From:	McCaslin, Tyler
To:	Zeng, Wei; "stephen.Wiedl@dnr.ga.gov"; "Elizabeth.Booth@dnr.ga.gov"; Hedeen, David
Cc:	Steven Layman; Kelly Kirven; Jones, Craig; Barrows, Christina
Subject:	RE: Rocky Mountain DLA Submittal
Date:	Friday, November 17, 2023 3:03:58 PM
Attachments:	image002.png image003.png Exhibit E Package - Intro and Water Quality.pdf

Hi Wei,

As requested from an earlier discussion, I have included an excerpt from Exhibit E including the introduction and water quality studies.

Please let me know if you have any questions or need any additional information.

Tyler McCaslin, PhD
Environmental Specialist
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7723 **Mobile:** 404-576-9097
Email: tyler.mccaslin@opc.com **Web:** www.opc.com

From: Jones, Craig <craig.jones@opc.com>
Sent: Thursday, November 16, 2023 2:59 PM
To: Zeng, Wei <Wei.Zeng@dnr.ga.gov>; 'stephen.Wiedl@dnr.ga.gov' <stephen.Wiedl@dnr.ga.gov>; 'Elizabeth.Booth@dnr.ga.gov' <Elizabeth.Booth@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Klein Schmidt Group (Kelly Kirven) <Kelly.Kirven@KleinschmidtGroup.com>
Subject: Rocky Mountain DLA Submittal

Good Afternoon Everyone,

I'm reaching out to give you a heads up that we will be submitting the Rocky Mountain DLA tomorrow. You will be receiving an email notification with links to the documents.

The comment period will run through February 15, 2024. However, we will be reaching out in the near future to schedule a meeting to discuss the DLA, including study results and proposed PM&E measures. Also, as we discussed this summer, we will be providing updated study results based on our 2023 analysis, which will be available before the end of the year.

Please feel free to reach out with any questions.

Best,

Craig

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From:	Jones, Craig
To:	Hakala, Jim
Cc:	McCaslin, Tyler; Barrows, Christina; Steven Layman
Subject:	Draft Water Quality Assessment Study Report Addendum
Date:	Tuesday, January 2, 2024 12:40:07 PM
Attachments:	image001.png 0498003 RM Water Quality Assessment 2nd Season_DRAFT_12-28-2023.pdf

Jim,

We are looking forward to meeting on Rocky PM&E measures this Friday. I just want to confirm that 9:00 a.m. is still okay with you and your team. We have flexibility to adjust the time if needed.

Also, I'm forwarding the preliminary, draft WQ assessment update that addresses the 2023 field season. Please feel free to forward to your team. Please note, this report is still under review and subject to change, but I want to make sure you have it for our discussion on Friday.

Please reach out if you have any questions, and I look forward to hearing where you all are at with respect to our proposal.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From:	Jones, Craig
To:	Zeng, Wei; "Elizabeth.Booth@dnr.ga.gov"; Hedeen, David
Cc:	McCaslin, Tyler; Barrows, Christina; Steven Layman
Subject:	Rocky Relicensing Draft WQ Study Update and Meeting Request
Date:	Tuesday, January 2, 2024 1:02:51 PM
Attachments:	image001.png 0498003 RM Water Quality Assessment 2nd Season_DRAFT_12-28-2023.pdf

Wei, David, and Liz,

Happy New Year, and I hope your holiday season went well.

As discussed last fall, I'm forwarding to you the preliminary, draft WQ assessment update that addresses DO relative to the 2023 field season. Please feel free to forward to anyone else on your team who should review. However, please note this report is still under review and subject to change, but I wanted to make sure you had it prior to the DLA comment deadline.

I'm also reaching out to see if we can schedule a meeting in the next couple of weeks, ideally before mid-January, to discuss the draft report and any questions you may have related to the DLA prior to filing comments. If you send me some possible dates/time, I'll work on our end to coordinate a meeting.

Best regards,

Craig

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

DRAFT STUDY REPORT ADDENDUM

WATER QUALITY ASSESSMENT STUDY REPORT

ROCKY MOUNTAIN PUMPED STORAGE HYDROELECTRIC PROJECT

(FERC No. 2725)

Prepared for:

Oglethorpe Power Corporation

Prepared by:

Kleinschmidt Associates

December 2023

Kleinschmidt

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This Study Report Addendum presents the results of water quality monitoring conducted in July-September 2023 for the Oglethorpe Power Corporation (An Electric Membership Corporation) (OPC) Water Quality Assessment Study for Federal Energy Regulatory Commission (FERC) relicensing of the Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725) (Rocky Mountain Project, the Project). These results supplement those findings provided in the Water Quality Assessment Study Report (Kleinschmidt 2023a) filed by OPC on November 17, 2023 with the Draft License Application and bring the study to a conclusion.

The Water Quality Assessment Study was conducted according to OPC's Final Study Plan for the Project distributed in August 2022 (OPC 2022; Kleinschmidt 2023a). The 1-year study included monthly water chemistry sampling at four stations and continuous monitoring of dissolved oxygen (DO) and water temperature in Heath Creek downstream of the Main Dam from June 2022 to June 2023. Based on meetings held with the Georgia Department of Natural Resources (GDNR) Environmental Protection Division, GDNR Wildlife Resources Division, and U.S. Fish and Wildlife Service in May-June 2023 regarding the preliminary study results, OPC conducted a second season of DO monitoring during July 2023-September 2023 to investigate potential causes of intermittent instances of DO concentrations falling below 4.0 milligrams per liter (mg/L) in Heath Creek.

As presented in the Water Quality Assessment Study Report (Kleinschmidt 2023a) and discussed in the agency meetings, hourly monitoring data collected in Heath Creek at station RM11 downstream of the Main Dam (Figure 1) documented several instances of DO concentrations falling below the instantaneous minimum criterion of 4.0 mg/L for short periods (1-5 hours) during July 2022 and August 2022. The deviations occurred upon the start of generation when flow releases from the Main Dam approximated or approached the continuous minimum flow of 1.2 cubic feet per second (cfs). Overall, monitoring in Heath Creek between June 2022 and October 2022 found that the daily average DO concentration was always greater than the daily average minimum criterion of 5.0 mg/L and hourly values were 4.0 mg/L or greater 98.5 percent of the time. Nevertheless, OPC proposed during the agency meetings to conduct a second season of water quality monitoring during July 2023-September 2023 to investigate potential causes of the infrequent DO deviations below 4.0 mg/L in Heath Creek downstream of the Main Dam.

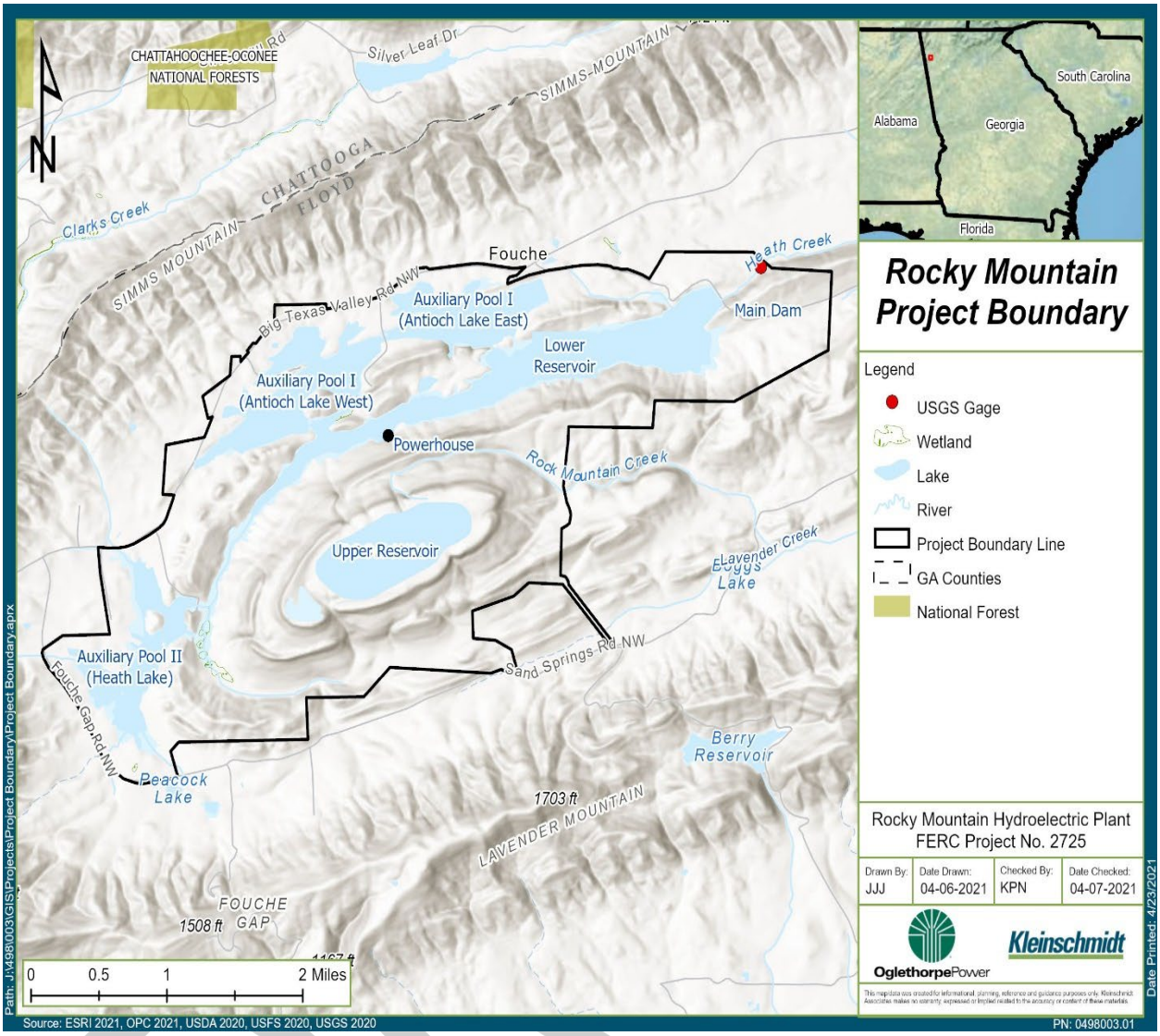


Figure 1 Project Boundary Map

2.0 OBJECTIVES AND STUDY AREA

OPC conducted targeted water quality monitoring during summer 2023 to determine the potential cause(s) of the intermittent and short-duration low-DO events observed during July 2022 and August 2022. This was accomplished using a combination of methods in Heath Creek and the Lower Reservoir as described in Section 3.0.

2.1 Objectives

The specific objectives of the second season of study during 2023 were to:

- Collect water quality data to potentially explain the mechanism(s) by which intermittent and short-duration low-DO events occur in Heath Creek, as documented during July 2022-August 2022.
- Develop water quality information sufficient for analyzing the effects of project operation and maintenance on water quality in the license application.

2.2 Study Area

The study area included the Lower Reservoir near the Main Dam and Heath Creek from the Main Dam downstream to U.S. Geological Survey (USGS) Gage No. 02388320 (Heath Creek near Armuchee, GA), located about 0.3 mile downstream of the Main Dam.

3.0 METHODOLOGY

3.1 Continuous Monitoring – Heath Creek

Hourly measurements of water temperature and DO in Heath Creek approximately 1,000 feet (ft) downstream of the Main Dam (station RM11) were continued from late June 2023 (end of first study season) through September 2023 (Figure 2). A second HOBO DO logger (Onset Computer Corp.) was deployed in Heath Creek approximately 190 ft downstream of the Main Dam[1] and set to record measurements of water temperature and DO at hourly intervals. The loggers were cleaned, downloaded, and checked for accuracy at two-week intervals. The continuous monitoring extended through September 2023 because representative data were not collected in September 2022 due to an extreme high-flow event that caused the logger to become buried in sediment. By October 2022, hourly DO values were continuously above 4.0 mg/L, ranging from 6.74 to 9.26 mg/L.

A linear stream distance of approximately 1,100 ft separated the DO logger near the Main Dam and the DO logger downstream at station RM11. To characterize potential longitudinal change in DO concentrations between these sites, DO measurements were taken at mid-depth with a YSI EXO3 sonde at numerous intervals, beginning at the dam and moving downstream, on July 13, 2023, a seasonally hot, dry summer day.

3.2 Vertical Profile Monitoring Events – Lower Reservoir

Four vertical profile monitoring events were conducted during July 2023 through September 2023 (specifically on July 12-13, August 17, September 6, and September 19) in the Lower Reservoir near the Main Dam during seasonally hot, dry weather when releases from the Main Dam approximated or approached the 1.2-cfs minimum flow. During the first event (July 12-13), a multiparameter sonde was deployed from the top of the Main Dam and suspended via rope into the reservoir at approximately the same elevation as the intake for the minimum flow pipe (El. 662 ft),[2] a depth 48.5 ft below the normal maximum pool elevation of 710.5 ft MSL. The sonde was programmed to record measurements of water temperature, DO, pH, conductivity, and turbidity at 15-minute intervals for a 24-hour period. On August 3, a third HOBO DO logger was deployed from

[1] The downstream outlet of the minimum flow pipe is about 15 ft downstream of the Main Dam.

[2] The inlet for the minimum flow pipe is located at 665 ft MSL. However, it draws water from the 4 ft diameter pipe with a centerline elevation of 662 ft MSL that feeds the 40-in and 10-in jet gates. Therefore, the effective intake elevation for the minimum flow intake is at approximately 662 ft MSL.

the top of the Main Dam and suspended via cable at the approximate minimum flow intake elevation. That logger was programmed to continuously record measurements of DO and water temperature at 15-minute intervals through September 30, 2023. Measurements were recorded at 15-minute intervals to provide higher-resolution characterization of DO conditions in the vicinity of the minimum flow intake over the pumping-generation cycle as the reservoir elevation changed.

Additionally, vertical profile measurements were collected using a multiparameter sonde in the Lower Reservoir near the Main Dam. Measurements of water temperature, DO, pH, conductivity, and turbidity were recorded at the surface and at 1-meter intervals down to the bottom. During each of the four events, one vertical profile was measured in the Lower Reservoir prior to the start of daily generation to represent the water column when corresponding DO values in Heath Creek were always above 4.0 mg/L in summer 2022. A second vertical profile was collected during the August 17 and September 19 monitoring events approximately 4 hours after the start of generation to represent the water column during the interval when corresponding DO values in Heath Creek tended to decline in summer 2022, sometimes below 4.0 mg/L (12 events), and then began recovering a few hours later.[3]

[3] Even if DO values in Heath Creek did not fall below 4.0 mg/L during a monitoring event, they were expected to decline during generation, and patterns of changes in the reservoir vertical profile from pre-generation to generation were likely to be informative with respect to potential sources of low-DO conditions in Heath Creek.

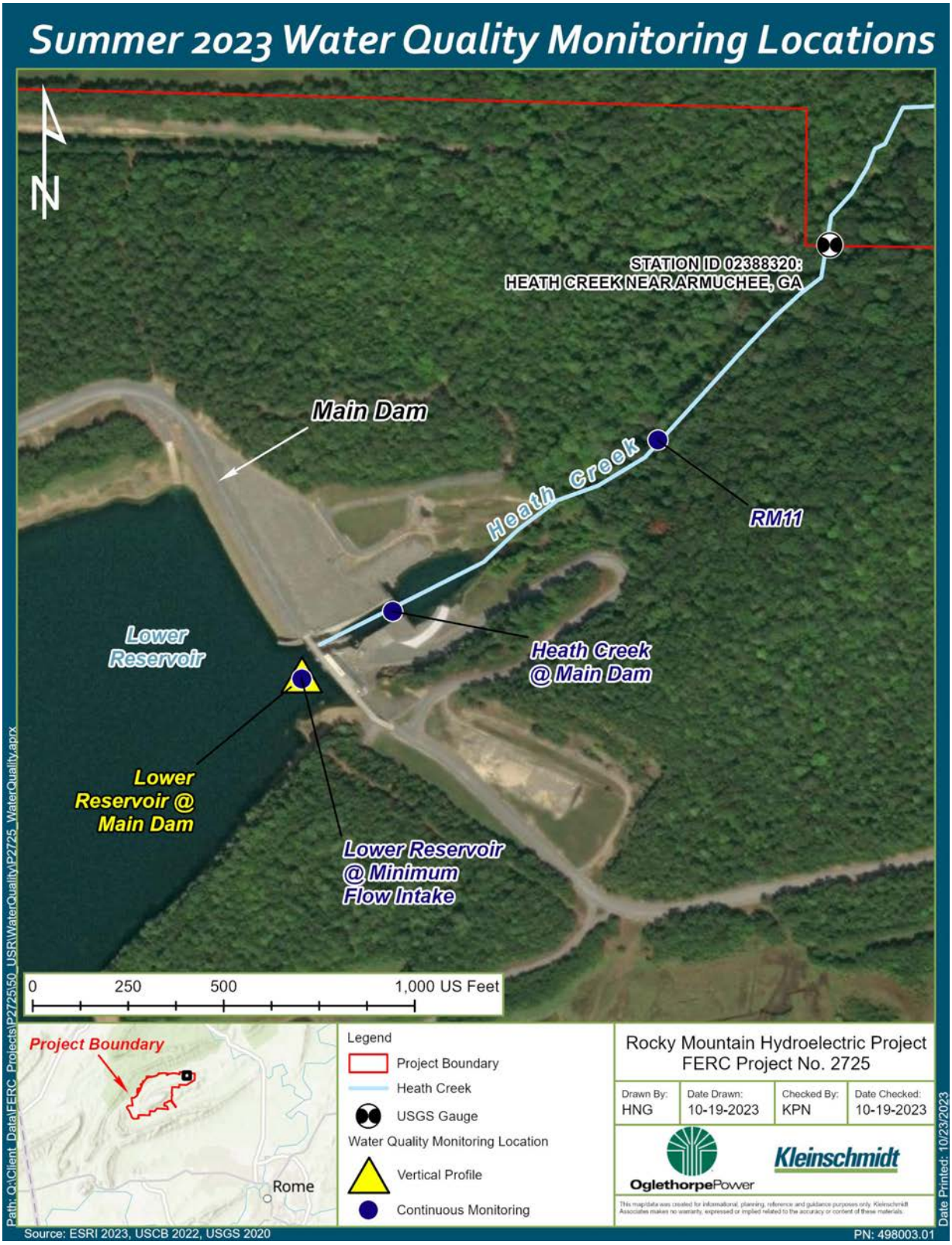


Figure 2 Water Quality Monitoring Locations

4.0 RESULTS

4.1 Continuous Monitoring – Heath Creek

Continuous monitoring at Heath Creek station RM11 showed higher average DO levels in July 2023 and August 2023 as compared to 2022 (Table 1). All hourly DO measurements recorded at RM11 from July 2023 through September 2023 were above 4.0 mg/L and all daily average DO levels were greater than 5.0 mg/L, with the exception of one date in September 2023. There were five DO measurements at RM11 on September 3, 2023 that were less than 4.0 mg/L, four of which were consecutive, occurring from 6 am to 9 am (lowest value was 3.14 mg/L at 8 am), and a single measurement of 3.87 mg/L at 8 pm. Additionally, the daily average for that day was 4.68 mg/L. During the critical period of May through October, in 2022 and 2023 combined, OPC collected a total of 6,200 hourly measurements of DO at station RM11, 99.3 percent of which were equal to or greater than 4.0 mg/L. Additionally during that same critical period, only one of 260 days that were monitored (0.4 percent) had a daily average DO concentration less than 5.0 mg/L.

Table 1 Summary of RM11 Dissolved Oxygen and Water Temperature Measurements from July to September in 2022 and 2023

Year	Month	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
		Minimum	Average	Maximum	Minimum	Average	Maximum
2023	JUL	4.91	7.18	9.13	22.64	26.24	30.32
	AUG	4.39	6.42	8.22	25.90	27.82	30.88
	SEP	3.14	6.54	8.47	23.74	26.39	29.56
2022	JUL	3.07	6.13	8.11	23.80	26.28	29.66
	AUG	2.32	6.12	8.11	26.30	27.58	30.22
	SEP	4.02	6.49	9.90	22.18	26.09	29.20

Continuous monitoring in Heath Creek approximately 190 ft downstream of the Main Dam showed slightly different results for DO when compared to RM11. DO levels at the Main Dam were consistently higher than those at downstream station RM11, with all instantaneous and daily average values greater than 4.0 and 5.0 mg/L, respectively (Table 2). A plot of hourly DO data from both Heath Creek loggers and streamflow as recorded at the USGS gage is provided in Figure 3. A plot of daily average DO data from both Heath Creek loggers and streamflow is provided in Figure 4.

Table 2 Summary and Comparison of Dissolved Oxygen and Water Temperature at Heath Creek Monitoring Sites from July 2023 to September 2023

Location	Month	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
		Minimum	Average	Maximum	Minimum	Average	Maximum
Heath Creek at Main Dam	JUL	5.78	7.33	8.99	22.7	26.3	28.4
	AUG	5.47	7.05	8.05	27.0	28.2	29.7
	SEP	6.62	7.21	8.30	25.3	27.3	29.2
RM11	JUL	4.91	7.18	9.13	22.64	26.24	30.32
	AUG	4.39	6.42	8.22	25.90	27.82	30.88
	SEP	3.14	6.54	8.47	23.74	26.39	29.56

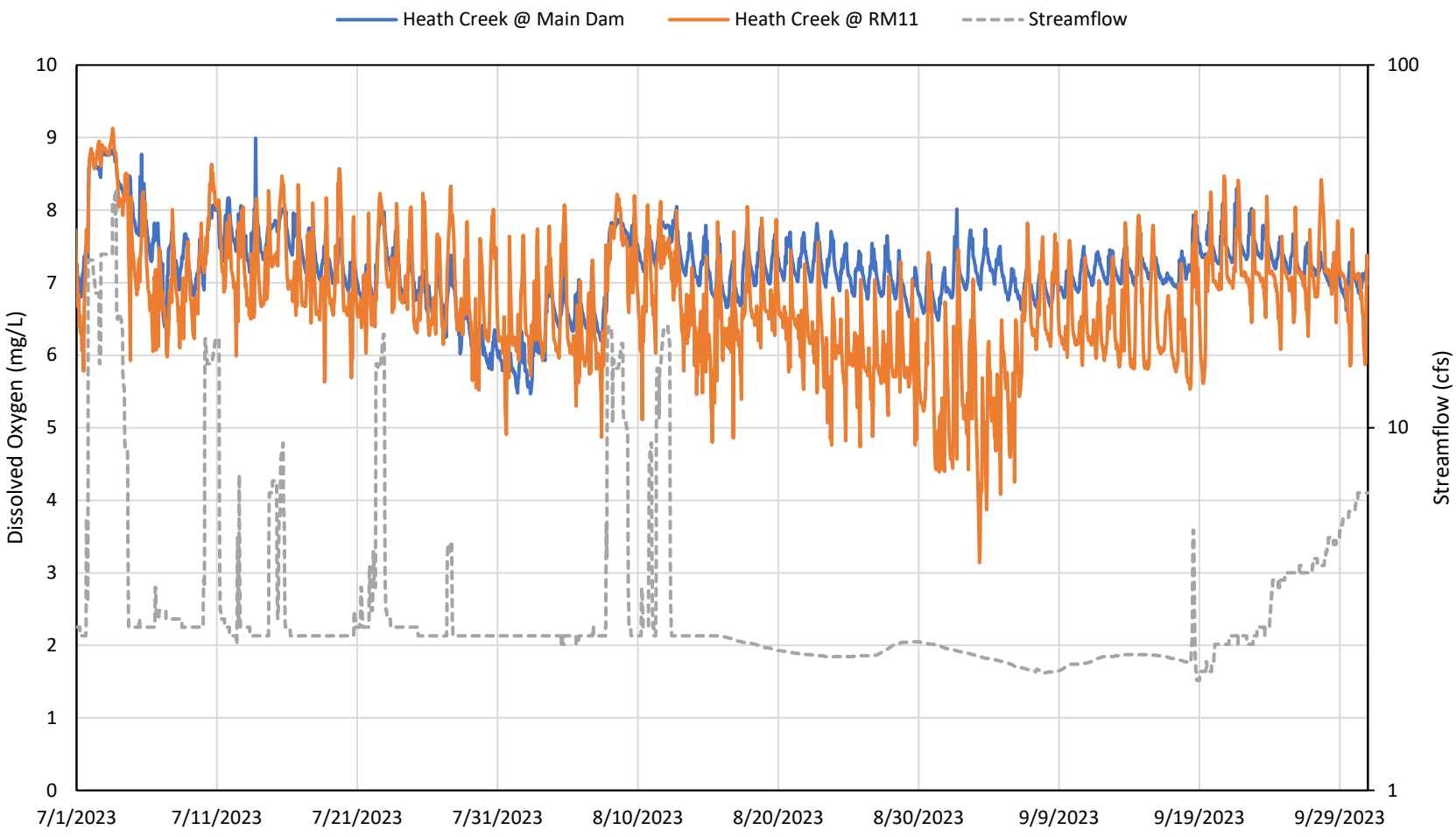


Figure 3 Heath Creek Hourly Dissolved Oxygen and Streamflow from July 2023 to September 2023

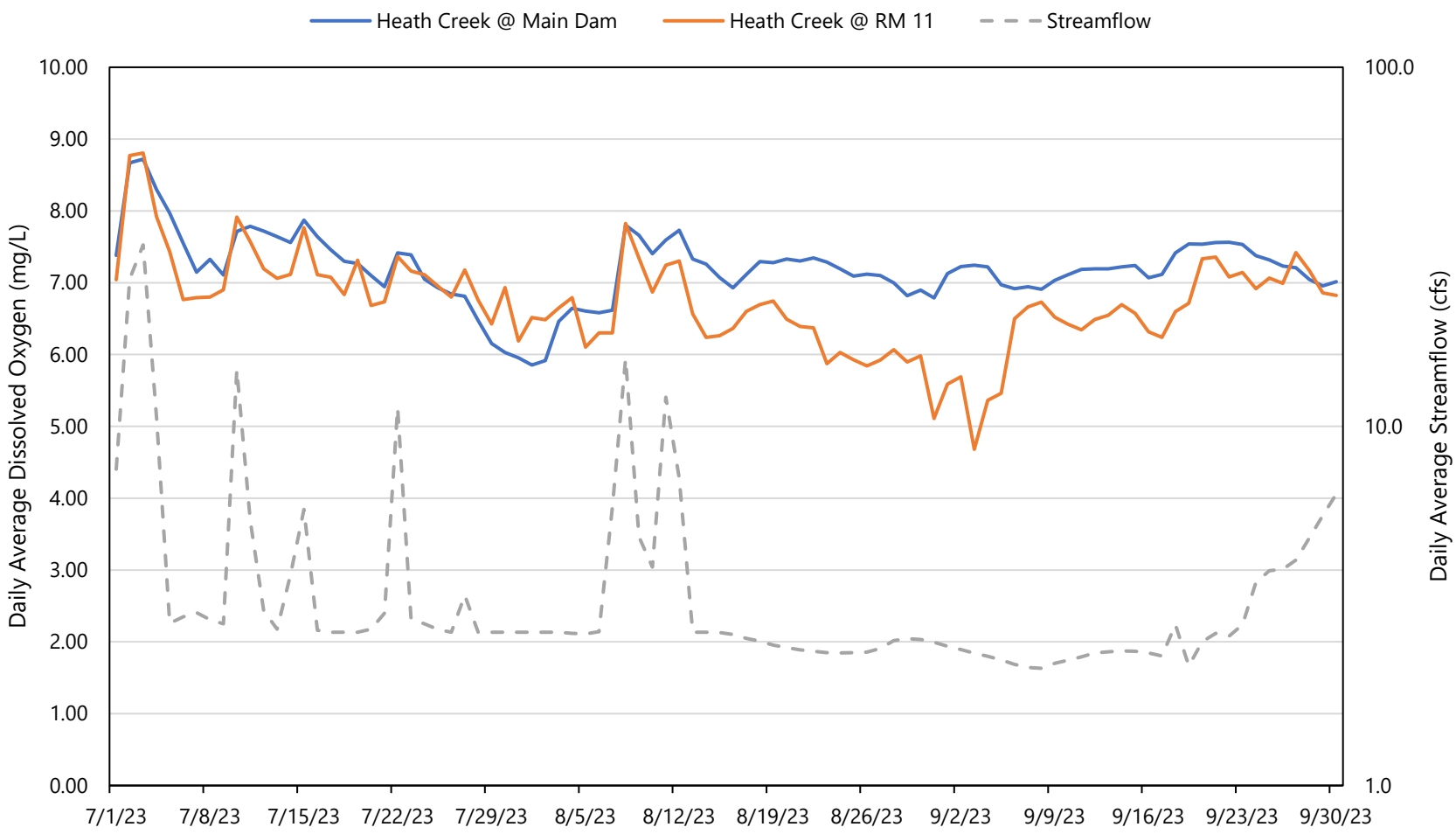


Figure 4 Heath Creek Daily Average Dissolved Oxygen and Streamflow from July 2023 to September 2023

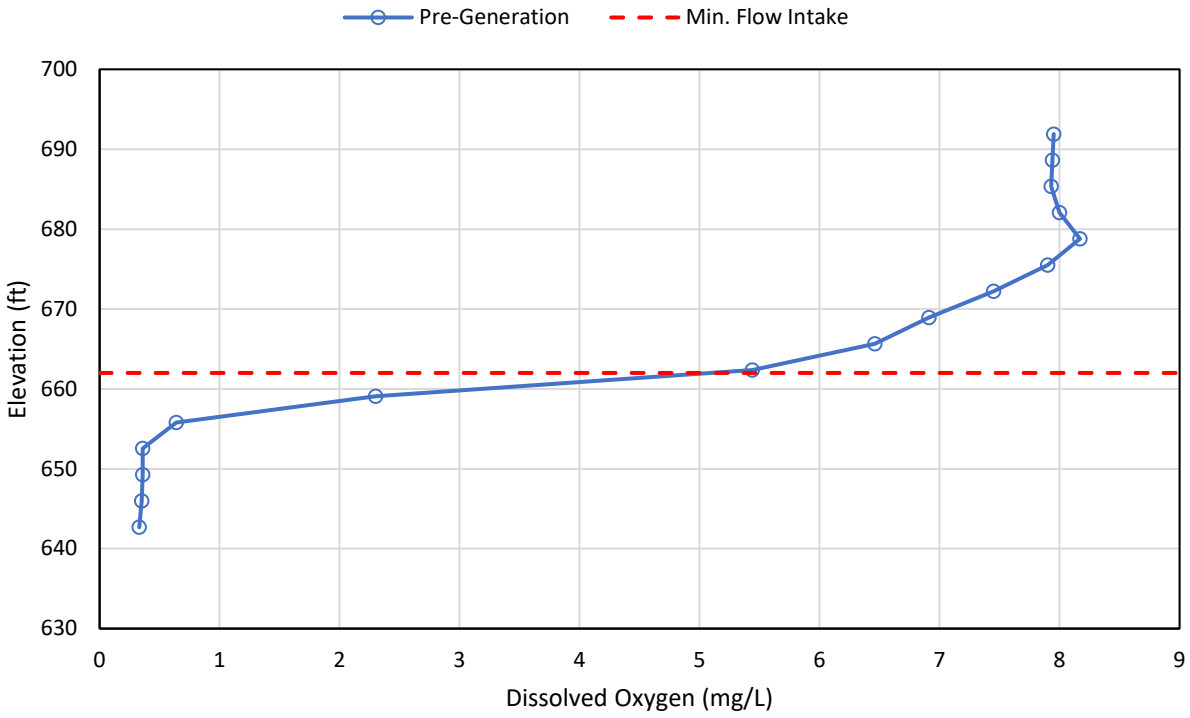
On July 13, 2023, DO concentration was measured at several locations in Heath Creek, starting at the logger located 190 ft downstream of the Main Dam and traversing downstream to the logger at station RM11. DO concentration was 7.82 mg/L at the Main Dam, increased slightly over a distance downstream of about 500 ft, then decreased almost linearly with increasing distance to a concentration of 7.26 mg/L at the station RM11 logger (Table 3).

Table 3 Heath Creek Longitudinal Water Quality Measurements Collected on July 13, 2023

Distance from Main Dam (ft)	DO (mg/L)	DO % Saturation	Water Temperature (°C)
190	7.82	96.2	25.84
440	7.84	96.6	26.00
530	7.93	98.5	26.44
630	8.02	99.8	26.50
658	8.03	100.1	26.58
718	7.97	99.1	26.48
778	7.85	97.1	26.17
836	7.86	97.2	26.19
876	7.82	96.6	26.10
911	7.80	96.3	26.05
956	7.73	95.2	25.93
992	7.66	94.1	25.83
1,050	7.55	92.5	25.67
1,074	7.45	91.1	25.57
1,174	7.43	90.8	25.52
1,194	7.44	91.0	25.52
1,215	7.41	90.5	25.50
1,233	7.39	90.3	25.49
1,249	7.26	88.6	25.42

4.2 Vertical Profiles

Vertical profile measurements collected in the Lower Reservoir indicated thermal and chemical stratification, with the minimum flow inlet elevation (662 ft) being just above or within the chemocline, the reservoir layer with the steepest vertical gradient in DO concentration. DO at the minimum flow intake elevation (662 ft) was approximately 5.2 mg/L on July 13, with concentrations dropping below 1.0 mg/L at elevations less than 656 ft (Figure 5). Water temperatures ranged from 29.06 °C at the surface to 14.27 °C at the bottom. DO at the minimum flow intake elevation was approximately 4.0 mg/L on August 17 in profiles collected prior to and during generation, with levels less than 1.0 mg/L at elevations less than 658 ft (Figure 6). During the September 6 pre-generation profile, DO levels at the minimum flow intake elevations were approximately 6.0 mg/L and 2.53 mg/L at an elevation of 659.1 ft (Figure 7). DO at the minimum flow intake elevation was approximately 6.1 mg/L on September 19 in profiles collected prior to and during generation, and 2.1 mg/L at an elevation of 657 ft (Figure 8). As indicated by these vertical profiles, DO concentrations at elevations 3 to 6 ft below the minimum flow inlet elevation were less than 1.0 to 3.0 mg/L.



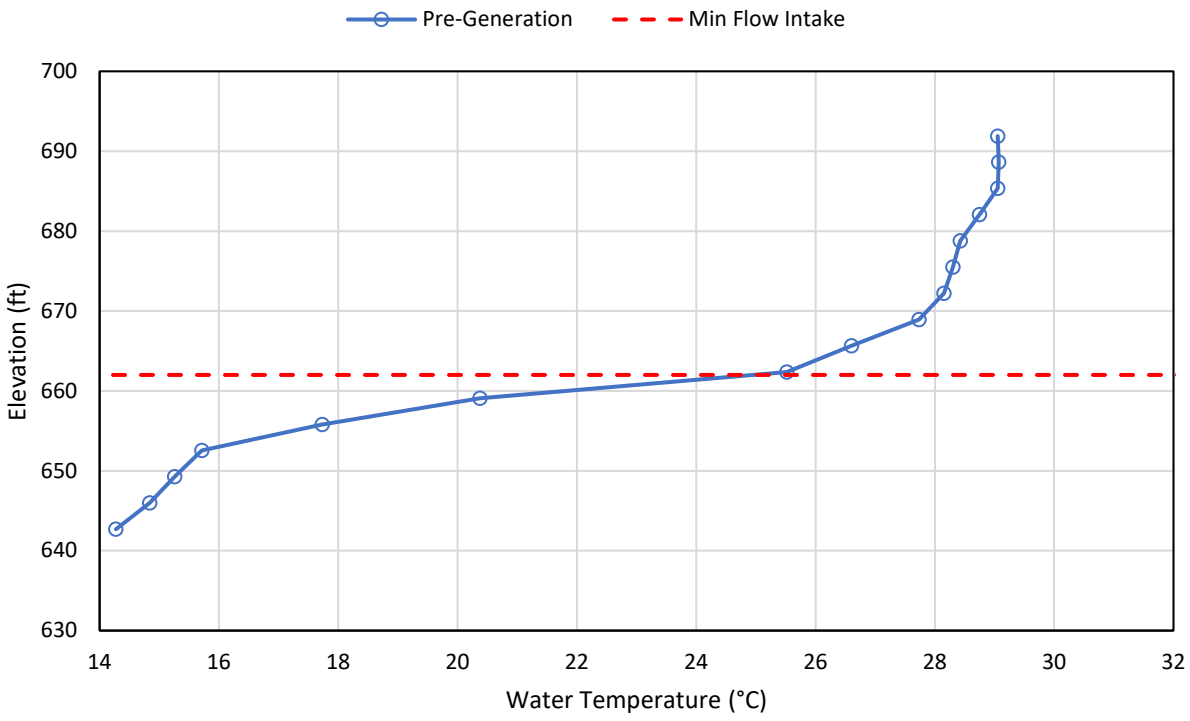


Figure 5 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on July 13, 2023

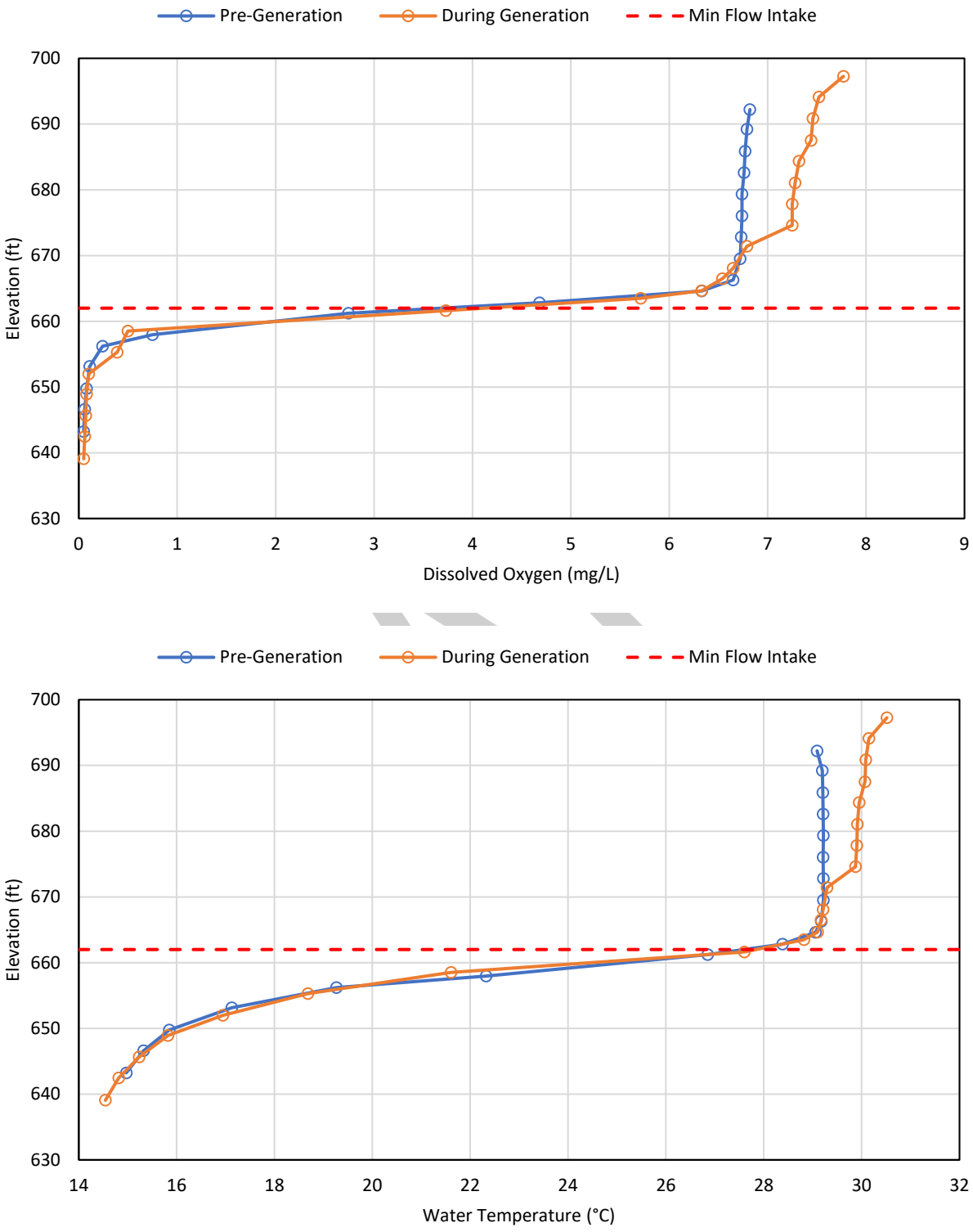
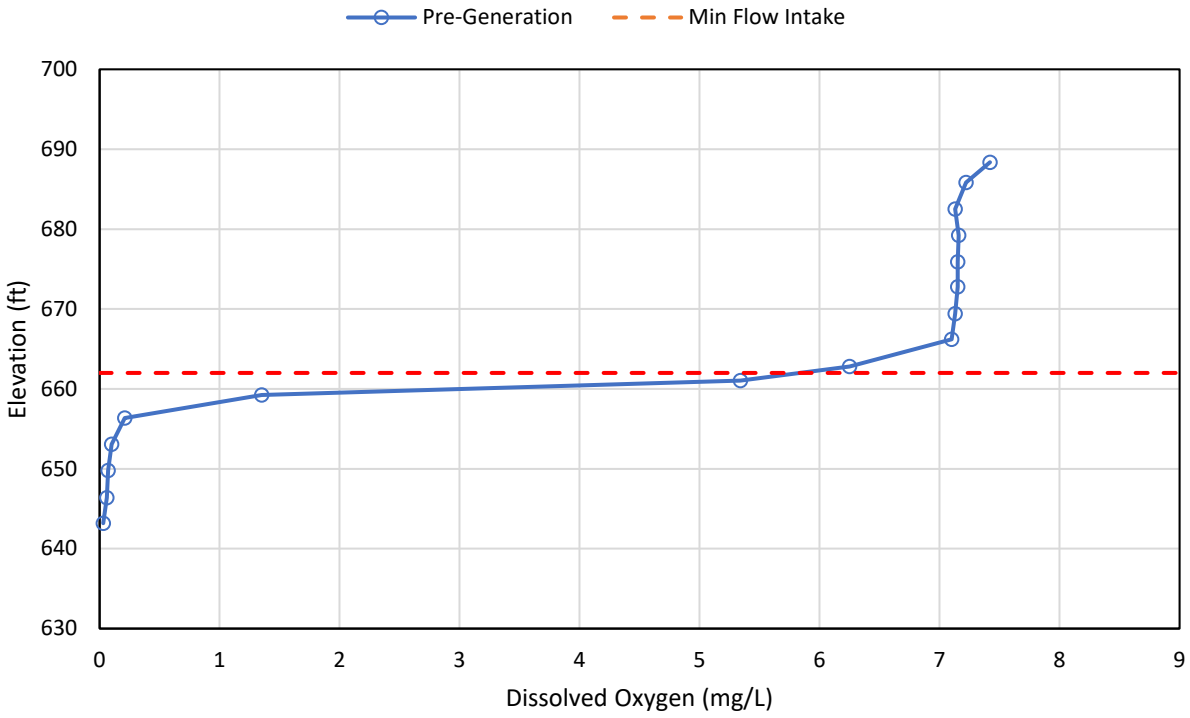


Figure 6 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on August 17, 2023



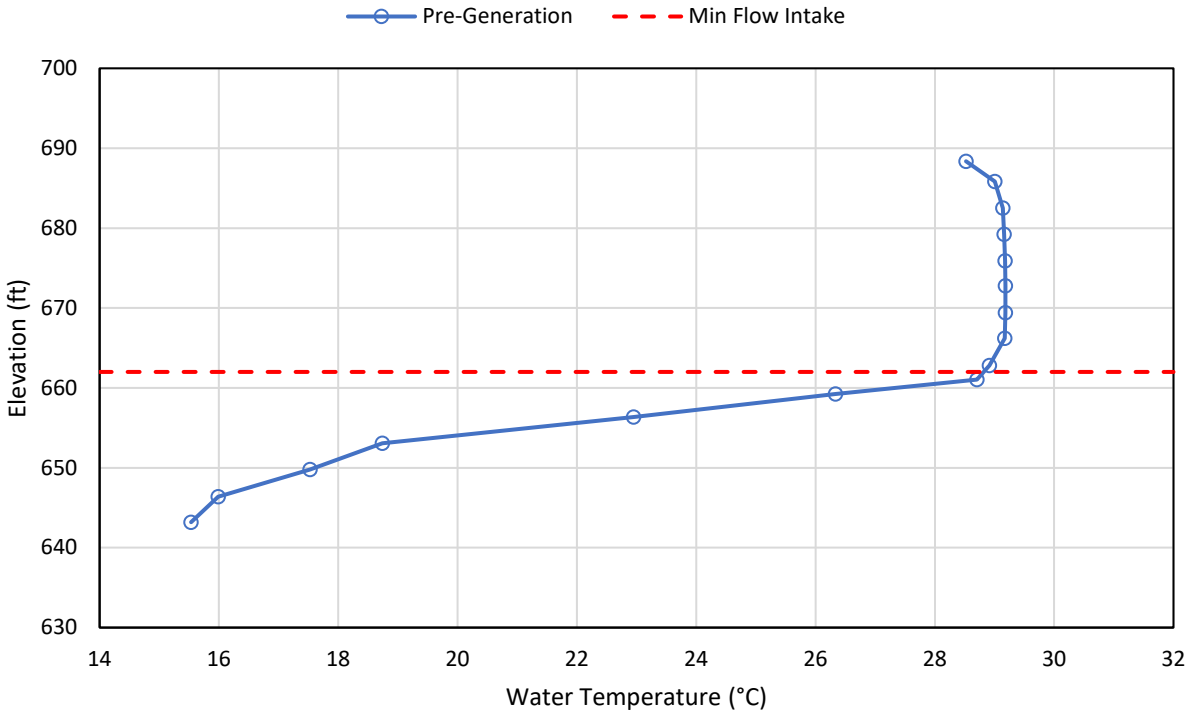


Figure 7 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on September 6, 2023

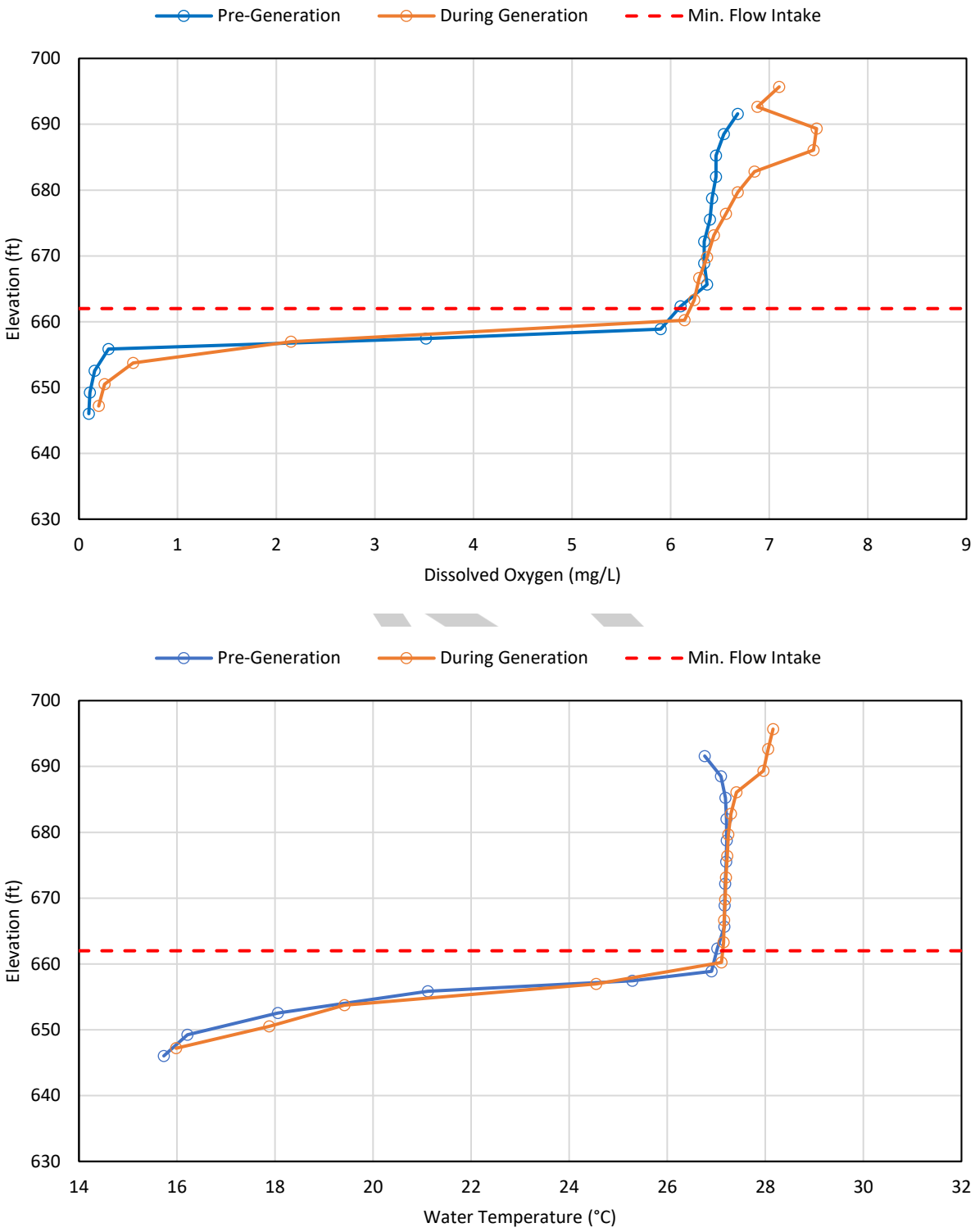


Figure 8 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on September 19, 2023

4.3 Minimum Flow Intake Monitoring

DO at the minimum flow intake elevation was monitored for a 24-hour period between July 12, 2023 and July 13, 2023. During that monitoring event, DO levels at the intake elevation prior to generation ranged between 5.31 and 7.00 mg/L. DO levels began to decline approximately 3.5 hours after generation began, dropping from 6.56 mg/L to a low of 4.41 mg/L (Figure 9). However, during the same period, DO levels in Heath Creek immediately below the Main Dam remained above 7.0 mg/L.

Data collected by the logger deployed in the Lower Reservoir at the minimum flow intake elevation from August 3, 2023 to September 30, 2023 showed a continuing trend of DO levels dropping after generation began and recovering after brief periods. During this monitoring period, DO levels in Heath Creek at the Main Dam consistently remained near or above 7.0 mg/L. Charts depicting Lower Reservoir water surface elevations and DO levels at the minimum flow intake and in Heath Creek at the Main Dam are provided in Figure 10 through Figure 17. These results indicate that the minimum flow release at the Main Dam becomes aerated as it falls from the discharge pipe to the stream and meets the applicable water quality standards for DO.

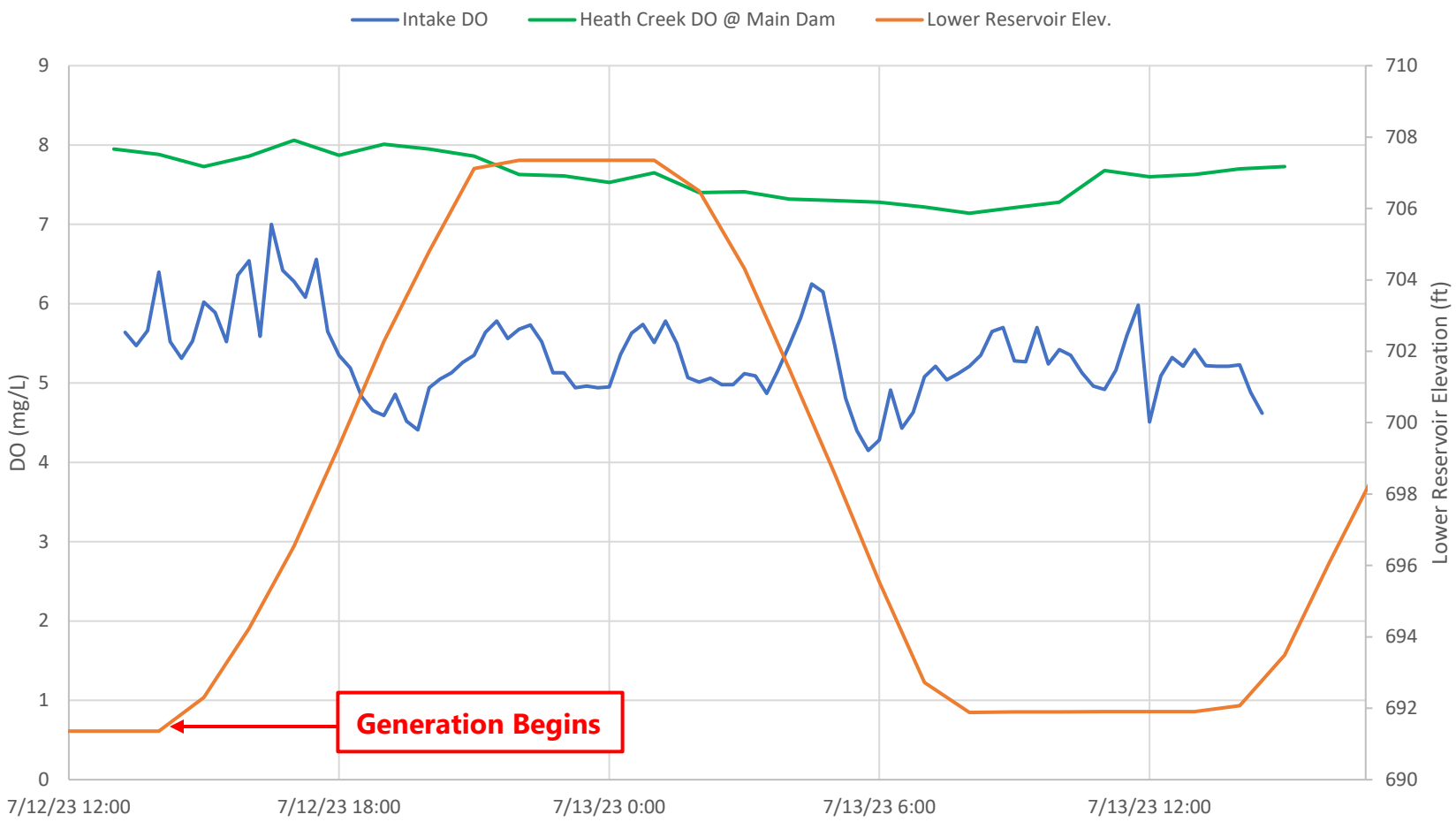


Figure 9 Minimum Flow Intake Monitoring Data – July 12-13, 2023

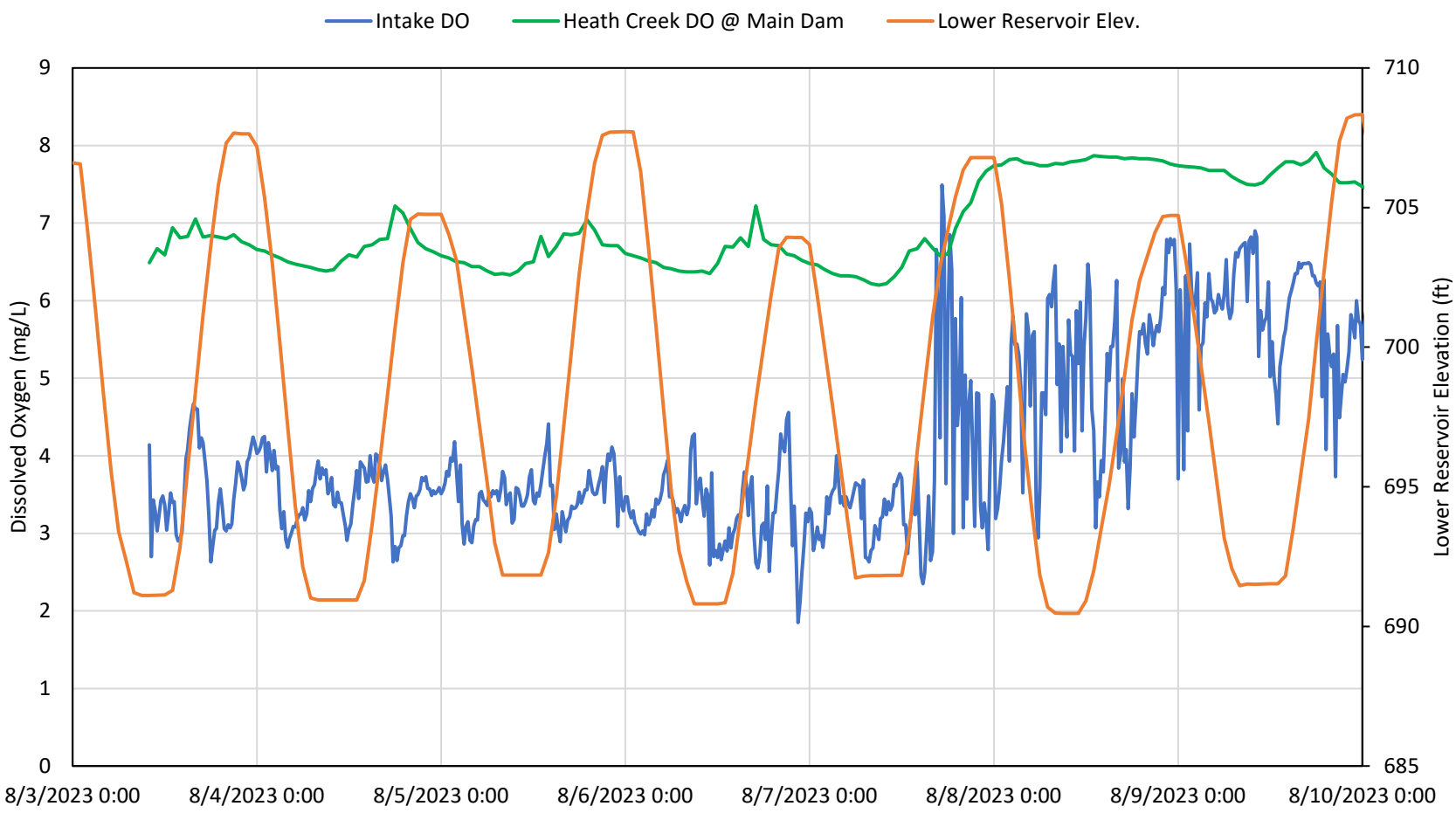


Figure 10 Minimum Flow Intake Monitoring Data – August 3-10, 2023

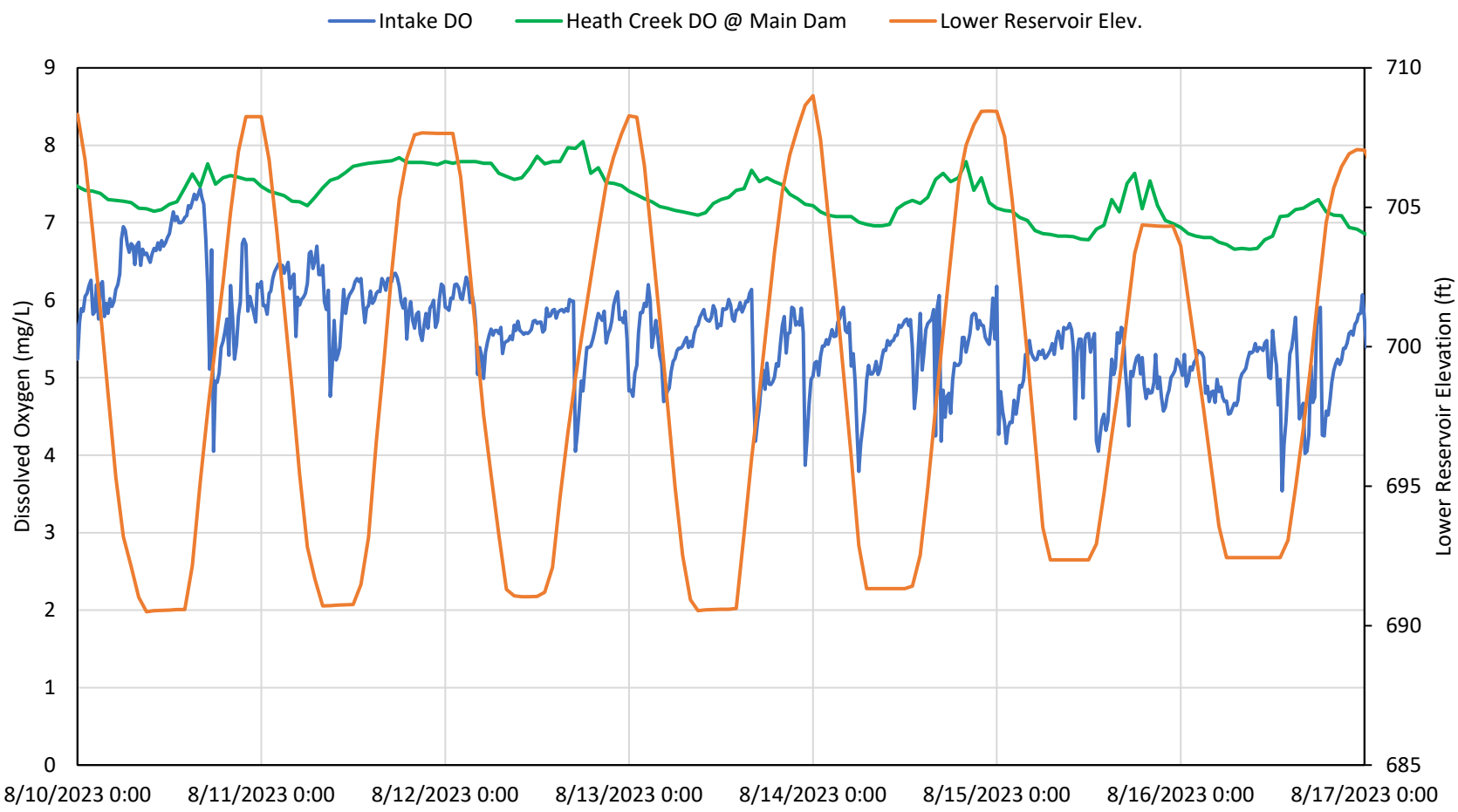


Figure 11 Minimum Flow Intake Monitoring Data – August 10-17, 2023

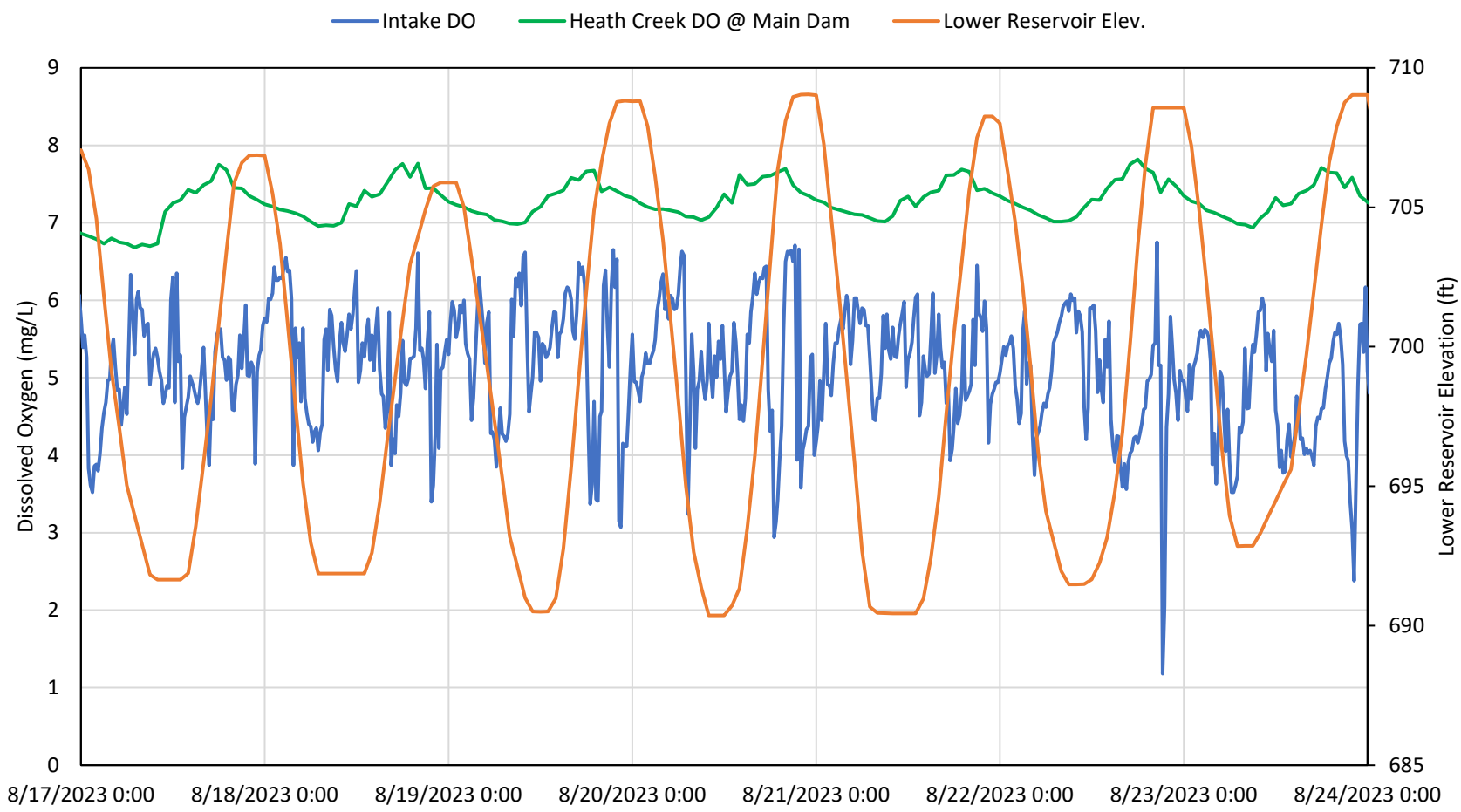


Figure 12 Minimum Flow Intake Monitoring Data – August 17-24, 2023

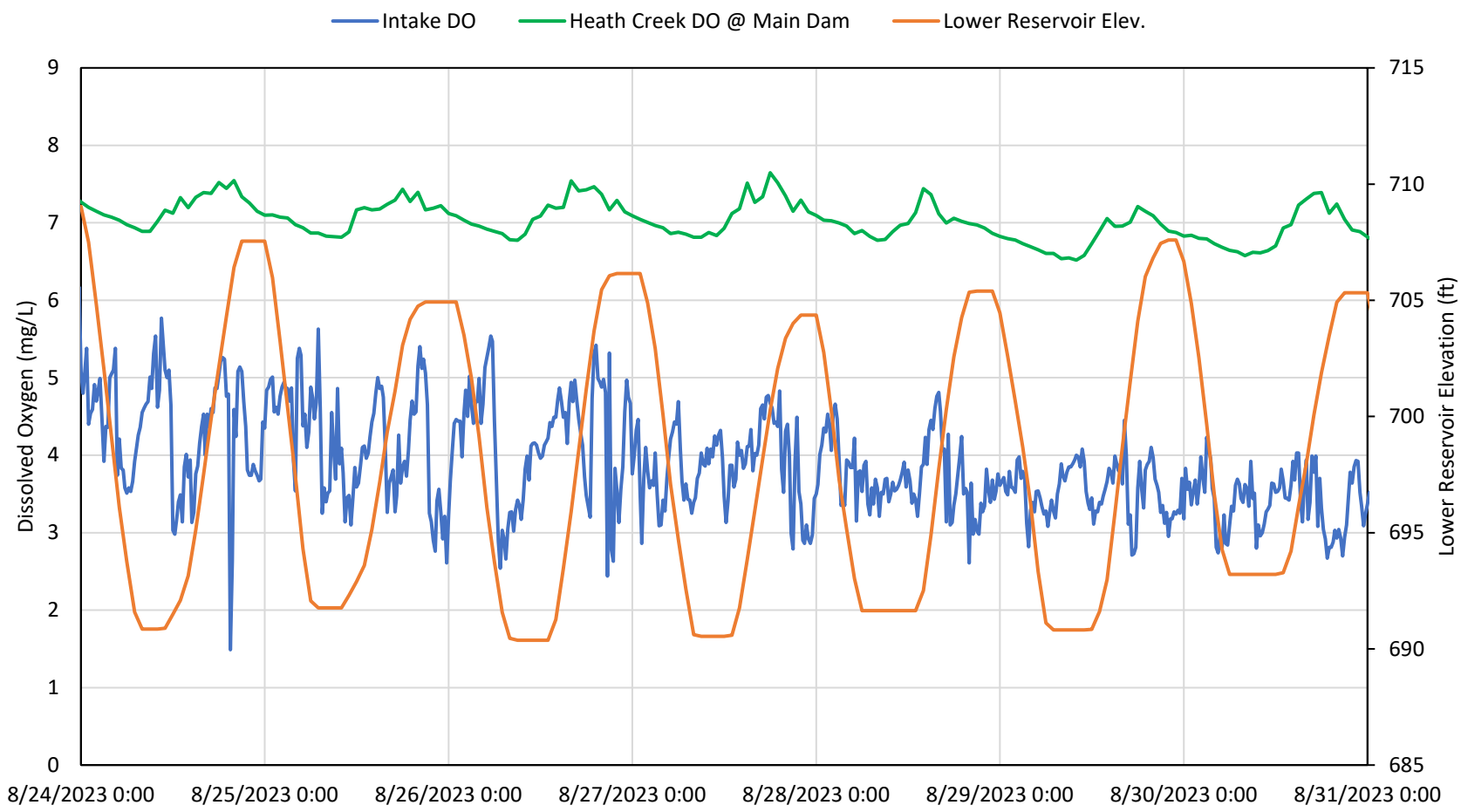


Figure 13 Minimum Flow Intake Monitoring Data – August 24-31, 2023

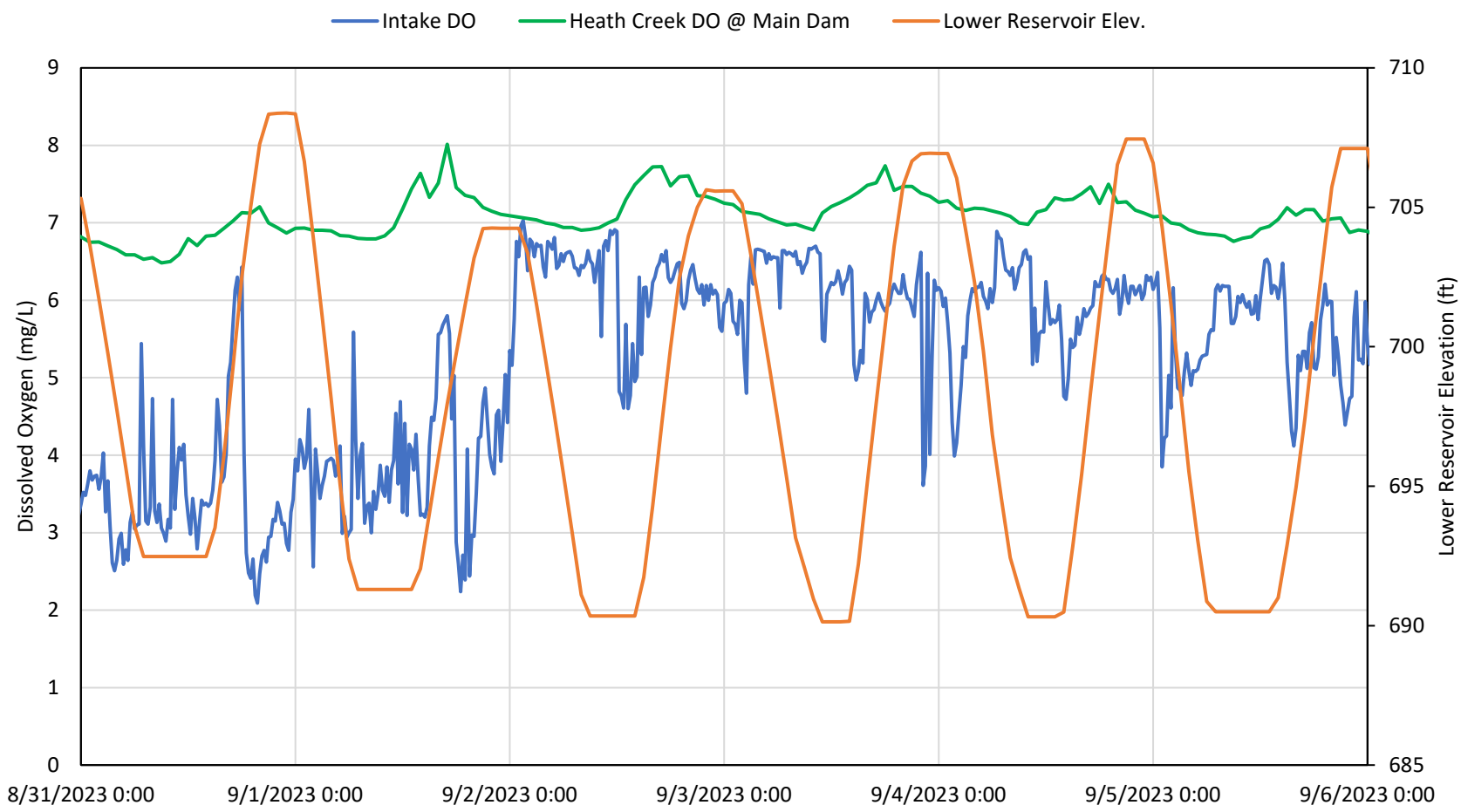


Figure 14 Minimum Flow Intake Monitoring Data – August 31-September 6, 2023

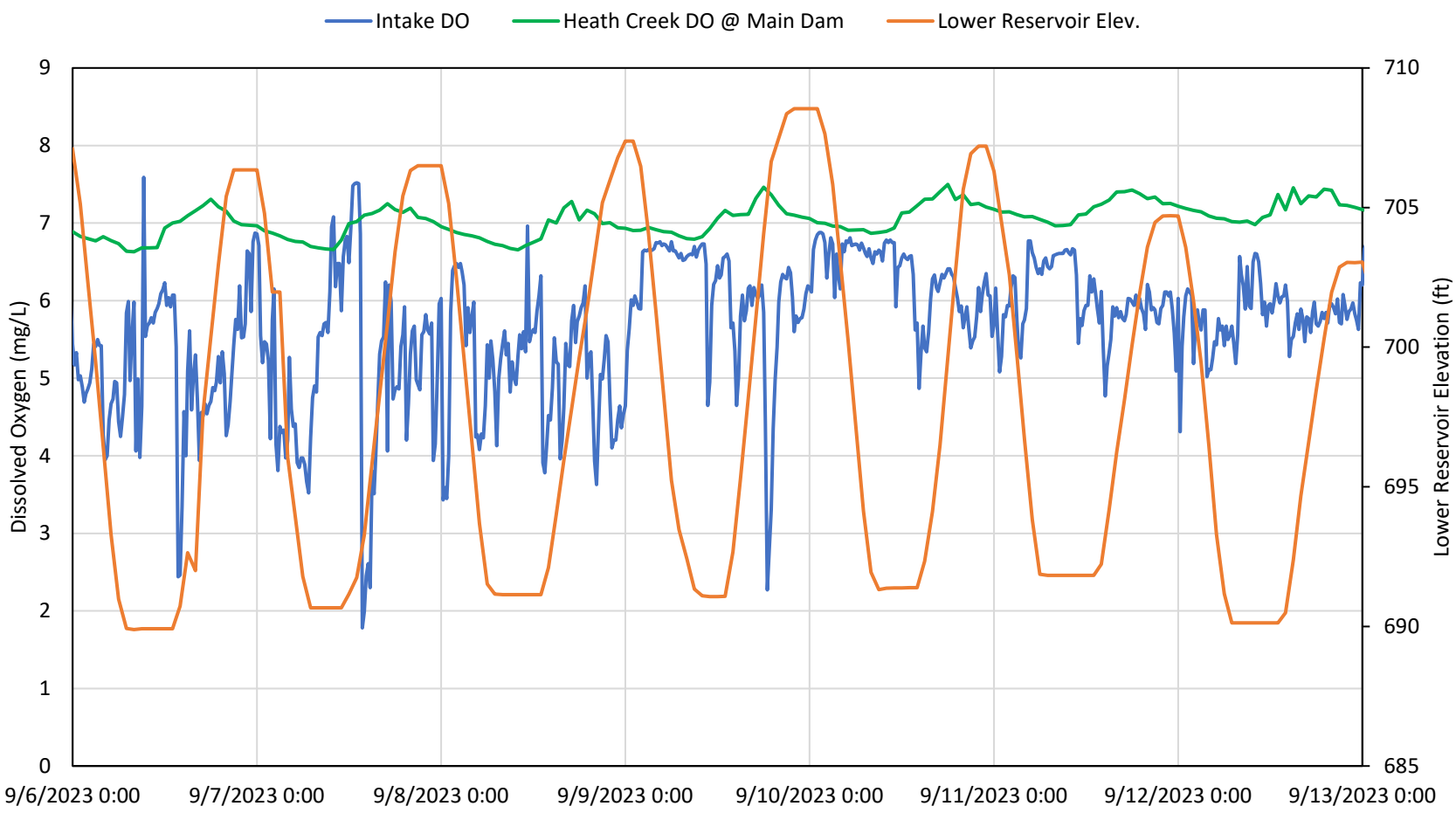


Figure 15 Minimum Flow Intake Monitoring Data – September 6-13, 2023

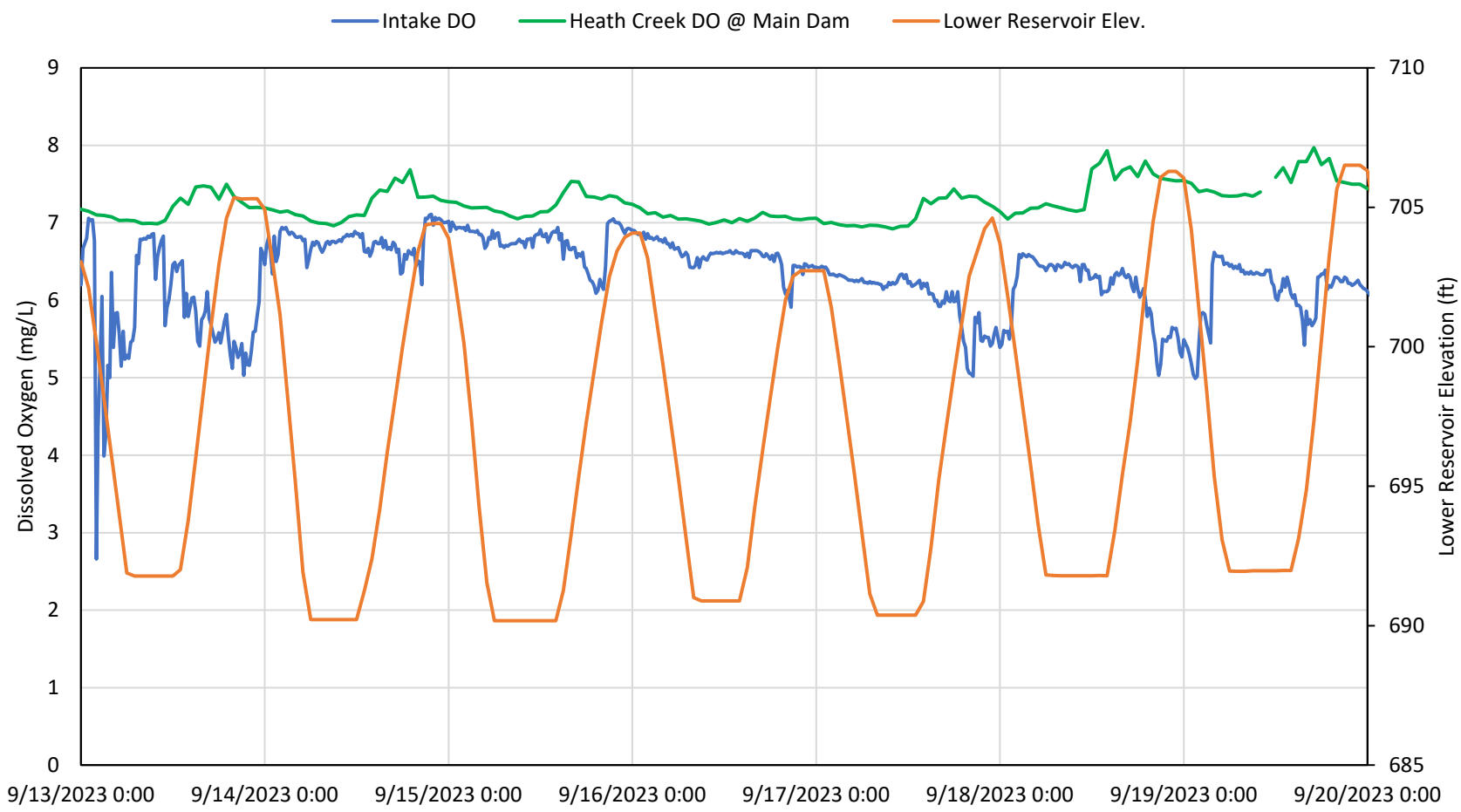


Figure 16 Minimum Flow Intake Monitoring Data – September 13-20, 2023

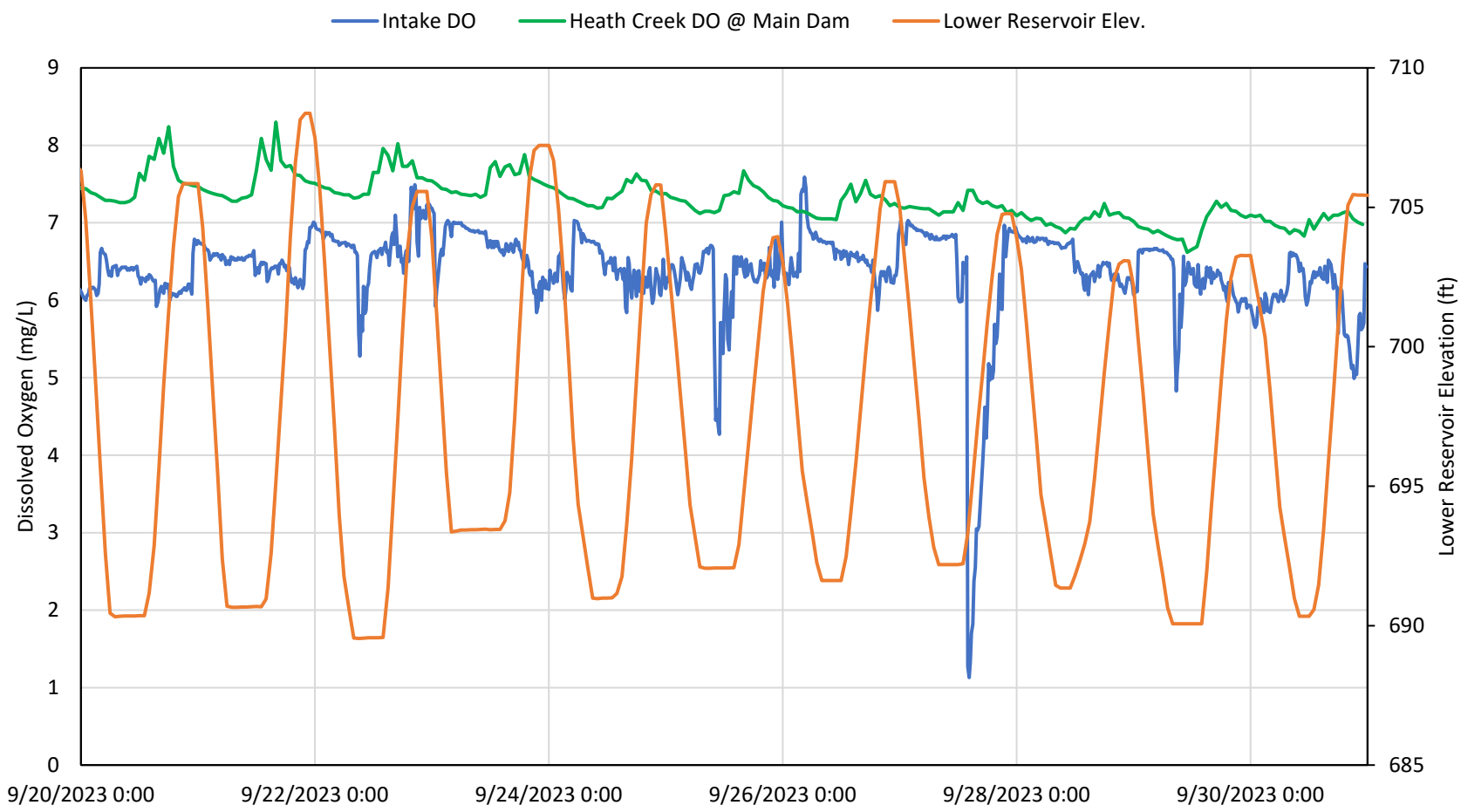


Figure 17 Minimum Flow Intake Monitoring Data – September 20-30, 2023

5.0 DISCUSSION

In 2022, there were 12 events when DO levels fell below 4.0 mg/L in Heath Creek at station RM11, although no days had a daily average DO of less than 5.0 mg/L. Those events appeared to be correlated with rising water surface elevations in the Lower Reservoir associated with the onset of generation.

Vertical profiles collected in the Lower Reservoir at the Main Dam in summer 2023 show that DO levels just below the minimum flow intake elevation, at depths greater than 48.5 ft below the normal maximum pool elevation, were very low, which is typical of southeastern reservoirs. Continuous monitoring showed that DO levels at the minimum flow intake elevation decreased in association with rising Lower Reservoir levels at the onset of generation. However, in 2023, there were only 2 events on the same day, September 3, when DO levels fell below 4.0 mg/L and the daily average DO was less than 5 mg/L at Heath Creek station RM11. Those events did not appear to be correlated with rising Lower Reservoir water levels. In fact, DO levels measured by the logger in Heath Creek just below the Main Dam remained at or above 7.0 mg/L during the same period due to aeration of the release and met the applicable water quality standards for DO.

Throughout the summer 2023 continuous monitoring period, minimum instantaneous and average DO concentrations in Heath Creek just below the Main Dam trended higher than those at downstream station RM11 (Table 2, Figures 3 and 4). The longitudinal profile collected in Heath Creek on July 13, 2023, showed that DO concentration decreased by 0.75 mg/L over a downstream distance of approximately 600 ft. The project area is known to have karst geology, with several springs occurring near the Main Dam. Natural groundwater inflow therefore likely influences lower summer DO levels downstream at station RM11, assuming the DO concentration of the groundwater is lower than surface waters. The physical habitat evaluation performed in Heath Creek downstream of the Main Dam during the Aquatic Resources Study (station HC-1) observed patches of groundwater inflow on the bottom of deeper pools in the upper section of the survey reach near the Main Dam (Kleinschmidt 2023b). Preconstruction geologic investigations identified several small springs on or near the Main Dam south abutment that drain toward Heath Creek (Harza Engineering Company 1990). Other springs occur nearby in the project area, as indicated by preconstruction investigations and the USGS hydrographic map, including Buffington Spring in the northern floodplain of Heath Creek downstream of the USGS gage.

6.0 SUMMARY AND CONCLUSIONS

OPC conducted targeted water quality monitoring during summer 2023 to determine the potential cause(s) of the intermittent low-DO events observed in July 2022 and August 2022. This was accomplished using a combination of methods in Heath Creek and the Lower Reservoir. The methods included:

- Continuous (hourly) monitoring of DO and water temperature in Heath Creek near the Main Dam and at RM11,
- Continuous (15-minute) monitoring in the Lower Reservoir at the approximate minimum flow intake elevation, and
- Vertical water quality profiles in the Lower Reservoir at the Main Dam.

Following is a summary of key findings of this study:

- During the critical period (May through October) in 2022 and 2023 combined, a total of 6,200 hourly DO measurements were recorded at station RM 11, of which 99.3 percent were equal to or greater than 4.0 mg/L; only one of the 260 days monitored during the critical period (0.4 percent) had a daily average DO concentration less than 5.0 mg/L.
- Continuous monitoring in Heath Creek approximately 190 ft downstream of the Main Dam during July 2023 through September 2023 showed DO levels were consistently higher than those in the Lower Reservoir at the elevation of the minimum flow intake due to aeration of the minimum flow release and were higher than those downstream at station RM11; all instantaneous and daily average values in Heath Creek at the Main Dam were greater than 4.0 and 5.0 mg/L, respectively, and met applicable water quality standards for DO.
- Vertical profile measurements collected in the Lower Reservoir indicated thermal and chemical stratification, with low DO levels at depths 3 to 6 ft below the minimum flow intake elevation.
- Continuous monitoring at the minimum flow intake elevation within the Lower Reservoir showed a continuing trend of DO levels dropping after generation began and recovering after brief periods; nevertheless, the minimum flow release at the Main Dam met applicable water quality standards for DO.

- Given the difference between DO levels measured in Heath Creek below the Main Dam and downstream at station RM11, observations of groundwater inflow in this reach during the fish community survey, and the known presence of several springs near the Main Dam, it is likely that natural groundwater inflow from karst geology influences lower summer DO levels at station RM11.

7.0 REFERENCES

Harza Engineering Company. 1990. Rocky Mountain Project, Preconstruction Geology, Volume I – Report. April 1990.

Kleinschmidt Associates (Kleinschmidt). 2023a. Water Quality Assessment Study Report. Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725). Prepared for Oglethorpe Power Corporation. September 2023.

Kleinschmidt Associates (Kleinschmidt). 2023b. Aquatic Resources Study Report. Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725). Prepared for Oglethorpe Power Corporation. August 2023.

From:	Jones, Craig
To:	"Booth, Elizabeth"; Zeng, Wei; Hedeen, David
Cc:	McCaslin, Tyler; Barrows, Christina; Steven Layman
Subject:	RE: Rocky Relicensing Draft WQ Study Update and Meeting Request
Date:	Wednesday, January 3, 2024 3:38:25 PM
Attachments:	image001.png

Hi Liz,

Thanks for your quick review of the report. We are working to pull together responses to your questions and will follow up as soon as possible.

In the meantime, please let us know what dates/times this month work for you, Wei, and David, and we'll be happy set something up to review the 2023 supplemental report and the DLA information.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
Sent: Tuesday, January 2, 2024 1:32 PM
To: Jones, Craig <craig.jones@opc.com>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

I have reviewed the report. I would like to know how frequently the water quality monitors were maintained? Could you provide the dates that the probes were switched out. Is there a possibility that there was algal growth on the DO probe that would explain the drop in DO observed at RM 11. Also, I spoke with WRD about the low pH observed that may have been a result of excess algal due to over fertilizing the reservoir. If you have them, it would be helpful, to see pictures of the dam outfall, the stream downstream of the dam, and the water quality monitor locations.

Thanks Liz

From: Jones, Craig <craig.jones@opc.com>
Sent: Tuesday, January 2, 2024 1:03 PM
To: Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: Rocky Relicensing Draft WQ Study Update and Meeting Request

Wei, David, and Liz,

Happy New Year, and I hope your holiday season went well.

As discussed last fall, I'm forwarding to you the preliminary, draft WQ assessment update that addresses DO relative to the 2023 field season. Please feel free to forward to anyone else on your team who should review. However, please note this report is still under review and subject to change, but I wanted to make sure you had it prior to the DLA comment deadline.

I'm also reaching out to see if we can schedule a meeting in the next couple of weeks, ideally before mid-January, to discuss the draft report and any questions you may have related to the DLA prior to filing comments. If you send me some possible dates/time, I'll work on our end to coordinate a meeting.

Best regards,

Craig

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From:	Jones, Craig
To:	"Hakala, Jim"
Cc:	McCaslin, Tyler; Kelly Kirven; Steven Layman; Barrows, Christina
Subject:	RE: Draft Water Quality Assessment Study Report Addendum
Date:	Thursday, January 4, 2024 7:54:12 PM
Attachments:	image001.png Recreation Use Analysis Study Report Correction_DRAFT_01-03-2024.docx

Hi Jim,

Thanks again for the heads up on the paragraph. We dug into the inconsistencies and discovered that although Table 5 was updated in the final report to include the additional data collected in spring 2023, the paragraph in question was not and only reflected data from an early draft of the report.

Fortunately, the updated data does not affect the overall study findings. Survey respondents' reasons for visiting the PFA remained the same after factoring in the 2023 data, and only minor changes occurred in the reported percentages. Please see the attached draft revision to the paragraph.

Happy to discuss in more detail tomorrow. Kelly, please clean up anything I may have misstated in the above.

Best

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From: Jones, Craig
Sent: Tuesday, January 2, 2024 2:07 PM
To: 'Hakala, Jim' <Jim.Hakala@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>
Subject: RE: Draft Water Quality Assessment Study Report Addendum

Thanks for the heads up, Jim. We'll take a look and be prepared to discuss on Friday. We'll send you and email update if we can pull together a brief explanation one way or the other ahead of time.
Best, cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From: Hakala, Jim <Jim.Hakala@dnr.ga.gov>
Sent: Tuesday, January 2, 2024 2:01 PM
To: Jones, Craig <craig.jones@opc.com>
Subject: RE: Draft Water Quality Assessment Study Report Addendum

External E-Mail

Thanks for the draft WQ report, Craig.

On another topic, in the Recreational Use Analysis Study Report (4.1.2, pg. 22, 1st paragraph), it appears there may be some inconsistencies between the text and Table 5 (4.1.2, pg. 22) regarding the percentages reported for visitor use reasons? For example, the text states "Respondents encountered at the Main entrance most often indicated they visited for boat fishing (52 percent), followed by bank fishing (24 percent),……" This is different than the 56 and 32% reported for boat and bank fishing, respectively, at the Main entrance in Table 5. There are several other instances in that same paragraph where the stated percentages do not align with what is reported in Table 5.

I bring this up now to perhaps give your folks a chance to clarify the true values (or our understanding of the percentages reported) at Friday's meeting.

See you Friday!

Jim

Jim Hakala
Northwest Georgia Region Fisheries Supervisor

Wildlife Resources Division
(706) 295-6102

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GEORGIA DEPARTMENT OF NATURAL RESOURCES

From: Jones, Craig <craig.jones@opc.com>

Sent: Tuesday, January 2, 2024 12:39 PM
To: Hakala, Jim <Jim.Hakala@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: Draft Water Quality Assessment Study Report Addendum

Jim,

We are looking forward to meeting on Rocky PM&E measures this Friday. I just want to confirm that 9:00 a.m. is still okay with you and your team. We have flexibility to adjust the time if needed.

Also, I'm forwarding the preliminary, draft WQ assessment update that addresses the 2023 field season. Please feel free to forward to your team. Please note, this report is still under review and subject to change, but I want to make sure you have it for our discussion on Friday.

Please reach out if you have any questions, and I look forward to hearing where you all are at with respect to our proposal.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

The paragraph refers to Table 5 and should read as follows:

> Visitors were asked to indicate all the reasons why they visited the Rocky Mountain PFA on the day of their interview (Table 5). Respondents encountered at the Main entrance most often indicated they visited for boat fishing (56 percent), followed by bank fishing (32 percent), and canoeing/kayaking (10 percent). A small percentage of visitors at the Main entrance indicated other reasons for visiting including biking, hiking, wildlife viewing, paddle boarding, and walking. Respondents encountered at the Beach entrance most often indicated they visited for swimming (52 percent), followed by bank fishing (34 percent), shoreline relaxation (25 percent), picnicking (25 percent), and camping (20 percent). Other reasons for visiting as noted at the Beach entrance included a small percentage each for canoeing/kayaking, wildlife viewing, boat fishing, hiking, scenic views, and attending a birthday party. Respondents encountered at the Heath entrance most often indicated they visited for boat fishing (83 percent), followed by bank fishing (16 percent), canoeing/kayaking (13 percent), shoreline relaxation (6 percent), camping (1 percent), and hunting (1 percent).

Meeting Summary
Rocky Mountain Relicensing PM&E Measures Meeting
with Georgia Department of Natural Resources Wildlife Resources Division

Date and Time: Friday, January 5, 2024, 9:00 am

Location: Georgia Department of Natural Resources Office, Armuchee, Georgia

Participants:

Jim Hakala, Georgia Department of Natural Resources (GDNR)
Clint Peacock, GDNR
Anakela Escobar, GDNR
David Gregory, GDNR
Craig Jones, Oglethorpe Power Corporation (OPC)
Tyler McCaslin, OPC
Christina Barrows, OPC
Kelly Kirven, Kleinschmidt Associates
Steve Layman, Kleinschmidt Associates

Prepared by: Steve Layman

Meeting Summary

The purpose of the meeting was to discuss the protection, mitigation, and enhancement (PM&E) measures proposed by OPC in the Draft License Application, which OPC distributed and filed with the Federal Energy Regulatory Commission on November 17, 2023. Discussions also included OPC's preliminary draft Water Quality Assessment study report addendum, which presented the results of summer 2023 dissolved oxygen (DO) monitoring in Heath Creek and the Lower Reservoir at the Main Dam. OPC shared the preliminary draft study report addendum with GDNR via email on January 2, 2024. GDNR had yet to file comments on the DLA.

GDNR expressed its support for OPC's proposed continued funding of the Resource Management Agreement for the Rocky Mountain Recreation and Public Fishing Area (PFA), which provides for a unique public-private partnership for a highly utilized PFA.

Discussion of PM&E measures included GDNR questions about recreation enhancements, Americans with Disabilities Act (ADA)-compliant recreation access, future recreation assessments, constraints to improving cellular and wifi access, plans for a new GDNR office building, drought operations relative to boat ramp access in Auxiliary Pools, and future land management for improved habitat and hunting opportunities. Discussion also included the water quality monitoring downstream in Heath Creek in summer 2023 and GDNR questions about potential chronic effects and any plans for future DO monitoring.

Meeting Summary
Rocky Mountain Relicensing
Draft License Application Water Quality Discussion
with Georgia Department of Natural Resources
Environmental Protection Division

Date and Time: Tuesday, January 16, 2024, 1:00 pm

Location: Virtual meeting on Microsoft Teams

Participants:

Elizabeth Booth, Georgia Department of Natural Resources Environmental Protection Division (GEPD)
Wei Zeng, GEPD
David Hedeen, GEPD
Craig Jones, Oglethorpe Power Corporation (OPC)
Tyler McCaslin, OPC
Jason Moak, Kleinschmidt Associates
Steve Layman, Kleinschmidt Associates

Prepared by: Steve Layman

Meeting Summary

The purpose of the meeting was to discuss OPC's preliminary draft Water Quality Assessment Study Report Addendum, which presented the results of summer 2023 dissolved oxygen (DO) monitoring in Heath Creek and the Lower Reservoir at the Main Dam. OPC shared the preliminary draft study report addendum with GEPD via email on January 2, 2024. The summer 2023 DO monitoring data were not yet available for analysis in the Draft License Application, which OPC filed with the Federal Energy Regulatory Commission on November 17, 2023.

OPC presented slides (attached) providing an overview of the summer 2023 DO monitoring approach, methods, and preliminary findings, including graphs of DO data at the various monitoring locations. Discussion included the monitoring locations, configuration of the minimum flow release pipe, and conductivity data; groundwater as a potential cause of occasional summer low DO values in Heath Creek; and further exploring the hypothesis by comparing summer 2022 and summer 2023 DO monitoring data and stream flow data for common trends indicative of groundwater influence.

OglethorpePower

Draft Study Report Addendum
Water Quality Assessment Study Report

Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725)

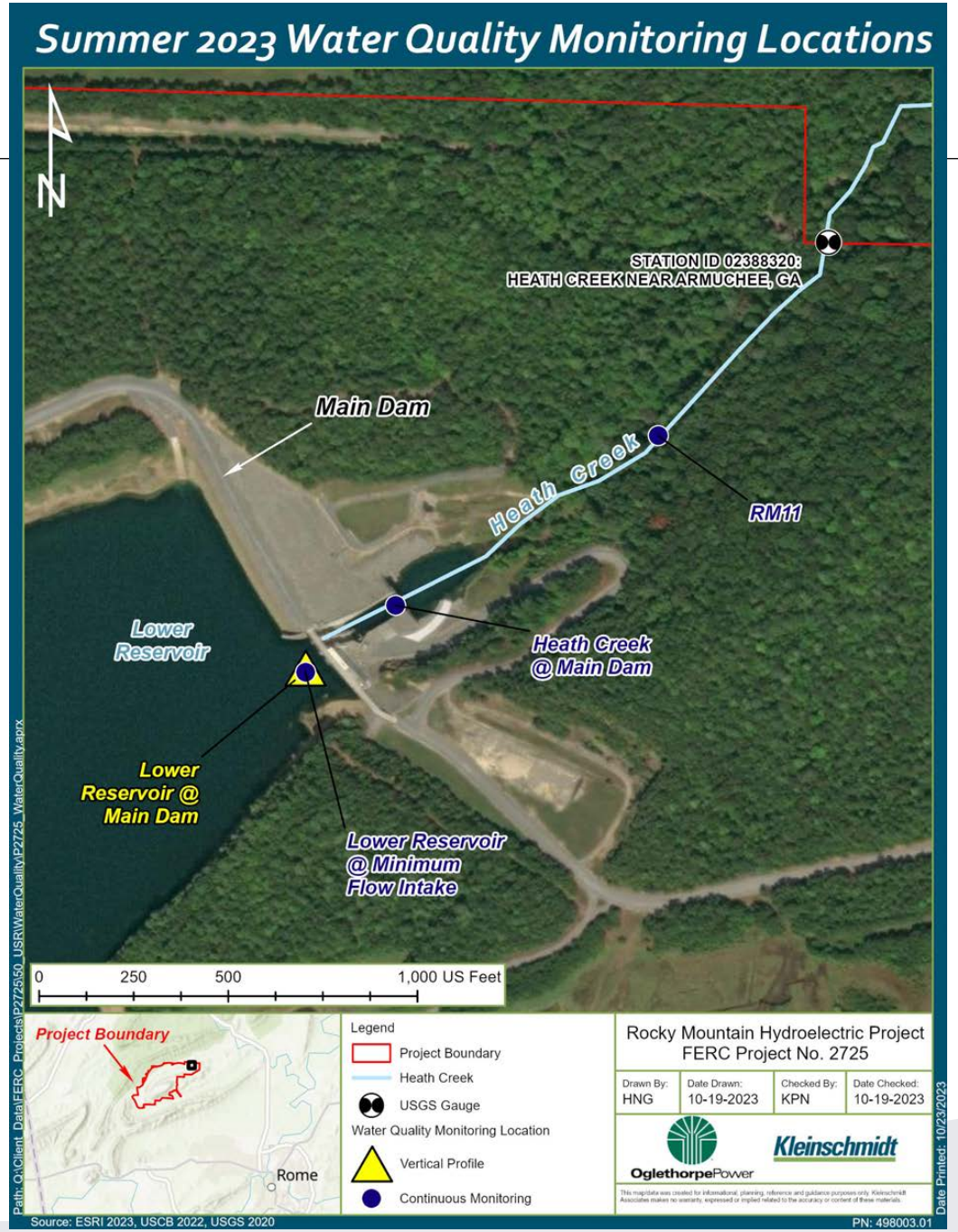
January 2024

Study Objectives

- Collect water quality data in summer 2023 to potentially explain mechanism(s) by which intermittent short-duration low-dissolved oxygen (DO) events occurred in Heath Creek in Jul-Aug 2022
- Develop water quality information sufficient for analyzing the effects of project operation and maintenance on water quality in the Final License Application

Study Area

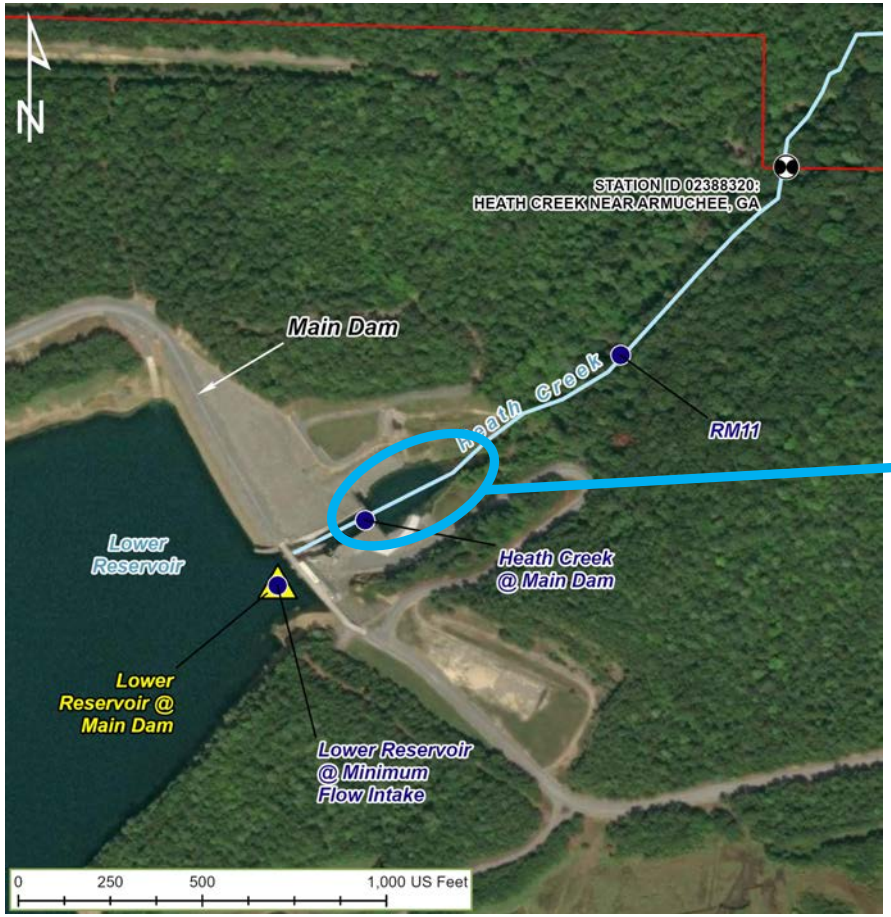
- Lower Reservoir just upstream of the Main Dam
- Heath Creek downstream of the Main Dam within the project boundary

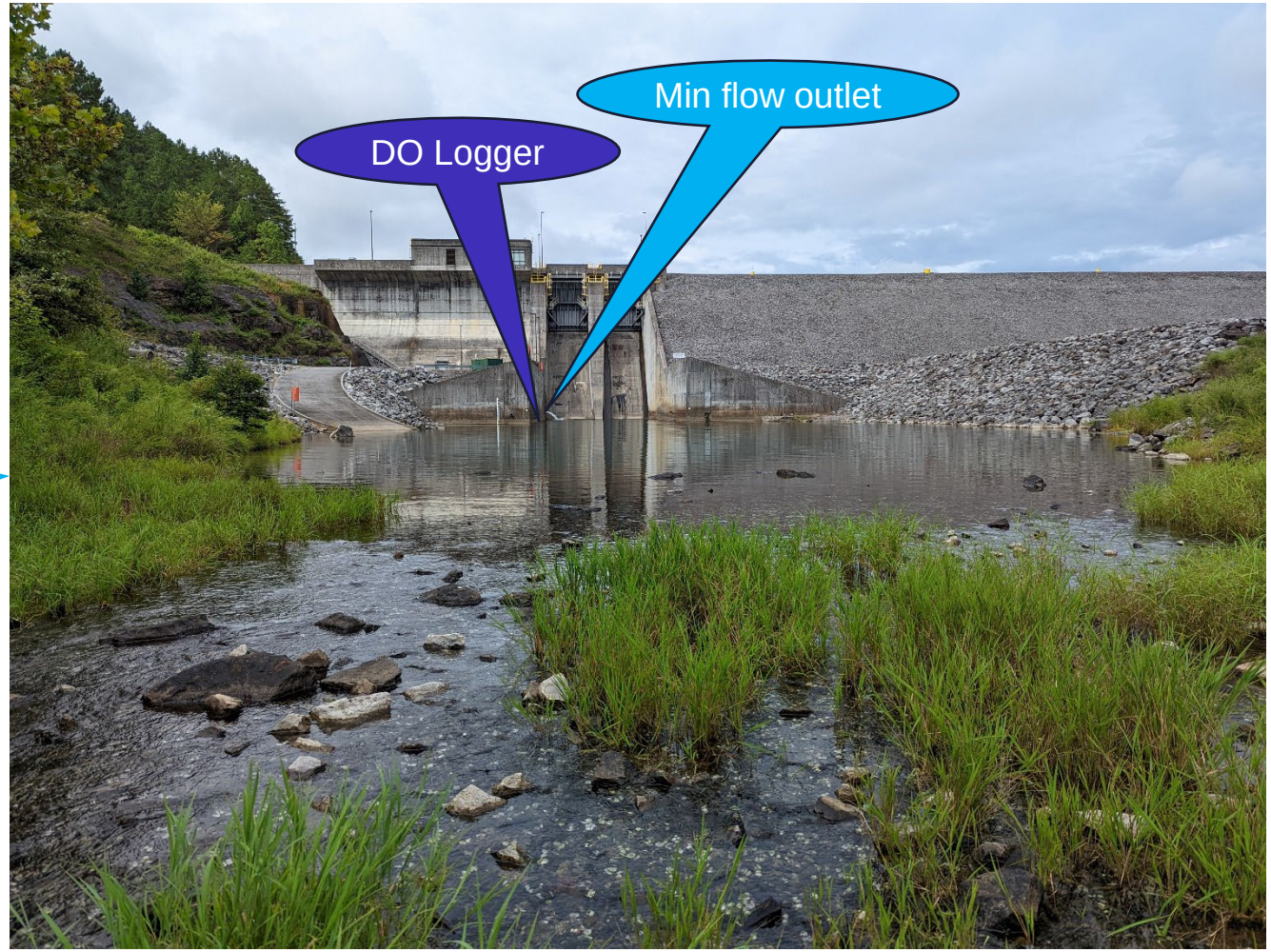


Methods

- Continuous monitoring in Heath Creek (Jul-Sep 2023)
  - Hourly measurements of water temperature and DO at two locations:
    - Station RM11 – 1,000 feet downstream of Main Dam
    - Heath Creek at Main Dam – 190 feet downstream of Main Dam
  - DO loggers cleaned, downloaded, and checked for accuracy every two weeks
- Longitudinal change in DO between two locations measured on Jul 13
- Vertical profile monitoring in Lower Reservoir (Jul-Sep 2023)
  - Four vertical profile events: Jul 12-13, Aug 17, Sep 6, Sep 19,
    - Water temperature, DO, pH, conductivity, and turbidity at 1-meter intervals
  - Continuous monitoring at elevation of intake for minimum flow pipe (about 48.5 feet below normal maximum pool elevation)
    - Monitoring event on Jul 12-13 using sonde deployed from Main Dam
    - DO logger continuously deployed from August 3-September 30
    - DO and water temperature recorded at 15-minute intervals

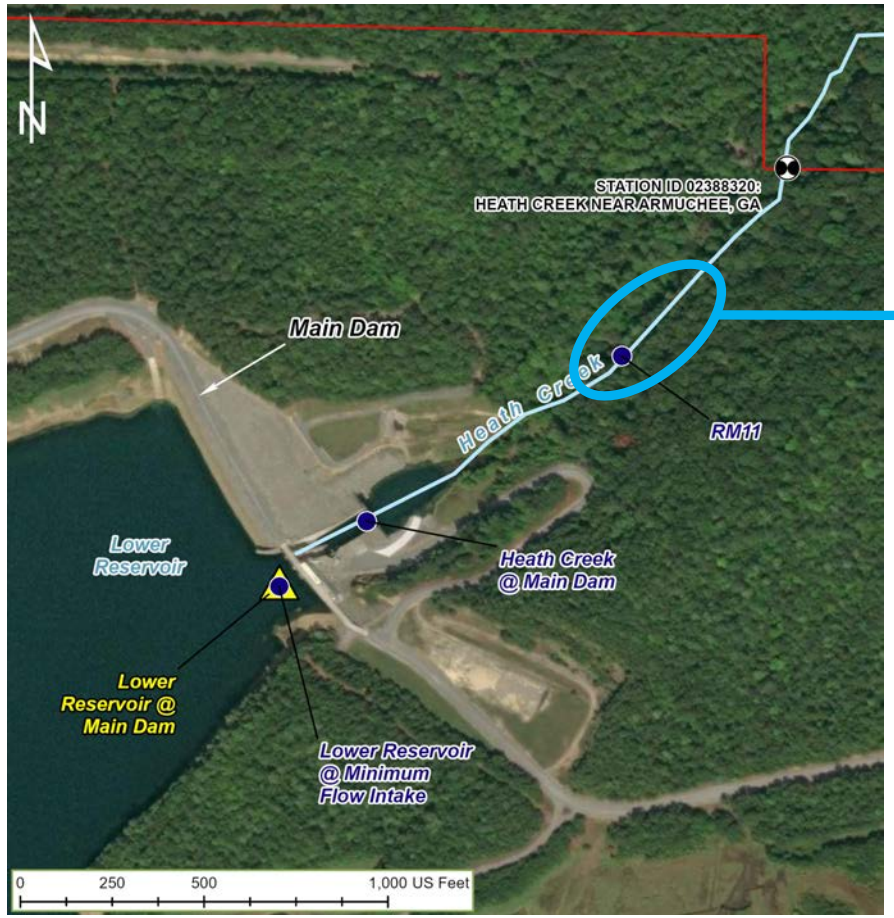
Heath Creek at Main Dam





August 24, 2022

Heath Creek at Station RM11



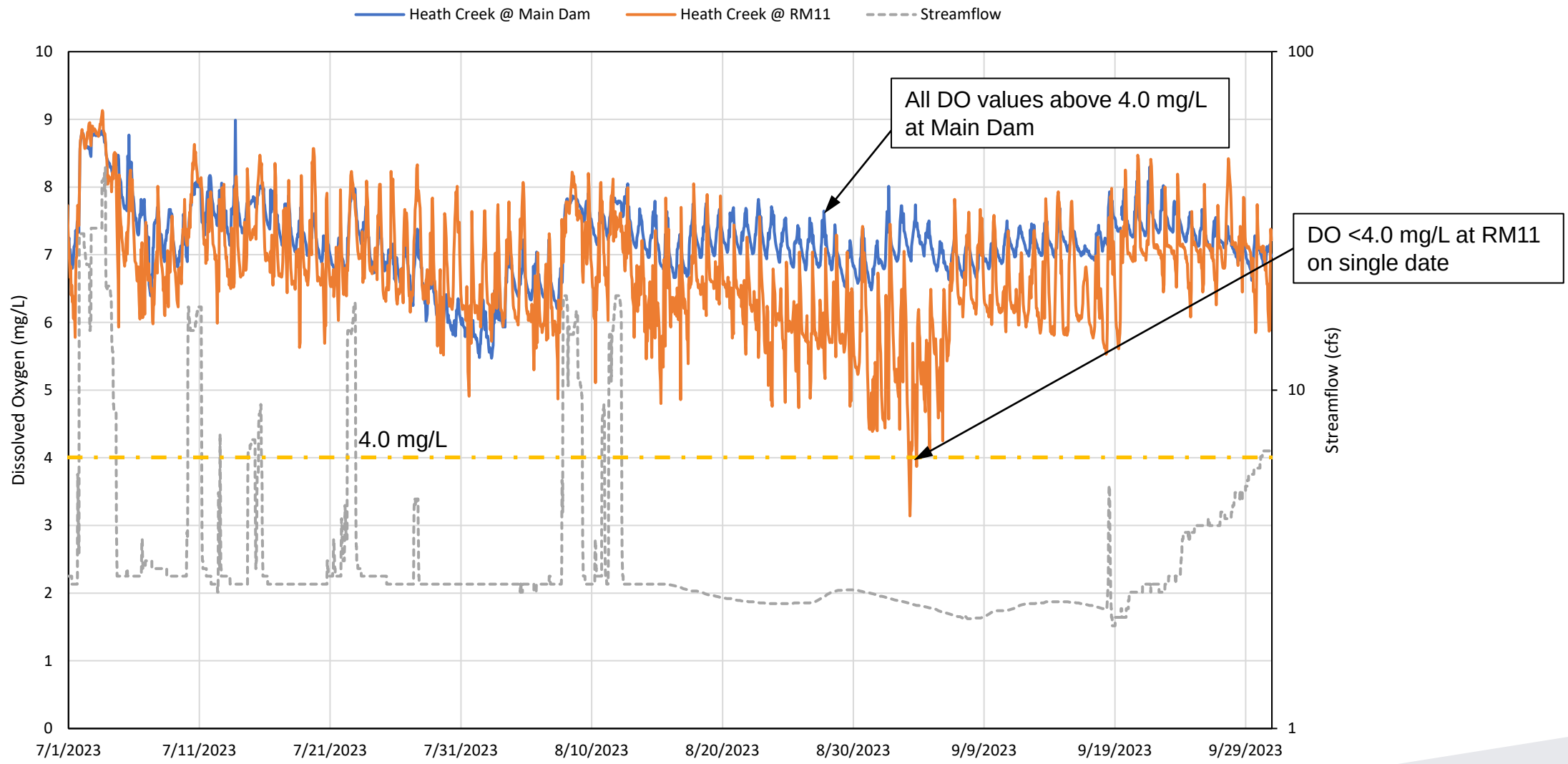
Vicinity of RM11

August 25, 2022

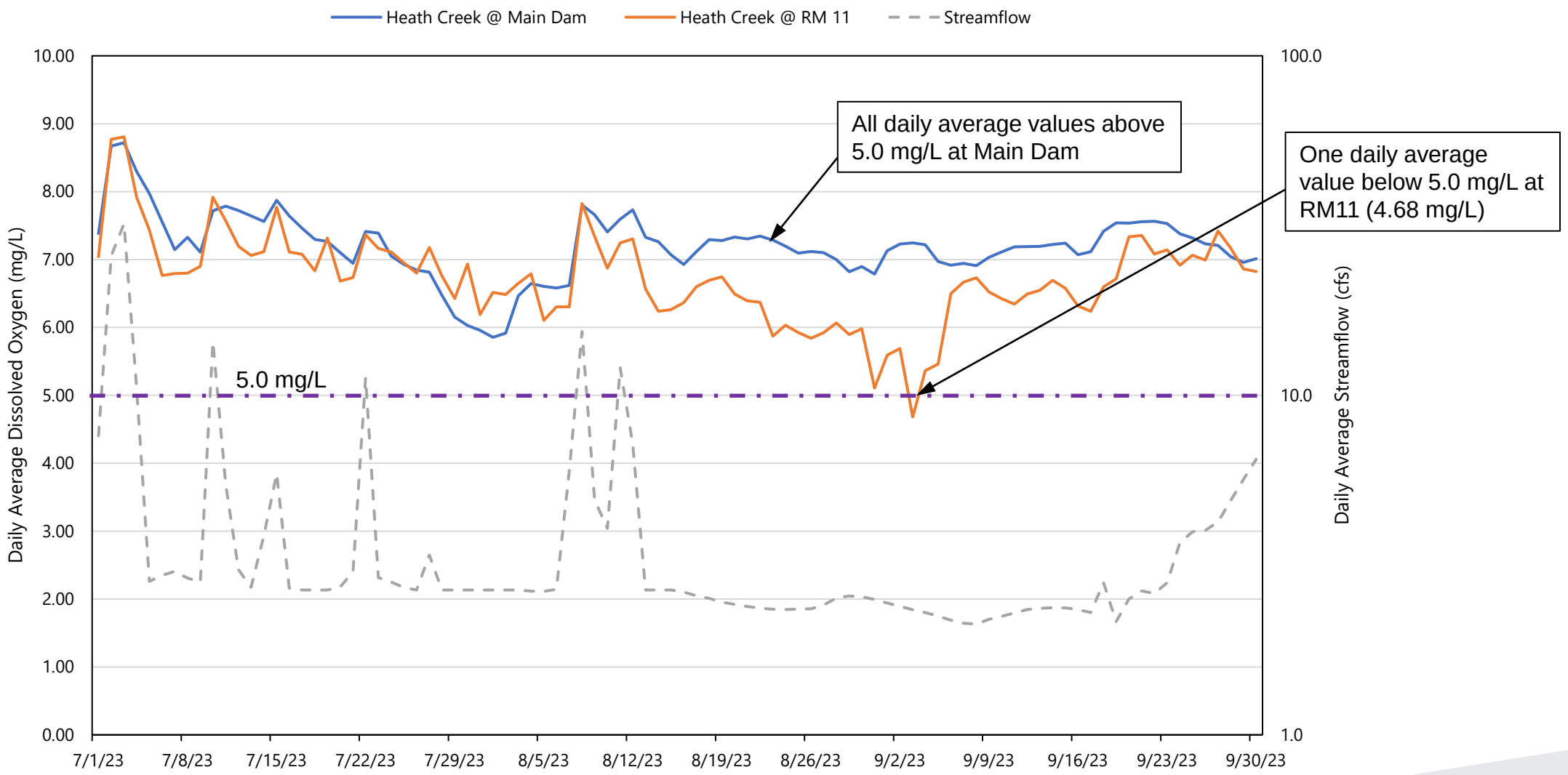
RM11 DO Logger

September 29, 2022

Results – Hourly DO & Streamflow in Heath Creek, Summer 2023



Results – Daily Average DO & Streamflow in Heath Creek, Summer 2023

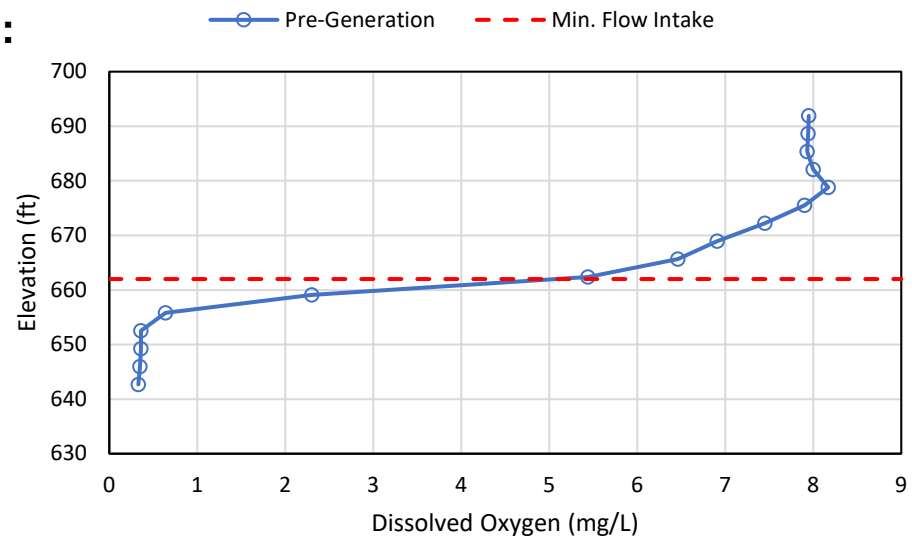


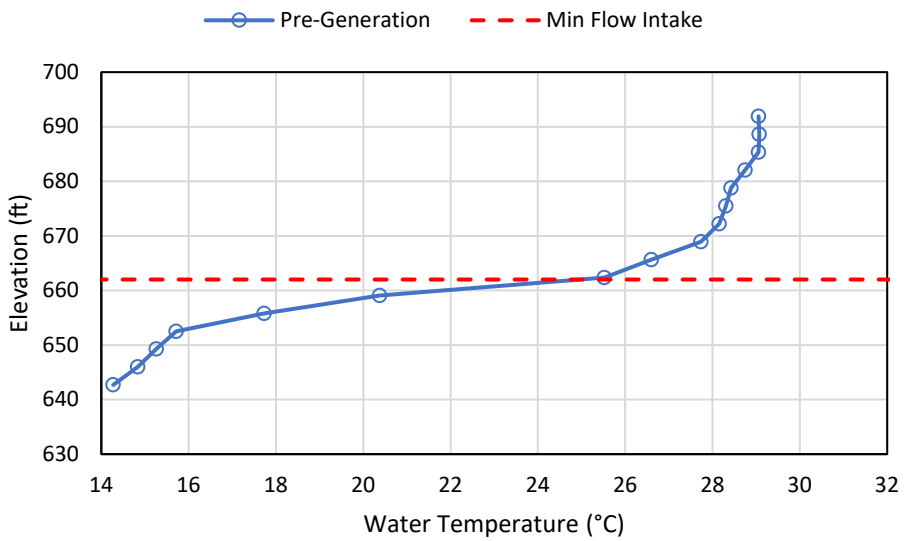
Heath Creek Longitudinal Change on July 13, 2023

Distance from Main Dam (ft)	DO (mg/L)	DO % Saturation	Water Temperature (°C)
190	7.82	96.2	25.84
440	7.84	96.6	26.00
530	7.93	98.5	26.44
630	8.02	99.8	26.50
658	max 8.03	100.1	26.58
718	7.97	99.1	26.48
778	7.85	97.1	26.17
836	7.86	97.2	26.19
876	7.82	96.6	26.10
911	7.80	96.3	26.05
956	7.73	95.2	25.93
992	7.66	94.1	25.83
1,050	7.55	92.5	25.67
1,074	7.45	91.1	25.57
1,174	7.43	90.8	25.52
1,194	7.44	91.0	25.52
1,215	7.41	90.5	25.50
1,233	7.39	90.3	25.49
1,249	min 7.26	88.6	25.42

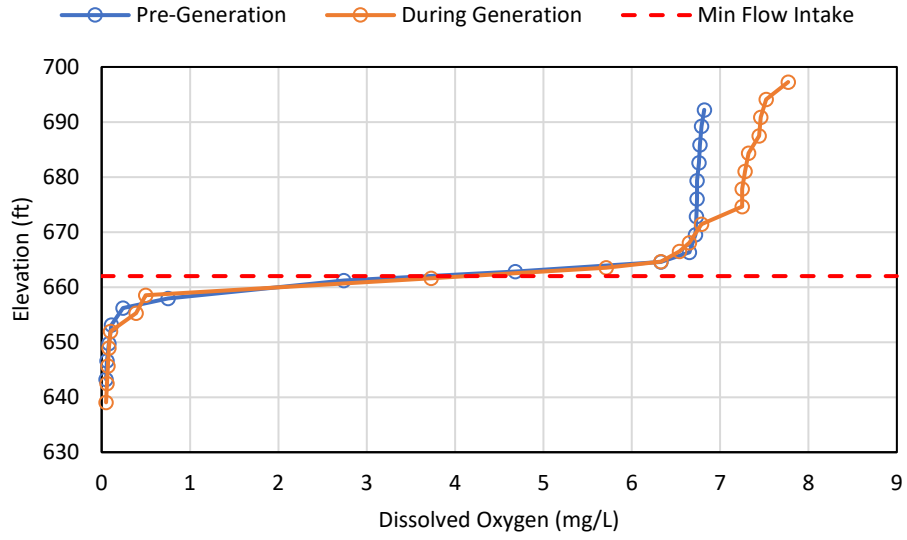
Vertical Profiles of DO in the Lower Reservoir

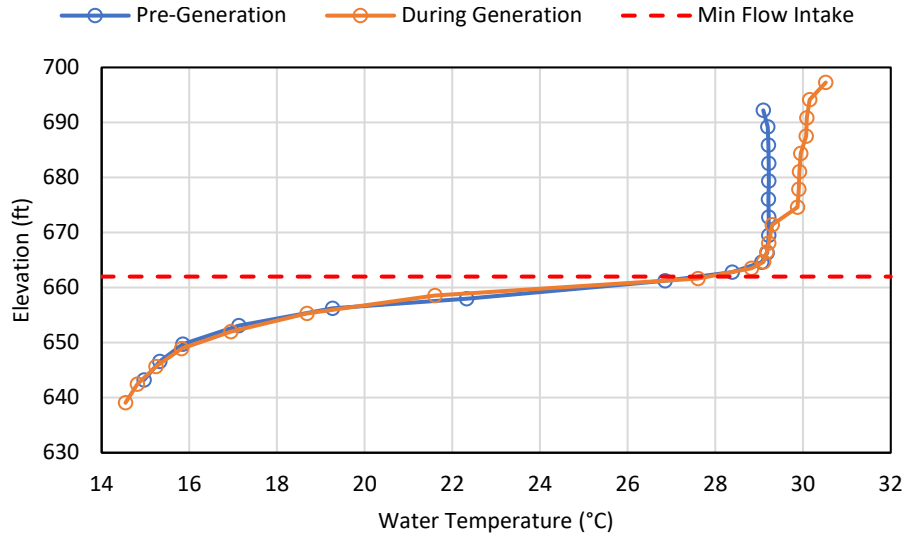
7/13/23:



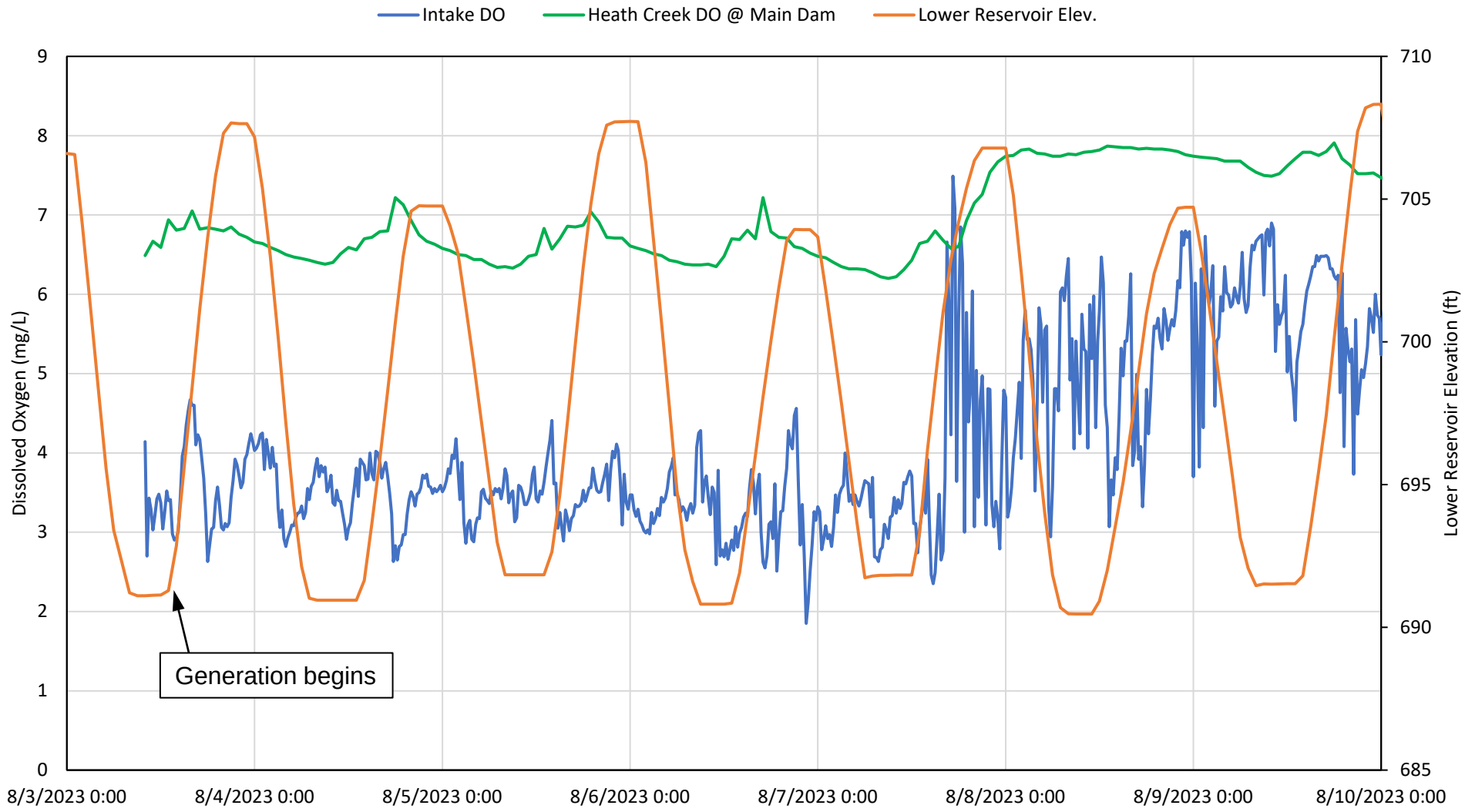


8/17/23:

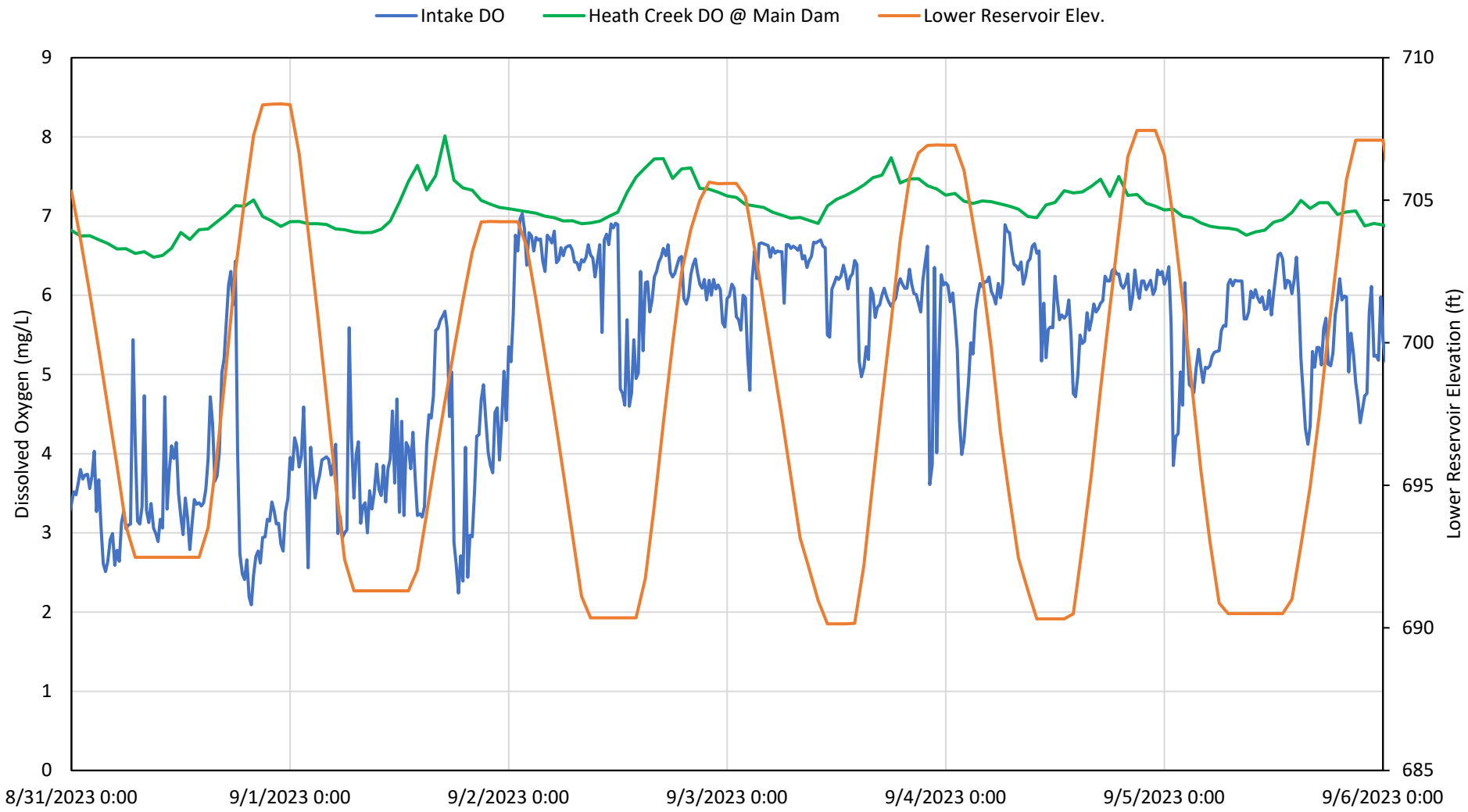




Minimum Flow Intake Monitoring – Aug 3-10, 2023



Minimum Flow Intake Monitoring – Aug 31-Sep 6, 2023



Summary of Key Preliminary Findings

- During the critical period (May-October) in 2022-2023 combined, 99.3% of the hourly DO measurements at station RM11 were ≥ 4.0 mg/L
- 99.6% of the 260 days monitored at RM11 during the critical period in 2022-2023 had a daily average DO concentration ≥ 5.0 mg/L
- Heath Creek below the Main Dam met applicable DO water quality standards 100% of the time during the summer 2023 monitoring period
- DO levels in Heath Creek below the Main Dam were higher than those in the Lower Reservoir at the elevation of the minimum flow intake due to aeration of the minimum flow release
- Available evidence suggests that natural groundwater inflow from karst geology likely influences lower summer DO levels at station RM11 compared to Heath Creek below the Main Dam

Questions and Discussion

From:	McCaslin, Tyler
To:	Booth, Elizabeth
Cc:	Jones, Craig; Barrows, Christina; Steven Layman; Kelly Kirven
Subject:	RE: Rocky Relicensing Draft WQ Study Update and Meeting Request
Date:	Wednesday, February 7, 2024 7:47:30 AM
Attachments:	image002.png image003.png 0498003 RM Water Quality Assessment 2nd Season_REVISED DRAFT_02-06-2024.pdf

---

Hi Liz,

Thank you very much for your feedback on our original draft of our water quality study report addendum for our second season of studies. Based on our meeting and discussion a couple of weeks ago, we have prepared a revised draft of the water quality assessment attached here for your review. This draft connects our summer 2023 findings to the results from summer 2022. We'd like to work with you on the language of these revisions prior to distribution to Wei, David, and DNR WRD.

If you could please take a look at this, and please let us know if you have any questions or additional comments we would greatly appreciate it. We would be happy to schedule time to discuss via Teams if that would be helpful.

Tyler McCaslin, PhD
Senior Environmental Specialist
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7723 **Mobile:** 404-576-9097
Email: tyler.mccaslin@opc.com **Web:** www.opc.com

From: Jones, Craig <craig.jones@opc.com>
Sent: Wednesday, January 3, 2024 7:03 PM
To: 'Hedeen, David' <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

Hi David,

Thanks for offering up the dates. Tuesday, January 16 at 1:00 p.m. will work well for all of us. I'll send a calendar invite shortly.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs

Draft Study Report Addendum

Water Quality Assessment Study Report

Rocky Mountain Pumped Storage Hydroelectric Project

(FERC No. 2725)

Prepared for:

Oglethorpe Power Corporation

Prepared by:

Kleinschmidt Associates

February 2024

Kleinschmidt

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This Study Report Addendum presents the results of water quality monitoring conducted in July-September 2023 for the Oglethorpe Power Corporation (An Electric Membership Corporation) (OPC) Water Quality Assessment Study for Federal Energy Regulatory Commission (FERC) relicensing of the Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725) (Rocky Mountain Project, the Project). These results supplement those findings provided in the Water Quality Assessment Study Report (Kleinschmidt 2023a) filed by OPC on November 17, 2023 with the Draft License Application and bring the study to a conclusion.

The Water Quality Assessment Study was conducted according to OPC's Final Study Plan for the Project distributed in August 2022 (OPC 2022; Kleinschmidt 2023a). The 1-year study included monthly water chemistry sampling at four stations and continuous monitoring of dissolved oxygen (DO) and water temperature in Heath Creek downstream of the Main Dam from June 2022 to June 2023. Based on meetings held with the Georgia Department of Natural Resources (GDNR) Environmental Protection Division, GDNR Wildlife Resources Division, and U.S. Fish and Wildlife Service in May-June 2023 regarding the preliminary study results, OPC conducted a second season of DO monitoring during July 2023-September 2023 to investigate potential causes of intermittent instances of DO concentrations falling below 4.0 milligrams per liter (mg/L) in Heath Creek.

As presented in the Water Quality Assessment Study Report (Kleinschmidt 2023a) and discussed in the agency meetings, hourly monitoring data collected in Heath Creek at station RM11 downstream of the Main Dam (Figure 1) documented several instances of DO concentrations falling below the instantaneous minimum criterion of 4.0 mg/L for short periods (1-5 hours) during July 2022 and August 2022. The deviations occurred upon the start of generation when flow releases from the Main Dam approximated or approached the continuous minimum flow of 1.2 cubic feet per second (cfs). Overall, monitoring in Heath Creek between June 2022 and October 2022 found that the daily average DO concentration was always greater than the daily average minimum criterion of 5.0 mg/L and hourly values were 4.0 mg/L or greater 98.5 percent of the time. Nevertheless, OPC proposed during the agency meetings to conduct a second season of water quality monitoring during July 2023-September 2023 to investigate potential causes of the infrequent DO deviations below 4.0 mg/L in Heath Creek downstream of the Main Dam.

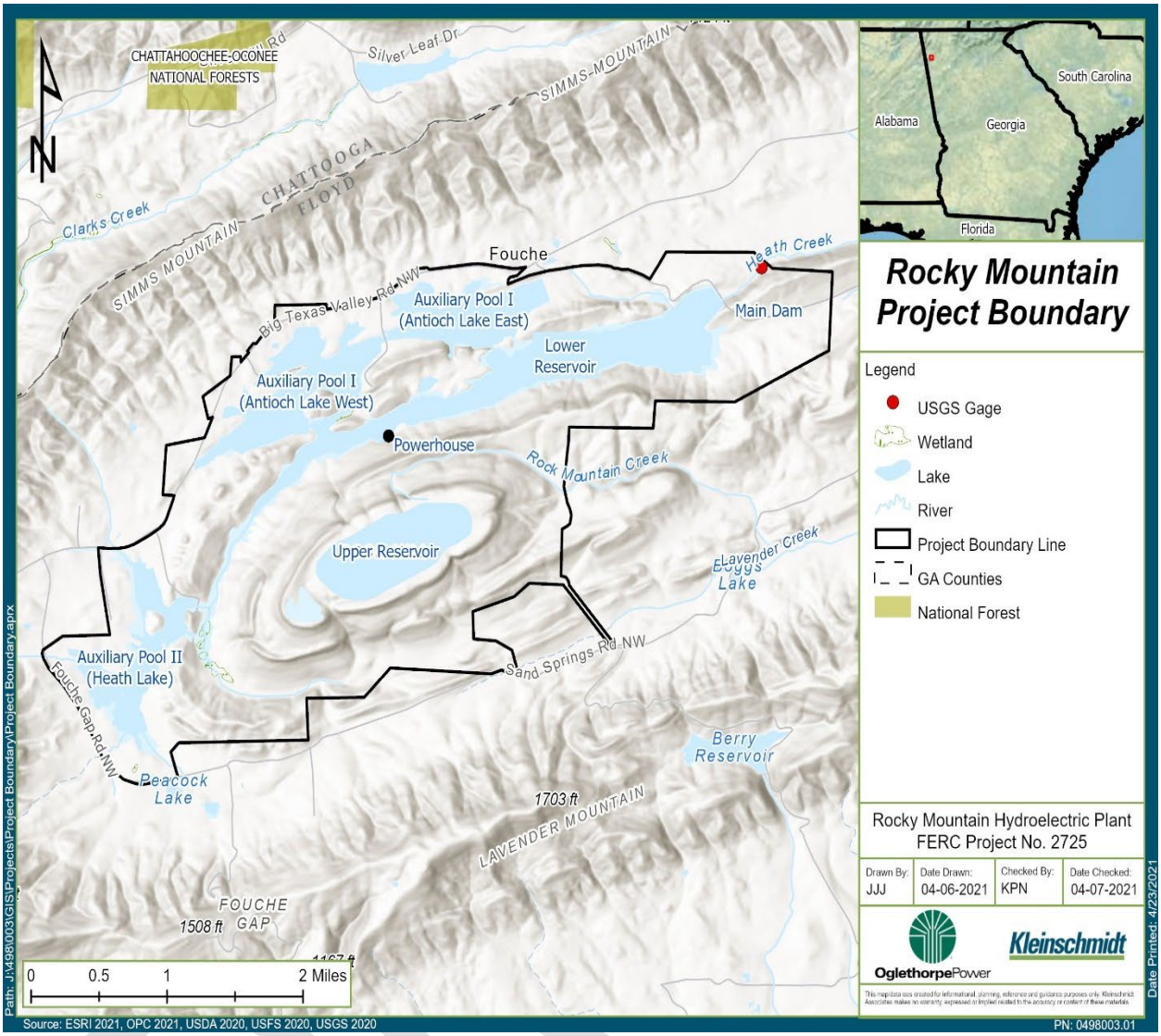


Figure 1 Project Boundary Map

2.0 OBJECTIVES AND STUDY AREA

OPC conducted targeted water quality monitoring during summer 2023 to determine the potential cause(s) of the intermittent and short-duration low-DO events observed during July 2022 and August 2022. This was accomplished using a combination of methods in Heath Creek and the Lower Reservoir as described in Section 3.0.

2.1 Objectives

The specific objectives of the second season of study during 2023 were to:

- Collect water quality data to potentially explain the mechanism(s) by which intermittent and short-duration low-DO events occur in Heath Creek, as documented during July 2022-August 2022.
- Develop water quality information sufficient for analyzing the effects of project operation and maintenance on water quality in the license application.

2.2 Study Area

The study area included the Lower Reservoir near the Main Dam and Heath Creek from the Main Dam downstream to U.S. Geological Survey (USGS) Gage No. 02388320 (Heath Creek near Armuchee, GA), located about 0.3 mile downstream of the Main Dam.

3.0 METHODOLOGY

3.1 Continuous Monitoring – Heath Creek

Hourly measurements of water temperature and DO in Heath Creek approximately 1,000 feet (ft) downstream of the Main Dam (station RM11) were continued from late June 2023 (end of first study season) through September 2023 (Figure 2). A second HOBO DO logger (Onset Computer Corp.) was deployed in Heath Creek approximately 190 ft downstream of the Main Dam[1] and set to record measurements of water temperature and DO at hourly intervals. The loggers were cleaned, downloaded, and checked for accuracy at two-week intervals. The continuous monitoring extended through September 2023 because representative data were not collected in September 2022 due to an extreme high-flow event that caused the logger to become buried in sediment. By October 2022, hourly DO values were continuously above 4.0 mg/L, ranging from 6.74 to 9.26 mg/L.

A linear stream distance of approximately 1,100 ft separated the DO logger near the Main Dam and the DO logger downstream at station RM11. To characterize potential longitudinal change in DO concentrations between these sites, DO measurements were taken at mid-depth with a YSI EXO3 sonde at numerous intervals, beginning at the dam and moving downstream, on July 13, 2023, a seasonally hot, dry summer day.

3.2 Vertical Profile Monitoring Events – Lower Reservoir

Four vertical profile monitoring events were conducted during July 2023 through September 2023 (specifically on July 12-13, August 17, September 6, and September 19) in the Lower Reservoir near the Main Dam during seasonally hot, dry weather when releases from the Main Dam approximated or approached the 1.2-cfs minimum flow. During the first event (July 12-13), a multiparameter sonde was deployed from the top of the Main Dam and suspended via rope into the reservoir at approximately the same elevation as the intake for the minimum flow pipe (El. 662 ft),[2] a depth 48.5 ft below the normal maximum pool elevation of 710.5 ft MSL. The sonde was programmed to record measurements of water temperature, DO, pH, conductivity, and turbidity at 15-minute intervals for a 24-hour period. On August 3, a third HOBO DO logger was deployed from

[1] The downstream outlet of the minimum flow pipe is about 15 ft downstream of the Main Dam. The outlet is 3 to 4 feet above the minimum tailrace pool level in Heath Creek.

[2] The inlet for the minimum flow pipe is located at 665 ft MSL. However, it draws water from the 4 ft diameter pipe with a centerline elevation of 662 ft MSL that feeds the 40-in and 10-in jet gates. Therefore, the effective intake elevation for the minimum flow intake is at approximately 662 ft MSL.

the top of the Main Dam and suspended via cable at the approximate minimum flow intake elevation. That logger was programmed to continuously record measurements of DO and water temperature at 15-minute intervals through September 30, 2023. Measurements were recorded at 15-minute intervals to provide higher-resolution characterization of DO conditions in the vicinity of the minimum flow intake over the pumping-generation cycle as the reservoir elevation changed.

Additionally, vertical profile measurements were collected using a multiparameter sonde in the Lower Reservoir near the Main Dam. Measurements of water temperature, DO, pH, conductivity, and turbidity were recorded at the surface and at 1-meter intervals down to the bottom. During each of the four events, one vertical profile was measured in the Lower Reservoir prior to the start of daily generation to represent the water column when corresponding DO values in Heath Creek were always above 4.0 mg/L in summer 2022. A second vertical profile was collected during the August 17 and September 19 monitoring events approximately 4 hours after the start of generation to represent the water column during the interval when corresponding DO values in Heath Creek tended to decline in summer 2022, sometimes below 4.0 mg/L (12 events), and then began recovering a few hours later.[3]

[3] Even if DO values in Heath Creek did not fall below 4.0 mg/L during a monitoring event, they were expected to decline during generation, and patterns of changes in the reservoir vertical profile from pre-generation to generation were likely to be informative with respect to potential sources of low-DO conditions in Heath Creek.

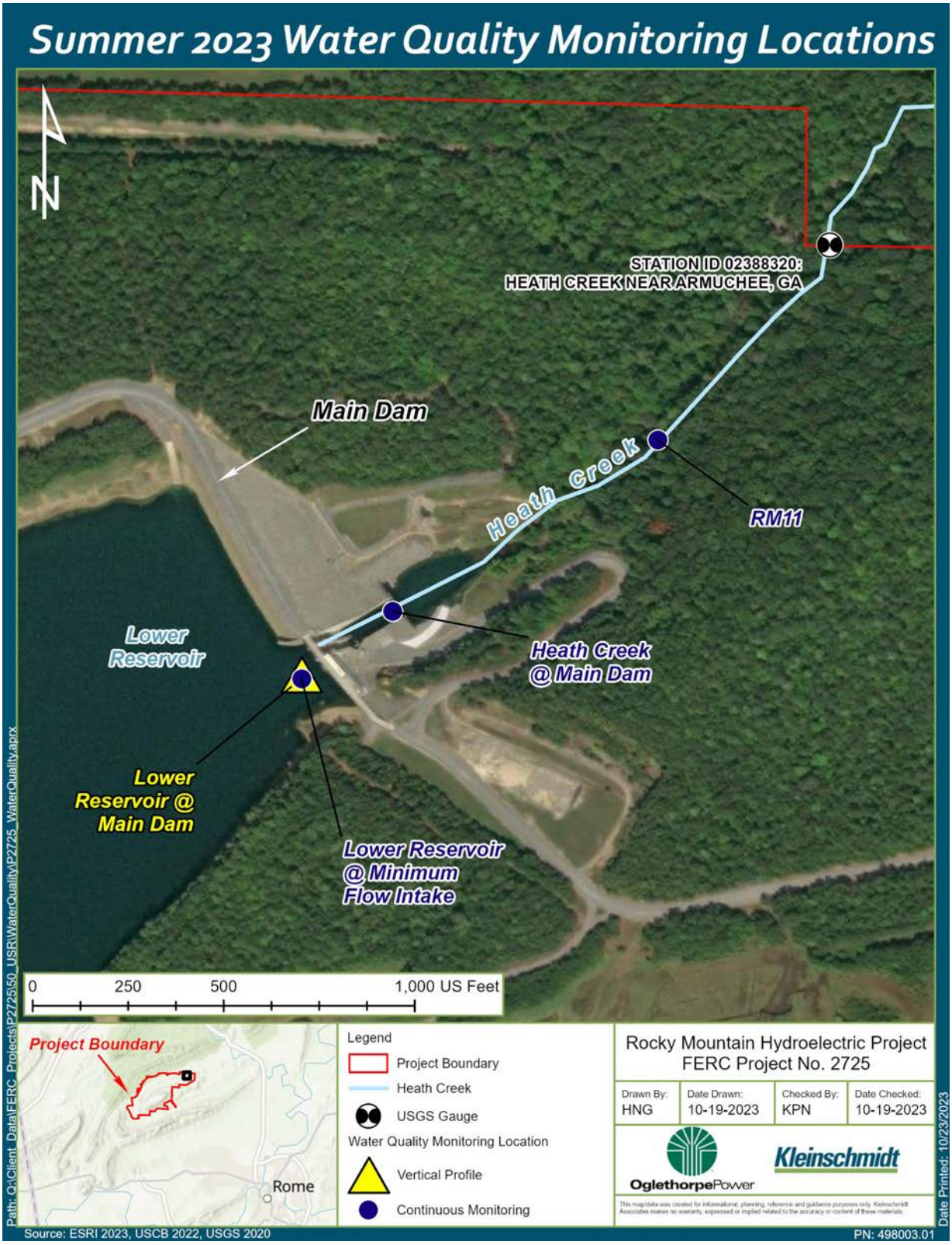


Figure 2 Water Quality Monitoring Locations

4.0 RESULTS

4.1 Continuous Monitoring – Heath Creek

Continuous monitoring at Heath Creek station RM11 showed higher average DO levels in July 2023 and August 2023 as compared to 2022 (Table 1). All hourly DO measurements recorded at RM11 from July 2023 through September 2023 were above 4.0 mg/L and all daily average DO levels were greater than 5.0 mg/L, with the exception of one date in September 2023. There were five DO measurements at RM11 on September 3, 2023 that were less than 4.0 mg/L, four of which were consecutive, occurring from 6 am to 9 am (lowest value was 3.14 mg/L at 8 am), and a single measurement of 3.87 mg/L at 8 pm. Additionally, the daily average for that day was 4.68 mg/L. During the critical period of May through October, in 2022 and 2023 combined, OPC collected a total of 6,200 hourly measurements of DO at station RM11, 99.3 percent of which were equal to or greater than 4.0 mg/L. Additionally during that same critical period, only one of 260 days that were monitored (0.4 percent) had a daily average DO concentration less than 5.0 mg/L.

Table 1 Summary of RM11 Dissolved Oxygen and Water Temperature Measurements from July to September in 2022 and 2023

Year	Month	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
		Minimum	Average	Maximum	Minimum	Average	Maximum
2023	JUL	4.91	7.18	9.13	22.64	26.24	30.32
	AUG	4.39	6.42	8.22	25.90	27.82	30.88
	SEP	3.14	6.54	8.47	23.74	26.39	29.56
2022	JUL	3.07	6.13	8.11	23.80	26.28	29.66
	AUG	2.32	6.12	8.11	26.30	27.58	30.22
	SEP	4.02	6.49	9.90	22.18	26.09	29.20

Continuous monitoring in Heath Creek approximately 190 ft downstream of the Main Dam showed slightly different results for DO when compared to RM11. DO levels at the Main Dam were consistently higher than those at downstream station RM11, with all instantaneous and daily average values greater than 4.0 and 5.0 mg/L, respectively (Table 2). A plot of hourly DO data from both Heath Creek loggers and streamflow as recorded at the USGS gage is provided in Figure 3. A plot of daily average DO data from both Heath Creek loggers and streamflow is provided in Figure 4.

Table 2 Summary and Comparison of Dissolved Oxygen and Water Temperature at Heath Creek Monitoring Sites from July 2023 to September 2023

Location	Month	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
		Minimum	Average	Maximum	Minimum	Average	Maximum
Heath Creek at Main Dam	JUL	5.78	7.33	8.99	22.7	26.3	28.4
	AUG	5.47	7.05	8.05	27.0	28.2	29.7
	SEP	6.62	7.21	8.30	25.3	27.3	29.2
RM11	JUL	4.91	7.18	9.13	22.64	26.24	30.32
	AUG	4.39	6.42	8.22	25.90	27.82	30.88
	SEP	3.14	6.54	8.47	23.74	26.39	29.56

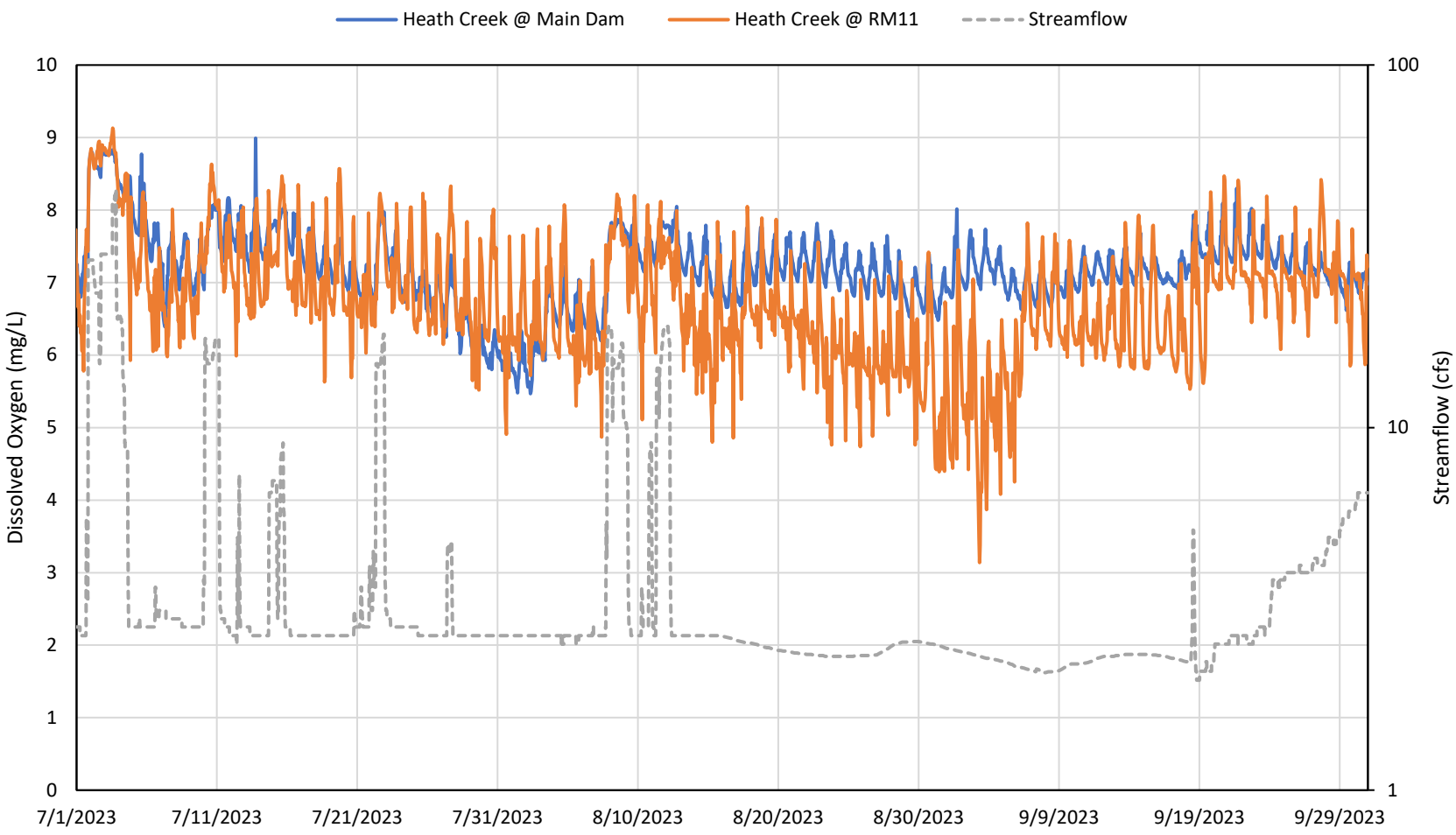


Figure 3 Heath Creek Hourly Dissolved Oxygen and Streamflow from July 2023 to September 2023

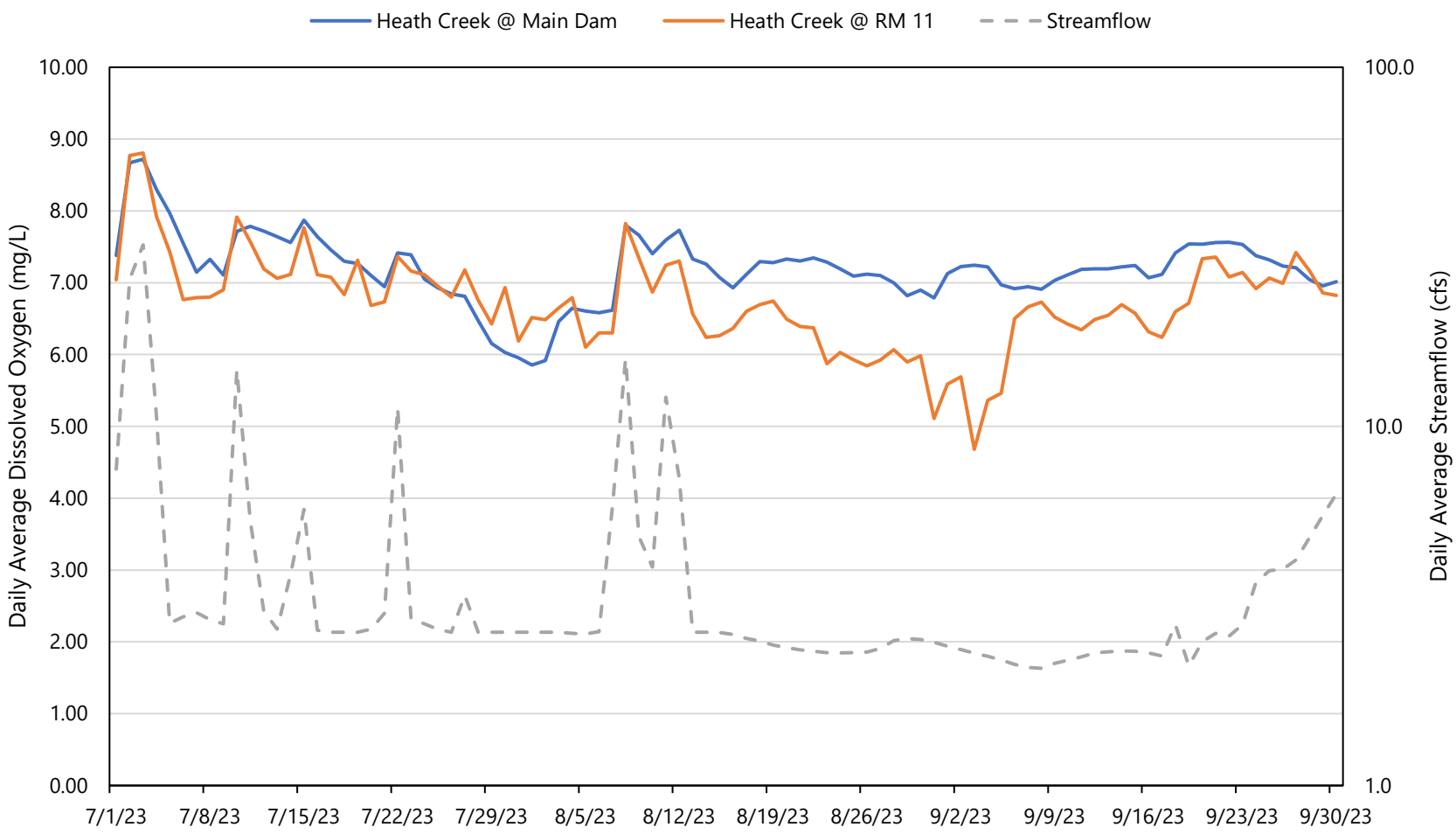


Figure 4 Heath Creek Daily Average Dissolved Oxygen and Streamflow from July 2023 to September 2023

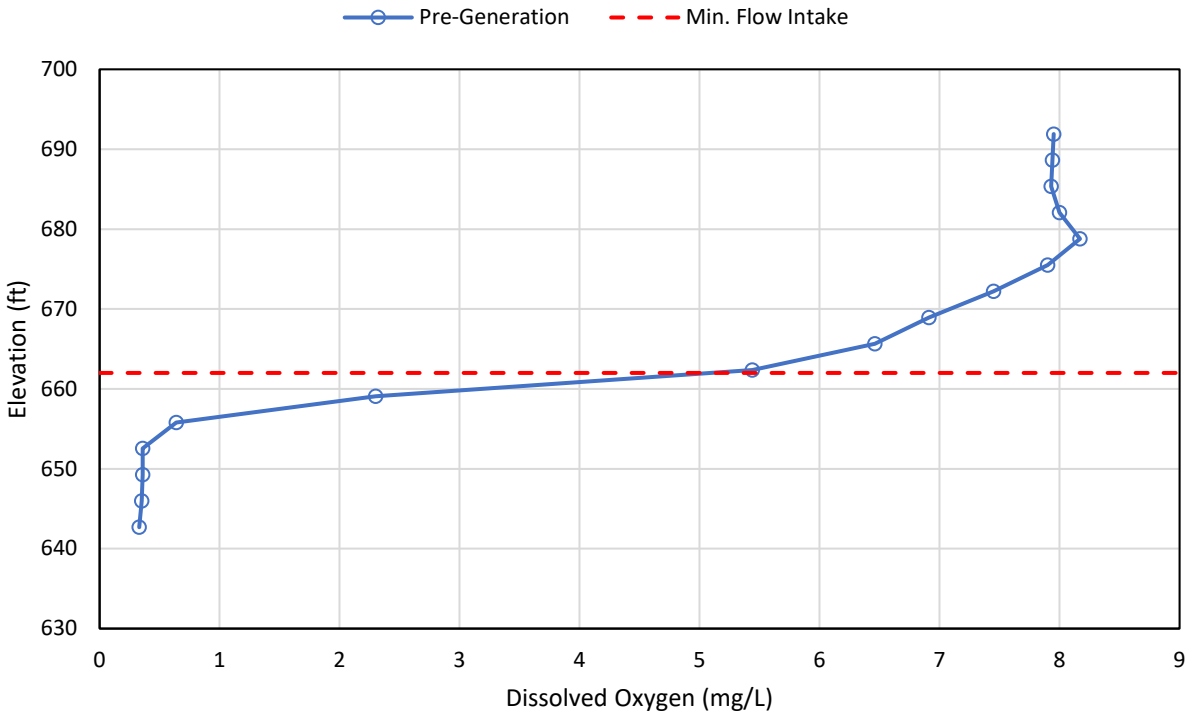
On July 13, 2023, DO concentration was measured at several locations in Heath Creek, starting at the logger located 190 ft downstream of the Main Dam and traversing downstream to the logger at station RM11. DO concentration was 7.82 mg/L at the Main Dam, increased slightly over a distance downstream of about 500 ft to the downstream end of an open pool, then decreased almost linearly with increasing distance to a concentration of 7.26 mg/L at the station RM11 logger (Table 3).

Table 3 Heath Creek Longitudinal Water Quality Measurements Collected on July 13, 2023

Distance from Main Dam (ft)	DO (mg/L)	DO % Saturation	Water Temperature (°C)
190	7.82	96.2	25.84
440	7.84	96.6	26.00
530	7.93	98.5	26.44
630	8.02	99.8	26.50
658	8.03	100.1	26.58
718	7.97	99.1	26.48
778	7.85	97.1	26.17
836	7.86	97.2	26.19
876	7.82	96.6	26.10
911	7.80	96.3	26.05
956	7.73	95.2	25.93
992	7.66	94.1	25.83
1,050	7.55	92.5	25.67
1,074	7.45	91.1	25.57
1,174	7.43	90.8	25.52
1,194	7.44	91.0	25.52
1,215	7.41	90.5	25.50
1,233	7.39	90.3	25.49
1,249	7.26	88.6	25.42

4.2 Vertical Profiles

Vertical profile measurements collected in the Lower Reservoir indicated thermal and chemical stratification, with the minimum flow inlet elevation (662 ft) being just above or within the chemocline, the reservoir layer with the steepest vertical gradient in DO concentration. DO at the minimum flow intake elevation (662 ft) was approximately 5.2 mg/L on July 13, with concentrations dropping below 1.0 mg/L at elevations less than 656 ft (Figure 5). Water temperatures ranged from 29.06 °C at the surface to 14.27 °C at the bottom. DO at the minimum flow intake elevation was approximately 4.0 mg/L on August 17 in profiles collected prior to and during generation, with levels less than 1.0 mg/L at elevations less than 658 ft (Figure 6). During the September 6 pre-generation profile, DO levels at the minimum flow intake elevations were approximately 6.0 mg/L and 2.53 mg/L at an elevation of 659.1 ft (Figure 7). DO at the minimum flow intake elevation was approximately 6.1 mg/L on September 19 in profiles collected prior to and during generation, and 2.1 mg/L at an elevation of 657 ft (Figure 8). As indicated by these vertical profiles, DO concentrations at elevations 3 to 6 ft below the minimum flow inlet elevation were less than 1.0 to 3.0 mg/L.



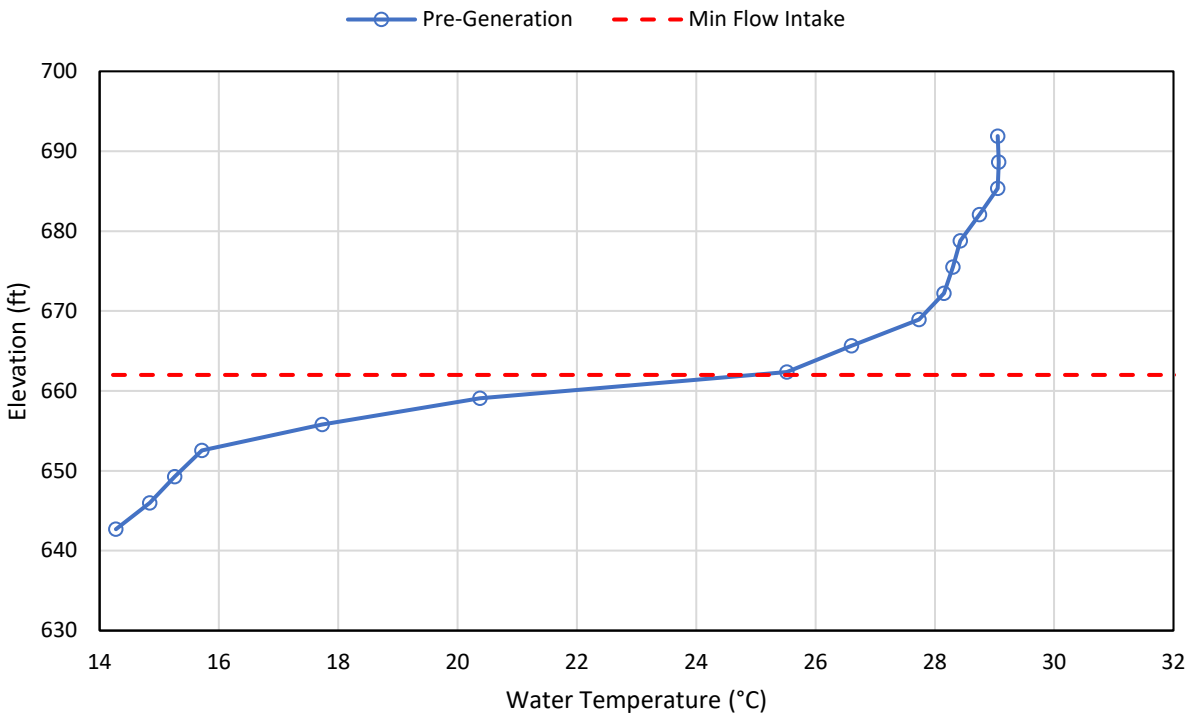
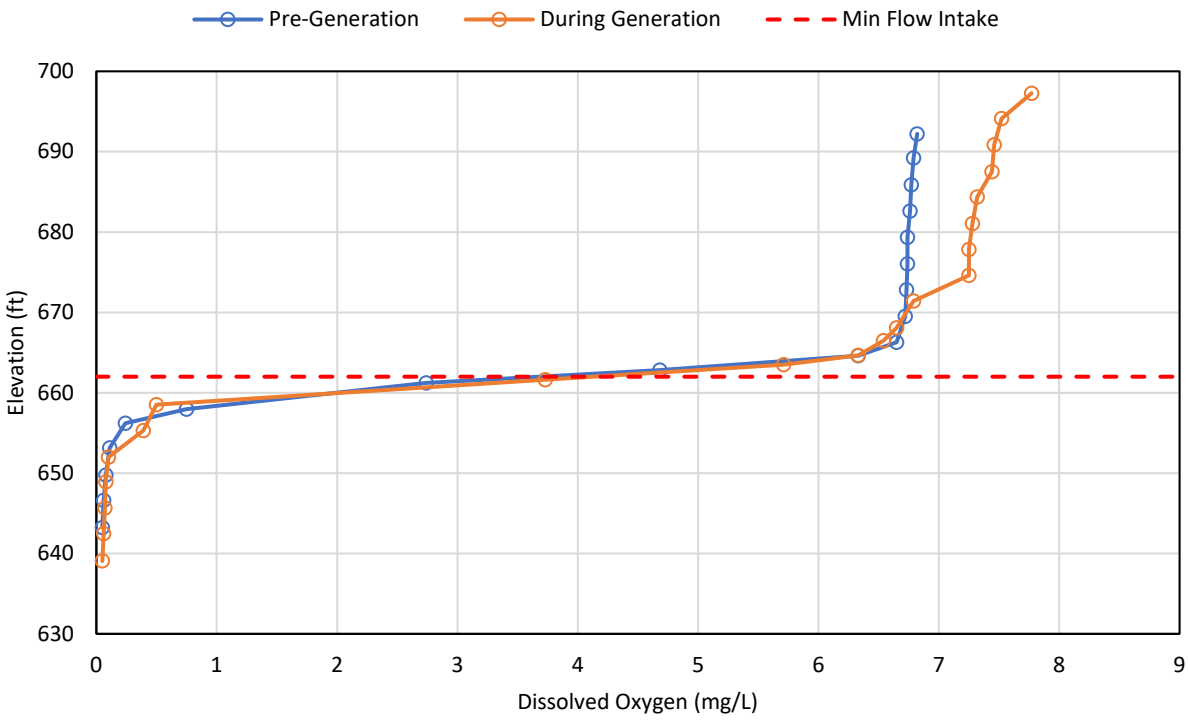


Figure 5 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on July 13, 2023



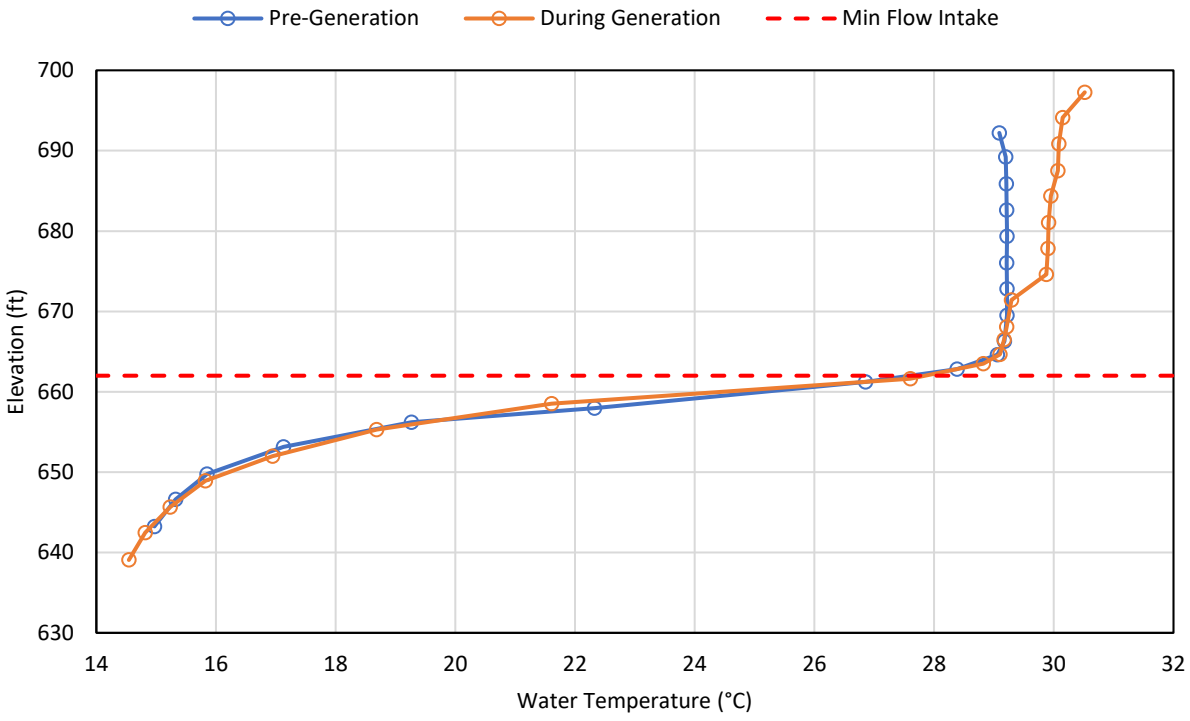
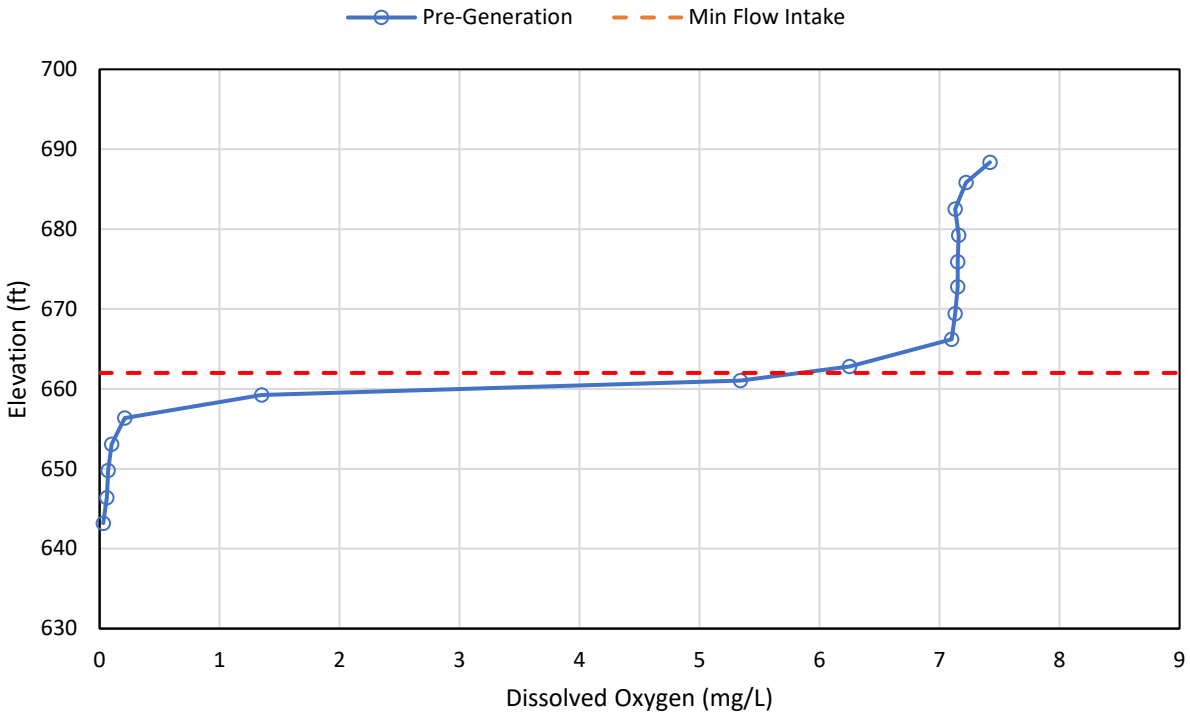


Figure 6 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on August 17, 2023



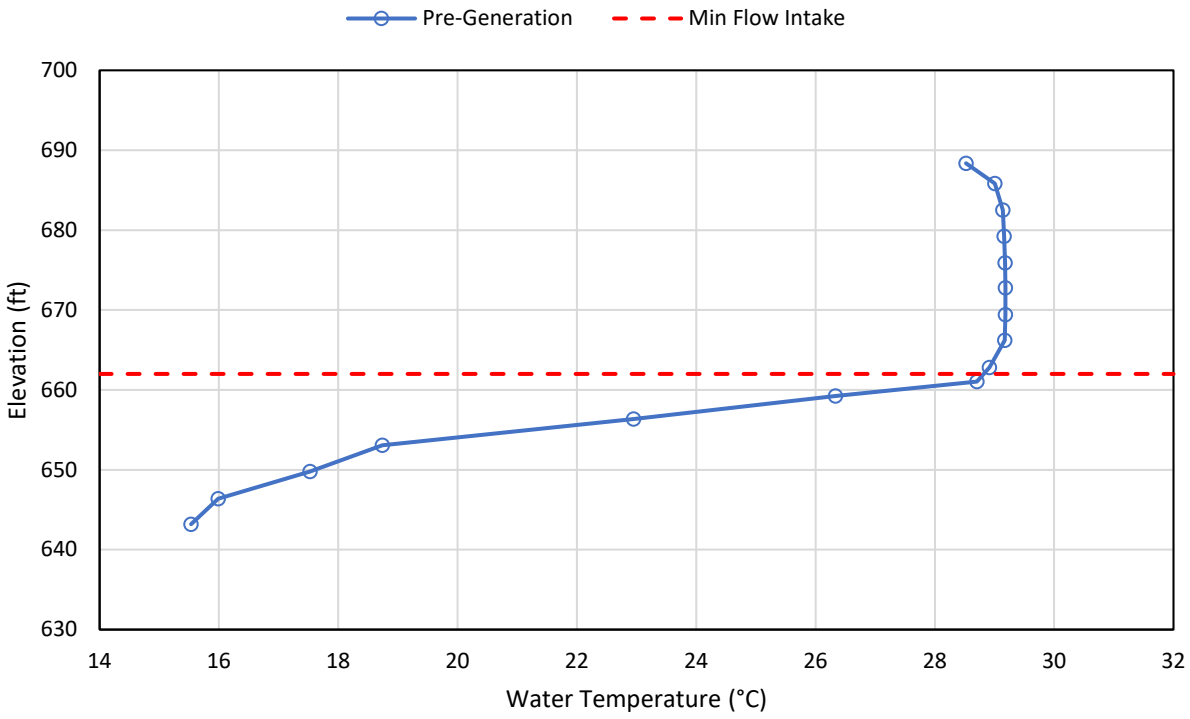
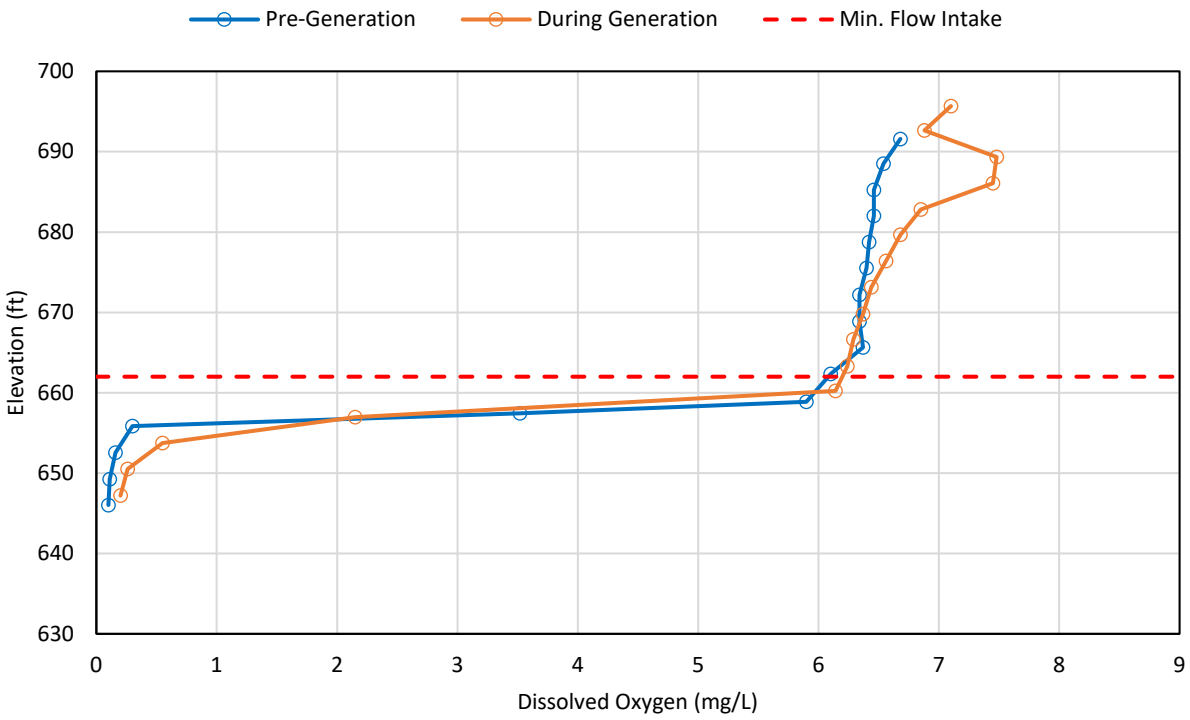


Figure 7 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on September 6, 2023



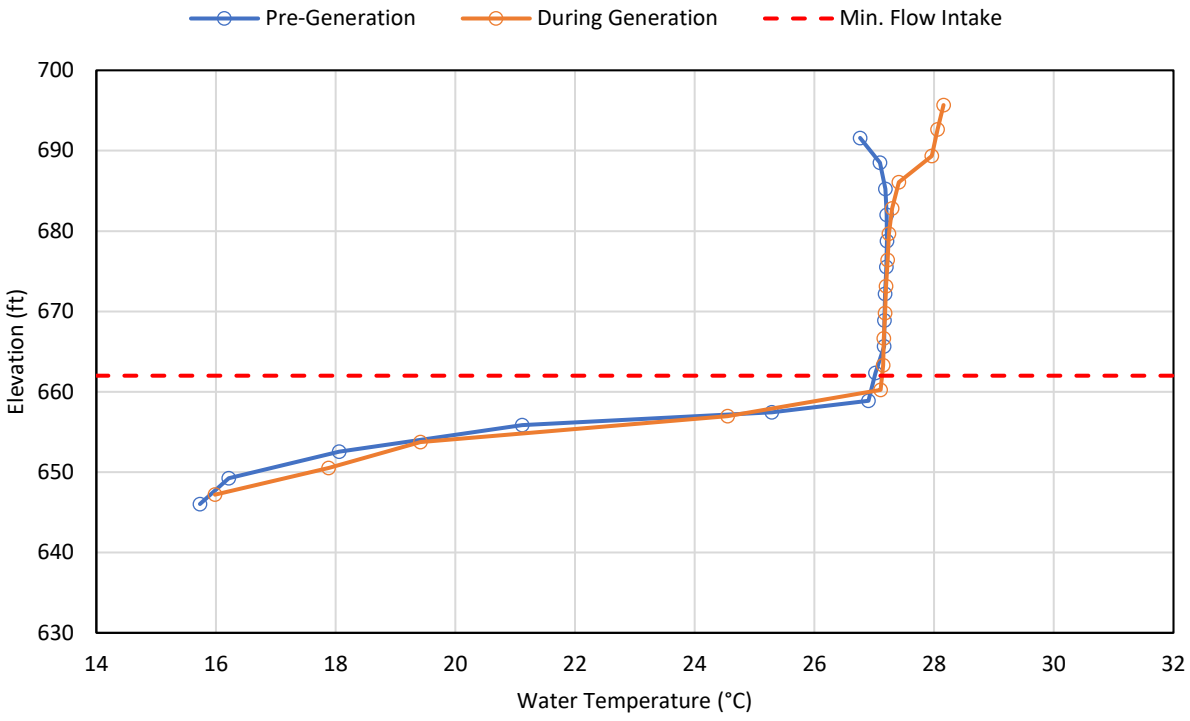


Figure 8 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on September 19, 2023

4.3 Minimum Flow Intake Monitoring

DO at the minimum flow intake elevation was monitored for a 24-hour period between July 12, 2023 and July 13, 2023. During that monitoring event, DO levels at the intake elevation prior to generation ranged between 5.31 and 7.00 mg/L. DO levels began to decline approximately 3.5 hours after generation began, dropping from 6.56 mg/L to a low of 4.41 mg/L (Figure 9). However, during the same period, DO levels in Heath Creek immediately below the Main Dam remained above 7.0 mg/L.

Data collected by the logger deployed in the Lower Reservoir at the minimum flow intake elevation from August 3, 2023 to September 30, 2023 showed a continuing trend of DO levels dropping after generation began and recovering after brief periods. During this monitoring period, DO levels in Heath Creek at the Main Dam consistently remained near or above 7.0 mg/L. Charts depicting Lower Reservoir water surface elevations and DO levels at the minimum flow intake and in Heath Creek at the Main Dam are provided in Figure 10 through Figure 17. These results indicate that the minimum flow release at the Main Dam becomes aerated as it falls from the discharge pipe to the stream and meets the applicable water quality standards for DO.

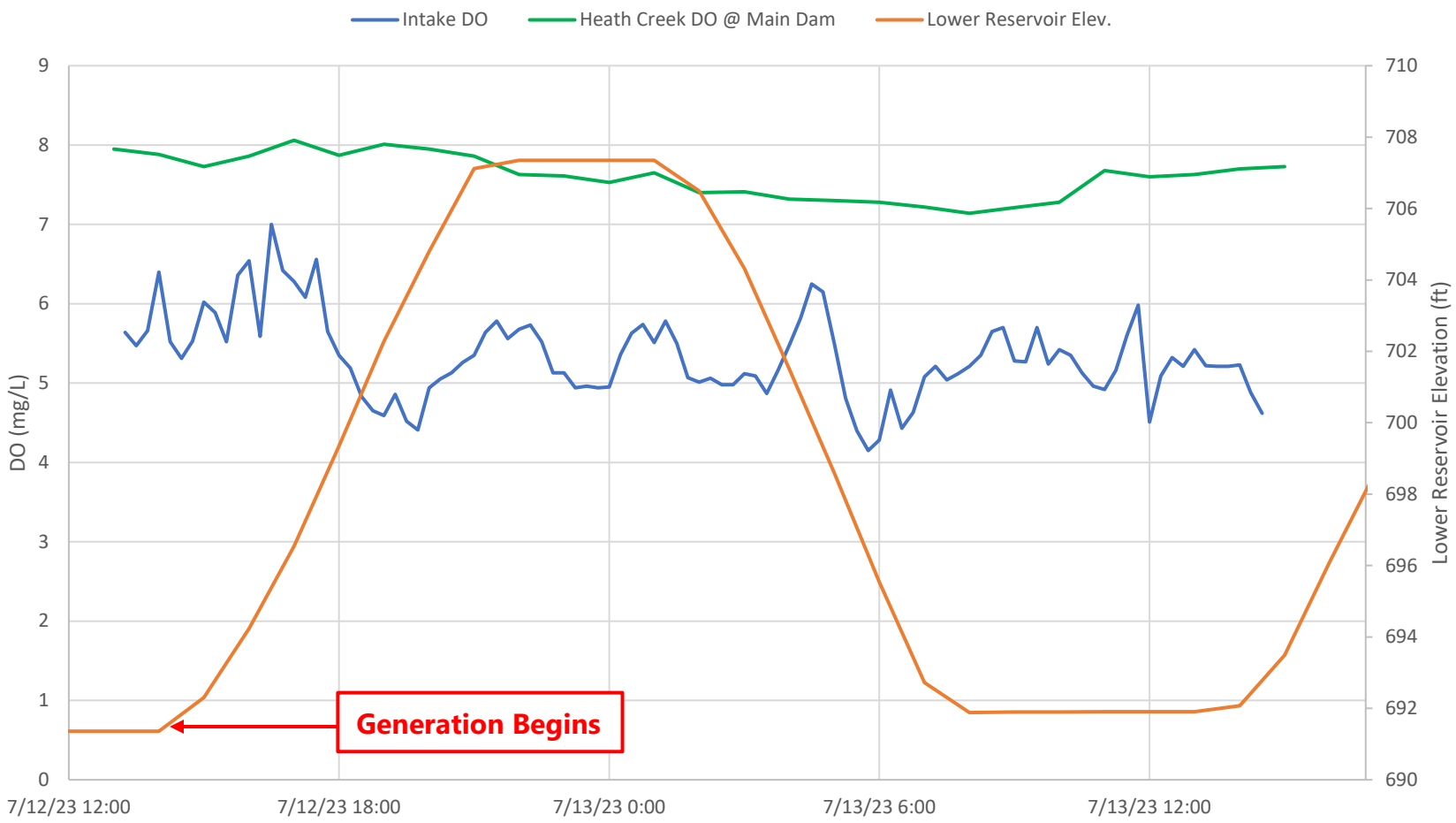


Figure 9 Minimum Flow Intake Monitoring Data – July 12-13, 2023

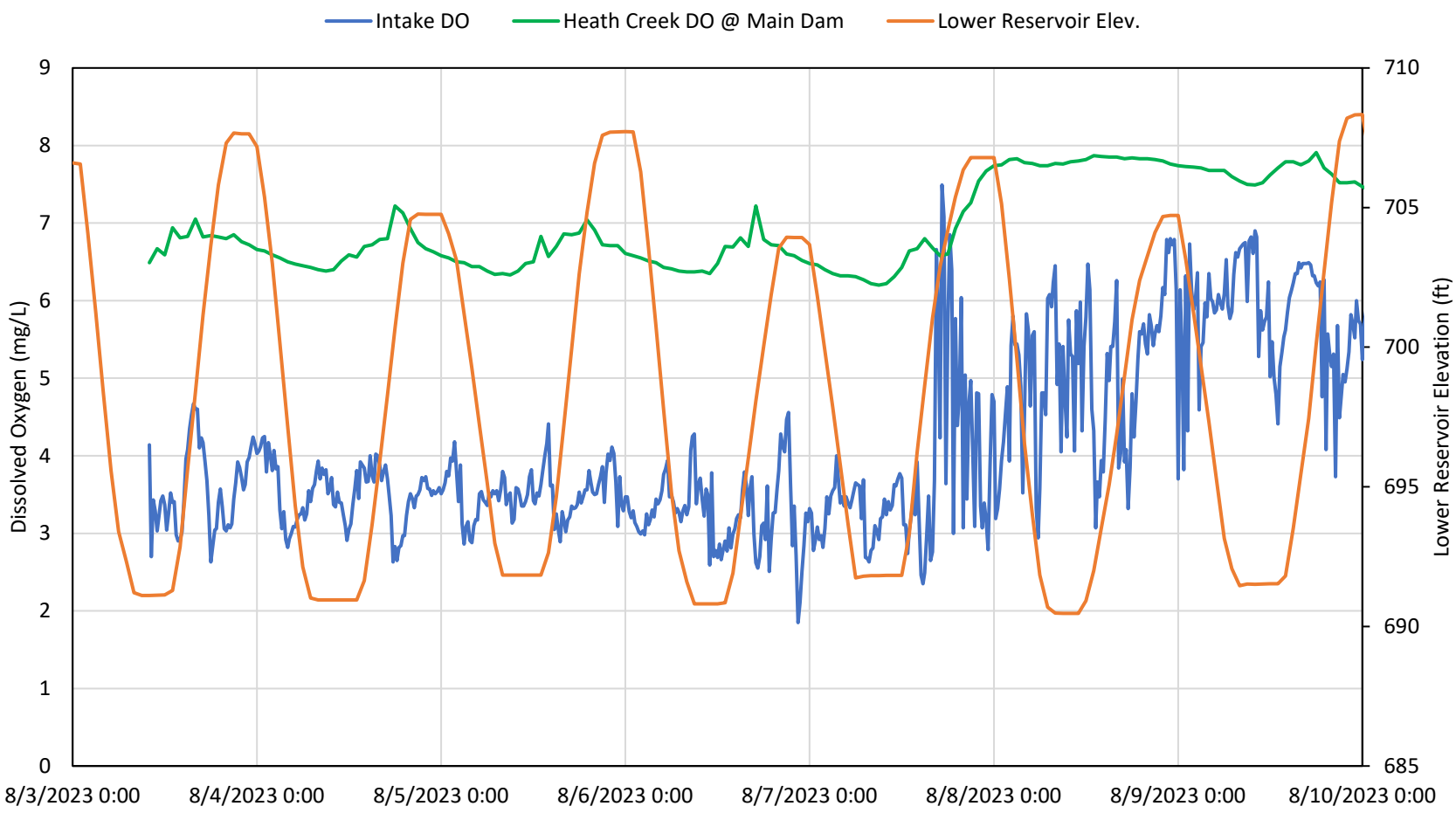


Figure 10 Minimum Flow Intake Monitoring Data – August 3-10, 2023

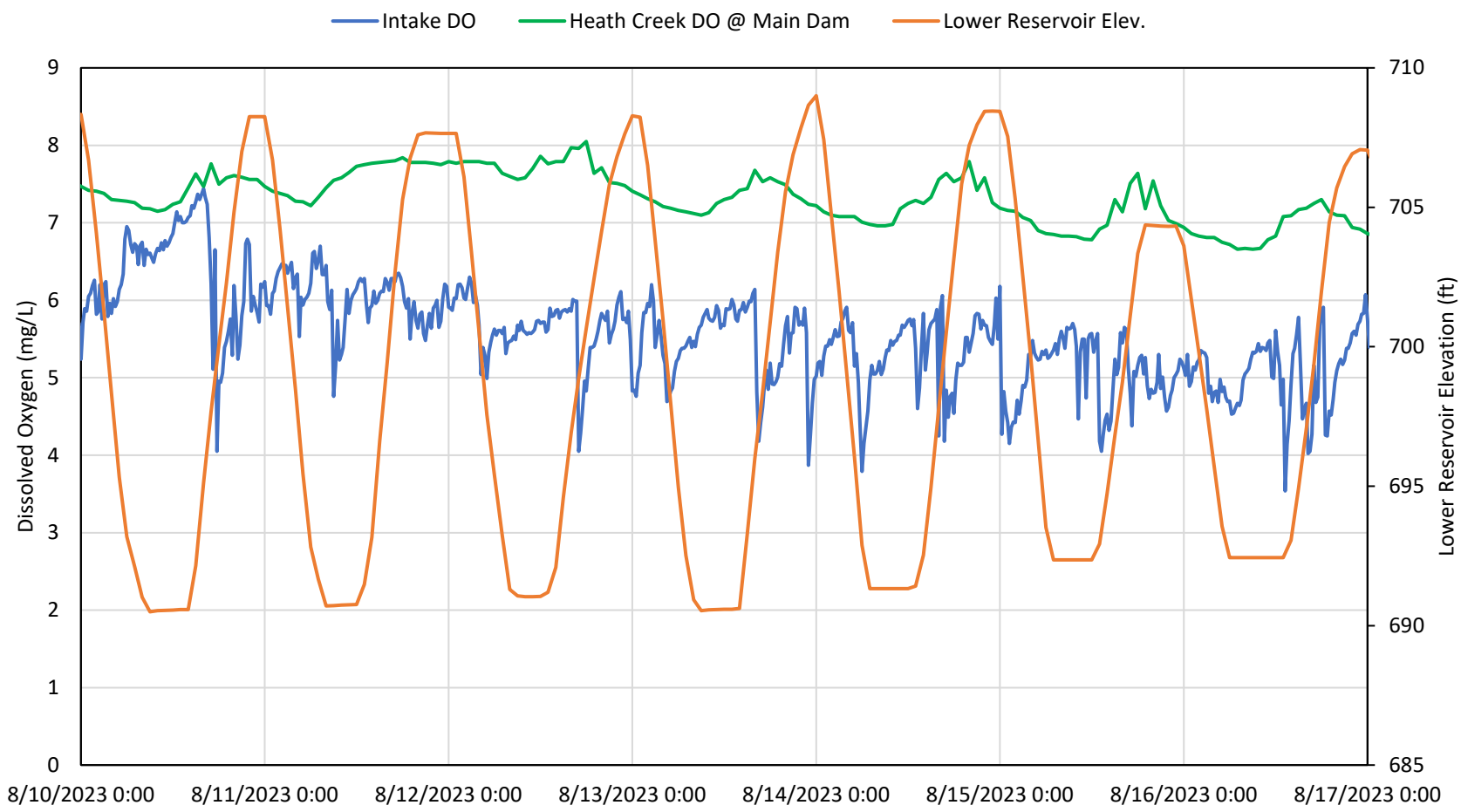


Figure 11 Minimum Flow Intake Monitoring Data – August 10-17, 2023

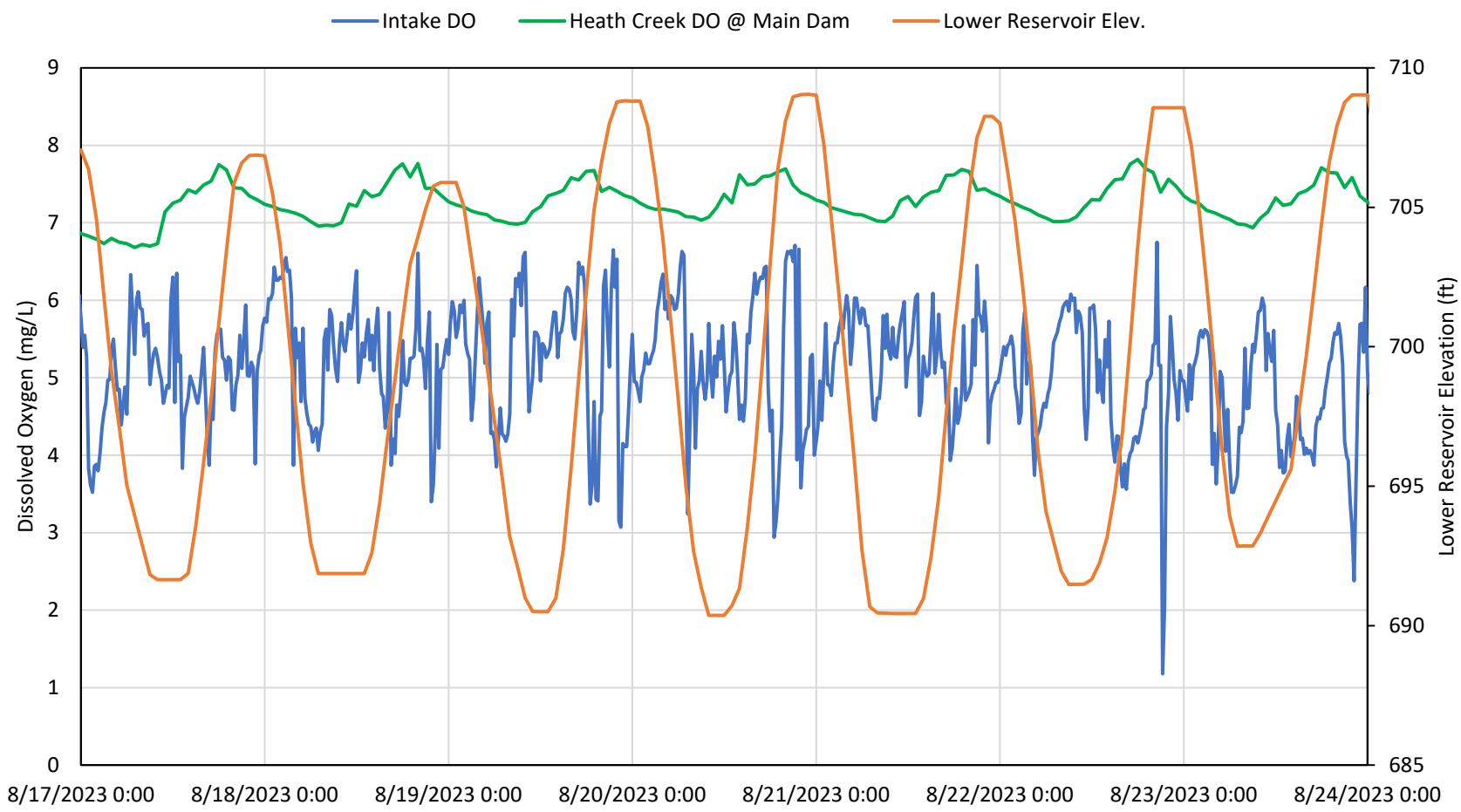


Figure 12 Minimum Flow Intake Monitoring Data – August 17-24, 2023

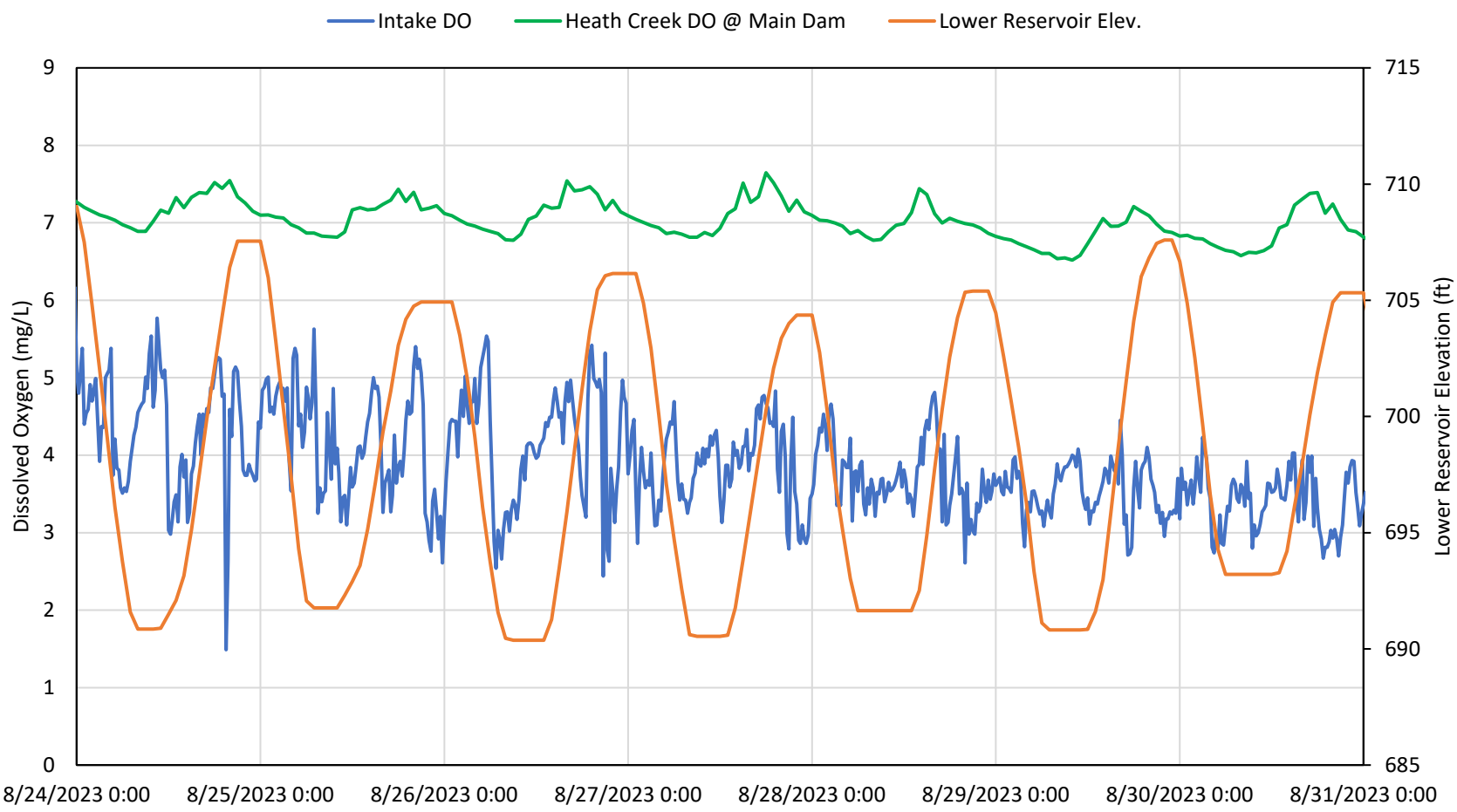


Figure 13 Minimum Flow Intake Monitoring Data – August 24-31, 2023

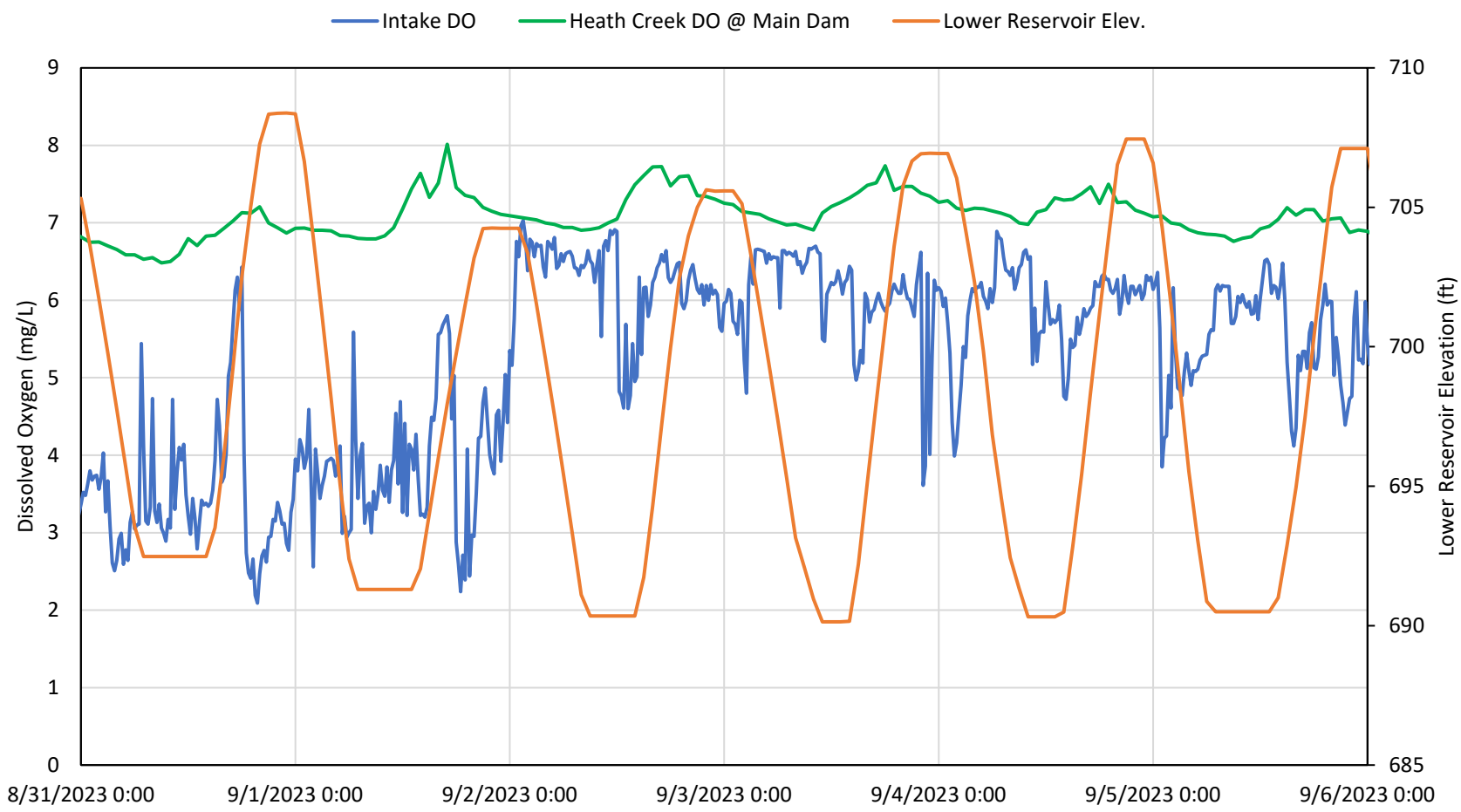


Figure 14 Minimum Flow Intake Monitoring Data – August 31-September 6, 2023

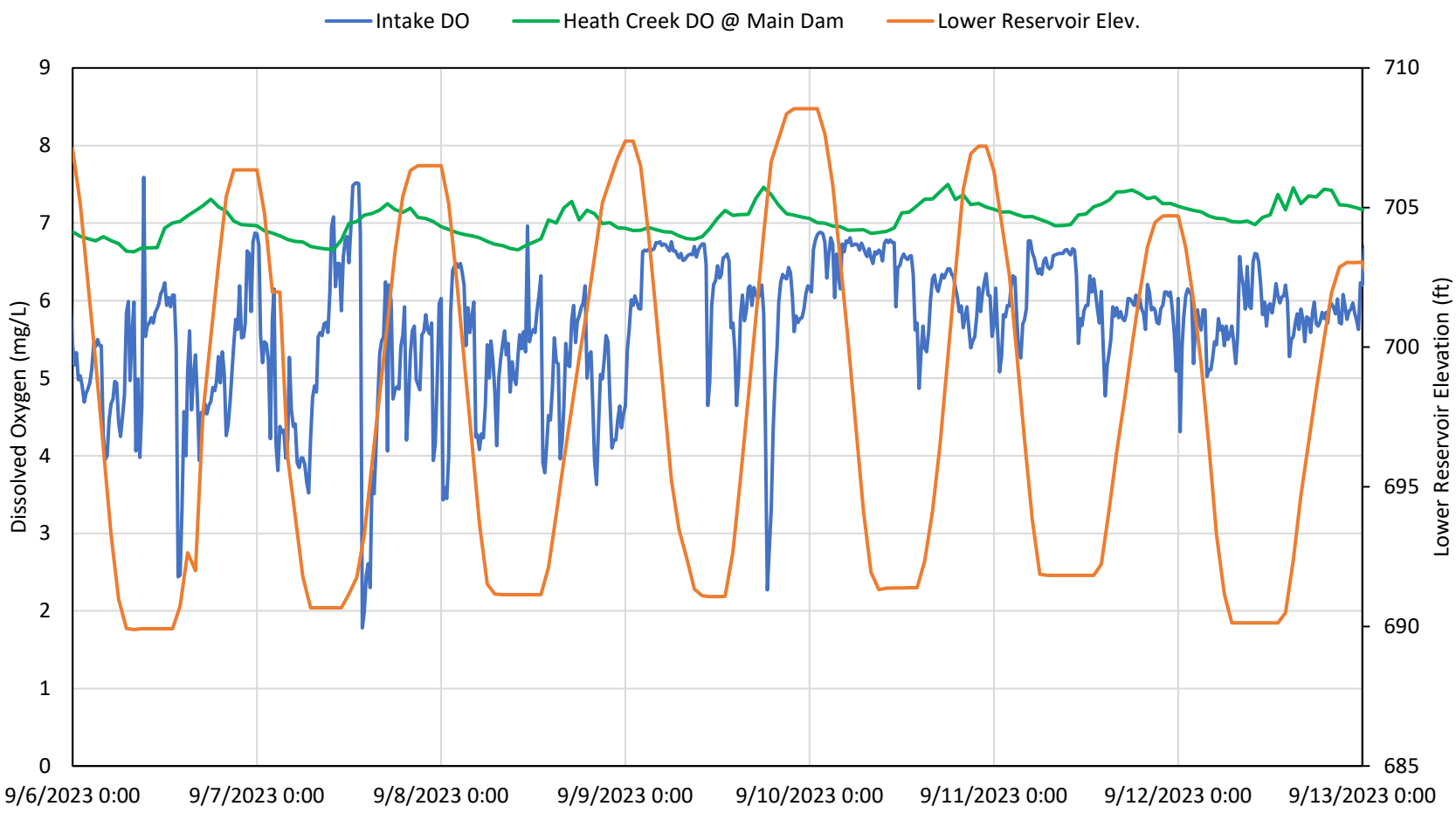


Figure 15 Minimum Flow Intake Monitoring Data – September 6-13, 2023

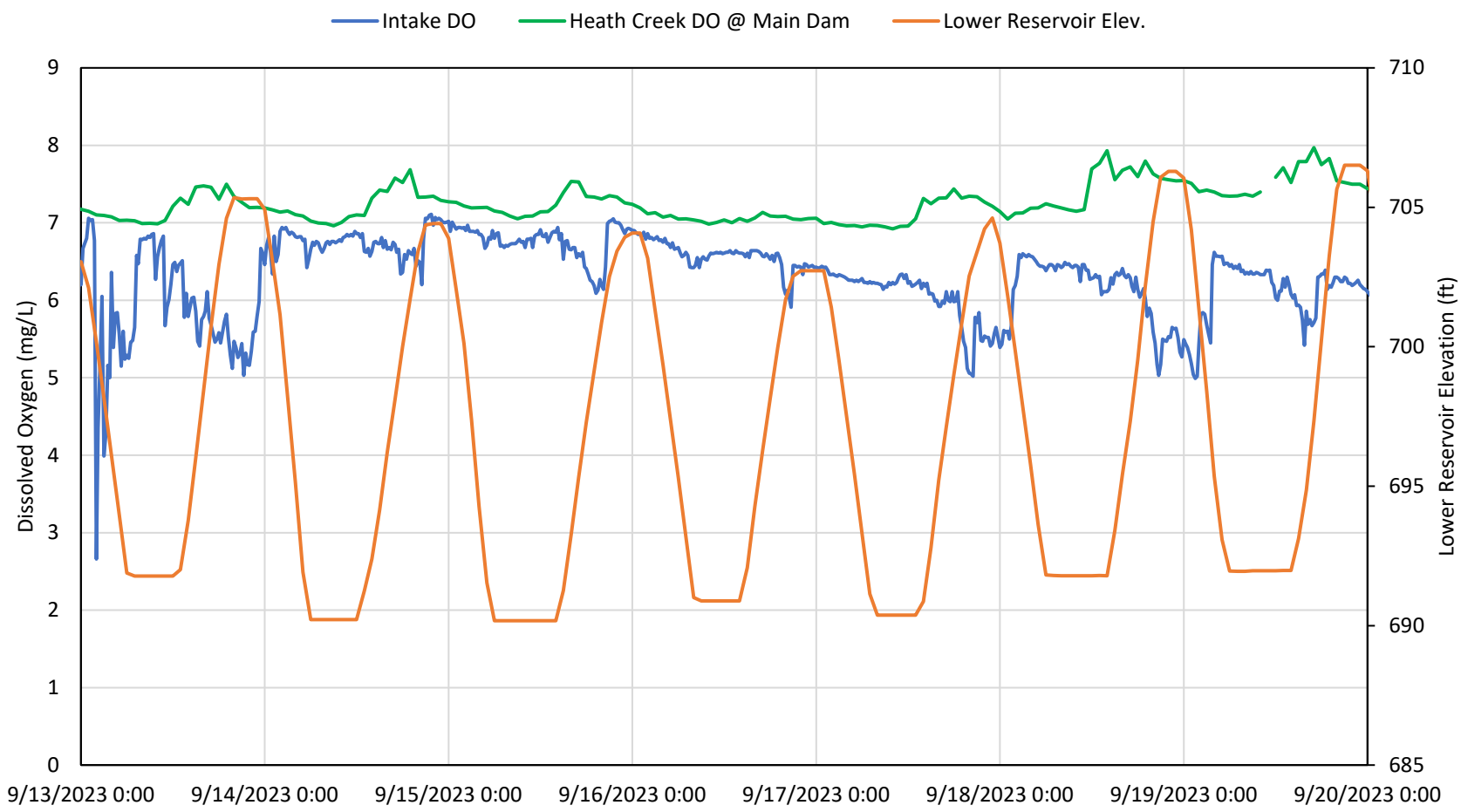


Figure 16 Minimum Flow Intake Monitoring Data – September 13-20, 2023

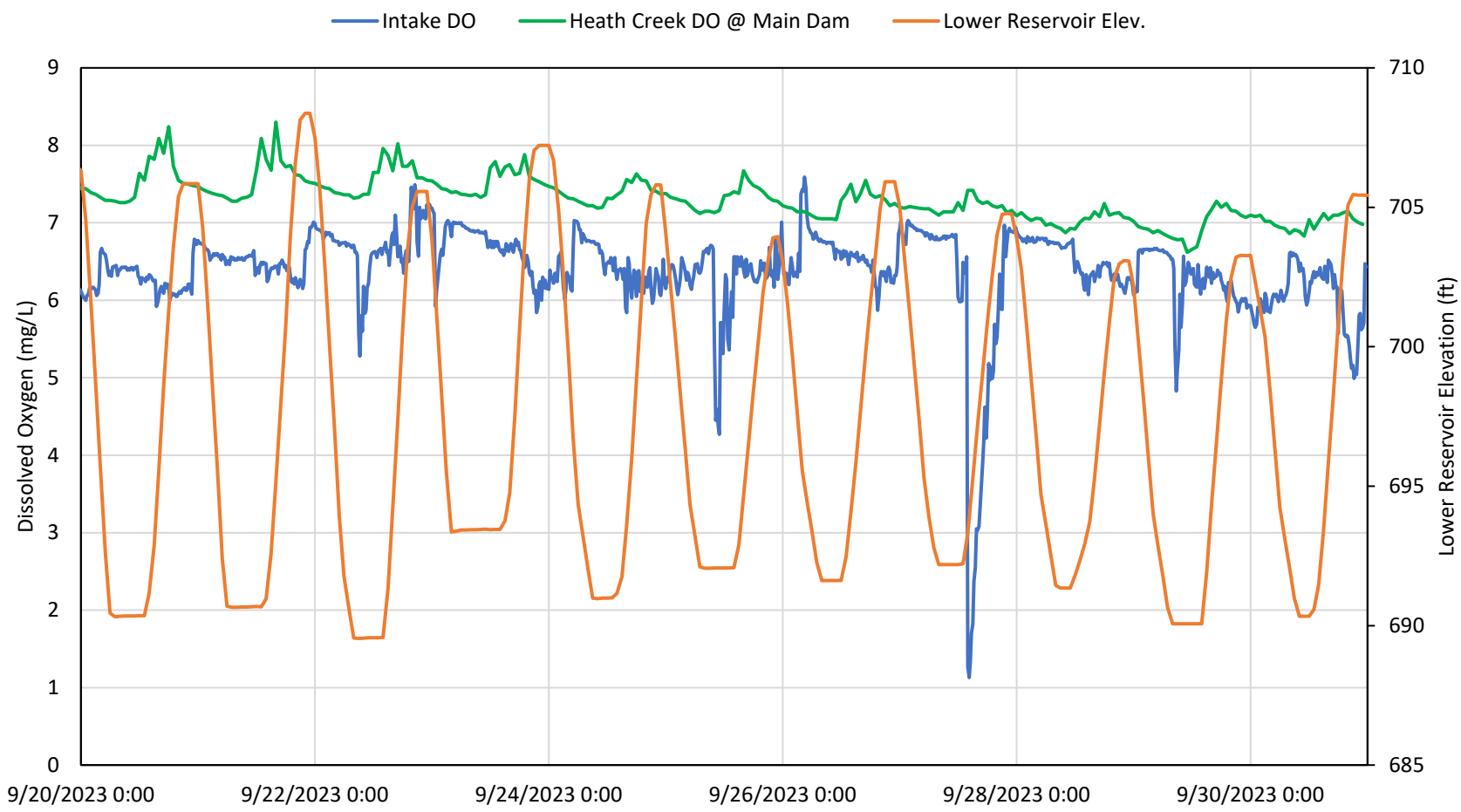


Figure 17 Minimum Flow Intake Monitoring Data – September 20-30, 2023

5.0 DISCUSSION

In 2022, there were 12 events when DO levels fell below 4.0 mg/L in Heath Creek at station RM11, although no days had a daily average DO of less than 5.0 mg/L. Those events appeared to be correlated with rising water surface elevations in the Lower Reservoir associated with the onset of generation.

Vertical profiles collected in the Lower Reservoir at the Main Dam in summer 2023 show that DO levels just below the minimum flow intake elevation, at depths greater than 48.5 ft below the normal maximum pool elevation, were very low, which is typical of southeastern reservoirs. Continuous monitoring showed that DO levels at the minimum flow intake elevation decreased in association with rising Lower Reservoir levels at the onset of generation. However, in 2023, there were only 2 events on the same day, September 3, when DO levels fell below 4.0 mg/L and the daily average DO was less than 5 mg/L at Heath Creek station RM11. Those events did not appear to be correlated with rising Lower Reservoir water levels. In fact, DO levels measured by the logger in Heath Creek just below the Main Dam remained at or above 7.0 mg/L during the same period due to aeration of the release and met the applicable water quality standards for DO.

Heath Creek below the Main Dam met the applicable DO water quality standards 100 percent of the time during the summer 2023 monitoring period, despite DO values in the Lower Reservoir at the elevation of the minimum flow intake falling below 4.0 mg/L on numerous occasions (Figures 10-17). This consistent trend indicated significant, constant aeration of the minimum flow release in falling several feet from the outlet into Heath Creek, which appears representative of the aeration provided by the minimum flow outlet during summer. The minimum hourly DO value reported below the Main Dam in July-September 2023 was 5.47 mg/L, while the monthly average values ranged from 7.05 to 7.33 mg/L (Table 2).

Throughout the summer 2023 continuous monitoring period, minimum instantaneous and average DO concentrations in Heath Creek just below the Main Dam trended higher than those at downstream station RM11 (Table 2, Figures 3 and 4). The longitudinal profile collected in Heath Creek on July 13, 2023, showed that DO concentration decreased by 0.77 mg/L over a downstream distance of approximately 600 ft. The project area is known to have karst geology, with several springs occurring near the Main Dam. Natural groundwater inflow therefore likely influences lower summer DO levels downstream at

station RM11, assuming the DO concentration of the groundwater is lower than surface waters.

The physical habitat evaluation performed in Heath Creek downstream of the Main Dam during the Aquatic Resources Study (station HC-1) observed patches of groundwater inflow on the bottom of deeper pools in the upper section of the survey reach near the Main Dam (Kleinschmidt 2023b). Preconstruction geologic investigations identified several small springs on or near the Main Dam south abutment that drain toward Heath Creek (Harza Engineering Company 1990). According to these investigations, karst aquifers in the Lower Reservoir area are characterized primarily by diffuse flow through limestone fractures and pores as opposed to conduit-like flow. Other springs occur nearby in the project area, as indicated by preconstruction investigations and the USGS hydrographic map, including Buffington Spring in the northern floodplain of Heath Creek downstream of the USGS gage.

The low-DO events previously reported in July and August 2022 (Kleinschmidt 2023a) occurred during a period when flows in Heath Creek were low for a prolonged period, ranging from 1.77 to 2.39 cfs at the USGS gage. Similarly, the low-DO event on September 3, 2023 occurred under dry conditions when Heath Creek flows averaged 2.31 to 2.36 cfs. Given that DO values in Heath Creek at the Main Dam ranged from 6.91 to 7.74 mg/L (7.24 mg/L average) on September 3, 2023, while DO values at station RM11 ranged from 3.14 to 6.25 mg/L (4.68 mg/L average) on the same day, diffuse groundwater inflow along the streambed most likely explains the pronounced decrease in DO over such a short distance. The loggers at both stations were serviced every two weeks, were found to be within calibration specifications, and were free of biofouling. Monthly water chemistry samples collected at station RM 11 in July and August 2022 as part of the first year of monitoring (Kleinschmidt 2023a) had 5-day biochemical oxygen demand (BOD5) values below the detection limit, ruling out BOD as a potential causative factor.

6.0 SUMMARY AND CONCLUSIONS

OPC conducted targeted water quality monitoring during summer 2023 to determine the potential cause(s) of the intermittent low-DO events observed in July 2022 and August 2022. This was accomplished using a combination of methods in Heath Creek and the Lower Reservoir. The methods included:

- Continuous (hourly) monitoring of DO and water temperature in Heath Creek near the Main Dam and at RM11,
- Continuous (15-minute) monitoring in the Lower Reservoir at the approximate minimum flow intake elevation, and
- Vertical water quality profiles in the Lower Reservoir at the Main Dam.

Following is a summary of key findings of this study:

- During the critical period (May through October) in 2022 and 2023 combined, a total of 6,200 hourly DO measurements were recorded at station RM 11, of which 99.3 percent were equal to or greater than 4.0 mg/L; only one of the 260 days monitored during the critical period (0.4 percent) had a daily average DO concentration less than 5.0 mg/L.
- Continuous monitoring in Heath Creek approximately 190 ft downstream of the Main Dam during July 2023 through September 2023 showed DO levels were consistently higher than those in the Lower Reservoir at the elevation of the minimum flow intake due to aeration of the minimum flow release and were higher than those downstream at station RM11. All instantaneous and daily average DO values in Heath Creek at the Main Dam were greater than 4.0 and 5.0 mg/L, respectively, and met applicable water quality standards for DO.
- Vertical profile measurements collected in the Lower Reservoir indicated thermal and chemical stratification, with low DO levels at depths 3 to 6 ft below the minimum flow intake elevation.
- Continuous monitoring at the minimum flow intake elevation within the Lower Reservoir in summer 2023 showed a trend of DO levels dropping after generation began and recovering after brief periods; nevertheless, the minimum flow release at the Main Dam met applicable DO water quality standards 100 percent of the time due to aeration of the release as it falls several feet into the creek.

- The low-DO events at station RM11 in summer 2022 and summer 2023 occurred under prolonged low flow conditions. The pronounced decline in DO concentration observed between Heath Creek below the Main Dam and station RM11 during the summer 2023 monitoring period indicates that the low-DO events in both summers were most likely caused by groundwater inflow along the streambed.
- Given the difference between DO levels measured in Heath Creek below the Main Dam and downstream at station RM11, observations of groundwater inflow in this reach during the fish community survey, and the known presence of several springs near the Main Dam, it is likely that natural groundwater inflow from karst geology influences lower summer DO levels at station RM11, especially during periods of low flow.

The results of the water quality monitoring conducted in 2022-2023, including two summers, show that continuous minimum flow releases from the Main Dam meet applicable water quality standards 100 percent of the time due to significant, sustained aeration of the release, that infrequent low-DO events in summer occur during prolonged periods of low flow, and that these deviations are likely caused by natural groundwater inflow into Heath Creek downstream of the Main Dam.

7.0 REFERENCES

Harza Engineering Company. 1990. Rocky Mountain Project, Preconstruction Geology, Volume I – Report. April 1990.

Kleinschmidt Associates (Kleinschmidt). 2023a. Water Quality Assessment Study Report. Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725). Prepared for Oglethorpe Power Corporation. September 2023.

Kleinschmidt Associates (Kleinschmidt). 2023b. Aquatic Resources Study Report. Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725). Prepared for Oglethorpe Power Corporation. August 2023.

From:	Booth, Elizabeth
To:	McCaslin, Tyler
Cc:	Jones, Craig; Barrows, Christina; Steven Layman; Kelly Kirven
Subject:	RE: Rocky Relicensing Draft WQ Study Update and Meeting Request
Date:	Wednesday, February 7, 2024 3:12:44 PM
Attachments:	image001.png image002.png

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If you could please take a look at this, and please let us know if you have any questions or additional comments we would greatly appreciate it. We would be happy to schedule time to discuss via Teams if that would be helpful.

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Wednesday, January 17 – 11 AM, 1 PM

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Manager – Wetlands Unit
Georgia Environmental Protection Division
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Best regards,

Craig

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From:	McCaslin, Tyler
To:	Booth, Elizabeth
Cc:	Jones, Craig; Barrows, Christina; Steven Layman; Kelly Kirven
Subject:	RE: Rocky Relicensing Draft WQ Study Update and Meeting Request
Date:	Friday, February 23, 2024 12:02:00 PM
Attachments:	image001.png image002.png

Hey Liz,

We have a few figure edits to share/discuss and we were wondering if you had time for a 15-30 min call in the next couple weeks.

I have our availability below:

Mon 2/26: 9:30-10:30
Tue 2/27: 8-9, 9:30-10:30
Mon 3/4: 9:30-11
Tue 3/5: 8-11
Thur 3/7: 9-10:30, 2-5

Thanks and looking forward to the chat.

-Tyler

From: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
Sent: Thursday, February 8, 2024 11:05 AM
To: McCaslin, Tyler <tyler.mccaslin@opc.com>
Cc: Jones, Craig <craig.jones@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Klein Schmidt Group (Kelly Kirven) <Kelly.Kirven@KleinschmidtGroup.com>
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Sent: Thursday, February 8, 2024 10:57 AM
To: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
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Hi Liz,

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information in the report, and we will get back to you shortly.

-Tyler

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Meeting Summary
Rocky Mountain Relicensing Draft Water Quality Study Update Meeting with Georgia Department of Natural Resources Environmental Protection Division

Date and Time: Tuesday, February 27, 2024, 8:00 am

Location: Virtual meeting on Microsoft Teams

Participants:

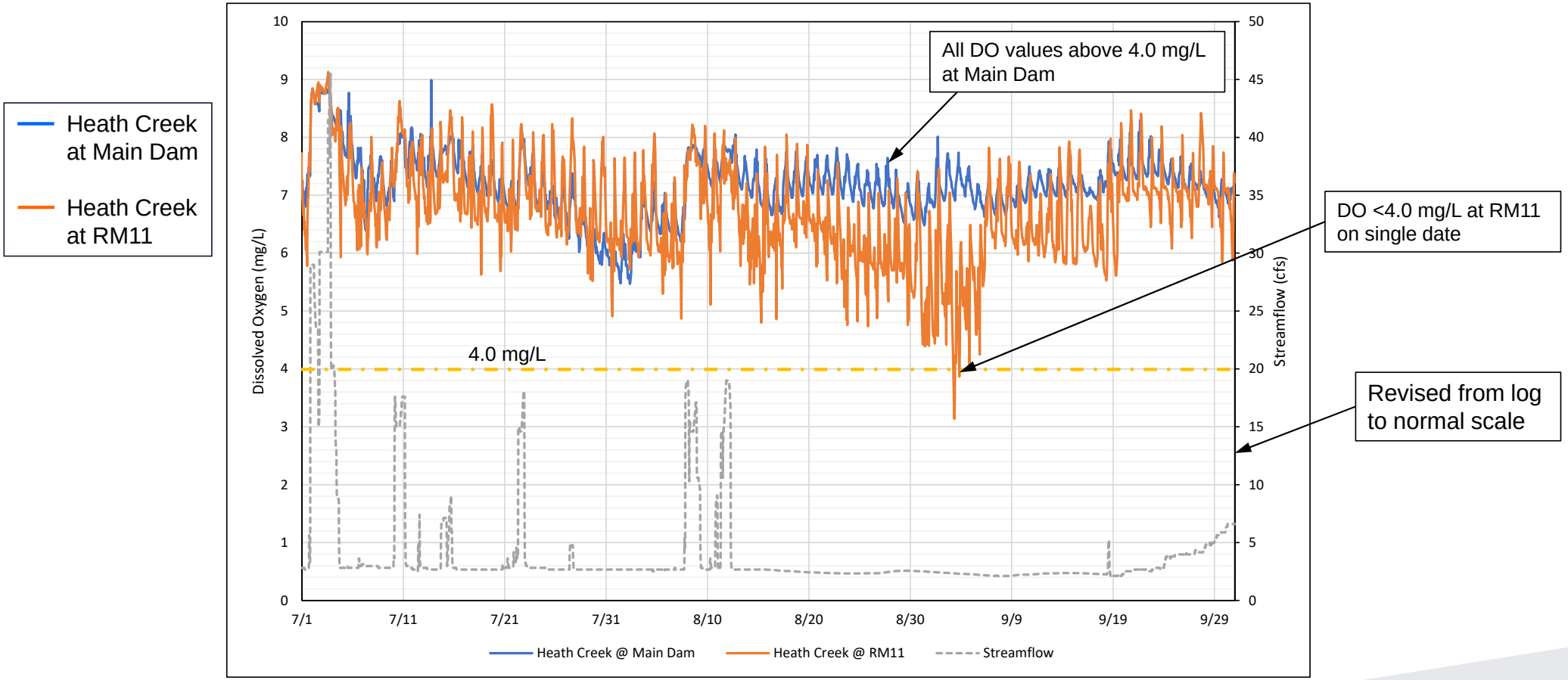
Elizabeth Booth, Georgia Department of Natural Resources Environmental Protection Division (GEPD)
Craig Jones, Oglethorpe Power Corporation (OPC)
Tyler McCaslin, OPC
Christina Barrows, OPC
Jason Moak, Kleinschmidt Associates
Steve Layman, Kleinschmidt Associates

Prepared by: Steve Layman

Meeting Summary

OPC met with GEPD to discuss revised and new water quality plots (attached) depicting summer 2022 and summer 2023 dissolved oxygen (DO) monitoring data and streamflow, and precipitation data (attached) to help evaluate groundwater inflow as a factor potentially contributing to occasional summer DO excursions in Heath Creek about 1,000 feet downstream of the Main Dam. These figures are to be incorporated into OPC's Water Quality Assessment Study Report Addendum, which will be filed with the Final License Application.

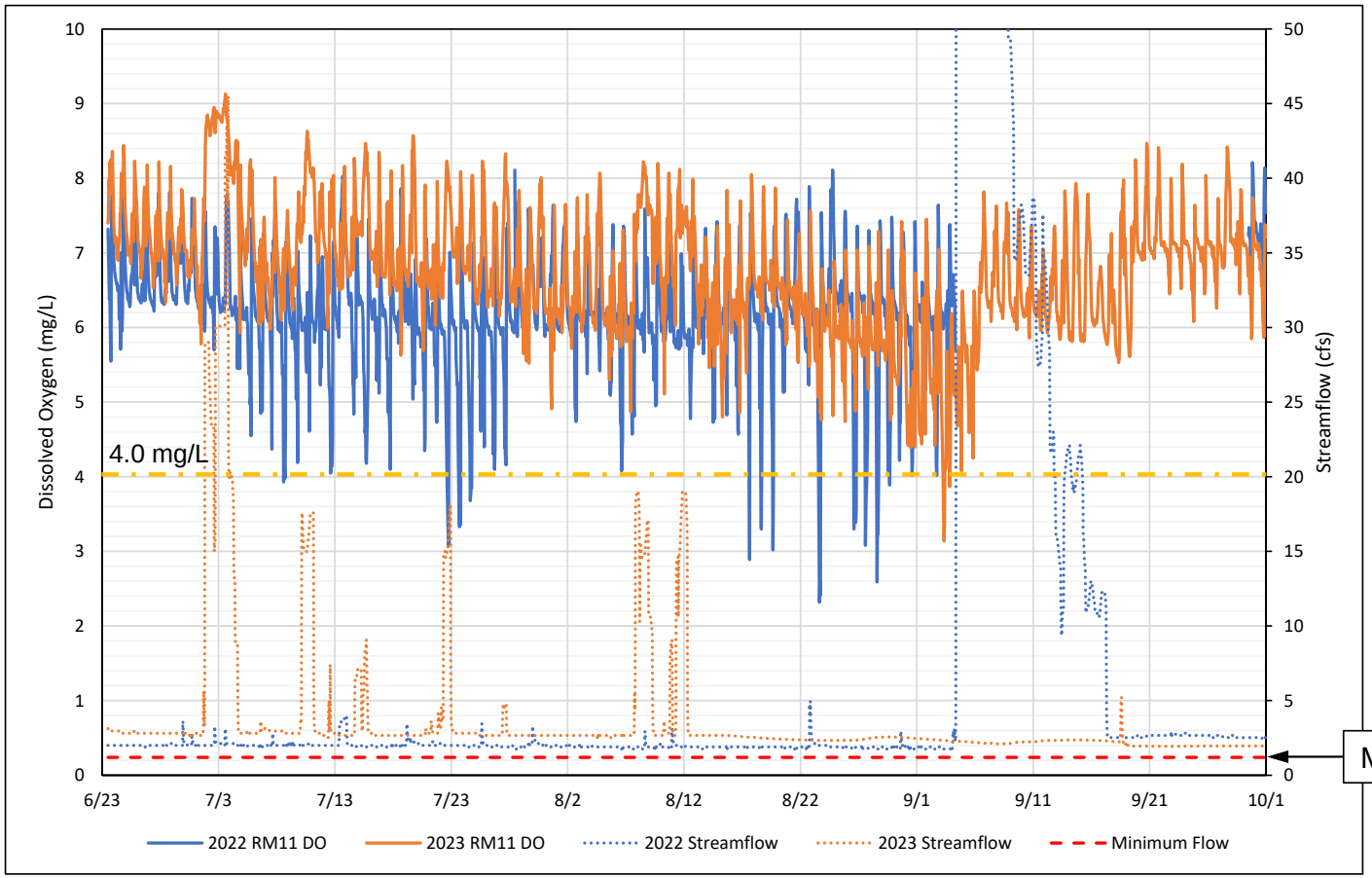
Revised Figure 3 – Heath Creek Hourly Dissolved Oxygen and Streamflow from July 2023 to September 2023



New Figure - Hourly Dissolved Oxygen and Streamflow in Heath Creek at Station RM11 in Summer 2022 and Summer 2023

Dissolved Oxygen:
- 2022 RM11
- 2023 RM11

Streamflow:
- 2022
- 2023

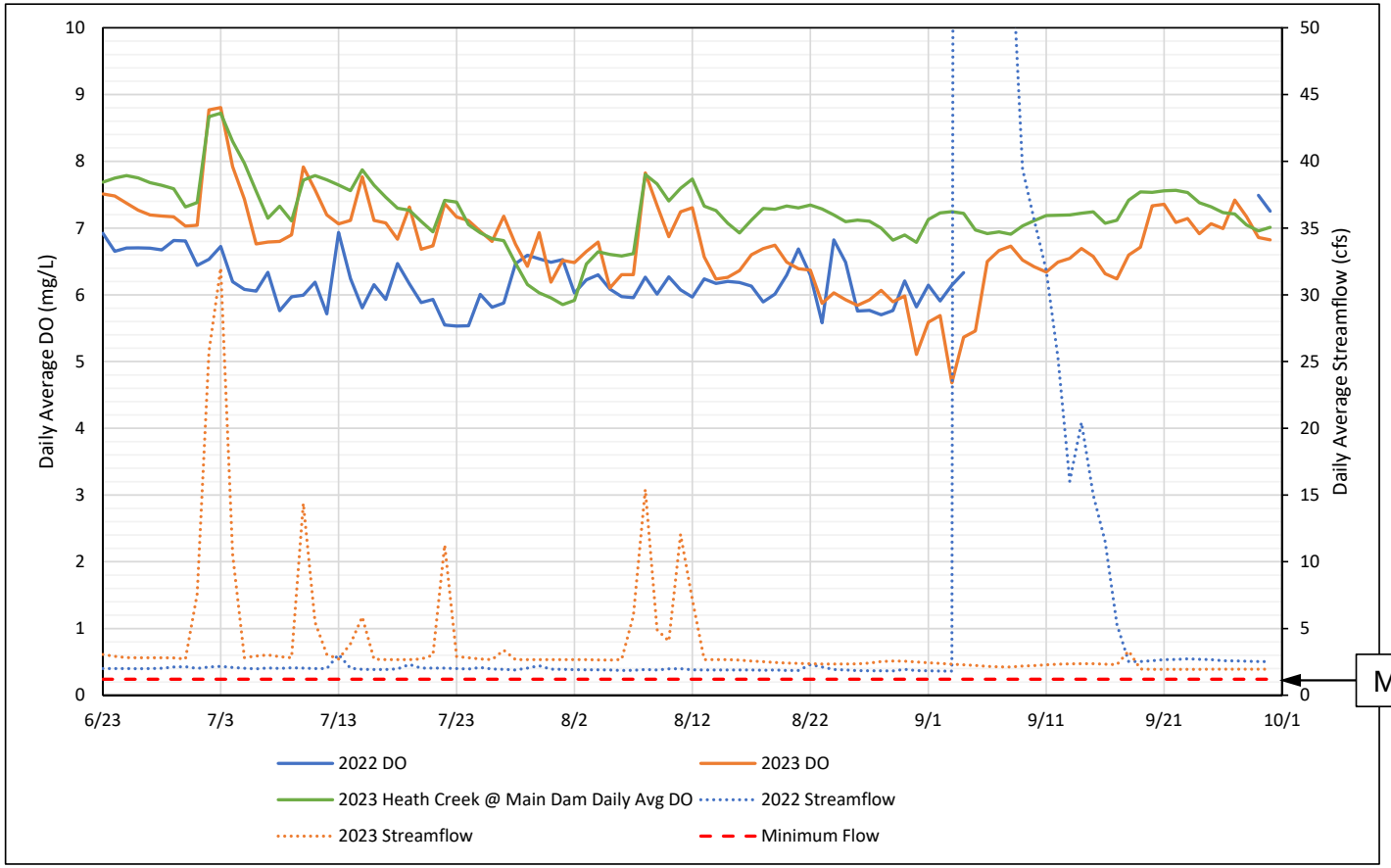


Minimum flow

New Figure – Daily Average Dissolved Oxygen and Streamflow in Heath Creek in Summer 2022 and Summer 2023

Dissolved Oxygen:
- 2022 @ RM11
- 2023 @ RM11
- 2023 @ Main Dam

Streamflow:
- 2022
- 2023



Minimum flow

Monthly Precipitation in 2022 and 2023

Month	2022	2023
May	3.96	1.45
June	1.35	3.23
July	3.29	8.30
August	3.20	3.84
September	4.91	1.09
July-August Total	6.49	12.14
Five-Month Total	16.71	17.91
Days with 0 Precip	97	108
Days with Precip > 1 in.	4	4
Days with Precip > 2 in.	1	1
Days with Precip > 3 in.	1	1

From:	McCaslin, Tyler
To:	"Bauer, Eric F"
Cc:	Steven Layman; Barrows, Christina; Jason Moak; Jones, Craig
Subject:	RE: [EXTERNAL] Informal Meeting with OPC Re. Rocky Mountain Comments
Date:	Monday, March 11, 2024 12:22:42 PM
Attachments:	image001.png image002.png 0498003 RM Water Quality Assessment 2nd Season_REVISED DRAFT_03-11-2024.pdf

---

Hi Eric,

I've attached a draft of our addendum to the water quality report in the DLA which includes findings from summer 2023.

Looking forward to our discussion, and please let us know if you have any questions.

Tyler McCaslin, PhD
Senior Environmental Specialist
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OglethorpePower

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Subject: RE: [EXTERNAL] Informal Meeting with OPC Re. Rocky Mountain Comments

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OglethorpePower

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Sent: Monday, March 11, 2024 10:34 AM
To: Jones, Craig <craig.jones@opc.com>

Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Barrows, Christina <christina.barrows@opc.com>
Subject: Re: [EXTERNAL] Informal Meeting with OPC Re. Rocky Mountain Comments

External E-Mail

Craig,

Sure, I'm free today after 2 or anytime tomorrow and Wednesday. Otherwise I'll be in other meetings or gone all of next week for a workshop but back on the 25th. Thanks!

-Eric

Eric Bauer (he/him)
Fish and Wildlife Biologist

Georgia Ecological Services

US Fish and Wildlife Service

RG Stephens, Jr. Federal Building

355 East Hancock Avenue, Room 320

Athens, GA 30601

Office: 706-535-2103

Teams: eric_bauer@fws.gov (preferred)

http://www.fws.gov/athens

Follow us on Facebook! https://www.facebook.com/GeorgiaFieldOffice

---

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Sent: Monday, March 11, 2024 10:28 AM
To: Bauer, Eric F <eric_bauer@fws.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Barrows, Christina <christina.barrows@opc.com>
Subject: [EXTERNAL] Informal Meeting with OPC Re. Rocky Mountain Comments

or responding.

Hi Eric,

Thank you for the comments on the Rocky Mountain DLA. I'm reaching out to see if we can schedule a meeting this week or early next week to discuss your comments in light of the year two DO study results? We'd like to walk through those findings with you since they may address most, if not all, of your DLA comments.

Can you give us some potential dates/times that work for you?

Best,

Craig

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From:	McCaslin, Tyler
To:	"Hedeen, David"; Zeng, Wei; Booth, Elizabeth
Cc:	Jones, Craig; Barrows, Christina; Steven Layman; Jason Moak
Subject:	RE: Rocky Relicensing Draft WQ Study Update and Meeting Request
Date:	Monday, March 11, 2024 12:58:04 PM
Attachments:	image002.png image003.png 0498003 RM Water Quality Assessment 2nd Season_REVISED DRAFT_03-11-2024.pdf

---

Hi Liz, Wei, and David,

I've attached an updated draft of the water quality addendum including additional studies performed in summer 2023 after working closely with Liz on the figures.

Please let us know if you have any questions or if we can provide any further clarification. We'd be happy to schedule a discussion if necessary.

Tyler McCaslin, PhD
Senior Environmental Specialist
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7723 **Mobile:** 404-576-9097
Email: tyler.mccaslin@opc.com **Web:** www.opc.com

From: Jones, Craig <craig.jones@opc.com>
Sent: Wednesday, January 3, 2024 7:03 PM
To: 'Hedeen, David' <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

Hi David,

Thanks for offering up the dates. Tuesday, January 16 at 1:00 p.m. will work well for all of us. I'll send a calendar invite shortly.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912

Email: craig.jones@opc.com **Web:** www.opc.com

OglethorpePower

From: Hedeen, David <david.hedeen@dnr.ga.gov>
Sent: Wednesday, January 3, 2024 4:09 PM
To: Jones, Craig <craig.jones@opc.com>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

External E-Mail

Craig – Below are times when the Liz, Wei, and I appear to have mutual availability within the next two weeks:

Thursday, January 11 – 10 AM, 11 AM, 1 PM
Tuesday, January 16 – 1 PM
Wednesday, January 17 – 11 AM, 1 PM

Would any of those times be suitable? Thank you,

David Hedeen
Manager – Wetlands Unit
Georgia Environmental Protection Division
7 Martin Luther King, Jr. Drive SW, Suite 450
Atlanta, GA 30334

david.hedeen@dnr.ga.gov
470-427-2730 (office)
678-483-2287 (cell)

From: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
Sent: Wednesday, January 3, 2024 3:39 PM
To: Jones, Craig <craig.jones@opc.com>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

I'll let David and wei set up the meeting. Thanks Liz

From: Jones, Craig <craig.jones@opc.com>
Sent: Wednesday, January 3, 2024 3:38 PM
To: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

Hi Liz,

Thanks for your quick review of the report. We are working to pull together responses to your questions and will follow up as soon as possible.

In the meantime, please let us know what dates/times this month work for you, Wei, and David, and we'll be happy set something up to review the 2023 supplemental report and the DLA information.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
Sent: Tuesday, January 2, 2024 1:32 PM
To: Jones, Craig <craig.jones@opc.com>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

I have reviewed the report. I would like to know how frequently the water quality monitors were

maintained? Could you provide the dates that the probes were switched out. Is there a possibility that there was algal growth on the DO probe that would explain the drop in DO observed at RM 11. Also, I spoke with WRD about the low pH observed that may have been a result of excess algal due to over fertilizing the reservoir. If you have them, it would be helpful, to see pictures of the dam outfall, the stream downstream of the dam, and the water quality monitor locations.

Thanks Liz

From: Jones, Craig <craig.jones@opc.com>
Sent: Tuesday, January 2, 2024 1:03 PM
To: Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: Rocky Relicensing Draft WQ Study Update and Meeting Request

Wei, David, and Liz,

Happy New Year, and I hope your holiday season went well.

As discussed last fall, I'm forwarding to you the preliminary, draft WQ assessment update that addresses DO relative to the 2023 field season. Please feel free to forward to anyone else on your team who should review. However, please note this report is still under review and subject to change, but I wanted to make sure you had it prior to the DLA comment deadline.

I'm also reaching out to see if we can schedule a meeting in the next couple of weeks, ideally before mid-January, to discuss the draft report and any questions you may have related to the DLA prior to filing comments. If you send me some possible dates/time, I'll work on our end to coordinate a meeting.

Best regards,

Craig

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

OglethorpePower

Draft Study Report Addendum

Water Quality Assessment Study Report

Rocky Mountain Pumped Storage Hydroelectric Project

(FERC No. 2725)

Prepared for:

Oglethorpe Power Corporation

Prepared by:

Kleinschmidt Associates

March 2024

Kleinschmidt

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This Study Report Addendum presents the results of water quality monitoring conducted in July-September 2023 for the Oglethorpe Power Corporation (An Electric Membership Corporation) (OPC) Water Quality Assessment Study for Federal Energy Regulatory Commission (FERC) relicensing of the Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725) (Rocky Mountain Project, the Project). These results supplement those findings provided in the Water Quality Assessment Study Report (Kleinschmidt 2023a) filed by OPC on November 17, 2023 with the Draft License Application and bring the study to a conclusion.

The Water Quality Assessment Study was conducted according to OPC's Final Study Plan for the Project distributed in August 2022 (OPC 2022; Kleinschmidt 2023a). The 1-year study included monthly water chemistry sampling at four stations and continuous monitoring of dissolved oxygen (DO) and water temperature in Heath Creek downstream of the Main Dam from June 2022 to June 2023. Based on meetings held with the Georgia Department of Natural Resources (GDNR) Environmental Protection Division, GDNR Wildlife Resources Division, and U.S. Fish and Wildlife Service in May-June 2023 regarding the preliminary study results, OPC conducted a second season of DO monitoring during July 2023-September 2023 to investigate potential causes of intermittent instances of DO concentrations falling below 4.0 milligrams per liter (mg/L) in Heath Creek.

As presented in the Water Quality Assessment Study Report (Kleinschmidt 2023a) and discussed in the agency meetings, hourly monitoring data collected in Heath Creek at station RM11 downstream of the Main Dam (Figure 1) documented several instances of DO concentrations falling below the instantaneous minimum criterion of 4.0 mg/L for short periods (1-5 hours) during July 2022 and August 2022. The deviations occurred upon the start of generation when flow releases from the Main Dam approximated or approached the continuous minimum flow of 1.2 cubic feet per second (cfs). Overall, monitoring in Heath Creek between June 2022 and October 2022 found that the daily average DO concentration was always greater than the daily average minimum criterion of 5.0 mg/L and hourly values were 4.0 mg/L or greater 98.5 percent of the time. Nevertheless, OPC proposed during the agency meetings to conduct a second season of water quality monitoring during July 2023-September 2023 to investigate potential causes of the infrequent DO deviations below 4.0 mg/L in Heath Creek downstream of the Main Dam.

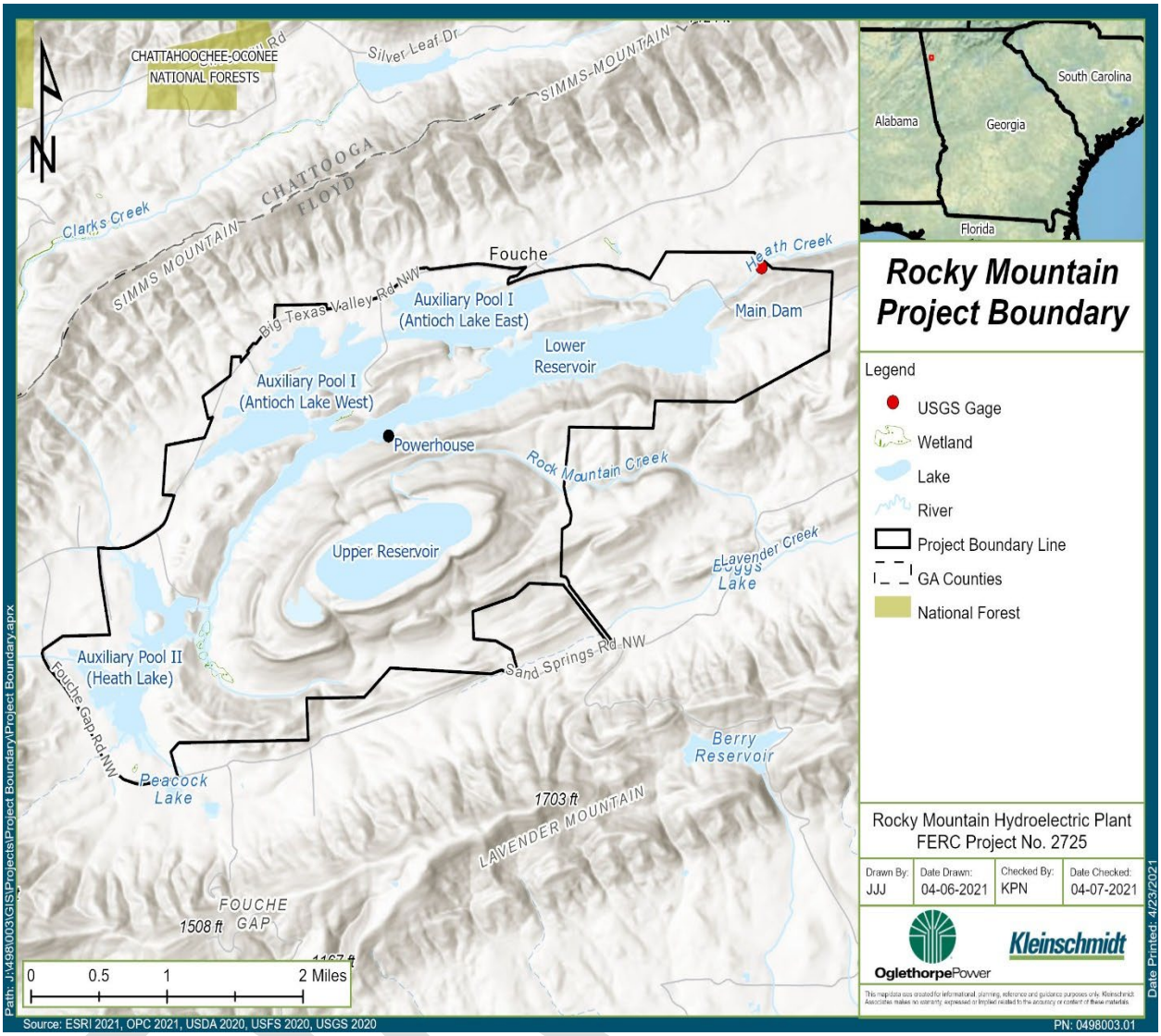


Figure 1 Project Boundary Map

2.0 OBJECTIVES AND STUDY AREA

OPC conducted targeted water quality monitoring during summer 2023 to determine the potential cause(s) of the intermittent and short-duration low-DO events observed during July 2022 and August 2022. This was accomplished using a combination of methods in Heath Creek and the Lower Reservoir as described in Section 3.0.

2.1 Objectives

The specific objectives of the second season of study during 2023 were to:

- Collect water quality data to potentially explain the mechanism(s) by which intermittent and short-duration low-DO events occur in Heath Creek, as documented during July 2022-August 2022.
- Develop water quality information sufficient for analyzing the effects of project operation and maintenance on water quality in the license application.

2.2 Study Area

The study area included the Lower Reservoir near the Main Dam and Heath Creek from the Main Dam downstream to U.S. Geological Survey (USGS) Gage No. 02388320 (Heath Creek near Armuchee, GA), located about 0.3 mile downstream of the Main Dam.

3.0 METHODOLOGY

3.1 Continuous Monitoring – Heath Creek

Hourly measurements of water temperature and DO in Heath Creek approximately 1,000 feet (ft) downstream of the Main Dam (station RM11) were continued from late June 2023 (end of first study season) through September 2023 (Figure 2). A second HOBO DO logger (Onset Computer Corp.) was deployed in Heath Creek approximately 190 ft downstream of the Main Dam[1] and set to record measurements of water temperature and DO at hourly intervals. The loggers were cleaned, downloaded, and checked for accuracy at two-week intervals. The continuous monitoring extended through September 2023 because representative data were not collected in September 2022 due to an extreme high-flow event that caused the logger to become buried in sediment. By October 2022, hourly DO values were continuously above 4.0 mg/L, ranging from 6.74 to 9.26 mg/L.

A linear stream distance of approximately 1,100 ft separated the DO logger near the Main Dam and the DO logger downstream at station RM11. To characterize potential longitudinal change in DO concentrations between these sites, DO measurements were taken at mid-depth with a YSI EXO3 sonde at numerous intervals, beginning at the dam and moving downstream, on July 13, 2023, a seasonally hot, dry summer day.

3.2 Vertical Profile Monitoring Events – Lower Reservoir

Four vertical profile monitoring events were conducted during July 2023 through September 2023 (specifically on July 12-13, August 17, September 6, and September 19) in the Lower Reservoir near the Main Dam during seasonally hot, dry weather when releases from the Main Dam approximated or approached the 1.2-cfs minimum flow. During the first event (July 12-13), a multiparameter sonde was deployed from the top of the Main Dam and suspended via rope into the reservoir at approximately the same elevation as the intake for the minimum flow pipe (El. 662 ft),[2] a depth 48.5 ft below the normal maximum pool elevation of 710.5 ft MSL. The sonde was programmed to record measurements of water temperature, DO, pH, conductivity, and turbidity at 15-minute intervals for a 24-hour period. On August 3, a third HOBO DO logger was deployed from

[1] The downstream outlet of the minimum flow pipe is about 15 ft downstream of the Main Dam. The outlet is 3 to 4 feet above the minimum tailrace pool level in Heath Creek.

[2] The inlet for the minimum flow pipe is located at 665 ft MSL. However, it draws water from the 4 ft diameter pipe with a centerline elevation of 662 ft MSL that feeds the 40-in and 10-in jet gates. Therefore, the effective intake elevation for the minimum flow intake is at approximately 662 ft MSL.

the top of the Main Dam and suspended via cable at the approximate minimum flow intake elevation. That logger was programmed to continuously record measurements of DO and water temperature at 15-minute intervals through September 30, 2023. Measurements were recorded at 15-minute intervals to provide higher-resolution characterization of DO conditions in the vicinity of the minimum flow intake over the pumping-generation cycle as the reservoir elevation changed.

Additionally, vertical profile measurements were collected using a multiparameter sonde in the Lower Reservoir near the Main Dam. Measurements of water temperature, DO, pH, conductivity, and turbidity were recorded at the surface and at 1-meter intervals down to the bottom. During each of the four events, one vertical profile was measured in the Lower Reservoir prior to the start of daily generation to represent the water column when corresponding DO values in Heath Creek were always above 4.0 mg/L in summer 2022. A second vertical profile was collected during the August 17 and September 19 monitoring events approximately 4 hours after the start of generation to represent the water column during the interval when corresponding DO values in Heath Creek tended to decline in summer 2022, sometimes below 4.0 mg/L (12 events), and then began recovering a few hours later.[3]

[3] Even if DO values in Heath Creek did not fall below 4.0 mg/L during a monitoring event, they were expected to decline during generation, and patterns of changes in the reservoir vertical profile from pre-generation to generation were likely to be informative with respect to potential sources of low-DO conditions in Heath Creek.

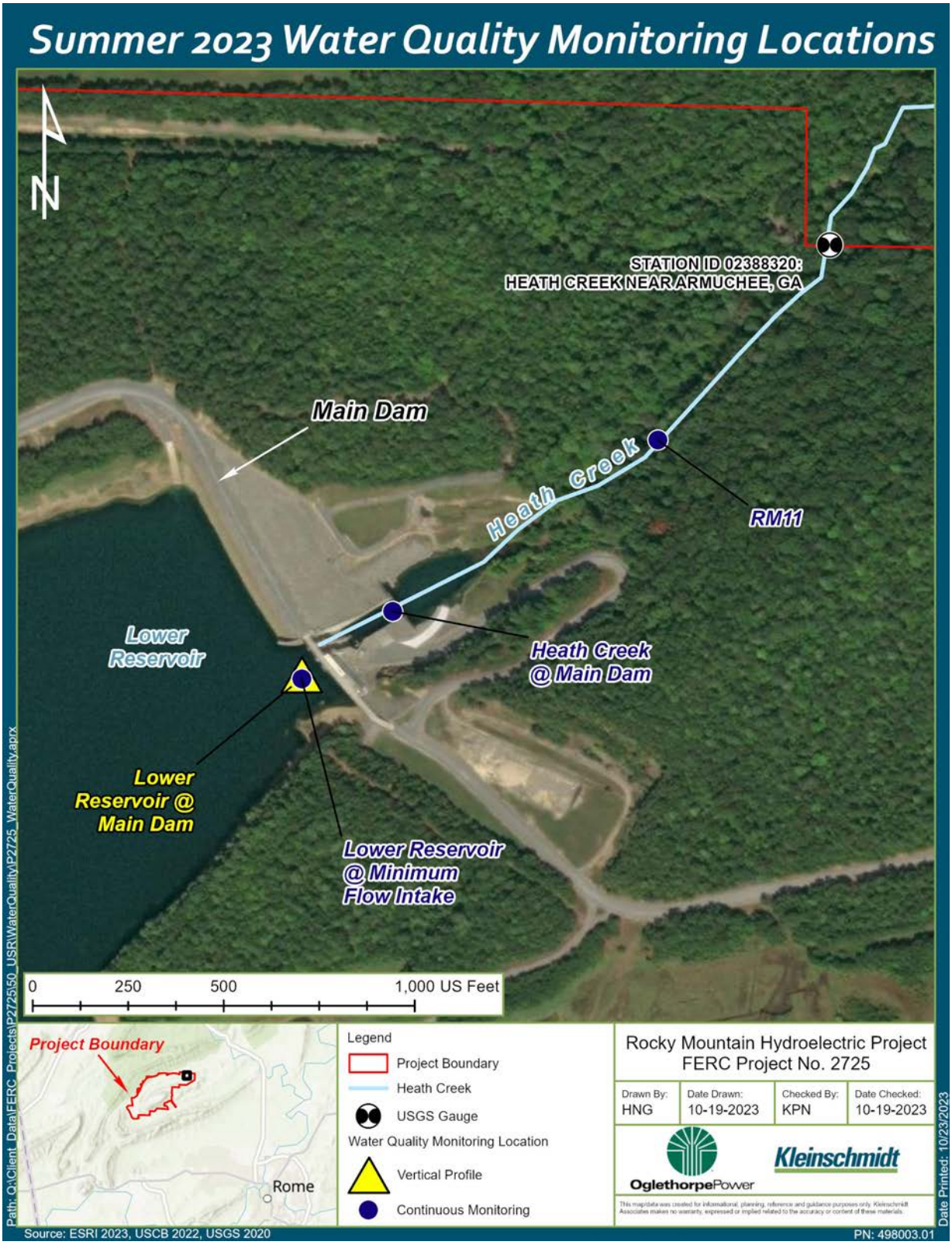


Figure 2 Water Quality Monitoring Locations

4.0 RESULTS

4.1 Continuous Monitoring – Heath Creek

Continuous monitoring at Heath Creek station RM11 showed higher average DO levels in July 2023 and August 2023 as compared to 2022 (Table 1). All hourly DO measurements recorded at RM11 from July 2023 through September 2023 were above 4.0 mg/L and all daily average DO levels were greater than 5.0 mg/L, with the exception of one date in September 2023. There were five DO measurements at RM11 on September 3, 2023 that were less than 4.0 mg/L, four of which were consecutive, occurring from 6 am to 9 am (lowest value was 3.14 mg/L at 8 am), and a single measurement of 3.87 mg/L at 8 pm. Additionally, the daily average for that day was 4.68 mg/L. During the critical period of May through October, in 2022 and 2023 combined, OPC collected a total of 6,200 hourly measurements of DO at station RM11, 99.3 percent of which were equal to or greater than 4.0 mg/L. Additionally during that same critical period, only one of 260 days that were monitored (0.4 percent) had a daily average DO concentration less than 5.0 mg/L.

Table 1 Summary of RM11 Dissolved Oxygen and Water Temperature Measurements from July to September in 2022 and 2023

Year	Month	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
		Minimum	Average	Maximum	Minimum	Average	Maximum
2023	JUL	4.91	7.18	9.13	22.64	26.24	30.32
	AUG	4.39	6.42	8.22	25.90	27.82	30.88
	SEP	3.14	6.54	8.47	23.74	26.39	29.56
2022	JUL	3.07	6.13	8.11	23.80	26.28	29.66
	AUG	2.32	6.12	8.11	26.30	27.58	30.22
	SEP	4.02	6.49	9.90	22.18	26.09	29.20

Continuous monitoring in Heath Creek approximately 190 ft downstream of the Main Dam showed slightly different results for DO when compared to RM11. DO levels at the Main Dam were consistently higher than those at downstream station RM11, with all instantaneous and daily average values greater than 4.0 and 5.0 mg/L, respectively (Table 2). A plot of hourly DO data from both Heath Creek loggers and streamflow as recorded at the USGS gage is provided in Figure 3. A plot of daily average DO data from both Heath Creek loggers and streamflow is provided in Figure 4.

Table 2 Summary and Comparison of Dissolved Oxygen and Water Temperature at Heath Creek Monitoring Sites from July 2023 to September 2023

Location	Month	Dissolved Oxygen (mg/L)			Water Temperature (°C)		
		Minimum	Average	Maximum	Minimum	Average	Maximum
Heath Creek at Main Dam	JUL	5.78	7.33	8.99	22.7	26.3	28.4
	AUG	5.47	7.05	8.05	27.0	28.2	29.7
	SEP	6.62	7.21	8.30	25.3	27.3	29.2
RM11	JUL	4.91	7.18	9.13	22.64	26.24	30.32
	AUG	4.39	6.42	8.22	25.90	27.82	30.88
	SEP	3.14	6.54	8.47	23.74	26.39	29.56

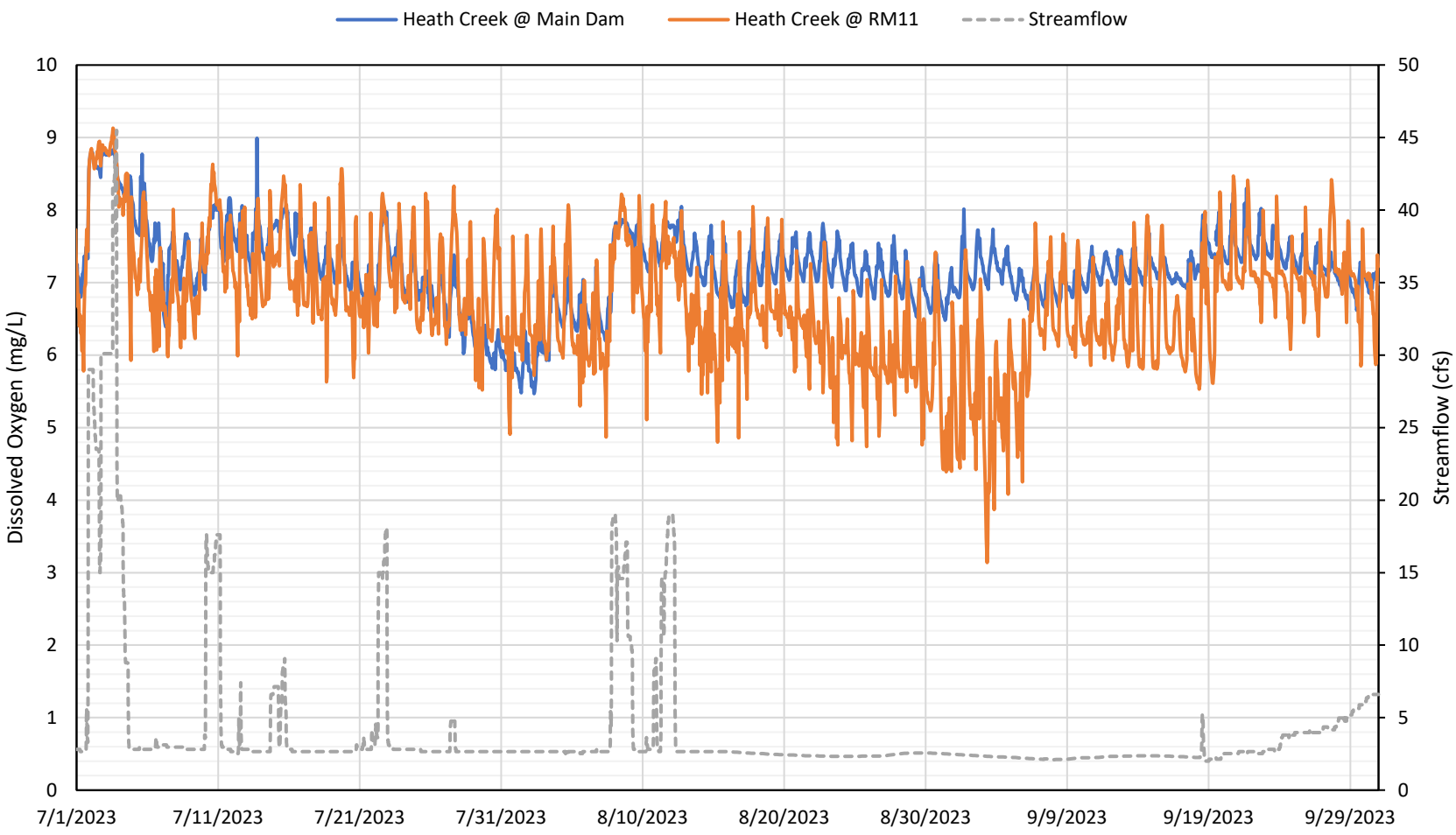


Figure 3 Heath Creek Hourly Dissolved Oxygen and Streamflow from July 2023 to September 2023

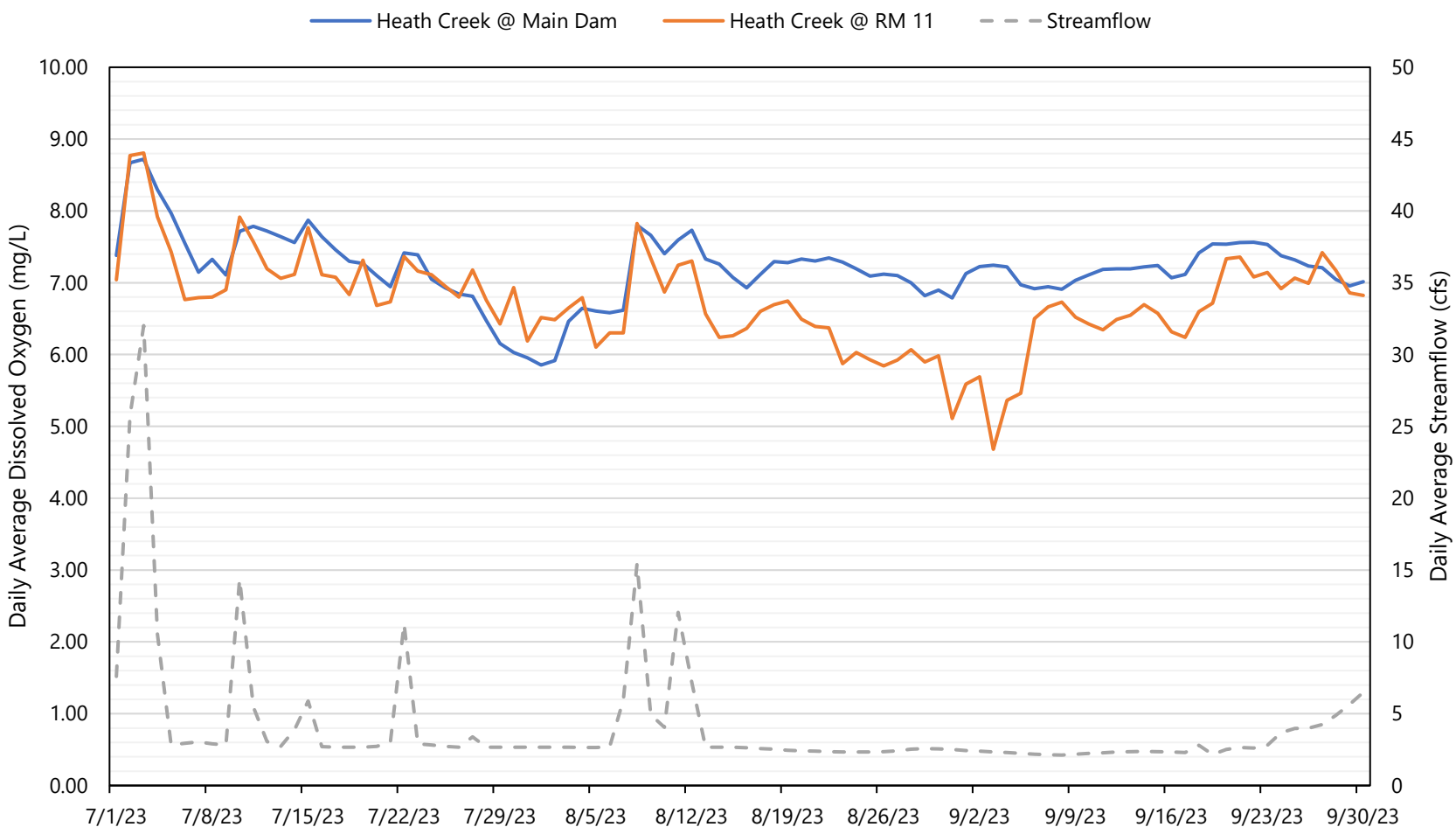


Figure 4 Heath Creek Daily Average Dissolved Oxygen and Streamflow from July 2023 to September 2023

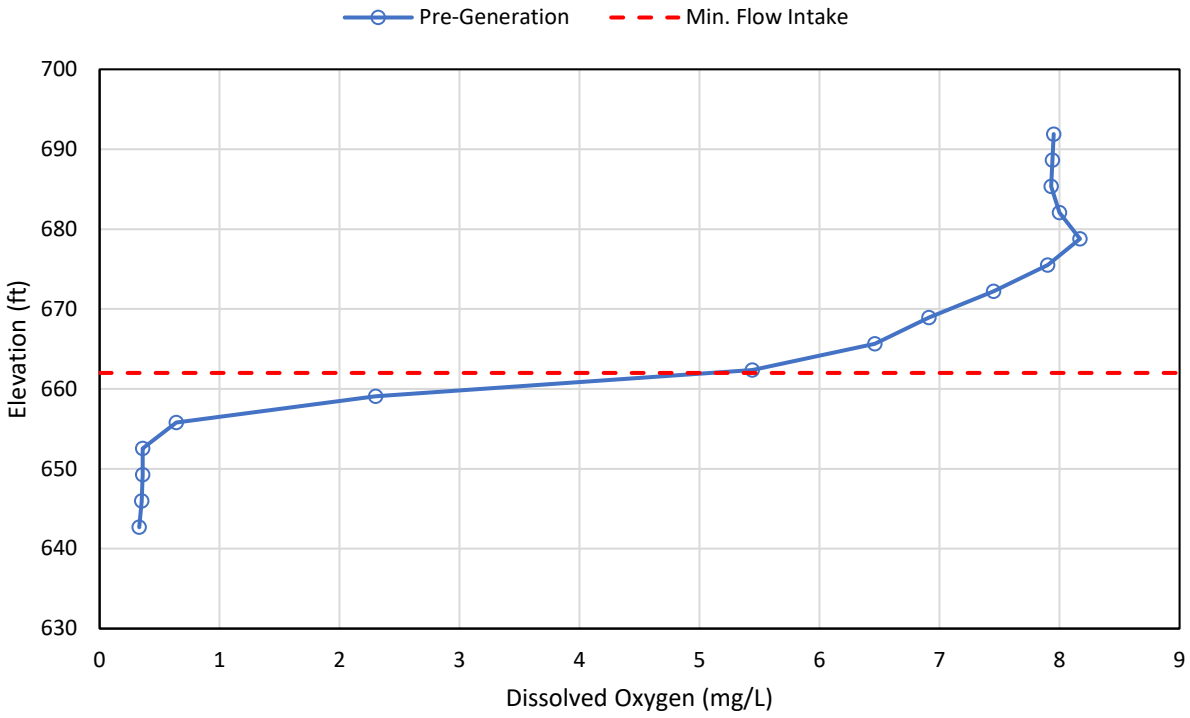
On July 13, 2023, DO concentration was measured at several locations in Heath Creek, starting at the logger located 190 ft downstream of the Main Dam and traversing downstream to the logger at station RM11. DO concentration was 7.82 mg/L at the Main Dam, increased slightly over a distance downstream of about 500 ft to the downstream end of an open pool, then decreased almost linearly with increasing distance to a concentration of 7.26 mg/L at the station RM11 logger (Table 3).

Table 3 Heath Creek Longitudinal Water Quality Measurements Collected on July 13, 2023

Distance from Main Dam (ft)	DO (mg/L)	DO % Saturation	Water Temperature (°C)
190	7.82	96.2	25.84
440	7.84	96.6	26.00
530	7.93	98.5	26.44
630	8.02	99.8	26.50
658	8.03	100.1	26.58
718	7.97	99.1	26.48
778	7.85	97.1	26.17
836	7.86	97.2	26.19
876	7.82	96.6	26.10
911	7.80	96.3	26.05
956	7.73	95.2	25.93
992	7.66	94.1	25.83
1,050	7.55	92.5	25.67
1,074	7.45	91.1	25.57
1,174	7.43	90.8	25.52
1,194	7.44	91.0	25.52
1,215	7.41	90.5	25.50
1,233	7.39	90.3	25.49
1,249	7.26	88.6	25.42

4.2 Vertical Profiles

Vertical profile measurements collected in the Lower Reservoir indicated thermal and chemical stratification, with the minimum flow inlet elevation (662 ft) being just above or within the chemocline, the reservoir layer with the steepest vertical gradient in DO concentration. DO at the minimum flow intake elevation (662 ft) was approximately 5.2 mg/L on July 13, with concentrations dropping below 1.0 mg/L at elevations less than 656 ft (Figure 5). Water temperatures ranged from 29.06 °C at the surface to 14.27 °C at the bottom. DO at the minimum flow intake elevation was approximately 4.0 mg/L on August 17 in profiles collected prior to and during generation, with levels less than 1.0 mg/L at elevations less than 658 ft (Figure 6). During the September 6 pre-generation profile, DO levels at the minimum flow intake elevations were approximately 6.0 mg/L and 2.53 mg/L at an elevation of 659.1 ft (Figure 7). DO at the minimum flow intake elevation was approximately 6.1 mg/L on September 19 in profiles collected prior to and during generation, and 2.1 mg/L at an elevation of 657 ft (Figure 8). As indicated by these vertical profiles, DO concentrations at elevations 3 to 6 ft below the minimum flow inlet elevation were less than 1.0 to 3.0 mg/L.



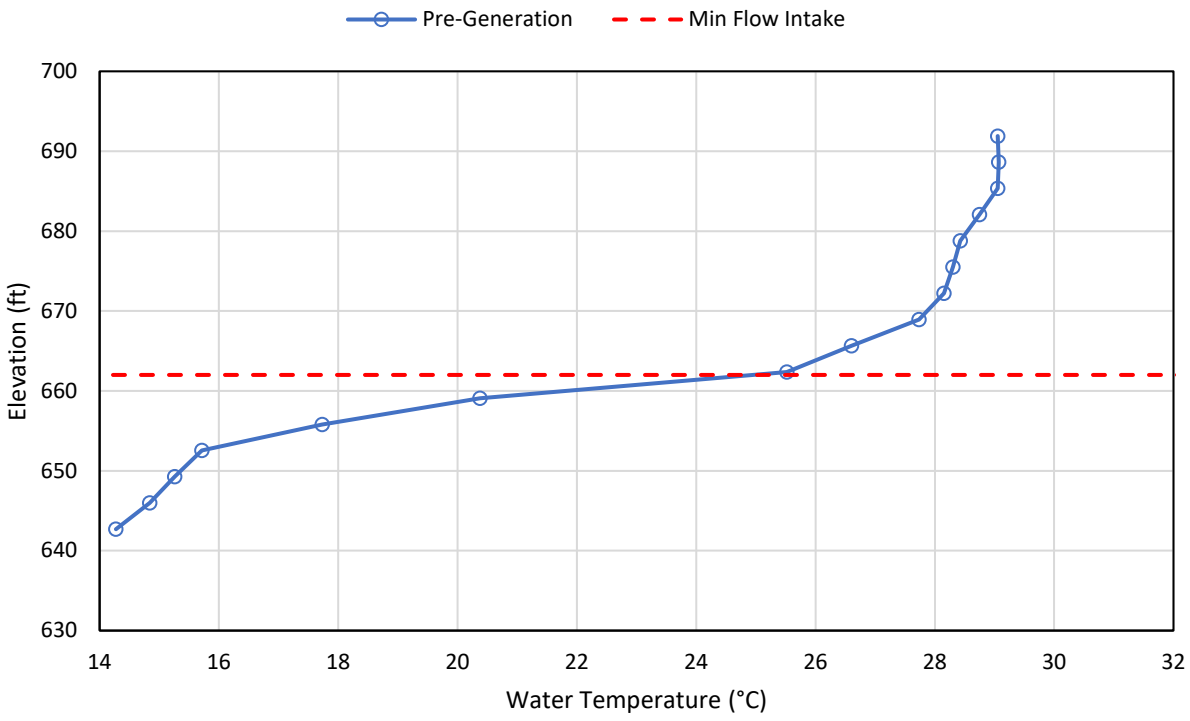
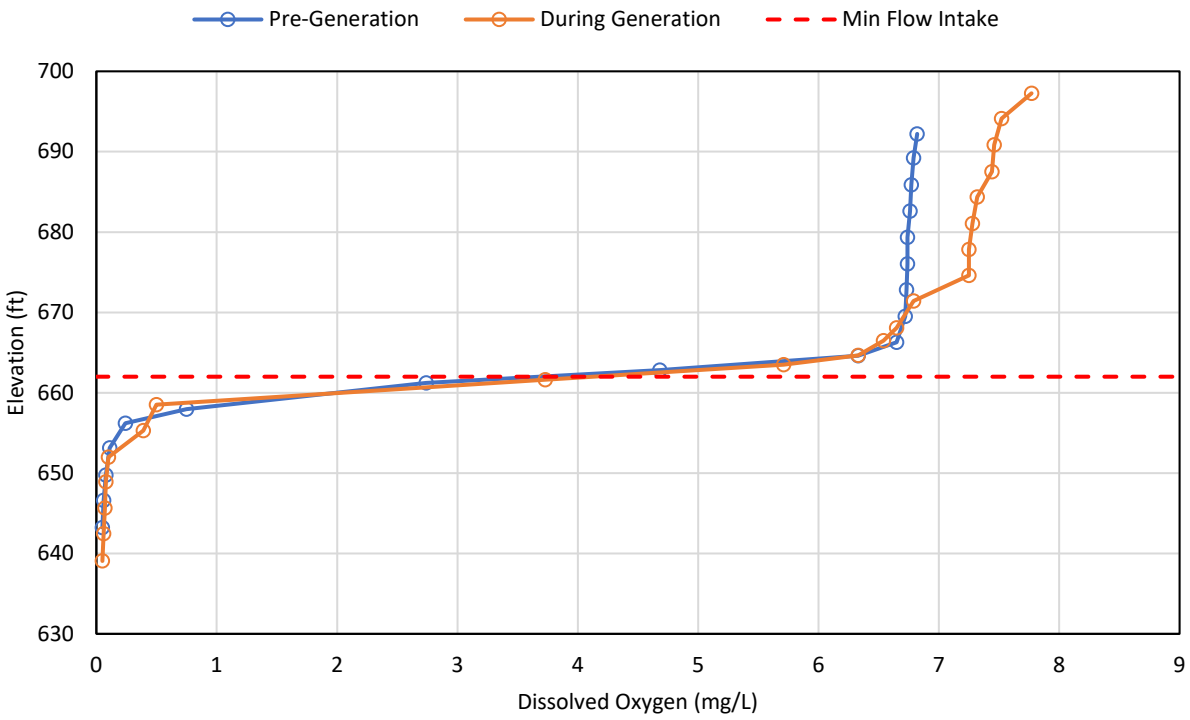


Figure 5 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on July 13, 2023



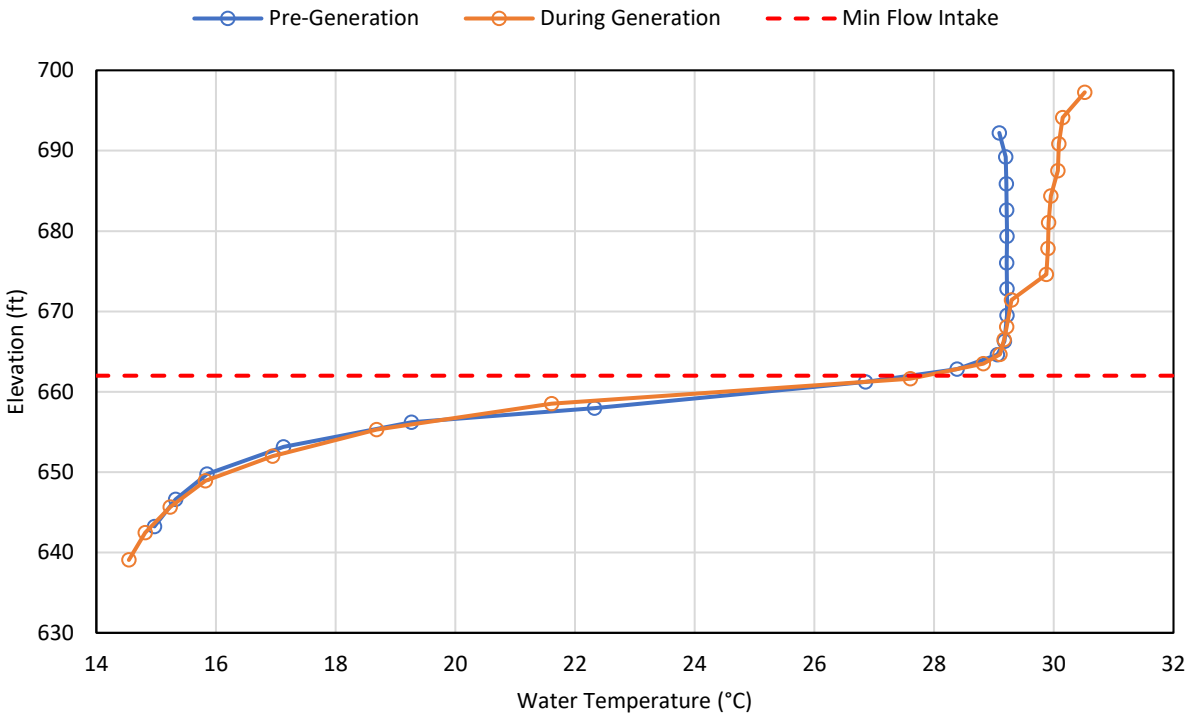


Figure 6 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on August 17, 2023

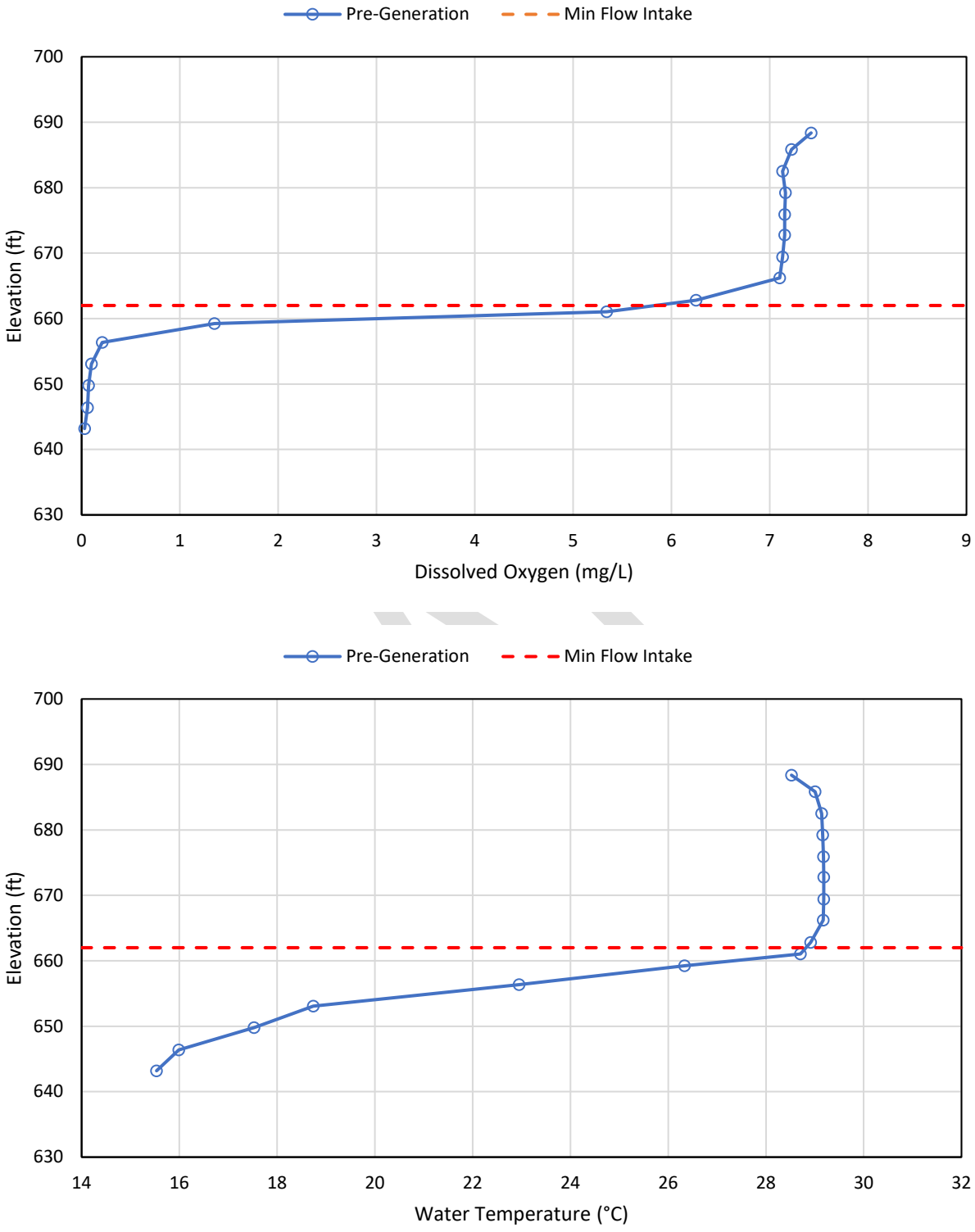
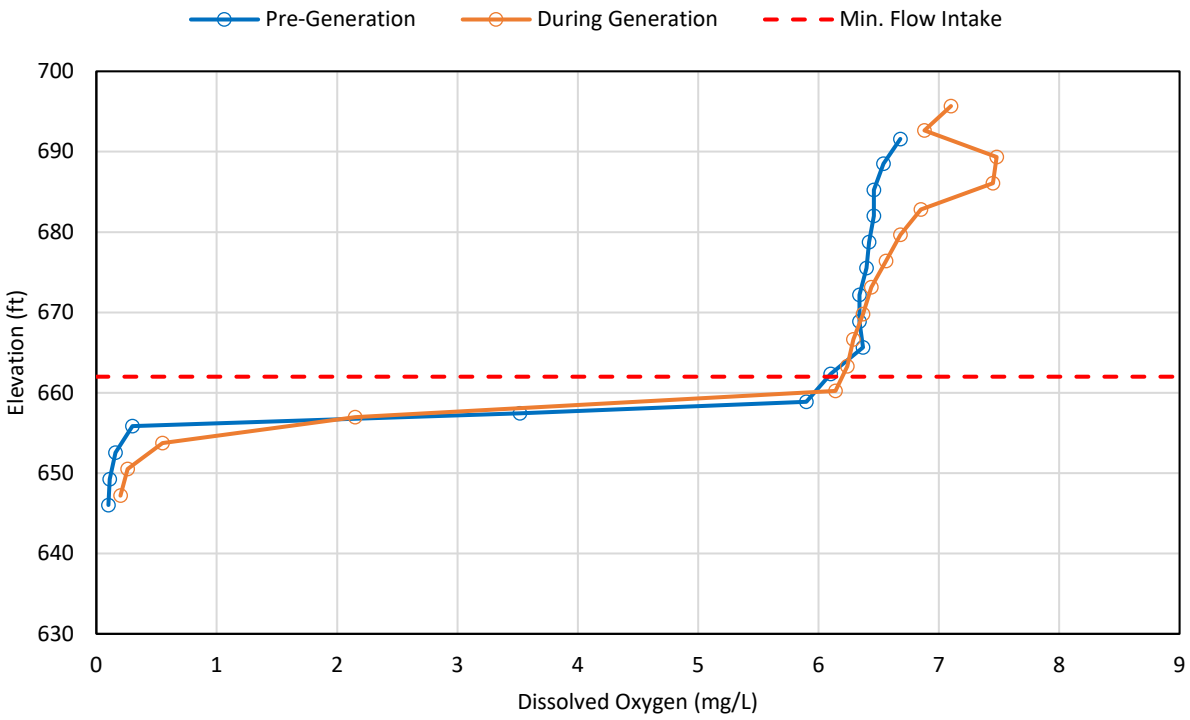


Figure 7 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on September 6, 2023



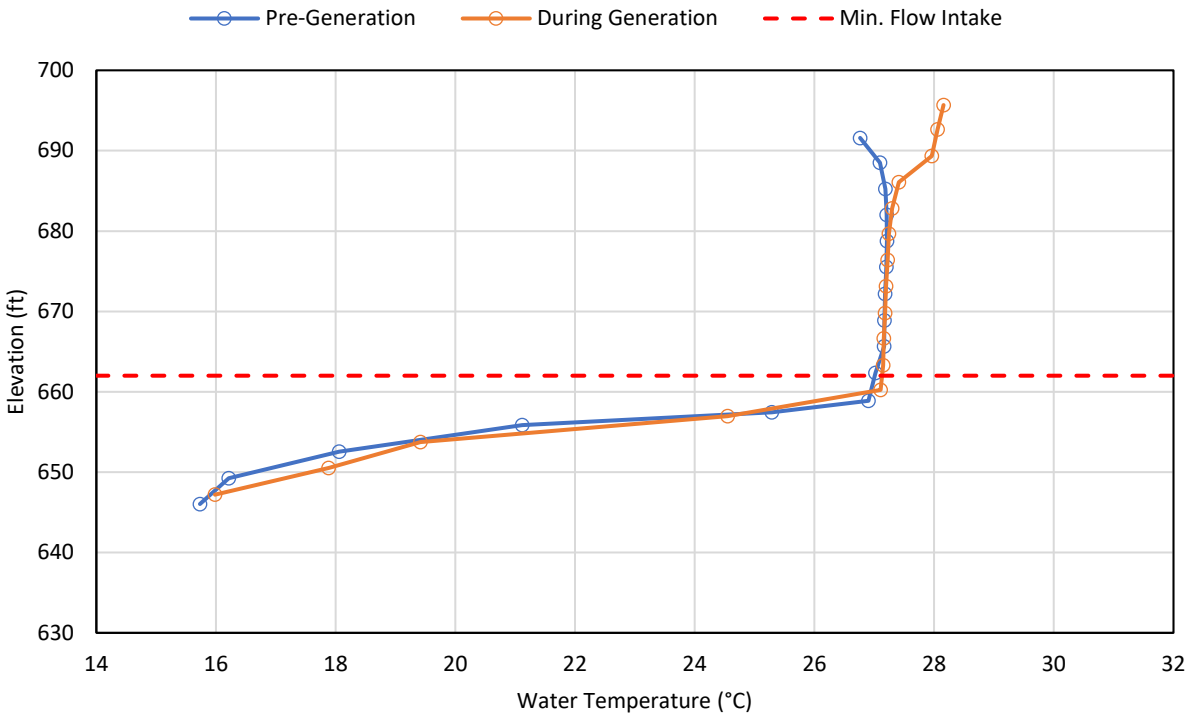


Figure 8 Vertical Profiles of Dissolved Oxygen and Water Temperature in the Lower Reservoir on September 19, 2023

4.3 Minimum Flow Intake Monitoring

DO at the minimum flow intake elevation was monitored for a 24-hour period between July 12, 2023 and July 13, 2023. During that monitoring event, DO levels at the intake elevation prior to generation ranged between 5.31 and 7.00 mg/L. DO levels began to decline approximately 3.5 hours after generation began, dropping from 6.56 mg/L to a low of 4.41 mg/L (Figure 9). However, during the same period, DO levels in Heath Creek immediately below the Main Dam remained above 7.0 mg/L.

Data collected by the logger deployed in the Lower Reservoir at the minimum flow intake elevation from August 3, 2023 to September 30, 2023 showed a continuing trend of DO levels dropping after generation began and recovering after brief periods. During this monitoring period, DO levels in Heath Creek at the Main Dam consistently remained near or above 7.0 mg/L. Charts depicting Lower Reservoir water surface elevations and DO levels at the minimum flow intake and in Heath Creek at the Main Dam are provided in Figure 10 through Figure 17. These results indicate that the minimum flow release at the Main Dam becomes aerated as it falls from the discharge pipe to the stream and meets the applicable water quality standards for DO.

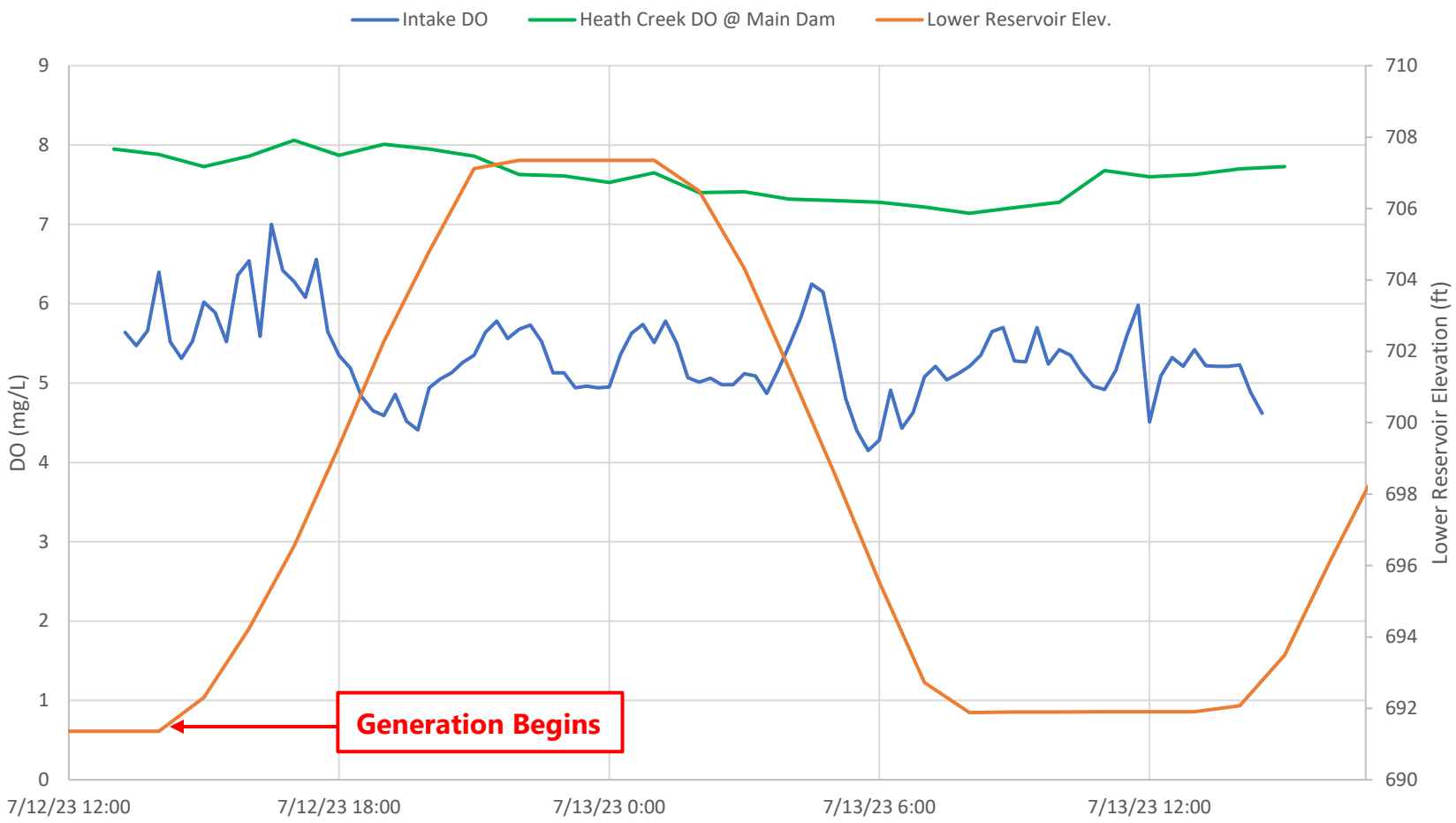


Figure 9 Minimum Flow Intake Monitoring Data – July 12-13, 2023

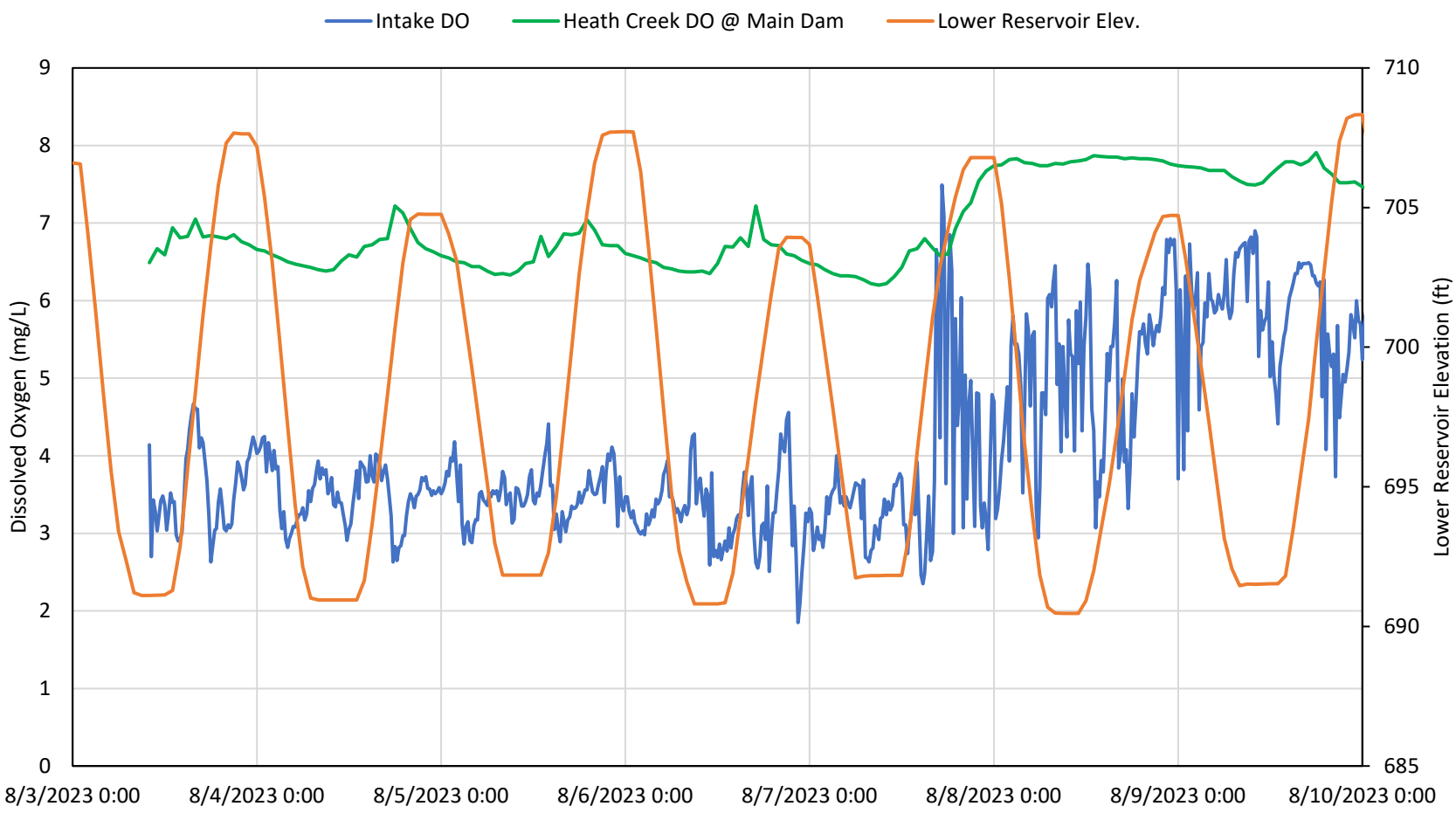


Figure 10 Minimum Flow Intake Monitoring Data – August 3-10, 2023

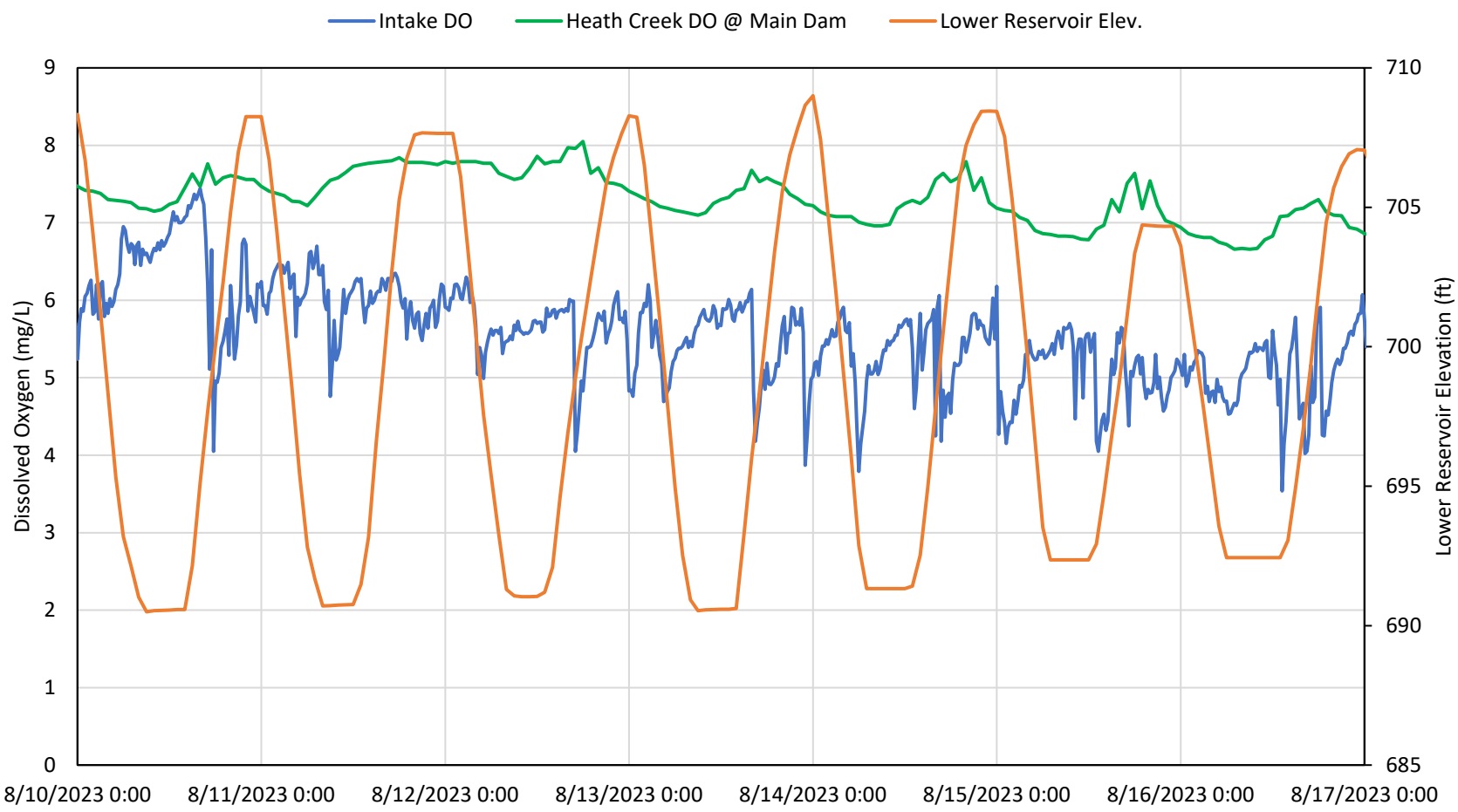


Figure 11 Minimum Flow Intake Monitoring Data – August 10-17, 2023

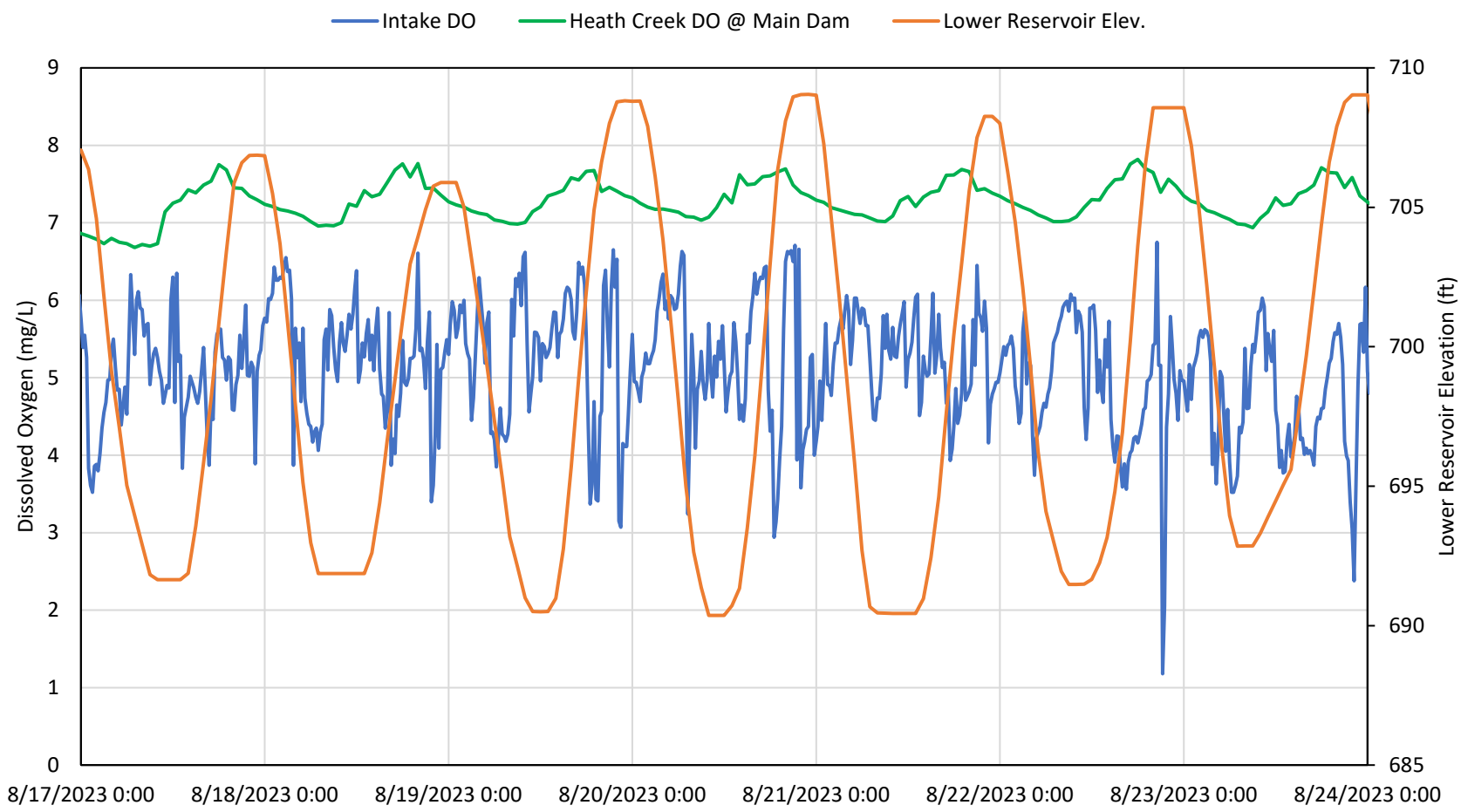


Figure 12 Minimum Flow Intake Monitoring Data – August 17-24, 2023

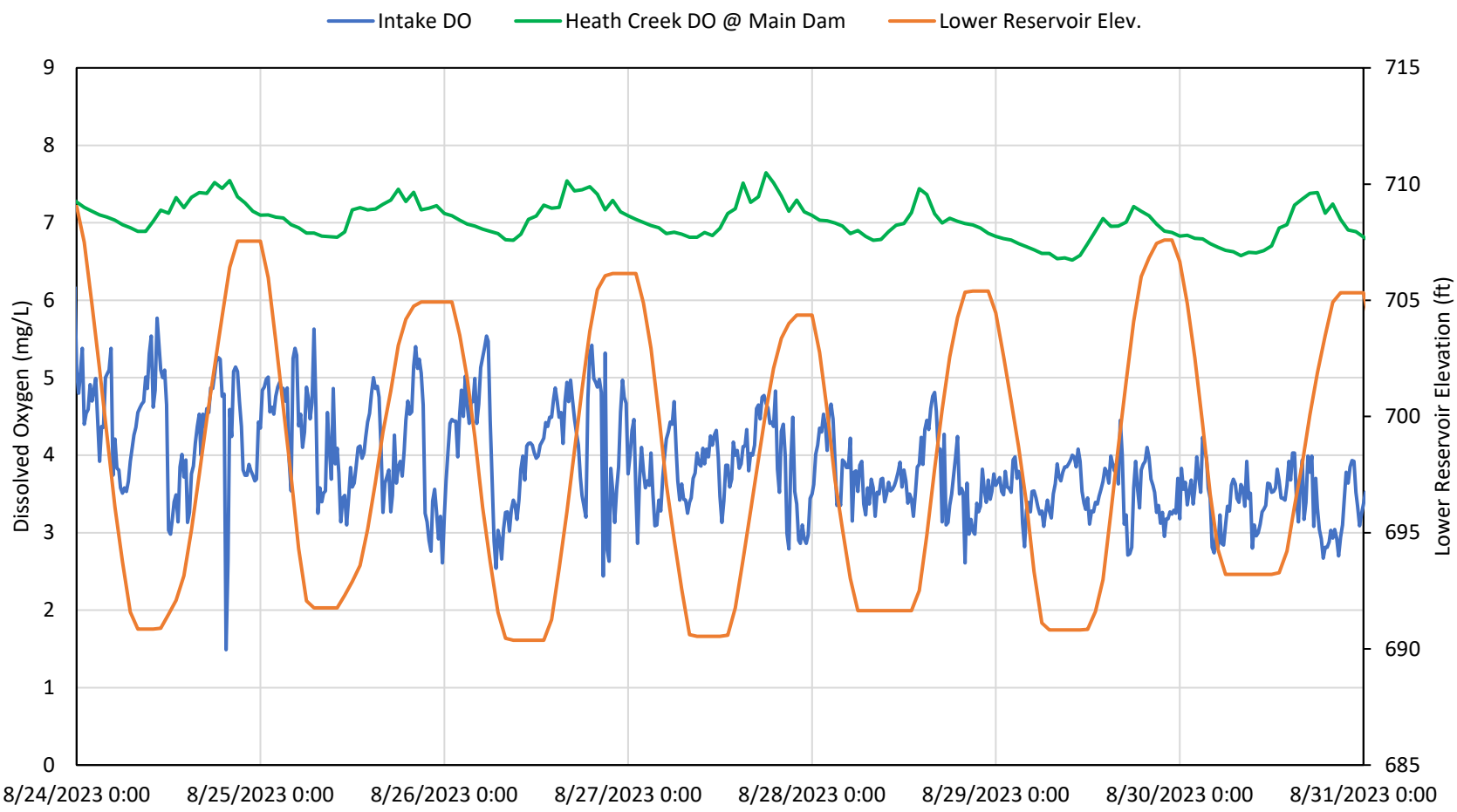


Figure 13 Minimum Flow Intake Monitoring Data – August 24-31, 2023

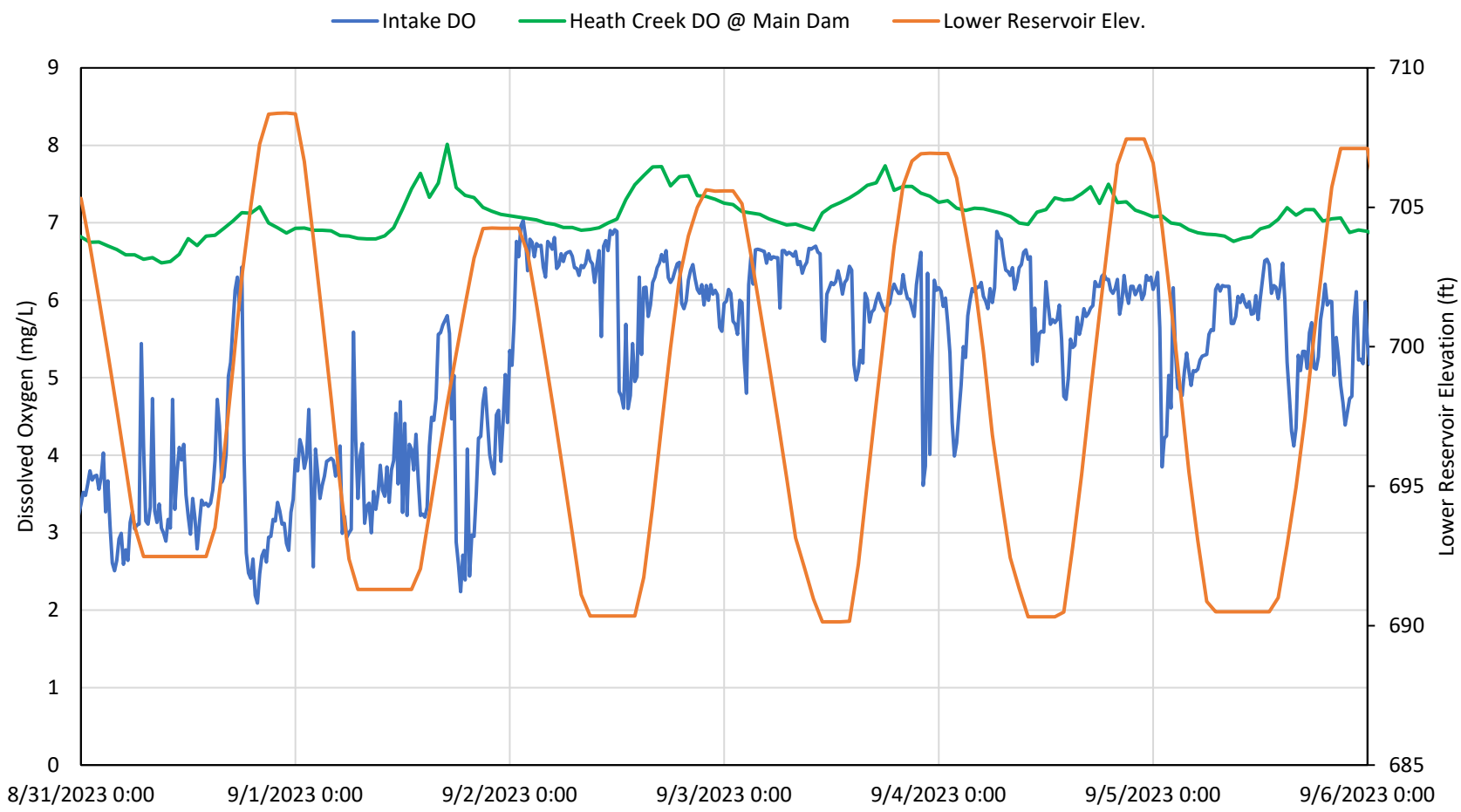


Figure 14 Minimum Flow Intake Monitoring Data – August 31-September 6, 2023

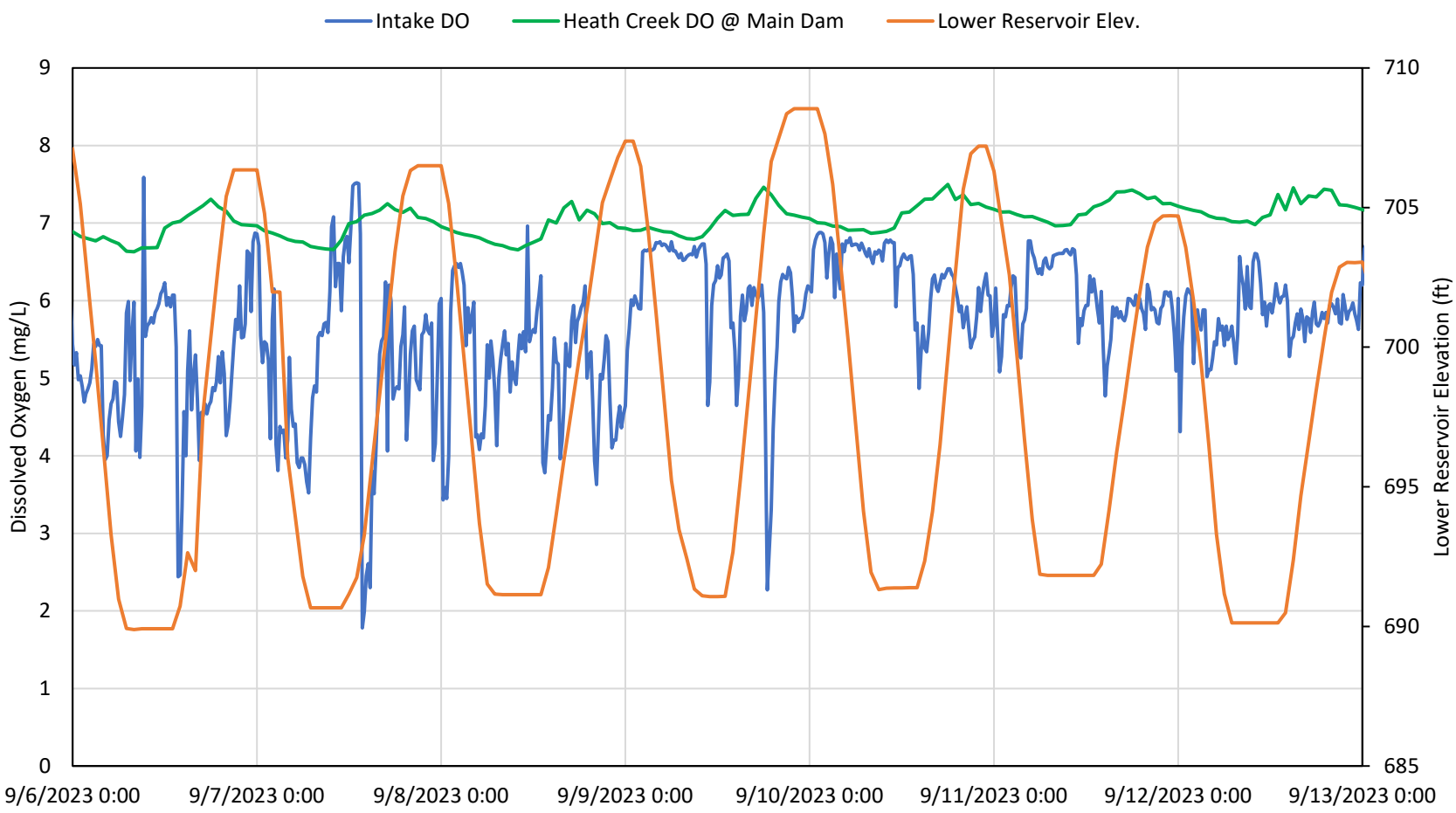


Figure 15 Minimum Flow Intake Monitoring Data – September 6-13, 2023

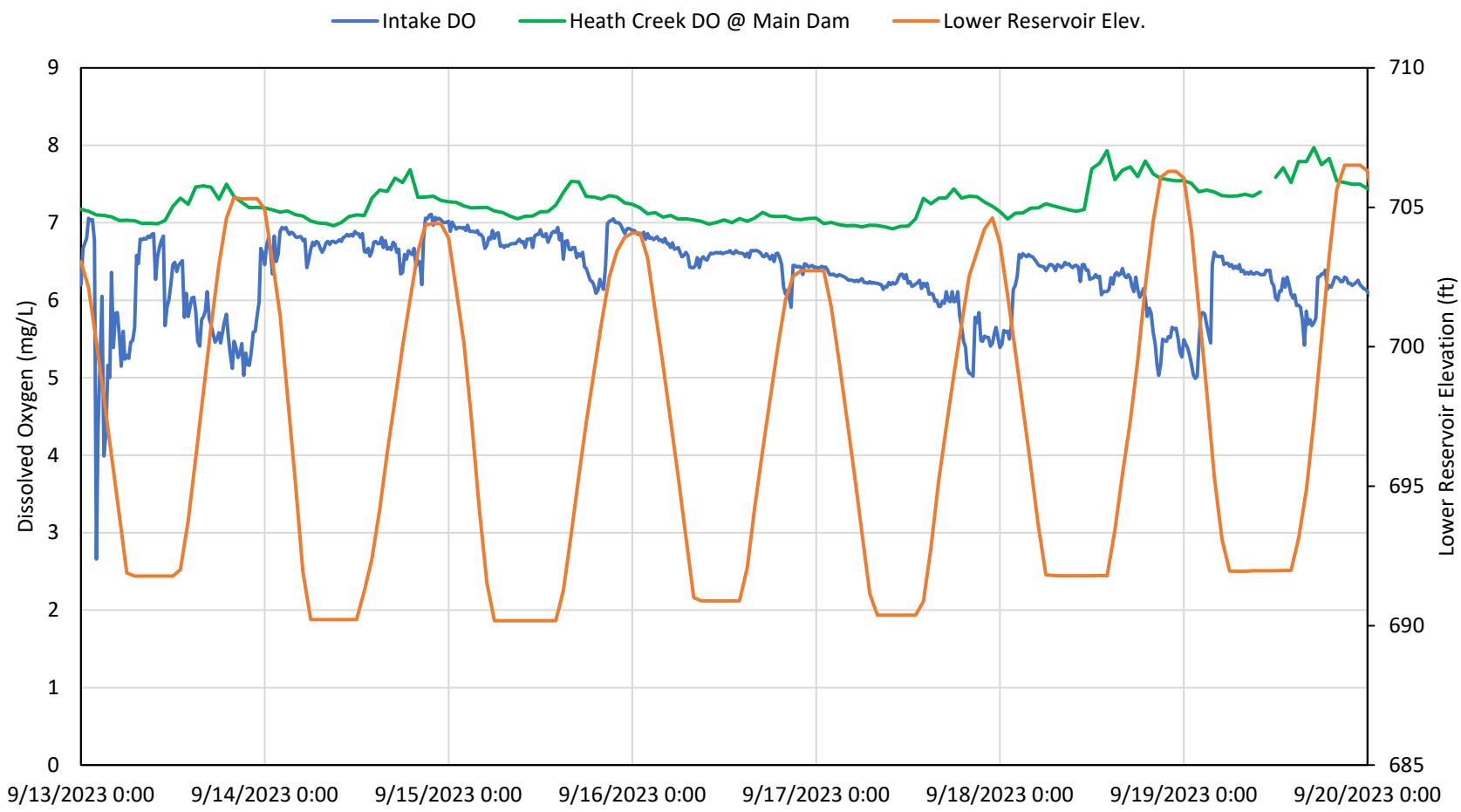


Figure 16 Minimum Flow Intake Monitoring Data – September 13-20, 2023

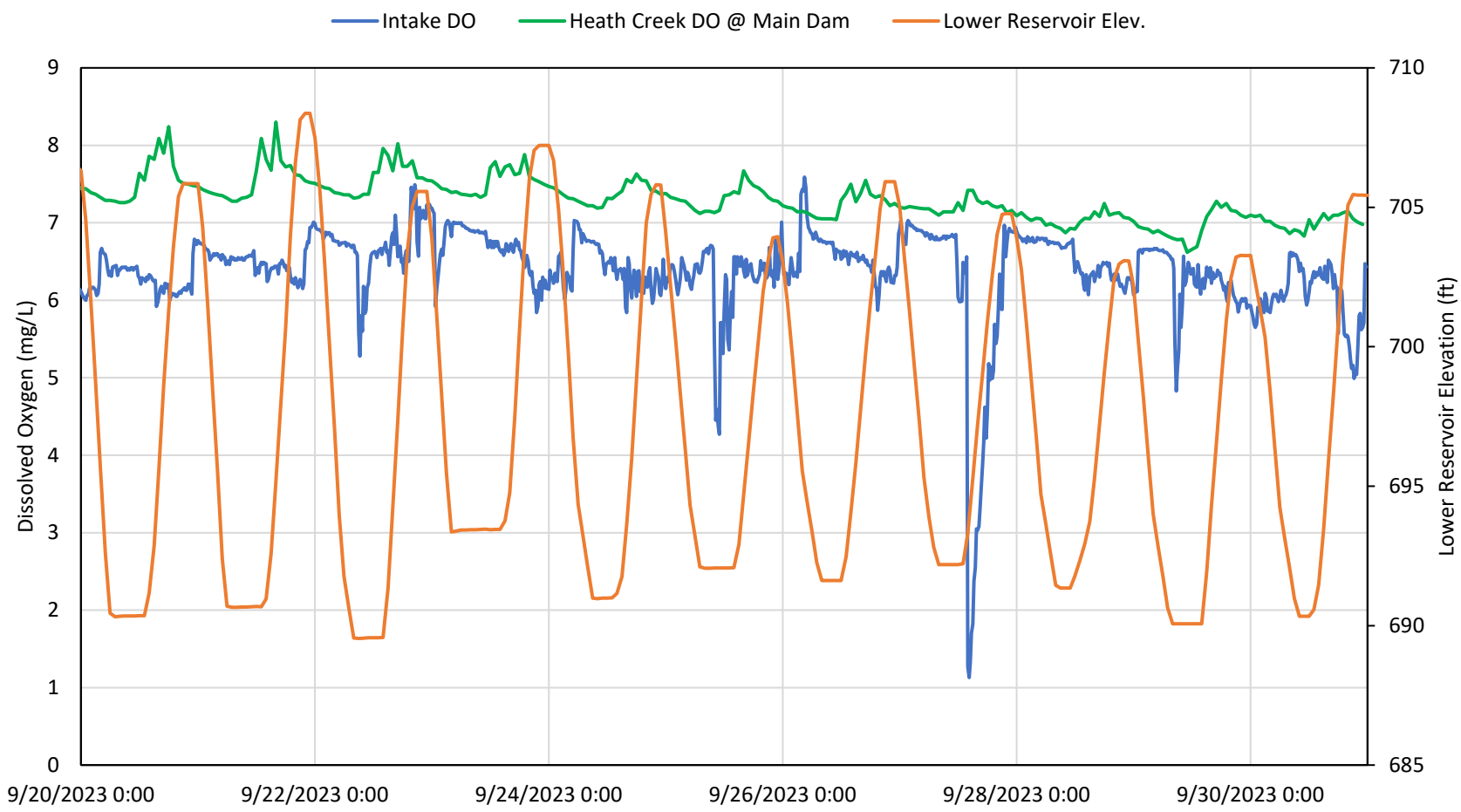


Figure 17 Minimum Flow Intake Monitoring Data – September 20-30, 2023

5.0 DISCUSSION

In 2022, there were 12 events when DO levels fell below 4.0 mg/L in Heath Creek at station RM11, although no days had a daily average DO of less than 5.0 mg/L. Those events appeared to be correlated with rising water surface elevations in the Lower Reservoir associated with the onset of generation.

Vertical profiles collected in the Lower Reservoir at the Main Dam in summer 2023 show that DO levels just below the minimum flow intake elevation, at depths greater than 48.5 ft below the normal maximum pool elevation, were very low, which is typical of southeastern reservoirs. Continuous monitoring showed that DO levels at the minimum flow intake elevation decreased in association with rising Lower Reservoir levels at the onset of generation. However, in 2023, there were only 2 events on the same day, September 3, when DO levels fell below 4.0 mg/L and the daily average DO was less than 5 mg/L at Heath Creek station RM11. Those events did not appear to be correlated with rising Lower Reservoir water levels. In fact, DO levels measured by the logger in Heath Creek just below the Main Dam remained at or above 7.0 mg/L during the same period due to aeration of the release and met the applicable water quality standards for DO.

Heath Creek below the Main Dam met the applicable DO water quality standards 100 percent of the time during the summer 2023 monitoring period, despite DO values in the Lower Reservoir at the elevation of the minimum flow intake falling below 4.0 mg/L on numerous occasions (Figures 10-17). This consistent trend indicated significant, constant aeration of the minimum flow release in falling several feet from the outlet into Heath Creek, which appears representative of the aeration provided by the minimum flow outlet during summer. The minimum hourly DO value reported below the Main Dam in July-September 2023 was 5.47 mg/L, while the monthly average values ranged from 7.05 to 7.33 mg/L (Table 2).

Throughout the summer 2023 continuous monitoring period, minimum instantaneous and daily average DO concentrations in Heath Creek just below the Main Dam trended higher than those at downstream station RM11 (Table 2, Figures 3 and 4). Figure 18 shows higher daily average DO values in Heath Creek below the Main Dam in 2023 than at RM11 in summer 2022 and summer 2023, especially in August to early September 2023. The longitudinal profile collected in Heath Creek on July 13, 2023, showed that DO concentration decreased by 0.77 mg/L over a downstream distance of approximately 600

ft (Table 3). The project area is known to have karst geology, with several springs occurring near the Main Dam. Natural groundwater inflow therefore likely influences lower summer DO levels downstream at station RM11, assuming the DO concentration of the groundwater is lower than surface waters.

The physical habitat evaluation performed in Heath Creek downstream of the Main Dam during the Aquatic Resources Study (station HC-1) observed patches of groundwater inflow on the bottom of deeper pools in the upper section of the survey reach near the Main Dam (Kleinschmidt 2023b). Preconstruction geologic investigations identified several small springs on or near the Main Dam south abutment that drain toward Heath Creek (Harza Engineering Company 1990). According to these investigations, karst aquifers in the Lower Reservoir area are characterized primarily by diffuse flow through limestone fractures and pores as opposed to conduit-like flow. Other springs occur nearby in the project area, as indicated by preconstruction investigations and the USGS hydrographic map, including Buffington Spring in the northern floodplain of Heath Creek downstream of the USGS gage.

The low-DO events previously reported in July and August 2022 at station RM11 (Kleinschmidt 2023a) occurred during a period when flows in Heath Creek were low for a prolonged period, ranging from 1.77 to 2.39 cfs at the USGS gage. Similarly, the low-DO event at RM11 on September 3, 2023 occurred under dry conditions when Heath Creek flows averaged 2.31 to 2.36 cfs. Figure 19 plots hourly DO at station RM11 and streamflow for summer 2022 and summer 2023 showing that lower DO values occurred during prolonged low-flow periods. Given that DO values in Heath Creek at the Main Dam ranged from 6.91 to 7.74 mg/L (7.24 mg/L average) on September 3, 2023, while DO values at station RM11 ranged from 3.14 to 6.25 mg/L (4.68 mg/L average) on the same day, diffuse groundwater inflow along the streambed most likely explains the pronounced decrease in DO over such a short distance. The loggers at both stations were serviced every two weeks, were found to be within calibration specifications, and were free of biofouling. Monthly water chemistry samples collected at station RM11 in July and August 2022 as part of the first year of monitoring (Kleinschmidt 2023a) had 5-day biochemical oxygen demand (BOD5) values below the detection limit, ruling out BOD as a potential causative factor.

Additionally, summer DO conditions at station RM11 appear to be related to precipitation and its effect on streamflow and not project operations. Precipitation data from the nearby Richard B. Russell Airport (6 miles east of the Project) were obtained from the

National Oceanic and Atmospheric Administration (NOAA 2024) and plotted versus streamflow for 2022 and 2023 in Figure 20 and Figure 21, respectively. These figures demonstrate how lack of precipitation resulted in low, stable to steadily decreasing streamflows that preceded the DO excursions at RM11 in July-August 2022 and early September 2023.

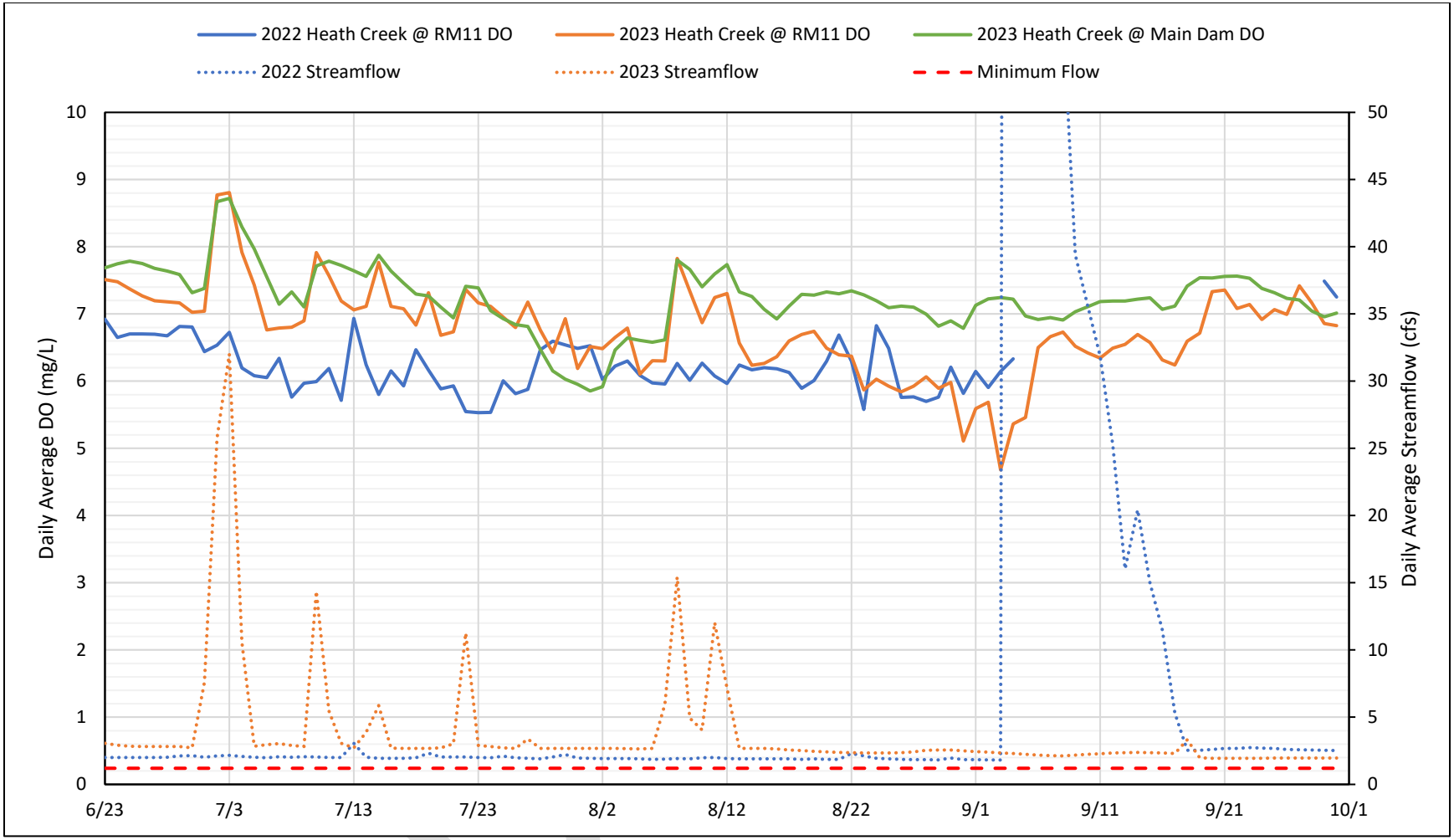


Figure 18 Daily Average Dissolved Oxygen and Streamflow in Heath Creek in Summer 2022 and Summer 2023

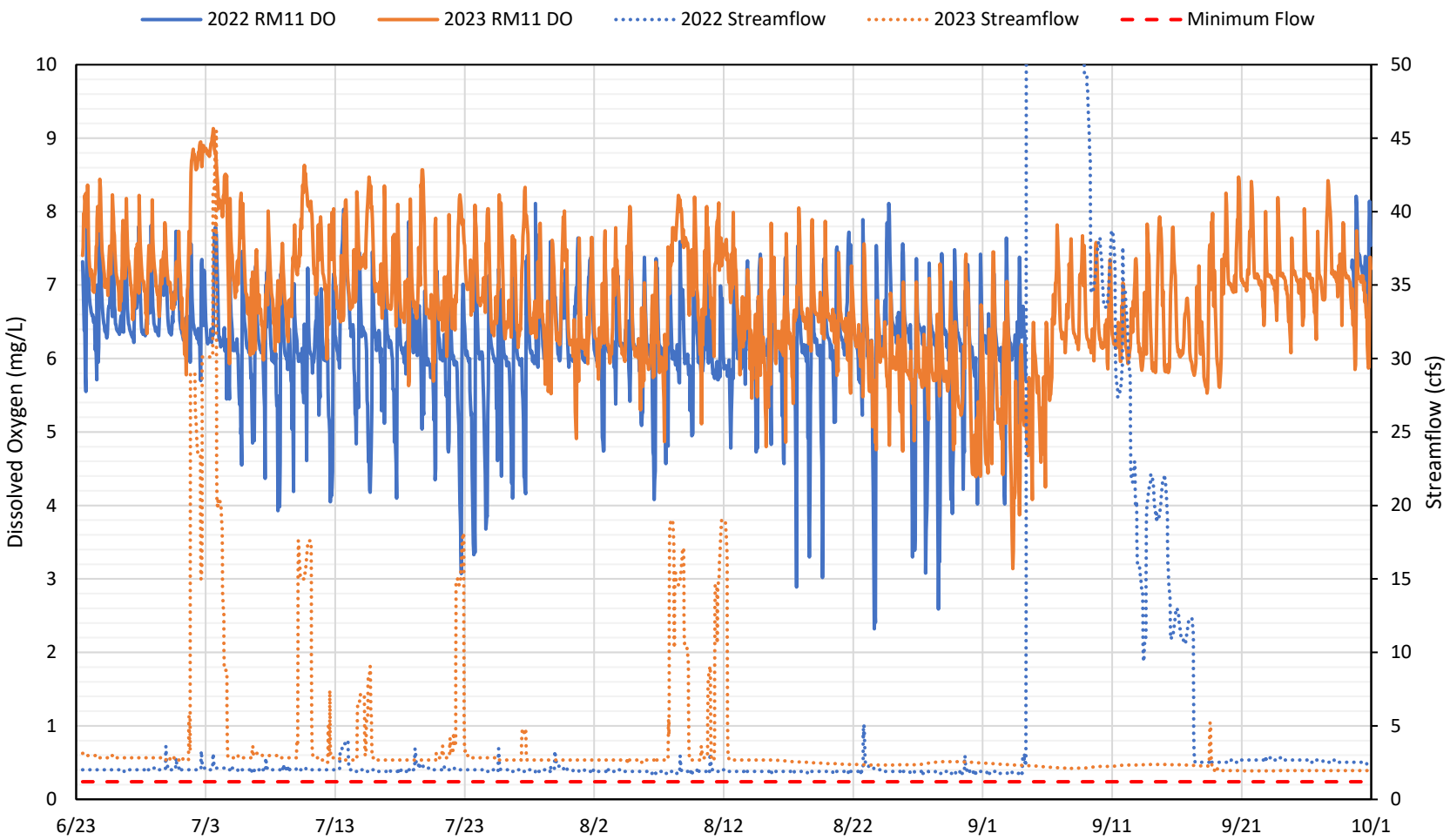


Figure 19 Hourly Dissolved Oxygen and Streamflow in Heath Creek at RM11 in Summer 2022 and Summer 2023

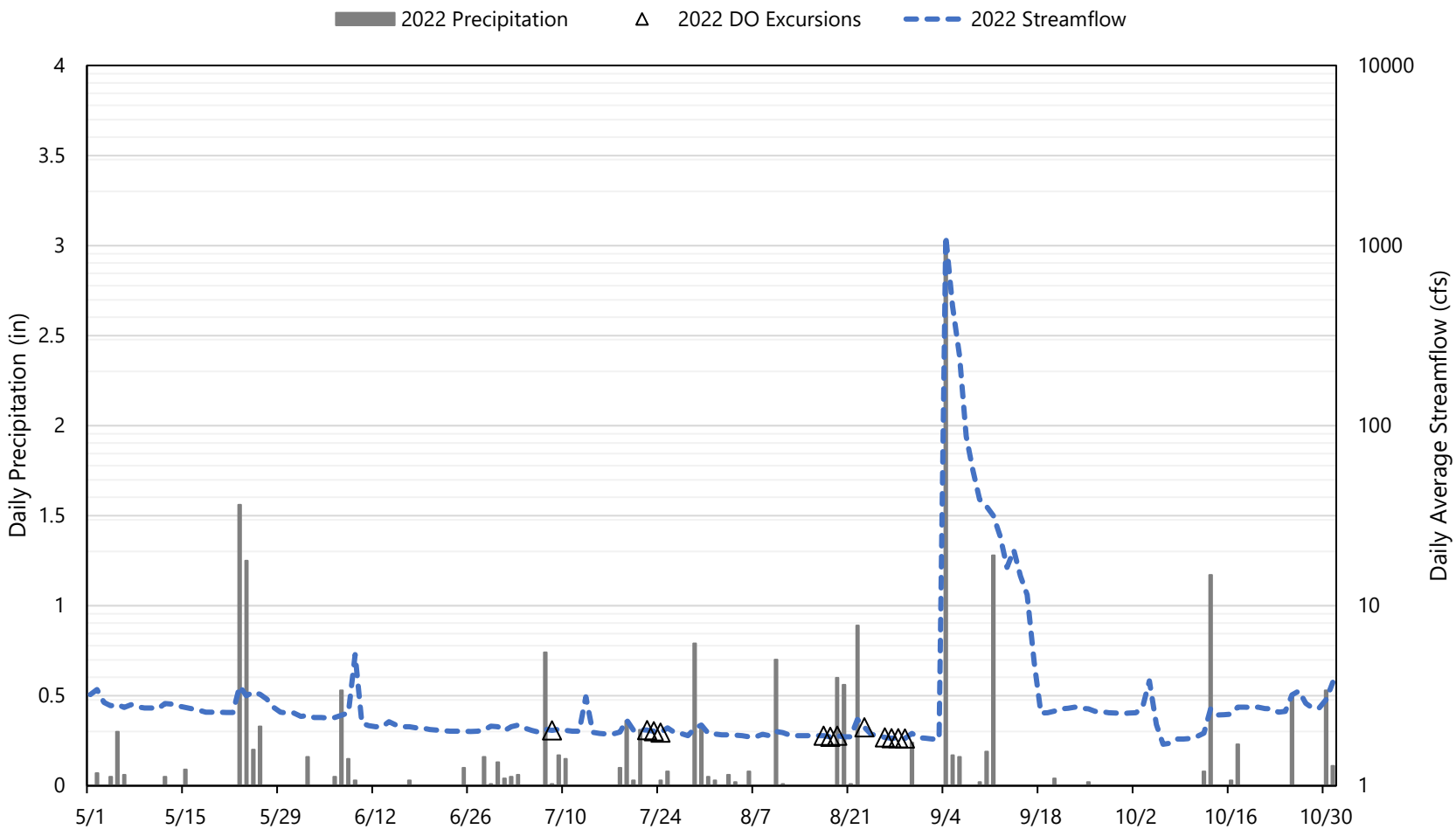


Figure 20 Heath Creek Streamflow and Precipitation in May to October 2022

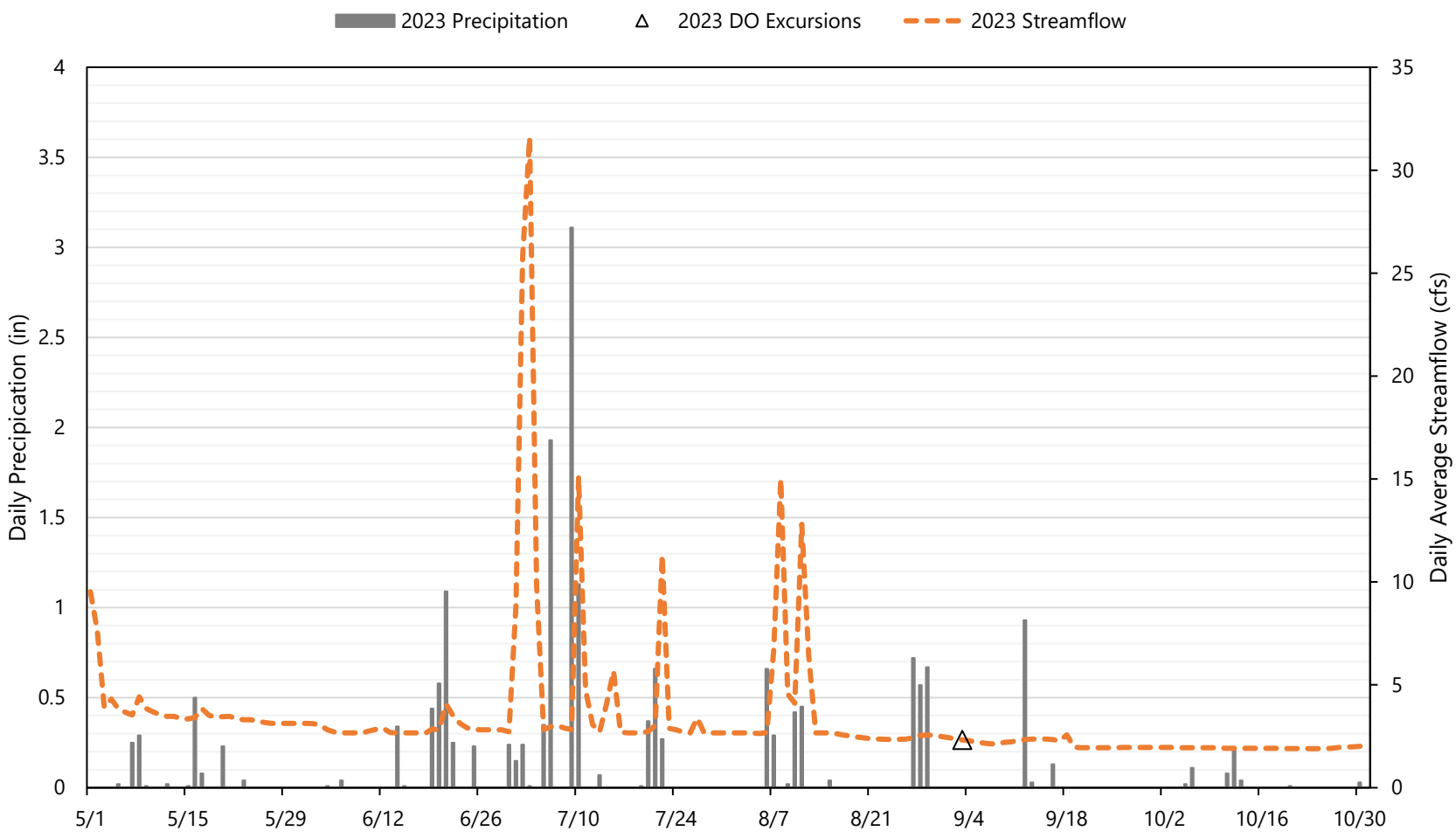


Figure 21 Heath Creek Streamflow and Precipitation in May to October 2023

6.0 SUMMARY AND CONCLUSIONS

OPC conducted targeted water quality monitoring during summer 2023 to determine the potential cause(s) of the intermittent low-DO events observed in July 2022 and August 2022. This was accomplished using a combination of methods in Heath Creek and the Lower Reservoir. The methods included:

- Continuous (hourly) monitoring of DO and water temperature in Heath Creek near the Main Dam and at RM11,
- Continuous (15-minute) monitoring in the Lower Reservoir at the approximate minimum flow intake elevation, and
- Vertical water quality profiles in the Lower Reservoir at the Main Dam.

Following is a summary of key findings of this study:

- During the critical period (May through October) in 2022 and 2023 combined, a total of 6,200 hourly DO measurements were recorded at station RM 11, of which 99.3 percent were equal to or greater than 4.0 mg/L; only one of the 260 days monitored during the critical period (0.4 percent) had a daily average DO concentration less than 5.0 mg/L.
- Continuous monitoring in Heath Creek approximately 190 ft downstream of the Main Dam during July 2023 through September 2023 showed DO levels were consistently higher than those in the Lower Reservoir at the elevation of the minimum flow intake due to aeration of the minimum flow release and were higher than those downstream at station RM11. All instantaneous and daily average DO values in Heath Creek at the Main Dam were greater than 4.0 and 5.0 mg/L, respectively, and met applicable water quality standards for DO.
- Vertical profile measurements collected in the Lower Reservoir indicated thermal and chemical stratification, with low DO levels at depths 3 to 6 ft below the minimum flow intake elevation.
- Continuous monitoring at the minimum flow intake elevation within the Lower Reservoir in summer 2023 showed a trend of DO levels dropping after generation began and recovering after brief periods; nevertheless, the minimum flow release at the Main Dam met applicable DO water quality standards 100 percent of the

time due to significant, sustained aeration of the release as it falls several feet into the creek.

- The low-DO events at station RM11 in summer 2022 and summer 2023 occurred under prolonged low flow conditions. The pronounced decline in DO concentration observed between Heath Creek below the Main Dam and station RM11 during the summer 2023 monitoring period indicates that the low-DO events in both summers were most likely caused by groundwater inflow along the streambed.
- Given the difference between DO levels measured in Heath Creek below the Main Dam and downstream at station RM11, observations of groundwater inflow in this reach during the fish community survey, and the known presence of several springs near the Main Dam, it is likely that natural groundwater inflow from karst geology influences lower summer DO levels at station RM11, especially during periods of low flow.

The results of the water quality monitoring conducted in 2022-2023, including two summers, show that continuous minimum flow releases from the Main Dam meet applicable water quality standards 100 percent of the time due to significant, sustained aeration of the release, that infrequent low-DO events in summer occur during prolonged periods of low flow due to low rainfall, and that these deviations are likely caused by natural groundwater inflow into Heath Creek downstream of the Main Dam.

7.0 REFERENCES

Harza Engineering Company. 1990. Rocky Mountain Project, Preconstruction Geology, Volume I – Report. April 1990.

Kleinschmidt Associates (Kleinschmidt). 2023a. Water Quality Assessment Study Report. Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725). Prepared for Oglethorpe Power Corporation. September 2023.

Kleinschmidt Associates (Kleinschmidt). 2023b. Aquatic Resources Study Report. Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725). Prepared for Oglethorpe Power Corporation. August 2023.

National Oceanic and Atmospheric Administration (NOAA). 2024. Climate Data Online – Station WBAN 93801. Available at: https://www.ncdc.noaa.gov/cdo-web/. Accessed March 4, 2024.

From:	Booth, Elizabeth
To:	McCaslin, Tyler; Hedeen, David; Zeng, Wei
Cc:	Jones, Craig; Barrows, Christina; Steven Layman; Jason Moak
Subject:	RE: Rocky Relicensing Draft WQ Study Update and Meeting Request
Date:	Monday, March 11, 2024 5:48:34 PM
Attachments:	image001.png image002.png

I'm still a little confused. Why did the DO go up in September 2023 when the flow in the river were still low?

From: McCaslin, Tyler <tyler.mccaslin@opc.com>
Sent: Monday, March 11, 2024 12:56 PM
To: Hedeen, David <david.hedeen@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
Cc: Jones, Craig <craig.jones@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Jason Moak <Jason.Moak@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

Hi Liz, Wei, and David,

I've attached an updated draft of the water quality addendum including additional studies performed in summer 2023 after working closely with Liz on the figures.

Please let us know if you have any questions or if we can provide any further clarification. We'd be happy to schedule a discussion if necessary.

Tyler McCaslin, PhD
Senior Environmental Specialist
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7723 **Mobile:** 404-576-9097
Email: tyler.mccaslin@opc.com **Web:** www.opc.com

From: Jones, Craig <craig.jones@opc.com>
Sent: Wednesday, January 3, 2024 7:03 PM
To: 'Hedeen, David' <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Booth, Elizabeth

<Elizabeth.Booth@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

Hi David,

Thanks for offering up the dates. Tuesday, January 16 at 1:00 p.m. will work well for all of us. I'll send a calendar invite shortly.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

From: Hedeen, David <david.hedeen@dnr.ga.gov>
Sent: Wednesday, January 3, 2024 4:09 PM
To: Jones, Craig <craig.jones@opc.com>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

External E-Mail

Craig – Below are times when the Liz, Wei, and I appear to have mutual availability within the next two weeks:

Thursday, January 11 – 10 AM, 11 AM, 1 PM
Tuesday, January 16 – 1 PM
Wednesday, January 17 – 11 AM, 1 PM

Would any of those times be suitable? Thank you,

David Hedeen
Manager – Wetlands Unit
Georgia Environmental Protection Division
7 Martin Luther King, Jr. Drive SW, Suite 450

Atlanta, GA 30334

david.hedeen@dnr.ga.gov
470-427-2730 (office)
678-483-2287 (cell)

From: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
Sent: Wednesday, January 3, 2024 3:39 PM
To: Jones, Craig <craig.jones@opc.com>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

I'll let David and wei set up the meeting. Thanks Liz

From: Jones, Craig <craig.jones@opc.com>
Sent: Wednesday, January 3, 2024 3:38 PM
To: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

Hi Liz,

Thanks for your quick review of the report. We are working to pull together responses to your questions and will follow up as soon as possible.

In the meantime, please let us know what dates/times this month work for you, Wei, and David, and we'll be happy set something up to review the 2023 supplemental report and the DLA information.

Best,

cj

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

OglethorpePower

From: Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>
Sent: Tuesday, January 2, 2024 1:32 PM
To: Jones, Craig <craig.jones@opc.com>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: RE: Rocky Relicensing Draft WQ Study Update and Meeting Request

External E-Mail

I have reviewed the report. I would like to know how frequently the water quality monitors were maintained? Could you provide the dates that the probes were switched out. Is there a possibility that there was algal growth on the DO probe that would explain the drop in DO observed at RM 11. Also, I spoke with WRD about the low pH observed that may have been a result of excess algal due to over fertilizing the reservoir. If you have them, it would be helpful, to see pictures of the dam outfall, the stream downstream of the dam, and the water quality monitor locations.

Thanks Liz

From: Jones, Craig <craig.jones@opc.com>
Sent: Tuesday, January 2, 2024 1:03 PM
To: Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Booth, Elizabeth <Elizabeth.Booth@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>
Cc: McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>
Subject: Rocky Relicensing Draft WQ Study Update and Meeting Request

Wei, David, and Liz,

Happy New Year, and I hope your holiday season went well.

As discussed last fall, I'm forwarding to you the preliminary, draft WQ assessment update that addresses DO relative to the 2023 field season. Please feel free to forward to anyone else on your team who should review. However, please note this report is still under review and subject to change, but I wanted to make sure you had it prior to the DLA comment deadline.

I'm also reaching out to see if we can schedule a meeting in the next couple of weeks, ideally before

mid-January, to discuss the draft report and any questions you may have related to the DLA prior to filing comments. If you send me some possible dates/time, I'll work on our end to coordinate a meeting.

Best regards,

Craig

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

Meeting Summary
Rocky Mountain Relicensing
Water Quality Report Addendum Discussion
with U.S. Fish and Wildlife Service

Date and Time: Tuesday, March 12, 2024, 3:00 pm

Location: Virtual meeting on Microsoft Teams

Participants:

Eric Bauer, U.S. Fish and Wildlife Service (FWS)
Craig Jones, Oglethorpe Power Corporation (OPC)
Tyler McCaslin, OPC
Christina Barrows, OPC
Jason Moak, Kleinschmidt Associates
Steve Layman, Kleinschmidt Associates

Prepared by: Steve Layman

Meeting Summary

The purpose of the meeting was to discuss OPC's preliminary draft Water Quality Assessment Study Report Addendum, which presented the results of summer 2023 dissolved oxygen (DO) monitoring in Heath Creek and the Lower Reservoir at the Main Dam. OPC shared a preliminary draft study report addendum with FWS via email on March 11, 2024. The summer 2023 DO monitoring data were not available for analysis in the Draft License Application (DLA), which OPC filed with the Federal Energy Regulatory Commission on November 17, 2023. FWS filed written comments on the DLA on February 9, 2024.

OPC presented slides (attached) providing an overview of the summer 2023 DO monitoring approach, methods, and preliminary findings, including graphs of DO data at the various monitoring locations. Discussion and questions included monitoring locations, the minimum flow release pipe and spillway gates, evaporative loss from project reservoirs, groundwater inflow as a factor contributing to occasional low summer DO values in Heath Creek, whether the Auxiliary Pools could be operated to mitigate summer DO excursions, and potential effects of summer DO excursions on aquatic communities.

The option of OPC holding a Joint Meeting with FWS and the Georgia Department of Natural Resources Environmental Protection Division and Wildlife Resources Division was also discussed to address any remaining FWS disagreement over OPC's analysis of summer water quality in Heath Creek.

Draft Study Report Addendum
Water Quality Assessment Study Report

Rocky Mountain Pumped Storage Hydroelectric Project (FERC No. 2725)

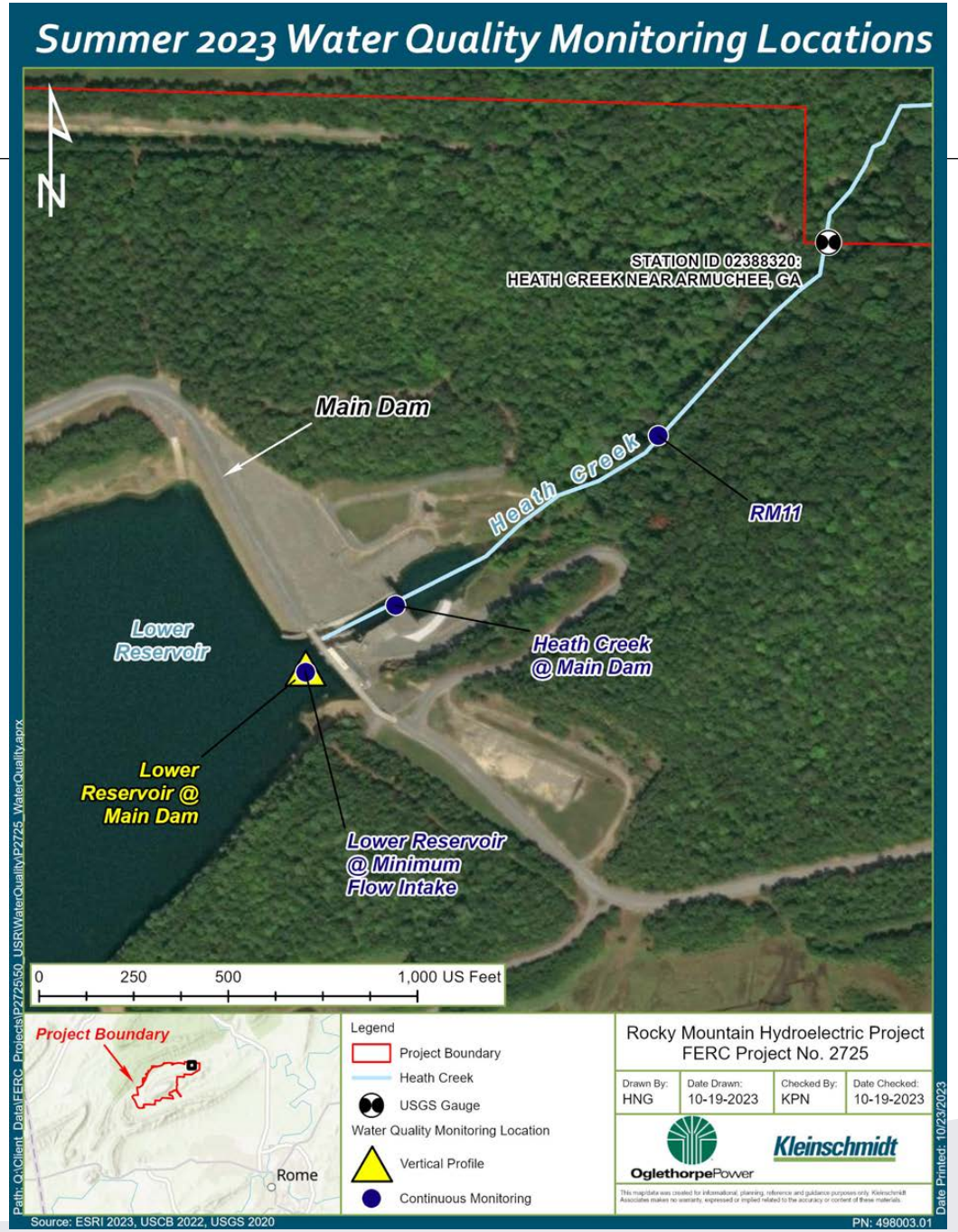
March 2024

Study Objectives

- Collect water quality data in summer 2023 to potentially explain mechanism(s) by which intermittent short-duration low-dissolved oxygen (DO) events occurred in Heath Creek in Jul-Aug 2022
- Develop water quality information sufficient for analyzing the effects of project operation and maintenance on water quality in the Final License Application

Study Area

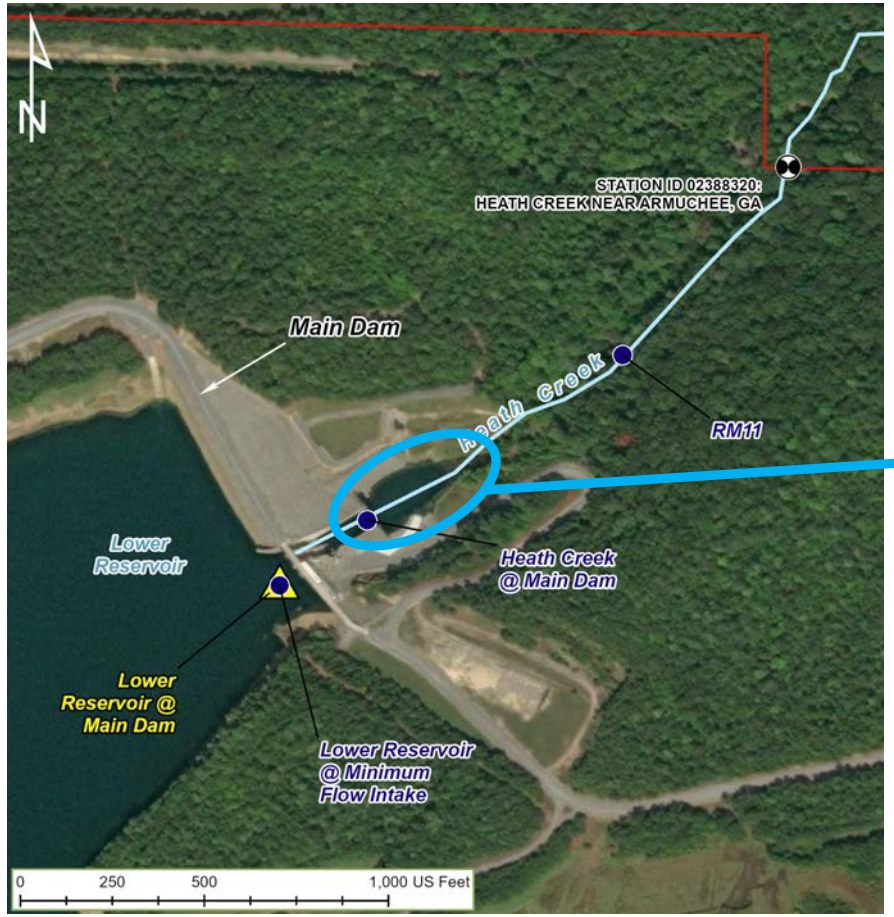
- Lower Reservoir just upstream of the Main Dam
- Heath Creek downstream of the Main Dam within the project boundary



Methods

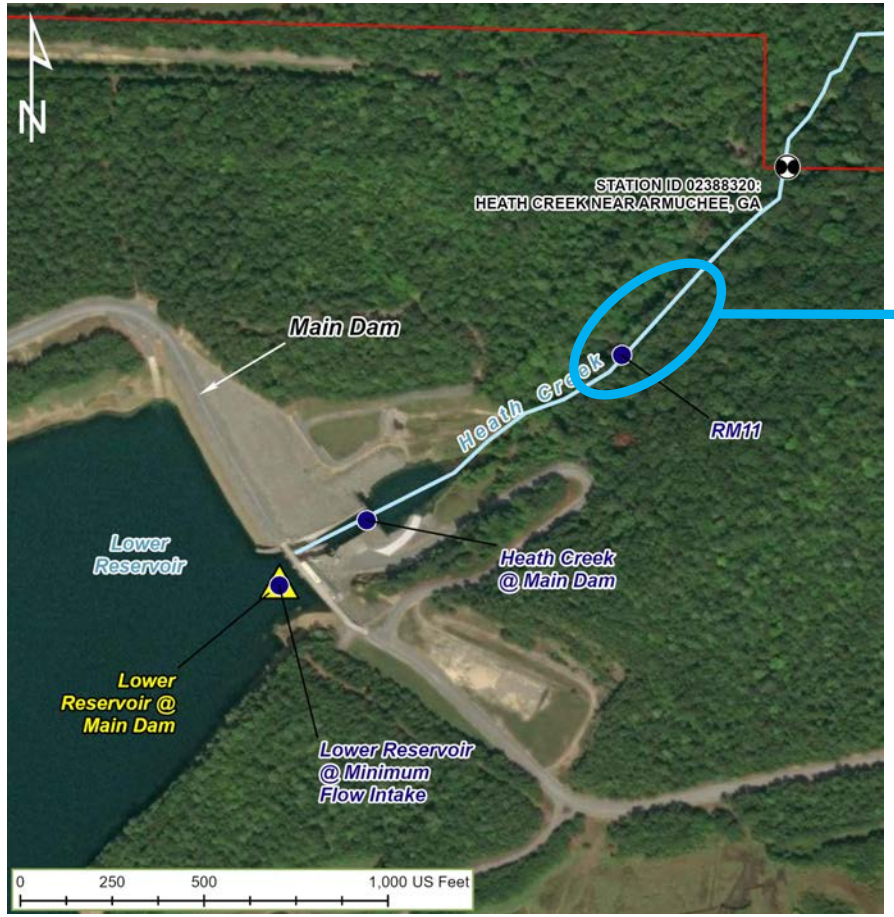
- Continuous monitoring in Heath Creek (Jul-Sep 2023)
  - Hourly measurements of water temperature and DO at two locations:
    - Station RM11 – 1,000 feet downstream of Main Dam
    - Heath Creek at Main Dam – 190 feet downstream of Main Dam
  - DO loggers cleaned, downloaded, and checked for accuracy every two weeks
- Longitudinal change in DO between two locations measured on Jul 13
- Vertical profile monitoring in Lower Reservoir (Jul-Sep 2023)
  - Four vertical profile events: Jul 12-13, Aug 17, Sep 6, Sep 19,
    - Water temperature, DO, pH, conductivity, and turbidity at 1-meter intervals
  - Continuous monitoring at elevation of intake for minimum flow pipe (about 48.5 feet below normal maximum pool elevation)
    - Monitoring event on Jul 12-13 using sonde deployed from Main Dam
    - DO logger continuously deployed from August 3-September 30
    - DO and water temperature recorded at 15-minute intervals

Heath Creek at Main Dam



August 24, 2022

Heath Creek at Station RM11



Vicinity of RM11

August 25, 2022

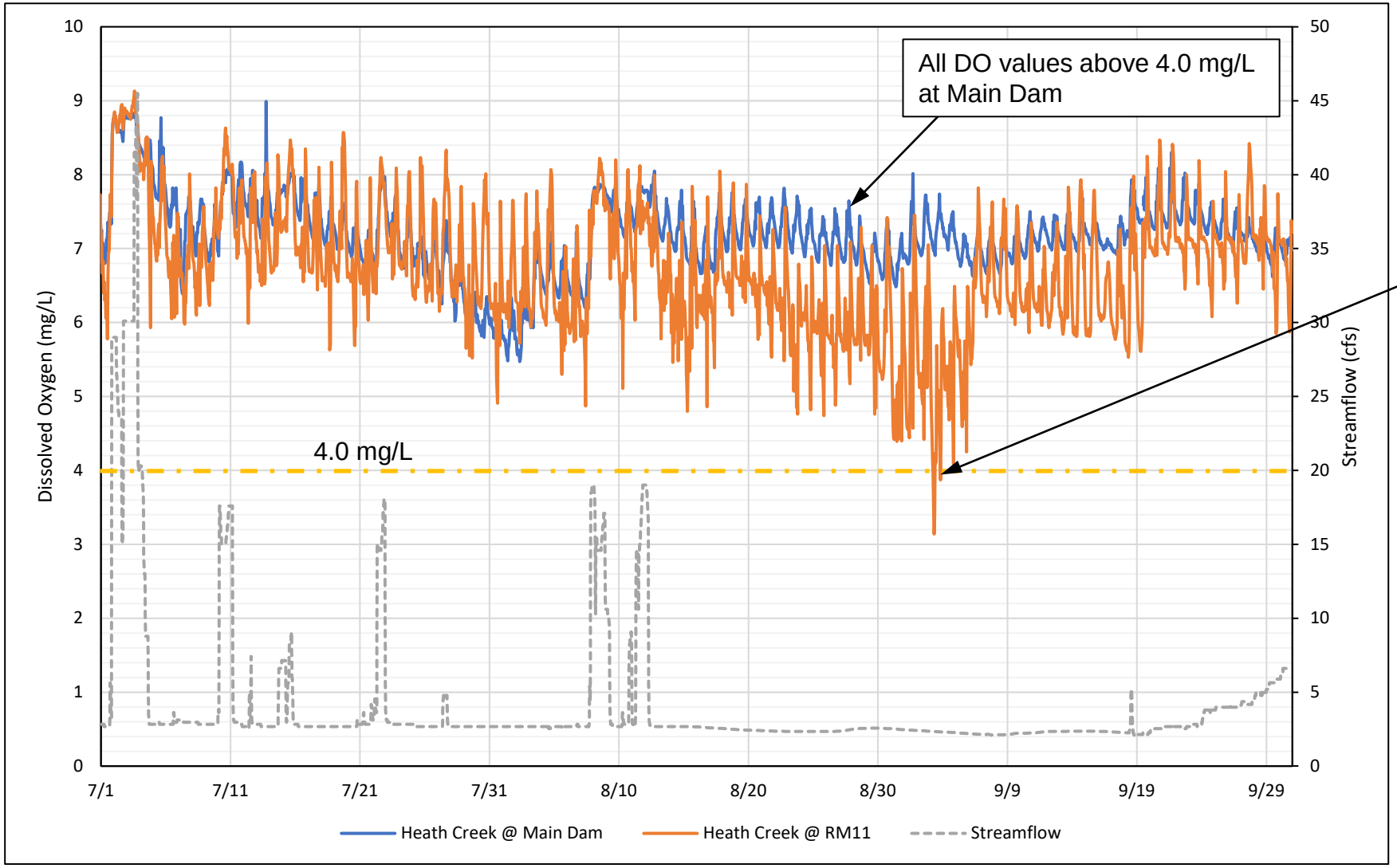
RM11 DO Logger

September 29, 2022

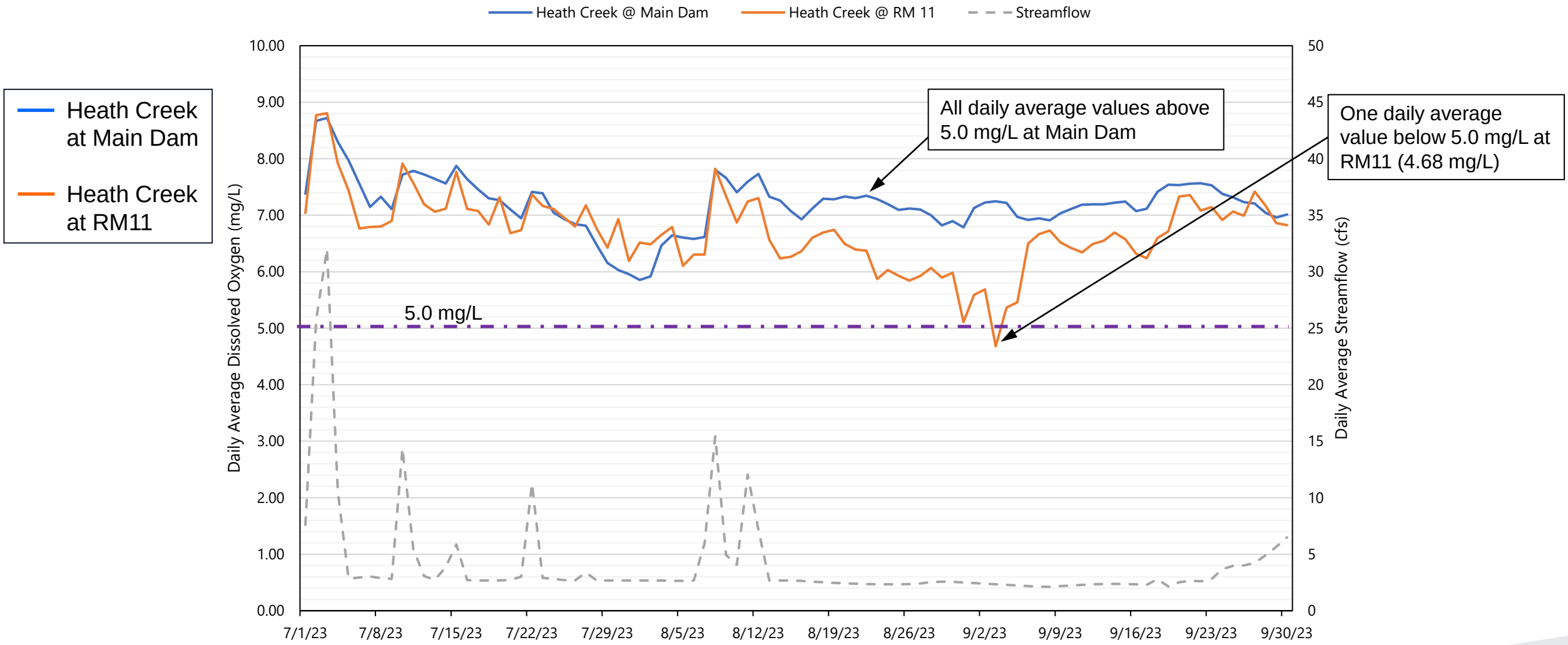
Results – Hourly DO & Streamflow in Heath Creek, Summer 2023

Heath Creek at Main Dam

Heath Creek at RM11



Results – Daily Average DO & Streamflow in Heath Creek, Summer 2023

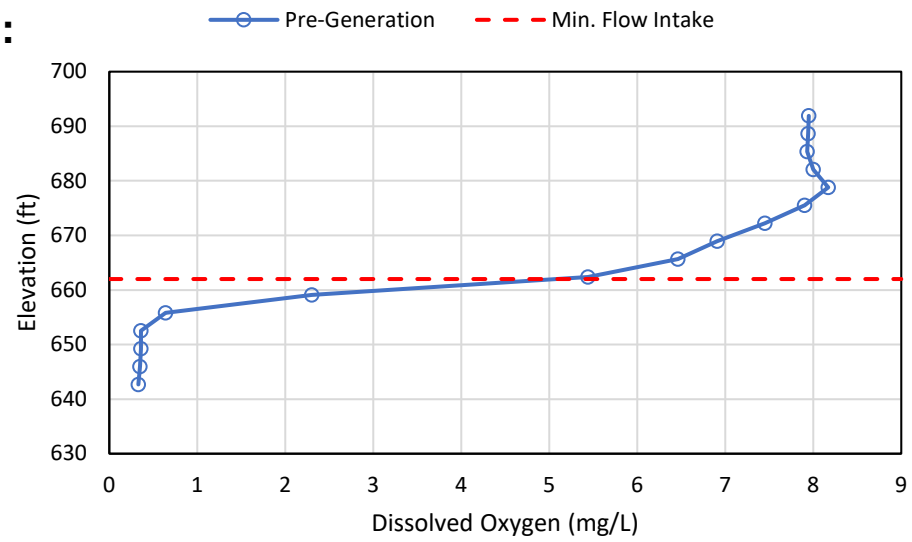


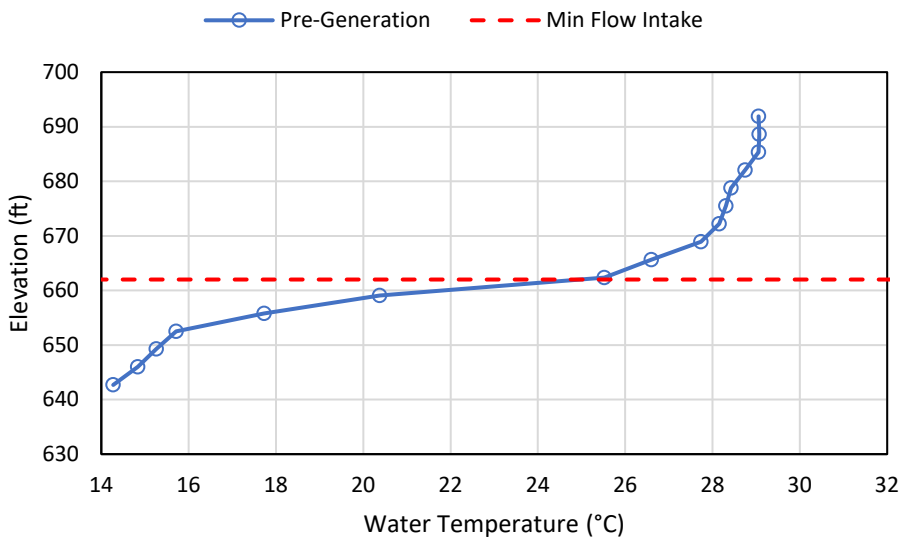
Heath Creek Longitudinal Change on July 13, 2023

Distance from Main Dam (ft)	DO (mg/L)	DO % Saturation	Water Temperature (°C)
190	7.82	96.2	25.84
440	7.84	96.6	26.00
530	7.93	98.5	26.44
630	8.02	99.8	26.50
658	max 8.03	100.1	26.58
718	7.97	99.1	26.48
778	7.85	97.1	26.17
836	7.86	97.2	26.19
876	7.82	96.6	26.10
911	7.80	96.3	26.05
956	7.73	95.2	25.93
992	7.66	94.1	25.83
1,050	7.55	92.5	25.67
1,074	7.45	91.1	25.57
1,174	7.43	90.8	25.52
1,194	7.44	91.0	25.52
1,215	7.41	90.5	25.50
1,233	7.39	90.3	25.49
1,249	min 7.26	88.6	25.42

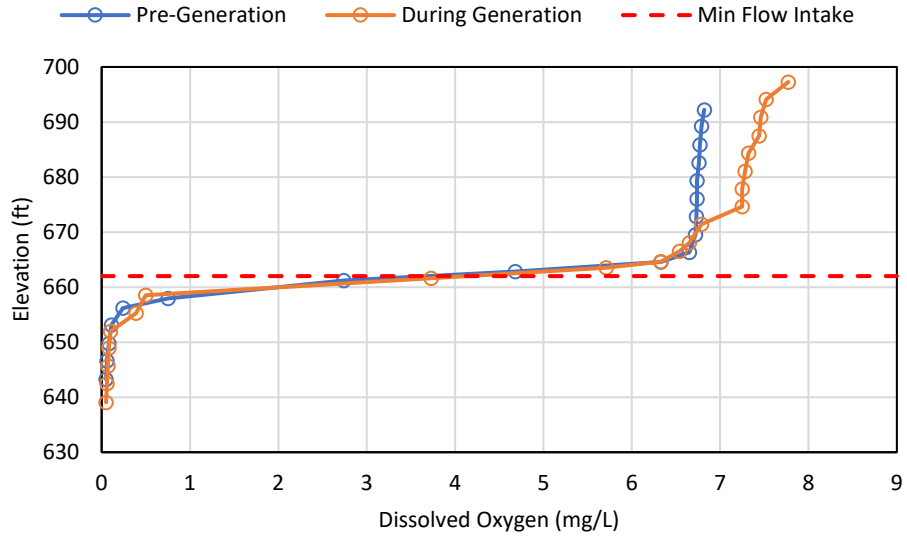
Vertical Profiles of DO in the Lower Reservoir

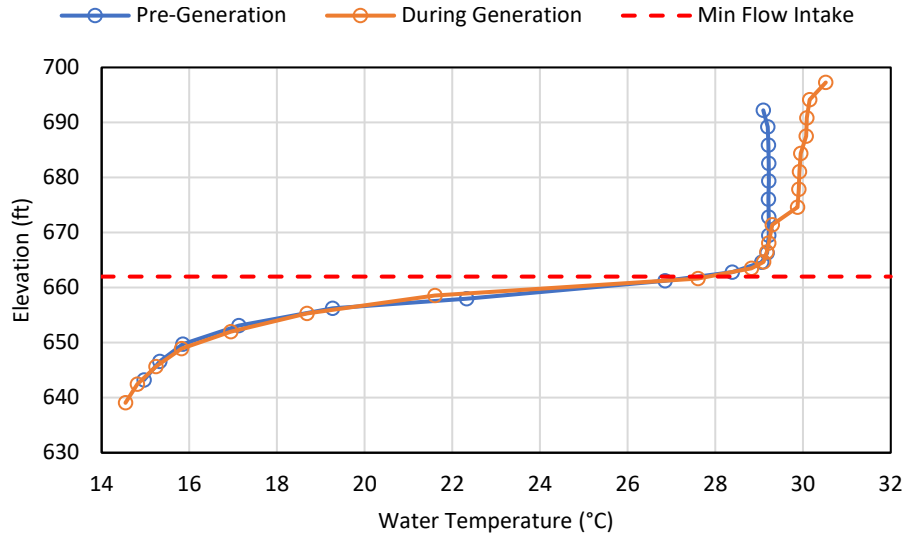
7/13/23:



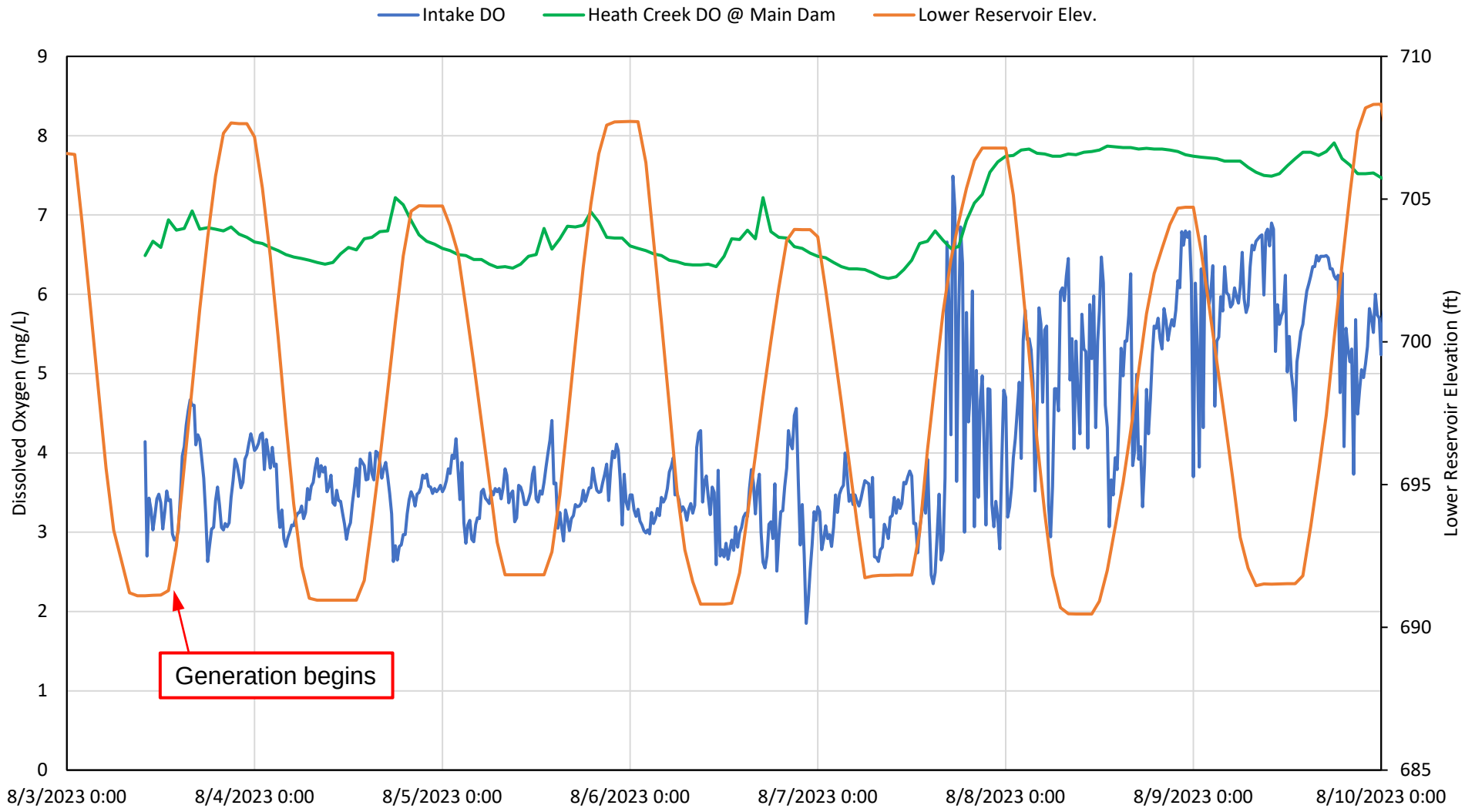


8/17/23:

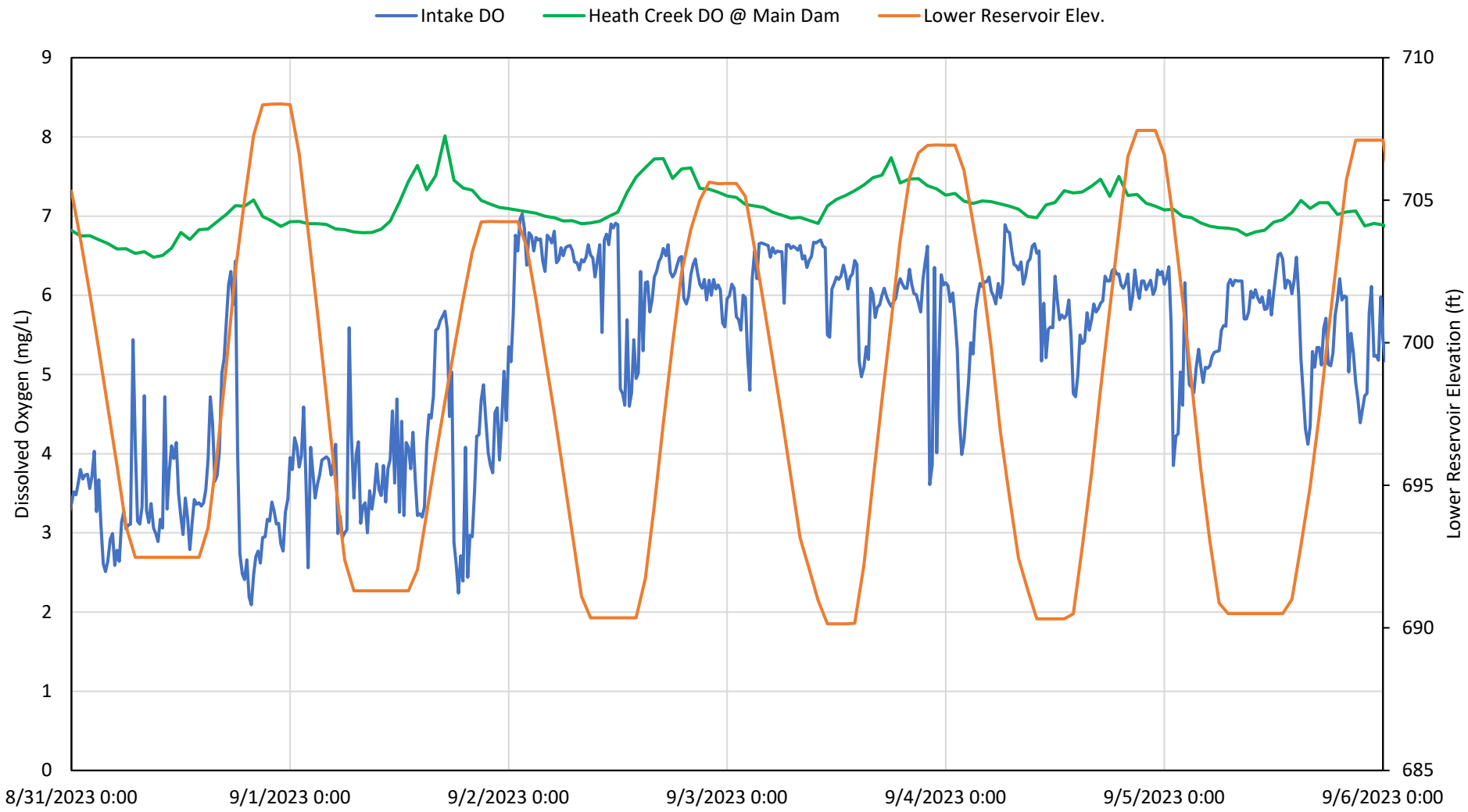




Minimum Flow Intake Monitoring – Aug 3-10, 2023



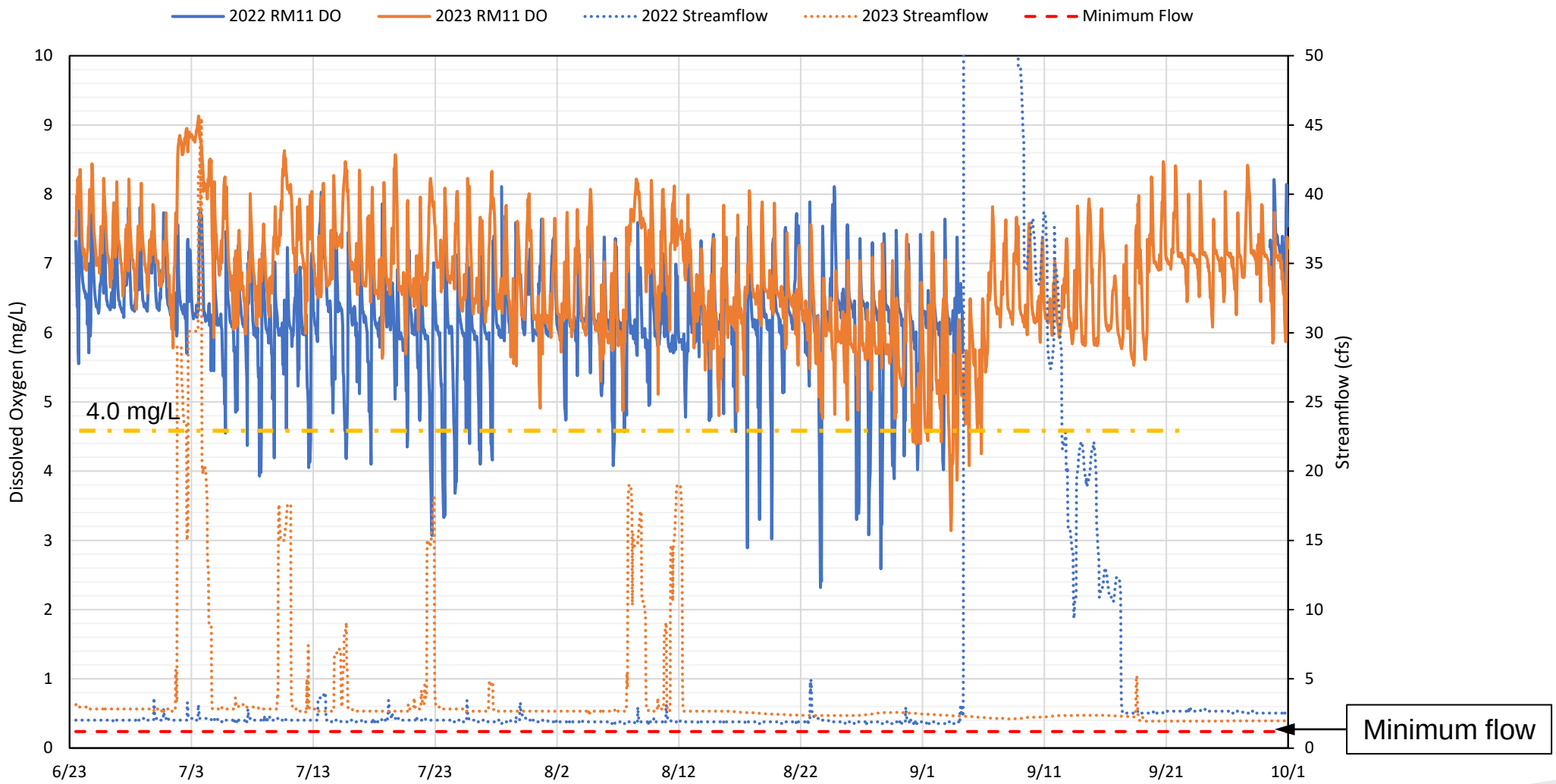
Minimum Flow Intake Monitoring – Aug 31-Sep 6, 2023



Hourly Dissolved Oxygen and Streamflow in Heath Creek at Station RM11 in Summer 2022 and Summer 2023

Dissolved Oxygen:
- 2022 RM11
- 2023 RM11

Streamflow:
- 2022
- 2023



Summary of Key Preliminary Findings

- During the critical period (May-October) in 2022-2023 combined, 99.3% of the hourly DO measurements at station RM11 were ≥ 4.0 mg/L
- 99.6% of the 260 days monitored at RM11 during the critical period in 2022-2023 had a daily average DO concentration ≥ 5.0 mg/L
- Heath Creek below the Main Dam met applicable DO water quality standards 100% of the time during the summer 2023 monitoring period
- DO levels in Heath Creek below the Main Dam were higher than those in the Lower Reservoir at the elevation of the minimum flow intake due to aeration of the minimum flow release
- Available evidence suggests that natural groundwater inflow from karst geology likely influences lower summer DO levels at station RM11 compared to Heath Creek below the Main Dam

Questions and Discussion

March 19, 2024

Debbie-Anne Reese
Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE Washington, DC 20426

Re: Rocky Mountain Pumped Storage Hydroelectric Project (FERC Project No. 2725) Joint Meeting

Dear Acting Secretary Reese:

Pursuant to 18 CFR § 16.8(c)(6) of the Commission's regulations, Oglethorpe Power Corporation (An Electric Membership Corporation) (OPC), co-licensee for the above referenced project, will be holding a Joint Meeting with the U.S. Fish and Wildlife Service (USFWS) and other agencies with similar interests, expertise, or responsibility, including Georgia Department of Natural Resources (DNR) Wildlife Resources Division, and DNR Environmental Protection Division.

Following coordination with the above agencies, OPC has scheduled the Joint Meeting virtually on April 11, 2024, at 3:00 P.M. The following is the agenda of the issues to be discussed at the meeting:

1. Dissolved Oxygen (DO) Downstream of the Project
    a. Discussion of Study Methods and Findings
    b. Discussion of Project Operations
    c. Discussion of USFWS Protection, Mitigation, or Enhancement Recommendations Related to DO

For more information about the meeting, please contact Tyler McCaslin at (770) 270-7723 or tyler.mccaslin@opc.com.

Best regards,

Craig A. Jones, Ph.D.
Vice President, EHS & Regulatory Affairs

Oglethorpe Power Corporation | 2100 E. Exchange Place | Tucker, GA 30084-5336
Phone 770-270-7600 | Fax 770-270-7872

From:	eFiling@ferc.gov
To:	Mealear Tauch; efilingacceptance@ferc.gov
Subject:	FERC Receipt of Filing in P-2725-000
Date:	Tuesday, March 19, 2024 8:51:43 AM

Caution: External Email

Confirmation of Receipt

This is to confirm receipt by the FERC Office of the Secretary of the following electronic submission:

-Submission ID: 1498202
-Docket(s) No.: P-2725-000
-Filed By: Oglethorpe Power Corporation (An Electric Membership Corporation)
-Signed By: Craig Jones
-Filing Desc: Joint Meeting Notice of Oglethorpe Power Corporation (An Electric Membership Corporation) under P-2725-000.
-Submission Date/Time: 3/19/2024 8:50:20 AM
-Projected Filed Date/Time: 3/19/2024 8:50:20 AM (Subject to Change based on OPM/FERC Closure)

Additional detail about your filing is available via the following link:

https://ferconline.ferc.gov/SubmissionStatus.aspx?hashcode=3uogUwUrQjTves6U0QsKXw

Thank you for participating in the FERC Electronic Filing System. If you have any questions, or if you detect errors in your submission or the FERC-generated PDF, please contact FERC at:

E-Mail: ferconlinesupport@ferc.gov mailto:ferconlinesupport@ferc.gov (do not send filings to this address)
Voice Mail: 866-208-3676.

From:	eFiling@ferc.gov
To:	Mealear Tauch; efilingacceptance@ferc.gov
Subject:	FERC Acceptance for Filing in P-2725-000
Date:	Tuesday, March 19, 2024 10:01:00 AM

Caution: External Email

Acceptance for Filing

The FERC Office of the Secretary has accepted the following electronic submission for filing (Acceptance for filing does not constitute approval of any application or self-certifying notice):

-Accession No.: 202403195068
-Docket(s) No.: P-2725-000
-Filed By: Oglethorpe Power Corporation (An Electric Membership Corporation)
-Signed By: Craig Jones
-Filing Type: Supplemental/Additional Information
-Filing Desc: Oglethorpe Power Corporation (An Electric Membership Corporation) submits Notice of Joint Agency Public Meeting scheduled on April 11, 2024, for the Rocky Mountain Pumped Storage Hydroelectric Project under P-2725.
-Submission Date/Time: 3/19/2024 8:50:20 AM
-Filed Date: 3/19/2024 8:50:20 AM

Your submission is now part of the record for the above Docket(s) and available in FERC's eLibrary system at:

https://elibrary.ferc.gov/eLibrary/docinfo?accession_num=20240319-5068

If you would like to receive e-mail notification when additional documents are added to the above docket(s), you can eSubscribe by docket at:

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Thank you again for using the FERC Electronic Filing System. If you need to contact us for any reason:

E-Mail: ferconlinesupport@ferc.gov mailto:ferconlinesupport@ferc.gov (do not send filings to this address)
Voice Mail: 866-208-3676.

From:	Bauer, Eric F
To:	Jones, Craig; Zeng, Wei; Hedeen, David; "Elizabeth.Booth@dnr.ga.gov"; Hakala, Jim; Escobar, Anakela; Steven Layman; Jason Moak; McCaslin, Tyler; Barrows, Christina; Bowen, Bryant; clint.peacock@dnr.ga.gov; Hakala, Jim
Subject:	Re: [EXTERNAL] Rocky Mountain Relicensing Joint Meeting
Date:	Thursday, April 11, 2024 5:21:33 PM
Attachments:	image001.png 20240328_RockyMountain_LowDOEvents.pptx

Thank you all for meeting today and providing your valuable insights and expertise.

Please forward on to anyone from our meeting that I forgot to include.

-Eric

Eric Bauer (he/him)
Fish and Wildlife Biologist
Georgia Ecological Services
US Fish and Wildlife Service
RG Stephens, Jr. Federal Building
355 East Hancock Avenue, Room 320
Athens, GA 30601
Office: 706-535-2103
Teams: eric_bauer@fws.gov (preferred)

http://www.fws.gov/athens
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From: Jones, Craig <craig.jones@opc.com>
Sent: Thursday, March 14, 2024 12:45 PM
To: Bauer, Eric F <eric_bauer@fws.gov>; Zeng, Wei <Wei.Zeng@dnr.ga.gov>; Hedeen, David <david.hedeen@dnr.ga.gov>; 'Elizabeth.Booth@dnr.ga.gov' <Elizabeth.Booth@dnr.ga.gov>; Hakala, Jim <Jim.Hakala@dnr.ga.gov>; Escobar, Anakela <anakela.escobar@dnr.ga.gov>; Klein Schmidt Group (Steven Layman) <Steven.Layman@Kleinschmidtgroup.com>; Jason Moak <Jason.Moak@Kleinschmidtgroup.com>; McCaslin, Tyler <tyler.mccaslin@opc.com>; Barrows, Christina <christina.barrows@opc.com>
Subject: [EXTERNAL] Rocky Mountain Relicensing Joint Meeting
When: Thursday, April 11, 2024 3:00 PM-5:00 PM.
Where: Microsoft Teams Meeting

Good Afternoon Everyone,

Thank you for coordinating with us to find a good time for this Joint Meeting. The meeting will be via Microsoft Teams.

I will be following up with more detail about the meeting including an agenda. Please reach out to me in the meantime with any questions.

Best,

Craig

Craig A. Jones, PhD
Vice President, EHS & Regulatory Affairs
Oglethorpe Power Corporation
2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

Microsoft Teams meeting

Join on your computer, mobile app or room device
Click here to join the meeting

Meeting ID: 279 656 028 877
Passcode: RzHY9s
Download Teams | Join on the web

Or call in (audio only)
+1 912-219-4112,,147452578# United States, Savannah
Phone Conference ID: 147 452 578#
Find a local number | Reset PIN

Learn More | Meeting options

Rocky Mountain Pumped Storage Hydroelectric Project: Impacts to water quality (DO) in Heath Creek

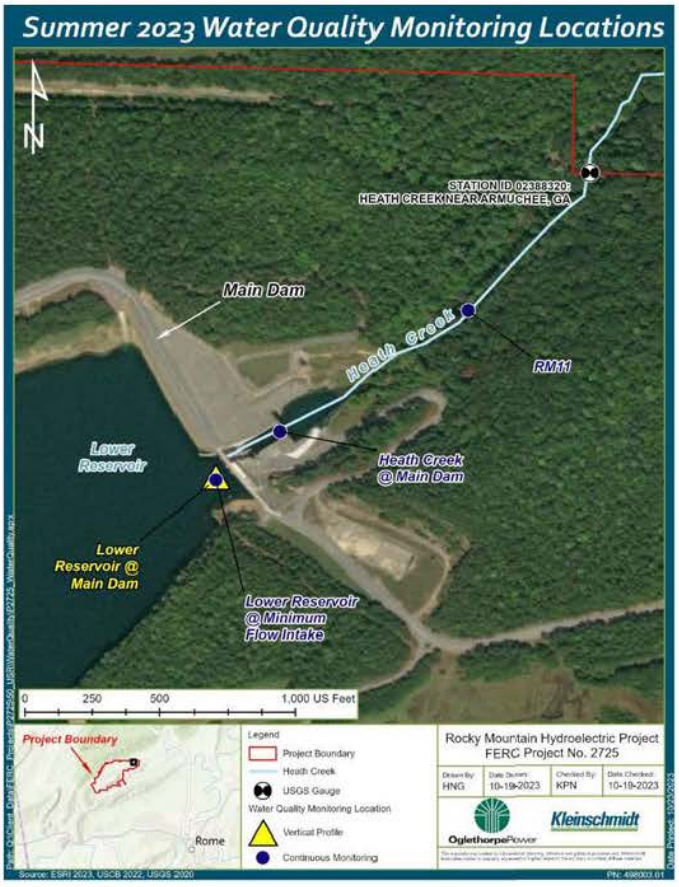


Figure 2 **Water Quality Monitoring Locations**

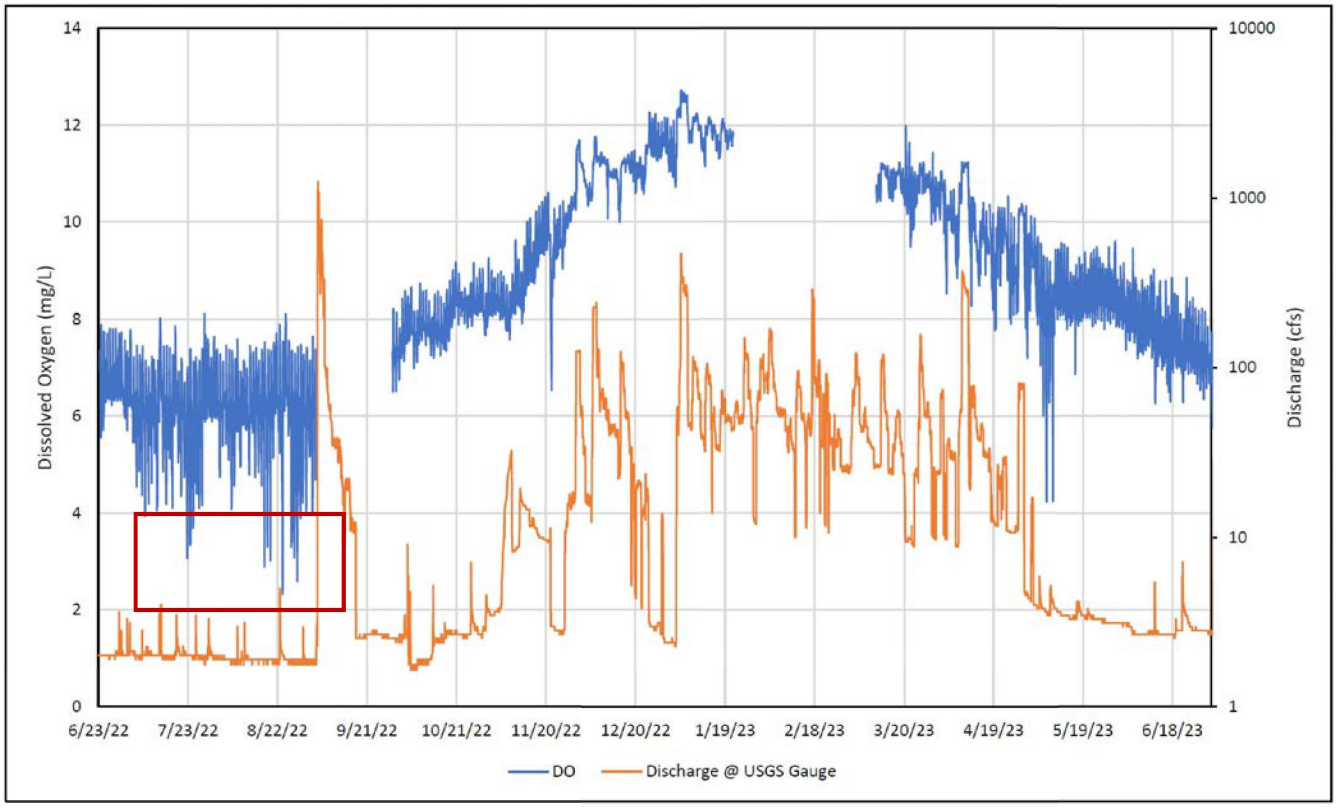


Figure 9 **Line Plot of Hourly Dissolved Oxygen Measurements in Heath Creek Below the Main Dam**

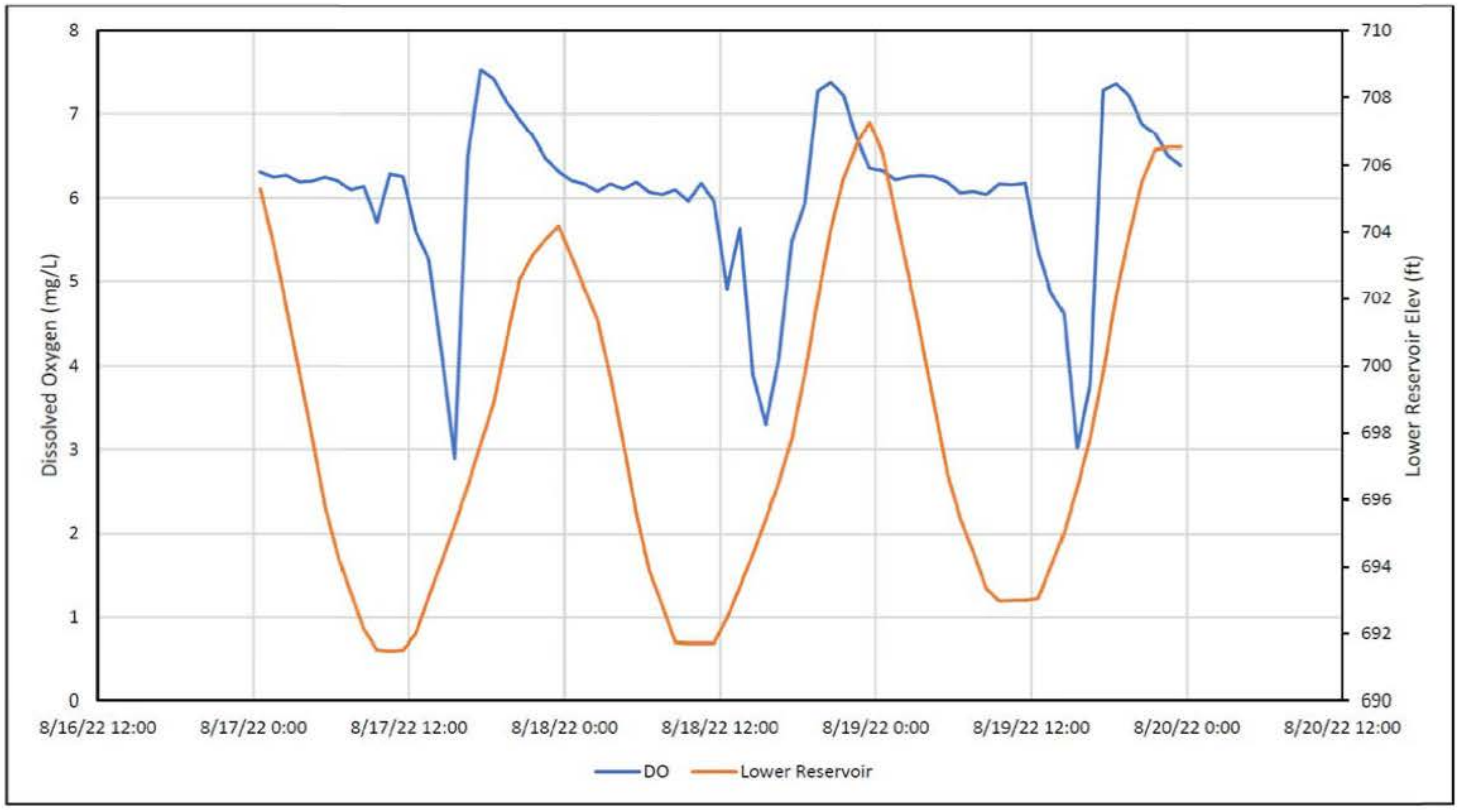


Figure 11 Line Plot Depicting a Low DO Event in August 2022

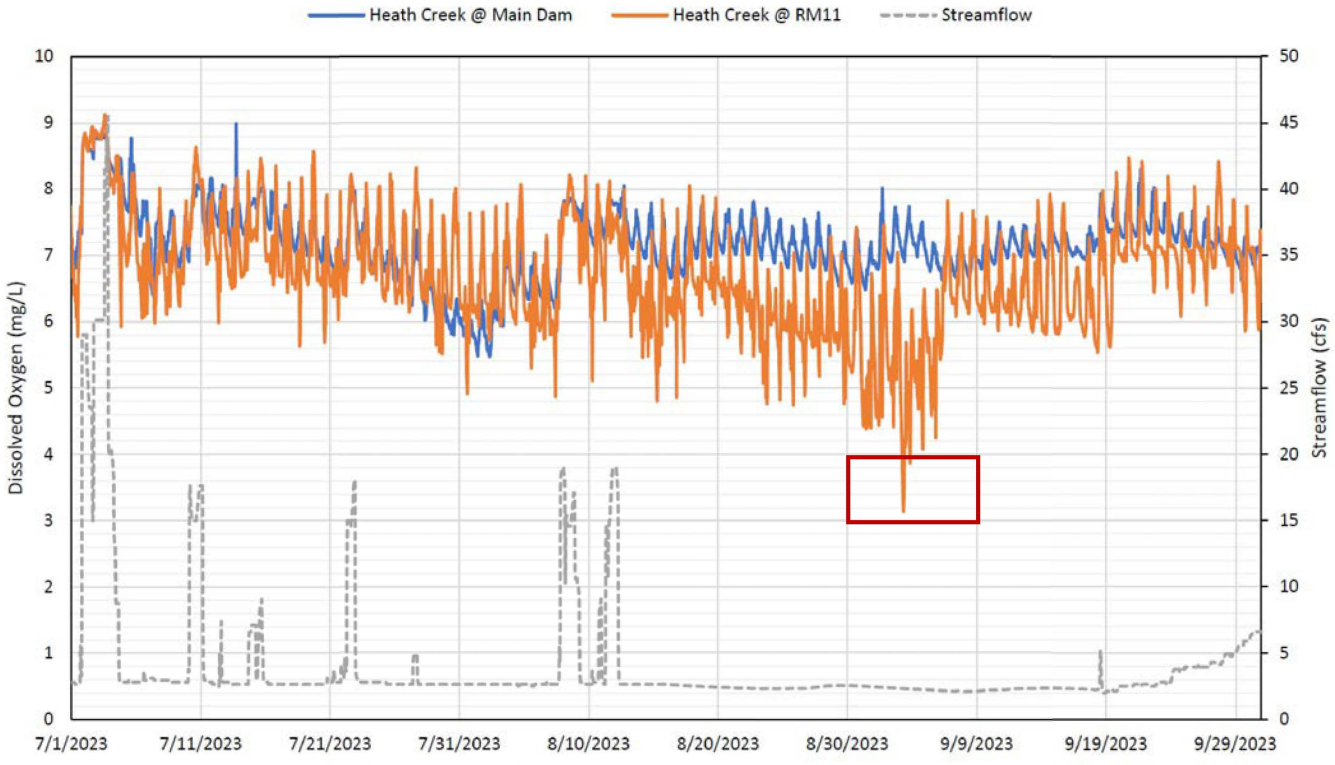


Figure 3 **Heath Creek Hourly Dissolved Oxygen and Streamflow from July 2023 to September 2023**

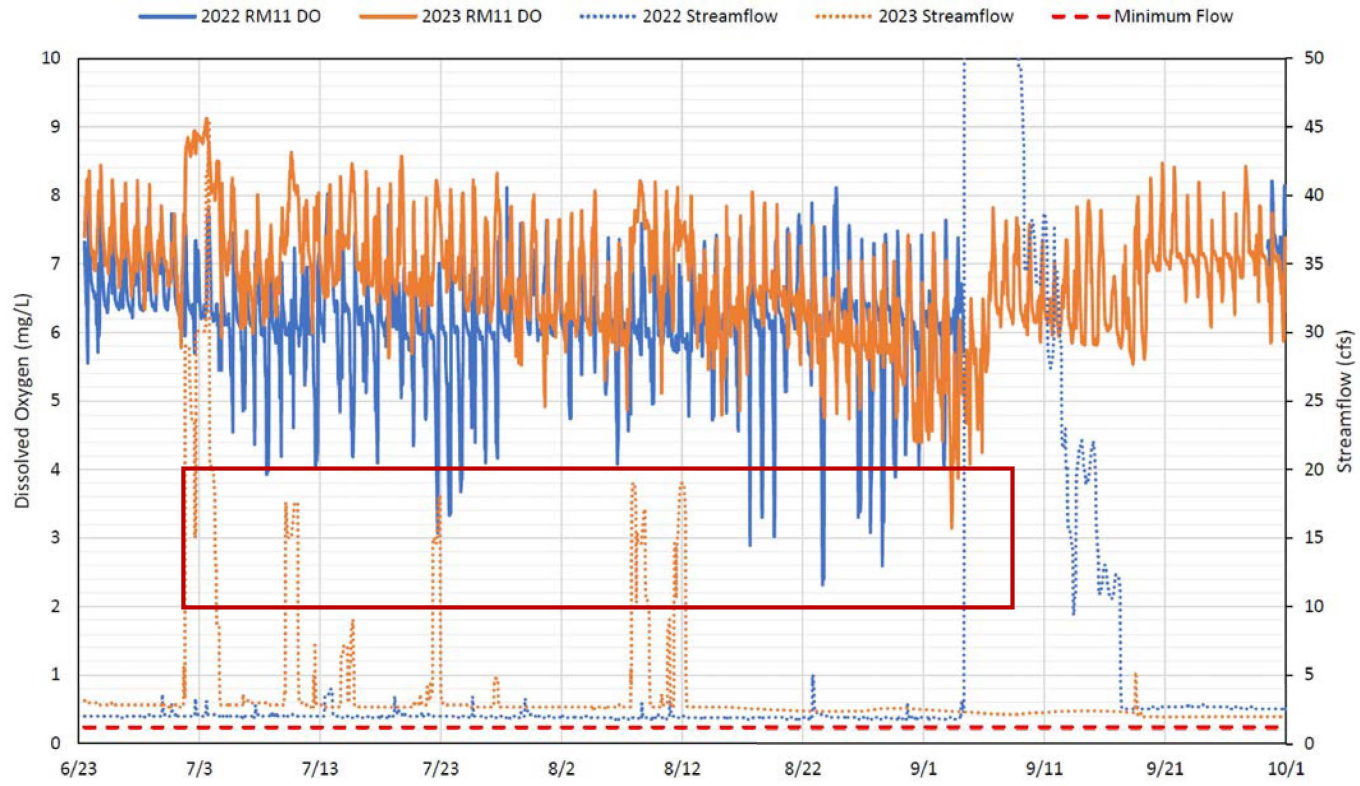


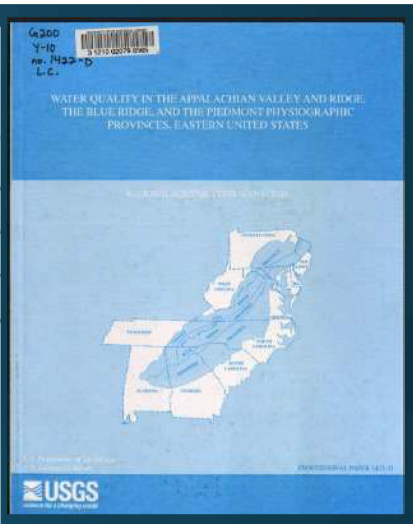
Figure 19 Hourly Dissolved Oxygen and Streamflow in Heath Creek at RM11 in Summer 2022 and Summer 2023

WQ study addendum

- Oglethorpe Power Company speculates that groundwater inflow into Heath Creek can explain these low DO events
  - Karst geology
  - Several springs near the main dam

TABLE 5.—*Summary statistics for selected properties and constituents of ground water, spring water, and surface water in the study area, by physiographic province—Continued*

Type of site and physiographic province	Number of analyses	Mean	Percentile values calculated from the data						
			5th	10th	25th	50th	75th	90th	95th
Dissolved-oxygen concentration, milligrams per liter									
Ground water:									
Valley and Ridge	359	4.8	0.3	0.5	1.3	5.4	8.1	9.1	9.8
Blue Ridge	14	5.8	.9	1.6	5.4	6.2	7.2	8.1	8.2
Piedmont	2,274	4.4	.2	.2	1.0	4.1	7.3	9.0	9.8
All ground water	2,647	4.5	.2	.2	1.0	4.2	7.4	9.0	9.8
Spring water:									
Valley and Ridge	196	7.5	3.9	4.4	6.0	7.7	8.8	10.0	10.6
Blue Ridge	2	7.2	6.2	6.2	6.2	7.2	8.2	8.2	8.2
Piedmont	92	8.5	4.7	6.2	7.9	8.8	9.5	10.4	11.1
All spring water	290	7.8	4.0	4.9	6.5	8.0	9.0	10.0	10.8
Surface water:									
Valley and Ridge	22,773	9.0	4.4	5.6	7.5	9.1	10.8	12.4	13.4
Blue Ridge	2,043	9.6	6.1	7.0	8.2	9.6	11.0	12.2	13.0
Piedmont	36,911	8.6	2.7	4.6	7.0	8.8	10.7	12.4	13.4
All surface water	61,727	8.8	3.4	5.1	7.2	9.0	10.8	12.4	13.4



Water Quality in the Appalachian Valley and Ridge, the Blue Ridge, and the Piedmont Physiographic Provinces, Eastern United States

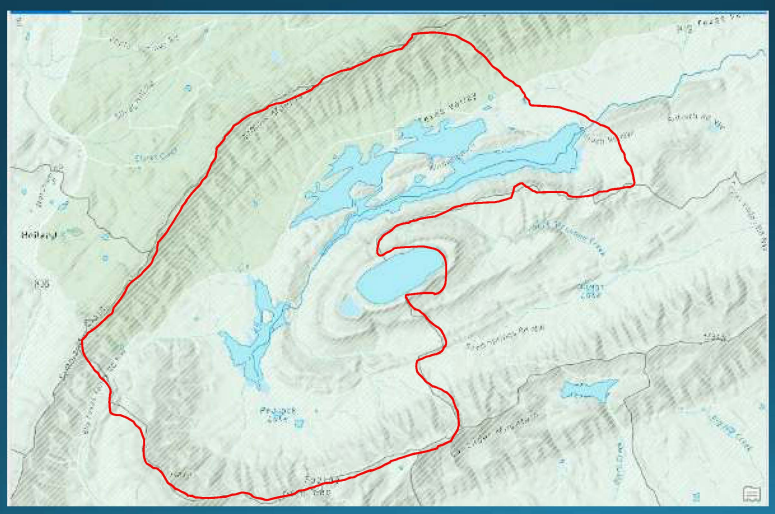
By L. J. BRIEL

REGIONAL AQUIFER-SYSTEM ANALYSIS—APPALACHIAN VALLEY AND PIEDMONT

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1422–D

Groundwater dynamics in Heath Creek

- Groundwater dynamics in Heath Creek are almost certainly driven by the reservoir and discharge from the dam.
  - ~99% or more of the drainage area for RM11 is held back by the dam



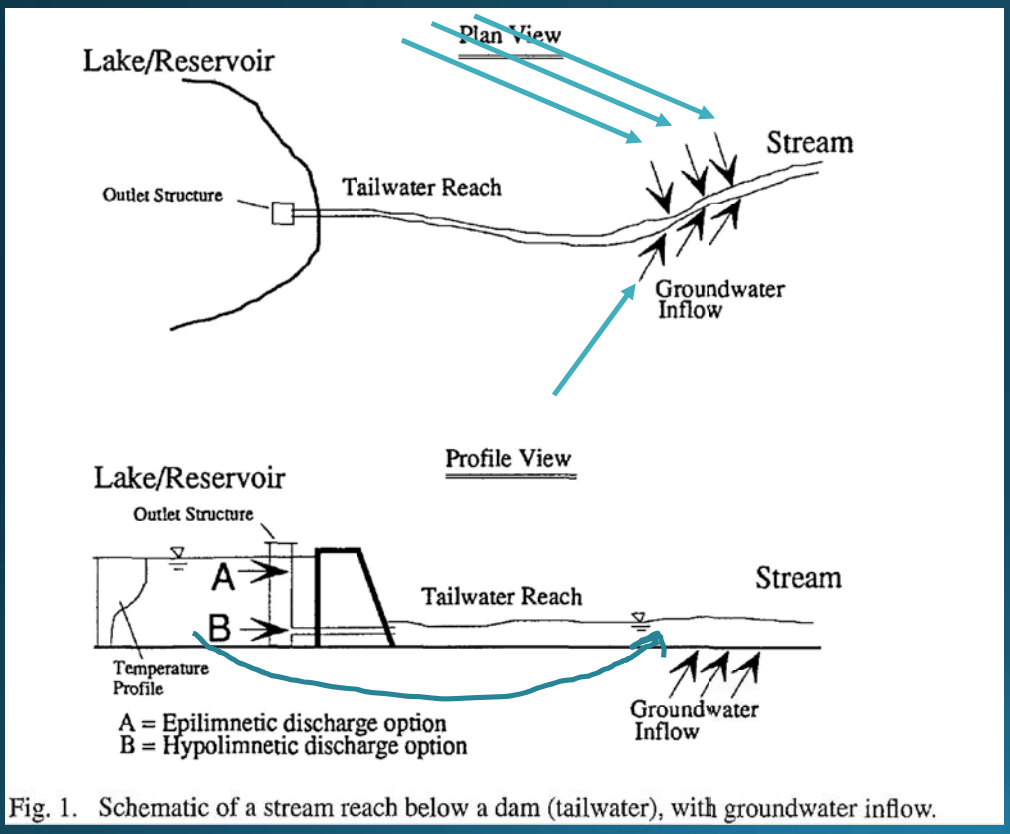


Fig. 1. Schematic of a stream reach below a dam (tailwater), with groundwater inflow.

Low DO groundwater is either coming from very limited DA not above the dam

OR

Deoxygenated hypolimnion through pore/aquafers/springs under the reservoir

MODELING OF CLIMATE CHANGE EFFECTS ON STREAM TEMPERATURES AND FISH HABITATS BELOW DAMS AND NEAR GROUNDWATER INPUTS

B. A. SINOKROT
Wenck Associates, Inc., Maple Plain, Minnesota 55359, U.S.A.
H. G. STEFAN
University of Minnesota, Dept. of Civil Engineering, St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minnesota 55414, U.S.A.
and
J. H. McCORMICK and J. G. EATON
Environmental Research Laboratory, U.S. Environmental Protection Agency, Duluth, Minnesota 55804, U.S.A.

Groundwater dynamics of Heath Creek

- Because of the very small drainage area not above the dam, relative groundwater contribution to HC discharge is almost certainly driven by discharge at the dam
  - High outflow = surface water pushing into and creating bank storage
  - Low flow = groundwater intrusion into HC
- Are dam operations increasing GW intrusion?

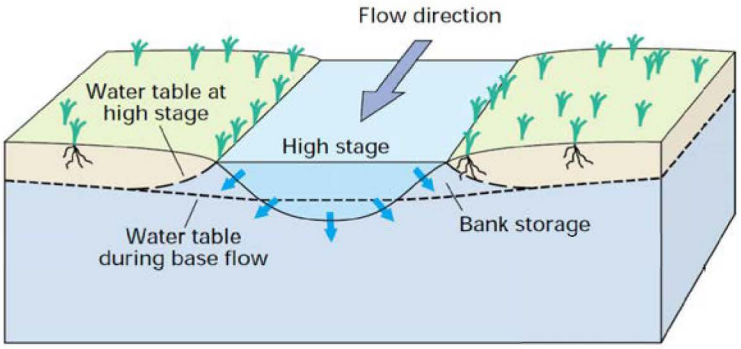
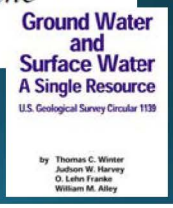


Figure 11. If stream levels rise higher than adjacent ground-water levels, stream water moves into the streambanks as bank storage.



RMPS minimum flows

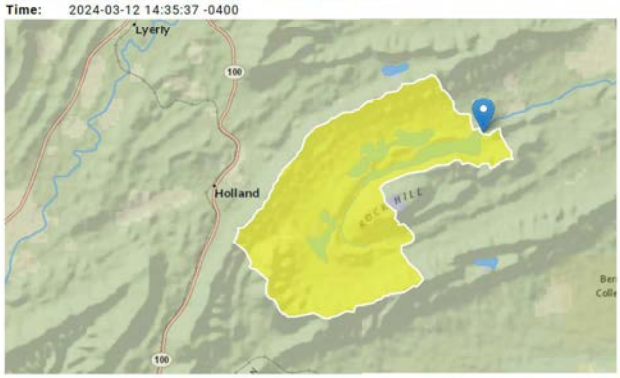
In accordance with Article 34 of the existing license, the Project provides a continuous minimum flow release of 1.2 cubic feet per second (cfs) from the Main Dam (Lower Reservoir) into Heath Creek.

The minimum instantaneous flow recorded from the flow release valve within the past five years during normal operation was 1.36 cfs.

3/12/24, 2:38 PM StreamStats

Rocky Mountain Pumped Storage

Region ID: GA
Workspace ID: GA20240312183514374000
Clicked Point (Latitude, Longitude): 34.36868, -85.26835
Time: 2024-03-12 14:35:37 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	20.637	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	23.6	feet per mi
DRNAREA	Area that drains to a point on a stream	15.9	square miles
ELEV	Mean Basin Elevation	883	feet

https://streamstats.usgs.gov/ss/

Monthly Flow Statistics Flow Report [N Georgia low flow 2017 5001]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIL	PIU
Jan 7 Day 10 Year Low Flow	7.53	ft^3/s	4.14	13.7
Feb 7 Day 10 Year Low Flow	9.67	ft^3/s	6.2	15.1
Mar 7 Day 10 Year Low Flow	11.8	ft^3/s	7.69	18.1
Apr 7 Day 10 Year Low Flow	11	ft^3/s	6.13	19.7
May 7 Day 10 Year Low Flow	7.93	ft^3/s	3.6	17.5
Jun 7 Day 10 Year Low Flow	5.5	ft^3/s	2.05	14.8
Jul 7 Day 10 Year Low Flow	3.58	ft^3/s	1.13	11.4
Aug 7 Day 10 Year Low Flow	2.33	ft^3/s	0.616	8.82
Sep 7 Day 10 Year Low Flow	1.97	ft^3/s	0.562	6.91
Oct 7 Day 10 Year Low Flow	2.51	ft^3/s	0.671	9.39
Nov 7 Day 10 Year Low Flow	4.96	ft^3/s	1.73	13.8
Dec 7 Day 10 Year Low Flow	5.72	ft^3/s	2.54	12.9

Monthly Flow Statistics Citations

Gotvald, A.J.,2017, Methods for estimating selected low-flow frequency statistics and mean annual flow for ungaged locations on streams in North Georgia: U.S. Geological Survey Scientific Investigations Report 2017–5001, 25 p. (https://doi.org/10.3133/sir20175001)

7Q10 Values

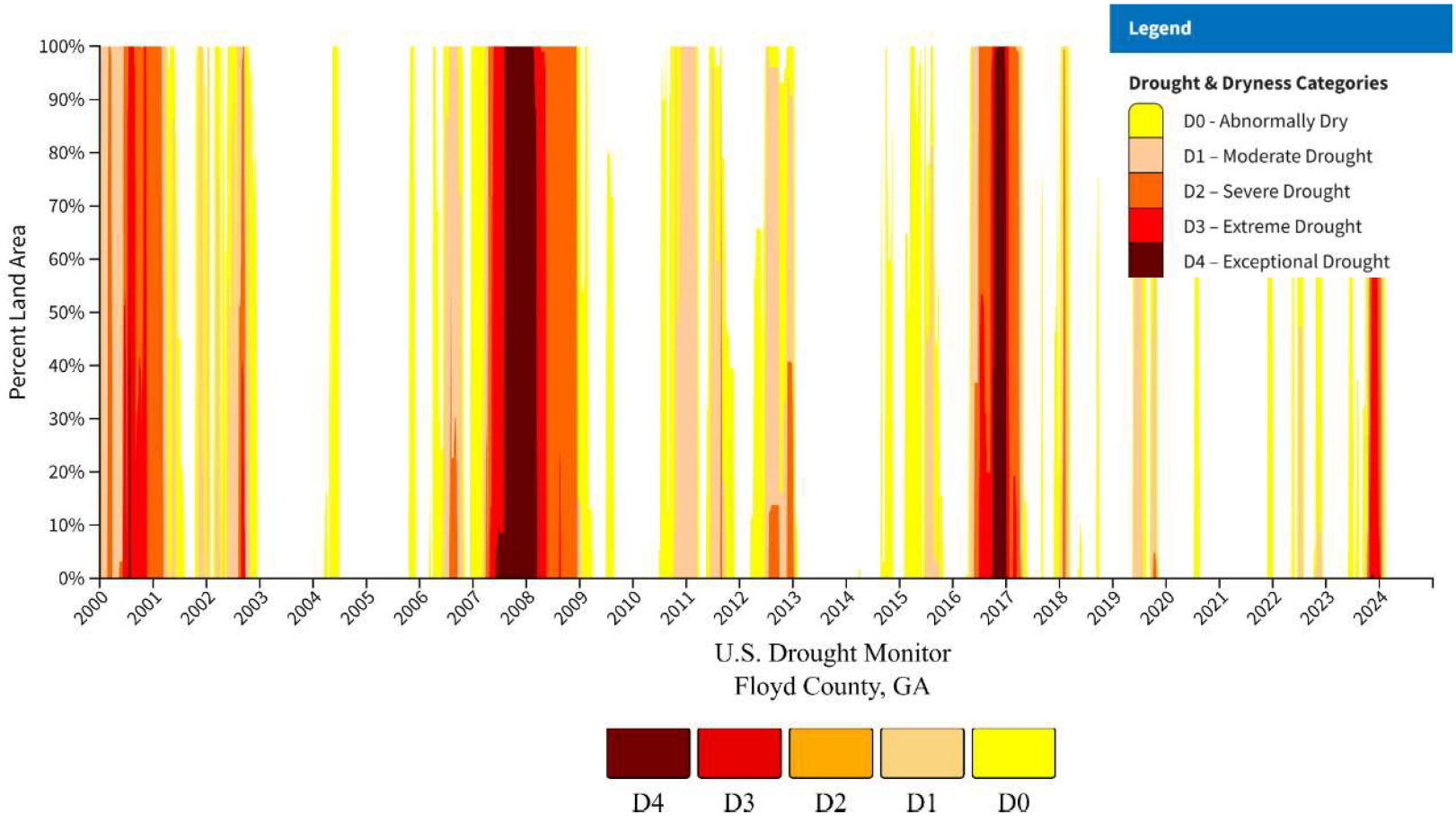
Low-Flow Statistics Flow Report [N Georgia low flow 2017 5001]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIL	PIU
1 Day 10 Year Low Flow	1.49	ft^3/s	0.377	5.89
7 Day 10 Year Low Flow	1.72	ft^3/s	0.46	6.44

Low-Flow Statistics Citations

Gotvald, A.J.,2017, Methods for estimating selected low-flow frequency statistics and mean annual flow for ungaged locations on streams in North Georgia: U.S. Geological Survey Scientific Investigations Report 2017–5001, 25 p. (https://doi.org/10.3133/sir20175001)


Legend
Drought & Dryness Categories
D0 - Abnormally Dry
D1 – Moderate Drought
D2 – Severe Drought
D3 – Extreme Drought
D4 – Exceptional Drought
Percent Land Area
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2000
2001
2002
2003
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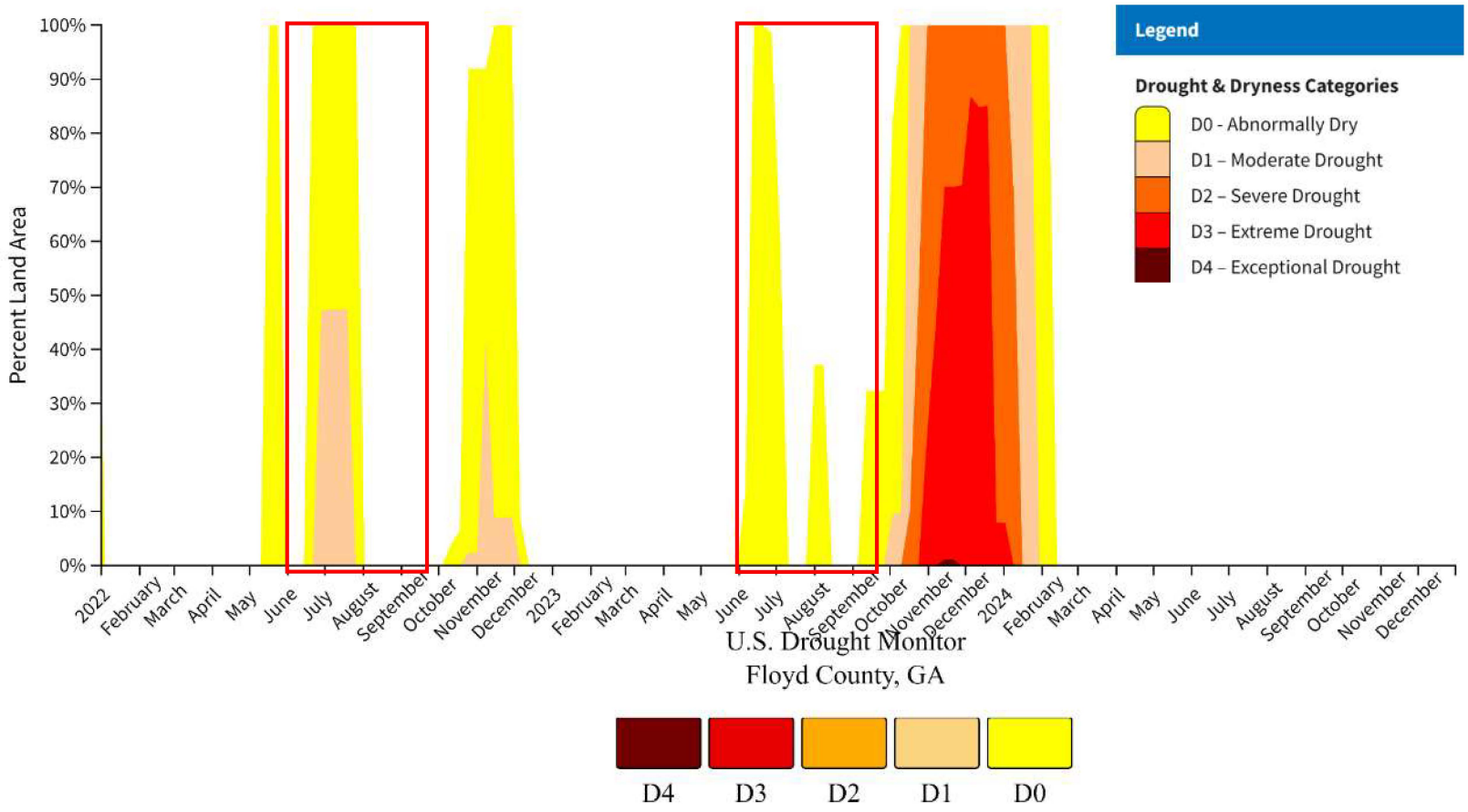
2024
U.S. Drought Monitor
Floyd County, GA
D4
D3
D2
D1
D0


Legend
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D2 – Severe Drought
D3 – Extreme Drought
D4 – Exceptional Drought
Percent Land Area
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2022
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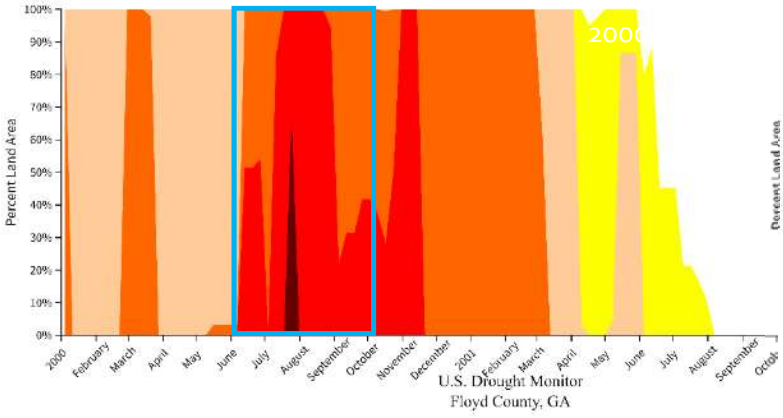
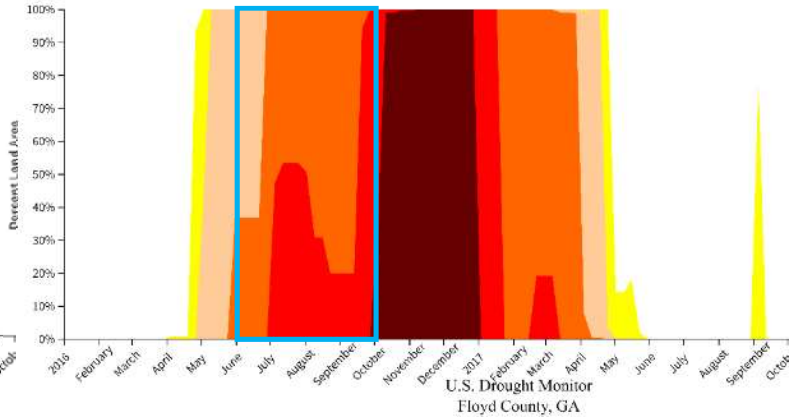
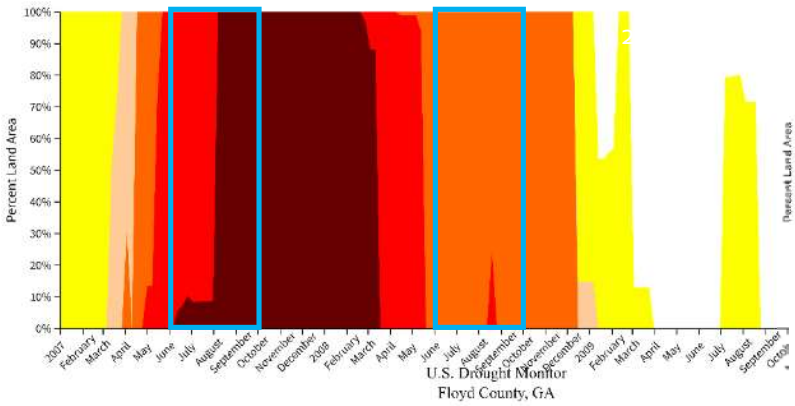
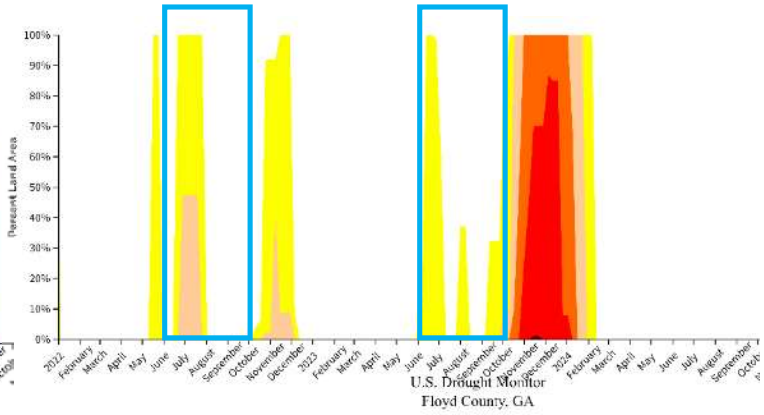
D0


Percent Land Area
U.S. Drought Monitor
Floyd County, GA


Percent Land Area
U.S. Drought Monitor
Floyd County, GA


Percent Land Area
U.S. Drought Monitor
Floyd County, GA


Percent Land Area
U.S. Drought Monitor
Floyd County, GA

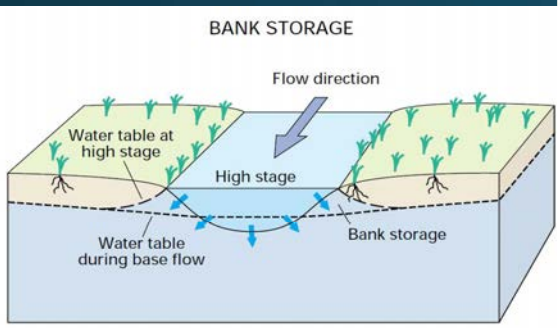
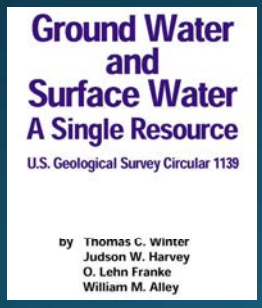


Figure 11. If stream levels rise higher than adjacent ground-water levels, stream water moves into the streambanks as bank storage.



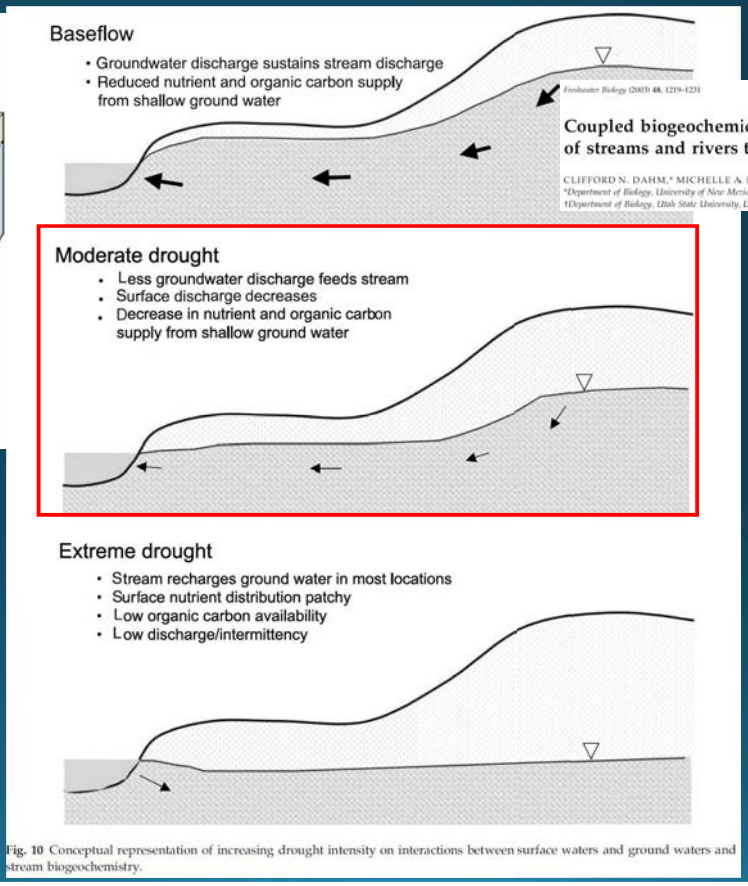


Fig. 10 Conceptual representation of increasing drought intensity on interactions between surface waters and ground waters and stream biogeochemistry.

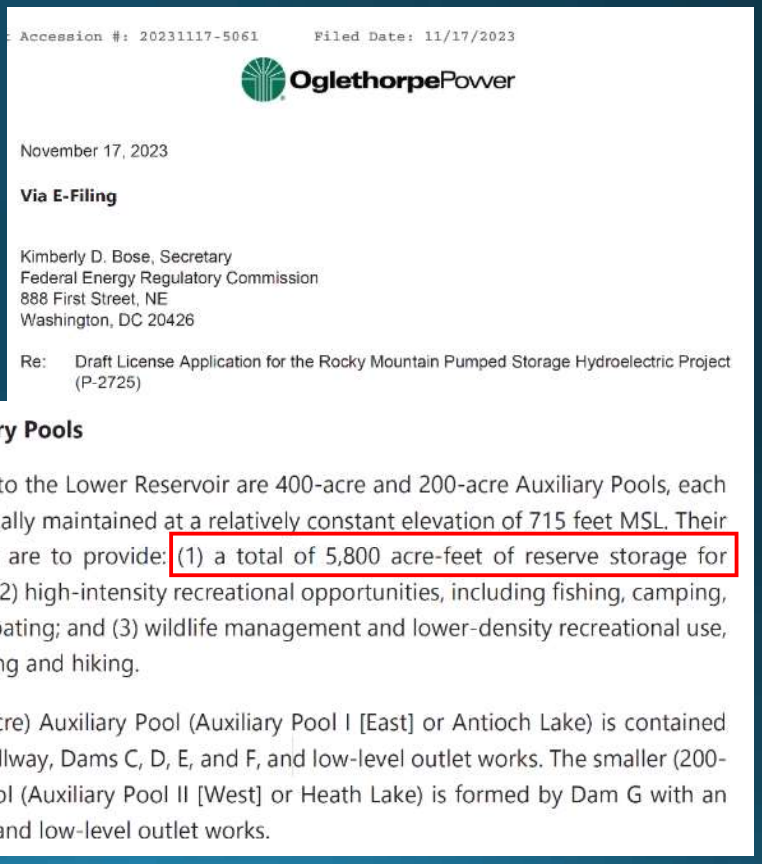
Coupled biogeochemical and hydrological responses of streams and rivers to drought

CLIFFORD N. DAHM,* MICHELLE A. BAKER,† DOUGLAS I. MOORE* AND JAMES R. THIBAULT*
*Department of Biology, University of New Mexico, Albuquerque, NM 87131, U.S.A.
†Department of Biology, Utah State University, Logan, UT 84322-5305, U.S.A.

Even in relatively wet years (2022-2023) operations appear to creating moderate drought conditions which is likely causing DO drops in HC.

Drought was explicitly considered in project creation

- two auxillary pools (600 Acres, 5800 Acre-feet of storage)



Accession #: 20231117-5061 Filed Date: 11/17/2023

OglethorpePower

November 17, 2023

Via E-Filing

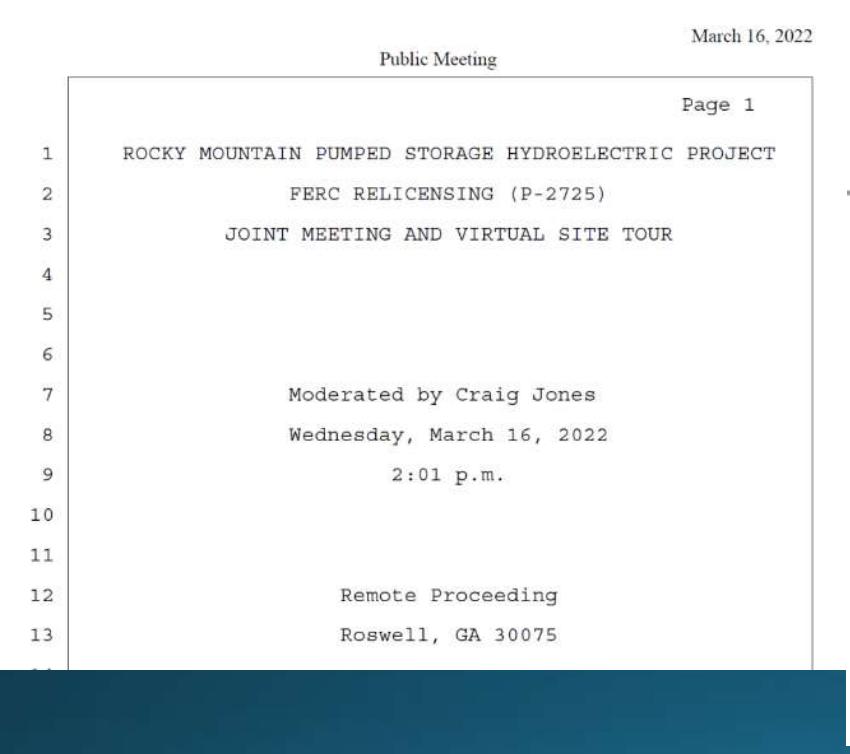
Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Draft License Application for the Rocky Mountain Pumped Storage Hydroelectric Project (P-2725)

2.4.3 Auxiliary Pools

Located adjacent to the Lower Reservoir are 400-acre and 200-acre Auxiliary Pools, each of which are normally maintained at a relatively constant elevation of 715 feet MSL. Their primary purposes are to provide: (1) a total of 5,800 acre-feet of reserve storage for drought periods; (2) high-intensity recreational opportunities, including fishing, camping, swimming, and boating; and (3) wildlife management and lower-density recreational use, including picnicking and hiking.

The larger (400-acre) Auxiliary Pool (Auxiliary Pool I [East] or Antioch Lake) is contained by an ungated spillway, Dams C, D, E, and F, and low-level outlet works. The smaller (200-acre) Auxiliary Pool (Auxiliary Pool II [West] or Heath Lake) is formed by Dam G with an ungated spillway and low-level outlet works.



March 16, 2022

Public Meeting

Page 1

ROCKY MOUNTAIN PUMPED STORAGE HYDROELECTRIC PROJECT

FERC RELICENSING (P-2725)

JOINT MEETING AND VIRTUAL SITE TOUR

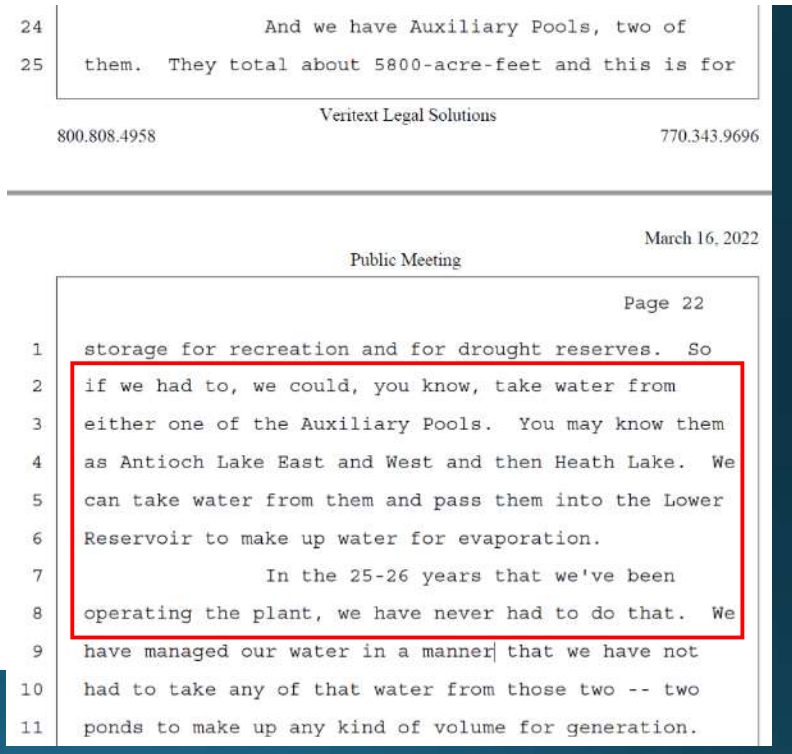
Moderated by Craig Jones

Wednesday, March 16, 2022

2:01 p.m.

Remote Proceeding

Roswell, GA 30075



And we have Auxiliary Pools, two of them. They total about 5800-acre-feet and this is for

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March 16, 2022

Public Meeting

Page 22

storage for recreation and for drought reserves. So if we had to, we could, you know, take water from either one of the Auxiliary Pools. You may know them as Antioch Lake East and West and then Heath Lake. We can take water from them and pass them into the Lower Reservoir to make up water for evaporation.

In the 25-26 years that we've been operating the plant, we have never had to do that. We have managed our water in a manner that we have not had to take any of that water from those two -- two ponds to make up any kind of volume for generation.

Not having to use the Auxillary lakes even during the exceptional drought of 2007-2008 suggests that HC is the resource that is sacrificing water during drought times to offset evaporative losses.

Why does this impact of operations need to be addressed?

- State minimum instantaneous DO is 4.0 mg/L
  - Even this standard is not fully protective of all aquatic organisms
    - Sensitive life stages (e.g. glochidia and juvenile mussels) and species (Ephemeroptera, Plecoptera, Trichoptera) are more susceptible
    - Listed and at-risk species of mussels occur in the Armuchee watershed and these species may be more susceptible to low DO than other more tolerant and common species
- Low DO is almost certainly a result of the dam and operations/changes to hydrology and groundwater dynamics

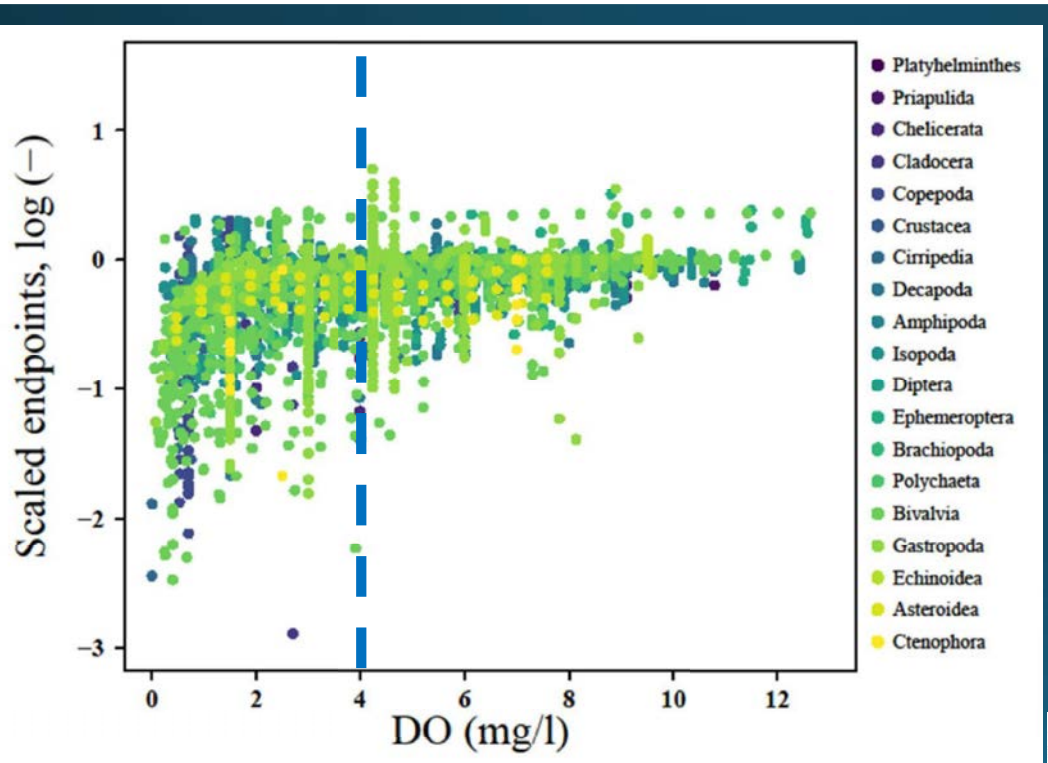

Fig. 1. Impacts of hypoxia on all measured processes, species are grouped in (sub)phyla or classes. Data were digitized and scaled to control (normoxic) conditions.

Meta-analysis shows that 4.0 mg/L is not protective of many species of aquatic invertebrates


Science of the Total Environment 652 (2019) 736–743
Contents lists available at ScienceDirect
Science of the Total Environment
journal homepage: www.elsevier.com/locate/scitotenv
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Review

Adverse impacts of hypoxia on aquatic invertebrates: A meta-analysis

Nika Galic [a,*], Tanner Hawkins [b], Valery E. Forbes [a]
[a] Department of Ecology, Evolution and Behavior, University of Minnesota, USA
[b] School of Biological Sciences, University of Nebraska-Lincoln, USA

Table 1 Summary of species sensitivity distributions associated with low dissolved oxygen (DO) aquatic hazard assessments for freshwater organisms. The number of the data points (n) and number of species (Sp) in each dataset; the *median*, *variance* and *range* for each dataset are provided, and the correlation coefficient (r^2), slope (b), and intercept (a) for each of the log-normal fitting models are listed

									Hazard concentration (mg DO/L (95% CI))					
Distributions	n	Sp	Median toxicity value	Var	Range	r^2	a	b	10%	50%	80%	90%	95%	99%
Lotic invertebrates	27	17	2.40	4.62	7.85	0.86	−0.66	1.97	0.49 (0.32–0.61)	2.17 (1.80–2.49)	5.78 (4.63–7.31)	9.65 (7.34–13.3)	14.7 (10.7–22.2)	32.6 (21.5–58.1)
Lentic invertebrates	8	4	2.06	1.20	3.28	0.97	−1.34	4.00	1.04 (0.93–1.15)	2.16 2.06–2.30)	3.51 (3.28–3.87)	4.52 (4.14–5.14)	5.58 (5.00–6.50)	8.25 (7.10–10.2)
Lotic and lentic invertebrates	48	31	1.53	5.62	8.72	0.90	−0.15	1.44	0.16 (0.12–0.20)	1.28 (1.09–1.46)	4.91 (4.02–6.01)	9.93 (7.78–12.9)	17.8 (13.3–24.3)	52.9 36.2–81.8)
All acute invertebrates	83	52	1.99	4.87	8.72	0.88	−0.33	1.64	0.30 (0.25–0.34)	1.57 (1.43–1.71)	4.68 (4.13–5.27)	8.27 (7.08–9.65)	13.2 (11.0–16.0)	32.0 (25.3–41.2)
Post-1986 invertebrates	8	6	0.93	0.28	1.44	0.97	−0.003	3.83	0.46 (0.41–0.52)	1.00 (0.94–1.06)	1.66 (1.54–1.84)	2.16 (1.95–2.49)	2.68 (2.38–3.20)	4.04 (3.43–5.13)
Pre-1986 invertebrates	75	47	2.20	5.11	8.72	0.86	−0.35	1.56	0.27 (0.21–0.32)	1.73 (1.51–1.95)	5.86 (4.94–7.00)	11.1 (9.00–14.0)	18.8 (14.7–24.9)	50.6 (36.6–73.6)
Chronic invertebrate LC_{50}	5	5	4.5	3.97	4.51	0.78	−0.62	1.53	0.37 (0.028–0.73)	2.53 (1.22–4.26)	8.96 (4.40–58.5)	17.4 (7.12–240)	30.0 (10.2–810)	83.4 (20.0–8589)
Warm water fish EC_{10}	5	4	5.00	0.66	2.02	0.80	−7.14	10.3	3.58 (2.94–3.98)	4.79 (4.52–5.17)	5.80 (5.42–6.67)	6.40 (5.87–7.75)	6.95 (6.25–8.81)	8.11 (7.01–11.3)
Cold water fish EC_{10}	16	7	5.20	2.53	6.82	0.64	−2.33	3.40	2.03 (0.31–2.65)	4.83 (3.25–5.80)	8.53 (6.18–19.2)	11.5 (7.73–43.0)	14.7 (9.33–87.6)	23.3 (13.0–336)
Warm water fish EC_{50}	5	4	1.38	0.51	1.75	0.94	−0.24	2.82	0.48 (0.28–0.62)	1.35 (1.12–1.58)	2.68 (2.12–3.66)	3.83 (2.85–5.94)	5.15 (3.59–9.05)	8.95 (5.56–19.9)
Cold water fish EC_{50}	16	7	2.26	0.81	3.72	0.89	−1.47	4.56	1.10 (0.90–1.24)	2.10 (1.92–2.26)	3.21 (2.87–3.65)	4.01 (3.48–4.77)	4.82 (4.08–5.97)	6.80 (5.46–9.15)
Warm and cold water fish LC_{50}	13	9	1.59	0.45	2.13	0.90	−0.33	3.28	0.52 (0.39–0.61)	1.26 (1.12–1.40)	2.28 (1.95–2.75)	3.11 (2.55–4.02)	4.01 (3.16–5.54)	6.46 (4.74–10.1)
EPT taxa	62	38	2.66	5.51	8.72	0.82	−0.39	1.49	0.28 (0.21–0.35)	1.93 (1.63–2.23)	6.86 (5.51–8.67)	13.3 (10.2–18.2)	23.1 (16.8–33.5)	64.5 (42.8–107)
None EPT taxa	21	14	0.96	0.94	4.27	0.72	−0.006	1.81	0.19 (0.04–0.30)	0.99 (0.64–1.29)	2.89 (1.82–5.58)	5.06 (2.89–14.1)	8.03 (4.18–32.2)	19.1 (8.17–149)
All fish and invertebrate LC_{50}	96	61	1.82	4.42	8.72	0.89	−0.33	1.75	0.28 (0.23–0.32)	1.64 (1.46–1.80)	5.22 (4.51–6.02)	9.59 (8.00–11.5)	15.8 (12.8–19.8)	40.6 (30.8–54.9)

Study conducted for setting DO criteria in Texas suggest that acute exposure to DO less than 4 would negatively impact more than 20% of aquatic invertebrate species.

Environ Sci Pollut Res (2018) 25:3139–3150
DOI 10.1007/s11356-017-8908-6

CrossMark

ENVIRONMENTAL QUALITY BENCHMARKS FOR AQUATIC ECOSYSTEM PROTECTION: DERIVATION AND APPLICATION

Revisiting inland hypoxia: diverse exceedances of dissolved oxygen thresholds for freshwater aquatic life

Gavin N. Saari[1] · Zhen Wang[1] · Bryan W. Brooks[1]

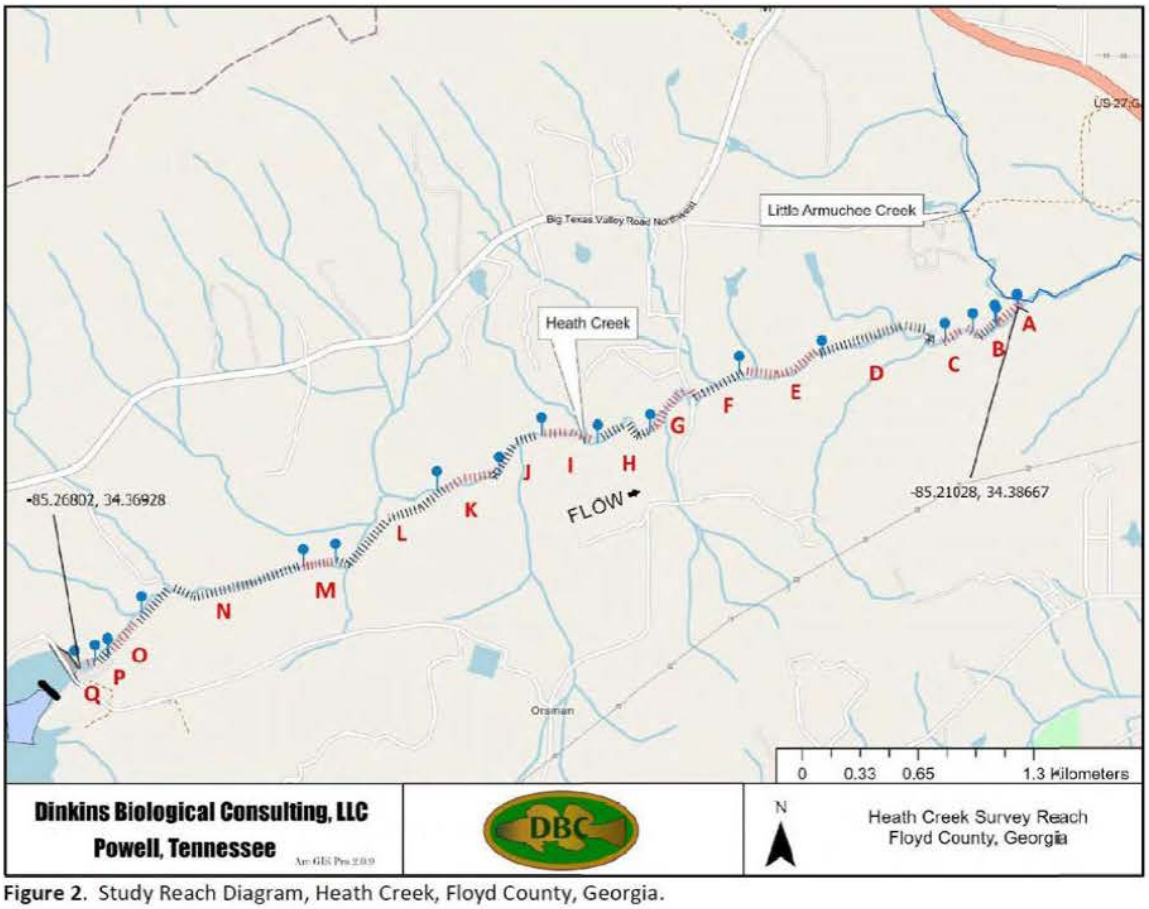


Figure 2. Study Reach Diagram, Heath Creek, Floyd County, Georgia.

SURVEY FOR FRESHWATER MUSSELS IN HEATH CREEK DOWNSTREAM OF ROCKY MOUNTAIN PUMPED STORAGE DAM, FLOYD COUNTY, GEORGIA

November 2022

Prepared by
Barbara Dinkins
Gerald Dinkins

Prepared for
for Kleinschmidt Group

Dinkins Biological Consulting, LLC
3720 West Beaver Creek
P O Box 1851
Powell, TN 37849

Table 2. Mussel species found in each survey section. Number of fresh dead in parentheses and number of relict shells in brackets. CPUE = Catch per unit effort in minutes.

Species	Reach Sections								
	A	B	C	D	E	F	G	H	I
Cambarunio nebulosus	(1)							1	
Leaunio lienosa		(2)	7(5)	1(4)[2]	[2]		1(7)	5(8)	
Villosa vibex	1	(1)	1(1)	(3)[1]			1(1)	1	2
Utterbackia imbecillis									
No. live mussels	1	0	8	1	0	0	2	7	2
No. live mussels/meter	0.01	0.00	0.03	0.00	0.00	0.00	0.01	0.02	0.01
CPUE	0.02	0.00	0.06	0.01	0.00	0.00	0.01	0.07	0.02
Campeloma regulare									
Pleurocera showalteri	Present								

Table 2 (cont.)

Species	Reach Sections							
	J	K	L	M	N	O	P	Q
Cambarunio nebulosus			Reach not sampled					
Leaunio lienosa	4(7)	10(19)		1(50)	7(82)	5(7)	4(42)	8(27)
Villosa vibex	1	(1)		(1)	1(12)	2(1)	(9)	83(5)
Utterbackia imbecillis		(2)						
No. live mussels	5	10		1	8	7	4	91
No. live mussels/meter	0.04	0.11		0.01	0.04	0.12	0.04	1.01
CPUE	0.01	0.03		0.00	0.01	0.04	0.04	1.14
Campeloma regulare.	Present							
Pleurocera showalteri								

Vast majority of mussels were found directly below the dam where GW intrusion is less likely to occur and thus less likely to experience low DO in water column and in the benthic/hyporheic zone (especially important for juvenile mussels and recruitment)

But there are also other potential reasons we often find them congregating below dams

Low DO increases stress response/behaviors even in tolerant mussels

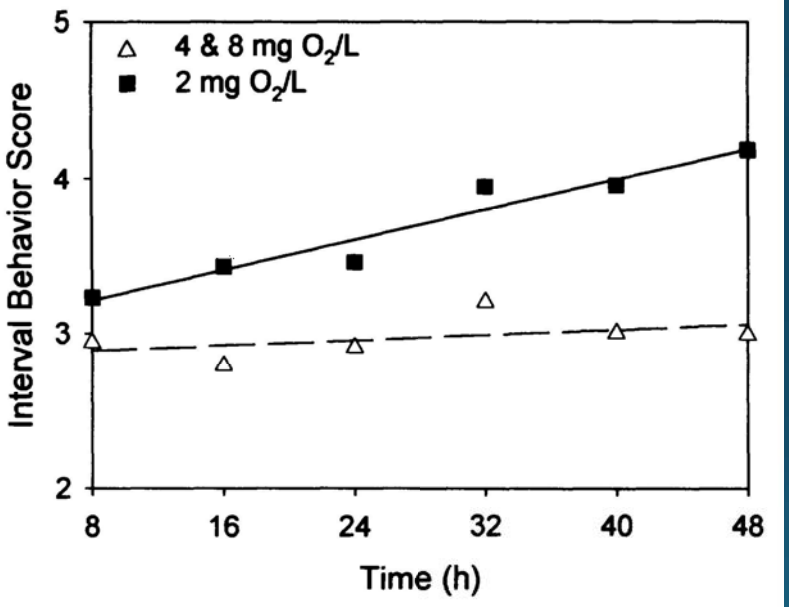


FIG. 4. Interval Behavior Score as a function of time, showing an increase in score with longer exposure to low oxygen, but no increase in score at mid and high concentrations.

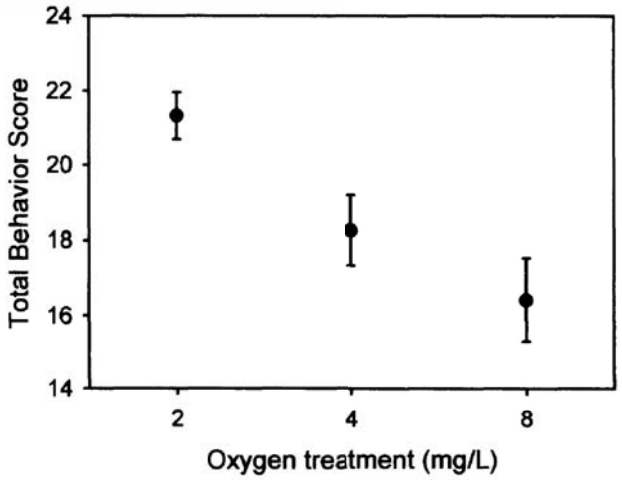


FIG. 2. Total Behavior Score (±1 SE) as a function of oxygen concentration. The treatment effect is significant at $p = 0.0035$.

J. N. Am. Benthol. Soc., 1998, 17(1):129–134

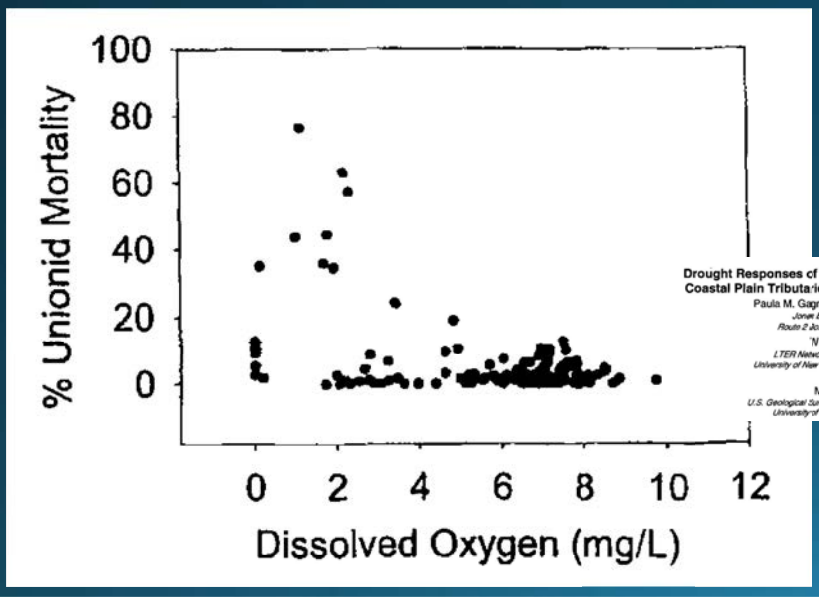
E. complanata is a very tolerant species

Effects of low dissolved oxygen on juvenile *Elliptio complanata* (Bivalvia:Unionidae)

BETH L. SPARKS[1] AND DAVID L. STRAYER[2]

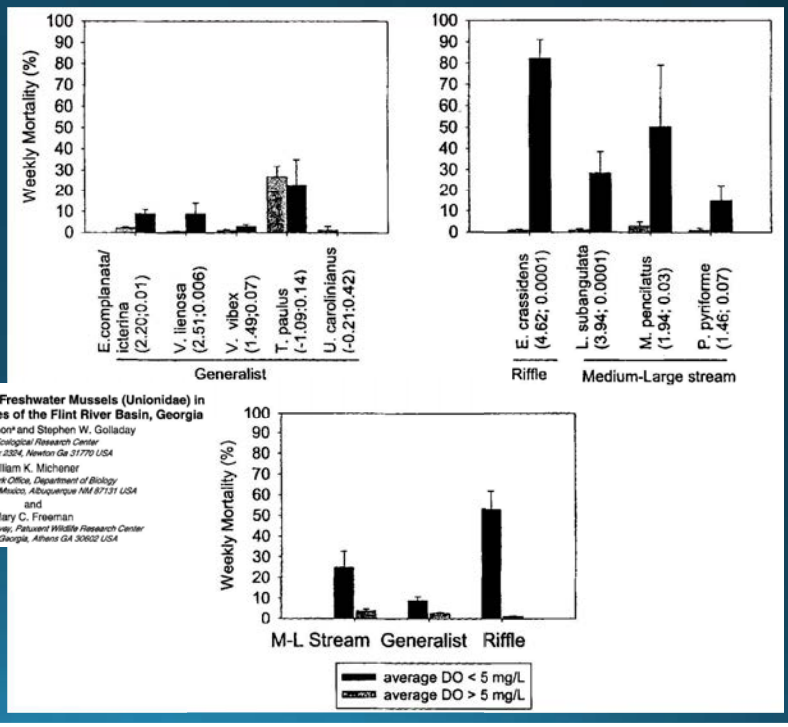
Institute of Ecosystem Studies, Box AB, Millbrook, New York 12545 USA

Low DO associated with drought events in the Flint River increased mortality in mussels, especially riffle specialists (sensitive species)



Drought Responses of Freshwater Mussels (Unionidae) in Coastal Plain Tributaries of the Flint River Basin, Georgia

Paula M. Gagnon[a] and Stephen W. Golladay
Jones Ecological Research Center
Route 2 Box 2324, Newton Ga 31770 USA
William K. Michener
LTER Network Office, Department of Biology
University of New Mexico, Albuquerque NM 87131 USA
and
Mary C. Freeman
U.S. Geological Survey, Patuxent Wildlife Research Center
University of Georgia, Athens GA 30602 USA



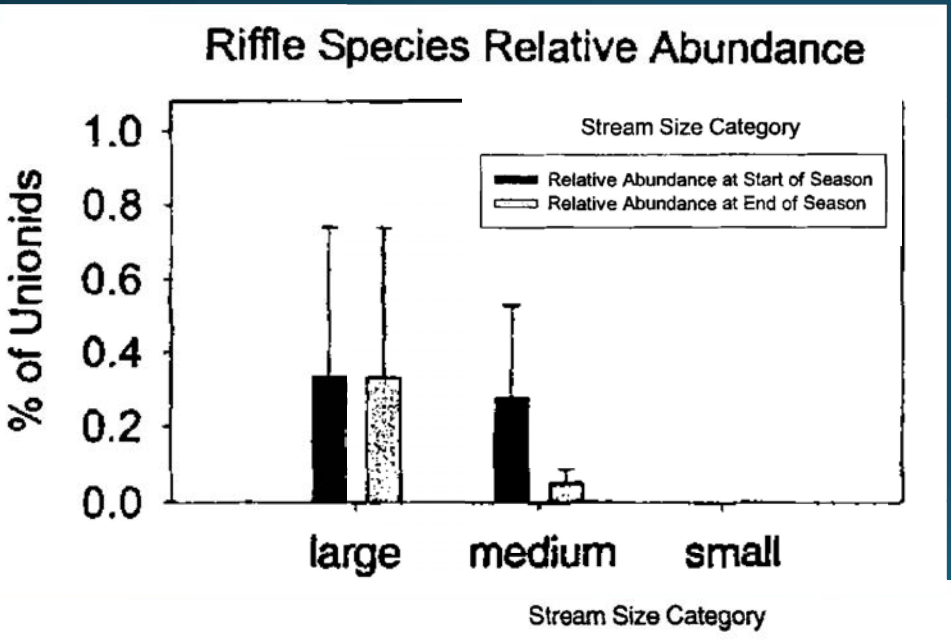


Figure 6. Relative abundance of different assemblages in each stream size category at the beginning and end of the survey period. Differences between groups are not statistically significant ($p>0.10$).

This mortality is also reflected in relative abundance of riffle specialists, especially in medium sized streams

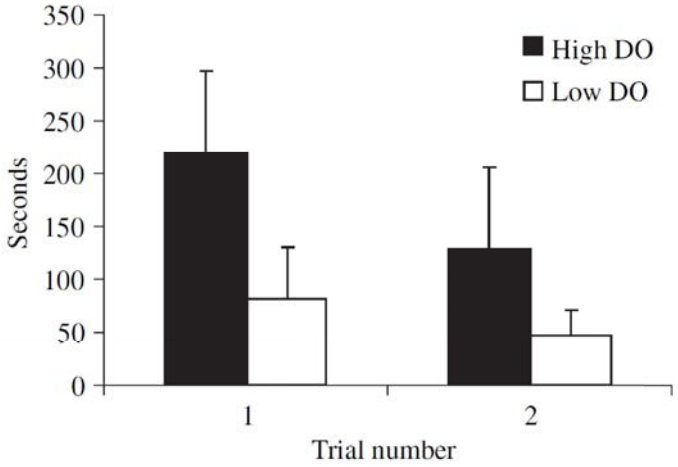


Fig. 1 Mean values and SD of time until valve reopening by clams following a simulated predator attack in low and high dissolved oxygen treatments. Two separate trials were conducted ($n = 30$ clams per treatment per trial). Differences between treatments were significant for both trials at $P < 0.05$. See text for details.

Freshwater Biology (2005) **50**, 1233–1238 doi:10.1111/j.1365-2427.2005.01396.x

Low dissolved oxygen levels reduce anti-predation behaviours of the freshwater clam *Corbicula fluminea*

MANERA E. SALOOM AND R. SCOT DUNCAN
Department of Biology, Birmingham-Southern College, Birmingham, Alabama, U.S.A.

Low DO decreases the length of anti-predator responses in even invasive/tolerant mussels/clams which could make them more susceptible to predation during low DO events

Low DO = 2.2 mg/L, high = 6.6 mg/L
After only 30 min acclimation at these conditions

Listed and At-Risk mussels in the Armuchee Creek watershed

***Cambarunio nebulosus* (Conrad, 1834)**
Alabama Rainbow

Life History
The Alabama Rainbow is a long term brooder and is gravid from late summer or fall to the following summer.

Status
The Alabama Rainbow has no state or federal protections. It has been petitioned for listing under the Endangered Species Act.
At-risk, Under Review

One collected in segment H (middle) and one fresh dead in segment A (furthest downstream)

Threats
Excess sedimentation due to inadequate riparian buffer zones, development, and agriculture covers suitable habitat and could potentially bury mussels. Poor agricultural practices may also cause eutrophication and *degrade* ***water quality***. Industrial effluent as well as sewage treatment plant discharges may also be degrading ***water quality***.

Hamiota altilis (Conrad, 1834)
Finelined Pocketbook

Historically occurred in the Armuchee watershed, shell found at two locations, one in a tributary to Armuchee Creek and one in the mainstem.

Life History

Females are known to brood glochidia from **late summer through late spring** and release superconglutinates during this time. The superconglutinate is comprised of a long gelatinous string with several glochidial packages attached and floats on the water current to resemble a small fish. The purpose of the superconglutinate is to attract predatory host fishes. Glochidia of this species successfully transformed on Largemouth Bass (*Micropterus salmoides*), Spotted Bass (*M. punctatus*), Coosa Bass (*M. coosae*), and Green Sunfish (*Lepomis cyanellus*) (Haag et al. 1995).

Status

Federal Protection: Listed **Threatened**
State Protection: Threatened

Threats

Currently, the Mobile Basin of Georgia is experiencing substantial development and timber removal along the banks. Excess sedimentation due to inadequate riparian buffer zones, development, and agriculture covers suitable habitat and could potentially bury mussels. Poor agricultural practices may also cause eutrophication and degrade ***water quality***. Proposed reservoirs may fragment or inundate extant populations in the Tallapoosa River Basin.

Pleurobema georgianum (I. Lea, 1841)
Southern Pigtoe

Live and fresh dead collected in tributaries to Armuchee Creek (2013-2014), shell (2013) and museum specimen (Pre-1974) collected from mainstem Armuchee creek

Life History

Specific life history information is unknown but is presumed to be similar to those of other individuals from in the genus Pleurobema, which brood and release glochidia from late spring through ***mid-summer***. It is also likely that this species uses a cyprinid as a fish host.

Status

Federal Protection: Listed **Endangered**
State Protection: Endangered

Threats

Excess sedimentation due to inadequate riparian buffer zones, development, and agriculture covers suitable habitat and could potentially bury mussels. Poor agricultural practices may also cause eutrophication and degrade ***water quality***. Industrial effluent as well as sewage treatment plant discharges may also be degrading ***water quality***.

Potential solutions

OPC notes in WQ study addendum that low-DO did not occur above 2.4 cfs

> The low-DO events previously reported in July and August 2022 at station RM11 (Kleinschmidt 2023a) occurred during a period when flows in Heath Creek were low for a prolonged period, ranging from 1.77 to 2.39 cfs at the USGS gage. Similarly, the low-DO event at RM11 on September 3, 2023 occurred under dry conditions when Heath Creek flows averaged 2.31 to 2.36 cfs. Figure 19 plots hourly DO at station RM11 and streamflow for summer 2022 and summer 2023 showing that lower DO values occurred during prolonged low-flow periods. Given that DO values in Heath Creek at the Main Dam ranged

Potential solutions

Increase minimum flow to ~2.4 year-round or 7Q10 or some % of inflow (harder to measure)

Cons

- Likely much more costly
- Issues measuring inflow on a project of this type
- May be more protective than is necessary to mitigate low DO events

Pros

- Simplicity in outflow measurement/management
- More protective
- Increasing system integrity will make it more resilient to natural disasters (e.g. drought) if/when can't release higher minimum flows

Create drought plan and supplement flows periodically (1-2 days/wk) during drought/dry periods to flush the creek and GW

Cons

- More time to develop
- Likely needs an adaptive management framework and more monitoring to dial in
- May be less protective of aquatic life that we haven't been measuring for impacts

Pros

- Likely much less costly and would require less water to be drawn from aux. pools
- May ameliorate the worst stressors without overshooting and meet state WQ standards with the least amount of water
- Supplemental minimum flows above inflow have been in use at other FERC projects in GA (Lloyd Shoals)

Uncertainties

- Feasibility
  - We anticipate that it won't take all much water to offset project impacts to downstream water quality
    - Assuming an additional 1.2 cfs = 2.38 Acre-feet/day to get to 2.4 cfs
    - Even in a worst case scenario of 122 consecutive days from June-September is only 290.4 Acre-feet out of 5800 Acre-feet of reserve storage in the auxiliary pools
    - Or a little less than 6 inches among the 600 (200 + 400 acre pools)
  - Specifics about operations
    - Can small amounts of water be pulled from the Auxiliary Pools or only in bulk?
  - Scenario modeling
    - Modeling different potential operations
      - How much more often would water need to be pulled from the Aux pools?
      - How much more beyond proposed drought operations would impacts be felt to recreational resources?
        - Boat ramp functionality, fisheries resources
- Cost-Benefit
  - Jurisdiction of FERC, not FWS

Federal Agency Obligations under Section 7(a)(1) of the Endangered Species Act
FWS Solicitor Memo and Analysis

United States Department of the Interior
OFFICE OF THE SOLICITOR
Washington, D.C. 20240

February 6, 2024

Memorandum

To: Martha Williams, Director, U.S. Fish and Wildlife Service

From: Sarah Krakoff, Deputy Solicitor for Parks and Wildlife
Shawn Finley, Attorney-Advisor, Division of Parks and Wildlife

SARAH KRAKOFF
Digitally signed by SARAH KRAKOFF
Date: 2024.02.06 13:21:00 -05'00'

Subject: Federal Agency Obligations under Section 7(a)(1) of the Endangered Species Act

I. ESA Section 7(a)(1) directs all Federal agencies (including the Service when implementing its authorities outside of the ESA) to carry out programs within their authorities to advance the recovery of endangered and threatened species.

ESA Section 7(a)(1) consists of two sentences to describe Federal agencies' responsibilities to conserve ESA-listed species:

> The Secretary shall review other programs administered by him and utilize such programs in furtherance of the purposes of this Act. All other Federal agencies shall, in consultation with and with the assistance of the Secretary, utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act.[4]

II. Federal agencies have non-discretionary obligations to develop and carry out programs to advance the recovery of ESA-listed species, but agencies have discretion about program design.

III. Federal agency discretion about how to fulfill Section 7(a)(1) obligations provides agencies with an opportunity to design their programs to meet their responsibilities under Section 7(a)(2).

Conclusion

Federal agencies have affirmative obligations to use their authorities to develop and carry out programs for the conservation of endangered and threatened species. This obligation is species-specific and is triggered when a species is listed under the ESA. Agencies have considerable discretion about what measures to take to meet the conservation obligation, but the duty to comply with Section 7(a)(1) is non-discretionary. Finally, Section 7(a)(1) programs that move species toward recovery may assist Federal agencies with their obligations under Section 7(a)(2) to ensure their actions do not jeopardize listed species. Robust Section 7(a)(1) programs therefore have the potential to streamline or, in highly successful cases, eliminate the need for consultation under Section 7(a)(2). For all of these reasons, Section 7(a)(1)'s front-end approach to species conservation holds a great deal of unrealized potential to achieve the ESA's goals of species protection and recovery.

RMPS is in a high priority and high diversity watershed (Armuchee Creek/Oostanaula River)
Listed and at-risk species are likely to have occurred in Heath Creek
FWS Recommendation: Conservation (which includes recovery such that protection is no longer needed) of listed and at-risk mussel species requires that we address water quality such that habitats are suitable for reintroductions and establishment of self-sustaining populations. However, the path to these goals is up to FERC's discretion.

FWS recommendation will likely include

- A request for proposed measures to offset project impacts on DO
  - We provided some examples but there are probably other potential solutions we haven't thought of
- That a drought plan be developed with modeling scenarios that
  - Examine the impacts to operations and recreational resources under different management scenarios that are likely to address water quality issues in HC
    - Should include information about how much more often increased flows would have triggered the proposed drought operations (pulling from the aux. pools)
    - If operationally possible, scenarios of pulling from aux. pools all at once or a little at a time
    - How much more often recreational resources (e.g. boat ramp function) would be impacted beyond the currently proposed drought operations
    - An estimate of how much more water would be needed on average historically to increase flows under various management scenarios.

From:	Bauer, Eric F
To:	Jones, Craig; Zeng, Wei; Hedeen, David; "Elizabeth.Booth@dnr.ga.gov"; Hakala, Jim; Escobar, Anakela; Steven Layman; Jason Moak; McCaslin, Tyler; Barrows, Christina; Bowen, Bryant; clint.peacock@dnr.ga.gov
Subject:	Re: [EXTERNAL] Rocky Mountain Relicensing Joint Meeting
Date:	Thursday, April 11, 2024 5:47:23 PM
Attachments:	image001.png

All,

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-Eric

Eric Bauer (he/him)
Fish and Wildlife Biologist
Georgia Ecological Services
US Fish and Wildlife Service
RG Stephens, Jr. Federal Building
355 East Hancock Avenue, Room 320
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Teams: eric_bauer@fws.gov (preferred)

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-Eric

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When: Thursday, April 11, 2024 3:00 PM-5:00 PM.
Where: Microsoft Teams Meeting

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I will be following up with more detail about the meeting including an agenda. Please reach out to me in the meantime with any questions.

Best,

Craig

Craig A. Jones, PhD
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2100 East Exchange Place, Tucker, GA 30084

Office: 770-270-7348 **Mobile:** 770-500-8912
Email: craig.jones@opc.com **Web:** www.opc.com

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From:	McCaslin, Tyler
To:	Bauer, Eric F; Jones, Craig; Zeng, Wei; Hedeen, David; "Elizabeth.Booth@dnr.ga.gov"; Hakala, Jim; Escobar, Anakela; Steven Layman; Jason Moak; Barrows, Christina; Bowen, Bryant; clint.peacock@dnr.ga.gov
Subject:	RE: [EXTERNAL] Rocky Mountain Relicensing Joint Meeting
Date:	Monday, April 15, 2024 7:00:34 AM
Attachments:	image001.png RM Project Preconstruction Geology Volume 4.pdf

Hi everyone,

Attached is the preconstruction geology report referenced during the presentation.

-Tyler

From: Bauer, Eric F <eric_bauer@fws.gov>
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Norm Holst

Oglethorpe Power Corporation
An Electric Membership Cooperative
Tucker, Georgia

ROCKY MOUNTAIN PROJECT

Preconstruction Geology

Volume IV
Appendix B - Inspection Trench Logs
Appendix C - Seismicity
Appendix D - Hydrogeology

April 1990

ROCKY MTN

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Oglethorpe Power Corporation
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Preconstruction Geology Report

April 1990

General Table of Contents

Rocky Mountain Project

Preconstruction Geology Report - April 1990

Volume IV - Appendices B, C, D

Appendix B - Inspection Trench Logs - 1989 OPC Investigations

Appendix C - Seismicity

Appendix D - Hydrogeology

ROCKY MOUNTAIN PROJECT

Preconstruction Geology Report

APPENDIX B

INSPECTION TRENCH LOGS

ROCKY MOUNTAIN PROJECT

APPENDIX B

INSPECTION TRENCH LOGS

TABLE OF CONTENTS

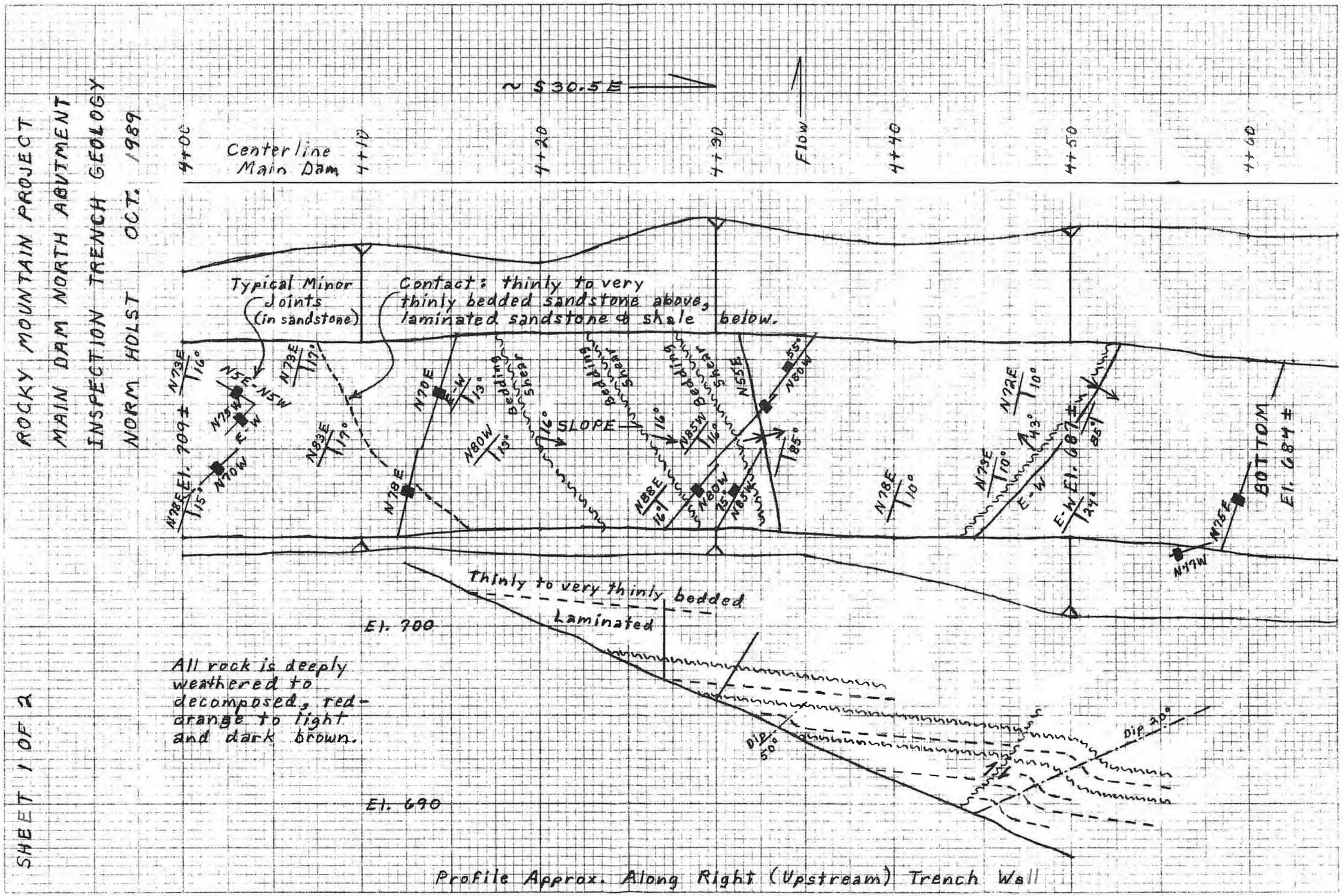
Lower Reservoirs

Inspection Trench Logs

1989

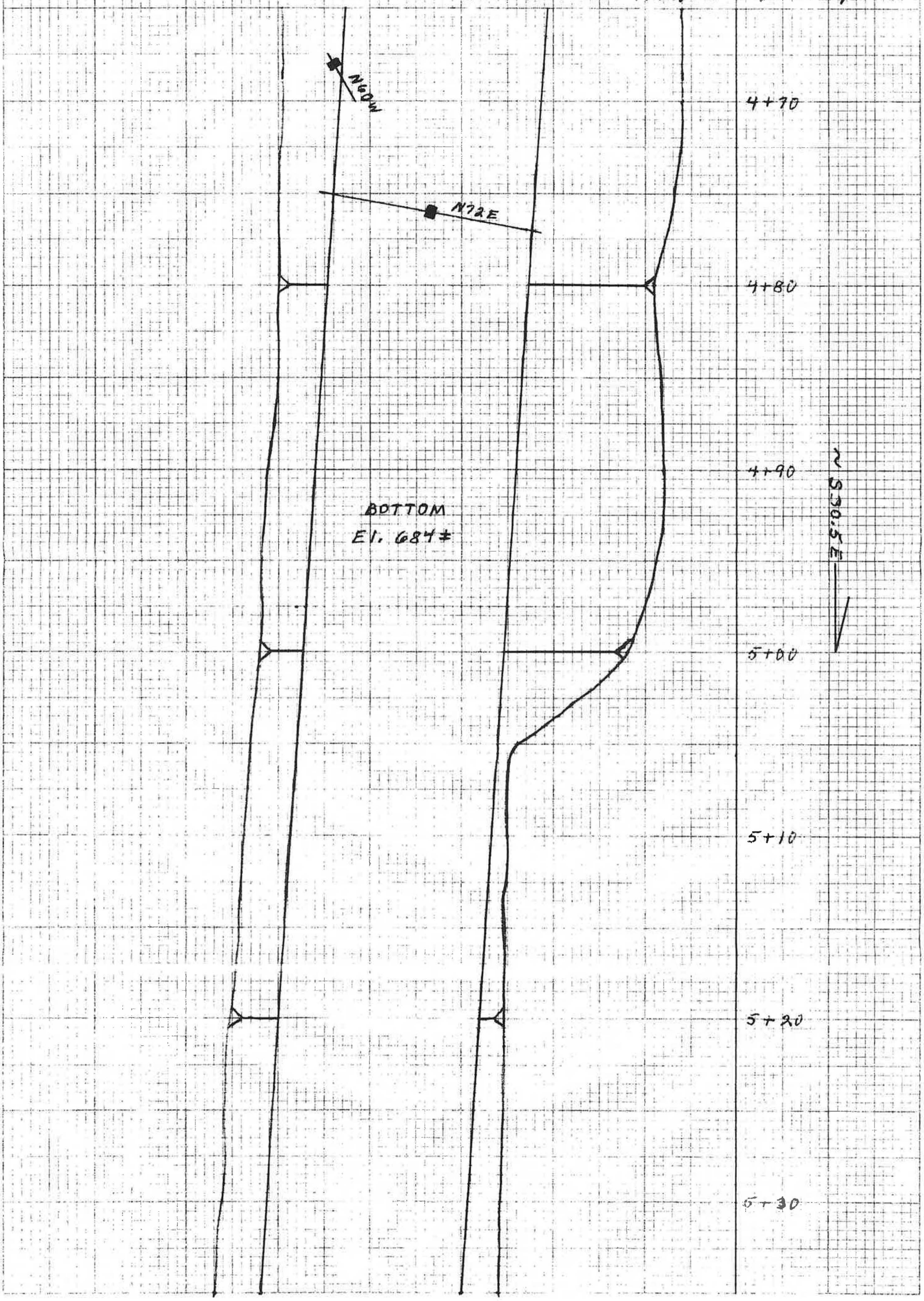
ROCKY MOUNTAIN PROJECT
MAIN DAM NORTH ABUTMENT
INSPECTION TRENCH GEOLOGY
NORM HOLST OCT. 1989

SHEET 1 OF 2

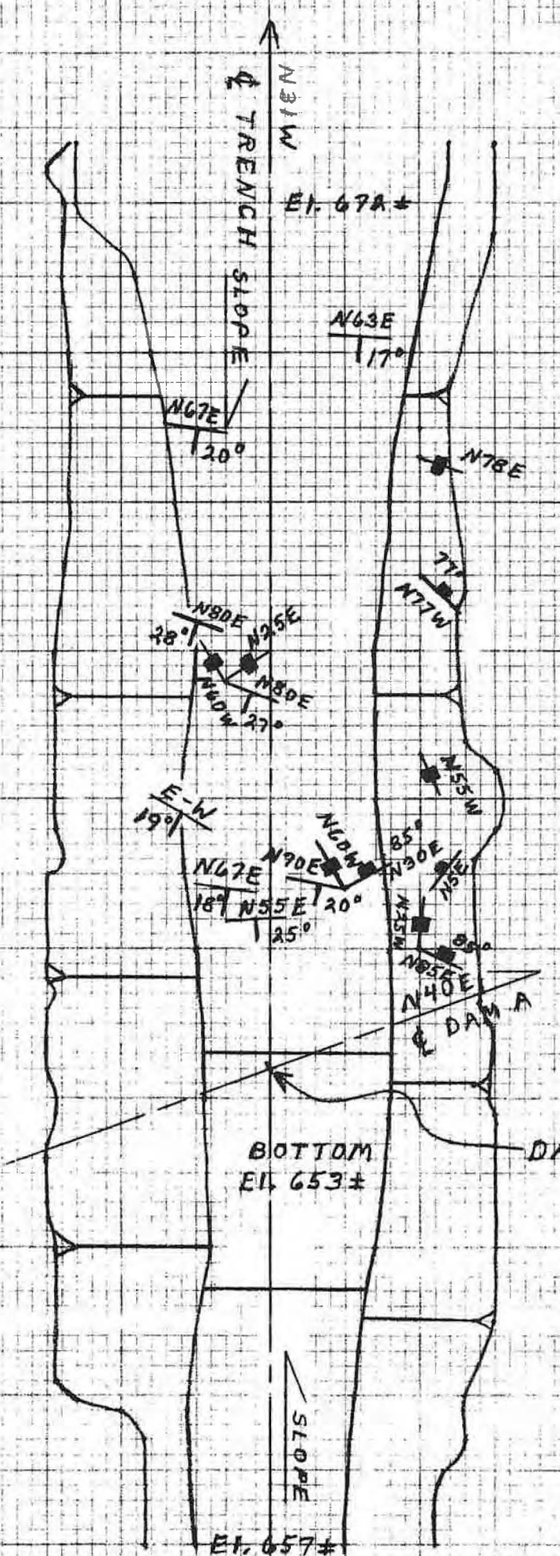


SHEET 2 OF 2

ROCKY MOUNTAIN PROJECT
MAIN DAM NORTH ABUTMENT
INSPECTION TRENCH GEOLOGY

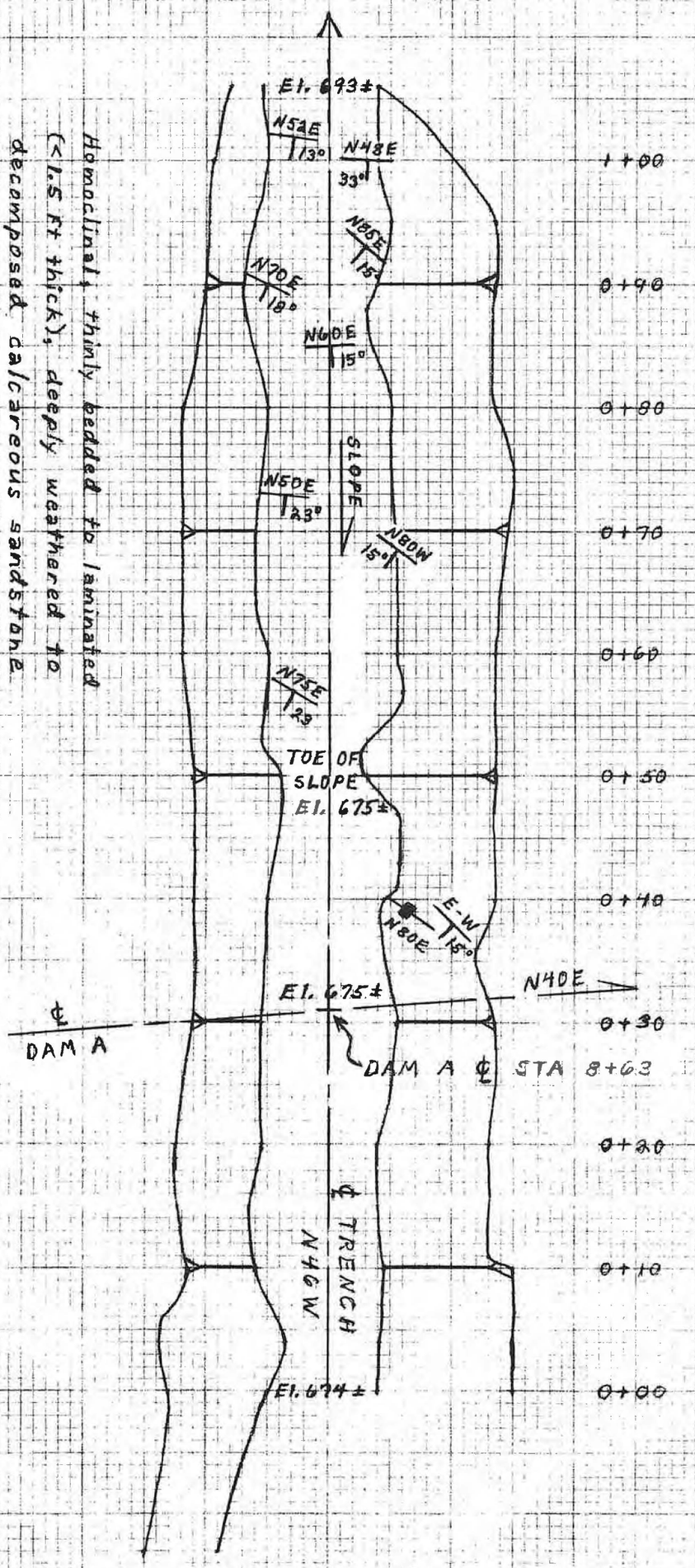


ROCKY MOUNTAIN PROJECT
DAM A RIGHT ABUTMENT
LOWER INSPECTION TRENCH
NORM HOLST OCT. 1989



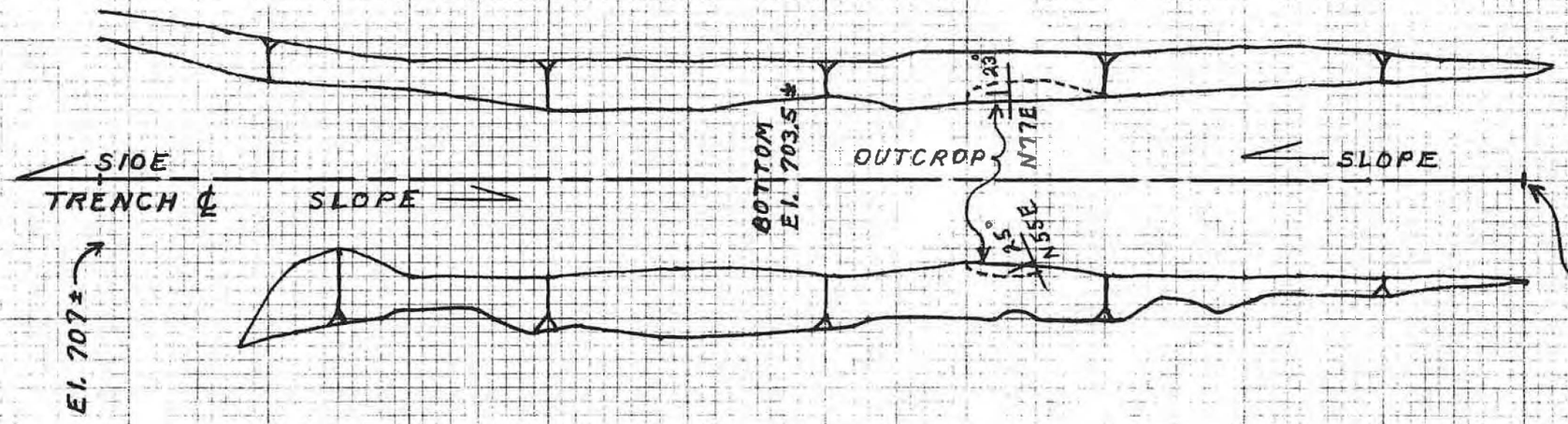
Homoclinal, medium bedded to laminated (<2.5 ft thick), deeply weathered to decomposed, calcareous sandstone and calcareous mudstone with salt calcite leached, red-orange to light and dark brown.

ROCKY MOUNTAIN PROJECT
RIGHT ABUTMENT DAM A
UPPER INSPECTION TRENCH
NORM HOLST OCT. 1989



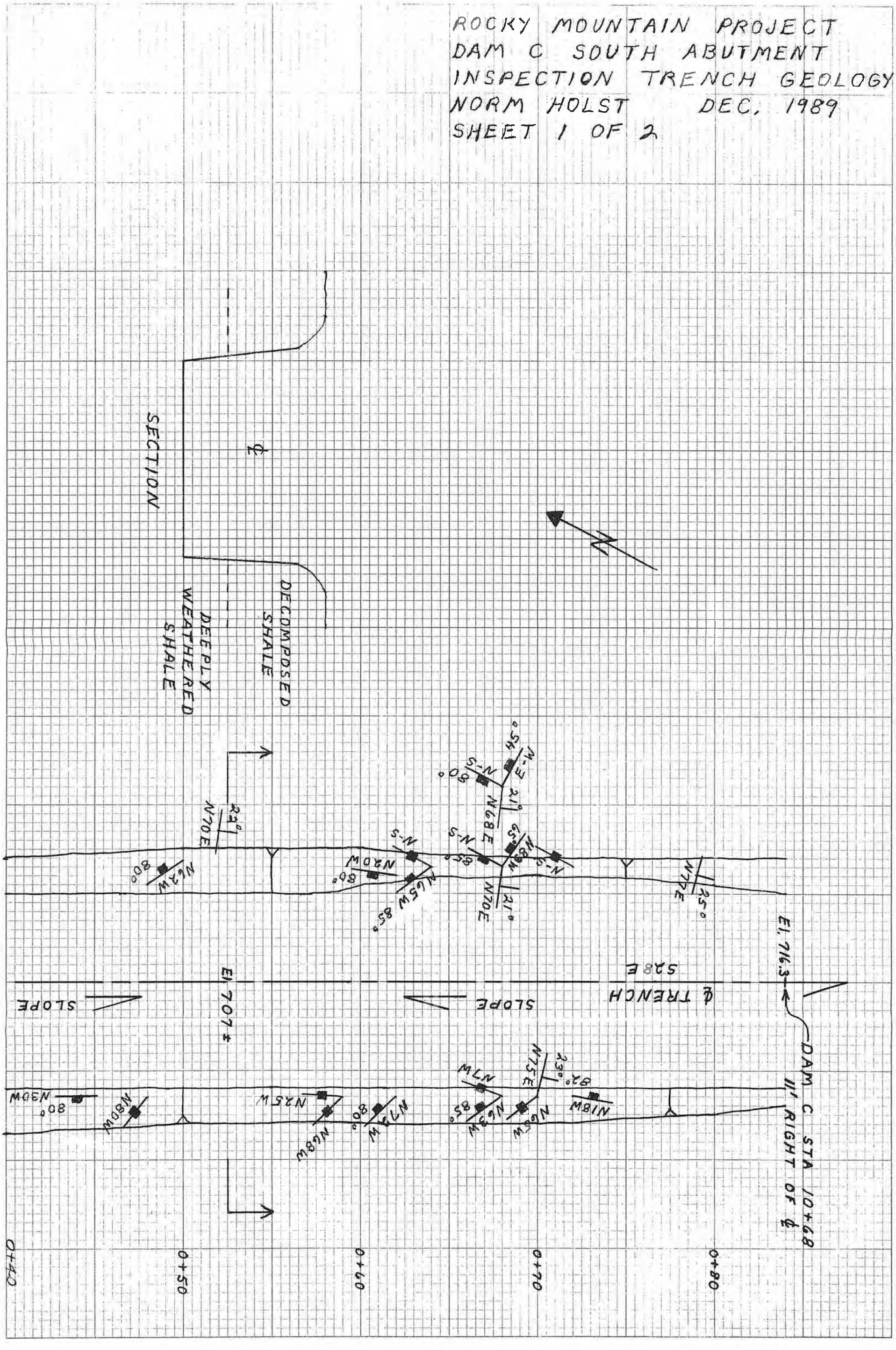
Homoclinal, thinly bedded to laminated (<1.5 Ft thick), deeply weathered to decomposed calcareous sandstone and calcareous mudstone with all calcite leached, red-orange to light and dark brown.

ROCKY MOUNTAIN PROJECT
DAM C NORTH ABUTMENT
INSPECTION TRENCH GEOLOGY
WORM HOLST NOV. 1989



1) Up to 1/2 Ft topsoil.
2) 2 to 4 Ft of subsoil: lean clay (CL), silty, light brown, wet, medium plasticity with a trace Fine sand.
3) Bottom of trench is in competent bedrock, but this is obscured by mud. Outcrop areas in trench walls noted.
4) Bedrock is homoclinal, little weathered, moderately hard, moderately strong, medium to dark gray shale.

ROCKY MOUNTAIN PROJECT
DAM C SOUTH ABUTMENT
INSPECTION TRENCH GEOLOGY
NORM HOLST DEC. 1989
SHEET 1 OF 2



ROCKY MOUNTAIN PROJECT
DAM C SOUTH ABUTMENT
INSPECTION TRENCH GEOLOGY
NORM HOLST DEC. 1989
SHEET 2 OF 2

1) All soil removed to decomposed bedrock.
2) 5 to 7 Ft of decomposed bedrock: very soft, very weak, friable and soil-like; light to dark brown or red, but retains rock structure, lamination and jointing.
3) Decomposed bedrock is underlain by deeply weathered bedrock in lowest 2½ to 3 Ft of trench: soft, weak, light gray.
4) Bedrock is shale; beds are homoclinal.