	6/22/2012	8:40	1.0
WQ-04	6/25/2012	9:10	1.0
WQ-04	6/27/2012	9:30	1.0
WQ-04	6/29/2012	12:22	5.2
WQ-04	7/2/2012	15:05	1.0
WQ-04	7/5/2012	9:00	1.0
WQ-04	7/9/2012	9:25	2.0
WQ-04	7/11/2012	8:40	1.0
WQ-04	7/13/2012	9:15	2.0
WQ-04	8/2/2012	8:30	1.0
WQ-04	8/6/2012	8:45	1.0
WQ-04	8/8/2012	8:55	1.0
WQ-04	8/10/2012	9:00	3.0
WQ-04	8/29/2012	9:10	1.0
WQ-04	9/2/2012	9:15	1.0
WQ-04	9/4/2012	9:10	43.2
WQ-04	9/7/2012	9:20	1.0
WQ-04	9/11/2012	8:40	1.0
WQ-04	9/14/2012	9:20	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-05	5/23/2012	10:00	3.0
WQ-05	5/24/2012	10:00	3.1
WQ-05	5/27/2012	9:30	2.0
WQ-05	5/29/2012	9:45	2.0
WQ-05	5/31/2012	8:35	5.2
WQ-05	6/8/2012	9:30	2.0
WQ-05	6/22/2012	9:30	7.2
WQ-05	6/25/2012	10:00	12.2
WQ-05	6/27/2012	10:30	4.1
WQ-05	6/29/2012	10:10	8.4
WQ-05	7/2/2012	13:35	1.0
WQ-05	7/5/2012	10:00	6.3
WQ-05	7/9/2012	10:15	14.6
WQ-05	7/11/2012	9:37	2.0
WQ-05	7/13/2012	10:05	16.0
WQ-05	8/2/2012	9:30	3.0
WQ-05	8/6/2012	9:45	2.0
WQ-05	8/8/2012	9:50	1.0
WQ-05	8/10/2012	9:55	3.1
WQ-05	8/29/2012	10:00	3.1
WQ-05	9/2/2012	10:05	1.0
WQ-05	9/4/2012	10:00	1.0
WQ-05	9/7/2012	10:10	4.1
WQ-05	9/11/2012	9:45	2.0
WQ-05	9/14/2012	10:10	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-06	5/23/2012	10:15	4.1
WQ-06	5/24/2012	10:15	2.0
WQ-06	5/27/2012	9:40	1.0
WQ-06	5/29/2012	9:55	1.0
WQ-06	5/31/2012	8:47	3.1
WQ-06	6/8/2012	9:40	6.1
WQ-06	6/22/2012	9:40	9.8
WQ-06	6/25/2012	10:10	7.5
WQ-06	6/27/2012	13:05	2.0
WQ-06	6/29/2012	10:20	9.4
WQ-06	7/2/2012	13:37	2.0
WQ-06	7/5/2012	10:10	8.4
WQ-06	7/9/2012	10:30	5.2
WQ-06	7/11/2012	9:50	2.0
WQ-06	7/13/2012	10:15	9.6
WQ-06	8/2/2012	10:00	5.2
WQ-06	8/6/2012	10:00	2.0
WQ-06	8/8/2012	9:55	6.3
WQ-06	8/10/2012	10:05	2.0
WQ-06	8/29/2012	10:05	1.0
WQ-06	9/2/2012	10:15	1.0
WQ-06	9/4/2012	10:10	1.0
WQ-06	9/7/2012	10:15	3.1
WQ-06	9/11/2012	10:00	1.0
WQ-06	9/14/2012	10:20	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-09	5/23/2012	10:25	1.0
WQ-09	5/24/2012	12:25	686.7
WQ-09	5/27/2012	10:00	5.2
WQ-09	5/29/2012	10:15	2.0
WQ-09	5/31/2012	9:24	13.4
WQ-09	6/8/2012	10:15	4.1
WQ-09	6/22/2012	10:00	19.7
WQ-09	6/25/2012	10:15	44.8
WQ-09	6/27/2012	12:30	1.0
WQ-09	6/29/2012	10:30	105.4
WQ-09	7/2/2012	13:20	5.2
WQ-09	7/5/2012	10:20	7.4
WQ-09	7/9/2012	10:40	14.6
WQ-09	7/11/2012	10:10	2.0
WQ-09	7/13/2012	10:25	1.0
WQ-09	8/2/2012	10:30	2.0
WQ-09	8/6/2012	10:15	1.0
WQ-09	8/8/2012	11:35	1.0
WQ-09	8/10/2012	10:15	1.0
WQ-09	8/29/2012	10:15	1.0
WQ-09	9/2/2012	10:25	44.7
WQ-09	9/4/2012	10:15	2.0
WQ-09	9/7/2012	10:25	165.0
WQ-09	9/11/2012	10:15	1.0
WQ-09	9/14/2012	10:30	2.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-10	5/23/2012	10:35	1.0
WQ-10	5/24/2012	12:35	26.6
WQ-10	5/27/2012	9:50	2.0
WQ-10	5/29/2012	10:05	2.0
WQ-10	5/31/2012	9:40	21.8
WQ-10	6/8/2012	10:00	1.0
WQ-10	6/22/2012	9:47	6.2
WQ-10	6/25/2012	10:20	26.5
WQ-10	6/27/2012	12:50	25.6
WQ-10	6/29/2012	12:22	83.6
WQ-10	7/2/2012	13:30	6.1
WQ-10	7/5/2012	10:30	40.4
WQ-10	7/9/2012	10:45	6.3
WQ-10	7/11/2012	10:30	9.7
WQ-10	7/13/2012	10:35	3.0
WQ-10	8/2/2012	10:40	1.0
WQ-10	8/6/2012	10:20	1.0
WQ-10	8/8/2012	11:45	6.2
WQ-10	8/10/2012	10:25	3.1
WQ-10	8/29/2012	10:20	5.1
WQ-10	9/2/2012	10:35	14.6
WQ-10	9/4/2012	10:20	1.0
WQ-10	9/7/2012	10:35	90.9
WQ-10	9/11/2012	10:25	13.4
WQ-10	9/14/2012	10:35	16.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-11	5/23/2012	12:12	1.0
WQ-11	5/24/2012	12:35	1.0
WQ-11	5/27/2012	11:50	2.0
WQ-11	5/29/2012	11:50	1.0
WQ-11	5/31/2012	12:20	1.0
WQ-11	6/8/2012	11:50	2.0
WQ-11	6/22/2012	12:00	2.0
WQ-11	6/25/2012	13:45	1.0
WQ-11	6/27/2012	10:25	7.5
WQ-11	7/2/2012	13:30	1.0
WQ-11	7/5/2012	14:00	2.0
WQ-11	7/9/2012	14:00	1.0
WQ-11	7/11/2012	11:20	6.3
WQ-11	7/13/2012	14:00	1.0
WQ-11	8/2/2012	11:20	1.0
WQ-11	8/6/2012	14:00	1.0
WQ-11	8/8/2012	12:10	1.0
WQ-11	8/10/2012	12:00	1.0
WQ-11	8/29/2012	13:35	1.0
WQ-11	9/2/2012	13:40	1.0
WQ-11	9/4/2012	11:30	2.0
WQ-11	9/7/2012	14:00	1.0
WQ-11	9/11/2012	10:55	1.0
WQ-11	9/14/2012	12:10	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-12	5/23/2012	13:00	1.0
WQ-12	5/24/2012	13:45	1.0
WQ-12	5/27/2012	12:30	5.2
WQ-12	5/29/2012	12:30	2.0
WQ-12	5/31/2012	13:05	1.0
WQ-12	6/8/2012	12:15	69.6
WQ-12	6/22/2012	11:30	4.1
WQ-12	6/25/2012	14:20	1.0
WQ-12	6/27/2012	13:30	1.0
WQ-12	7/2/2012	13:05	3.1
WQ-12	7/5/2012	14:30	1.0
WQ-12	7/9/2012	14:30	1.0
WQ-12	7/11/2012	11:45	3.1
WQ-12	7/13/2012	14:30	4.1
WQ-12	8/2/2012	12:00	3.1
WQ-12	8/6/2012	14:30	4.1
WQ-12	8/8/2012	12:40	4.1
WQ-12	8/10/2012	12:25	3.1
WQ-12	8/29/2012	2:15	4.1
WQ-12	9/2/2012	14:15	3.1
WQ-12	9/4/2012	12:30	2.0
WQ-12	9/7/2012	13:30	1.0
WQ-12	9/11/2012	11:25	3.1
WQ-12	9/14/2012	12:40	2.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-15	5/23/2012	#	#
WQ-15	5/24/2012	15:05	1.0
WQ-15	5/27/2012	14:20	1.0
WQ-15	5/29/2012	13:45	1.0
WQ-15	5/31/2012	12:30	1.0
WQ-15	6/8/2012	13:50	1.0
WQ-15	6/22/2012	12:00	3.1
WQ-15	6/25/2012	12:10	8.6
WQ-15	6/27/2012	12:25	7.5
WQ-15	6/29/2012	12:10	1.0
WQ-15	7/2/2012	8:30	1.0
WQ-15	7/5/2012	12:20	21.8
WQ-15	7/9/2012	12:30	9.8
WQ-15	7/11/2012	8:55	16.0
WQ-15	7/13/2012	12:05	14.6
WQ-15	8/2/2012	9:35	5.2
WQ-15	8/6/2012	12:10	12.2
WQ-15	8/8/2012	13:40	14.6
WQ-15	8/10/2012	13:20	7.5
WQ-15	8/29/2012	12:05	1.0
WQ-15	9/2/2012	12:10	2.0
WQ-15	9/4/2012	14:00	2.0
WQ-15	9/7/2012	12:05	1.0
WQ-15	9/11/2012	9:07	1.0
WQ-15	9/14/2012	14:10	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-16	5/23/2012	13:10	1.0
WQ-16	5/24/2012	10:30	1.0
WQ-16	5/27/2012	10:25	1.0
WQ-16	5/29/2012	10:30	1.0
WQ-16	5/31/2012	10:05	3.1
WQ-16	6/8/2012	10:30	2.0
WQ-16	6/22/2012	10:15	3.0
WQ-16	6/25/2012	10:35	2.0
WQ-16	6/27/2012	14:00	1.0
WQ-16	6/29/2012	14:45	1.0
WQ-16	7/2/2012	9:48	1.0
WQ-16	7/5/2012	10:40	8.4
WQ-16	7/9/2012	14:45	6.3
WQ-16	7/11/2012	10:50	1.0
WQ-16	7/13/2012	10:50	1.0
WQ-16	8/2/2012	11:35	1.0
WQ-16	8/6/2012	10:40	1.0
WQ-16	8/8/2012	10:15	2.0
WQ-16	8/10/2012	10:40	1.0
WQ-16	8/29/2012	10:30	45.5
WQ-16	9/2/2012	14:45	5.2
WQ-16	9/4/2012	10:30	1.0
WQ-16	9/7/2012	13:15	5.2
WQ-16	9/11/2012	11:00	34.1
WQ-16	9/14/2012	10:45	31.8

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-17	5/23/2012	14:25	1.0
WQ-17	5/24/2012	13:40	2.0
WQ-17	5/27/2012	15:10	2.0
WQ-17	5/29/2012	14:45	1.0
WQ-17	5/31/2012	13:25	12.0
WQ-17	6/8/2012	14:45	7.4
WQ-17	6/22/2012	14:30	5.2
WQ-17	6/25/2012	12:50	1.0
WQ-17	6/27/2012	13:35	1.0
WQ-17	6/29/2012	13:00	3.1
WQ-17	7/2/2012	9:05	5.2
WQ-17	7/5/2012	13:05	7.5
WQ-17	7/9/2012	13:15	13.5
WQ-17	7/11/2012	9:52	5.2
WQ-17	7/13/2012	13:00	63.1
WQ-17	8/2/2012	***	***
WQ-17	8/6/2012	***	***
WQ-17	8/8/2012	***	***
WQ-17	8/10/2012	***	***
WQ-17	8/29/2012	***	***
WQ-17	9/2/2012	***	***
WQ-17	9/4/2012	***	***
WQ-17	9/7/2012	***	***
WQ-17	9/11/2012	***	***
WQ-17	9/14/2012	***	***

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-18	5/23/2012	15:10	1.0
WQ-18	5/24/2012	11:50	1.0
WQ-18	5/27/2012	13:00	1.0
WQ-18	5/29/2012	15:20	1.0
WQ-18	5/31/2012	10:15	1.0
WQ-18	6/8/2012	12:35	75.9
WQ-18	6/22/2012	10:35	1.0
WQ-18	6/25/2012	15:15	1.0
WQ-18	6/27/2012	12:00	1.0
WQ-18	6/29/2012	15:15	3.1
WQ-18	7/2/2012	10:10	1.0
WQ-18	7/5/2012	15:00	9.8
WQ-18	7/9/2012	15:15	8.6
WQ-18	7/11/2012	11:10	16.0
WQ-18	7/13/2012	15:00	2.0
WQ-18	8/2/2012	11:15	33.1
WQ-18	8/6/2012	15:00	95.9
WQ-18	8/8/2012	10:30	39.9
WQ-18	8/10/2012	14:50	18.5
WQ-18	8/29/2012	14:45	37.9
WQ-18	9/2/2012	14:45	12.2
WQ-18	9/4/2012	15:15	13.1
WQ-18	9/7/2012	14:45	6.3
WQ-18	9/11/2012	10:40	3.1
WQ-18	9/14/2012	13:00	3.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-19	5/23/2012	14:35	3.0
WQ-19	5/24/2012	13:50	1.0
WQ-19	5/27/2012	15:20	1.0
WQ-19	5/29/2012	14:58	1.0
WQ-19	5/31/2012	13:45	1.0
WQ-19	6/8/2012	15:00	6.3
WQ-19	6/22/2012	14:40	4.1
WQ-19	6/25/2012	13:00	1.0
WQ-19	6/27/2012	14:10	1.0
WQ-19	6/29/2012	13:15	1.0
WQ-19	7/2/2012	9:12	1.0
WQ-19	7/5/2012	13:20	1.0
WQ-19	7/9/2012	13:20	1.0
WQ-19	7/11/2012	10:07	1.0
WQ-19	7/13/2012	13:10	1.0
WQ-19	8/2/2012	10:40	1.0
WQ-19	8/6/2012	13:10	1.0
WQ-19	8/8/2012	14:30	1.0
WQ-19	8/10/2012	14:30	1.0
WQ-19	8/29/2012	13:00	1.0
WQ-19	9/2/2012	15:00	1.0
WQ-19	9/4/2012	15:00	1.0
WQ-19	9/7/2012	13:00	1.0
WQ-19	9/11/2012	10:06	1.0
WQ-19	9/14/2012	14:50	1.0

Sample ID	Date	Time	E.Coli MPN/100 mL
WQ-20	5/23/2012	15:30	1.0
WQ-20	5/24/2012	10:45	2.0
WQ-20	5/27/2012	10:40	1.0
WQ-20	5/29/2012	10:40	1.0
WQ-20	5/31/2012	10:30	1.0
WQ-20	6/8/2012	10:40	1.0
WQ-20	6/22/2012	14:45	2.0
WQ-20	6/25/2012	10:45	1.0
WQ-20	6/27/2012	14:20	1.0
WQ-20	6/29/2012	10:45	1.0
WQ-20	7/2/2012	9:39	1.0
WQ-20	7/5/2012	15:15	1.0
WQ-20	7/9/2012	10:55	1.0
WQ-20	7/11/2012	10:35	1.0
WQ-20	7/13/2012	13:20	1.0
WQ-20	8/2/2012	10:55	1.0
WQ-20	8/6/2012	10:50	1.0
WQ-20	8/8/2012	10:40	1.0
WQ-20	8/10/2012	10:50	2.0
WQ-20	8/29/2012	10:40	1.0
WQ-20	9/2/2012	10:45	1.0
WQ-20	9/4/2012	10:45	1.0
WQ-20	9/7/2012	10:45	1.0
WQ-20	9/11/2012	10:15	1.0
WQ-20	9/14/2012	15:05	89.3

* Unsafe to reach location due to weather conditions

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

\# No data available