

WR-1 WATER QUALITY TECHNICAL MEMORANDUM

**KERN RIVER NO. 3 HYDROELECTRIC PROJECT
*FERC PROJECT No. 2290***

PREPARED FOR:



October 2024

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
DO	dissolved oxygen
FERC	Federal Energy Regulatory Commission
ISR	Initial Study Report
KR3	Kern River No. 3
mg/L	milligrams per liter
mL	milliliter
MPN	most probable number
NFKR	North Fork Kern River
Project	Kern River No. 3 Hydroelectric Project (FERC Project No. 2290)
SCE	Southern California Edison
SPD	Study Plan Determination
USR	Updated Study Report

1.0 INTRODUCTION

This updated Technical Memorandum provides complete methods and findings of the WR-1 Water Quality Study in support of Southern California Edison's (SCE's) Kern River No. 3 (KR3) Hydroelectric Project (Project) relicensing, Federal Energy Regulatory Commission (FERC) Project No. 2290. The WR-1 Study Plan was included in SCE's Revised Study Plan filed on July 1, 2022 (SCE, 2022). In the October 12, 2022, Study Plan Determination (SPD) (FERC, 2022), FERC approved the WR-1 Study Plan with modifications, stipulating that SCE deploy data loggers for 12 months, from June 1, 2022, through May 31, 2023, to capture data throughout the year; originally, data loggers were to be deployed only from June 1, 2022, through September 30, 2022. Because of equipment issues (i.e., loss of loggers and siltation), data collected through May 31, 2023, were insufficient to characterize water quality conditions in the Project reaches. SCE conducted additional sampling to remedy data gaps, including redeploying loggers through September 2024. Additionally, in its *Determination on Requests for Study Modifications and New Studies* (FERC, 2024) issued May 30, 2024, FERC required additional bacteria monitoring to collect samples during two holiday weekends and an evaluation of potential effects on water quality along the North Fork Kern River (NFKR) during periods of spills along the flowline.

This updated Technical Memorandum includes data collected through September 2024 and is being filed with FERC as part of SCE's Updated Study Report.

2.0 STUDY GOALS AND OBJECTIVES

The objectives of the study, as outlined in the WR-1 Study Plan (SCE, 2022) and as amended in the SPD (FERC, 2022), are as follow:

- Collect current stream water temperature data to characterize current water temperatures over the year.
- Collect current dissolved oxygen (DO) monitoring data to characterize current DO concentrations over the year.
- Collect surface water grab samples to characterize indicator bacteria concentrations.

3.0 STUDY AREA AND STUDY SITES

The study area includes stream reaches along the NFKR and Salmon and Corral Creeks for the purposes of characterization and data collection relevant to understanding potential effects of Project operations and maintenance activities on water quality.

Temperature and DO monitoring occurred at 10 sites: 7 locations within Project-affected reaches and 3 comparison (control) sites upstream of the FERC Project Boundary. Bacterial sampling was conducted at a subset of these sites. Exact locations of the monitoring stations were determined in the field based on sampling suitability (i.e., well mixed and deep enough for representative sampling) and accessibility. Site coordinates of sampling sites were documented with a hand-held Global Positioning System (GPS)

unit. Established station locations were used during subsequent water quality monitoring efforts. Specifically excluded from the study area were areas where access was unsafe (i.e., very steep terrain or high streamflow). Specific study sites are described in Table 3-1 and shown in Figure 3-1.

Table 3-1. Water Quality Sampling Sites

Site #	Site ID	Site Name	Project-Affected Reach (Yes/No)	Monitoring Type	Location ^a	
					Latitude °N	Longitude °E
1	WQ-NFKR-19.0	NFKR upstream of Fairview Diversion impoundment pool	No	Temperature, DO, bacterial	35.947210	118.478025
2	WQ-NFKR-18.5	NFKR immediately downstream of Fairview Dam	Yes	Temperature, DO	35.944487	118.479529
3	WQ-NFKR-10.9	NFKR at Gold Ledge Campground	Yes	Temperature, DO, bacterial	35.870767	118.453950
4	WQ-NFKR-3.2	NFKR immediately upstream of the KR3 Powerhouse	Yes	Temperature, DO, bacterial	35.776250	118.436628
5	WQ-NFKR-3.0	NFKR downstream of the KR3 Powerhouse	Yes	Temperature, DO	35.774770	118.435442
6	WQ-NFKR-1.2	NFKR at the existing Kernville USACE gage	Yes	Temperature, DO	35.755301	118.422665
7	WQ-CC-1.4	Corral Creek upstream of the Project diversion	No	Temperature, DO	35.853067	118.430824
8	WQ-CC-0.4	Corral Creek upstream of NFKR confluence ^b	Yes	Temperature, DO, bacterial	35.850922	118.451506
9	WQ-SC-0.55	Salmon Creek upstream of the Project diversion	No	Temperature, DO	35.899562	118.458797
10	WQ-SC-0.05	Salmon Creek upstream of NFKR confluence	Yes	Temperature, DO, bacterial	35.895918	118.466196

°E = degree east; °N = degree North; KR3 = Kern River No. 3; NFKR = North Fork Kern River; DO = dissolved oxygen; Project = Kern River No. 3 Hydroelectric Project; USACE = U.S. Army Corps of Engineers

Notes:

^a Datum: World Geodetic System 84

^b Segments of Corral Creek were dry during July, August, and September 2024. Temperature and DO loggers were relocated to a wetted stream pool approximately 1.1 miles upstream (35.852740°N, -118.432098°E) on July 16, 2024.

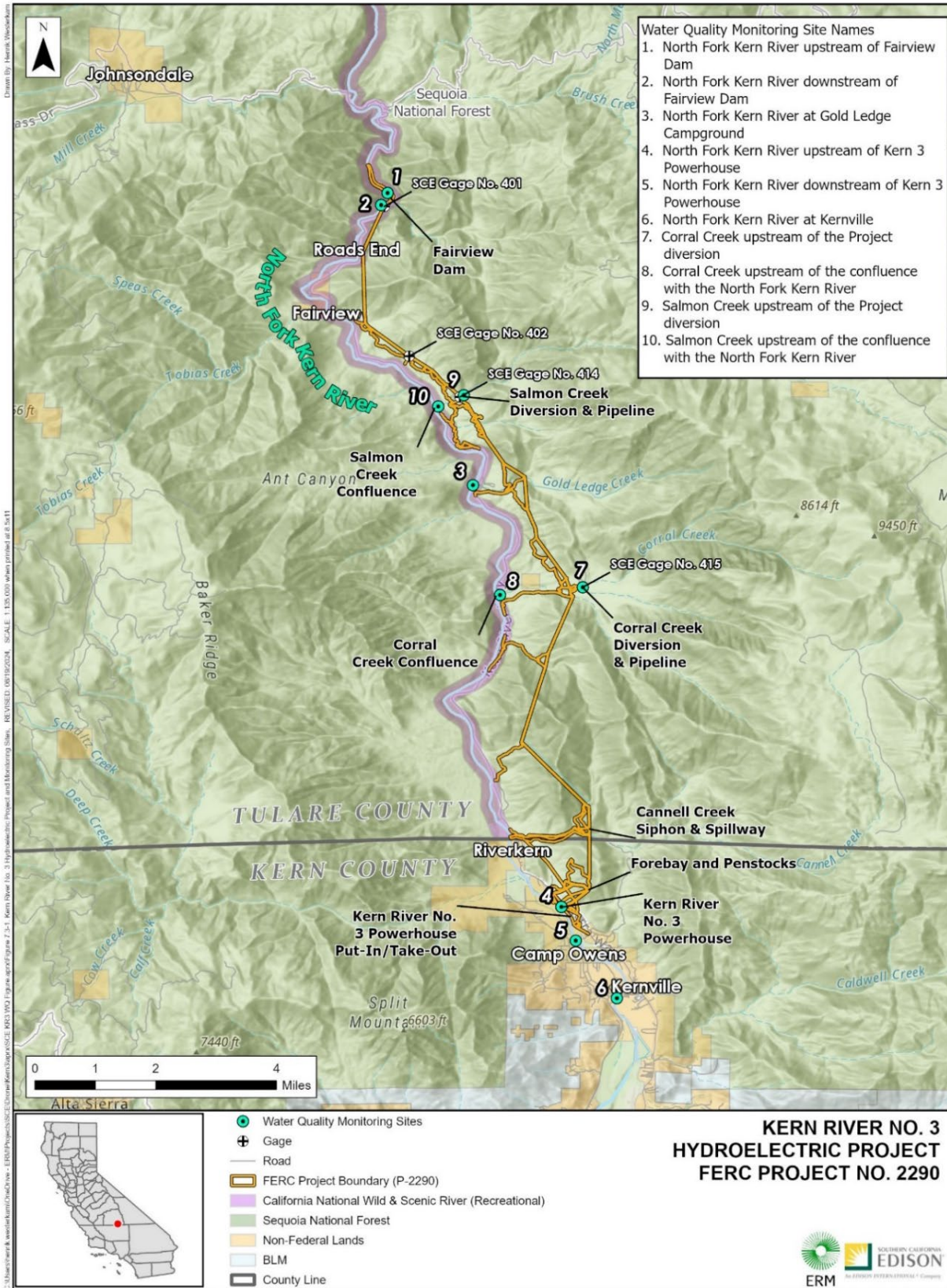


Figure 3-1. Water Quality Monitoring Sites.

4.0 METHODS

Study implementation followed the methods described in SCE's Revised Study Plan (SCE, 2022), as amended by FERC in its SPD (FERC, 2022) and *Determination on Requests for Study Modifications and New Studies* (FERC, 2024), with the following exceptions.

Study Plan Modifications

Based on identified data gaps during initial deployment of water temperature loggers and the FERC (2024) determination, SCE modified the Study Plan and redeployed water temperature and DO loggers to collect an additional year of data through summer 2024.

Study Plan Variances

- Continuous data from water temperature and DO data loggers
 - Data gaps in the continuous data record occurred at some locations during the initial data collection period. High flows affected safe access and resulted in equipment loss.
 - Quality assurance review of the data identified several exclusion periods at some locations due to apparent sensor fouling and siltation or burial.
 - To remedy data gaps, loggers were redeployed from October 2023 through September 2024.
- Bacterial sampling
 - Additional bacterial samples were collected in fall 2022.
 - The bacterial sampling event during the summer 2023 recreation season (including the July 4, 2023, holiday) was postponed due to high flows and potentially unsafe access conditions. This sampling was subsequently completed in July 2024.
 - Additional surface water grab samples for laboratory enumeration of *Escherichia coli* (*E. coli*) bacteria samples were collected during the 2024 summer recreation season to determine compliance with an adopted amendment of the water quality objective for bacteria stipulated in the *Water Quality Control Plan for the Tulare Lake Basin* (Basin Plan; CVRWQCB, 2018).
 - Bacterial samples could not be collected at Corral Creek upstream of the NFKR (Site 8) on sampling dates between July 10 and September 10, 2024, because the stream was dry.

4.1. WATER TEMPERATURE AND DISSOLVED OXYGEN MONITORING

Factory-calibrated water temperature data loggers (i.e., Onset HOBO U22-001) and pre-calibrated DO data loggers (i.e., Onset HOBO U26-001) were placed inside protective housings and were then installed in each stream segment near thalweg locations representative of the main channel (see Table 3-1 and Figure 3-1 for site locations). DO loggers were calibrated approximately monthly following manufacturer instructions from October 2023 through September 2024. Water temperature and DO readings were recorded at 15-minute intervals.

4.1.1. MONITORING PERIODS

Water temperature loggers were installed at each site from May 11, 2021, through October 18, 2021; May 1, 2022, through May 11, 2023; and October 25, 2023, through September 24, 2024. DO loggers were deployed from May 10, 2021, through October 18, 2021; May 26, 2022, through November 10, 2022; and October 25, 2023, through September 24, 2024. Some DO and temperature loggers were not retrieved or redeployed during these periods because of equipment malfunctions, stream access conditions, and/or theft. Because of high stream flows, all DO loggers were removed from their monitoring locations from November 10, 2022, through October 25, 2023.

Based on identified data gaps and quality assurance issues in data collected prior to October 2023 (see Section 4.1.2, *Quality Assurance Review and Data Validation*), DO loggers were redeployed in October 2023 to collect a more robust dataset. Additional methods for calibrating, collecting, and corroborating DO data were implemented and included monthly site visits to clean sensors, recalibrate the DO loggers, and download data. Furthermore, instantaneous water temperature and DO measurements were collected using a multi-parameter water quality instrument (i.e., YSI EXO or similar model) during most of the monthly site visits to compare to DO logger data.

4.1.2. QUALITY ASSURANCE REVIEW AND DATA VALIDATION

Upon return to the laboratory and prior to analysis of data collected from water temperature and DO loggers, data were downloaded into Microsoft Excel. Data quality reviews included identification of (1) periods when the units were in water, (2) periods of logger siltation, and (3) additional anomalies related to sensor fouling or other equipment issues.

Data quality issues resulting from high flows, sensor fouling, equipment failures, and infrequent calibrations were identified in the DO data collected prior to October 2023. The loggers deployed prior to October 2023 in many cases produced datasets with erroneous values (e.g., abnormally low DO), which were likely not representative of stream conditions; therefore, these data were excluded. Because of these data quality issues, DO data collected prior to October 2023 have been qualified.

The primary data exclusion was applied to periods when the data loggers were not physically deployed in the NFKR or tributary streams within the study area. These records can be roughly determined by comparing the deployment/retrieval times with the data

record. For water temperatures, large shifts in the daily minimum to maximum range were used to indicate periods when the data loggers were sampling air versus water temperatures. Evidence of sediment accumulation and fouling was recorded on DO loggers deployed at several sites. Data exclusions for these conditions were made based on extreme fluctuations from ambient conditions to zero. Periods of biofouling were identified by observations of decreases in DO between site checks alongside visual evidence of algae growth on sensors. Exclusions were also made based upon erroneous sensor readings in the raw data record (e.g., 0, -999). For data collected after October 2023, instantaneous water temperature and DO measurements were used to confirm data were acceptable. Instantaneous DO measurements were generally within 1 milligram per liter (mg/L) of the continuous DO logger measurements at the time of redeployment. Excluded data periods are identified as data gaps in the figures provided in this report (Appendices A and B).

Following data review, validated water temperature and DO data were used to calculate daily mean values based on the average of all 15-minute readings for a given day, and daily maxima or minima were the maximum or minimum temperature reading for a given day.

4.2. BACTERIAL SAMPLING

Surface water samples were collected at five sites along the NFKR and its tributaries (see Table 3-1 and Figure 3-1 for site locations). Samples were collected in laboratory-supplied sterile bottles, immediately stored on ice at 4 degrees Celsius (°C), and transported to the Pace Analytical Laboratory (Bakersfield, California) within an 8-hour hold time. In 2022 and 2023, preliminary samples were collected during nine dates; all samples were analyzed for fecal coliform, and four samples were analyzed for *E. coli*. In 2024, six samples were collected within a 30-day period surrounding the Fourth of July holiday (June 6 to July 10), and five samples were collected surrounding the Labor Day holiday (August 13 to September 10); all samples were analyzed for fecal coliform and *E. coli*. Water samples were analyzed for bacteria using standard laboratory methods (SM-9223B and SM-9221E) and reported as the most probable number of bacterial cells per 100 milliliters.

5.0 DATA SUMMARY

5.1. WATER TEMPERATURE AND DISSOLVED OXYGEN

Daily maximum, minimum, and mean water temperatures and DO were plotted by site within the Fairview Dam Bypass Reach¹ (Sites 2 through 4), NFKR comparison sites upstream (Site 1) and downstream of the Fairview Dam Bypass Reach (Sites 5 and 6), Corral Creek (Sites 7 and 8), and Salmon Creek (Sites 9 and 10). The plots are provided in Appendix A and B. Monthly mean water temperatures and DO are provided in Table 5.1-1 and Table 5.1-2, respectively.

¹ The Fairview Dam Bypass Reach is defined as the approximately 16-mile bypass reach of the NFKR between Fairview Dam and the KR3 Powerhouse tailrace.

Water temperatures were generally lower in upstream reaches and warmer in downstream reaches. Seasonal variations in water temperature—cooler temperatures in the winter and higher temperatures in the summer—were observed. DO concentrations were higher in the winter, when water temperatures were cooler. DO concentrations were consistently greater than the 8 mg/L water quality objective from the Basin Plan (CVRWQCB, 2018) except at a few sites in the summer during periods of warmer water temperatures.

Table 5.1-1. Water Temperature Monthly Means, 2021–2024

Year	Month ^a	Mean Monthly Water Temperature (°C)									
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
2021	May	14.3	14.4	16.6	18.5	17.1	16.0	14.3	15.6	13.4	14.3
	June	19.2	19.2	20.9	22.6	21.9	21.4	17.2	17.7 ^b	16.7	19.7
	July	22.1	22.1	23.7	25.0	24.8	24.8	19.5	26.0	22.2	25.0
	Aug	20.4	20.4	21.9	22.9	22.7	22.9	18.4	25.5	20.5	23.9
	Sept	17.2	17.3	18.8	20.1	20.8 ^b	20.0	16.5	25.5	17.4	18.9
	Oct	12.5	12.5	13.5	14.9	N/A	15.0	12.9	23.4	11.1	12.2
2022	May	13.3	13.4	15.3	17.2	15.3	14.9	13.7	14.8	12.6	13.5
	June	17.6	17.7	19.4	21.1	19	19.4	16.6	17.7	17.3	18.2
	July	20.9	21	22.3	23.9	23.4	24.5	18.9	N/A	21.1	21.6
	Aug	21.6 ^b	21.7 ^b	22.8 ^b	23.0	23.1	23.4	19.3	N/A	21.1	22.2
	Sept	18.5	20.7	19.6	21.0	21.2	21.5	17.5	N/A	18.5	19.7
	Oct	12.8	N/A	14.1	15.4	15.5	15.9	14.0	13.7 ^b	12.9	14.1
	Nov	4.9	5.0	6.3	7.6	6.8	N/A	8.8	9.6	5.0	N/A
	Dec	2.9	3.0	4.6	6.0	3.7	N/A	7.6	7.0	3.6	N/A
2023	Jan	3.0	3.1	3.8	4.8	3.9	N/A	4.8	6.0	3.1	N/A
	Feb	3.2	3.4	4.3	5.4	3.7	N/A	4.1	5.4	2.0	N/A
	March	10.2	10.4	10.6	11.0	10.5	N/A	3.3 ^b	5.5 ^b	10.4	N/A
	April	17.2	17.3	17.4	17.3	17.1	N/A	NA	NA	17.5	N/A
	May	18.6	18.5	18.5	18.6	18.7	N/A	11.1	12.2	21.2	N/A
	June	N/A	N/A	N/A	N/A	N/A	N/A	13.4	15.8	24.3	N/A
	Oct	8.1	8.3	9.8	11.6	8.7	8.1	10.9	11.8	6.4	7.0
	Nov	6.0	6.1	7.6	9.3	6.4	7.0	9.4	9.3	4.7	5.2
	Dec	4.5	4.6	6.0	7.4	4.9	5.7	8.4	7.4	3.7	4.1

Year	Month ^a	Mean Monthly Water Temperature (°C)									
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
2024	Jan	3.8	5.8	5.3	6.7	4.4	4.9	7.6	6.6	3.0-	3.4
	Feb	4.8	4.8	5.9	7.3	5.4	6.2	7.0	7.4	3.7	4.1
	March	6.7	6.9	7.4	8.5	7.3	8.0	7.5	8.4	4.4	4.8
	April	8.7	8.6	10.3	10.6	9.3	10.0	8.3	10.3	6.8	7.1
	May	10.8	10.1	11.5	12.5	11.6	12.3	11.6	13.6	10.3	10.7
	June	15.7	15.0	16.5	17.6	16.2	17.2	16.8	19.3	15.3	15.9
	July	19.4	19.5	21.4	23.8	19.9	21.1	19.3	20.0	18.9	19.8
	Aug	18.7	18.7	20.3	21.0	19.6	20.7	17.8	18.0	17.8	19.1
	Sept	16.8	16.9	18.7	20.3	N/A	19.0	16.5	16.6	15.9	17.0

°C = degrees Celsius; N/A = data not available

Notes:

^a No data were collected from November 2021 through April 2022 and July 2023 through September 2023.

^b Denotes months with fewer than 10 usable data points for monthly mean.

Table 5.1-2. Dissolved Oxygen Monthly Means, 2021–2024

Year	Month ^a	Mean Monthly Dissolved Oxygen (mg/L)									
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
2021	May ^b	9.1	8.8	8.7	N/A	7.8	N/A	7	6.1	9.2	N/A
	June ^b	8.6	7.6	7.7	N/A	6.8 ^c	N/A	4.4	6.8	7.9	N/A
	July ^b	N/A	7.1	7.2	7	N/A	N/A	3.4	7.3	7	N/A
	Aug ^b	7	7.3	7.9	7.5	N/A	N/A	3.5	7.6	7.2	N/A
	Sept ^b	6.9	7.4	7.5	6.9	8.3	N/A	4.9	7.6	8	N/A
	Oct ^b	7.6	N/A	N/A	7.5	9.2	N/A	7.1	7.9	9.6	N/A
2022	May ^b	8.3 ^c	8.6 ^c	N/A	N/A	N/A	N/A	7.0 ^c	N/A	8.3 ^c	N/A
	June ^b	7.8	8.1	N/A	N/A	N/A	N/A	6.6	N/A	7.8	N/A
	July ^b	7.1	7.5	7.4 ^c	N/A	N/A	N/A	6	N/A	6.9	N/A
	Aug ^b	N/A	N/A	7.3	N/A	N/A	N/A	6.3	N/A	6.9	N/A
	Sept ^b	7.3	8.2	7.7	N/A	N/A	N/A	6.9	N/A	7.4	N/A
	Oct ^b	N/A	8.9	8.7	N/A	N/A	N/A	7.9	N/A	8.6	N/A
2023	Nov ^b	9.9 ^c	10.3	10.2	9.5	N/A	N/A	N/A	N/A	10.1	N/A
	Oct	10.6	10.6	10.3	10.0	10.5	10.7	9.7	9.6	11.1	10.8
	Nov	11.1	11.1	10.6	10.3	11.0	11.0	9.7	10.2	11.3	11.2
	Dec	11.7	11.6	11.2	10.8	11.4	11.4	10.2	10.7	11.6	11.6

Year	Month ^a	Mean Monthly Dissolved Oxygen (mg/L)									
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
2024	Jan	11.2	11.9	11.5	11.0	11.7	11.7	10.6	10.9	11.9	11.9
	Feb	11.6	11.7	11.4	10.9	11.4	11.4	10.6	10.8	11.8	11.7
	Mar	10.5	11.0	10.7	10.6	11.0	11.0	10.9	10.6	11.7	12.0
	Apr	10.4	10.1	10.4	9.9	10.9	10.7	10.8	10.5	11.2	11.8
	May	10.1	N/A	10.2	9.1	10.2	10.1	9.2	N/A	10.2	10.6
	Jun	9.2	8.8	9.1	8.7	9.1	9.4	8.2	7.8	9.0	9.0
	Jul	8.2	8.3	7.9	7.0	8.2	8.2	7.5	7.7	8.2	7.8
	Aug	8.3	8.5	7.7	8.3	7.8	8.4	7.5	7.8	8.3	7.7
	Sept	8.7	7.7	7.7	8.0	N/A	8.2	7.8	8.3	8.8	8.2

DO = dissolved oxygen; mg/L = milligram per liter; N/A = data not available

Notes:

^a No data were collected from November 2021 through April 2022 and from December 2022 through September 2023.

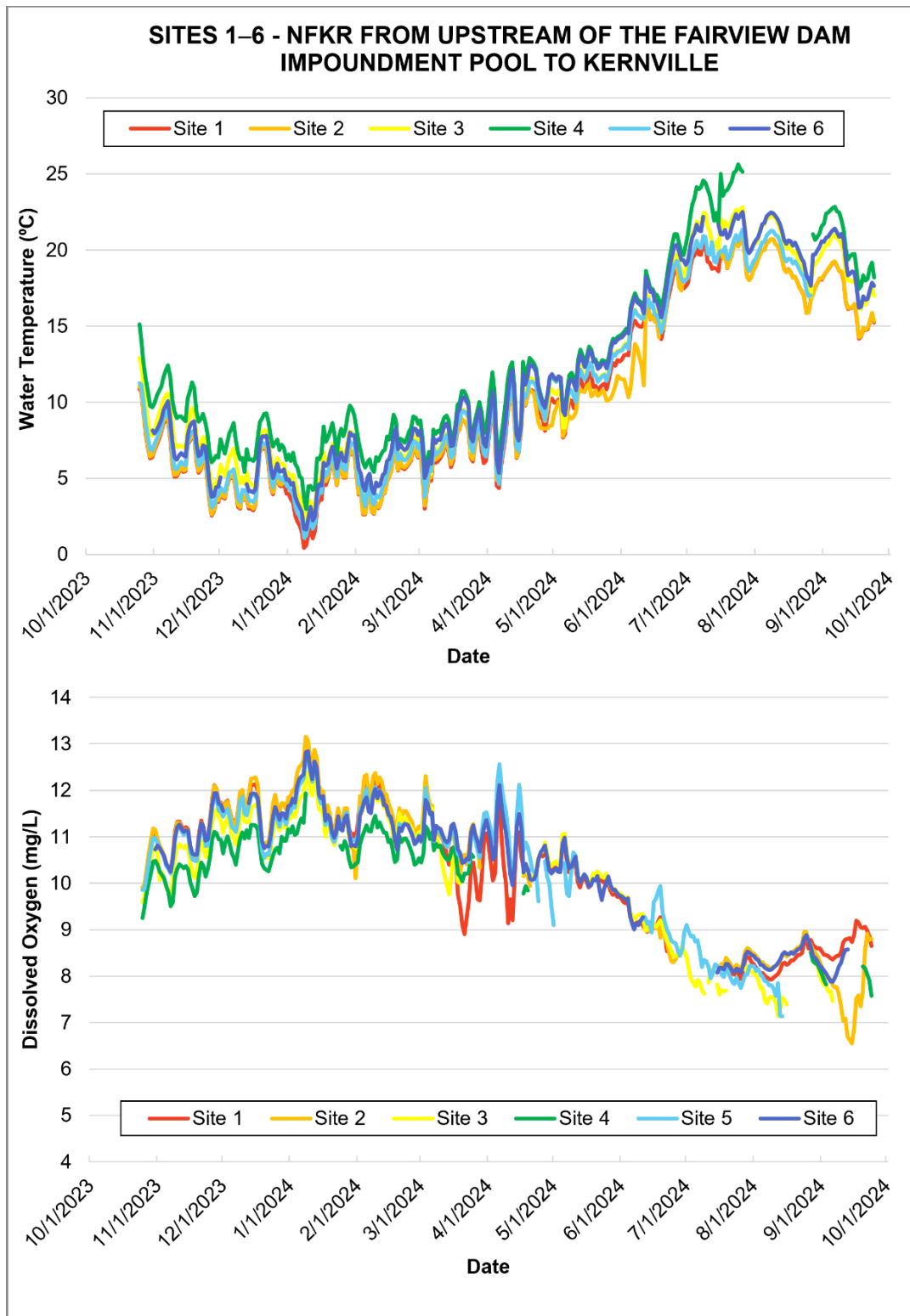
^b DO data from these months have been qualified because of data quality issues identified during analysis.

^c Denotes months with fewer than 10 data points for monthly mean.

5.1.1. NORTH FORK KERN RIVER (SITES 1 THROUGH 6)

Water temperatures were generally similar across sampling sites in the NFKR and exhibited some seasonal and spatial variation (see Figure 5.1-1, Table 5.1-1, Figures A-1 through A-6 in Appendix A, and Figures B-1 through B-6 in Appendix B). Water temperatures were coldest during the winter and warmest during the summer. Site 1—the comparison site located upstream of Fairview Dam—had similar temperatures to Site 2, located immediately downstream of the dam, during all months (Figure 5.1-1).

DO concentrations were consistently greater than the 8 mg/L water quality objective in the Basin Plan (CVRWQCB, 2018). At some sites during summer, DO concentrations were less than 8 mg/L, but these lower concentrations were generally similar across Project-affected reaches and comparison sites (see Figure 5.1-1 and Table 5.1-2; Figures A-11 through A-15 in Appendix A; and Figures B-1 through B-6 in Appendix B). As expected, due to gas solubility relationships with water temperature, DO concentrations in the NFKR were generally higher in the winter and spring and lower in the summer and fall. All instantaneous DO measurements collected during deployment and retrieval of the loggers were greater than 8 mg/L (Appendix C).



°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

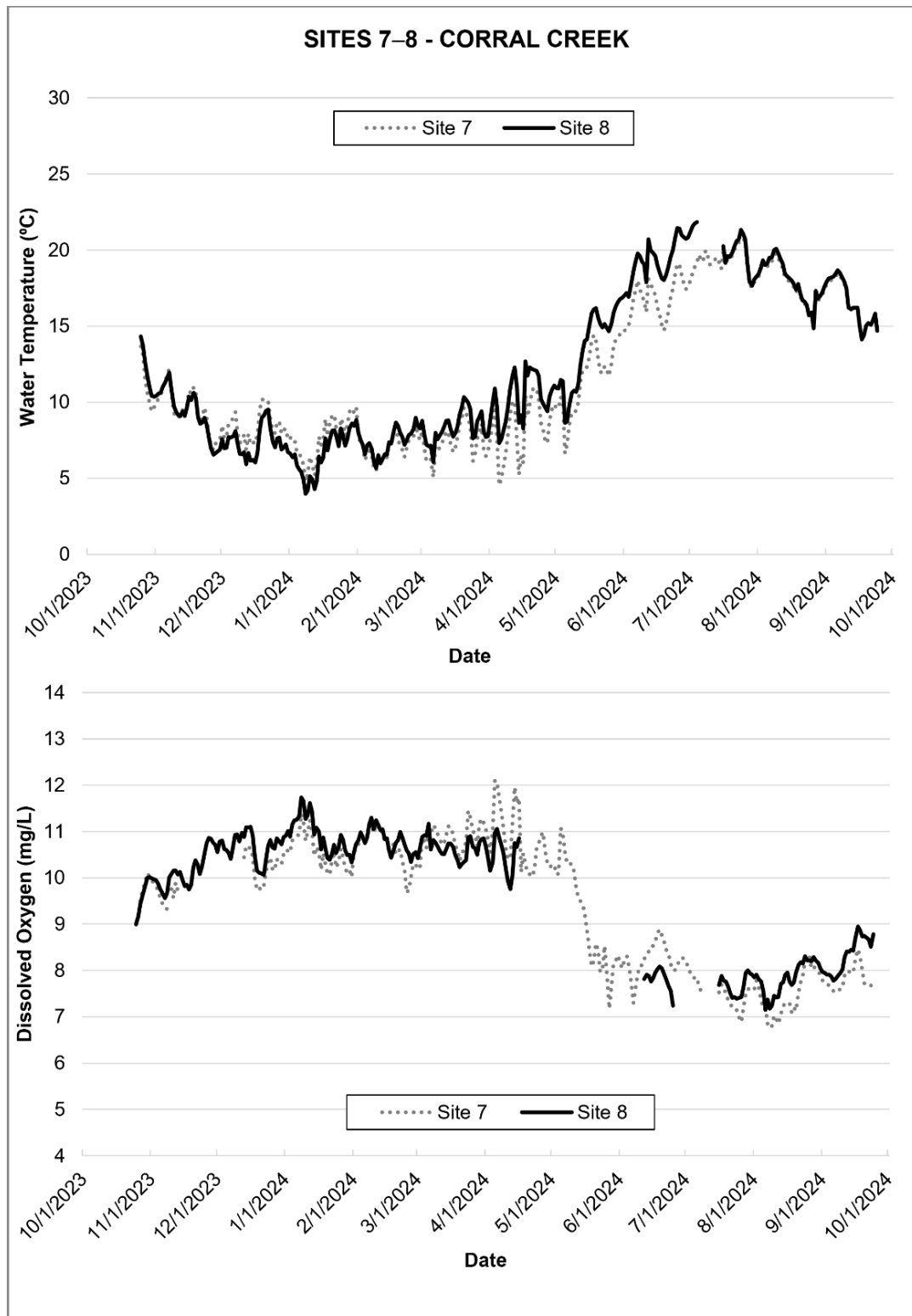
Figure 5.1-1. Mean Daily Water Temperature (top) and Mean Daily Dissolved Oxygen (bottom) at Six Sites in the North Fork Kern River, October 2023 to September 2024.

5.1.2. CORRAL CREEK (SITES 7 AND 8)

Water temperatures in Corral Creek exhibited some seasonal variation with the lowest temperatures during the winter and the highest during the summer (see Figure 5.1-2 and Table 5.1-1; Figures A-7 and A-8 in Appendix A; and Figures B-7 and B-8 in Appendix B). Site 8 downstream of the Corral Creek Diversion generally had slightly warmer temperatures in the summer than Site 7, which is upstream of the diversion. This expected temperature variation occurs as a result of solar heating.

Corral Creek near the confluence with the NFKR was dry during an extended period in summer 2024, despite flow in the stream reaches upstream and downstream of the Corral Creek Diversion. The water temperature logger at Site 8 was moved roughly 1.1 miles upstream in July 2024 to ensure the logger remained submerged throughout the monitoring period. As a result of the logger relocation, the water temperatures measured at the two sites between July 2024 through September 2024 were similar because they were closer to one another (Figure 5.1-2).

As found in the NFKR, DO was generally higher in the winter and spring than the summer and fall, primarily due to low water temperatures (see Figure 5.1-2 and Table 5.1-2; Figures A-16 and A-17 in Appendix A; and Figures B-7 and B-8 in Appendix B). DO was lower than the 8 mg/L water quality objective in the Basin Plan (CVRWQCB, 2018) during portions of the summer but was consistent both upstream and downstream of Corral Creek Diversion. All instantaneous DO measurements collected during deployment and retrieval of the loggers were greater than 8 mg/L (Appendix C).



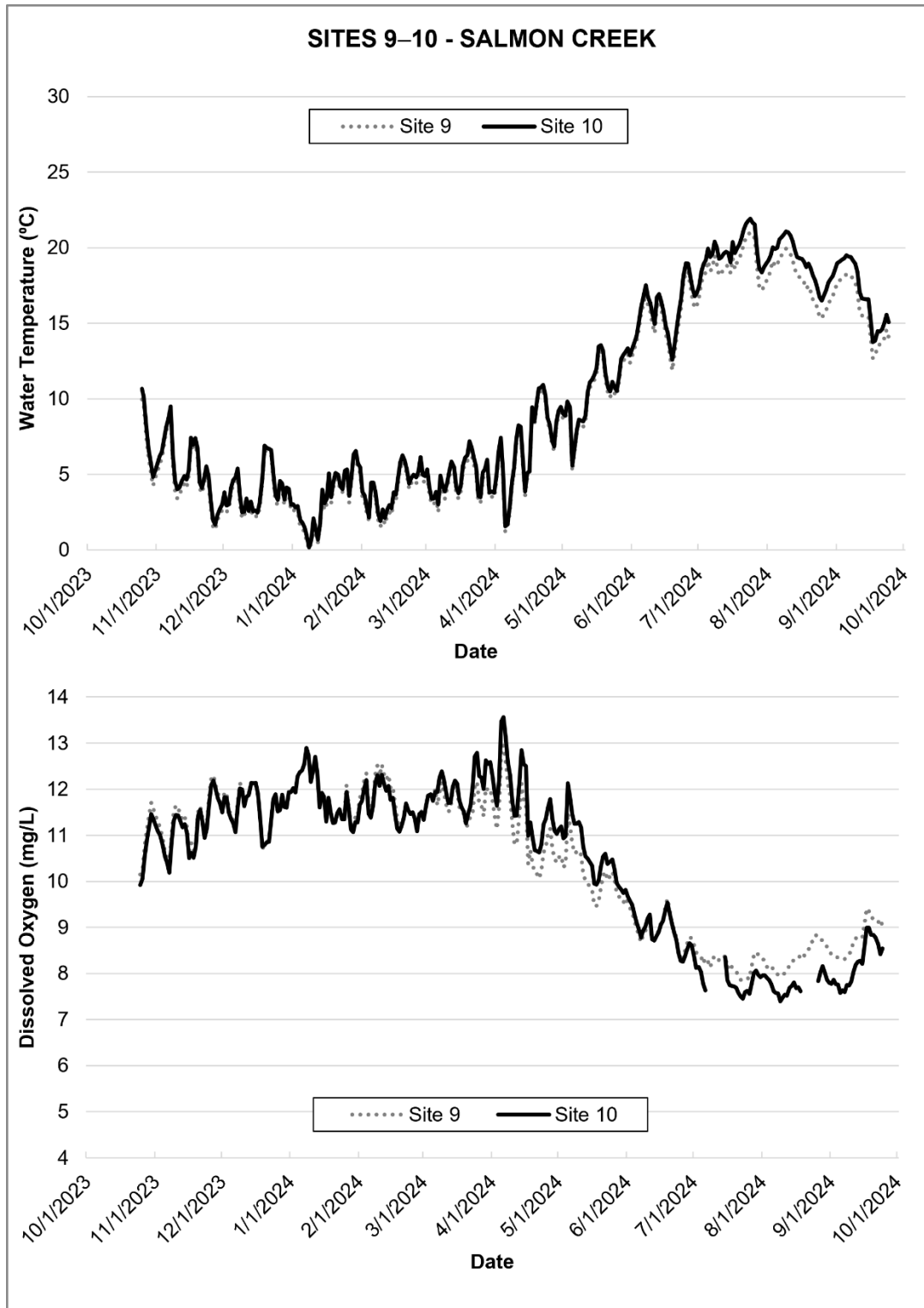
°C = degrees Celsius; mg/L = milligrams per liter

Figure 5.1-2. Mean Daily Water Temperature (top) and Mean Daily Dissolved Oxygen (bottom) in Corral Creek Upstream (Site 7) and Downstream (Site 8) of Corral Creek Diversion, October 2023 to September 2024.

5.1.3. SALMON CREEK (SITES 9 AND 10)

Water temperature in Salmon Creek exhibited some seasonal variation with the lowest temperatures during the winter and the highest temperatures during the summer (see Figure 5.1-3 and Table 5.1-1; Figures A-9 and A-10 in Appendix A; and Figures B-9 and B-10 in Appendix B). Site 9 upstream of the Salmon Creek Diversion showed slightly lower temperatures during the summer than Site 10 downstream of the diversion, likely the result of solar heating.

DO concentrations in Salmon Creek generally correlate with water temperatures. In the summer, daily minimum DO concentrations were less than the 8 mg/L water quality objective in the Basin Plan (CVRWQCB, 2018) for some periods (see Figure 5.1-3 and Table 5.1-2; Figures A-16 and A-17 in Appendix A; and Figures B-9 and B-10 in Appendix B). All instantaneous DO measurements collected during deployment and retrieval of the loggers were greater than 8 mg/L (Appendix C). Site 9 generally had slightly higher summer DO levels than Site 10.



°C = degrees Celsius; mg/L = milligrams per liter

Figure 5.1-3. Mean Daily Water Temperature (top) and Mean Daily Dissolved Oxygen (bottom) in Salmon Creek Upstream (Site 9) and Downstream (Site 10) of Salmon Creek Diversion, November 2023 to September 2024.

5.2. BACTERIOLOGICAL MONITORING RESULTS

Due to the lotic (i.e., flowing) conditions at riverine sites and low hydraulic retention of Fairview Dam and other diversion dams, all sites monitored showed low levels of fecal coliform (Table 5.2-1) and *E.coli* (Table 5.2-2).

Fecal coliform values were low during the 2022, 2023, and 2024 sampling periods (Table 5.2-1). Fecal coliform values were higher at all sites during the September 12, 2022, sampling period likely due to a run-off event following heavy rain on September 10, 2022. During 2024, all fecal coliform results surrounding the Fourth of July (June 6 to July 10) and Labor Day holiday (August 13 to September 10) weekends were less than the laboratory reporting limits (i.e., non-detectable).

Table 5.2-1. Fecal Coliform Sampling Results, 2022–2024

Year	Date	Fecal Coliform (MPN/100 mL)				
		Site 1	Site 3	Site 4	Site 8	Site 10
2022	9/6	2.2	5.1	16	>23	9.2
	9/12	>23 ^b	>23 ^b	>23 ^b	>23 ^b	>23 ^b
	9/19	3.6	9.2	6.9	1.1	9.2
	9/26	2.2	2.2	3.6	2.2	1.1
2023	8/8	4.5	2	4.5	13	11
	8/14	34	23	22	4.5	49
	8/23	<18	230	78	20	230
	8/28	7.8	7.8	21	46	23
	9/5	1.8	2	2	4.5	33
2024	6/6	<1	<1	<1	<1	<1
	6/13	<1.8	<1.8	<1.8	<1.8	<1.8
	6/18	<1.8	<1.8	<1.8	<1.8	<1.8
	6/27	<1.8	<1.8	<1.8	<1.8	<1.8
	7/8	<1.8	<1.8	<1.8	<1.8	<1.8
	7/10	<1.8	<1.8	<1.8	-- ^a	<1.8
	8/13	<1.8	<1.8	<1.8	-- ^a	<1.8
	8/20	<1.8	<1.8	<1.8	-- ^a	<1.8
	8/27	<1.8	<1.8	<1.8	-- ^a	<1.8
	9/3	<1.8	<1.8	<1.8	-- ^a	<1.8
9/10	<1.8	<1.8	<1.8	-- ^a	<1.8	

-- = no data available; MPN = most probable number; mL = milliliter; NFKR = North Fork Kern River
 Notes:

^a Water sample not collected Corral Creek upstream of the NFKR (Site 8) on sampling dates between July 10 and September 10, 2024, because the stream was dry.

^b Values greater than 23 were not analyzed in the fecal coliform standard range and cannot be used to evaluate state objectives. Additional samples will be collected in 2023 and 2024.

E. coli values were low during the 2022, 2023, and 2024 sampling periods (Table 5.2-2). During 2024, all *E. coli* results surrounding the Fourth of July (June 6 to July 10) and Labor Day holiday (August 13 to September 10) weekends were less than the laboratory reporting limits (i.e., non-detectable) except during the June 6, 2024, sampling event.

Table 5.2-2. *Escherichia coli* Sampling Results, 2022–2024

Year	Date	<i>Escherichia coli</i> (MPN/100 mL)				
		Site 1	Site 3	Site 4	Site 8	Site 10
2022	10/6	<1	5.2	3.1	1	2
2023	8/23	28	28	34	40	240
	8/28	7.5	6.3	2	19	6.3
	9/5	7.5	5.2	5.2	7.4	9.7
2024	6/6	12	24	110	12	14
	6/13	<1	<1	<1	<1	<1
	6/18	<1	<1	<1	<1	<1
	6/27	<1	<1	<1	<1	<1
	7/8	<1	<1	<1	<1	<1
	7/10	<1	<1	<1	-- ^a	<1
	8/13	<1	<1	<1	-- ^a	<1
	8/20	<1	<1	<1	-- ^a	<1
	8/27	<1	<1	<1	-- ^a	<1
	9/3	<1	<1	<1	-- ^a	<1
9/10	<1	<1	<1	-- ^a	<1	

< = less than laboratory reporting limits; -- = no data; MPN = most probable number; mL = milliliter

Notes:

^a Water sample not collected Corral Creek upstream of the NFKR (Site 8) on sampling dates between July 10 and September 10, 2024, because the stream was dry.

6.0 STUDY SPECIFIC CONSULTATION

No study-specific consultation was conducted for WR-1 Study.

7.0 OUTSTANDING STUDY PLAN ELEMENTS

There are no outstanding Study Plan elements.

8.0 REFERENCES

CVRWQCB (California Valley Regional Water Quality Control Board). 2018. *Water Quality Control Plan for the Tulare Lake Basin*. Third Edition. Revised May 2018 (with Approved Amendments). California Valley Regional Water Quality Control Board, Central Valley Region.

FERC (Federal Energy Regulatory Commission). 2022. *Study Plan Determination for the Kern River No. 3 Hydroelectric Project*. Accession No. 20221012-3024. October 12.

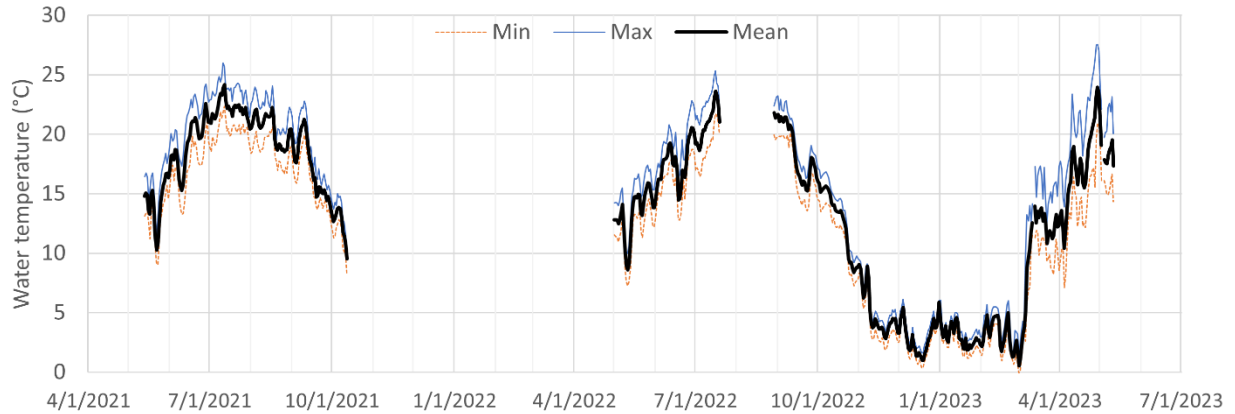
FERC (Federal Energy Regulatory Commission). 2024. *Determination on Requests for Study Modifications and New Studies*. Accession No. 20240530-3030. May 30.

SCE (Southern California Edison). 2022. *Kern River No. 3 Hydroelectric Project, Revised Study Plan*. Filed with FERC July 1. Accession No. 20220705-5032

APPENDIX A
WATER TEMPERATURE AND DISSOLVED OXYGEN FIGURES, 2021 TO 2023

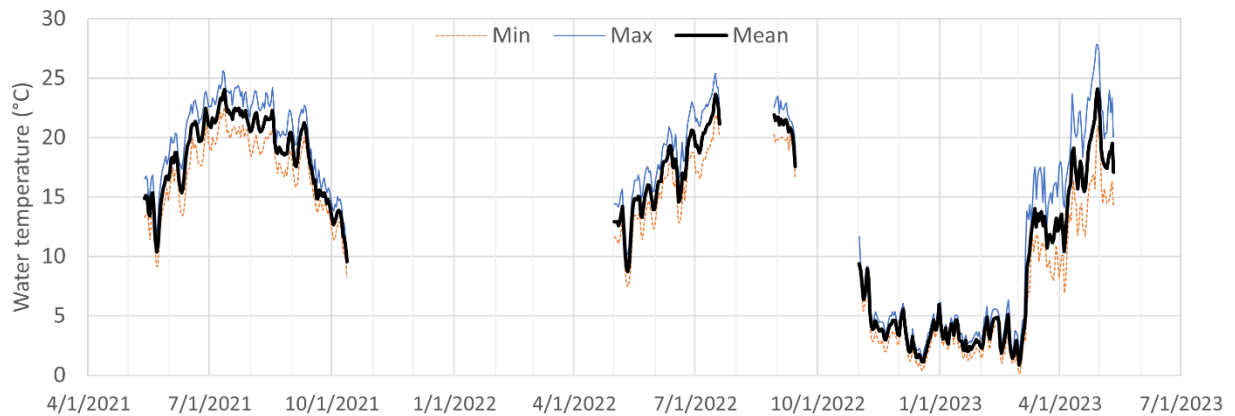
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Water Temperature



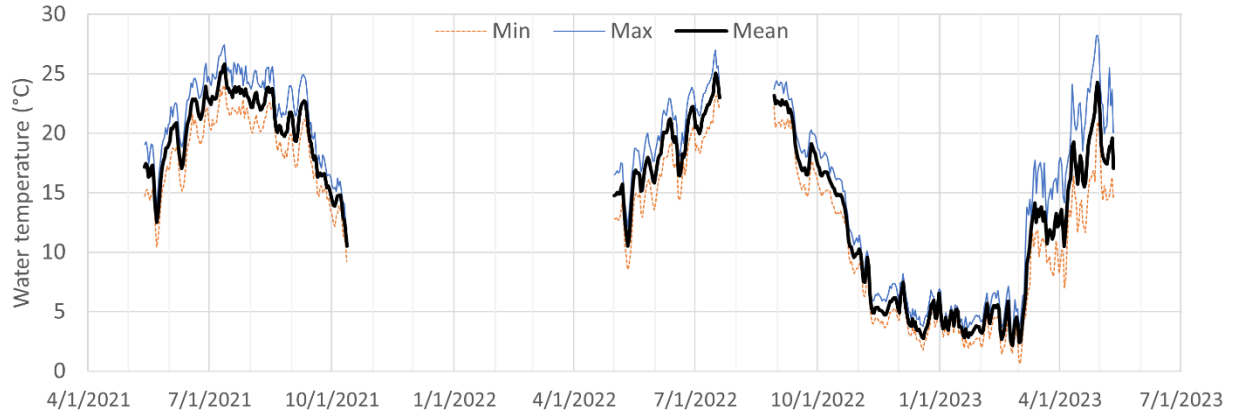
°C = degrees Celsius

Figure A-1. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 1, North Fork Kern River Upstream of the Fairview Dam Impoundment Pool, 2021–2023.



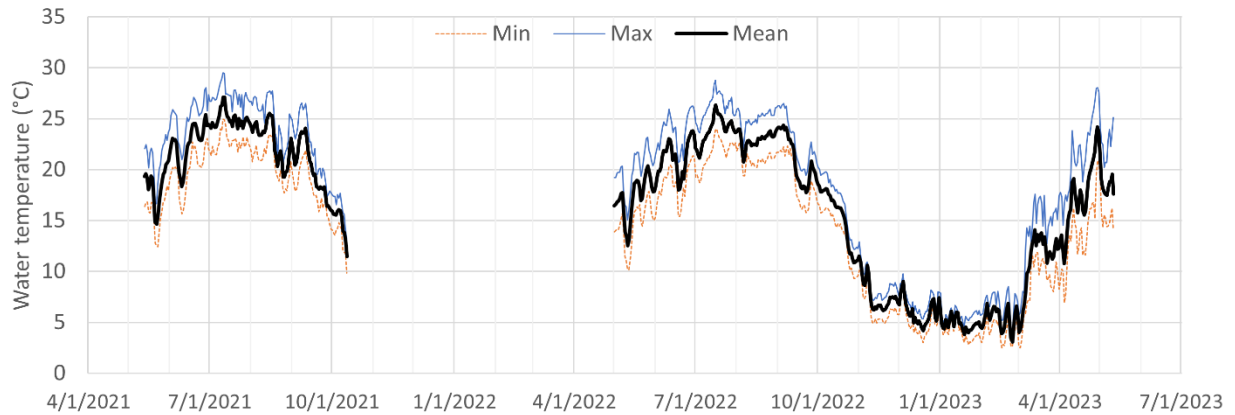
°C = degrees Celsius

Figure A-2. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 2, North Fork Kern River Immediately Downstream of the Fairview Dam, 2021–2023.



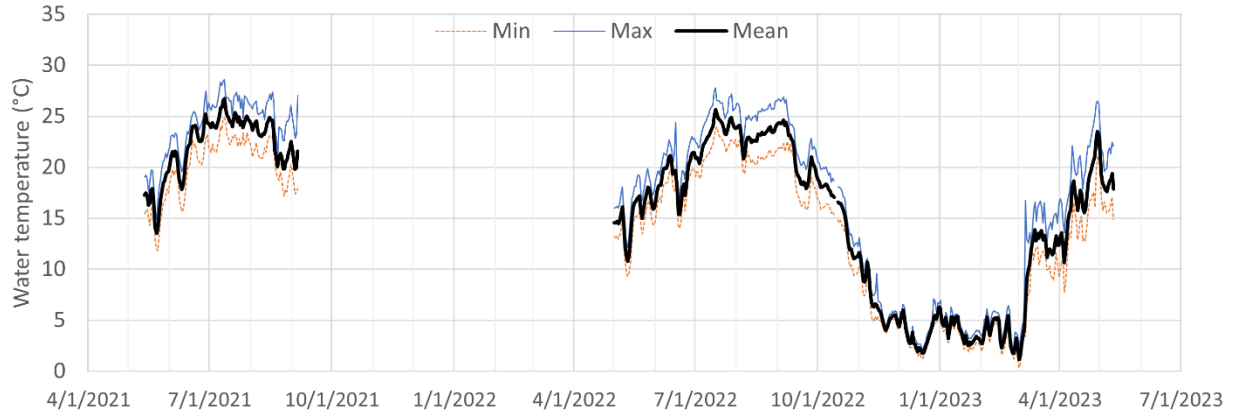
°C = degrees Celsius

Figure A-3. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 3, North Fork Kern River at Gold Ledge Campground, 2021–2023.



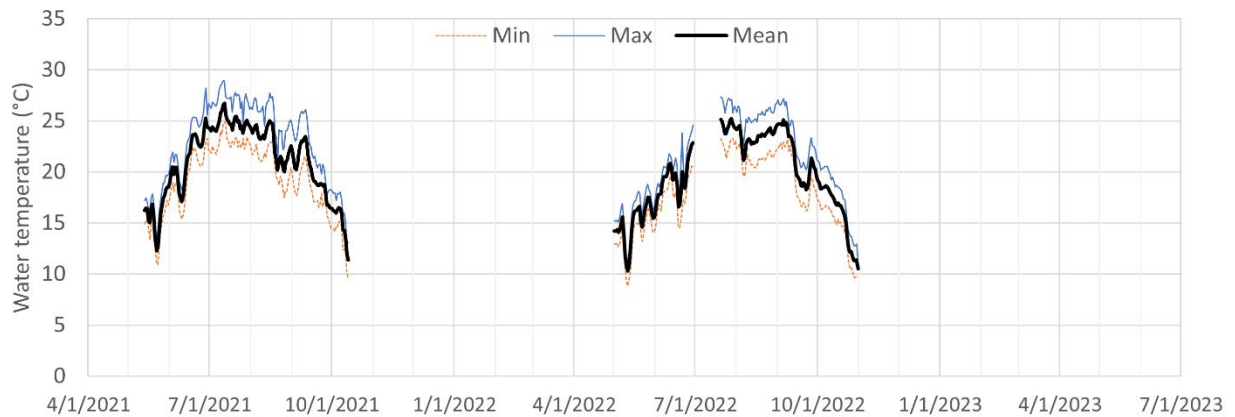
°C = degrees Celsius

Figure A-4. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 4, North Fork Kern River Immediately Upstream of the Kern River No. 3 Powerhouse, 2021–2023.



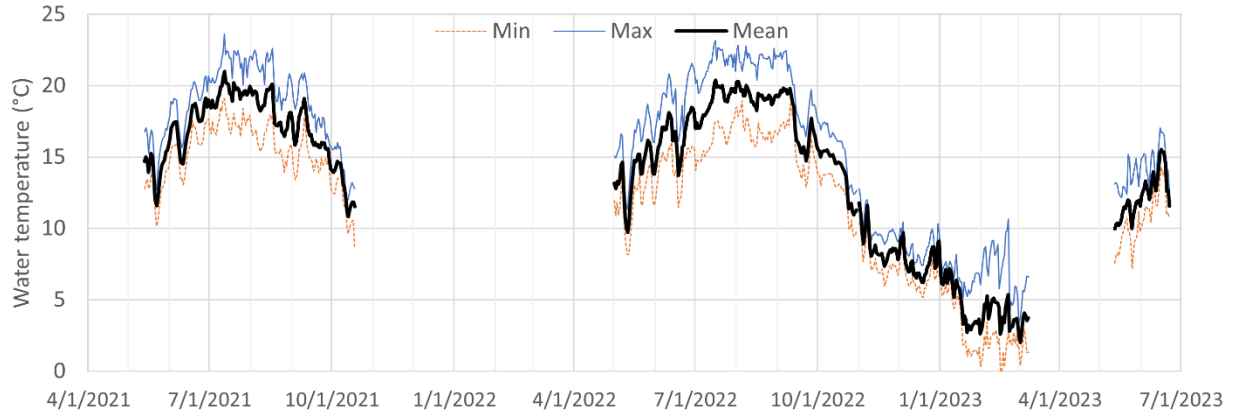
°C = degrees Celsius

Figure A-5. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 5, North Fork Kern River downstream of the Kern River No. 3 Powerhouse, 2021–2023.



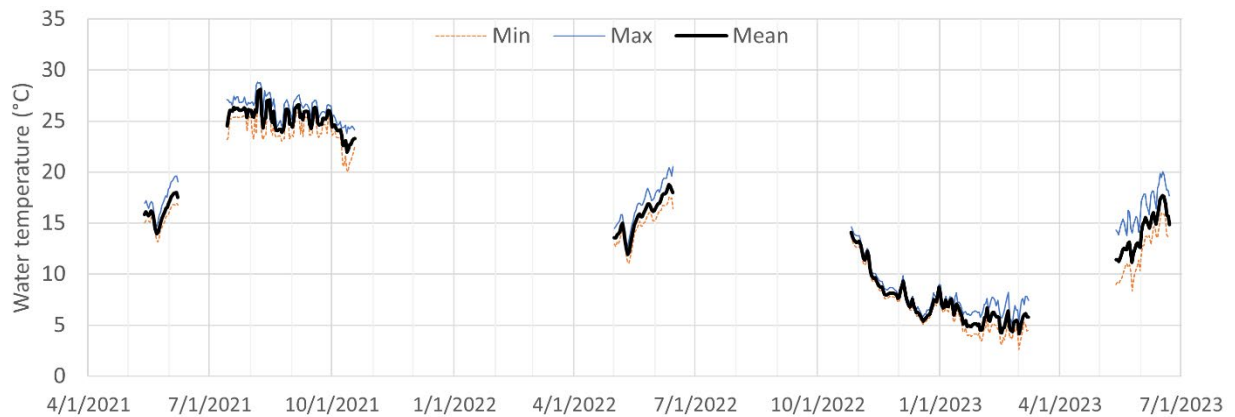
°C = degrees Celsius

Figure A-6. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 6, North Fork Kern River at the Existing Kernville U.S. Army Corps of Engineers Gage, 2021–2023.



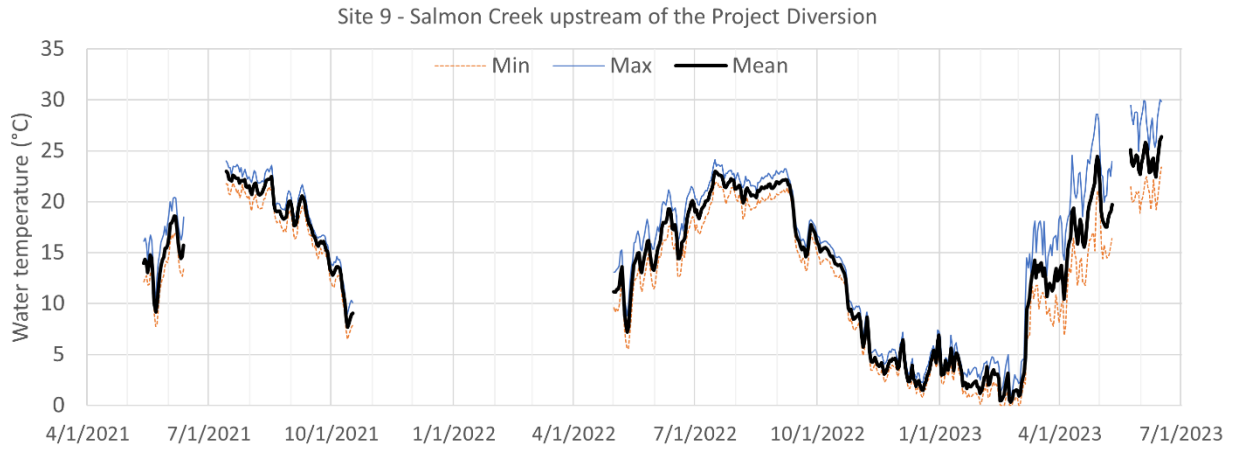
°C = degrees Celsius

Figure A-7. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 7, Corral Creek Upstream of the Project Diversion, 2021–2023.



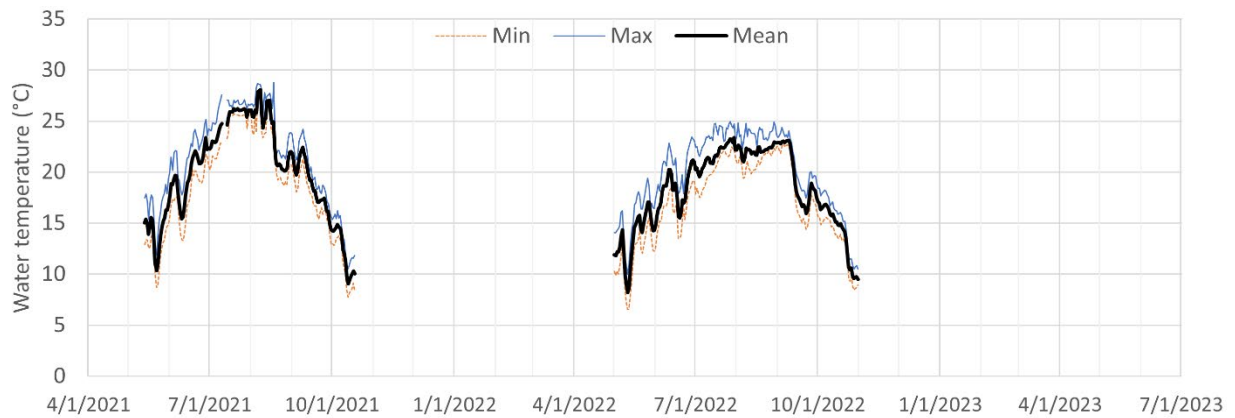
°C = degrees Celsius

Figure A-8. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 8, Corral Creek Upstream of its Confluence with the North Fork of the Kern River, 2021–2023.



°C = degrees Celsius

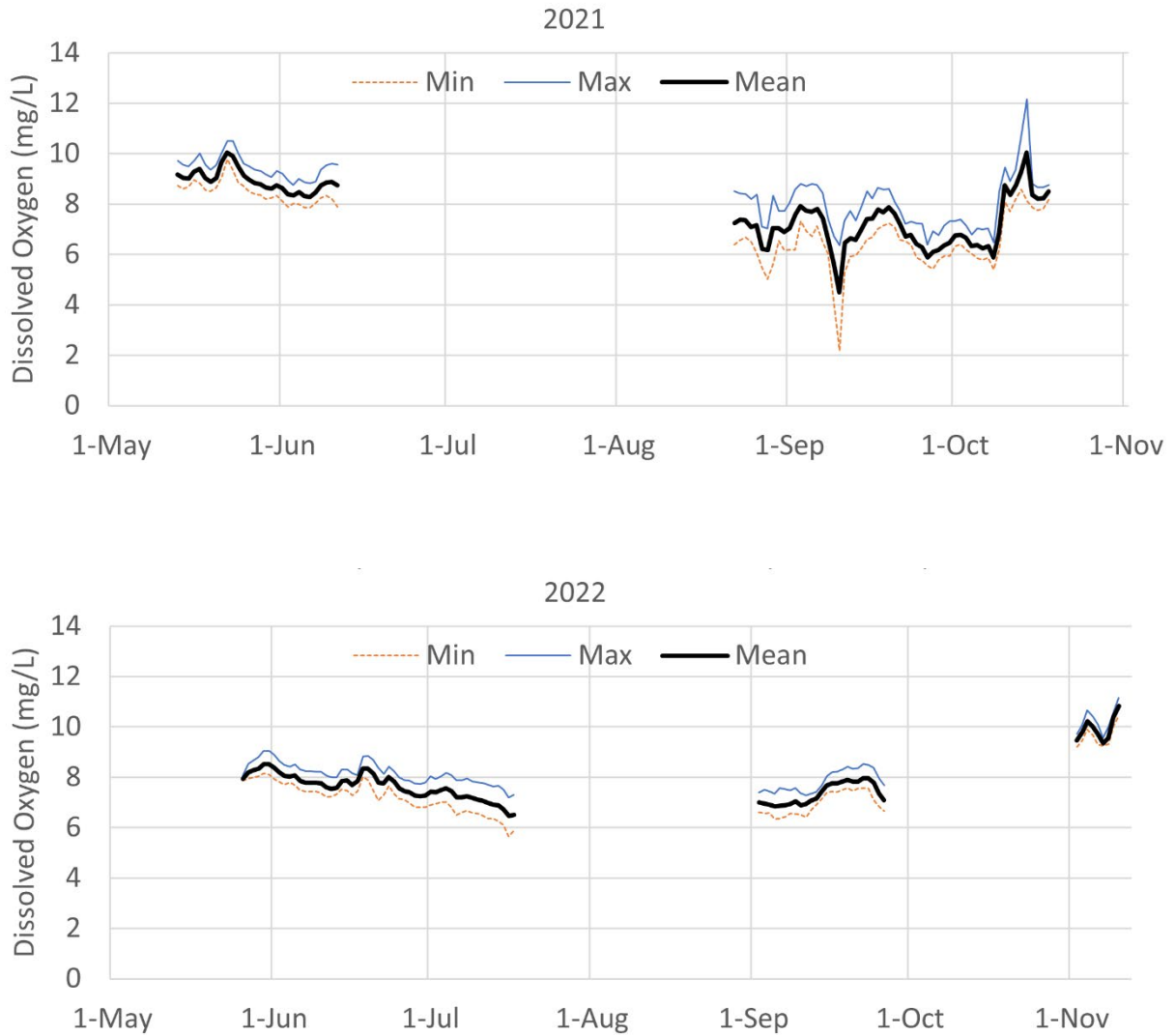
Figure A-9. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 9, Salmon Creek Upstream of the Project Diversion, 2021–2023.



°C = degrees Celsius

Figure A-10. Daily Mean, Minimum, and Maximum Water Temperature (°C) at Site 10, Salmon Creek Upstream of the Confluence with the North Fork Kern River, 2021–2023.

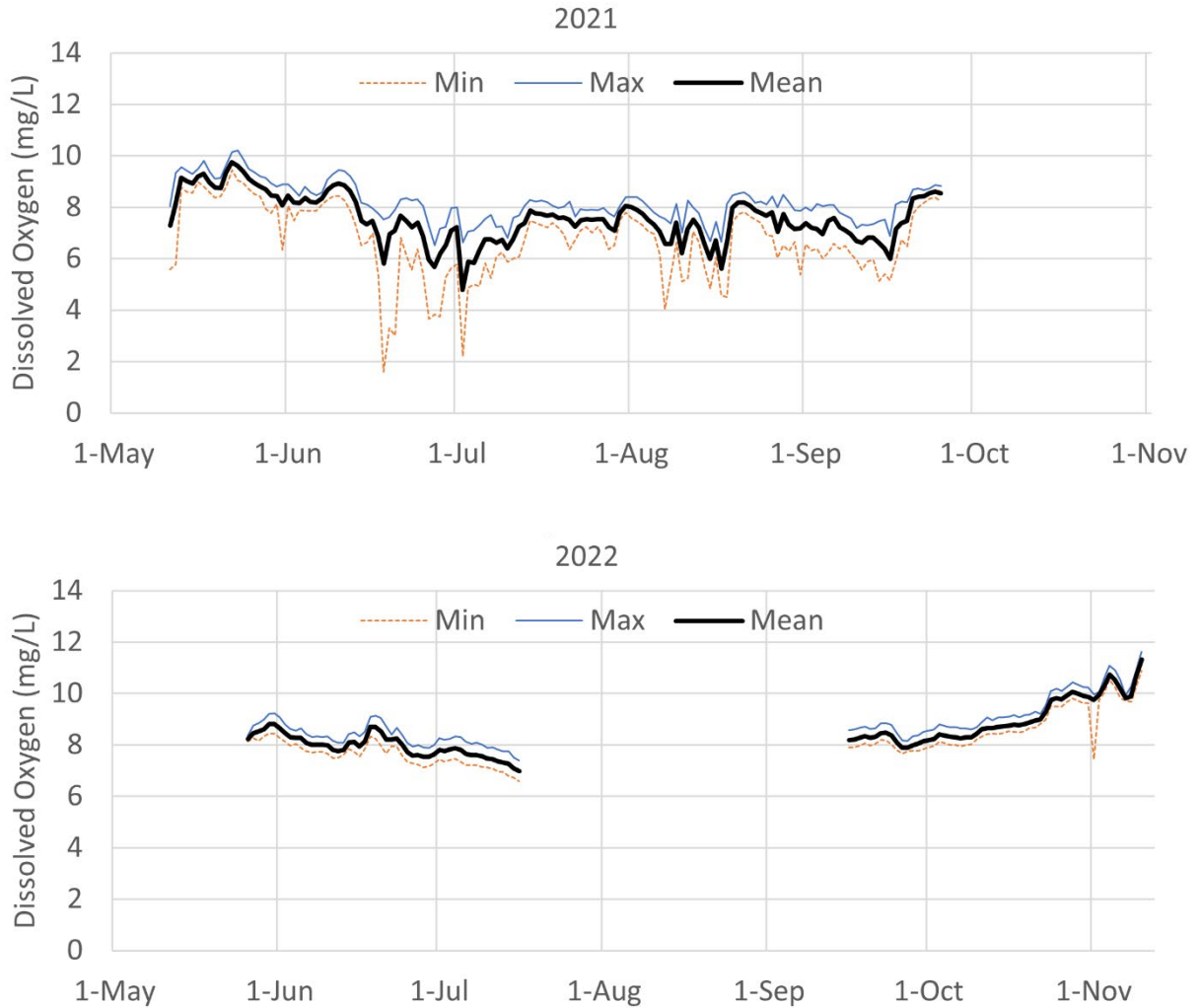
Dissolved Oxygen



mg/L = milligrams per liter

Note: Dissolved oxygen data from these months have been qualified due to data quality issues identified during analysis.

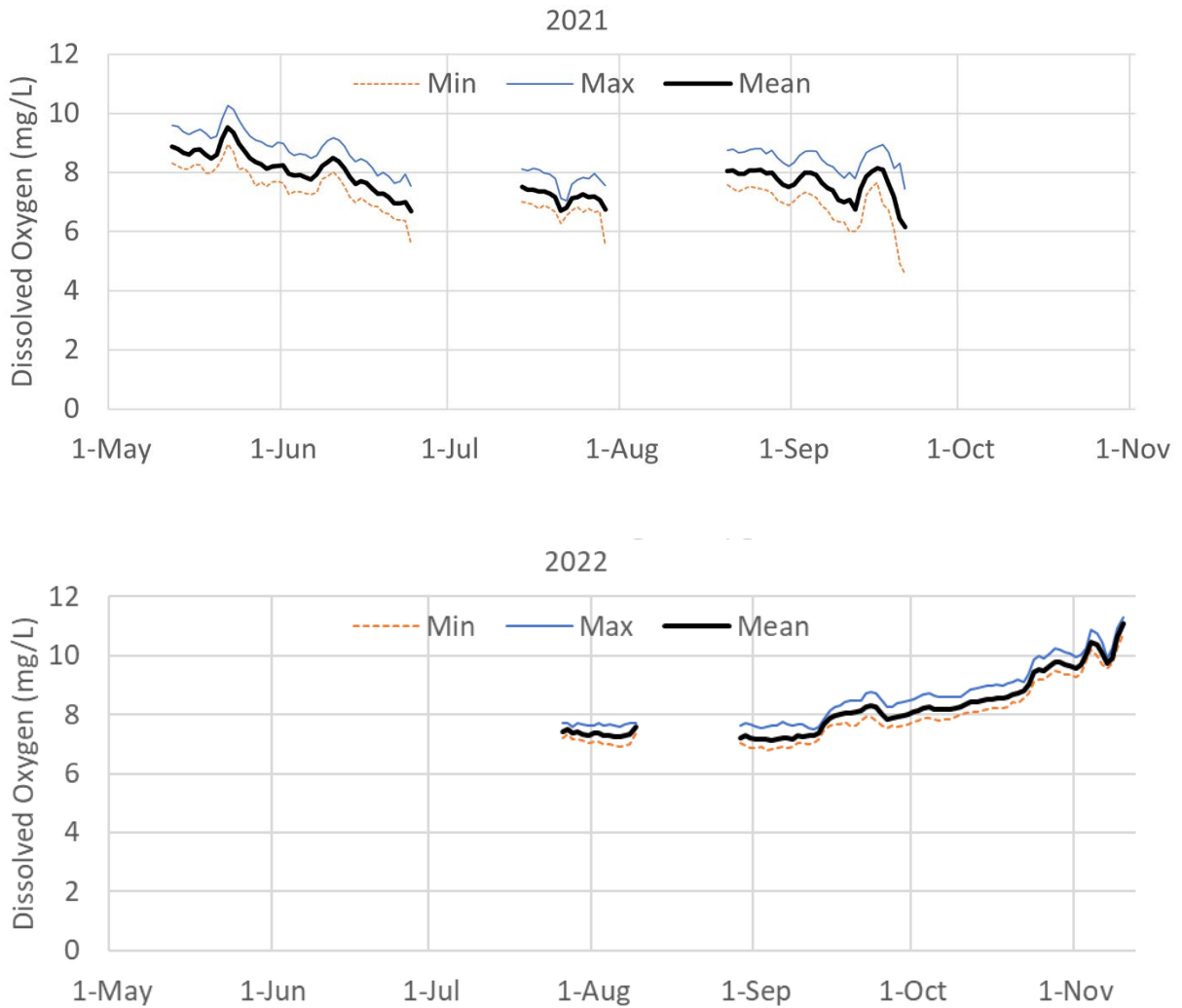
Figure A-11. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 1, North Fork Kern River Upstream of the Fairview Dam Impoundment Pool, 2021–2022.



mg/L = milligrams per liter

Notes: Dissolved oxygen data from these months have been qualified due to data quality issues identified during analysis.

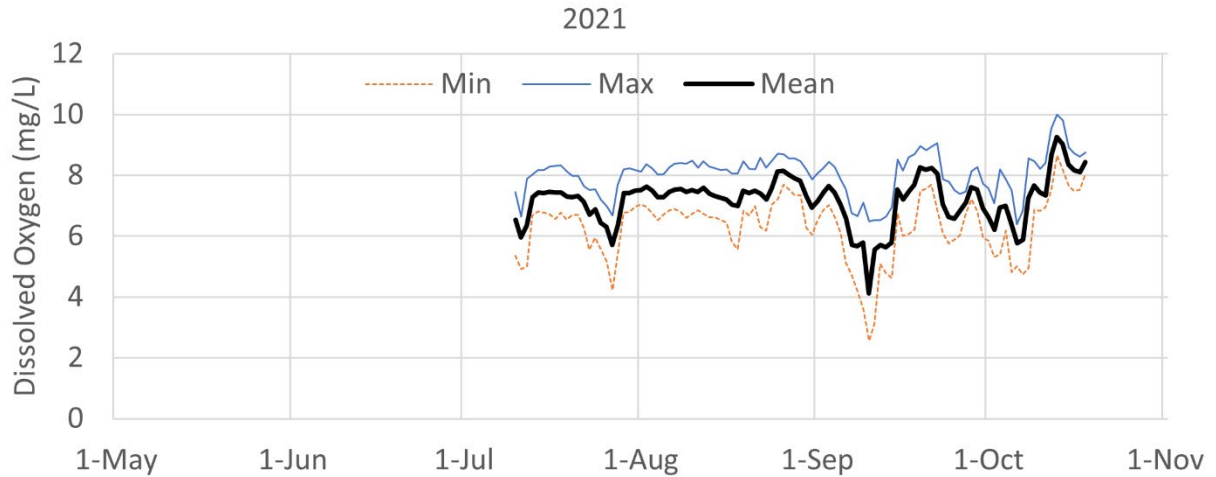
Figure A-12. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 2, North Fork Kern River Downstream of the Fairview Dam, 2021–2022.



mg/L = milligrams per liter

Note: Dissolved oxygen data from these months have been qualified due to data quality issues identified during analysis.

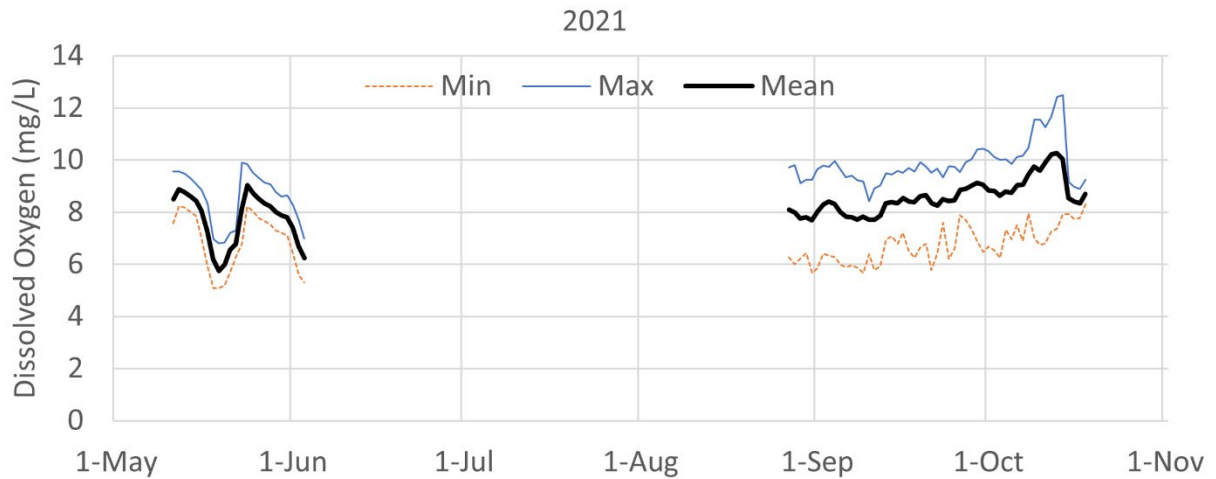
Figure A-13. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 3, North Fork Kern River at Gold Ledge Campground, 2021–2022.



mg/L = milligrams per liter

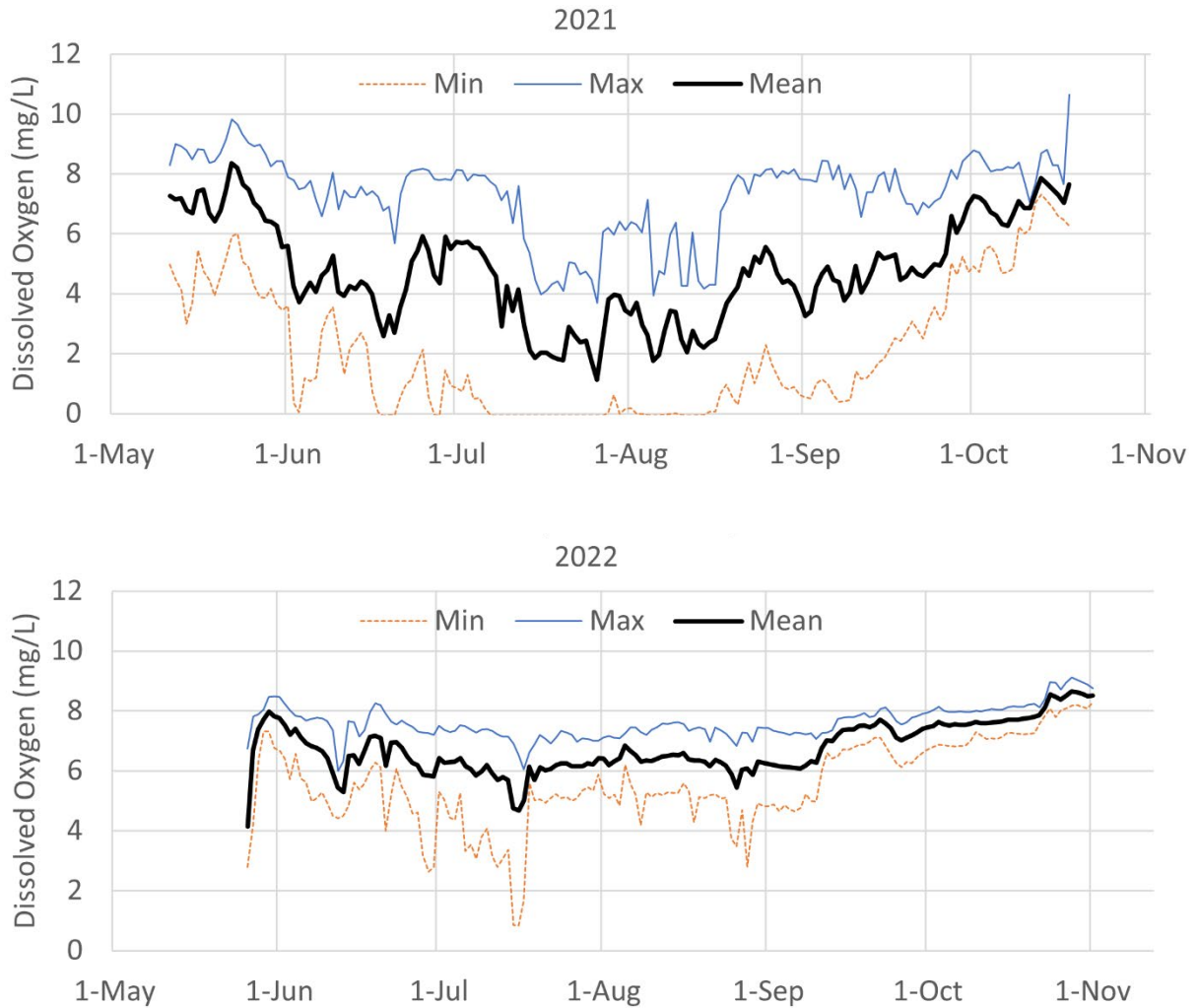
Note: Dissolved oxygen data from these months have been qualified due to data quality issues identified during analysis.

Figure A-14. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 4 North Fork Kern River Upstream of the Kern River No. 3 Powerhouse, 2021.



mg/L = milligrams per liter

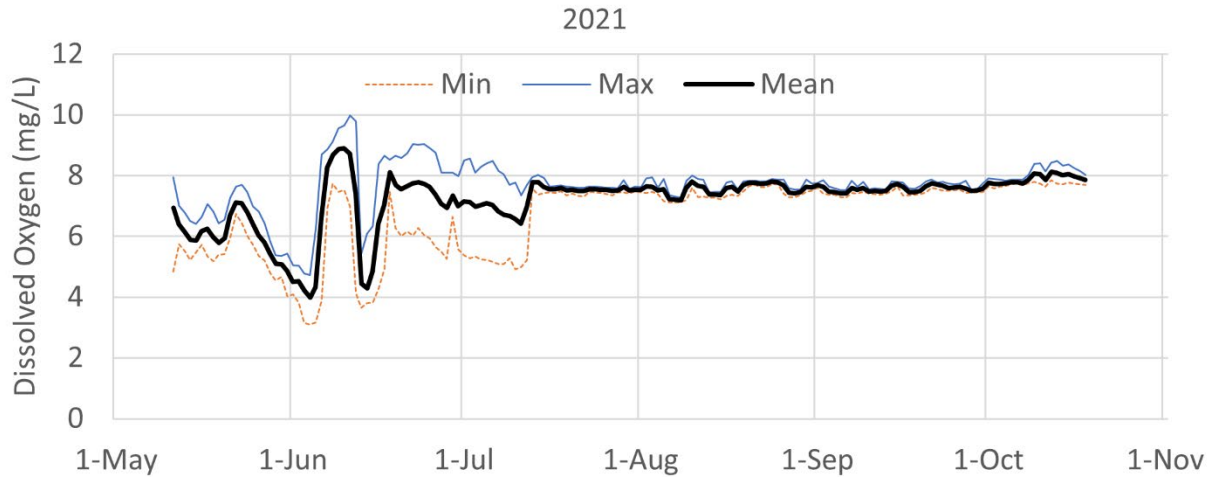
Figure A-15. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 5, North Fork Kern River Downstream of the Kern River No. 3 Powerhouse, 2021.



mg/L = milligrams per liter

Note: Dissolved oxygen data from these months have been qualified due to data quality issues identified during analysis.

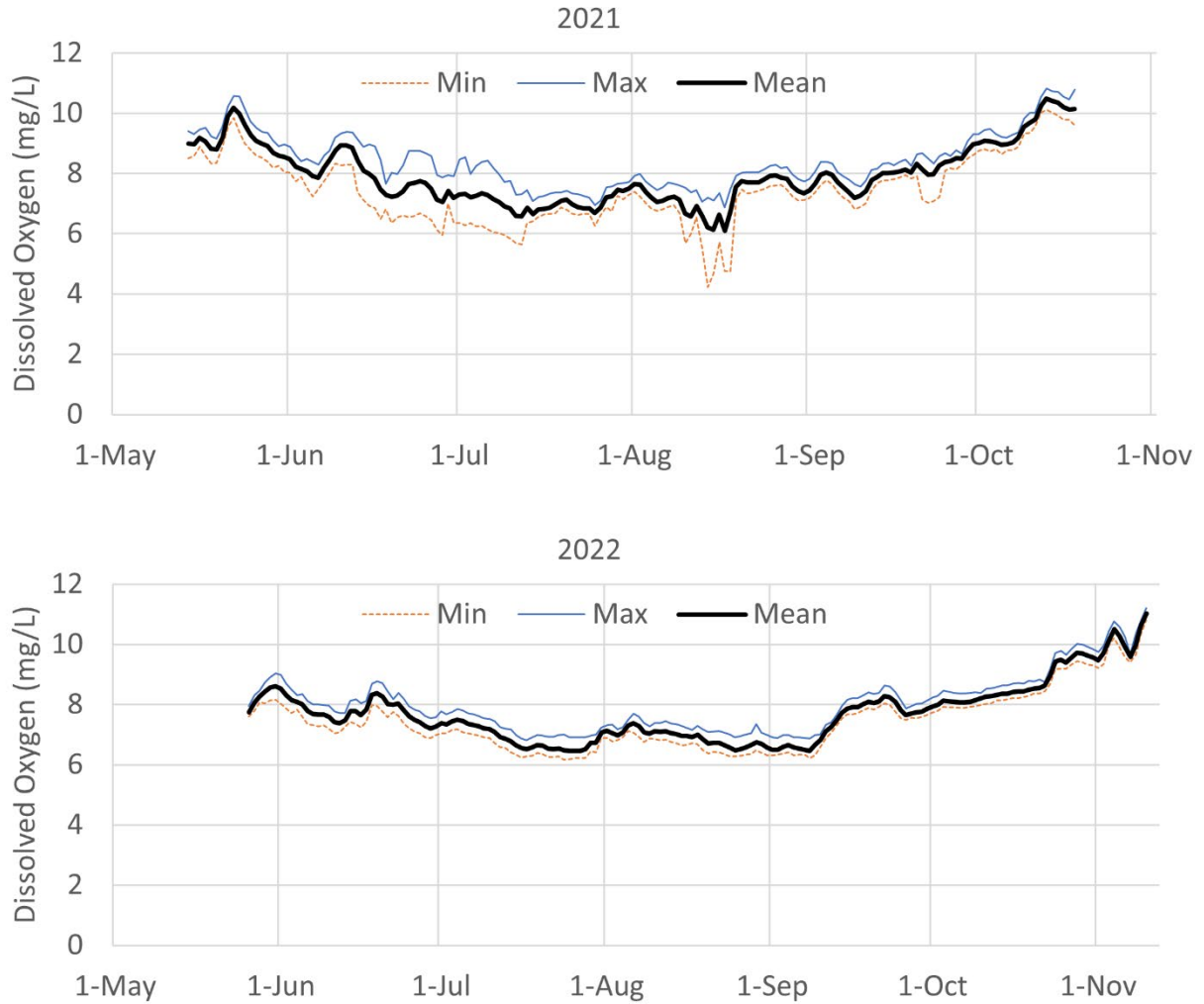
Figure A-16. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 7, Corral Creek Upstream of the Project Diversion, 2021–2022.



mg/L = milligrams per liter

Note: Dissolved oxygen data from these months have been qualified due to data quality issues identified during analysis.

Figure A-17. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 8, Corral Creek Upstream of its Confluence with the North Fork of the Kern River, 2021.



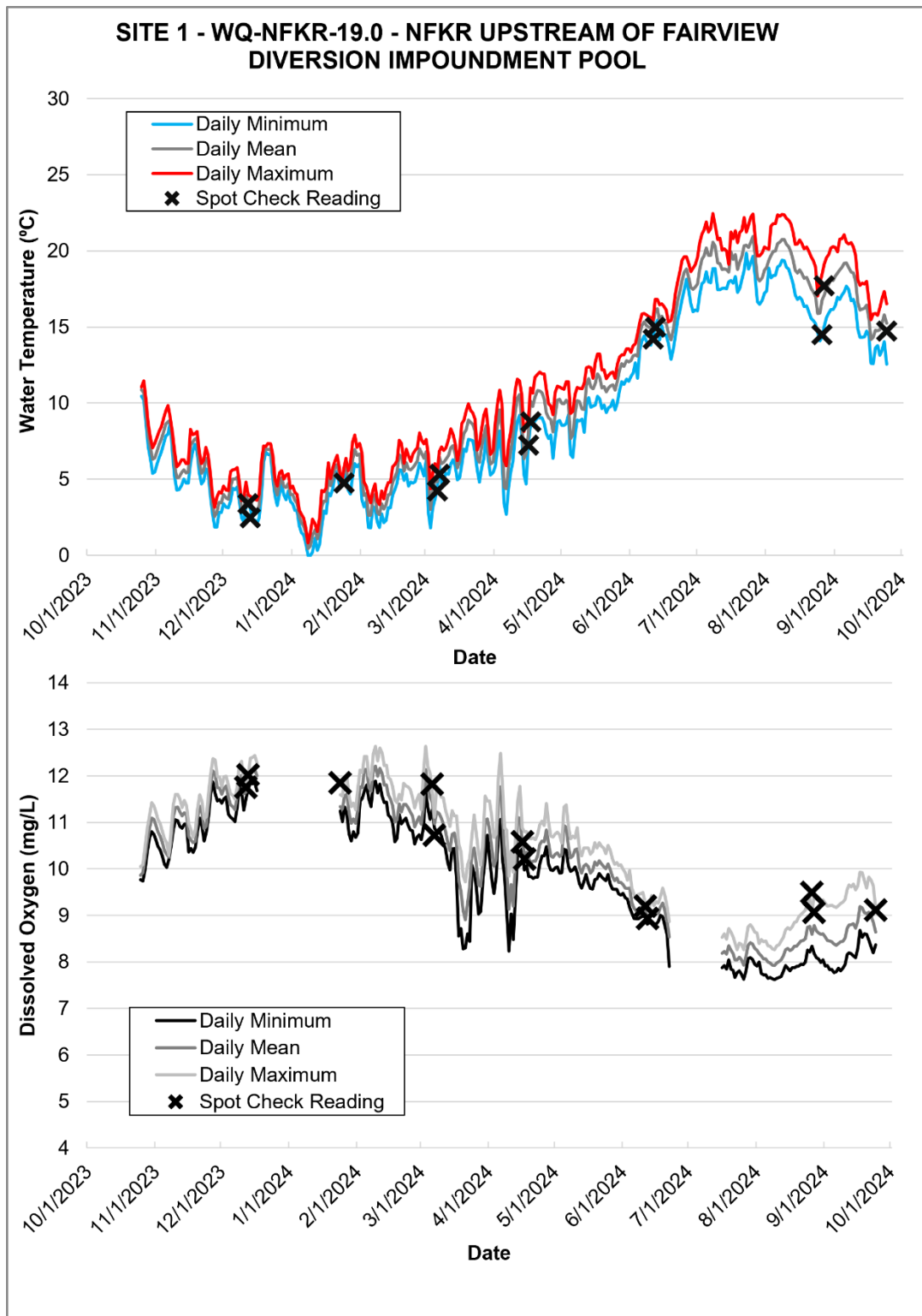
mg/L = milligrams per liter

Note: Dissolved oxygen data from these months have been qualified due to data quality issues identified during analysis.

Figure A-18. Daily Mean, Minimum, and Maximum Dissolved Oxygen (mg/L) at Site 9, Salmon Creek Upstream of the Project Diversion, 2021–2022.

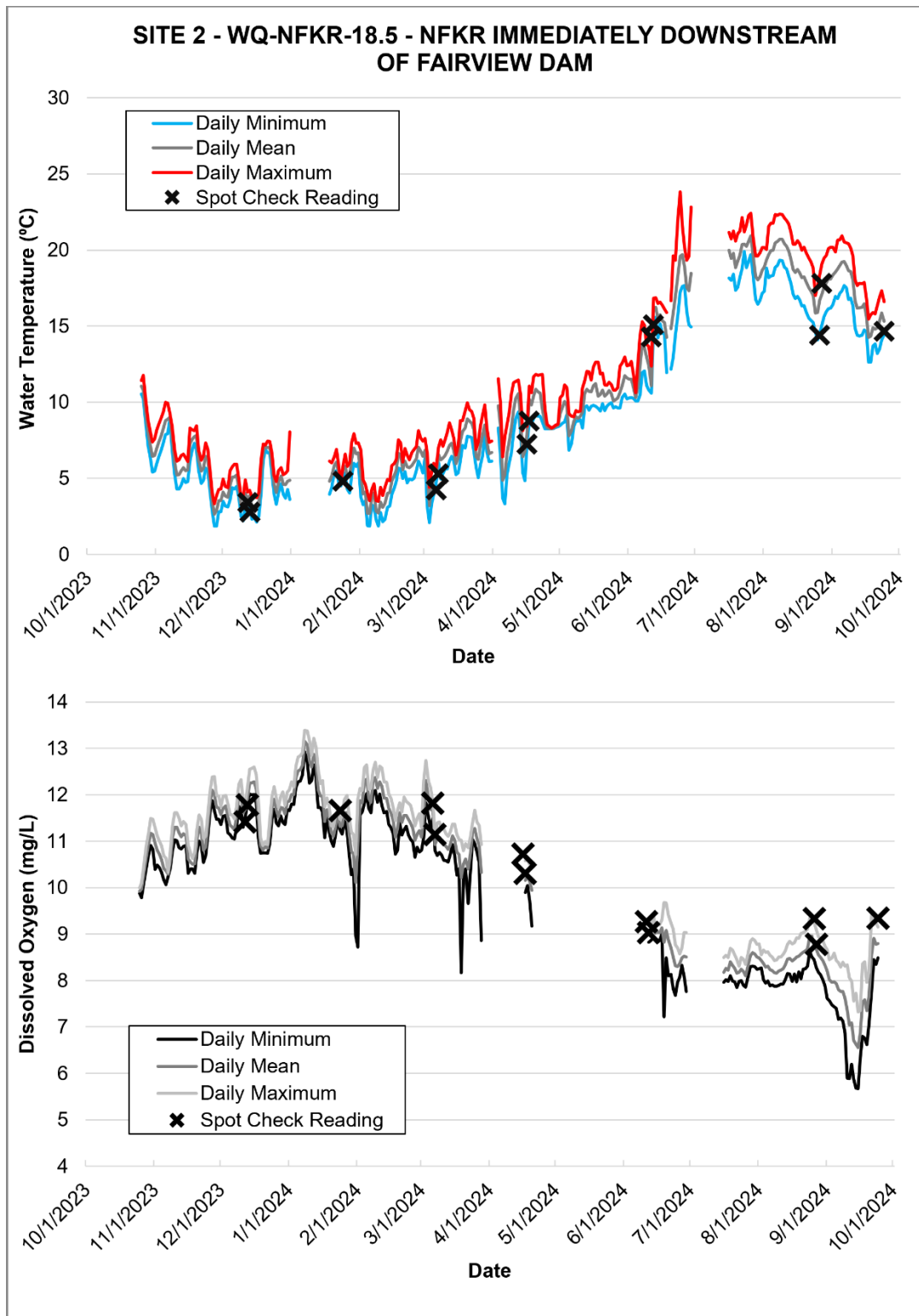
**APPENDIX B
WATER TEMPERATURE AND DISSOLVED OXYGEN FIGURES, OCTOBER 2023
TO SEPTEMBER 2024**

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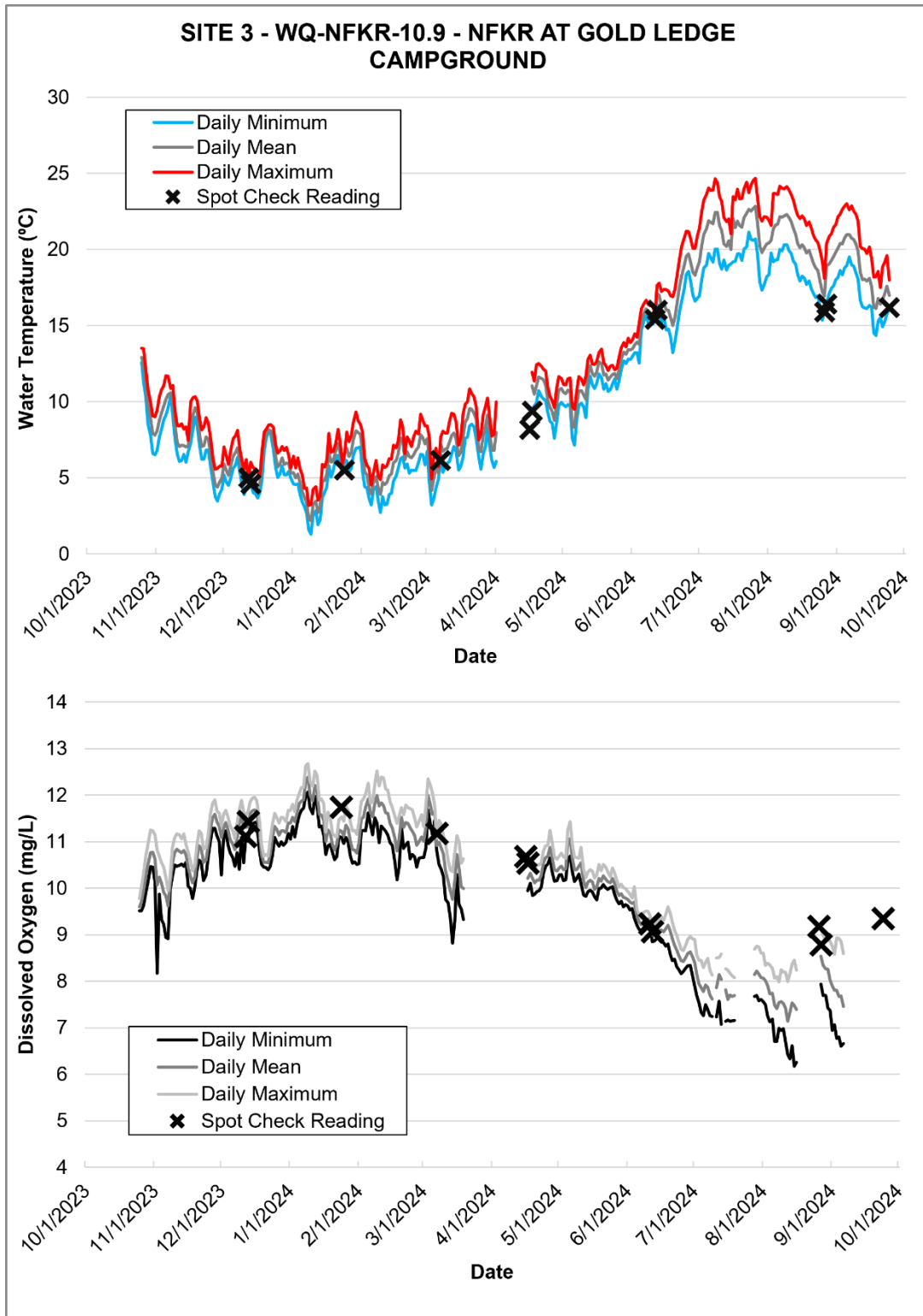
°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

Figure B-1. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 1, North Fork Kern River Upstream of the Fairview Dam Impoundment Pool, October 2023 to September 2024.



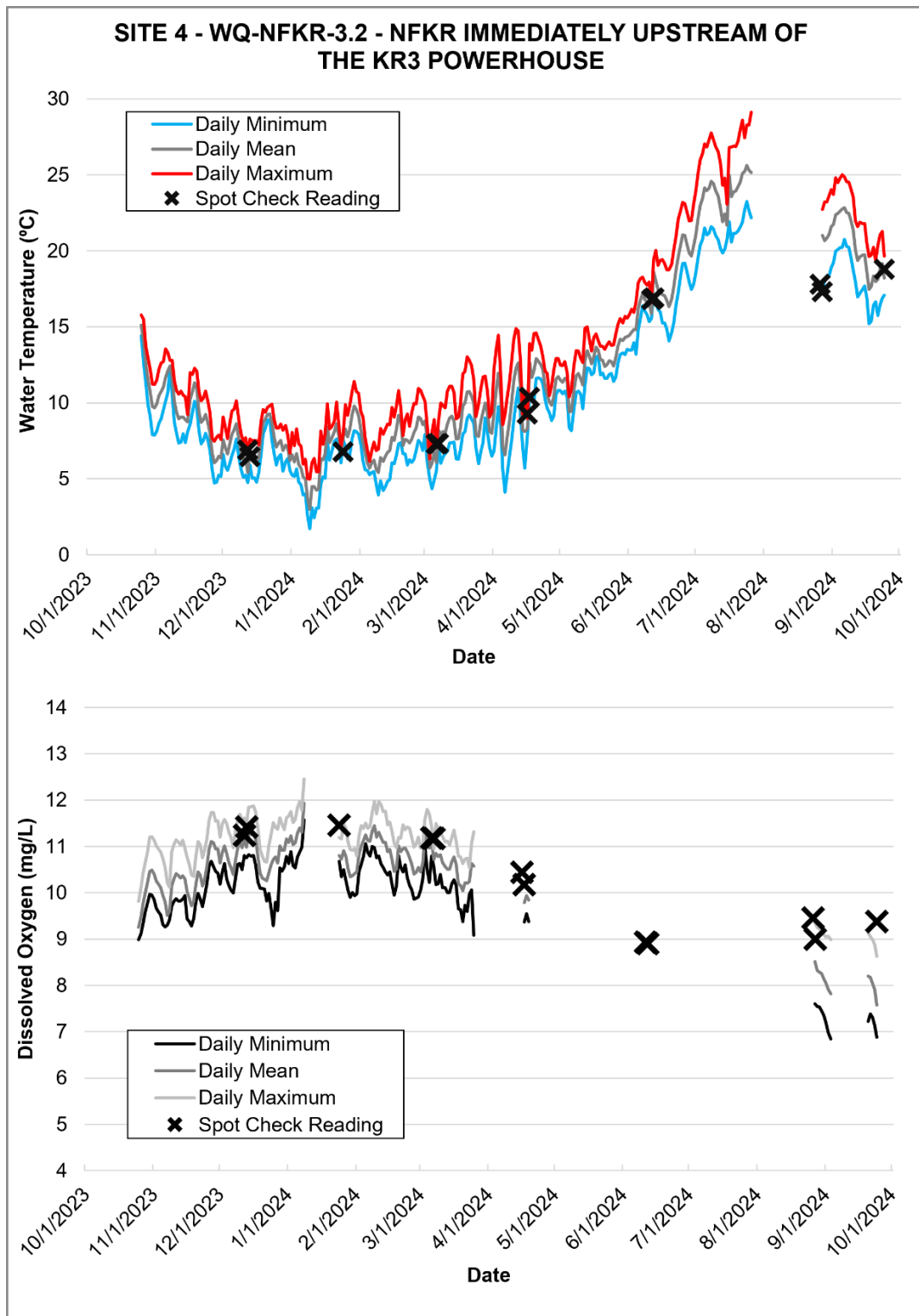
°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

Figure B-2. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 2, North Fork Kern River Downstream of the Fairview Dam, October 2023 to September 2024.



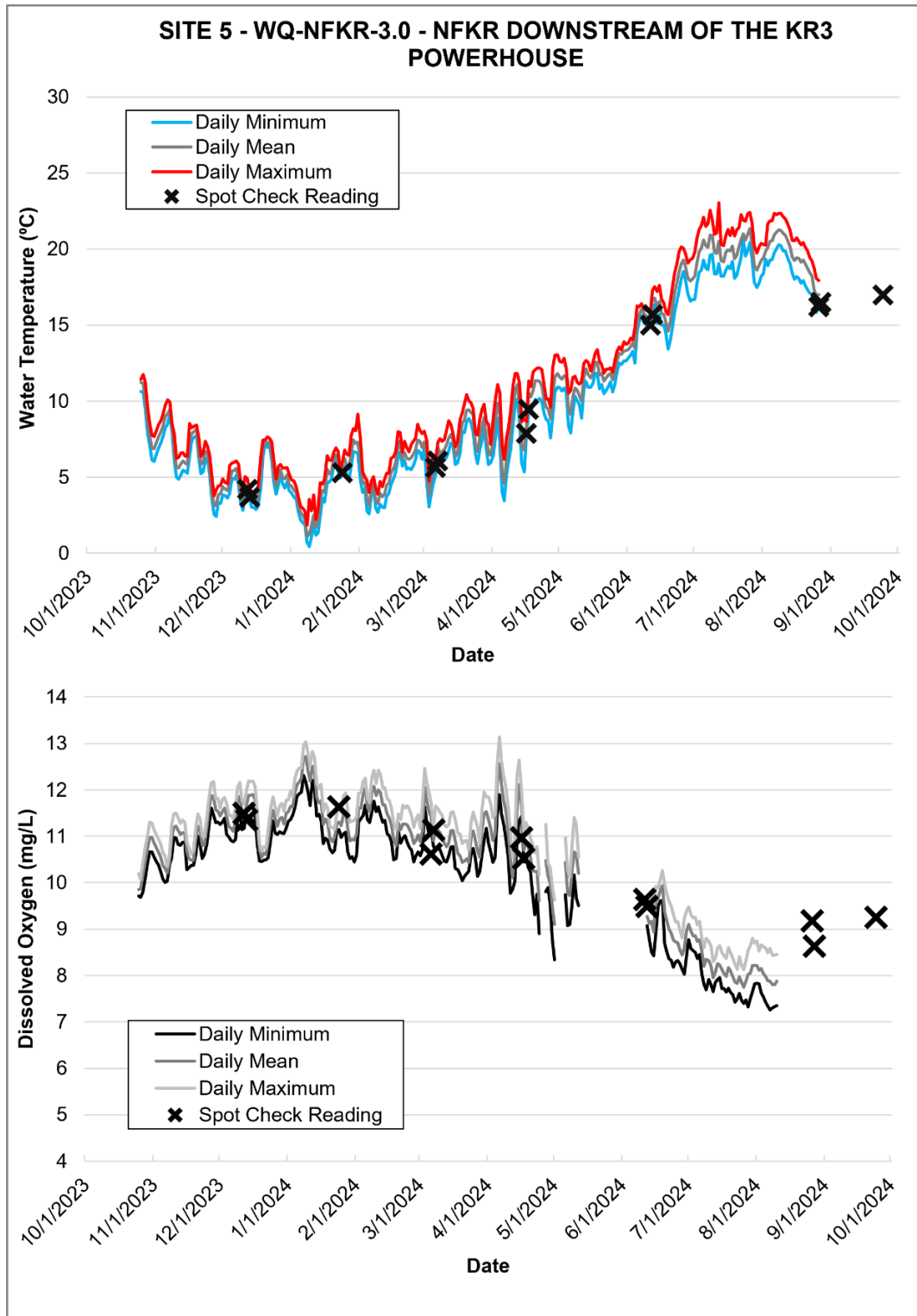
°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

Figure B-3. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 3, North Fork Kern River at Gold Ledge Campground, October 2023 to September 2024.



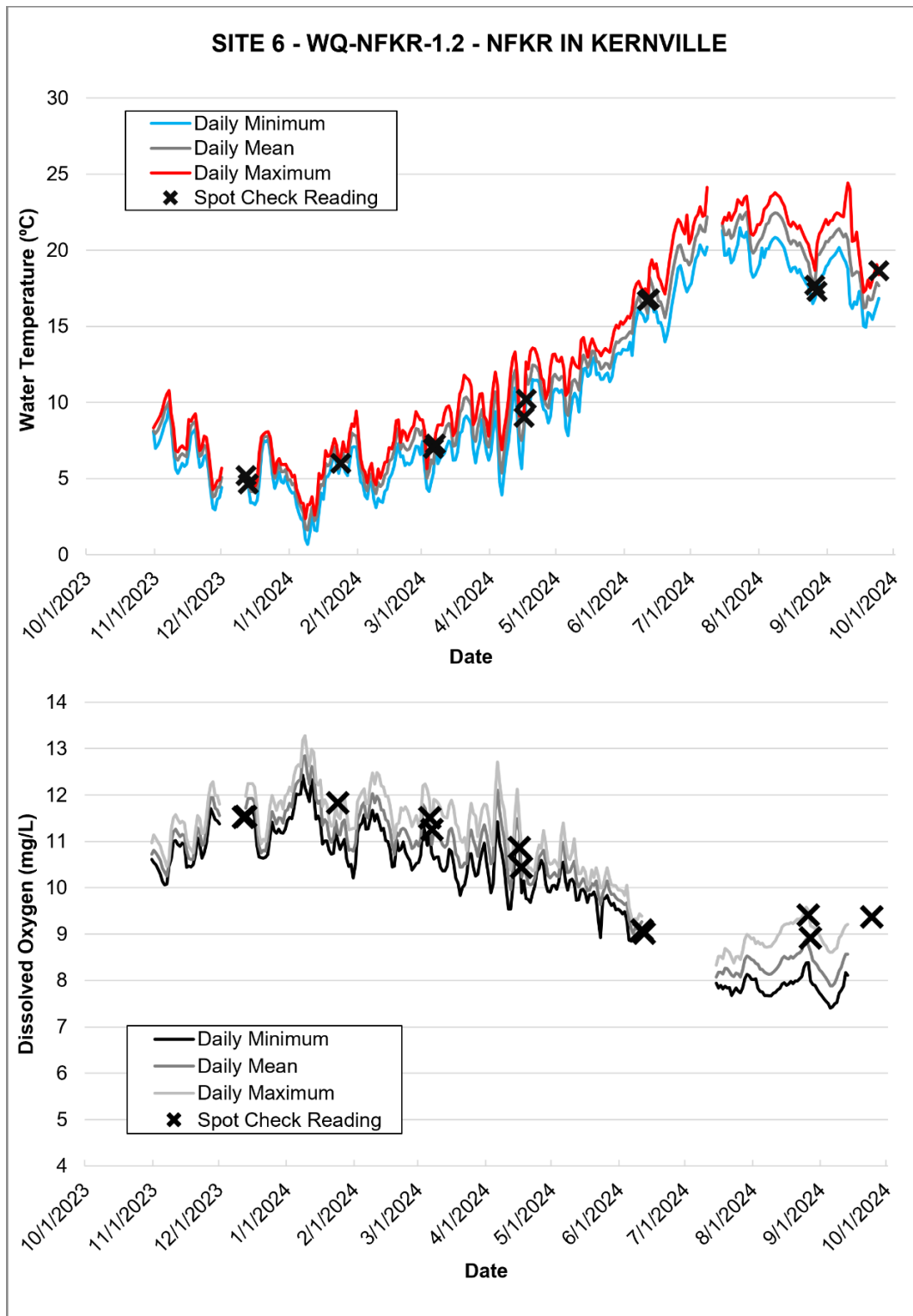
°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

Figure B-4. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 4, North Fork Kern River Downstream of the Kern River No. 3 Powerhouse, October 2023 to September 2024.



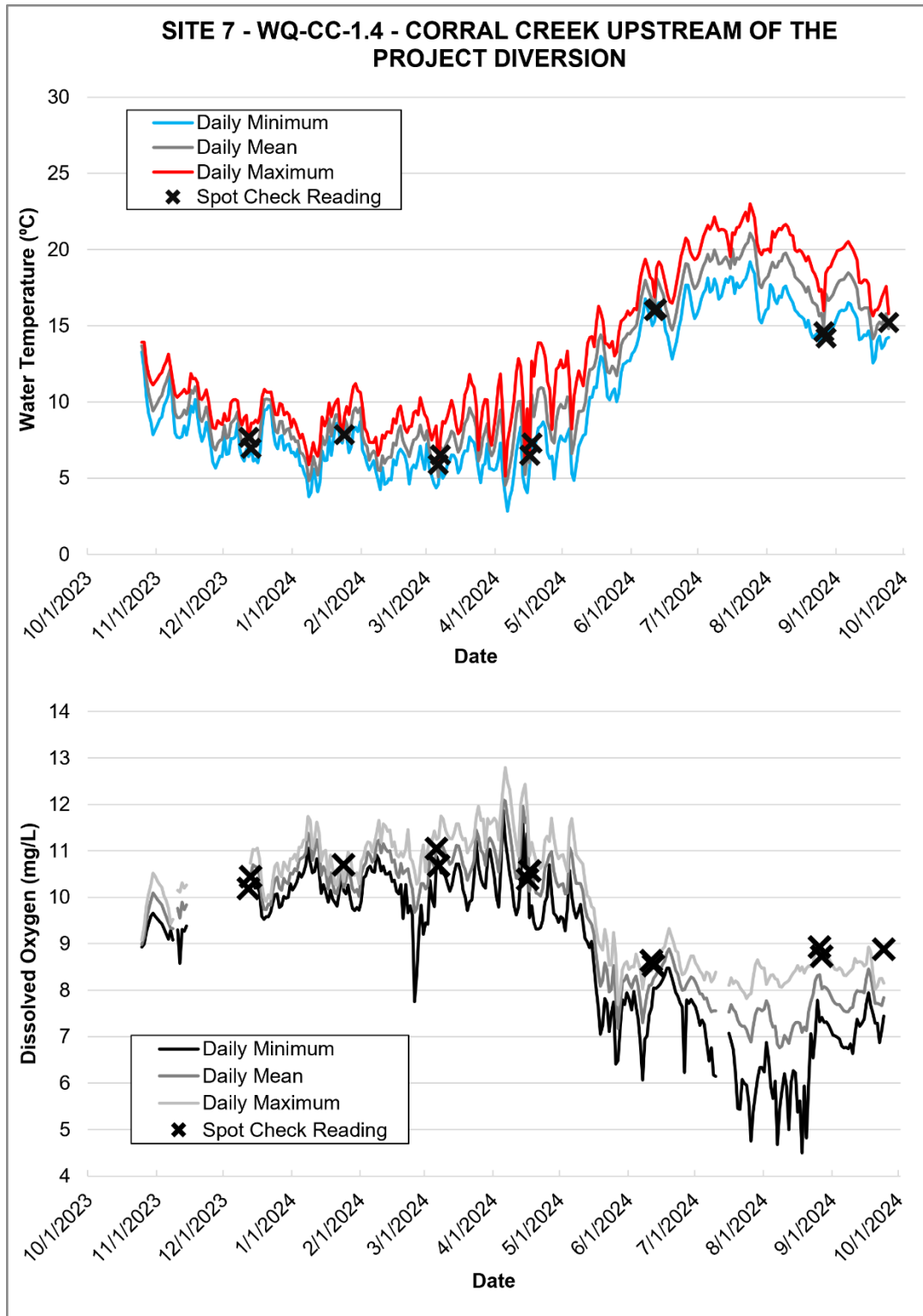
°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

Figure B-5. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 5, North Fork Kern River Upstream of the Kern River No. 3 Powerhouse, October 2023 to September 2024.



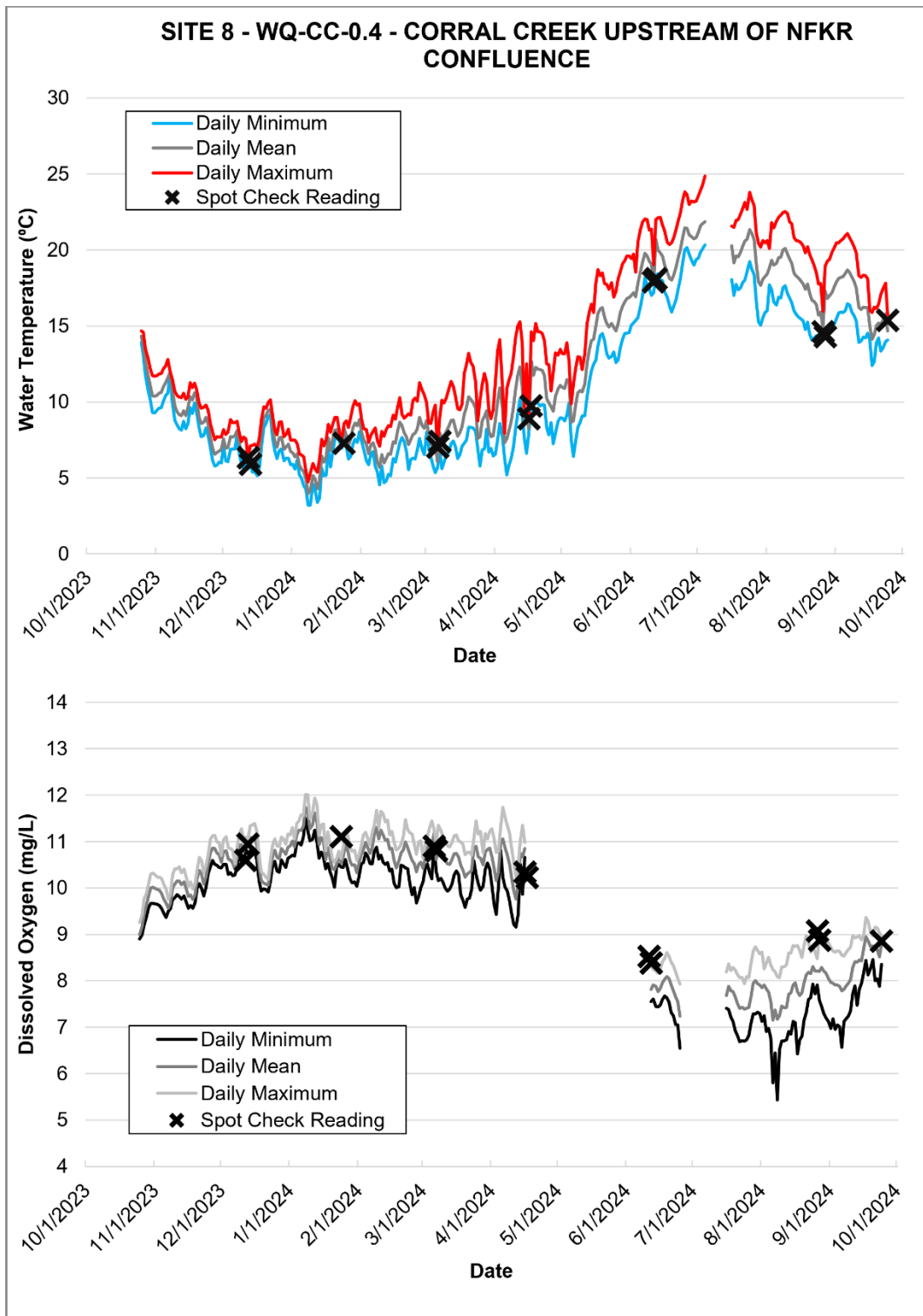
°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

Figure B-6. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 6, North Fork Kern River at Kernville, October 2023 to September 2024.



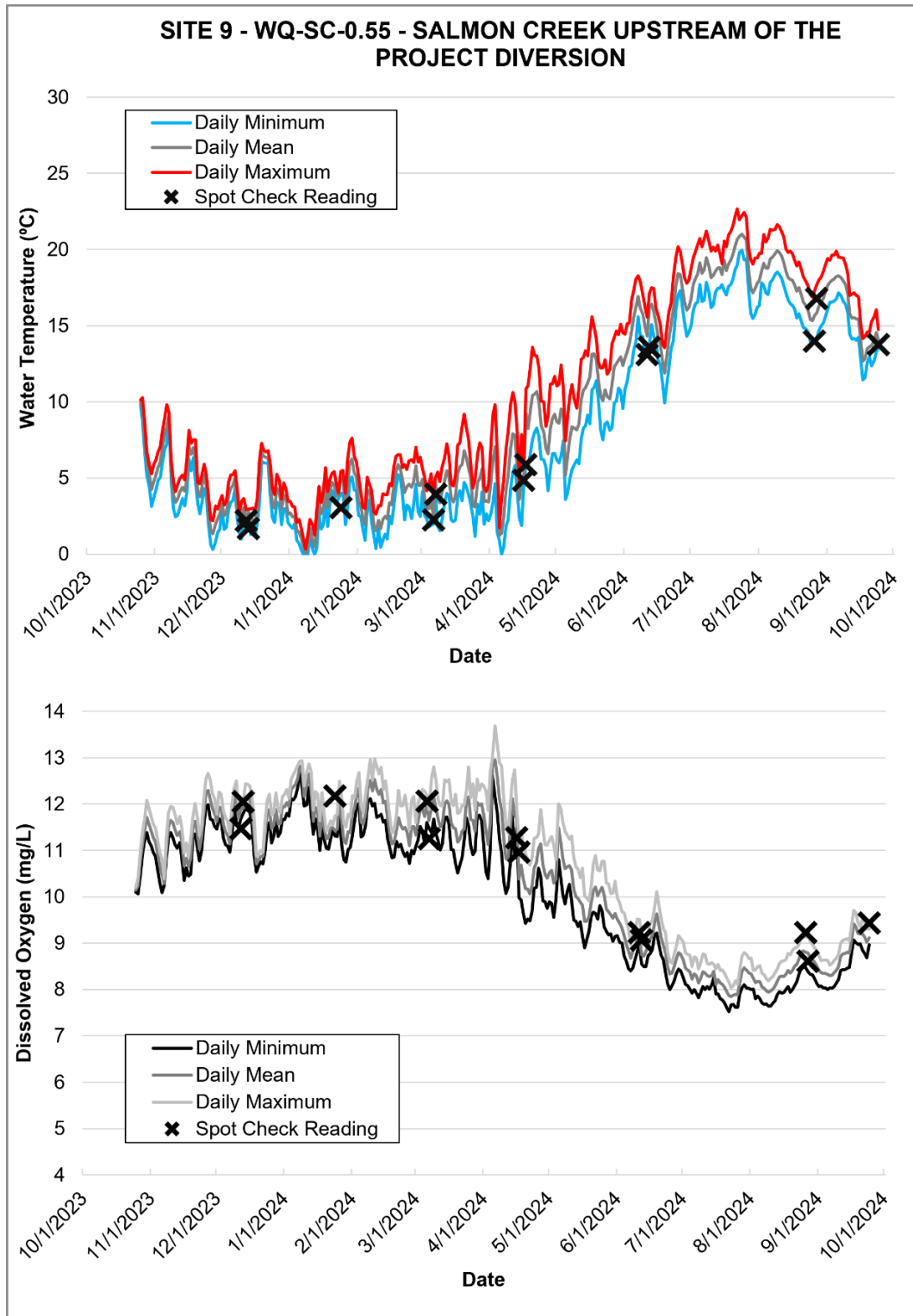
°C = degrees Celsius; mg/L = milligrams per liter

Figure B-7. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 7, Corral Creek Upstream of the Project Diversion, October 2023 to September 2024.



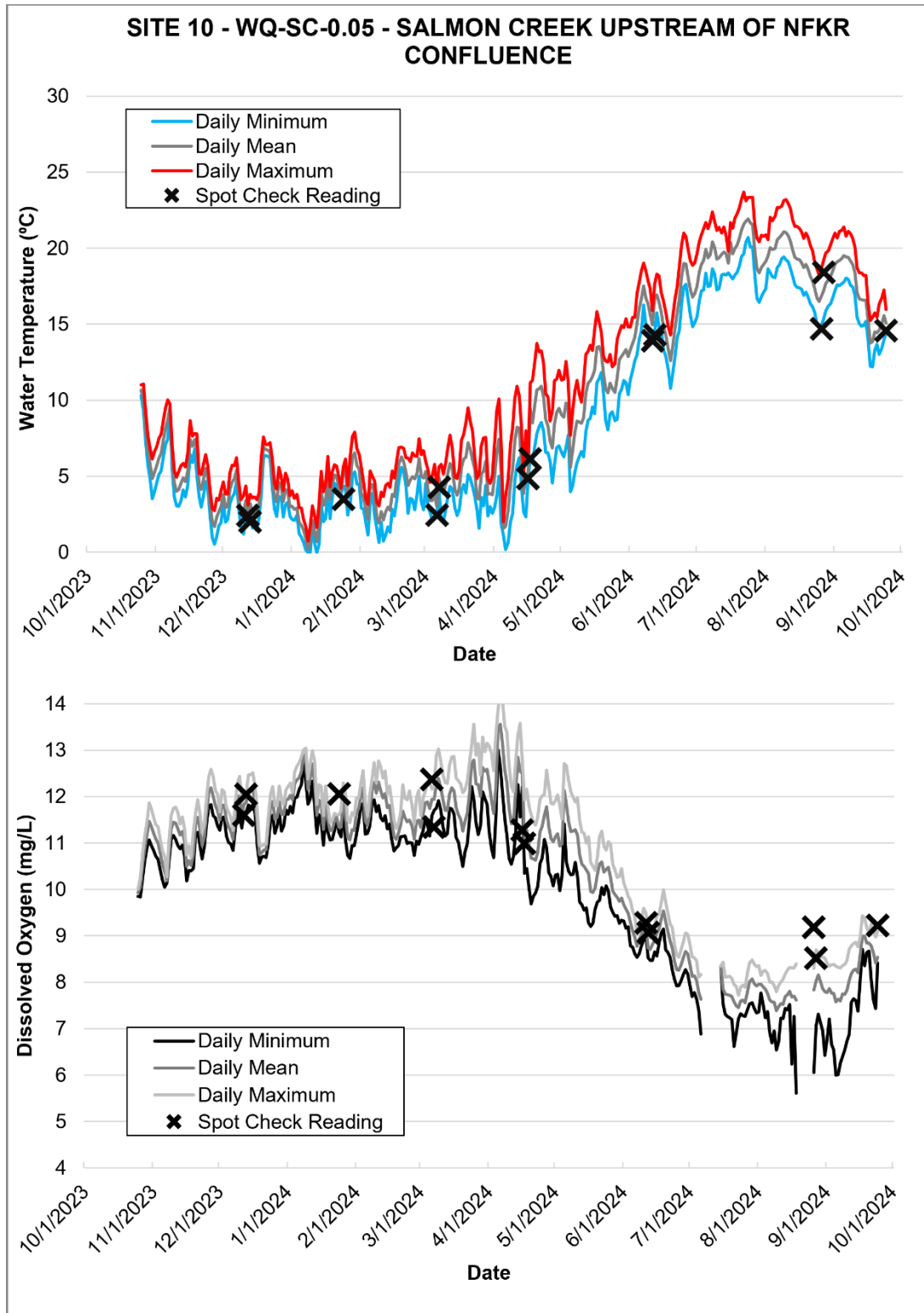
°C = degrees Celsius; mg/L = milligrams per liter

Figure B-8. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 8, Corral Creek Upstream of its Confluence with the North Fork of the Kern River, October 2023 to September 2024.



°C = degrees Celsius; mg/L = milligrams per liter

Figure B-9. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 9, Salmon Creek Upstream of the Project Diversion, October 2023 to September 2024.



°C = degrees Celsius; mg/L = milligrams per liter; NFKR = North Fork Kern River

Figure B-10. Daily Mean, Minimum, and Maximum Water Temperature (top) and Dissolved Oxygen (bottom) at Site 10, Salmon Creek Upstream of the Confluence with the North Fork Kern River, October 2023 to September 2024.

APPENDIX C
INSTANTANEOUS DISSOLVED OXYGEN AND WATER TEMPERATURE
MEASUREMENTS, DECEMBER 2023 TO SEPTEMBER 2024

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Table C-1. Instantaneous Dissolved Oxygen and Water Temperature Measurements Collected During Logger Retrieval and Deployments Between December 2023 and September 2024.

Site 1: WQ-NFKR-19.0 NFKR upstream of Fairview Diversion impoundment pool			Site 2: WQ-NFKR-18.5 NFKR immediately downstream of Fairview Dam			Site 3: WQ-NFKR-10.9 NFKR at Gold Ledge Campground			Site 4: WQ-NFKR-3.2 NFKR immediately upstream of the KR3 Powerhouse			Site 5: WQ-NFKR-3.0 NFKR downstream of the KR3 Powerhouse		
Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)
12/12/2023	11.8	3.4	12/12/2023	11.4	3.4	12/12/2023	11.1	5.0	12/12/2023	11.2	6.9	12/12/2023	11.5	4.2
12/13/2023	12.0	2.5	12/13/2023	11.8	2.8	12/13/2023	11.4	4.6	12/13/2023	11.4	6.5	12/13/2023	11.4	3.7
1/24/2024	11.9	4.7	1/24/2024	11.7	4.8	1/24/2024	11.7	5.5	1/24/2024	11.5	6.8	1/24/2024	11.6	5.3
3/6/2024	11.8	4.2	3/6/2024	11.8	4.2	3/6/2024	--	--	3/6/2024	11.2	7.3	3/6/2024	10.6	5.6
3/7/2024	10.7	5.3	3/7/2024	11.1	5.3	3/7/2024	11.2	6.1	3/7/2024	11.2	7.3	3/7/2024	11.1	6.1
4/16/2024	10.6	7.2	4/16/2024	10.7	7.2	4/16/2024	10.7	8.2	4/16/2024	10.4	9.3	4/16/2024	11.0	7.9
4/17/2024	10.2	8.8	4/17/2024	10.3	8.8	4/17/2024	10.5	9.4	4/17/2024	10.2	10.4	4/17/2024	10.5	9.45
6/11/2024	9.2	14.2	6/11/2024	9.3	14.3	6/11/2024	9.2	15.4	6/11/2024	8.9	16.8	6/11/2024	9.6	15.0
6/12/2024	8.9	15.0	6/12/2024	9.0	15.1	6/12/2024	9.1	16.0	6/12/2024	8.9	16.9	6/12/2024	9.5	15.7
8/26/2024	9.5	14.5	8/26/2024	9.3	14.4	8/26/2024	9.2	15.9	8/26/2024	9.5	17.8	8/26/2024	9.2	16.2
8/26/2024	9.1	17.7	8/26/2024	8.8	17.8	8/27/2024	8.8	16.4	8/27/2024	9.0	17.3	8/27/2024	8.6	16.5
9/24/2024	9.1	14.7	9/24/2024	9.3	14.7	9/24/2024	9.4	16.2	9/24/2024	9.4	18.8	9/24/2024	9.3	17.0
Site 6: WQ-NFKR-1.2 NFKR in Kernville			Site 7: WQ-CC-1.4 Corral Creek upstream of the Project diversion			Site 8: WQ-CC-0.4 Corral Creek upstream of NFKR confluence			Site 9: WQ-SC-0.55 Salmon Creek upstream of the Project diversion			Site 10: WQ-SC-0.05 Salmon Creek upstream of NFKR confluence		
Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)	Date	Dissolved Oxygen (mg/L)	Water Temperature (°C)
12/12/2023	11.5	5.2	12/12/2023	10.2	7.7	12/12/2023	10.6	6.3	12/12/2023	11.5	2.2	12/12/2023	11.6	2.4
12/13/2023	11.5	4.6	12/13/2023	10.4	7.0	12/13/2023	10.9	5.9	12/13/2023	12.1	1.7	12/13/2023	12.1	2.0
1/24/2024	11.8	6.0	1/24/2024	10.7	7.9	1/24/2024	11.1	7.3	1/24/2024	12.2	3.1	1/24/2024	12.1	3.5
3/6/2024	11.5	7.0	3/6/2024	11.1	5.9	3/6/2024	10.9	7.0	3/6/2024	12.1	2.3	3/6/2024	12.4	2.4
3/7/2024	11.3	7.3	3/7/2024	10.7	6.5	3/7/2024	10.8	7.4	3/7/2024	11.3	4.0	3/7/2024	11.3	4.3
4/16/2024	10.9	9.0	4/16/2024	10.4	6.5	4/16/2024	10.3	8.9	4/16/2024	11.3	4.9	4/16/2024	11.3	4.9
4/17/2024	10.4	10.2	4/17/2024	10.6	7.3	4/17/2024	10.2	9.7	4/17/2024	11.0	5.9	4/17/2024	11.0	6.1
6/11/2024	9.1	16.7	6/11/2024	8.6	16.0	6/11/2024	8.5	17.9	6/11/2024	9.2	13.1	6/11/2024	9.3	13.9
6/12/2024	9.0	16.8	6/12/2024	8.5	16.1	6/12/2024	8.4	18.1	6/12/2024	9.1	13.6	6/12/2024	9.1	14.3
8/26/2024	9.4	17.7	8/26/2024	8.9	14.6	8/26/2024	9.1	14.6	8/26/2024	9.2	14.0	8/26/2024	9.2	14.7
8/27/2024	8.9	17.3	8/27/2024	8.7	14.2	8/27/2024	8.9	14.3	8/26/2024	8.6	16.8	8/26/2024	8.5	18.4
9/24/2024	9.4	18.6	9/24/2024	8.9	15.2	9/24/2024	8.9	15.4	9/24/2024	9.4	13.8	9/24/2024	9.2	14.6

°C = degrees Celsius; -- = no data available; mg/L = milligram per liter; NFKR = North Fork Kern River; Project = Kern River No. 3 Hydroelectric Project

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