

AVISTA CORPORATION

2019

LONG LAKE HED

TEMPERATURE MONITORING REPORT

WASHINGTON 401 CERTIFICATION, SECTION 5.5

Spokane River Hydroelectric Project
FERC Project No. 2545

Prepared By:



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List of Acronyms and Abbreviations

7-DADM	7-day average daily maximum temperature
°C	degrees Celsius
Avista	Avista Corporation
Certification	Section 401 water quality certification
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
DO WQAP	Dissolved Oxygen Water Quality Attainment Plan
FERC	Federal Energy Regulatory Commission
Golder	Golder Associates Inc.
HED	hydroelectric development
LLFB	Long Lake forebay monitoring station
LLTR	Long Lake HED tailwater monitoring station
LLGEN	Long Lake generation plume monitoring station
m	meter(s)
MS5	Hydrolab [®] MS5 Multiprobe [®]
Project	Spokane River Project
QAPP	Quality Assurance Project Plan
RM	River mile
Spokane Tribe	Spokane Tribe of Indians
TDG	total dissolved gas
Temperature WQAP	Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan
WAC	Washington Administrative Code
WRIA	Water Resource Inventory Area
WQM QAPP	Water Quality Monitoring and Quality Assurance Project Plan

1.0 INTRODUCTION

On June 18, 2009, the Federal Energy Regulatory Commission (FERC) issued a new license for the Spokane River Project (Project), FERC Project No. 2545 (FERC 2009a), which incorporated the Washington Department of Ecology (Ecology) Section 401 Water Quality Certification (Certification; Ecology 2009). In accordance with Section 5.10 and 5.5 of the Certification, Avista Corporation (Avista) developed the Water Quality Monitoring and Quality Assurance Project Plan (WQM QAPP; Avista 2009) and the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan (Temperature WQAP; Avista 2011) in consultation with Ecology and the Spokane Tribe of Indians (Spokane Tribe). Avista filed the Ecology-approved WQM QAPP with FERC on August 13, 2009 and FERC approved it with modification on September 17, 2009 (FERC 2009b). Avista filed the Ecology-approved Temperature WQAP with FERC on January 26, 2011. On May 10, 2011, FERC (2011) issued an order approving and amending the 2009 WQM QAPP, pursuant to Article 401(A)(12) of the license.

As part of the Temperature WQAP, Avista is required to provide an annual summary report of the available temperature water quality monitoring results to Ecology by March 1 on an annual basis. Previous reports summarized Long Lake Hydroelectric Development (HED) temperature data collected in 2010 and 2011 (Golder 2012), in 2012 (Golder 2013), in 2013 (Golder 2014), in 2014 (Golder 2015), in 2015 (Golder and Mattax Solutions 2016), in 2016 (Golder and Mattax Solutions 2017), in 2017 (Avista 2018a), and in 2018 (Avista 2019a). This report summarizes temperature monitoring conducted for Long Lake HED during the 2019 calendar year.

2.0 MONITORING ACTIVITIES

2.1 2019 Monitoring Objectives

The overall objectives of the Temperature WQAP Monitoring Report are to:

- Document monitoring periods
- Summarize temperature monitoring results
- Document compliance with the applicable water quality standards
- Describe any proposed changes to the Temperature WQAP and WQM QAPP

In addition to the above objectives, we have included information pertaining to the Spokane Tribe's water quality standards in regards to waters downstream of the Project.

2.2 Monitoring Locations and Periods

Water temperature data that are included in annual summary reports are from a number of water quality monitoring programs as described in the Temperature WQAP (Avista 2011). This report presents temperatures obtained as a component of monitoring programs focused on Spokane River water quality (Ecology 2020a, 2020b), Long Lake HED total dissolved gas (Avista 2020a), and Long Lake HED dissolved oxygen (Avista 2020b). As was discussed in the 2018 Long Lake

HED Temperature Monitoring Report (Avista 2019a), temperature monitoring was not conducted at the monitoring locations within Lake Spokane in 2019.

2.2.1 Lake Spokane

Temperature monitoring was conducted at two river stations upstream of Lake Spokane (inflow stations) and one location in the Long Lake Dam Tailrace (Table 2-1 and Figure 2-1). These monitoring efforts are described in more detail below.

2.2.1.1 Inflow Stations

Ecology has monitored temperature, along with other water quality parameters, in the Spokane River and Little Spokane River a short distance upstream of its confluence with Lake Spokane. This was done under Ecology's River and Stream Water Quality Ambient Monitoring Program, which monitors by water year.¹ Ecology's sampling effort at these two stations was conducted in accordance with the Stream Ambient Monitoring QAPP (Ecology 2003). Preliminary data for the Spokane River at Nine Mile Bridge station (54A090) and Little Spokane River near Mouth station (55B070) located on the Little Spokane River at River Mile (RM) 1.1 were accessed on January 30, 2020.

2.2.1.2 Within Lake Spokane

As was discussed in the 2018 Long Lake HED Temperature Monitoring Report (Avista 2019a), temperature monitoring was not conducted at the monitoring locations within Lake Spokane in 2019.

2.2.2 Long Lake Dam Tailrace

In 2019, Avista monitored temperature at one location at the Long Lake HED: at a station 0.6 mile downstream of Long Lake Dam referred to as LLTR. All monitoring, including quality control protocols, was conducted in accordance with Avista's Total Dissolved Gas (TDG) Monitoring Plan (Golder Associates Inc 2010) and Detailed Dissolved Oxygen (DO) Phase II Feasibility and Implementation Plan (Avista 2010). Under this program, water temperature, total dissolved gas, and DO concentrations were monitored with Hydrolab[®] MS5 Multiprobe[®] (MS5) instruments.

In the past, Ecology has conducted monitoring at Station 54A070, which is located below Long Lake Dam. Ecology ceased monitoring at this station in 2010, and hence no new temperature data were available when Ecology's database was accessed on January 30, 2020 (Ecology 2020c).

2.3 Temperature Numeric Criteria

The Washington state numeric temperature criterion that applies to Lake Spokane and the Long Lake HED tailrace (WAC 173-201A-602, WRIA 54 Notes 1, 2, and 3) limits 1-day maximum

¹ The "water year" is defined as the 12-month period from October 1 to September 30 of the following year.

temperature to no more than 20.0 degrees Celsius (°C) due to human activities. In addition, water temperature shall not be increased by greater than 0.3°C when natural conditions exceed 20.0°C.

The numeric temperature criteria for the Spokane Tribe, whose reservation is located downstream of the Project, are applicable from the upstream Spokane Indian Reservation boundary (approximately RM 32.7) to the mouth of the Spokane River (RM 0). For reference, the upstream boundary of the Spokane Indian Reservation is located approximately 1.2 miles downstream of Long Lake Dam and approximately 0.6 miles downstream of the Avista and Ecology monitoring stations located below the dam (LLTR). The Spokane River temperature criteria are the Class A 7-day average daily maximum temperature (7-DADM) criteria. The 7-DADM is calculated as the arithmetic average of seven consecutive measures of daily maximum temperatures, with the 7-DADM for any individual day calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days before and the three days after that date. The maximum allowable limit (7-DADM) for the Spokane River varies throughout the year as described below (Spokane Tribe 2003):

- 18.5°C between June 1 and August 31;
- 13.5°C between September 1 and September 30;
- 11°C between October 1 and March 31; and
- 13.5°C between April 1 and May 31.

3.0 RESULTS

Results of the 2019 temperature monitoring are discussed by monitoring location, along with a comparison to the 20.0°C Washington State water quality criterion. In addition, the discussion in Section 5.0 presents a comparison of the temperature results for the monitoring location below Long Lake Dam with the corresponding Spokane Tribe water quality criteria.

3.1.1 Lake Spokane

Water temperature was monitored at three locations: Ecology's Spokane River at Nine Mile Bridge station (54A090), Ecology's Little Spokane River station (55B070), and Avista's LLTR station in the Long Lake Dam Tailrace.

3.1.1.1 Inflow Stations

Ecology's Spokane River at Nine Mile Bridge station (54A090) was monitored monthly from January through November. Reported water temperatures for this timeframe ranged from 3.9°C in February to 16.4°C in June (Table 3-1). All monitored water temperatures were less than the 20.0°C Washington State criterion.

Ecology's Little Spokane River station, 55B070, was monitored monthly from January through November. Water temperatures during this timeframe ranged from 4.5°C in January to 15.5°C in June (Table 3-2). All monitored water temperatures were less than the 20.0°C Washington State criterion.

3.1.2 Long Lake Dam Tailrace

Long Lake Dam Tailrace data was collected at one location: LLTR. Water temperature data was collected in 15-minute intervals from March 28 through October 31 as part of Avista's Washington Total Dissolved Gas Monitoring Plan and the Detailed DO Phase II Feasibility and Implementation Plan (Figure 3-1).

LLTR

Daily maximum water temperatures ranged from 6.6°C in Mid-April to 19.6°C on August 23 (Table 3-3). Temperatures of greater than the 20.0°C Washington State criterion did not occur at this location in 2019. It should be noted, water temperature was not recorded from April 16 through May 2, and from June 10 through June 30 due to equipment failures.

4.0 SCHEDULE

Avista has prepared, obtained approval for, and implemented the Temperature WQAP and WQM QAPP, as well as other plans to address Lake Spokane temperatures, nutrients, and DO. Avista will continue to coordinate implementation of measures to improve water quality with the ultimate goal of meeting the water quality standard which consists of a numeric and narrative component. The list below summarizes plans that are currently being implemented along with Avista's planned actions towards this goal.

- **WQM QAPP** - Prepared the WQM QAPP (Avista 2009) in consultation with Ecology and the Spokane Tribe. Approval of this plan was obtained from Ecology on August 13, 2009 and from FERC with modifications on September 17, 2009 (FERC 2009b).
- **Temperature WQAP** - Prepared the Temperature WQAP (Avista 2011) in consultation with Ecology and the Spokane Tribe. Approval of this plan was obtained from Ecology on January 25, 2011 and from FERC (2011) on May 10, 2011 in an order approving and amending the 2009 WQM QAPP, pursuant to Article 401(A)(12). Avista will continue to provide annual reports summarizing water temperature data for the Long Lake HED in accordance to the approved Temperature WQAP, WQ QAPP and WQM QAPP.
- **Lake Spokane DO WQAP** – Avista prepared the Lake Spokane DO WQAP (Avista and Golder 2012), which discussed nine feasible potential measures to improve DO conditions. Upon receiving FERC approval (December 19, 2012), Avista began implementing the DO WQAP and has submitted Annual Reports for the work completed in 2013 through 2015 and 2017 to 2018 (Avista 2014, 2015, 2016a, 2018b, and 2019b), a Five Year Summary Report for the work completed from 2013 through 2016 (Avista 2017), and an Eight Year Summary Report for the work completed from 2013 through 2019 (Avista 2020c). The Lake Spokane DO WQAP Annual Reports provide a summary of the baseline monitoring, implementation activities, effectiveness of the implementation activities, and proposed actions of the upcoming year. In accordance with the DO WQAP, following completion of the 2017 nutrient monitoring season, Avista and Ecology

evaluated the results and success of monitoring baseline nutrient conditions in Lake Spokane. Nutrient monitoring (ex. nitrogen and phosphorus) was not conducted in 2018, but in-situ DO, temperature, conductivity and pH were measured and zooplankton were collected at the six baseline monitoring stations (LL5 through LL0), and at the four supplemental monitoring stations (LL3a, LL2a, LL2b, and LL1a). In 2019, Avista shifted focus from baseline monitoring to conducting more detailed analysis on the 2010 through 2018 water quality data in an effort to explore the relationship between rainbow trout habitat utilization in Lake Spokane and the multitude of water quality attribute information that is available from the lake (Avista 2020c).

The Lake Spokane DO WQAP Annual, Five-Year and Eight-Year Reports provide a summary of the baseline monitoring, implementation activities, effectiveness of the implementation activities, and proposed actions of the upcoming year. The implementation activities' goals are primarily related to improving DO in the lake. These measures likely have a secondary positive impact on water temperatures in the lake.

- **Cold Water Fish Habitat Evaluation** – Avista continued to evaluate cold water fish habitat in Lake Spokane. Based on a 16°C thermal standard and an 8.0 mg/L DO standard, water quality data within Lake Spokane suggests that rainbow trout are likely inhabiting cooler water in the metalimnion and upper portions of the hypolimnion. In addition, the habitat volumes for temperature and DO together, as well as separately, suggest that temperature is restricting habitat more than DO.

Interestingly, and as discussed in the Lake Spokane DO WQAP Eight-Year Report (Avista 2020c), results from Avista's multi-year fish population and habitat assessment for rainbow trout indicate rainbow trout in Lake Spokane are inhabiting the epilimnion during the summer months, frequently surpassing the 16°C temperature and 8.0 mg/l DO standards. This is based on results of tagged rainbow trout, tracked throughout the reservoir from early July through November in 2017 and April through October of 2018. Avista will continue to work with Ecology and WDFW to further evaluate the results of the rainbow trout habitat assessment, in conjunction with lake-wide water quality parameters, with the goal of obtaining a better understanding of Lake Spokane's core summer salmonid habitat.

- **Hangman Creek Basin Shoreline Stabilization and Agricultural Practices** - Avista continues to track plans and progress addressing erosion control in the Hangman Creek Basin by participating in meetings, including the Spokane Conservation District's Hangman Creek Bi-State Watershed Project and Ecology's Spokane River and Lake Spokane DO TMDL Advisory Committee meetings.
- **Upper Hangman Creek Wetland Restoration-** Avista and the Coeur d'Alene Tribe have acquired approximately 1,022 acres on upper Hangman Creek, within the southern portion of the Coeur d'Alene Tribe Reservation in Benewah County, Idaho approximately 10 miles east of the Washington-Idaho

Stateline. Site-specific wetland management plans are updated annually for approximately 500-acres of these properties and include establishing long-term, self-sustaining native emergent, scrub-shrub and/or forested wetlands, riparian habitat and associated uplands, through preservation, restoration and enhancement activities. These properties were all previously in agricultural use and include straightened creek beds prior to the acquisition. Given Hangman Creek is a significant contributor of sediment and associated phosphorus loading to the Spokane River, Avista anticipates a TP load reduction from the wetland mitigation work. Since 2013, approximately 14,649 native tree and shrub species have been planted on this wetland complex. Avista continues to maintain and replace trees as needed.

- **Wetland Restoration/Enhancement** – In 2017, Avista acquired the 109-acre Sacheen Springs property, located on the west branch of the Little Spokane River. This property contains a highly valuable wetland complex with approximately 59 acres of emergent, scrub-shrub and forested wetlands and approximately 50 acres of adjacent upland forested buffer. Several seeps, springs, perennial and annual creeks are also found on the property. Avista completed a detailed site-specific wetland management plan and began implementing it upon Ecology and FERC’s approval in 2014. Herbicide application to control terrestrial invasive weeds was completed in 2014, 2015, and 2016 which should help improve the overall biodiversity and function of the wetland property. The property was purchased “in fee” and in 2017, Avista pursued a conservation easement in order to protect it in perpetuity. Activities conducted during 2018 included several site visits to monitor site conditions, identify future maintenance activities and control invasive weeds in accordance with the site-specific wetland management plan. Invasive weed control measures included herbicide treatment of 8.5 acres, primarily to control infestation of Reed canary grass, an invasive species present along the access road. Activities conducted during 2019 included: (a) monitoring the effectiveness of previous treatments on reducing the area occupied within two stands of reed canarygrass monocultures, (b) completing the Sacheen Springs Wetland Five-Year Monitoring Report 2014-2018, (c) constructing a new gate with a wing fence across the road along the Avista property boundary, (d) removing 600-feet of old 3-strand barbed wire fence along the property boundary, and (e) finalizing a conservation easement on the property with the Inland Northwest Land Conservancy in August 2019.
- **Little Spokane Wetland & Shoreline Restoration** - As part of the Nine Mile Hydroelectric Development’s Rehabilitation Program, Avista partnered with the Washington State Parks and Recreation Commission Parks (State Parks) to complete a wetland and shoreline restoration project on four acres within the Little Spokane Natural Area Preserve. The Natural Area Preserve is a popular location for recreation, however two invasive weed species, yellow flag iris and purple loosestrife, have severely constricted large sections of the river and adjacent shoreline. The mitigation project included herbicide treatments on four acres of yellow flag iris and purple loosestrife invasive weed species during 2014 and 2015. Additionally, in 2014 four trees were removed from

the Nine Mile barge landing site and relocated to the Little Spokane River Mitigation Site for large woody debris habitat. After two consecutive years of herbicide applications the stands of invasive weeds greatly reduced by an estimated 90%-100%. Also, during 2015, Avista partnered with the Washington Department of Natural Resources to implement re-vegetation of the site which included planting 400 trees and shrubs (black cottonwoods, quaking aspens, chock cherry and red osier dogwood). Individual plants were enclosed with four foot welded wire fencing for protection from browsing and the base was wrapped with a protective sleeve for protection from small mammals, and herbicide spot treatments are completed as well. During 2018, Avista conducted several site visits to monitor site conditions and conduct maintenance activities such as, noxious weed control by mechanical and chemical means, and fence repair and removal. Avista transferred the long-term maintenance of this project back to State Parks (owner of the property) in 2019, having fulfilled the project components.

- **Floating Treatment Wetland** - Avista partnered with the Stevens County Conservation District (SCCD) and Spokane Community College (SCC) to install a floating wetland in the downstream portion of Lake Spokane, adjacent to Avista owned shoreline. The purpose of the floating wetland is for potential TP removal and wave attenuation, as well as to gain information on plant species growth and fish habitat. The floating wetland was installed during the spring of 2018 and consists of two 40-foot long log structures (each consisting of three logs bolted together), located approximately 100 feet from the shore. During June of 2018, SCC students assembled approximately 20 floating wetland platforms, anchored the platforms to the log structure, and planted the platforms with approximately 240 plants (including, but not limited to sedge, rush, willow, and bulrush species). Throughout the summer season, the SCC students monitored the site for plant survivability, presence of invasive plants, wildlife activity, fish habitat, and shoreline wave impacts. The floating wetland platform was removed in October and approximately 180 of the plants were planted along the adjacent shoreline. Three plant samples (two sedge and one rush) were submitted for total phosphorus and total nitrogen analyses in order to get a rough estimate of the total phosphorus and nitrogen removed by the plants. Additionally, basic field water quality parameters were collected, including the deployment of temperature logger arrays.

In June 2019, SCC constructed and installed 30 wetland structures. Avista supplemented this effort with 12 additional wetland structures planted with 200 common rush and 400 beaked sedge seedlings. SCC conducted similar monitoring to 2018, including water quality monitoring, minimal plant tissue nutrient analysis and underwater video recording. Avista focused monitoring efforts in 2019 on both plant biomass changes and wave attenuation potential. To measure biomass changes, the above-ground biomass was collected on 8 random seedlings prior to planting, four rush and four sedge. Weight and moisture content was recorded. In October, during structure removal, the above-water biomass weight and moisture content was recorded. Additionally,

a wave attenuation pilot study was conducted in October 2019 to measure any affect the floating wetland may have on dissipating wave energy. Results from the wave study indicate that waves behind the floating wetlands were slightly smaller in height and contain slightly fewer wave peaks per wave set. Other factors that may have influenced these results are the topography of the lake bed along the shoreline and spatial variability in the waves. Without further testing no definite conclusion can be made regarding wave attenuation by the floating wetland.

- **Land Protection** - Avista previously identified approximately 215 acres of land that was used for grazing under lease from Washington State Department of Natural Resources (DNR). This land is located within the south half of Section 16 in Township 27 North, Rand 40 E.W. M. in Stevens County. Avista and State Parks pursued a lease for the 215 acres of land from DNR with the intent of changing the land use. DNR leased the property to State Parks in 2017 for public recreation, and therefore no longer allows grazing on this property.

In addition, Avista owns over 1,000 acres of land, of which approximately 350 acres are located within 200 feet of the Lake Spokane shoreline in Spokane, Stevens, and Lincoln counties at the downstream end of the reservoir. This includes approximately 14-miles of Avista-owned shoreline that is managed in accordance with Avista's, FERC approved, Spokane River Project Land Use Management Plan (Avista 2016b). For the most part this land is contiguous along the north and south shorelines and is managed primarily for conservation purposes. Specific details related to Avista's land use management activities are included in the Land Use Management Plan, a copy of which is available upon request. In August 2019, Avista finalized a conservation easement with the Inland Northwest Land Conservancy to permanently protect the properties located along the south shore of Lake Spokane.

- **Bulkhead Removal** - During 2019, Avista worked with several Lake Spokane shoreline landowners in Spokane County to replace existing concrete, stacked rock, riprap, or other similar hardened bulkheads with natural shoreline materials or those that utilize bioengineered products that use native vegetation, when and where possible. The 2018/2019 winter drawdown allowed construction to begin on one of these bulkhead replacement projects, the Wright Project, located just downstream of Sportsman's Paradise. Construction was completed in January 2019 and plantings were installed in April 2019. The Wright Project is intended to help reduce non-point source phosphorus loading into Lake Spokane and will be used as a prototype to educate other Lake Spokane shoreline homeowners about how they too can improve water quality in Lake Spokane by these types of projects.
- **Carp Population Reduction Program** – In 2019, Avista implemented the third year of its common carp (*Cyprinus carpio*) removal program on Lake Spokane. The removal effort was done in cooperation with WDFW and the

Spokane Tribe of Indians, and completed under a Scientific Collection Permit issued by WDFW.

The removal effort occurred during two, four day sampling events; May 20 through 23 and June 3 through 5, and focused on sampling carp during their spring spawning behavior. A total of 577 carp were collected along with 653 other fish considered by-catch. All carp were removed from the water and placed into a refuse bin and transported to the Greater Wenatchee Regional Landfill for disposal. The 577 carp collected in 2019 totaled approximately 5,432 lbs of biomass being completely removed from the watershed. Using the average total phosphorus to weight ratio, provided in the ALS Environmental 2018 lab analysis, removal was calculated to be 28.9 lbs of total phosphorus in 2019 (Table 26). Combining the 2017, 2018, and 2019 carp removal sampling, a total of 143 lbs of total phosphorous has been removed from Lake Spokane by Avista's carp reduction program. That number does not quantify the amount of phosphorous that will no longer be re-activated in the water column by excretion or bioturbation (during the feeding and spawning behavior of these carp).

- **Long Lake HED Turbine Aeration and Tailrace DO Monitoring** – Avista will continue to refine implementation of turbine aeration that was initiated in 2010, based on real-time water quality measurements that are monitored 0.6 miles downstream of Long Lake Dam from July 1 through October 30. Avista also will continue to coordinate results with the DO TMDL efforts, and evaluate the need for additional DO enhancement measures in accordance with the FERC-approved schedule (FERC 2010).
- **Long Lake Dam Spillway Modification Project for TDG Abatement and Monitoring** Avista completed construction of the Long Lake Dam spillway modifications for the TDG project in December 2016. The performance of the structural modifications and spillgate protocols were evaluated during 2017 and 2018. Water quality monitoring is also being conducted (2017 through 2019) in order to confirm the effectiveness of the spillway modifications and spillgate operations. Results of the 2017 and 2018 water quality monitoring indicate TDG values downstream are frequently below incoming values at higher flows, suggesting the spillway modification project has positively influenced TDG percent saturation downstream (Avista 2018c and 2019c). TDG water quality data collected at Long Lake Dam in 2019 was incomplete due to TDG and DO probe sensors issues and could not be reliably used to evaluate the spillways effectiveness (Avista 2020a).

5.0 DISCUSSION

5.1 Lake Spokane

Temperature profile monitoring was not conducted in Lake Spokane during 2019. Measurements at both the Spokane River at Nine Mile Bridge station and Little Spokane River station did not exceed the 20.0°C criterion.

5.2 Long Lake Dam Tailrace

The 20.0°C Washington State criterion was not exceeded at LLTR in 2019, reaching a maximum temperature of 19.6°C (Table 3-3).

Monitoring results indicate the Spokane Tribe's 7-DADM criteria established for tribal waters were exceeded at LLTR from May 16 through May 31, and July 7 through October 28 (Table 5-1, Figure 5-1). It is important to note the LLTR monitoring station, from which 2019 temperature data were collected, is located approximately 0.6 miles upstream from the reservation boundary where the Tribe's criteria is applicable.

As part of a non-License Agreement, Avista provides the Spokane Tribe with funds to complete water quality improvements to help address temperature exceedances, along with other water quality improvement needs downstream of the Project. To date, the Spokane Tribe has planted trees and completed stream stabilization efforts in the Chamokane Creek watershed to reduce surface water temperatures. Avista and the Spokane Tribe will continue working together in the future to improve water quality within the reservation. These projects relate to DO, TDG, and temperature within the reservation.

6.0 PROPOSED CHANGES TO THE TEMPERATURE WQAP AND WQM QAPP

6.1 Spring Season Monitoring

Avista plans to monitor TDG at LLTR and LLGEN during the high-flow season (typically March/April through June) in 2020.

6.2 Summer Season, Tailrace Monitoring

As approved by Ecology in 2015, Avista will continue to monitor summer critical season water quality at the LLTR station, but not at LLFB because the complex hydraulic dynamics near the forebay intake cause substantial temperature variability near the dam over short time periods.

6.3 Summer Season, Lake Spokane Monitoring

Avista will not monitor water quality in Lake Spokane in the summer of 2020, but will continue exploring the relationship between rainbow trout habitat utilization in Lake Spokane and the multitude of water quality attribute information that is available from the lake. This detailed analysis may be helpful in understanding the complex connections between fish habitat utilization, water quality, and zooplankton/phytoplankton data available for Lake Spokane. Results of analysis could be used to more accurately assess the core summer salmonid habitat available in Lake Spokane or identify data gaps in the existing water quality data. We anticipate the results of past and future sampling may be incorporated in the CEQUAL-W2 model as a means to extrapolate the point data to help characterize habitat in the entire reservoir.

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TABLES

Table 2-1: Long Lake HED Temperature Monitoring Stations and Periods.

Monitoring Station	Location	NAD83 Decimal Degrees		2019 Monitoring Year	
		Latitude	Longitude	Start	End
54A090	Spokane River at Nine mile Bridge approximately 0.2 miles downstream of Nine Mile Dam, at river mile (RM) 58	47.7767	117.5448	1/15/2019	11/6/2019
55B070	On the Little Spokane River approximately 1.5 miles upstream from its confluence with Lake Spokane, at RM 1.1	47.7829	117.5305	1/15/2019	11/6/2019
LLTR	On left downstream bank, at water pump house approximately 0.6 mile downstream from Long Lake Dam.	47.8375	117.8503	3/28/2019	10/31/2019
54A070	Approximately 0.6 mile downstream of Long Lake Dam, at the Highway 231 Bridge and RM 33.3.	47.8391	117.8525	Not Available	

Table 3-1: Spokane River at Nine Mile Bridge (54A090) Temperature Monitored in 2019.

Date	Maximum Daily Water Temperature (°C)
01/15/19	4.5
02/13/19	3.9
03/12/19	5.9
04/16/19	5.3
05/14/19	13.2
06/11/19	16.4
07/16/19	15.8
08/13/19	15.1
09/17/19	14.2
10/09/19	10.9
11/06/19	8.2

Notes:

On January 30, 2020, accessed preliminary data from Ecology's website:

<https://apps.ecology.wa.gov/eim/search/Eim/EIMSearchResults.aspx?ResultType=EIMTabs&LocationUserIds=54A090&LocationUserIdSearchType=Contains&LocationUserAliasSearchFlag=True&FieldActivityDateRangeBeginning=1%2f1%2f2019+12%3a00%3a00+AM&FieldActivityDateRangeEnding=12%2f31%2f2019+12%3a00%3a00+AM>.

The 20.0°C criterion was not exceeded at this monitoring location in 2019.

Table 3-2: Little Spokane River Upstream of Lake Spokane (55B070) Temperature Monitored in 2019.

Date	Maximum Daily Water Temperature (°C)
01/15/19	4.5
02/13/19	5.9
03/12/19	6.4
04/16/19	9.2
05/14/19	13.4
06/11/19	15.5
07/16/19	13.8
08/13/19	13.7
09/17/19	11.8
10/09/19	9.1
11/06/19	6.9

Notes:

On January 30, 2020, accessed preliminary data from Ecology's website:
<https://apps.ecology.wa.gov/eim/search/Eim/EIMSearchResults.aspx?ResultType=EIMTabs&LocationUserIds=55B070&LocationUserIdSearchType=Contains&LocationUserIDAliasSearchFlag=True&FieldActivityDateRangeBeginning=1%2f1%2f2019+12%3a00%3a00+AM&FieldActivityDateRangeEnding=12%2f31%2f2019+12%3a00%3a00+AM>.

The 20.0°C criterion was not exceeded at this monitoring location in 2019.

Table 3-3: LLTR Daily Maximum Temperature in 2019.

Day	Water Temperature (°C)							
	March	April	May	June	July	August	September	October
1		7.6	N/A	15.1	18.1	19.4	19.0	15.5
2		7.4	N/A	15.7	18.0	19.2	18.9	15.2
3		7.4	9.3	15.4	18.3	18.9	18.9	14.9
4		7.3	9.3	15.8	18.4	19.2	19.0	14.7
5		7.4	9.4	16.2	18.9	19.1	18.8	14.5
6		7.3	9.6	16.1	18.6	19.0	18.7	14.3
7		7.3	10.1	15.9	18.3	19.1	18.8	14.1
8		7.3	11.0	16.2	18.3	19.3	18.7	14.0
9		7.2	11.6	16.1	18.6	19.1	18.6	14.0
10		6.9	11.5	N/A	18.7	19.5	18.4	13.7
11		6.8	11.7	N/A	18.6	19.3	18.2	13.4
12		6.7	12.7	N/A	18.8	19.3	18.3	13.1
13		6.6	12.7	N/A	18.6	19.4	18.2	13.0
14		6.6	12.9	N/A	18.6	19.3	18.0	12.9
15		6.6	13.6	N/A	19.1	19.3	18.2	12.6
16		N/A	14.0	N/A	19.1	19.4	17.7	12.5
17		N/A	14.1	N/A	18.8	19.3	17.9	12.5
18		N/A	14.3	N/A	18.4	19.2	17.6	12.1
19		N/A	14.5	N/A	18.6	18.9	17.6	11.9
20		N/A	14.4	N/A	18.5	N/A	17.5	12.0
21		N/A	14.4	N/A	19.1	19.4	17.4	11.9
22		N/A	14.6	N/A	18.8	19.2	17.3	11.9
23		N/A	14.5	N/A	18.9	19.6	17.2	11.6
24		N/A	14.4	N/A	18.7	19.4	16.6	11.6
25		N/A	14.5	N/A	18.8	18.9	16.5	11.8
26		N/A	14.8	N/A	18.9	19.1	16.4	11.5
27		N/A	14.7	N/A	18.7	19.4	16.3	11.3
28	7.0	N/A	14.3	N/A	19.2	19.2	16.4	11.3
29	6.9	N/A	14.4	N/A	19.0	19.4	16.0	11.0
30	6.9	N/A	14.7	N/A	19.3	19.5	15.8	10.9
31	6.8		14.8		19.3	19.5		10.7

Table 5-1: Comparison of LLTR 2019 Values to Spokane Tribe WQ Standards.

Day	Water Temperature (°C)							
	March	April	May	June	July	August	September	October
1		7.2	N/A	15.1	N/A	19.2	19.2	15.5
2		7.3	N/A	15.4	N/A	19.2	19.1	15.2
3		7.3	N/A	15.6	N/A	19.2	19.0	15.0
4		7.4	N/A	15.7	18.4	19.1	18.9	14.7
5		7.3	N/A	15.9	18.4	19.1	18.8	14.5
6		7.3	10.0	15.9	18.5	19.1	18.8	14.3
7		7.2	10.4	N/A	18.6	19.2	18.7	14.2
8		7.2	10.7	N/A	18.6	19.2	18.6	14.0
9		7.1	11.2	N/A	18.6	19.2	18.5	13.8
10		7.0	11.6	N/A	18.6	19.3	18.5	13.6
11		6.9	12.0	N/A	18.6	19.3	18.3	13.4
12		6.8	12.4	N/A	18.7	19.3	18.3	13.2
13		N/A	12.7	N/A	18.8	19.3	18.1	13.0
14		N/A	13.1	N/A	18.8	19.3	18.0	12.8
15		N/A	13.5	N/A	18.8	19.3	18.0	12.7
16		N/A	13.7	N/A	18.7	19.2	17.9	12.5
17		N/A	14.0	N/A	18.7	N/A	17.8	12.3
18		N/A	14.2	N/A	18.8	N/A	17.7	12.2
19		N/A	14.3	N/A	18.8	N/A	17.5	12.1
20		N/A	14.4	N/A	18.7	N/A	17.5	12.0
21		N/A	14.4	N/A	18.7	N/A	17.3	11.9
22		N/A	14.5	N/A	18.8	N/A	17.1	11.8
23		N/A	14.5	N/A	18.8	N/A	17.0	11.8
24		N/A	14.5	N/A	18.8	19.3	16.8	11.7
25		N/A	14.5	N/A	18.9	19.3	16.7	11.6
26		N/A	14.5	N/A	18.9	19.3	16.5	11.4
27		N/A	14.5	N/A	18.9	19.3	16.3	11.3
28		N/A	14.6	N/A	19.0	19.3	16.1	11.2
29		N/A	14.7	N/A	19.1	19.3	15.9	N/A
30		N/A	14.8	N/A	19.2	19.3	15.7	N/A
31	7.2		14.9		19.2	19.2		N/A

FIGURES

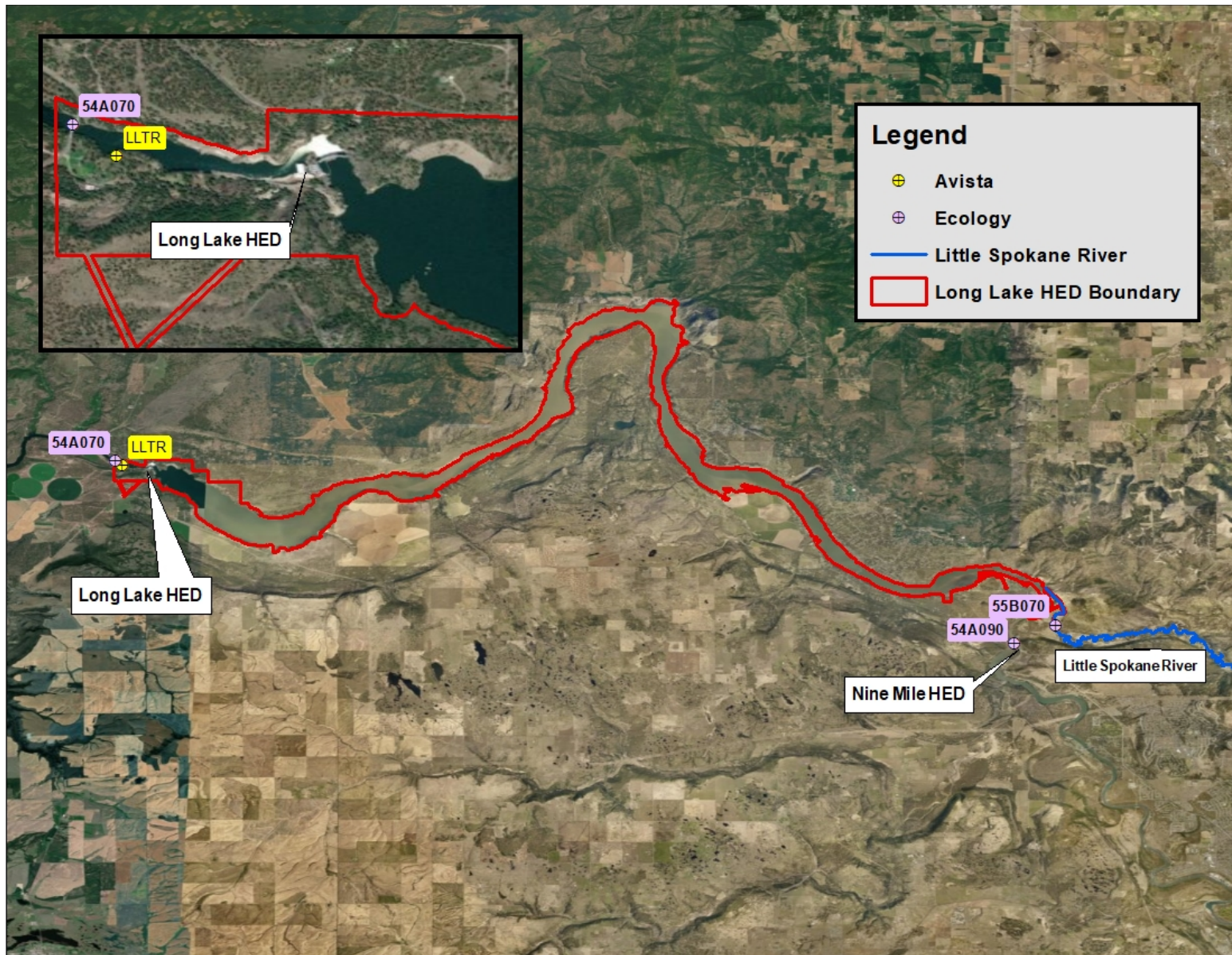


Figure 2-1: Long Lake HED 2019 Temperature Monitoring Stations.

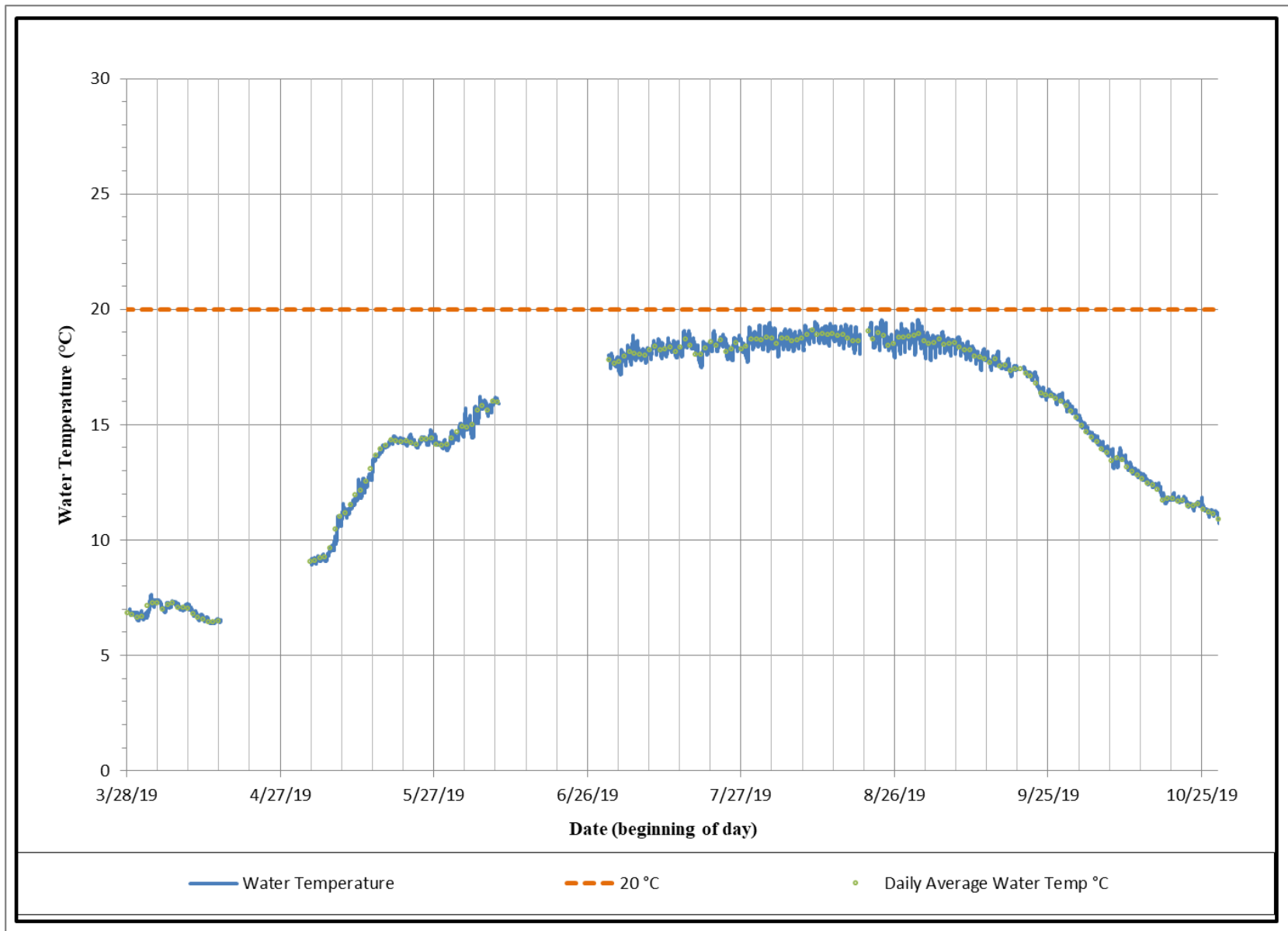


Figure 3-1: LLTR Temperature Time Series, 2019.

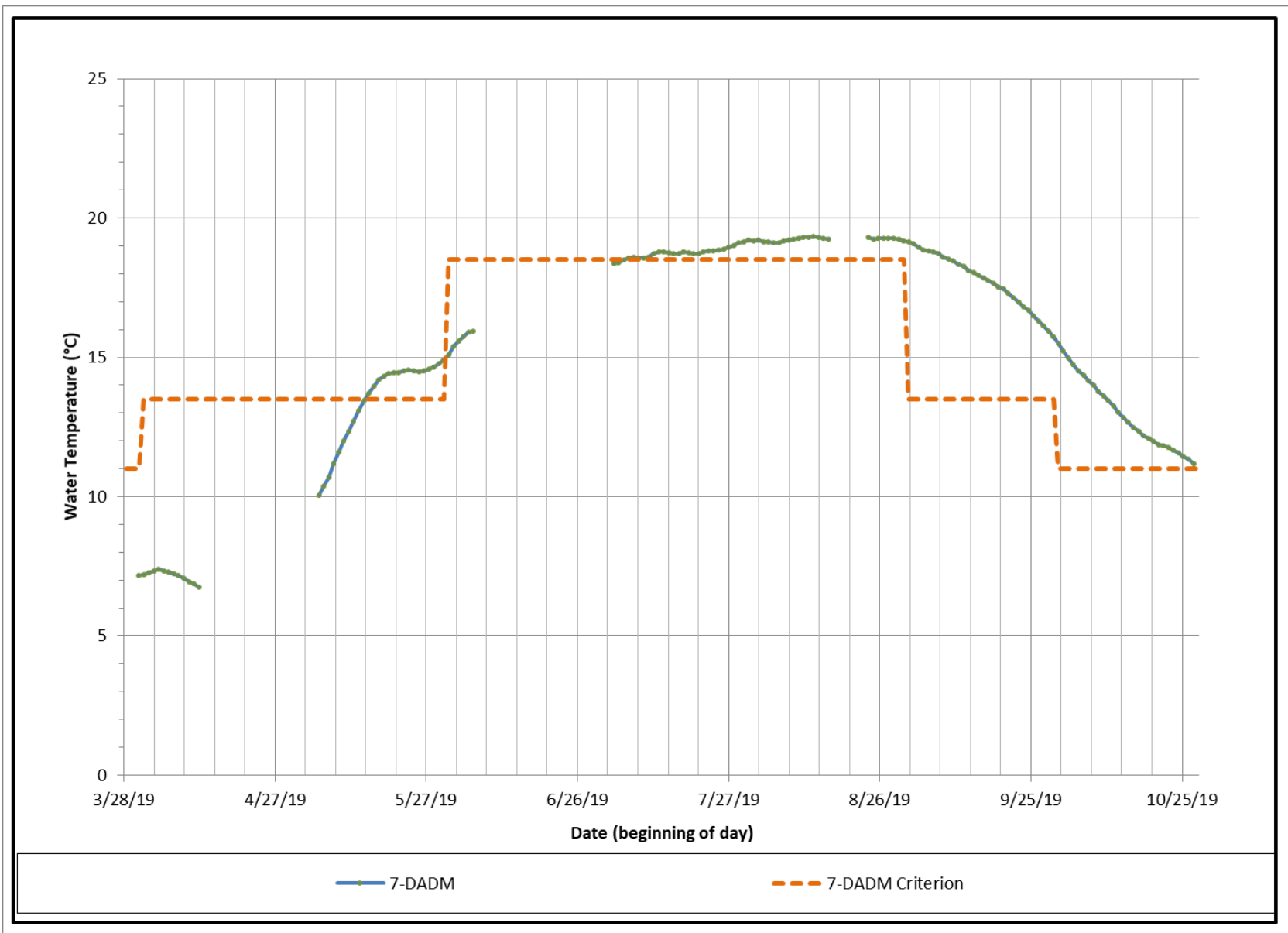


Figure 5-1: LLTR 7-DADM Time Series, 2019.

APPENDIX A
CONSULTATION RECORD



1411 East Mission Avenue
PO Box 3727
Spokane, WA 99220-3727

February 25, 2020

Chad Atkins, Water Quality Program
Washington Department of Ecology
Eastern Regional Office
4601 N Monroe Street
Spokane, WA 99205-1295

**Subject: Spokane River Hydroelectric Project, FERC Project No. 2545
2019 Long Lake Hydroelectric Development Temperature Monitoring
Report**

Dear Chad:

I have enclosed the 2019 Long Lake Hydroelectric Development Temperature Monitoring Report (Temperature Monitoring Report) for your review and approval. The Temperature Monitoring Report was completed in accordance with the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan, which was required by the Federal Energy Regulatory Commission (FERC) Spokane River Hydroelectric Project License Appendix B, Section 5.5.B.

We request your review and approval by **March 31, 2020**. This will allow us time to incorporate your comments and recommendations as appropriate, and submit the Temperature Monitoring Report to FERC by April 15, 2020.

Please feel free to call me at (509) 495-4084 or Meghan Lunney at (509) 495-4643 if you have any questions about the Temperature Monitoring Report.

Sincerely,

Chris Moan
Fisheries Habitat Biologist

Enclosure (1)

cc: Chad Brown, Ecology
Brian Crossley, Spokane Tribe
Meghan Lunney, Avista

From: Bauer, Jordan (ECY) <jbau461@ECY.WA.GOV>
Sent: Monday, April 6, 2020 4:24 PM
To: Moan, Chris; Lunney, Meghan
Cc: Atkins, Chad (ECY)
Subject: [External] RE: Request for Ecology Review and Approval – Avista 2019 Long Lake HED Temperature Monitoring Report – Section 5.5 Spokane River Hydroelectric Project No. 2545

Dear Chris Moan,

The Department of Ecology (Ecology) has reviewed Avista's submittal of the *2019 Long Lake HED Temperature Monitoring Report*. This report was received by Ecology on February 25, 2020. The report is required in accordance with Section 5.5 (B) of Ecology's 401 Certification (Certification) and consistent with Spokane River Hydroelectric Project No. 2545 (License).

The purpose of this e-mail is to inform you that Ecology *approves* this report as meeting all the requirements of reporting defined in Section 5.5 of the Certification. We acknowledge the proposed changes to temperature monitoring and proposed activities for the 2020 season.

Ecology looks forward to future discussions as we continue to evaluate temperature in the Spokane River system and its' relationship with ongoing implementation projects in Lake Spokane. Please feel free to contact me with any questions.

Sincerely,

*Jordan Bauer
Hydropower Compliance Coordinator
Washington Department of Ecology
Water Quality Program
(509) 590-5486*

USE CAUTION - EXTERNAL SENDER

Do not click on links or open attachments that are not familiar.

For questions or concerns, please e-mail phishing@avistacorp.com

ECOLOGY COMMENTS AND AVISTA RESPONSES

Ecology Comment

Ecology acknowledged that the 2019 Long Lake HED Temperature Monitoring Report is required in accordance with Section 5.5 (B) of Ecology's 401 Certification (Certification) and consistent with Spokane River Hydroelectric Project No. 2545 (License).

Avista Response

Comment noted.

Ecology Comment

Ecology approves the 2019 Long Lake HED Temperature Monitoring Report as meeting all the requirements of reporting defined in Section 5.5 of the Certification.

Avista Response

Avista appreciates Ecology's approval of the 2019 Long Lake HED Temperature Monitoring Report.

Ecology Comment

Ecology acknowledges Avista's proposed changes to temperature monitoring and proposed activities for the 2020 season.

Avista Response

Comment noted.

Ecology Comment

Ecology looks forward to future discussions as we continue to evaluate temperature in the Spokane River system and its' relationship with ongoing implementation projects in Lake Spokane.

Avista Response

Avista looks forward to continued collaboration and discussions with Ecology in evaluating water temperature in the Spokane River system.



1411 East Mission Avenue
PO Box 3727
Spokane, WA 99220-3727

February 25, 2020

Brian Crossley
Water and Fish Program Manager
Spokane Tribe Natural Resources
P.O. Box 480
Wellpinit, WA 99040

**Subject: Spokane River Hydroelectric Project, FERC Project No. 2545
2019 Long Lake Hydroelectric Development Temperature Monitoring Report**

Dear Brian:

I have enclosed the 2019 Long Lake Hydroelectric Development Temperature Monitoring Report (Temperature Monitoring Report) for your review and comment. The Temperature Monitoring Report was completed in accordance with the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan, which was required by the Federal Energy Regulatory Commission (FERC) Spokane River Hydroelectric Project License Appendix B, Section 5.5.B.

Per the October 2008 Settlement Agreement between Avista and the Spokane Tribe, we would like to receive any comments that you may have on the Temperature Monitoring Report by **March 31, 2020**. This will allow us time to incorporate your comments as appropriate, and submit the Temperature Monitoring Report to FERC by April 15, 2020.

Please feel free to call me at (509) 495-4084 or Meghan Lunney at (509) 495-4643 if you have any questions about the Temperature Monitoring Report.

Sincerely,

Chris Moan
Fisheries Habitat Biologist

Enclosure (1)

cc: Chad Atkins, Ecology
Meghan Lunney, Avista



Spokane Tribal Natural Resources

P.O. Box 480 • Wellpinit, WA 99040 • (509) 626 - 4400 • fax 258 - 9600

3/31/2020

Chris Moan, Avista Corp.
1411 East Mission Avenue
PO Box 3727 MSC-25
Spokane WA 99220

Dear Chris:


Casey Flanagan, my staff Project Manager, and I have reviewed the 2019 total dissolved gas, dissolved oxygen and temperature monitoring reports. These reports focus on Long Lake Dam and its effects on dissolved oxygen, total dissolved gas and temperature.

The dissolved oxygen (DO) mitigation continues to improve below the dam by an increased quantity of fish sampled. Non-generation dissolved oxygen levels are not adequately characterized and in the last paragraph of the results section it talks about only meeting the DO criteria during generation, whereas the 1st paragraph in the Discussion includes non-aeration times in the determination of success in meeting the 110% criterion. Naturally there would not have been high levels at the site during these time periods. DO was less than the 8 mg/L 49.7% of the non-generation hours and was measured as low as 6.5 mg/L in August.

With respect to Total Dissolved Gas (TDG) the spill deflectors reduce the TDG however the range of TDG measurements was not provided. Reporting TDG similar to DO would be helpful in showing the exceedences of the standards by the percentage of the study period.

Temperature in the Spokane River continues to exceed standards through the summer and fall, which can be detrimental to native salmonid species living within Little Falls Pool and within the Spokane Arm of Lake Roosevelt. During the monitoring period Avista tracked trout in Lake Spokane but no water quality data is provided. An interflow layer exists in Lake Spokane where temperatures are conducive to salmonid rearing however is there enough oxygen within that layer to support their normal activities.

Sincerely,


Brian Crossley
Water & Fish Program Manager
crossley@spokanetribe.com

cc: Patrick McGuire, Dept. of Ecology
BJ Kieffer, Director Dept. of Natural Resources
Danny Kieffer, Tribal Council

SPOKANE TRIBE OF INDIANS COMMENTS AND AVISTA RESPONSES

Spokane Tribe of Indians (STOI) Comment

Temperature in the Spokane River continues to exceed standards through the summer and fall, which can be detrimental to native salmonid species living within Little Falls Pool and within the Spokane Arms of Lake Roosevelt.

Avista Response

Water temperatures at Avista's downstream monitoring location (LLTR) did not meet the Spokane Tribe's water quality standards from July through October in 2019, but met the Washington State Lower Spokane River criterion, with water temperatures remaining below 20.0 °C in 2019.

As part of a non-License Agreement, Avista provides the Spokane Tribe with funds to complete water quality improvements to help address temperature exceedances, along with other water quality improvement needs downstream of the Project. To date, the Spokane Tribe has planted trees and completed stream stabilization efforts in the Chamokane Creek watershed to reduce surface water temperatures. Avista and the Spokane Tribe will continue working together in the future to improve water quality within the Reservation. Based on the continued high summer and fall water temperatures downstream of Long Lake HED, Avista is open to focusing mitigation efforts on projects downstream of Long Lake HED that influence water temperature.

STOI Comment

During the monitoring period Avista tracked trout in Lake Spokane, but no water quality data is provided.

Avista Response

Avista tracked rainbow trout in Lake Spokane during 2017 and 2018. A summary of the 2017 and 2018 results are as follows:

Of the twenty fish tagged during 2017, thirteen were found on a consistent basis. Tagged fish were found in depths ranging between 0 -16 meters from the surface of the water. Fish were found lower in the water column in July averaging slightly over 6 meters in depth, compared to average depths ranging from 1.8 to 3.2 meters in August through October. These fish occupied water temperatures ranging from 8.4 °C in November to 23.6 °C in mid-August. Fish were frequently found above 16 °C in late summer. In fact, during one tracking event on September 8, 2017, seven fish were found inhabiting water that was above 20 °C.

Twenty-one of the twenty-five fish tagged in 2018 were detected at some point in 2018, along with an additional six tags detected from fish that were tagged in 2017. Individual fish depth selections did not vary substantially throughout the season with two patterns emerging. Rainbow trout were either found at less than 6 meters below the surface of the water or between 6 to 15.6 meters.

Fish that remained close to the surface in July and August experienced a temperature range of 18.0 to 20.4 °C. Three fish found deeper in the water column were found at

temperatures averaging 15.6 °C. In September, water temperatures began to decrease, staying at or below 19.6 °C and falling to below 14.8 °C for the remainder of the season for the fish near the surface. Overall, in 2018, a majority of fish selected depths near the surface, in the epilimnion, resulting in the fish staying at much warmer temperatures than anticipated. The temperatures in the epilimnion during the warmer months of summer reach the rainbow trout upper limits of presumed preference, which corresponds with the trends seen in 2017.

Further details about the rainbow trout tracking study can be found in Avista's Lake Spokane Dissolved Oxygen Water Quality Attainment (DO WQAP) 2017 and 2018 Annual Summary Reports, as well as the DO WQAP Eight Year Report or by contacting Chris Moan at 509-495-4084.

STOI Comment

An interflow layer exists in Lake Spokane where temperatures are conducive to salmonid rearing however is there is enough oxygen within that layer to support their normal activities.

Avista Response

Yes, Lake Spokane has an interflow layer which typically develops in July and lasts throughout the summer. A thorough analysis of rainbow trout location relative to water quality parameters are described in Avista's DO WQAP Eight Year Report, which is available upon request. Overall, data from fish tracking efforts in 2017 and 2018 indicate that stocked rainbow trout in Lake Spokane were utilizing warmer habitat than expected. In late August and September 2018, colder habitat was available in the upper portions of the reservoir with sufficient dissolved oxygen levels but none of the tagged fish were found in those areas. The tagged fish appeared to mostly use the area of the reservoir from near the State Parks Riverside boat launch to Sportsman's Paradise and were primarily found within the epilimnion of the water column.